Attachment K

MPSC Case No. U-21775, MPSC Order, August 21, 2025

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

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In the matter, on the Commission's own motion, to open a docket for load serving entities in Michigan to file their capacity demonstrations for the 2028/2029 planning year as required by MCL 460.6w.	)	Case No. U-21775
In the matter, on the Commission's own motion, to open a docket for load serving entities in Michigan to file their capacity demonstrations for the 2029/2030 planning year as required by MCL 460.6w.	)	Case No. U-21907

At the August 21, 2025 meeting of the Michigan Public Service Commission in Lansing, Michigan.

PRESENT: Hon. Daniel C. Scripps, Chair
Hon. Katherine L. Peretick, Commissioner
Hon. Shaquila Myers, Commissioner

ORDER

Background and Procedural History

Public Act 3 of 1939, as amended by Public Act 341 of 2016 (Act 341), MCL 460.6w(8) (Section 6w(8)), requires each electric utility, alternative electric supplier (AES), cooperative electric utility, and municipally owned electric utility to demonstrate to the Commission, in a format determined by the Commission, that each load serving entity (LSE) owns or has contractual rights to sufficient capacity to meet its capacity obligations as set by the appropriate

independent system operator (ISO), or the Commission, as applicable.[1] This is known as a state reliability mechanism (SRM) capacity demonstration.

Act 341 states that regulated electric utilities' capacity demonstration filings are due by December 1 each year, with filings by AESs, cooperatives, and municipally owned electric utilities due by the seventh business day in February each year. MCL 460.6w(8)(a)-(b). However, the statute also allows the Commission to adjust these dates to ensure proper alignment with the ISO's procedures and requirements. MCL 460.6w(10). In the September 15, 2017 order in Case No. U-18197 (September 15 order), the Commission adopted a format for the capacity demonstration filings required by Section 6w(8), including templates for reporting and for affidavits.[2] Each year, the Commission opens a docket for the purpose of receiving those filings, and sets due dates for the filings and for the Commission Staff's (Staff's) report providing an analysis of the sufficiency of each LSE's capacity demonstration.

In the August 22, 2024 order in Case Nos. U-21393 *et al*. (August 22 order), the Commission opened the docket in Case No. U-21775 for the purpose of receiving the LSEs'

[1] MCL 460.6w(12)(a) defines the appropriate ISO as the Midcontinent Independent System Operator, Inc. (MISO). MCL 460.6w(11) also states that "[n]othing in this act shall prevent the commission from determining a generation capacity charge under the reliability assurance agreement, rate schedule FERC [Federal Energy Regulatory Commission] No. 44 of the independent system operator known as PJM Interconnection, LLC [PJM]. . . ."

[2] The filing requirements have been slightly modified in the intervening years. *See*, September 13, 2018 order in Case No. U-20154. In the March 17, 2019 order in Case No. U-20154, the Commission also approved a protective order for use with capacity demonstration filings. That protective order may also be used in Case No. U-21907 for the 2029/2030 capacity demonstration.

capacity demonstrations for the 2028/2029 planning year (PY).[3] In response to a shift to a seasonal capacity auction and other developments at MISO, the Commission adjusted the capacity demonstration filing dates as permitted under Section 6w(10) and directed larger investor-owned utilities (IOUs)[4] to file by February 24, 2025; smaller IOUs to file by March 3, 2025; and AESs, cooperatives, and municipally owned utilities to file by March 17, 2025. The Commission also directed the Staff to file its analysis of the demonstrations no later than May 12, 2025.

On February 27, 2025, the Commission issued an order in Case Nos. U-21393 *et al*. (February 27 order) granting a motion for clarification filed by Energy Michigan regarding the requirements applicable to the capacity demonstrations filed by AESs pursuant to Section 6w(8)(b). In the February 27 order, the Commission clarified the wording in the Capacity Demonstration Process and Requirements document and General Affidavit to align with its previously expressed interpretation that Section 6w's four-year forward capacity demonstration requirement does not prevent an LSE from entering into other capacity agreements or contracts outside of the original capacity contract after the LSE has made its capacity obligation. Specifically, the Commission revised the language in the Capacity Demonstration Process and Requirements document and General Affidavit to read, "commitment

[3] MCL 460.6w(8)(a) states that if an SRM is to be established, the Commission shall require, among other things, each electric utility to demonstrate by December 1 of each year that "for the planning year beginning 4 years after the beginning of the current planning year" that the utility owns or has contractual rights to sufficient capacity to meet its load obligations. Thus, the statute requires the capacity demonstrations to be four years out after the year the capacity demonstrations are required to be filed. As such, the capacity filings in Case No. U-21775 cover the 2028/2029 PY.

[4] A large IOU is considered to be an electric utility with one million customers or more, and a smaller IOU is considered to be an electric utility with less than one million customers.

to maintain the **contract** four years forward regardless of any early out provisions" rather than "commitment to maintain the **contracted amount** four years forward regardless of any early out provisions." February 27 order, p. 8 (emphasis in original to show revision); *see also*, *id*., Exhibits A, B, C, and D. The Commission also added language to the Capacity Demonstration Process and Requirements document, stating that "maintaining the contract four years forward" does not prohibit an LSE from selling surplus capacity to a buyer at some point in the future via a new contract. Additionally, the Commission included the following language in the revised Capacity Demonstration Process and Requirements document and General Affidavit to clarify that any surplus capacity sold must not be used by another LSE in that same year's demonstration to avoid the double counting of capacity: "Statements to achieve/maintain resources do not prohibit an LSE from entering into future transactions to sell surplus capacity provided that the same capacity is not used by another Michigan LSE as part of its capacity demonstration for the same planning year." February 27 order, pp. 8-9; *see also*, *id*., Exhibits A and B.

In compliance with Section 6w(8) and the August 22 order, all LSEs required to file capacity demonstrations by the directed deadlines have filed, and on May 12, 2025, the Staff filed its Capacity Demonstration Results: The Planning Year 2028/29 report (Staff Report).

Additionally, on April 29, 2025, the Staff filed the 2025 Statewide Energy Storage Target Calculation, which is the calculation that identifies each LSE serving customers in Michigan and its proportional share of the minimum statewide energy storage target, using peak load information for the previous five years filed in capacity demonstration filings under Section 6w. The Staff performed this calculation in accordance with the methodology approved by the Commission in the January 23, 2025 order in Case No. U-21571 (January 23 order). In the 2025

Statewide Energy Storage Target Calculation filing, the Staff explains that the calculation is to be used by LSEs filing either an energy storage plan or contracts for the necessary qualifying storage facilities in the current year, in accordance with Section 101 of Public Act 235 of 2023, MCL 460.1101. These calculations will be updated annually by the Staff to allow for LSEs filing in that year to use the most recent data. Future updates to the calculated storage capacity for each LSE will be filed by the Staff annually through 2029, in the open docket for LSE capacity demonstration filings, within 30 days after the completion of capacity demonstration filings as required under Section 6w for that year. *See*, Case No. U-21775, filing # U-21775-0057; *see also*, January 23 order, p. 29.

This order summarizes the Staff Report, addresses recommendations therein, and opens a new docket, Case No. U-21907, for the receipt of capacity demonstration filings for the 2029/2030 PY.

The Commission Staff Report

Following an executive summary of the Staff Report, the Staff explains that, as part of its pre-capacity demonstration process, it consulted with several LSEs to discuss the requirements of the capacity demonstration process.

Turning to the capacity demonstration filings, the Staff states that by February 24, 2025, DTE Electric Company (DTE Electric) and Consumers Energy Company (Consumers) filed capacity demonstrations; by March 3, 2025, Alpena Power Company, Indiana Michigan Power Company (I&M), Northern States Power Company, Upper Michigan Energy Resources Corporation, and Upper Peninsula Power Company filed capacity demonstrations; and by March 17, 2025, American Rural Cooperative, Bayfield Electric, Calpine Energy Solutions, LLC, City of Escanaba, City of Stephenson, City of Wakefield, Cloverland Electric Cooperative,

CMS ERM Michigan LLC, Constellation NewEnergy Inc., Croswell Light and Power, Daggett Electric Department, NRG Energy Services LLC f/k/a Direct Energy Services LLC, Energy Harbor LLC, the Michigan Public Power Agency, Michigan South Central Power Agency (MSCPA), Newberry Water and Light Board, Union City Electric Department, Wolverine Power Supply Cooperative, Inc., and WPPI Energy filed capacity demonstrations. The Staff states that all LSEs, with the exception of MSCPA, discussed *infra*, were able to procure capacity necessary to demonstrate compliance in all four seasons of the 2028/2029 PY at the time of the LSE's filing. Per the Staff Report, two LSEs' filings indicated a shortage of capacity in the compliance year compared with projections of forecasted growth. However, Section 6w requires all LSEs to demonstrate enough resources to cover prompt-year obligations, and both LSEs met this requirement. Following a review of the two filings, the Staff determined that these entities demonstrated sufficient capacity. The Staff notes that both LSEs are in negotiations to acquire the appropriate amount of capacity needed to meet their forecasted growth. Staff Report, p. 6. The Staff adds that several AESs filed letters in the docket indicating that they are currently not serving customers in Michigan and, therefore, did not make a capacity demonstration filing.[5]

The Staff explains that it audited each capacity demonstration filing and requested more information when necessary. Per the Staff Report, each filing included the demonstration for the required compliance year (2028/2029 PY) and that most filings included an update for the 2025/2026 PY through the compliance year and complied with the Commission's directive in the

[5] The AESs that filed letters in Case No. U-21775 indicating that they are currently not serving customers in Michigan include the following: AEP Energy Inc.; BP Energy Retail Company LLC; Dillon Power LLC; Direct Energy Services LLC; Energy Services Providers, Inc.; Interstate Gas Supply, LLC; Just Energy Advanced Solutions LLC; ENGIE Power and Gas LLC; Energy International Power Marketing Corporation; MidAmerican Energy Services, LLC; Nordic Energy Services, LLC; Texas Retail Energy, LLC; and UP Power Marketing LLC. Staff Report, p. 6, n. 8.

August 22 order for LSEs to include data for the prompt year (2025/2026 PY) and interim years (2026/2027 PY and 2027/2028 PY) in their capacity demonstrations. In the cases of municipal and cooperative utilities that provided only the compliance year, the Staff states that it was able to estimate the amount of capacity available for the prompt and interim years. The Staff recommends that the Commission continue to require LSEs to include updated prompt and interim year capacity obligation and resource obligation information in future filings as this information aids the Staff in tracking changes to load and resources and in projecting the zonal resources adequacy more accurately. Staff Report, pp. 6-7.

Turning to MSCPA, the Staff indicates that at the time of the filing of the Staff Report, MSCPA did not have rights to sufficient capacity to meet its capacity obligations. The Staff explains that MSCPA was in the process of negotiating a bilateral contract to meet the deficiency with the intent to submit a revised capacity demonstration by the self-imposed deadline of September 1, 2025, showing sufficient resources to meet its capacity requirements. The Staff states that it met with MSCPA on April 30, 2025, to discuss its capacity compliance and to encourage urgency in securing the capacity necessary to meet its obligations. Staff Report, p. 7. Subsequent to the filing of the Staff report on May 12, 2025, MSCPA filed under seal a revised capacity demonstration on July 23, 2025. *See*, Case No. U-21775, filing # U-21775-0059. On August 12, 2025, the Staff filed a memorandum in Case No. U-21775 indicating that it had reviewed MSCPA's confidential filing and confirming that MSCPA acquired a new capacity resource to meet its 2028/2029 PY capacity requirements for all four seasons. *See*, Case No. U-21775, filing # U-21775-0060.

The Staff Report also gives an overview of zonal resource adequacy for Michigan, which contains load that spans two regional transmission organizations (RTOs), MISO and PJM, with

the majority of the state's load located in MISO's footprint. Beginning with MISO resource adequacy, the Staff explains that Michigan LSEs serve load in MISO local resource zones (LRZs or zones) 1, 2, and 7.[6] The Staff then explains MISO's resource adequacy construct as follows:

> MISO establishes capacity obligations for all LSEs based on peak load forecasts and a planning reserve margin [(PRM)] percentage [ ] necessary to meet the North American Electric Reliability Corporation's (NERC['s]) Loss of Load Expectation (LOLE) standard of 1 day in 10 years. LSEs within MISO can meet their capacity requirements either through a Fixed Resource Adequacy Plan (FRAP), self-schedule, Reliability Based Demand Curve (RBDC) opt-out (new this planning year [. . . .]), paying the capacity deficiency charge, or through the Planning Resource Auction (PRA). The PRA is a residual market for LSEs that choose not to utilize other participation options or do not have enough capacity resources, either owned or purchased bilaterally, to satisfy their capacity obligations, and thus need to purchase additional resources.
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> Within MISOs [sic] resource adequacy construct, the Planning Reserve Margin Requirement [PRMR] and the LCR [local clearing requirement] must be satisfied to meet the LOLE. The PRMR is determined through LOLE modeling based on the coincident MISO peak forecast and resources adjusted as necessary to meet the standard. PRMR resources are not location specific, i.e. they can come from outside an LSE's zone. Individual LSEs are responsible for their own share of the zone's PRMR. The ability to use imports to meet PRMR makes it likely all zones will meet this requirement. Failure to meet PRMR would only occur if there were not enough resources available within all of MISO's footprint or in the subregion (MISO North/Central or MISO South) given subregional transmission constraints.

Staff Report, p. 9.

Explaining the LCR further, the Staff states that the LCR is the minimum required capacity to be located within a zone to meet the LOLE standard while accounting for the zone's ability to import. The LCR is for the entire zone, not an individual LSE. The Staff notes that, at this time,

[6] The majority of the Lower Peninsula falls into Zone 7, with the exception of the southwest corner that is located within PJM's territory. The majority of the Upper Peninsula falls within Zone 2, with the exception of a small area in the most western corner that falls into Zone 1.

there is no LCR requirement under MCL 460.6w applicable to individual LSEs in Michigan.[7]

The Staff explains that:

> [t]he LCR is determined by performing a LOLE analysis on each zone individually, to determine the Local Reliability Requirement (LRR), or the

[7] MCL 460.6w(8) requires an LCR as part of the SRM capacity demonstrations. In the September 15 order, the Commission indicated that it would open a contested case to establish the LCR for future capacity demonstrations beginning in 2022 and beyond. September 15 order, pp. 40-42. This order was appealed on two grounds: (1) that the Commission lacked the authority to impose an LCR on individual providers and (2) that if the Commission has the authority, it must implement the LCR pursuant to a rulemaking under the Administrative Procedures Act of 1969 (APA), MCL 24.201 *et seq*. While the September 15 order was on appeal, the Commission issued an order in Case No. U-18444 establishing a methodology to apply the LCR to individual energy providers. June 28, 2018 order in Case No. U-18444, pp. 122-131. On September 13, 2018, the Commission issued an order (September 13 order) granting a motion for stay in Case No. U-18444, putting a hold on the implementation of the LCR pending the outcome of the appeal of the September 15 order. September 13 order, pp. 9-13. The Michigan Court of Appeals subsequently ruled that the Commission did not have the authority under Act 341 to impose an LCR on individual providers. *In re Reliability Plans of Electric Utilities for 2017-2021*, 325 Mich App 207, 221; 926 NW2d 584 (2018). The Court of Appeals did not address the second point of the appeal, which was that if the Commission did have such authority, the LCR requirement should be implemented through a rulemaking pursuant to the APA. The Michigan Supreme Court reversed the Court of Appeals, finding that the Commission does have the authority pursuant to MCL 460.6w to impose an LCR on individual providers and remanded the case to the Court of Appeals for further review to determine the Commission's compliance with the APA in imposing the LCR. *In re Reliability Plans of Electric Utilities for 2017-2021*, 505 Mich 97, 102; 949 NW2d 73 (2020). On December 3, 2020, the Court of Appeals held that the September 15 order (imposing an LCR on AESs individually in Case No. U-18197) did not equate to administrative rules in violation of the APA and did not exceed the Commission's authority granted by the Legislature. *In re Reliability Plans of Electric Utilities for 2017-2021*, unpublished per curiam opinion of the Court of Appeals, issued December 3, 2020 (Docket Nos. 340600 and 340607).

Energy Michigan, Inc. (Energy Michigan) and the Association of Businesses Advocating Tariff Equity (ABATE) filed a complaint in federal district court challenging the constitutionality of the individual LCR. On February 24, 2023, the United States District Court for the Eastern District of Michigan issued a judgment in favor of the Commission dismissing with prejudice the complaint filed by Energy Michigan and ABATE and finding that the plaintiffs did not meet their burden to show that the individual LCR requirement discriminates against interstate commerce, while the defendants established the necessity and legitimate purpose of the LCR in ensuring grid reliability that cannot be accomplished via reasonable nondiscriminatory alternatives. On March 24, 2023, the plaintiffs filed a joint notice of appeal of the February 24, 2023 final judgment to the United States Court of Appeals for the Sixth Circuit. Given the appeal, litigation regarding the LCR requirements is currently pending at the federal level.

> resources a zone would need to meet the loss-of-load standard if it were separated from MISO. Separately, MISO determines the import and export limits for each zone by performing a seasonal transfer analysis study. The study produces Zonal Import Ability (ZIA) and Zonal Export Ability (ZEA) values, which are then adjusted by the amount of controllable exports to non-MISO load to determine Capacity Import Limits (CIL) and Capacity Export Limits (CEL). The ZIA is an input to the LCR calculation, and the LCR, CEL, and CIL, and subregional constraints are inputs to the PRA clearing process.

Staff Report, p. 9.

The Staff states that in the 2023/2024 PY, MISO implemented a seasonal resource adequacy requirement for each summer, fall, winter, and spring season and a seasonal accredited capacity (SAC) methodology for certain resources participating in MISO's PRA to align with real time availability and planned outages. The Staff explains that it reviewed these changes with participants in technical conferences per the June 22, 2022 order in Case No. U-21099. The August 22 order (the capacity demonstration docket for the 2027/2028 PY) directed LSEs in MISO to demonstrate seasonal capacity obligations based on MISO's seasonal resource adequacy construct. Staff Report, p. 10. Discussing other changes in MISO, the Staff states that on June 27, 2024, FERC accepted MISO's RBDC tariff revisions to incorporate sloped demand curves into the PRA. *Id.*; *see also*, *Order Accepting Tariff Revisions*, 187 FERC ¶ 61,202 (June 27, 2024).

If an LRZ does not have enough resources to meet its seasonal requirements, the entire zone clears at the seasonal cost of new entry (seasonal CONE). For the 2025/2026 PY, seasonal CONE (in dollars per megawatt- (MW-) day) is equal to $130,930 per MW-year divided by the number of days in the seasons experiencing shortage in Zone 7. The Staff clarifies that this resource adequacy construct is based on probabilistic determinations and that failure to meet the requirements would not necessarily mean that the LRZ will experience a loss of load event. Staff Report, p. 10.

Providing further detail regarding the RBDC, the Staff explains that MISO introduced sloped demand curves in its resource adequacy construct in the 2025 PRA. Per the Staff Report, the systemwide RBDC addresses overall reliability needs across the entire system, while the subregional RBDCs capture additional reliability requirements specific to each subregion. While delayed for the time being due to the complexity of adding another 10 curves per season, MISO ultimately seeks to develop RBDCs at the LRZ level. The Staff then explains how MISO develops each curve and its relation to reliability and pricing metrics. Staff Report, pp. 10-11 (referencing MISO's Reliability-Based Demand Curves Conceptual Design White Paper (September 2023), available at 20230906 RASC Item 02 Draft RBDC White Paper630104.pdf (last accessed August 21, 2025)).

The Staff further explains that:

> [t]he RBDCs fundamentally change the objective function of the PRA, from minimizing as-offered costs to minimizing the difference between supply offers and demand offers to maximize social surplus. The clearing quantities may vary from the initial PRMR, but the value of the reliability contribution of any additional MWs cleared must be greater than or equal to the cost of procuring those MWs. The PRA is conducted using an optimization to simultaneously complete the following tasks: (1) meet the supply demand balance both for MISO and for each of the two Planning Areas (MISO North/Central and MISO South); (2) meet the LCR for each LRZ; (3) efficiently use transmission transfer capability between LRZs; and (4) respect the Sub-Regional Power Balance Constraint. Step 1 of the auction clearing process solves an optimization problem to identify which type of RBDC produces a higher MW obligation for a given subregion, share-of-Systemwide or Subregional. Step 2 of the process solves the clearing and pricing problem based on the RBDC identified in step 1 and outputs both the resource clearing (Final PRMR) and the auction clearing price (ACP) for each LRZ and External Resource Zone. A final step verifies the solution found in step 2. The auction clearing price is determined by where the supply offer curve meets the applicable RBDC, and is equal to the marginal cost of capacity, the regional marginal cost of capacity, the marginal cost of financially binding LCR, CEL, and CIL for an LRZ, and the marginal cost of financially binding Subregional Export Constraints and Subregional Import Constraints. For more information on auction clearing under RBDC[,] see Appendix M of MISO's Business Practice Manual 11.

Staff Report, p. 11. The Staff adds that MISO included an RBDC Opt-Out mechanism that allows an LSE to opt-out provided it cannot then include a partial opt-out, the opt-out will be locked in for three consecutive years, and it must include the RBDC opt-out adder percentage in its obligation. *Id*.

Speaking to future resource adequacy construct changes, the Staff reports that MISO has recently filed or is currently working on FERC filings to address challenges related to demand side resources and that MISO intends to implement enhanced resource adequacy risk modeling and a Direct Loss-of-Load (DLOL) accreditation methodology beginning in planning year 2028/2029. Staff Report, p. 12 (citing FERC Docket No. ER24-1638-000 (application filed March 28, 2024)). Starting with the 2025/2026 PY, MISO has committed to publishing indicative accreditation results based on the DLOL methodology prior to each PRA. The Staff explains that these proposed reforms will align the PRMR with accreditation of all resource classes but given the ongoing work, the indicative PRMR values under DLOL are not yet available. The Staff recounts that several LSEs asked whether DLOL accreditation should be used in this instant capacity demonstration case since the demonstration year aligns with the first year of DLOL implementation (2025/2026 PY). The Staff recommends that LSEs follow the prompt-year MISO adequacy resource construct and also recommends that the Commission determine a timeline to implement MISO's DLOL accreditation changes into the state capacity demonstration process if it deems it necessary to implement these changes prior to MISO's tariff changes effective in PY 2028/2029.

For MISO Zone 7, the Staff provides a table showing the annual MISO LOLE report data, as well as another table showing a comparison of LRZ 7 aggregated resources demonstrated plus known undemonstrated resources likely to still be available for each season in PY 2028/2029 and

MISO's resource adequacy requirements for PY 2025/2026. *Id*., pp. 13-15. With the caveat that its findings are based on projections that are subject to change, the Staff concludes that Zone 7 has a surplus of resources compared to the projected LCR for all four seasons. Specifically, Zone 7's summer PRMR is 21,228 zonal resources credits (ZRCs) and the LCR is 19,681 ZRCs. The total LRZ 7 resources offered in the PRA for the summer season in the prompt year is 20,884 ZRCs, which exceeds the anticipated LCR by 2,203 ZRCs but falls short of the zone's portion of PRMR. *Id*., p. 16. The zone relied on 785.5 ZRCs of external resources to meet its resource adequacy requirement target. *Id*.

For the interim years, the Staff Report contends that again, while subject to change, LRZ 7 has a capacity surplus for both years compared to the projected LCRs. The Staff notes that the capacity margin appears tight in 2026/2027 across all four seasons with the tightest capacity position in the fall season. *Id*., pp. 16-17.

As to Zone 2, which encompasses most of Michigan's Upper Peninsula and parts of Wisconsin, the Staff notes that MISO does not define MW capacity import or export limits between states within the same MISO zone and therefore, the data available to the Staff is not comprehensive enough to project a zonal capacity position for Michigan's Zone 2 similar to Zone 7. However, the Staff was able to conclude that: (1) all Michigan LSEs in Zone 2 demonstrated sufficient capacity resources, and (2) the 2024 MISO PRA results indicated an installed capacity surplus in PY 2024/2025. The Staff also states that Zone 2 has CILs of 4,370 MW in summer; 6,537 MW in fall; 6,522 MW in winter; and 6,439 MW in spring. *Id*., p. 17.

Turning to Zone 1, which includes a small fraction of Michigan's Upper Peninsula, the Staff reports that all Zone 1 LSEs demonstrated sufficient capacity obligations for the compliance year

and that the 2025/2026 MISO PRA shows sufficient capacity for each season in PY 2025/2026, adding that Zone 1 relied on a small amount of imports to meet its resource adequacy target in winter and spring. *Id*., p. 17.

For Michigan LSEs serving load within PJM, the Staff notes that only a few LSEs in Michigan serve load within the PJM territory but that these LSEs are still subject to the capacity requirements of Section 6w. LSEs in PJM must meet capacity obligations through participation in PJM's reliability pricing model base residual auction (BRA) or through PJM's fixed resource requirement (FRR) plan. I&M, the largest Michigan-serving LSE in PJM, uses the FRR and indicates in the instant capacity demonstration that it plans to continue to do so. The Staff Report includes a table presenting a summary of PJM's capacity demonstration, and the Staff states that all PJM LSEs have sufficient capacity and that it expects all PJM LSEs to continue to meet their capacity obligations with continued monitoring by the Staff. Staff Report, p. 18.

The Staff also notes that I&M's customer choice cap was reset to 10% on February 1, 2019, pursuant to MCL 460.10a(1)(c) and the July 12, 2017 order in Case No. U-16090 (July 12 order). July 12 order, p. 3. I&M is responsible for providing capacity for its choice program, but if its suppliers opt to self-supply capacity, the company will need to include this in its FRR plan. Per the Staff Report, NERC projects PJM to have sufficient electric supply and categorizes PJM as having an elevated risk level post 2026, with resource additions not keeping up with generator retirements and demand growth, and with winter replacing summer as the higher risk period because of generator performance and fuel supply issues. Lastly, the Staff notes delays in PJM's BRA schedule due to pending decisions from FERC related to the capacity auction. The Staff Report also provides the current BRA schedule, which is scheduled to take place every six months until the schedule is no longer delayed. Staff Report, pp. 18-19.

In compliance with the Commission's request in the September 15 order, the Staff provides a table in the report identifying the capacity by type for each individual electric provider (without revealing the provider's identity) with a breakdown for each provider included as Appendix A to the Staff Report. The table describes the supplier type and the percentage of their demonstrated capacity that is owned; derived from demand response (DR), a power purchase agreement, or ZRC contract; or acquired at auction. Staff Report, pp. 19-20.

Explaining DR as an optional source of capacity, the Staff describes DR as having a prominent role in LSEs' integrated resource plan (IRP) filings and the Staff's obligation to complete a statewide study of DR potential in Michigan every five years. The Staff states that Consumers and DTE Electric included DR in their respective IRP filings and capacity demonstrations and that the Staff will continue to monitor Consumers' and DTE Electric's DR as well as DR use across Michigan. *Id*., p. 20.

Noting the Commission's affirmation of an AES' ability to offer DR programs through curtailment service providers or third-party aggregators, the Staff states that it is aware of 85 ZRCs of DR offered into the 2025 MISO capacity market. The Staff continues to collaborate to ensure that aggregated DR load modification is accounted for when dispatched on MISO's coincident peak and to monitor FERC Order 2222[8] discussions. *Id*., p. 21.

As to ZRC contracts, the Staff recommends that forward ZRC contracts be used for capacity demonstration purposes to specify delivery of the ZRCs in the MISO Module E Capacity Tracking (MECT) tool prior to the applicable PRA auction. There was an increase in the

[8] *Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators*, 172 FERC ¶ 61,247 (September 17, 2020). FERC issued subsequent versions of FERC Order 2222, namely FERC Order 2222-A and FERC Order 2222-B. *See*, 174 FERC ¶ 61,197 (March 18, 2021) and 175 FERC ¶ 61,227 (June 17, 2021), respectively.

percentage of ZRC contracts utilized this year by utilities, municipal utilities, and cooperatives compared to last year's capacity demonstration. The Staff highlights the following:

> An important thing to note is that ZRCs are defined in MISO's tariff and are created in the prompt year when UCAP [unforced capacity] for supply-side and demand-side resources are converted into ZRCs in the MISO MECT. ZRCs for any year further out than the prompt year are projected and don't become ZRCs until the prompt year. ZRCs are fungible products that can be sold or transferred, and in some cases, sold more than once. The characteristics of ZRCs allow for them to be easily traded and tracked within the MISO MECT. MISO has a view into the source and transfers of those ZRCs that occur prior to the PRA in the prompt year, and those ZRC transfers are audited by Staff as a secondary check on the ZRC contracts utilized in the capacity demonstrations.

Staff Report, p. 21.

Following a brief explanation of its process for accounting for AES load switching, which was made more complex with the change to the seasonal construct, the Staff states that it continues to see an increase in load switching among LSEs. *Id*., pp. 21-22. The Staff recommends that LSEs that include load switching information in their filing include it within the Contracted Resources section on the spreadsheet templates provided for the capacity demonstration for the demonstration years as well as the interim years. The Staff also recommends that both the losing and the gaining suppliers have copies of the load switching affidavits in each of their filings, enabling the Staff to easily cross-reference that the load is being accounted for.

Lastly, the Staff includes a discussion of capacity retirements and additions, stating that NERC's 2024 Long Term Reliability Assessment shows added resource capacity on the Bulk Power System (BPS) falling short of industry projections the year prior, demonstrating an over-projection of natural gas, solar, and wind resources, and giving evidence to project delays. Additionally, the Lawrence Berkeley National Laboratory's April 2024 interconnection queue study showed that only 19% of the projects (and just 14% of their capacity) that submitted

interconnection requests from 2000 to 2018 reached commercial operations by the end of 2023. *Id*., p. 22. Because of interconnection backlog issues, the Staff notes that some RTOs have taken steps to address these issues including PJM's Reliability Resource Initiative, both PJM's and MISO's work to reduce queue cycle times through automation, and MISO's Expedited Resource Addition Study (ERAS) process.[9] The Staff conveys that Michigan continues to follow national trends showing a tightening capacity position due to scheduled retirements outpacing replacement capacity buildout. The Staff notes that it met with LSEs to discuss their capacity concerns and explains that various factors could cause delays for new capacity additions, namely broad economic factors such as supply chain constraints, labor shortages, high component prices, and delays associated with obtaining permitting, regulatory approval, or interconnection queue delays. Per the Staff:

> The issue may be further exacerbated should demand increase faster than expected due to unanticipated loads such as data centers, as well as electrification of the building and transportation sectors. Staff has noted a significant number of planned resources used as demonstrated capacity in this case and recent previous cases that have not come to fruition in the demonstration year as planned, with estimates in the range of 900-1000 MW/year removed from the list of planned resources due to delays or cancellations. There are many instances of this occurring with IRP-identified resources, consequently Staff met with both large investor-owned utilities to discuss this issue in depth and determine what actions can be taken to overcome the delays. One of these utilities indicated they are in the process of quantifying project delays and terminations, and early estimates showed an average delay of ~1.5 years past Commercial Operation Date (COD) and a project failure rate greater than 25%.

[9] At the time the Staff Report was filed, MISO's ERAS process was pending approval before FERC. Following an initial rejection by FERC on May 16, 2025, and subsequent revisions to its ERAS proposal by MISO, FERC approved MISO's revised filing on July 21, 2025, in FERC Docket No. ER25-2454- 000, with the condition that MISO make a compliance filing by August 20, 2025, reflecting revised tariff language previously submitted by MISO. *See*, *Order Accepting Tariff Revisions, Subject to Condition*, 192 FERC ¶ 61,064 (July 21, 2025) (July 21 FERC order). FERC approved the ERAS tariff effective August 6, 2025. *See*, July 21 order, pp. 98, 135.

Staff Report, pp. 22-23. The Staff adds that some capacity from the Palisades Nuclear Power Plant was included in Michigan's capacity demonstration for Spring 2026 (the remainder of the capacity is being contracted by an LSE in Indiana). The Palisades capacity would provide resource adequacy benefits to Zone 7 and be counted towards meeting the LCR for Zone 7.[10] Staff Report, p. 23.

In its conclusions and recommendations, the Staff repeats that all LSEs have complied with their capacity demonstration obligations pursuant to Section 6w and expresses its appreciation for the cooperation of all LSEs. *Id*., pp. 20-21. The Staff then presents a summary of its recommendations:

1. Staff recommends the Commission continue to direct all LSEs to include updated prompt year and interim year capacity obligation and resource information in future filings.

2. Staff recommends the Commission direct all LSEs to provide [an] MECT screenshot of their prompt load obligations (PRMR/PLC [peak load contribution]) to facilitate the Storage Target calculation used to comply with Public Act 235.

3. The Commission should determine a timeline to implement MISO's DLOL accreditation changes into the state capacity demonstration process if it deems it necessary to implement prior to MISO tariff changes effective PY 2028-29.

4. Staff recommends that filing entities who include load switching information in their filing include it within the Contracted Resources [section] on the spreadsheet templates provided for the capacity demonstration for the demonstration years as well as the interim years. Staff also recommends that both the losing and the gaining suppliers have copies of the load switching affidavits in each of their

[10] At the time of the filing of the Staff Report, the re-start of the Palisades Nuclear Plant was pending approval before the U.S. Nuclear Regulatory Commission (NRC). On July 24, 2025, NRC granted some key approvals necessary to the re-start of the Palisades Nuclear Plant. Namely, NRC approved six exemptions from the requirements of Title 10 of the Code of Federal Regulations (10 CFR) Section 50.82(a)(2), "Termination of license," concerning the prohibition against operating the reactor and emplacing fuel into the reactor vessel for the Palisades Nuclear Plant. The exemptions will be effective on August 25, 2025. *See*, NRC Docket No. 50-255; NRC-2025-0346 (July 24, 2025). However, other licensing actions remain pending before NRC as of the date of this order.

filings, so Staff is able to cross check that the load is being accounted for.

Staff Report, p. 23.

Discussion

To begin, the Commission appreciates the efforts of the Staff in obtaining and analyzing the capacity information needed for this year's capacity demonstrations and for drafting the Staff Report as well as the filing of the 2025 Statewide Energy Storage Target Calculation. The Commission also appreciates the cooperation of all Michigan LSEs for their capacity demonstration filings.

Before addressing the Staff Report, the Commission takes this opportunity to note an update relevant to the state's capacity outlook that occurred after the filing of the Staff Report. On May 23, 2025, the U.S. Department of Energy (DOE) issued an emergency order to MISO in coordination with Consumers, pursuant to Section 202(c) of the Federal Power Act, to ensure that the J.H. Campbell Power Plant (Campbell Plant) in West Olive, Michigan remains available for operation to minimize any potential generation shortfall that could lead to unnecessary power outages. *See*, DOE, Order No. 202-25-3 (May 23, 2025). The Campbell Plant was scheduled to cease operations on May 31, 2025. The Commission notes that the retirement of the Campbell Plant was planned for in Consumers' 2022 IRP and replacement capacity has been procured through the purchase of a natural gas fired power plant in 2023, extending the retirement dates for two other fossil fuel units, increasing demand side resources such as DR and energy waste reduction, and adding renewable energy and energy storage resources through 2040. *See*, June 23, 2022 order in Case No. U-21090, pp. 5, 95 (approving a settlement agreement resolving all issues in the case); *see also*, *id*., Exhibit A, pp. 4-5. Consumers also filed its capacity demonstration on February 24, 2025, prior to the issuance of the DOE's emergency order and

demonstrated sufficient capacity for the compliance PY. *See*, Case No. U-21775, filing # U-21775-0012; *see also*, Staff Report, pp. 6, 23.

Turning to the Staff Report, the Commission accepts the Staff Report's findings regarding resource adequacy in MISO LRZs 1, 2, and 7 and in the PJM market, the capacity demonstrations made by the LSEs, and the 2025 Statewide Energy Storage Target Calculation. The Commission also accepts the Staff's filing of a memorandum in this docket on August 12, 2025, confirming its review of MSCPA's revised capacity demonstration filing indicating that MSCPA has secured the capacity necessary to satisfy its capacity obligation under Section 6w. The Commission finds that MSCPA has resolved its capacity shortage issue and has now complied with the requirements of Section 6w.

As noted in last year's capacity demonstration report, the Staff stated in this year's report that most LSEs included updates for the 2025/2026 PY through the 2027/2028 PY. For the upcoming capacity demonstration in Case No. U-21907, the Commission agrees with the Staff's recommendation for LSEs to continue providing this additional information and thus, directs LSEs to provide capacity resource data for the prompt year (2026/2027) and interim years (2027/2028 and 2028/2029) in addition to the compliance year (2029/2030) data. The additional data is to be included in the upcoming February 24, March 3, and March 17, 2026 capacity demonstration filings opened by this order in Case No. U-21907. The Staff shall then file its 2029/2030 PY capacity demonstration report in Case No. U-21907 no later than May 12, 2026.

Before addressing the Staff's recommendations, the Commission notes that in the Staff Report, the Staff described the DLOL accreditation and referenced MISO's application for approval of the revised tariff to establish DLOL accreditation that was filed with FERC on March 28, 2024. The Commission adds that on October 25, 2024, FERC approved MISO's

proposed tariff revisions to establish the DLOL accreditation methodology. *See*, 189 FERC ¶ 61,065 (October 25, 2024). As the Staff indicated, MISO will implement the DLOL accreditation methodology in the 2028/2029 PY and is continuing its work to provide the PRMR values under the DLOL methodology. The Staff recommended that the Commission determine a timeline to implement MISO's DLOL accreditation changes into Michigan's capacity demonstration process if the Commission finds such action to be necessary prior to the effective date of the revised MISO tariff in 2028/2029. The Commission finds that establishing such a timeline is not necessary at this time given MISO's ongoing work to establish the PRMR values that will be used in the DLOL methodology. Therefore, the Commission will continue to monitor MISO's progress in this area and will revisit this issue as more information becomes available. At this time, the Commission agrees with the Staff's recommendation to LSEs for the instant capacity demonstration and for future demonstrations that they should follow the prompt-year MISO resource adequacy construct.

Turning to the Staff's other recommendations, the Commission finds these recommendations to be reasonable and necessary to provide the Commission with comprehensive information regarding an LSE's capacity position for the prompt, interim, and compliance years and to satisfy the requirements of Section 6w. Therefore, with the exception of the establishment of a timeline to implement DLOL into Michigan's capacity demonstration process, the Commission adopts the Staff's recommendations set forth in the Staff Report. *See*, Staff Report, p. 23.

With this order, the Commission also opens the Case No. U-21907 docket for the purpose of receiving next year's capacity demonstrations from required LSEs pursuant to Section 6w. As mentioned above, electric utilities required to file capacity demonstrations pursuant to Section 6w(8)(a) for the 2029/2030 PY shall make that filing no later than 5:00 p.m. (Eastern

time (ET)) on February 24 and March 3, 2026 in Case No. U-21907. LSEs required to file capacity demonstrations pursuant to Section 6w(8)(b) for the 2029/2030 planning year shall make that filing no later than 5:00 p.m. (ET) on March 17, 2026, in Case No. U-21907. Electric utilities and LSEs shall include in their respective filings capacity resource data for the prompt (2026/2027) and interim years (2027/2028 and 2028/2029) as well as the compliance year (2029/2030). All LSEs making required filings pursuant to Section 6w(8) shall utilize the Capacity Demonstration Filing Process and Requirements document, General Affidavit, and, as applicable, AES Load Switching Affidavit attached to this order as Exhibits A, B, and C, respectively. All filing LSEs shall also provide an MECT screenshot (or equivalent) of their prompt load obligations (PRMR/PLC) to facilitate the energy storage target calculation used to comply with Act 235. Lastly, LSEs who include load switching information in their capacity demonstration filing shall include such information within the Contracted Resources section on the spreadsheet templates provided for the capacity demonstration for the demonstration years as well as the interim years. Also, both the losing and the gaining suppliers in the load switching arrangement shall include copies of the AES Load Switching Affidavit, attached to this order as Exhibit C, in each of their capacity demonstration filings, enabling the Staff to easily cross-reference that the load is being accounted for.

THEREFORE, IT IS ORDERED that:

A. The Commission Staff's May 12, 2025 Capacity Demonstration Results Report and 2025 Statewide Energy Storage Target Calculation filed in Case No. U-21775 are accepted.

B. Electric utilities required to file capacity demonstrations pursuant to MCL 460.6w(8)(a) for the 2029/2030 planning year shall make that filing no later than 5:00 p.m. (Eastern time) on February 24 and March 3, 2026, in Case No. U-21907, as described in this order and in the

Capacity Demonstration Filing Process and Requirements document attached to this order as Exhibit A. Load serving entities required to file capacity demonstrations pursuant to MCL 460.6w(8)(b) for the 2029/2030 planning year shall make that filing no later than 5:00 p.m. (Eastern time) on March 17, 2026, in Case No. U-21907. Electric utilities and load serving entities shall include in their respective filings capacity resource data for the prompt (2026/2027) and interim years (2027/2028 and 2028/2029) as well as the compliance year (2029/2030), as described in this order. Load serving entities required to file capacity demonstrations pursuant to MCL 460.6w(8) shall utilize the Capacity Demonstration Filing Process and Requirements document and General Affidavit attached to this order as Exhibits A and B, respectively.

C. The Commission Staff shall file a report analyzing the sufficiency of the capacity demonstrations for the 2029/2030 planning year no later than 5:00 p.m. (Eastern time) on May 12, 2026, in Case No. U-21907.

D. The Commission Staff shall file in Case No. U-21907 the update to the energy storage capacity amounts for electric providers using the Statewide Energy Storage Target Calculation within 30 days after the completion of the capacity demonstrations for the 2029/2030 planning year required under MCL 460.6w.

E. Any load serving entity required to file capacity demonstrations pursuant to MCL 460.6w(8) for the 2029/2030 planning year shall provide a Module E Capacity Tracking screenshot (or equivalent) of its respective prompt load obligations (planning reserve margin requirement/peak load contribution) to facilitate the energy storage target calculation used to comply with Public Act 235 of 2023, MCL 460.1001 *et seq*., as described in this order.

F. Any load serving entity that includes load switching information in its capacity demonstration filing shall include it within the Contracted Resources section on the spreadsheet

templates provided for the capacity demonstration for the demonstration years as well as the interim years. Both the losing and the gaining suppliers in the load switching arrangement shall include copies of the AES Load Switching Affidavit, attached to this order as Exhibit C, in their respective capacity demonstration filings.

G. The docket in Case No. U-21775 is closed, and the docket in Case No. U-21907 is opened for the purpose of receiving the capacity demonstration filings for the 2029/2030 planning year and the Statewide Energy Storage Target Calculations to be filed by the Commission Staff.

The Commission reserves jurisdiction and may issue further orders as necessary.

Any party desiring to appeal this order must do so in the appropriate court within 30 days after issuance and notice of this order, pursuant to MCL 462.26. To comply with the Michigan Rules of Court's requirement to notify the Commission of an appeal, appellants shall send required notices to both the Commission's Executive Secretary and to the Commission's Legal Counsel. Electronic notifications should be sent to the Executive Secretary at LARA-MPSC-Edockets@michigan.gov and to the Michigan Department of Attorney General - Public Service Division at sheac1@michigan.gov. In lieu of electronic submissions, paper copies of such notifications may be sent to the Executive Secretary and the Attorney General - Public Service Division at 7109 W. Saginaw Hwy., Lansing, MI 48917.

MICHIGAN PUBLIC SERVICE COMMISSION

Daniel C. Scripps, Chair

Katherine L. Peretick, Commissioner

Shaquila Myers, Commissioner

By its action of August 21, 2025.

Lisa Felice, Executive Secretary

CAPACITY DEMONSTRATION PROCESS AND REQUIREMENTS

The Michigan Public Service Commission (MPSC or Commission) will open a new docket annually for capacity demonstrations filings. The Commission order opening the capacity demonstration docket will provide updated requirements for load serving entities (LSE) to follow in making demonstrations. The capacity demonstration filings shall include four years of load obligations and capacity resources. The capacity demonstration for year four will be used to determine if the LSE has met its capacity obligations, while the data filed for years one through three will be used for informational purposes only. For the demonstration year, each LSE's capacity obligation will be equal to its most recent capacity obligation as specified by the applicable Independent System Operator (ISO).

For LSEs in the Midwest Independent System Operator (MISO), the capacity obligation will be based on the MISO seasonal resource adequacy construct. LSEs will be obligated to demonstrate enough capacity (owned or contracted) to meet the LSE's capacity obligation for each season. The specific capacity obligation for each season will be the LSE's prompt year (upcoming year) Initial Planning Reserve Margin Requirement (PRMR) for each respective season. According to the MISO Tariff, the Peak Load Contribution (PLC) for each retail customer in the Electrical Distribution Company's (EDC) area – including the EDC's own LSE – includes the retail customer's demand at the time of MISO's peak demand for each prior season, transmission losses, planning reserve margin %, and an adjustment factor for the prompt year seasonal EDC forecasts. The Initial PRMR for each LSE for a season consists of the sum of the PLCs for the retail customers assigned to that LSE[1]. MISO LSEs will be obligated to demonstrate enough capacity for the demonstration year to meet its prompt year Initial PRMR MISO requirements[2].

For LSEs in PJM, the capacity obligation will be based on the PJM Reliability Pricing Model (RPM). LSEs in the PJM service territory can meet their Independent System Operator capacity obligations either through participation in PJM's (RPM) Base Residual Auction (BRA) or through PJM's Fixed Resource Requirement (FRR) capacity plan. The timing of PJM LSEs capacity demonstrations to the Commission will remain the same as those expected of MISO LSEs; however, PJM LSEs will be allowed to file an amended capacity demonstration two weeks after the completion of the BRA. The capacity demonstration should include the FRR capacity plan or BRA results. Meeting PJM's capacity obligations, including any applicable Percentage Internal Resources Required for the delivery year will constitute a satisfactory demonstration, and the demonstrating LSE should provide evidence that it has met PJM's capacity obligations.

LSEs shall provide documentation to Staff verifying the applicable capacity obligation from the LSEs ISO.[3]

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[1] The Initial PRMR determination for all LSEs, including the EDC's own LSE, shall be made according to the MISO tariff. See MISO tariff Module E-1, Section 69A.1.1.e and Section 69A.1.2.1.b.

[2] LSEs that develop their load forecasts based on forward year values may use these values instead of prompt year values for capacity demonstration requirements if they are higher than the prompt year requirements. LSEs obligations should not be reduced to an amount less then the prompt year requirements due to declining forecasts for forward years.

[3] Documentation could be included in the filing or shared in a meeting (virtual or in person) with Staff, similar to how resource contracts are shared.

Individual Locational Requirement

The individual locational requirement adopted by the MPSC in the June 28, 2018 Order in Case No. U-18444 remains stayed[4]. There is currently no individual locational requirement applicable to capacity demonstration filings.

Resource Demonstrations

As a default, resources shall be accredited as they are in their respective ISO.

For MISO LSEs, resources should be counted at the same seasonal accredited capacity value that they will receive in the prompt year for each season. If prompt year capacity value is not finalized, resources shall be counted at the seasonal accredited capacity level from the most recent information available.

For PJM LSEs, resources shall be based on the credited UCAP capacity value that they are credited within the PJM RPM for the demonstration year.

New resources (in either ISO) shall receive capacity credit they would reasonably receive within the various resource adequacy constructs. LSEs should provide documentation supporting the capacity accreditation of new resources.

Resource accreditation may vary from ISO accreditation if the LSE is able to provide reasonable support that the resource will be valued at a different capacity amount when the demonstration year becomes the delivery year. These variations will be evaluated by Staff on a case-by-case basis.

The minimum acceptable support for all resources submitted as part of a capacity demonstration is based upon the type of resource and is outlined below. Statements to achieve/maintain resources do not prohibit an LSE from entering into a future transaction to sell surplus capacity provided that the same capacity is not used by another Michigan LSE as part of its capacity demonstration filing for the same planning year.

Existing Generation (Owned)

The minimum acceptable support for existing generation that is included in a capacity demonstration include:

1) An affidavit from an officer of the company claiming ownership of the unit(s), including a commitment of the unit(s) to LSE load in the applicable demonstration year,
2) A copy of the existing resource qualification of the unit(s) from the applicable ISO, such as a MISO Module E Capacity Tracking Tool (MECT) screenshot in the MISO region, and;
3) If there are Michigan retail tariffs or customer contracts associated with the resources, copies shall be provided.

[4] Stayed by the September 13, 2018 Order in Case No. U-18444.

Existing Demand Response or Energy Efficiency Resources
(that have not been netted against load)

The minimum acceptable support for existing demand response resources or energy efficiency resources that have not already been netted against load include:

1) An affidavit from an officer of the company outlining the resource(s), including a commitment to maintain at least that same level of resources four years forward,
2) A copy of the existing resource qualification of the resource(s) from the applicable ISO, such as a MISO MECT screenshot, and;
3) If there are Michigan retail tariffs or customer contracts associated with the resources, copies shall be provided.

New or Upgraded Generation (Owned)

The minimum acceptable support for proposed new generation include:

1) An affidavit from an officer of the company outlining the plans for the new generation including resources outlined in the utilities' most recent IRP,[5] milestones such as planned in-service date, expected regulatory approval date(s), planned date to enter the generator interconnection queue, expected date for generator interconnection agreement, construction timeline, etc.,
2) Documentation supporting the expected resource qualification from the ISO for the new unit(s), and;
3) If there are Michigan retail tariffs or customer contracts associated with the resources, copies shall be provided.

For new generation submitted as part of a capacity demonstration, the LSE shall update and submit the above information on an annual basis with each subsequent capacity demonstration until the unit(s) are in service.

New Demand Response or Energy Efficiency Resources
(that have not been netted against load)

The minimum acceptable support for new demand response resources or energy efficiency resources that have not already been netted against load included in a capacity demonstration include:

1) An affidavit from an officer of the company outlining the plans for the resource(s), including a commitment to achieve and/or maintain at least that same level of resources four years forward,
2) Evidence that the customer's distribution utility has been notified of specific customers participating in the resource,
3) Specific plans to have the resource(s) qualified by the independent system operator, and;

[5] If including resources included in the utility's most recent approved IRP, the utility shall also file a status update in the next capacity demonstration docket.

4) If there are Michigan retail tariffs or customer contracts associated with the resources, copies shall be provided.

For new demand response or energy efficiency resources submitted as part of a capacity demonstration, the LSE shall update and submit the above information on an annual basis with each subsequent capacity demonstration until the resource(s) are in service. Final qualification / approval from the independent system operator should be submitted in a subsequent demonstration.

Capacity Contract

The minimum acceptable support for capacity contracts with existing generation include:

1) An affidavit from an officer of the company including a copy of the contract that specifies the unit(s) or pool of generation that is the source of the contract, including the location of the unit(s) or pool. The affidavit shall include a commitment to maintain the contract four years forward regardless of any early out clauses in the contract, and;
2) A copy of the existing resource qualification of the unit(s) or pool from the applicable ISO, such as a MISO MECT screenshot.

Forward ZRC contracts

For MISO LSEs that use ZRC contracts to meet capacity obligations. The minimum acceptable support for forward ZRC contracts includes an affidavit from an officer of the company including a copy of the contract that specifies the zonal location of the ZRCs. The affidavit shall include a commitment to maintain the contract four years forward regardless of any early-out clauses in the contract. A forward ZRC contract that does not specify the zonal location of the ZRCs will be deemed insufficient towards meeting any portion of a locational requirement, unless the LSE provides other alternative support for the location of the ZRCs.

Any LSE that utilized a ZRC contract as part of their previous capacity demonstrations must provide prompt-year ZRC transfer documentation (such as a MECT Module E screenshot) or provide Staff with the ability to confidentially review ZRC transfers in person at the Commission office.

If the Commission were to implement an individual locational requirement, ZRC contracts submitted in an LSE capacity demonstration to meet this forward locational requirement must clearly designate that the resources are coming from the applicable zone. LSEs must provide evidence to support this. For resources currently located outside of the LSE's zone that will (by the demonstration year) count towards meeting the Local Clearing Requirement of the LSE's zone should be supported by evidence provided by the demonstration LSE. Existing contracts specifically with resources outside of an LSE's MISO zone will count towards meeting forward locational requirements if they are for a period of at least twenty years and the contracts were entered into prior to MISO's implementation of local resource zones on June 1, 2013.

Aggregated EERs, Aggregated Storage, Aggregated DERs

The minimum acceptable support for aggregated energy efficiency resources (EERs), aggregated storage, and aggregated distributed energy resources (DERs) include:

1) An affidavit from an officer of the company outlining the resource(s), including a commitment to achieve and/or maintain at least that same level of resource(s) four years forward,
2) Documentation from the ISO showing resource accreditation in the prompt-year for the resource(s), such as a MISO MECT screenshot, and;
3) If there are Michigan retail tariffs or customer contracts associated with the resource(s), copies shall be provided.

MISO PRA Purchases

The amount of ZRCs planned to be purchased through the MISO Planning Resource Auction (PRA) process[6] that will be deemed prudent in an approved capacity demonstration will be limited to 5% of the LSE's total requirement. A capacity demonstration filed by an LSE that includes a plan to purchase ZRCs in the PRA four years in the future in excess of 5% will not constitute a demonstration that the LSE owns or has contracted resources to meet its future capacity obligations, unless those ZRCs are tied to specific identified resources that are committed to be offered in the PRA, by contract, on behalf of the LSE for the applicable planning year.

Interim Years[7]

Once the Commission has determined that the capacity demonstration made by an LSE is sufficient, it shall not be re-litigated or "trued-up" in the interim years. If, subsequent to its initial satisfactory capacity demonstration, an LSE experiences an unforeseen outage at one of its generation assets, or has variation in its total load obligations, these matters will be settled in the capacity auctions of the respective ISO. The LSE's initial capacity demonstration will not be re-examined to reconcile projected interim year load obligations or generating resource capacity ratings with actual values that are experienced in that interim year.

Additional Considerations for Capacity Demonstrations

Other types of documentation submitted as part of a capacity demonstration will be evaluated on a case-by-case basis. Because some of the documentation that is required to be filed in these proceedings is commercially sensitive, competitive information, it shall continue to be treated in a confidential manner, as has been done in the past. The Staff shall file a memo in the docket as directed by the Commission, outlining its findings from the demonstration filings, including a listing of any entities whose demonstration, in Staff's opinion, was insufficient.

In the case where a demonstration filing is deemed insufficient by Staff, Staff would recommend that the Commission open a contested case docket, whereby the LSE in question could attempt to prove that

[6] Since 2012, LSEs do not literally purchase ZRCs in the PRA. The current terminology in the MISO tariff of "purchase through the PRA process" means that MISO is charging an LSE more for capacity to satisfy the LSE's PRMR than it is paying the LSE for ZRCs submitted into the PRA.

[7] Year 1 (prompt year), Year 2, and Year 3 of the demonstration.

its capacity demonstration should be deemed acceptable. The outcome of that case would be a Commission order potentially authorizing Statewide Reliability Mechanism capacity charges to Retail Open Access customer load as well as a respective increase in capacity obligations assigned to the incumbent utility as the Provider of Last Resort for capacity service. Any contested demonstration cases will be opened as soon as practicable following the issuance of the Staff memo and be completed within six months.

If an LSE has met the capacity demonstration requirements, no contested case will be opened, and no further action will be taken regarding any capacity demonstration that has been deemed sufficient by Staff and accepted by the Commission.

Filing Timeline

Section 6w of Public Act 341 of 2016 gives specific filing dates for LSEs to make capacity demonstrations but gives the Commission the authority to adjust the dates if needed to properly align with the ISO procedures and requirements. The timeline below better aligns with the MISO PRA, allowing capacity obligations and resource accreditation to better match the values used by MISO in the prompt year.

For Demonstration Year 2029/2030	
Docket Opened by Commission	Summer/Fall 2025
Larger Investor-Owned Electric Utilities[8] Filing Due	February 24th, 2026
Smaller Investor-Owned Electric Utilities[9] Filing Due	March 3, 2026
All Other LSEs Filing Due	March 17th, 2026
Staff Report on Capacity Demonstration Findings	May 12th, 2026
Commission Order	Summer/Fall 2026

The specific filing dates will be established by the Commission in each subsequent capacity demonstration docket and will generally align with the filing timeline above. LSEs will be allowed to supplement filings after the filing date and prior to Staff's report, if changes at the ISO level, for capacity obligation or resource accreditation, necessitate updated filings[10].

Demonstration Format

In addition to all of the items outlined above, Staff shall provide updated capacity demonstration documents (Reporting Templates and Sample Affidavits)[11] to be utilized by each LSE when filing its demonstration.

[8] A large investor-owned utility is considered to be an electric utility with one million or more customers.
[9] A smaller investor-owned utility is considered to be an electric utility with less than one million customers.
[10] In this event, LSEs should notify Staff as soon as practicable that a supplemental filing is imminent and make the filing with sufficient time to allow Staff to review and incorporate those changes into the report.
[11] Documents will be posted to the MPSC Capacity Demonstration webpage (https://www.michigan.gov/mpsc/commission/workgroups/2016-energy-legislation/capacity-demonstration).

S T A T E O F M I C H I G A N

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter, on the Commission's own motion, to open a docket for load serving entities in Michigan to file their capacity demonstrations as required by MCL 460.6w.	)))))	Case No. U-21775

AFFIDAVIT OF [Name of Company Officer]

STATE OF MICHIGAN

COUNTY OF (County name)

[NAME of Company Officer], being duly sworn, states that the following information and attached exhibits are true and accurate to the best of his/her reasonable knowledge and belief, regarding [the company's] satisfaction of its Michigan capacity demonstration requirements:

1. [Description of role and responsibilities within company]

2. [Overview of company]

3. [Overview of filing – if applicable for LSE, describe the load in each RTO, each local resource zone, and each service territory]

4. **Existing Generation - Owned** [Claim ownership of the unit(s), including a commitment of the unit(s) to LSE load in the applicable Michigan zone four years forward. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

5. **Existing Demand Response or Energy Efficiency Resources (Not Netted Against Load)** [Outline the resource(s), including a commitment to maintain at least that same level of resources four years forward. If an AES has a LMR, describe how the transmission losses are applied in each service territory. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

6. **Existing Demand Response or Energy Efficiency Resources (Netted Against Load)** [Outline what is netted against load, current programs, and how big these programs are.]

7. **New or Upgraded Generation – Owned** [Outline the detailed plans for the new generation including milestones such as planned in-service date, expected regulatory approval date(s), planned date to enter the MISO generator interconnection queue, expected date for MISO

generator interconnection agreement, construction timeline, etc. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

8. **New Demand Response or Energy Efficiency Resources (Not Netted Against Load)** [Outline the plans for the resource(s), including a commitment to achieve and/or maintain at least that same level of resources four years forward. If an AES has a LMR, describe how the transmission losses are applied in each service territory. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

9. **Existing Generation (Capacity Contract)** [Include a copy of the contract that specifies the unit(s) or pool of generation that is the source of the contract, including the location of the unit(s) or pool (can be filed confidentially) and state commitment to maintain the contract four years forward regardless of any early out clauses in the contract. In lieu of filing a copy of the contract(s), provide information set forth in the MPSC Order on Rehearing in Case No. U-18197, dated November 21, 2017, for Staff/Commission contract review. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

10. **Forward ZRC Contracts** [Include a copy of the contract that specifies the zonal locations of the ZRCs. The affidavit should include a commitment to maintain the contract four years forward regardless of any early out clauses in the contract. In lieu of filing a copy of the contract(s), provide information set forth in the MPSC Order on Rehearing in Case No. U-18197, dated November 21, 2017, for Staff/Commission contract review. (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)]

11. **Planning Reserve Auction Purchases** (If this does not apply to your LSE, state that it is not applicable in planning year 20**-20**.)

_____
NAME

SUBSCRIBED AND SWORN TO BEFORE ME on the _____ day of [month], [year].

_____
Notary Public

My Commission Expires: _____

ALTERNATIVE ELECTRIC SUPPLIER LOAD SWITCHING AFFIDAVIT

State of _____

County of _____

[NAME], [title] of ("Receiving Supplier"), upon oath deposes and states that the following information is true and accurate to the best of his/her reasonable knowledge and belief:

("Receiving Supplier") will assume responsibility for an additional _____ MW in capacity peak load contribution values ("Additional PLC Value") associated with migrating customer load in _____ service territory for Planning Year 20** - 20**, over and above ("Receiving Supplier's") capacity demonstration obligation. ("Receiving Supplier") understands that the customer load reflected in this Additional PLC Value is currently the responsibility of ("Losing Supplier").

This Affidavit is being provided at the behest of the Michigan Public Service Commission Staff, in furtherance of implementation of Section 6w of Public Act 341.

_____
NAME

SUBSCRIBED AND SWORN TO BEFORE ME on the _____ day of [month], [year].

_____
Notary Public

My Commission Expires: _____

P R O O F O F S E R V I C E

STATE OF MICHIGAN)

Case No. U-21775 *et al.*

County of Ingham)

Brianna Brown being duly sworn, deposes and says that on August 21, 2025 A.D. she electronically notified the attached list of this **Commission Order via e-mail transmission**, to the persons as shown on the attached service list (Listserv Distribution List).

Brianna Brown

Subscribed and sworn to before me
this 21st day of August 2025.

Angela P. Sanderson
Notary Public, Shiawassee County, Michigan
As acting in Eaton County
My Commission Expires: May 21, 2030

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Attachment KK

MI-Regional-Haze-SIP-Supplement-2021

SUPPLEMENT TO
MICHIGAN'S AUGUST 23, 2021,
REGIONAL HAZE STATE IMPLEMENTATION PLAN REVISION
FOR THE SECOND PLANNING PERIOD

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Michigan Department of Environment, Great Lakes, and Energy
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909-7760
https://www.michigan.gov/air

[Public Notice Draft for 30-day Public Comment Period]

March 2025

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APPENDIX 1	Michigan's August 23, 2021, Regional Haze State Implementation Plan Revision Submittal for the Second Implementation Period
APPENDIX 2	LADCO, "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 – 2028 Planning Period: Technical Support Document," June 17, 2021.
APPENDIX 3	LADCO, "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule, 2018–2028 Planning Period: TSD Supplemental Materials, June 17, 2021."
APPENDIX 4	"Statement of the Mid-Atlantic/Northeast Visibility Union (MANE-VU) States Concerning a Course of Action within MANE-VU toward Assuring Reasonable Progress for the Second Regional Haze Implementation Period (2018 – 2019)" for Indiana, Kentucky, Michigan, North Carolina, Ohio, Virginia, and West Virginia, August 25, 2017. https://otcair.org/manevuUpload/Publication/Formal%20Actions/MANE-VU%20Inter-Regional%20Ask%20Final%208-25-2017.pdf
APPENDIX 5	MANE-VU Regional Haze Consultation Report, MANE-VU Technical Support Committee. July 27, 2018 https://otcair.org/manevuUpload/Publication/Correspondence/MANE-VU_RH_ConsultationReport_Appendices_ThankYouLetters_08302018.pdf
APPENDIX 6	LADCO's Response to "MANE-VU Regional Haze Consultative Process," December 20, 2017
APPENDIX 7	LADCO's Response to "MANE-VU Regional Haze Consultative Process," May 23, 2018
APPENDIX 8	DTE – Trenton Channel, Unit 9A; St. Clair Units 1, 2, 3, 6, 7, Belle River Units 1 and 2: Federal Consent Decree, United States v. DTE Energy, Case No. 2:10-cv-13101-BAF-RSW (E.D. Mich)., Consent Decree entered May 14, 2020. https://www.justice.gov/enrd/consent-decree/file/1276421/download
APPENDIX 9	DTE – Belle River Units 1 and 2: Settlement Agreement, Case No. U-21193 – In the Matter of the Application of DTE Electric Company for Approval of an Integrated Resource Plan under MCL 460.6t and for other relief. Michigan Public Service Commission. July 26, 2023
APPENDIX 10	Consumers Energy – Dan E. Karn Units 3 and 4 and J.H. Campbell Units 1 and 2: Settlement Agreement, Case No. U-21090 – In the Matter of the Application of Consumers Energy Company for Approval of an Integrated Resource Plan under MCL 460.6t, certain account approvals and for other relief. Michigan Public Service Commission. April 20, 2022
APPENDIX 11	Consumers Energy – J.H. Campbell Units 1 and 2: Settlement Agreement affirmed in the State of Michigan Court of Appeals. *See* No. 362294 Public Service Commission, LC No. 00-021090, March 23, 2023. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000007I2GEAA0
APPENDIX 12	Empire Iron Mining Partnership, EGLE Air Quality Division Activity Report: On-Site Inspection, January 17, 2024, https://www.egle.state.mi.us/aps/downloads/SRN/B1827/B1827_SAR_20240117.pdf
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EXECUTIVE SUMMARY

The federal Clean Air Act (CAA) sections 169A and B [42 United States Code (U.S.C.), Sections 7491 and 7492] require the protection of visibility in 156 mandatory Federal Class I areas (Class I areas). These areas consist of all international parks, national wilderness areas and national memorial parks exceeding 5,000 acres, and national parks exceeding 6,000 acres that were in existence on August 7, 1977, for which visibility was found to be an important value, as stated in CAA section 162(a) [42 U.S.C. 7472(a)]. The United States Environmental Protection Agency's (USEPA) 1999 Regional Haze Rule, Title 40 of the Code of Federal Regulations (CFR) 51.308, requires states to develop and implement State Implementation Plan (SIP) revisions on a periodic basis to reduce visibility impairment, known as regional haze, resulting from "manmade air pollution." SIP revisions for the second planning period were due July 31, 2021. *See* 82 Federal Register (FR) 3078, January 10, 2017.

On August 23, 2021, the Michigan Department of Environment, Great Lakes, and Energy (formerly known as the Department of Environmental Quality, collectively referred to as "EGLE" in this document) submitted to the USEPA its Regional Haze SIP revision for the second implementation period, covering the 10-year period of 2019 to 2028. (Michigan's August 23, 2021, Regional Haze SIP submittal is included in full as Appendix 1 to this SIP Supplement). This document is a supplement to the Regional Haze SIP submitted to the USEPA in August 2021. The primary purpose is to expand on the four-factor analysis included in the original SIP submittal. It also addresses further the emission reductions that have occurred as well as those expected in the future from the shutdown of electric generation units (EGU) throughout the state of Michigan. The shutdown information is a key component to understanding the continued reduction in sulfur dioxide (SO_2) and oxides of nitrogen (NO_X) emissions in Michigan that improve visibility at Michigan's two Class I areas addressed in this SIP. These reductions also positively impact visibility in downwind regions of the country. The appendices contain details of each EGU that has shut down in recent years and those planning on shutting down in the relatively near future. This detail on emission reductions in the state expands on Michigan's position taken in the 2021 Regional Haze SIP submittal that visibility continues to improve and that additional emission reductions from the sources reviewed for the four-factor analysis would have little impact on already-improving visibility compared to the many reductions from EGUs.

Some other considerations in this supplement address USEPA guidance and input that may not have been addressed in the August 2021 SIP submittal. On July 8, 2021, approximately seven weeks before EGLE submitted its 2021 Regional Haze SIP revision, the USEPA released a memo entitled "Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period" (2021 Clarifications Memo)[1], describing clarifications to the Regional Haze Rule and USEPA's "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period," published on August 20, 2019 (2019 Regional Haze Guidance)[2]. Because of the timing of the memo and the July 31, 2021, deadline for SIP revisions contained in the Regional Haze Rule, EGLE did not have a timely opportunity to fully assess the clarifications, revise its SIP submittal accordingly, or provide a second 60-day Federal Land Management (FLM) consultation period and public comment period.

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[1] Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. USEPA Office of Air Quality Planning and Standards, Research Triangle Park (July 8, 2021). (2021 Clarifications Memo) https://www.epa.gov/system/files/documents/2021-07/clarifications-regarding-regional-haze-state-implementation-plans-for-the-second-implementation-period.pdf.

[2] Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. https://www.epa.gov/visibility/guidance-regional-haze-state-implementation-plans-second-implementation-period EPA Office of Air Quality Planning and Standards, Research Triangle Park (August 20, 2019).

This SIP supplement also provides additional information and justification to ensure Michigan achieves its reasonable progress goals for 2028 and meets the requirements as specified under 40 CFR 51.308(f). Coupled with Michigan's 2021 Regional Haze SIP submittal, this SIP supplement provides further evaluation of control measures and strategies as potential components of EGLE's Long-term Strategy (LTS) as required under 40 CFR 51.308(h)(4). The evaluation was conducted in accordance with the Regional Haze SIP development steps outlined in the USEPA's 2019 Regional Haze Guidance document outlined in the Table of Contents.

Overall, EGLE's LTS relies on on-the-books and on-the-way control measures that include, among other things, the retirements of 30 coal and fossil-fuel fired EGUs at 12 different power plants during the second implementation period. Based on the 2016 emissions inventory, the retirements that have already occurred during the second implementation period between 2018 and 2024 account for reductions in emissions of 17,417 tons per year (tpy) NO_X and 42,655 tpy SO_2. On the way are also the retirements of 3 more coal-fired EGUs required under a settlement agreement by May 31, 2025, representing additional reductions in emissions of 2,346 tpy NO_X and 12,850 tpy SO_2 based on the 2016 inventory. Together, these reductions represent a historically significant decrease in Michigan's statewide emissions by 30 percent NO_X and 65 percent SO_2 from all units in the second implementation period, with a sum, annual emissions in tons divided by distance in kilometers between a source and the nearest Class I area (Q/d) of 1.0 or greater. With still more on the way, 2 additional coal-fired EGUs will be retired under the same settlement agreement by May 31, 2031, representing additional reductions of 40 tpy NO_X and 58 tpy SO_2 in the third implementation period.

To summarize, this SIP supplement provides updates, additional information, and justification for:

- Determination of Affected Class I Areas
- Selection of Source for Analysis
- Confirmations of Source Retirements
- Effective Control Demonstrations
- Full Four-factor Analyses for Emission Units at Billerud Escanaba LLC, Graymont Western Lime, Inc., and Tilden Mining Company LC
- LTS and Control Measures Necessary to make Reasonable Progress
- Reasonable Progress Goals
- Progress Report

For this SIP supplement, EGLE facilitated a 60-day consultation period with the FLM as required by 51.308(i)(2) as well as an opportunity for public comment and hearing. EGLE made revisions based on comments received during the consultation and comment period, and EGLE's response to comments is included in the appendices.

EGLE is providing this SIP Supplement at this time fully aware that the USEPA became subject to a final action deadline set for May 30, 2025, for Michigan's Regional Haze SIP through a Federal Consent Decree that was entered on July 12, 2024, by the United States (U.S.) District Court for the District of Columbia. See *Sierra Club, et al. v. United States Environmental Protection Agency, et al.*, No. 1:23–cv–01744–JDB (U.S. District Court for the District of Columbia).

Together, Michigan's 2021 Regional Haze SIP Revision and this SIP Supplement address all required elements of 40 CFR 51.308(f) and demonstrate satisfactory progress toward the long-term visibility goals in the Regional Haze Rule and the CAA. This SIP does not include the relaxation of any existing requirements and therefore will not interfere with the attainment or

maintenance of the National Ambient Air Quality Standards (NAAQS) in accordance with section 110(l) of the CAA.

1. Step 1: AMBIENT DATA ANALYSIS

Identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days and determine baseline, current, and natural visibility conditions for each Class I area within the state. See 40 CFR 51.308(f)(1).

EGLE's ambient data analysis was provided in Section 2 of Michigan's 2021 Regional Haze SIP submittal, beginning on page 6. Michigan's August 23, 2021, Regional Haze SIP submittal is provided in full as Appendix 1 to this SIP Supplement.

2. Step 2: DETERMINATION OF AFFECTED CLASS I AREAS IN OTHER STATES

Determine which Class I area(s) in other states may be affected by the state's own emissions. See 40 CFR 51.308(f)(2)

The determination of affected Class I Areas is initially addressed in Section 2 of Michigan's 2021 Regional Haze SIP submittal, beginning on page 7 (*See* Appendix 1). Further elaboration is provided below.

To determine the impact on visibility at Class I areas from sources in Michigan for the second implementation period, EGLE relied upon modeling performed by the Lake Michigan Air Directors Consortium (LADCO). LADCO is the regional planning organization representing the states of Michigan, Illinois, Indiana, Minnesota, Ohio, and Wisconsin. LADCO used the Comprehensive Air Quality Model with extensions Particulate Matter Source Apportionment Tool (PSAT) for its analysis. LADCO tagged states and regions as well as individual point sources and inventory source groups to apportion emissions to states and regions. Then LADCO estimated relative visibility impacts in 2028 by projecting representative emissions inventories and known emission controls using 2011 and 2016 as base years. *See* Appendices 2 and 3: "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 – 2028 Planning Period: Technical Support Document and Supplemental Materials," June 17, 2021 (LADCO's 2021 Technical Support Document).

2.1 Updated Information for the Determination of Affected Class I Areas

Michigan's 2021 Regional Haze SIP submittal contained data on projected visibility in 2028 based on LADCO's modeling using a 2011 base year. Reflecting LADCO's more recent modeling for the 2028 projections with a 2016 base year, updated tables and figures appear in Step 6, below, to depict EGLE's 2028 reasonable progress goals for Isle Royale and Seney under the projected 2028 deciviews on the 20 percent most impaired and clearest days.

Table 6 is sourced from Table 8-5 of LADCO's 2021 Technical Support Document. This Table 6 updates Table 3 in Michigan's 2021 Regional Haze SIP submittal, which relied on modeling results using the 2011 base year, with the more recent modeling results using the 2016 base year.

Table 6: 2028_{2016} Tracer Contributions to b_{ext} on the Most Impaired Days at the LADCO Class I Areas

Source region tags	Source contributions to 2028 visibility at IMPROVE Sites (Mm-1)				Percent source contributions to 2028 visibility at IMPROVE Sites (%)			
IMPROVE Sites	ISLE1	SENE1	BOWA1	VOYA2	ISLE1	SENE1	BOWA1	VOYA2
Total Bext	**48.6**	**57.4**	**40.5**	**41.0**				
Rayleigh	12.0	12.0	11.0	12.0	24.7%	20.9%	27.2%	29.2%
Sea salt (SS)	0.3	0.2	0.2	0.3	0.5%	0.4%	0.5%	0.7%
Biogenic	1.4	1.8	1.2	1.3	2.9%	3.1%	2.9%	3.1%
ICBC	10.5	9.9	9.7	10.0	21.5%	17.2%	23.9%	24.4%
OC Estimated	4.2	5.1	3.6	3.5	8.6%	8.9%	8.9%	8.6%
Fire	0.9	0.9	0.9	0.4	1.9%	1.5%	2.1%	0.9%
Int'l anthropogenic	1.7	2.7	1.7	2.3	3.5%	4.8%	4.3%	5.7%
Offshore	0.2	0.2	0.1	0.1	0.5%	0.4%	0.1%	0.1%
West	1.6	1.9	1.9	1.8	3.4%	3.2%	4.6%	4.4%
Northeast	0.1	0.3	0.1	0.1	0.2%	0.5%	0.2%	0.2%
Southeast	0.4	1.3	0.2	0.2	0.8%	2.2%	0.6%	0.5%
CenSARA Other	2.4	1.8	1.9	1.5	4.9%	3.2%	4.6%	3.6%
IA	1.4	1.5	0.9	0.9	2.9%	2.6%	2.3%	2.1%
MO	1.4	1.7	0.8	0.6	3.0%	3.0%	2.1%	1.6%
TX	0.6	0.3	0.3	0.3	1.1%	0.6%	0.8%	0.7%
IL	2.0	3.6	0.6	0.4	4.0%	6.3%	1.6%	1.0%
WI	2.3	3.5	0.9	0.4	4.8%	6.2%	2.3%	1.0%
MI	1.7	3.4	0.1	0.2	3.5%	6.0%	0.3%	0.5%
OH	0.2	1.2	0.2	0.2	0.4%	2.0%	0.4%	0.5%
MN	2.4	1.7	3.9	4.4	5.0%	3.0%	9.6%	10.6%
IN (Total)	0.9	2.3	0.2	0.2	1.9%	4.0%	0.6%	0.5%
IN (Nonpoint)	0.3	0.7	0.1	0.1	0.6%	1.2%	0.2%	0.2%
IN (Rockport EGU)	0.0	0.1	0.0	0.0	0.1%	0.1%	0.0%	0.0%
IN (Gibson EGU)	0.0	0.1	0.0	0.0	0.1%	0.1%	0.0%	0.0%
IN (other EGU)	0.2	0.5	0.0	0.0	0.4%	0.8%	0.1%	0.1%
IN (Cement)	0.0	0.0	0.0	0.0	0.0%	0.1%	0.0%	0.0%
IN (Iron & Steel)	0.3	0.7	0.0	0.1	0.6%	1.2%	0.1%	0.1%
IN (Plastics & Resins)	0.0	0.0	0.0	0.0	0.0%	0.1%	0.0%	0.0%
IN (Aluminum)	0.0	0.0	0.0	0.0	0.0%	0.0%	0.0%	0.0%
IN (Other Point)	0.1	0.2	0.0	0.0	0.2%	0.4%	0.1%	0.0%
Other Anthro	0.0	0.0	0.0	0.0	0.0%	0.0%	0.0%	0.0%
Aggregated by RPO								
Natural	2.3	2.7	2.0	1.6	5%	5%	5%	4%
LADCO	9.6	15.7	6.0	5.8	20%	27%	15%	14%
WRAP	1.6	1.9	1.9	1.8	3%	3%	5%	4%
CenSARA	5.8	5.4	4.0	3.3	12%	9%	10%	8%
VISTAS	0.4	1.3	0.2	0.2	1%	2%	1%	0%

Source: LADCO's "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 – 2028 Planning Period: Technical Support Document," Table 8-5, June 17, 2021.

By sorting the regional visibility impairment contributions in units of inverse megameters (Mm^{-1}) in descending order for the source region tags in Table 6 above, 80 percent of the total contribution to visibility impairment at Isle Royale and 74 percent at Seney are attributed to regions with a contribution of 3.5 percent or greater.

Based on LADCO's 2028 modeled projections using the 2016 base year, Table 7 lists the Class I areas where Michigan contributes more than 1 percent to the 2028 modeled total light extinction. Although Michigan's contribution to visibility impairment is less than 1 percent at Voyageurs and Boundary Waters; both are listed below since they are located within the LADCO region.

Table 7: Class I Areas Impacted by Michigan Based on LADCO Source Apportionment Modeling Results for 2028, 2028 Adjusted Glidepath, and 2028 Projected Visibility on Most Impaired Days

Class I Area	State	LADCO 2028_{2016} Projected Total Light Extinction (Mm^{-1})	LADCO 2028_{2016} Projected Michigan Contribution (Mm^{-1})	LADCO 2028_{2016} Projected Michigan Contribution (%)
Seney Wilderness Area	MI	57.36	3.44	6.00%
Isle Royale National Park	MI	48.62	1.71	3.51%
Lye Brook Wilderness	VT	42.86	1.35	3.15%
Brigantine Wilderness Area	NJ	69.4	1.64	2.36%
Great Gulf Wilderness	NH	36.4	0.62	1.70%
Presidential Range-Dry River Wilderness	NH	36.4	0.62	1.70%
Mammoth Cave National Park	KY	74.18	1.11	1.49%
Acadia National Park	ME	41.9	0.59	1.42%
Shenandoah National Park	VA	50.63	0.66	1.29%
Swanquarter Wilderness Area	NC	48.52	0.62	1.29%
James River Face Wilderness	VA	53.42	0.62	1.15%
Moosehorn Wilderness Area	ME	37.33	0.41	1.09%
Roosevelt Campobello International Park	ME	37.33	0.41	1.09%
Dolly Sods Wilderness	WV	54.03	0.56	1.03%
Otter Creek Wilderness	WV	54.03	0.56	1.03%
Voyageurs National Park	MN	41.03	0.20	0.48%
Boundary Waters Canoe Area Wilderness	MN	40.51	0.11	0.28%

Source: LADCO's "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 – 2028 Planning Period: Technical Support Document and Supplemental Materials," June 17, 2021 (*See* Appendices 2 and 3).

LADCO's "2021 Technical Support Document Modeling Files for the 2016 base year, 2028 modeling, specifically the "2016-based 2028 glidepaths and PSAT tracer contributions" spreadsheet posted on LADCO's electronic docket at https://www.ladco.org/reports/technical-support/ladco-regional-haze-tsd-second-implementation-period/

Based on the 2028 projections, Michigan is projected to contribute 3.44 Mm^{-1} to visibility impairment at Seney and 1.71 Mm^{-1} at Isle Royale, representing 6.00 percent and 3.51 percent to the total contributions to visibility impairment, respectively. To a lesser extent, Michigan is also projected to contribute 1.35 Mm^{-1} or less to visibility impairment at Class I areas in other states, representing 3.15 percent or less of the total contributions as shown in Table 7, above.

2.2. Addressing Impacts on Out-of-State Class I Areas

Under 40 CFR 51.308(f)(2)(ii)(B), States must consider and address the emissions reduction measures identified by other States for their sources as being necessary to make reasonable progress in the mandatory out-of-state Class I area.

Outside LADCO, the Mid-Atlantic/Northeast Visibility Union (MANE-VU) is the regional planning organization for the Northeastern and Mid-Atlantic States and Tribal Governments, which includes: Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Penobscot Indian Nation, Rhode Island, St. Regis Mohawk Tribe, and Vermont, and suburbs of Washington, D.C. Southeastern Air Pollution Control Agencies (SESARM) is the regional planning organization for Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia and the Eastern Band of the Cherokee Indians. Of the 17 Class I areas listed in Table 7, 4 are located in the LADCO states, 7 are located in the MANE-VU states, and 6 are located in SESARM. Michigan's contribution to visibility impairment in Class I areas is 6 percent or less in LADCO, 3.15 percent or less in MANE-VU, and 1.49 percent or less in SESARM.

As noted in Michigan's 2021 Regional Haze submittal, to the extent that Michigan affects Class I areas in other states, MANE–VU sent a letter to Michigan and other upwind states dated August 25, 2017, identifying large emission sources that MANE-VU wanted further controlled as a response to the Regional Haze Rule (*See* Appendix 4).

In Michigan, MANE-VU's August 25, 2017, letter identified the following units as contributing 3.0 Mm^{-1} or more to visibility impacts at one or more MANE-VU Class I areas based on 2011 and 2015 emissions:

- DTE – St. Clair Power Plant (Units 1, 2, 3, 4, 6, collectively)
- DTE – Belle River Power Plant (Units 1 and 2, separately)

For these sources, MANE-VU presented five requests:

- Ensure most effective use of control technologies on a year-round basis for EGUs > 25 MW.
- Perform four-factor analyses for new emission controls.
- Pursue an ultra-low sulfur fuel oil standard.
- Pursue enforceable means to lock in lower emission rates for sources >250 million British Thermal Units (MMBtu)/hour that have switched fuels.
- Consider energy efficiency, combined heat and power, as well as fuel cells, wind, and solar energy.

Additionally, on July 27, 2018, MANE-VU sent a consultation report to non-MANE-VU states that it identified as having sources that significantly contributed to visibility impairment at the Class I areas within the MANE-VU region (*See* Appendix 5). Michigan was determined to be one of the 14 states that MANE-VU identified for consultation. The July 27, 2018, MANE-VU requests included the following measures that would apply to sources in Michigan:

- A 90 percent reduction from the 2002 SO_2 emission levels should be achieved at the following uncontrolled sources in Michigan:

- DTE – Trenton Channel Power Plant, Unit 9A
- DTE – St. Clair, Unit 7

The State of New Jersey (a representative of MANE-VU) also approached Michigan with a request in a letter dated June 23, 2021: “Although New Jersey recognizes that St. Clair Power Plant is scheduled to be shut down in 2022 as stated in Section B of Michigan’s proposed SIP submittal, New Jersey requests that Michigan document in its SIP that this shutdown is permanent and enforceable.” (*See* Appendix E (*Comments Received*) of Michigan’s 2021 Second Planning Period Regional Haze Submittal to the USEPA.)

In response to the August 25, 2017, and July 27, 2018, MANE-VU requests, LADCO represented Michigan and the other LADCO states by replying with letters dated December 20, 2017, and May 23, 2018 (*See* Appendices 6 and 7). LADCO indicated that the 2011 and 2015 base year inventories and 2018 projections used by MANE-VU neglected the use of best available emissions information in the screening analysis, and that MANE-VU’s impact assessments did not accurately characterize the regional haze impacts of the LADCO sources on receptors in the MANE-VU region. LADCO explained that MANE-VU’s 2018 projections did not reflect significant shifts in the energy and industrial sections that had occurred.

As to the Michigan sources specifically identified by New Jersey and MANE-VU, EGLE responds that each was subject to a Federal Consent Decree in United States v. DTE Energy, Case No. 2:10-cv-13101-BAF-RSW (E.D. Mich.), which was entered May 14, 2020. https://www.justice.gov/enrd/consent-decree/file/1276421/download (*See* Appendix 8). The Consent Decree required DTE to “retrofit, refuel, or repower” the following units:

- Belle River Units 1 and 2 by December 31, 2030
- St. Clair Units 2, 3, 6 and 7 by December 31, 2022
- Trenton Channel Unit 9 by December 31, 2022

Each unit listed above has already taken measures to reduce emissions beyond the requests themselves. The emission reductions achieved are federally enforceable and permanent, and are discussed in further detail below in Section 3.3 for sources that already have Effective Emission Control Measures.

- St. Clair retired Unit 4 in 2017, Unit 1 in 2019, and Units 2, 3 ,6, and 7 in 2022, while Unit 5 has been retired since 1980. (*See* Appendix 33-A with the Certified Retired Unit Exemption Forms.)
- DTE – Trenton Channel, Unit 9A, retired in 2022. (*See* Appendix 33-C with the Certified Retired Unit Exemption Form.)

- DTE Belle River, Units 1 and 2, were required to operate a low NO_X combustion system with overfire air and became subject to emission limits of 0.290 lb./MMBtu NO_X, 0.680 lb./MMBtu SO_2, and 0.030 lb./MMBtu particulate matter (PM) under the Consent Decree. DTE is also in the process of converting Belle River Units 1 and 2 to natural gas by December 2025 and December 2026, respectively. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000008puPjAAI (*See* Appendix 9).

As discussed further below under Section 3.3.1, other large emitters of NO_X and SO_2 in the EGU category in Michigan have also experienced shutdowns and retirements since MANE-VU initiated consultation in 2017, such as the coal-fired boilers at the Consumers Energy – Dan E. Karn Plant, Lansing Board of Water and Light (LBWL) – Erickson Station, DTE Electric – River Rouge Power Plant, and Michigan Hub Plant. These shutdowns/retirements of coal-fired EGUs resulted in reduced emissions of greenhouse gases, as well as NOx and SO_2. Michigan expects that these operational changes will have a positive impact on visibility impairment at nearby Class I areas in surrounding states, including those that are part of MANE-VU.

3. Step 3: SELECTION OF SOURCES FOR ANALYSIS

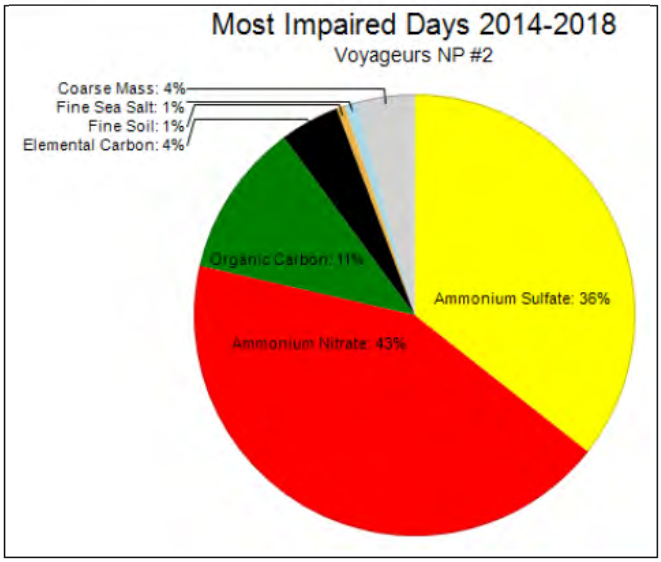
Select the emission sources for which an analysis of emission control measures will be completed in the second implementation period and explain the basis for these selections. For the purpose of this source selection step, a state may consider estimated visibility impacts (or surrogate metrics for visibility impacts), the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv), and other factors that are reasonable to consider.

3.1 Determination of Which Pollutants to Consider

Contributing to regional haze are direct and precursor pollutants that primarily include SO_2, NO_X, fine and coarse PM, volatile organic compounds (VOC), and ammonia (NH_3). Depending on the location of the Class I areas, there may be only certain pollutants and precursors that dominate visibility impairment.

Based on the analyses in LADCO's 2021 Technical Support Document of the IMPROVE monitoring data, NO_X and SO_2 emissions were found to lead to the formation of the particulate species of nitrate and sulfate that currently contribute more to visibility impairment in the LADCO Class I Areas than $PM_{2.5}$, NH_3, and VOC. Figure 5 illustrates the PM species contribution plot for Voyageurs National Park, for which LADCO noted, "The PM species contributions for other LADCO region Class I areas are similar to Voyageurs." *See* LADCO's 2021 Technical Support Document, page 70.

Figure 5: Average PM Species Composition at Voyageurs National Park, Minnesota on the Most Impaired Days during 2014 – 2018



Source: LADCO's 2021 Technical Support Document, Figure 6-2.

The USEPA's August 20, 2019, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period" (2019 Regional Haze Guidance) states:

> "When selecting sources for analysis of control measures, a state may focus on the PM species that dominate visibility impairment at the Class I areas affected by emissions from the state and then select only sources with emissions of those dominant pollutants and their precursors." 2019 Regional Haze Guidance, page 11.

As discussed below in Section 3.2 Estimation of Baseline Visibility Impacts for Source Selection, EGLE's source selection process followed LADCO's approach in considering the sum of NH_3, NO_X, $PM_{2.5}$ and SO_2 emissions from Michigan sources divided by the distance to the closest Class I area. Then in Section 4 Characterization of Factors for Emission Control Measures, given the predominance of NO_X and SO_2 emissions contributing to visibility impairment at the LADCO Class I areas, EGLE focused on NO_X and SO_2 emissions in the evaluation of control measures necessary for reasonable progress.

3.2 Estimation of Baseline Visibility Impacts for Source Selection

To estimate visibility impacts for the purpose of selecting sources for further evaluation, the 2019 Regional Haze Guidance lists the following techniques from the least complicated to the most complicated and resource-intensive:

1) Emissions divided by distance (Q/d)
2) Trajectory analyses
3) Residence time analyses
4) Photochemical modeling (zero-out and/or source apportionment)

Among the least complicated techniques, a Q/d analysis is a surrogate analysis using tons/year emissions (Q) divided by distance in kilometers (d) from the Class I areas to estimate emissions source impacts at downwind receptors when air quality modeling would be overly resource-intensive and is not therefore a feasible process to support decision making.

3.2.1 Background on Previous Q/d Analysis

In an effort to support Region 5 states in the process of selecting sources/units for the Regional Haze Second Implementation Period, LADCO complied a detailed Q/d Analysis using the National Emissions Inventory (NEI) Collaborative 2016 alpha inventory for NO_X, SO_2, NH_3, VOCs, and fine particulate matter ($PM_{2.5}$) as the best available inventory at that time. *See* ‘‘Base Year Selection Workgroup Final Report,’’ produced by the Inventory Collaborative Base Year Selection Workgroup, April 5, 2017. 2017-12-12_Base_Year_Selection_Report_V1.1.pdf

In Michigan’s 2021 Regional Haze SIP submittal on pages 9-10, EGLE describes how Michigan’s estimation relied on LADCO’s Q/d method to identify sources in the state for a possible four-factor analysis. At the time, EGLE screened in sources using a Q/d > 4 based on 2016 actual emissions to represent approximately 80 percent of emissions from Michigan sources. Through this process, EGLE identified the following sources:

Paper Manufacturing Facilities:
- Neenah Paper
- Verso Quinnesec
- Verso Escanaba

Cement Manufacturer:
- St. Marys – Charlevoix

Lime Facility:
- Graymont – Gulliver

Power Plants:
- DTE – Monroe
- DTE – Belle River
- Consumers Energy – J.H. Campbell
- Consumers Energy – Dan E. Karn

During the FLM consultation process, the FLMs recommended Michigan also address the following facilities:

- Tilden Mining Company LC
- Holcim d/b/a Lafarge Alpena Plant
- LBWL – Erickson Station
- EES Coke Battery LLC
- Midland Cogeneration Venture
- L’Anse Warden Electric Company
- US Steel Great Lakes Works

3.2.2 Revised Q/d Analysis for the Selection of Impacting Sources

In this SIP supplement, EGLE re-examines LADCO's Q/d's analysis to further expand and refine its earlier source selection process.

Using the NEI collaborative 2016 alpha inventory to gather NO_X, SO_2, $PM_{2.5}$, VOCs, and NH_3 emissions data for an exhaustive list of Michigan sources of air pollution, LADCO's 2021 Technical Support Document provided calculations of the unit Q/d for each source. EGLE cross checked the inventory data with the Clean Air Markets Program Data (https://campd.epa.gov/) and the Michigan Air Emissions Reporting Systems Annual Pollutant Totals Query (https://www.egle.state.mi.us/maers/emissions_query.asp).

In selecting a Q/d threshold value that would serve as a metric for identifying sources of high impact potential on visibility impairment at Class I areas, EGLE's Air Quality Division (AQD) intended to set this threshold at a value that would capture nearly 80 percent of the total combined emissions of haze forming pollutants from all sources throughout the state.

The 2019 Regional Haze Guidance states, "In the most simple implementation of Q/d, metrics and thresholds can be defined on the basis of the sum of emissions of all visibility-impairing pollutants." The 2019 Regional Haze Guidance also notes, however, "it may be best to evaluate Q/d metrics on an individual pollutant basis. Additionally, since the magnitude of Q/d may vary considerably when total emissions are considered versus emissions of individual primary PM and precursor pollutants, appropriate pollutant-specific Q/d thresholds…may need to be considered." (2019 Regional Haze Rule, pg. 13.)

Table 8 lists each of the units indexed by LADCO's Q/d analysis with a Q/d of 1.0 or greater. Table 8 includes Q/d by unit level, facility level, and pollutant specific unit level (NO_X and SO_2). Unit level and facility level 'Q' were based on the sum of 2016 actual emissions for NH_3, NO_X, $PM_{2.5}$, and SO_2 in tpy. Pollutant-specific unit level Q was based on 2016 emissions for NO_X and SO_2, individually. The distance 'd' in kilometers (km) was from the source to the closest Class I area (CIA) drawn from the following list:

- Isle Royale National Park (ISLE)
- Seney Wilderness Area (SENE)
- Boundary Waters Canoe Area Wilderness
- Voyageurs National Park (VOYA)
- Mingo Wilderness Area
- Mammoth Cave National Park
- Dolly Sods Wilderness (DOSO)

The emissions for all analyzed sources were totaled and multiplied by a factor of 0.80 (80 percent). The target "80 percent" value functioned as a guidepost for setting a Q/d threshold to identify sources for possible four-factor analyses.

To capture 80 percent of emissions of NO_X and SO_2 collectively, an incremental evaluation led to a threshold Q/d>6 on an individual pollutant basis at the unit level for NO_X and SO_2 separately. As described in the 2019 Regional Haze Guidance, it may be best to evaluate Q/d metrics on an individual pollutant basis since the magnitude of a Q/d based on total emissions may vary considerably from a Q/d based on the individual primary PM and precursor pollutants. Inclusion of the other haze precursors ($PM_{2.5}$, VOC, and ammonia) in the Q/d analysis would not

reflect NO_X and SO_2 as the dominant species contributing to visibility impairment in the LADCO Class I areas. Additionally, a unit pollutant level Q/d approach recognizes that the evaluation of control measures takes place at the unit level, and that addressing NO_X and SO_2 emissions would entail entirely different control systems. In the Q/d analysis below, a pollutant specific unit Q/d>6 threshold captured 70 percent of NO_X and 85 percent of SO_2 emissions, and 79 percent of both NO_X and SO_2, collectively.

In Table 8, units with a pollutant specific unit Q/d>6 are highlighted in green, and units that have retired or have an enforceable commitment to retire by 2028 or soon thereafter are highlighted in orange with an asterisk (*) to differentiate colors for viewing when no color option is available.

Table 8: Sources Listed by Q/d for Source Selection Process

KEY: Green shaded cells: Units selected based on Pollutant Specific Unit Q/d>6
Orange shaded cells with * to differentiate color: Units selected based on retirement

Facility Name	Sector	Agency Unit ID	Facility Unit ID	2016 Base Year Emissions (tpy)					Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)	CIA (km)
				NH3	NO_X	$PM_{2.5}$	SO_2	Total					
TILDEN MINING COMPANY LC	NON-EGU	EU0087	EU Kiln 2–gas fired	0	5070	62.1	3.3	5135.3	42.8	42.3	0.0	108.6	ISLE
		EU0064	EU Kiln 1–gas fired	0	4544.5	143.4	4.1	4691.9	39.2	37.9	0.0		120
		EU0064	EU Kiln 1–coal fired	0	1545	48.7	131.2	1724.9	14.4	12.9	1.1		
		EU0087	EU Kiln 2 –coal fired	0	1320.5	16.2	105.5	1442.1	12	11.0	0.9		
ST. CLAIR / BELLE RIVER POWER PLANT	EGU	EU0120	Belle River Unit 2	0	3950.5	0.9	11590	15541.4	32.5	8.2	24.2	105.1	SENE
		EU0119	Belle River Unit 1	0	3040	0.2	9235	12275.2	25.6	6.3	19.3		479
*ST. CLAIR / BELLE RIVER POWER PLANT	EGU	EU0111	St. Clair Boiler 7	0	1046	2.6	5600	6648.6	13.9	*2.2	*11.7		
		EU0107	St. Clair Boiler 3	0	910	0	1780	2690	5.6	*1.9	*3.7		
		EU0106	St. Clair Boiler 2	0	913.5	0.4	1763	2676.9	5.6	*1.9	*3.7		
		EU0105	St. Clair Boiler 1	0	1273	0.3	2385.5	3658.8	7.6	*2.7	*5.0		
		EU0110	St. Clair Boiler 6	0	596	0.5	3019.5	3616	7.6	*1.2	*6.3		
		EU0108	St. Clair Boiler 4	0	694.5	0	1780.5	2475	5.2	*1.4	*3.7		
	NON-EGU	EU0117	St. Clair Diesel Generator 12-1	0	720.5	12.4	0.3	733.3	1.5	*1.5	*0.0		
*WISCONSIN ELECTRIC POWER COMPANY, Marquette – Presque Isle	EGU	EU0036	Boiler 9	0.1	926.5	0.6	1386.5	2313.7	20.4	*8.2	*12.3	84.9	ISLE
		EU0034	Boiler 7	0.1	934	0.6	1344.5	2279.2	20.1	*8.3	*11.9		113
		EU0035	Boiler 8	0.1	895.5	0.6	1317.5	2213.7	19.5	*7.9	*11.7		
		EU0033	Boiler 6	0.1	503.5	0.4	921.5	1425.4	12.6	*4.5	*8.2		
		EU0032	Boiler 5	0.1	491.2	0.4	914.5	1406.1	12.4	*4.3	*8.1		
EMPIRE IRON MINING PARTNERSHIP	NON-EGU	EU0147	Unit 4	0	2021.5	33.5	271.9	2326.8	19.4	16.8	2.3	41.5	ISLE

Facility Name	Sector	Agency Unit ID	Facility Unit ID	2016 Base Year Emissions (tpy)					Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)	CIA (km)
				NH3	NO_X	$PM_{2.5}$	SO_2	Total					
		EU0143	Unit 2	0	1350	97	50.6	1497.6	12.5	11.3	0.4		120
		EU0145	Unit 3	0	1010.5	96.5	50.4	1157.4	9.6	8.4	0.4		
*J. H. Campbell Plant	EGU	EU0062	Boiler 3	21.1	806.5	17.6	6900	7745.2	20.6	*2.1	*18.4	40.6	SENE
		EU0059	Boiler 1	6	1234.5	8.5	2522.5	3771.5	10	*3.3	*6.7		376
		EU0061	Boiler 2	9.8	305.2	21.7	3427	3763.7	10	*0.8	*9.1		
St. Marys Cement, Inc. - Charlevoix Plant	NON-EGU	RG0148	Compiled Kiln	6.8	2063	34	1178.5	3282.2	27.5	17.3	9.9	27.5	SENE 119
LAFARGE MIDWEST INC. - Alpena	NON-EGU	EU0181	Kiln 23	2.5	1419.5	4.5	452.8	1879.4	7.9	5.9	1.9	25.9	SENE
(Now Holcim (US), Inc.		EU0176	Kiln 22	2.7	1447.5	4.9	490	1945.1	8	6.0	2.0		240
DBA Lafarge Alpena Plant)		EU0161	Kiln 20	1.6	729.5	17.5	544.5	1293.1	5.4	3.0	2.3		
		EU0158	Kiln 19	1.5	630.5	10.3	445.4	1087.6	4.5	2.6	1.9		
*DTE - Electric Company TRENTON CHANNEL	EGU	EU0035	Boiler 9A	0	1763.5	12.1	9395	11170.6	24.2	*3.8	*20.3	25.8	DOS O
		RG0053	High Pressure Boilers	0	179.2	0.2	549.5	728.9	1.6	0.4	1.2		462
Verso Escanaba LLC (Now Billerud Escanaba LLC)	NON-EGU	EU0183	Recovery Furnace 10	0	623.5	107.8	15.2	746.5	7.2	3.1	0.1	22.5	ISLE
		EU0139	No. 11 Power Boiler	0	606.8	12.2	687.4	1306.4	12.7	3.0	3.4		201
		EU0161	Boiler 8	0	261.2	9.2	0.7	271.1	2.6	1.3	0.0		
NEENAH PAPER – MICHIGAN, INC - Munising	NON-EGU	EU0080	Boiler 1	0	264.6	1.4	588.5	854.5	15.5	4.8	10.7	15.5	SENE 55
Detroit Edison DTE Electric Company - Monroe Power Plant	EGU	EU0063	Unit 3	0	1220.5	7.5	800	2028	4.5	2.7	1.8	14.3	DOS O
		EU0064	Unit 4	0	1129.5	4.6	738.5	1872.6	4.1	2.5	1.6		454
		EU0062	Unit 1	0	998.5	4.6	529.5	1532.6	3.4	2.2	1.2		
		EU0068	Unit 2	0	760.5	5.7	275.3	1041.4	2.3	1.7	0.6		
Midland Cogeneration Venture	EGU	RG0063	SV0001	0.0	357.7	19.7	4.4	381.8	1.2	1.1	0.0	11.6	SENE 330
Combined Cycle Gas			SV0002	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		

Facility Name	Sector	Agency Unit ID	Facility Unit ID	2016 Base Year Emissions (tpy)					Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)	CIA (km)
				NH3	NO_X	$PM_{2.5}$	SO_2	Total					
Turbines			SV0003	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0004	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0005	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0011	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0006	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0007	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0008	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0009	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
			SV0012	0.0	321.9	17.7	3.9	343.6	1.0	1.0	0.0		
*B. C. Cobb Plant	EGU	RG0028	Boilers 4 & 5	0.1	643.5	28.1	2712.5	3384.1	10	*1.9	*8.0	10	SENE 339
*DTE - Electric Company RIVER ROUGE	EGU	EU0040	Unit 3	0	1814	4.5	2723.8	4542.3	9.7	*3.9	*5.8	9.7	DOSO 470
*LBWL, Erickson Station	EGU	EU0007	Coal-fired boiler	0.1	1058.5	1.4	2588.5	3648.6	8.8	*2.6	*6.3	8.8	SENE 413
GRAYMONT WESTERN LIME, INC.	NON-EGU	EU0001	EU Kiln 1	0	254.5	13.3	19.6	287.4	8.1	7.1	0.5	8.1	SENE 36
TES Filer City Station	EGU	RG0017	Boilers 1 & 2	0.1	1373.5	46.4	360.1	1780.1	7.7	5.9	1.6	7.7	SENE 232
VERSO QUINNESEC LLC (Now Billerud Quinnesec LLC)	NON-EGU	EU0153	Recovery Furnace	0	603	73.9	14	691	4.2	3.7	0.1	7.6	SENE 164
		EU0159	Waste Fuel Boiler	9.1	418.8	13.2	117.9	558.9	3.4	2.6	0.7		
*LBWL - Eckert Station	EGU	RG0023	Coal Fired Boiler	0.1	785.5	12.4	1858	2656	6.4	*1.9	*4.5	6.4	SENE 412
*Consumers Energy – J.C. Weadock Facility	EGU	RG0060	Weadock 7 & 8	0	510.5	30.9	1635.5	2176.9	6.4	*1.5	*4.8	9.8	SENE 338
*Consumers Energy – D.E. Karn Facility		RG0058	Karn 1 & 2	0	213.8	12	283.9	509.7	3.4	*0.6	*0.8		SENE 338
L'ANSE WARDEN ELECTRIC COMPANY LLC	EGU	EU0009	Boiler 1	0.1	373.5	0.9	243.7	618.2	6.2	4.6	3.0	6.2	ISLE 82
*MARQUETTE BOARD OF LIGHT & POWER - Shiras	EGU	EU0003	Boiler 3	0	196.7	44.5	419	660.1	5.4	*1.7	*3.7	5.4	SENE 114

Facility Name	Sector	Agency Unit ID	Facility Unit ID	2016 Base Year Emissions (tpy)					Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)	CIA (km)
				NH3	NO_X	$PM_{2.5}$	SO_2	Total					
EES COKE BATTERY LLC	NON-EGU	EU0007	Coke Oven Gas Flare	0	521	200.9	1110	1831.9	1.4	1.1	2.4	5.3	DOSO 471
		EU0008	No. 5 Coke Battery	111.8	0	0	0	111.8	3.9	0.0	0.0		
PENINSULA COPPER INDUSTRIES, INC.	NON-EGU			86.5	0	0	0	86.5	3	0.0	0.0	5.3	ISLE
				0	202.9	21.1	503	727	2.3	5.3	13.2		38
J.R. WHITING CO.	EGU	EU0021	Boiler 3	0	217.4	18.8	484.7	720.9	1.6	0.5	1.1	4.6	DOSO
		EU0019	Boiler 1	0	178.3	6.1	440.6	625	1.6	0.4	1.0		453
		EU0020	Boiler 2	14.4	589	7.3	527.5	1138.2	1.4	1.3	1.2		
Marquette Branch Prison	NON-EGU	EU0005	Diesel Electric Generator	0	161.9	12.3	10.6	184.7	1.6	1.4	0.1	3.3	SENE 113
		EU0006	Diesel Electric Generator	0	161.9	12.3	10.6	184.7	1.6	1.4	0.1		
Guardian Industries, LLC	NON-EGU	EU0079	Line 1	0	917	271.5	343.9	1532.4	3.3	2.0	0.7	3.3	DOSO 470
GREAT LAKES GAS TRANSMISSION STATION #10	OIL GAS	EU0006	Unit 1001	0	61.3	2.6	1.4	65.3	1.5	1.4	0.0	2.7	SENE 44
		EU0007	Unit 1002	0	49.1	2.1	1.1	52.2	1.2	1.1	0.0		
Morton Salt, Inc.	NON-EGU	EU0023	Boiler	0	161.3	15	393.9	570.2	2.5	0.7	1.7	2.5	SENE 230
J.B. Sims Generating Station	EGU	EU0023	PC Boiler	0	459.4	9.5	364.9	833.8	2.3	1.3	1.0	2.3	SENE 359
CARMEUSE LIME, INC., RIVER ROUGE OPERATION	NON-EGU	RG0025	Kilns 1 & 2	0	565	6.2	438.2	1009.4	2.1	1.2	0.9	2.1	DOSO 471
WEYERHAEUSER NR COMPANY	NON-EGU	RG0062	Dryers 1, 2, 3, 4 and Coen Burner	0	94.2	339.7	3.1	437	2.1	0.4	0.0	2.1	SENE 213
Consumers Energy - Muskegon River Compressor Station	OIL GAS	RG0062	Engines H9, H10, H11, H12 (HBA-10) and T11, T12	0	508.7	7.8	0.1	516.5	2	2.0	0.0	2	SENE 257

Facility Name	Sector	Agency Unit ID	Facility Unit ID	2016 Base Year Emissions (tpy)					Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)	CIA (km)
				NH3	NO_X	$PM_{2.5}$	SO_2	Total					
ANR Pipeline Company - Lincoln Compressor Station	OIL GAS	EU0017	Natural Gas Compressor Engine	0	497.8	8.4	0.1	506.3	1.8	1.8	0.0	1.8	SENE 274
Cadillac Renewable Energy Facility	EGU	EU0006	Wood/bark Boiler	9	177.7	17.1	57.7	261.3	1.1	0.8	0.3	1.1	SENE 229
Packaging Corporation of America - Filer City Mill	NON-EGU	EU0037	Boiler 1	2.8	246.7	6.7	0.5	256.7	1.1	1.1	0.0	1.1	SENE 232
Great Lakes Gas - Farwell Compressor Station 12	OIL GAS	EU0016	Natural Gas Engine	0	279.9	8.5	0.1	288.5	1.1	1.0	0.0	1.1	SENE 274
Viking Energy of McBain	EGU	EU0003	Wood Fired Boiler	0	37.8	2.2	206.7	246.7	1	0.2	0.9	1	SENE 239
DETROIT RENEWABLE POWER LLC	EGU	EU0020	Boiler 11	0	435.4	3	45.6	484	1	0.9	0.1	1	DOSO 475
TOTAL EMISSIONS for Sources with Unit Q/d of 1.0 or Greater				287	68,547	2,259	91,160	162,252					
TOTAL Emissions from Sources with Unit Q/d > 6 per Pollutant + Retirements					48,273		77,413						
% of Total Emissions Represented by Selected Sources					**70%**		**85%**						

Source:

- LADCO's "Modeling and Analysis for Demonstrating Reasonable Progress for the Regional Haze Rule 2018 – 2028 Planning Period: Technical Support Document," June 17, 2021. *See* Appendices G and H.
- LADCO's 2021 Technical Support Document Modeling Files for the 2016 base year, 2028 modeling, specifically the "Process level report of Q/D sources (Haze_Control_Sheet_6.9.xlsx)" spreadsheet posted on LADCO's electronic docket at https://www.ladco.org/reports/technical-support/ladco-regional-haze-tsd-second-implementation-period/
- Clean Air Markets Program Data https://campd.epa.gov/
- Michigan Air Emissions Reporting Systems Annual Pollutant Totals Query https://www.egle.state.mi.us/maers/emissions_query.asp

To summarize, the application of the pollutant specific unit Q/d>6 threshold as a screening tool for the Q/d data compiled by LADCO generated the following updated list of 'selected sources' for possible four-factor analyses. Although the FLMs recommended selecting EES Coke Battery LLC, Midland Cogeneration Venture, L'Anse Warden Electric Company, and US Steel Great Lakes Works, emissions for these sources were below the pollutant specific unit Q/d>6 threshold and beyond EGLE's 80 percent target. As shown in Table 9 below, the pollutant specific unit Q/d>6 threshold level captured Michigan's largest sources with the greatest impacts on visibility impairment.

Table 9: Sources Selected for Possible Four-factor Analysis

KEY: Green shaded cells: Units selected based on Pollutant Specific Unit Q/d>6
Orange shaded cells with * to differentiate colors: Units selected based on Retirement

Facility Name	Sector	Facility Unit ID	Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)
TILDEN MINING COMPANY LC	NON-EGU	EU Kiln 2–gas fired	42.8	42.3	0.0	108.6
		EU Kiln 1–gas fired	39.2	37.9	0.0	
		EU Kiln 1–coal fired	14.4	12.9	1.1	
		EU Kiln 2 –coal fired	12	11.0	0.9	
ST. CLAIR / BELLE RIVER POWER PLANT	EGU	Belle River Unit 2	32.5	8.2	24.2	105.1
		Belle River Unit 1	25.6	6.3	19.3	
*ST. CLAIR / BELLE RIVER POWER PLANT	EGU	St. Clair Boiler 7	13.9	*2.2	*11.7	
		St. Clair Boiler 3	5.6	*1.9	*3.7	
		St. Clair Boiler 2	5.6	*1.9	*3.7	
		St. Clair Boiler 1	7.6	*2.7	*5.0	
		St. Clair Boiler 6	7.6	*1.2	*6.3	
		St. Clair Boiler 4	5.2	*1.4	*3.7	
	NON-EGU	St. Clair Diesel Generator 12-1	1.5	*1.5	*0.0	
*WISCONSIN ELECTRIC POWER COMPANY, Marquette – Presque Isle	EGU	Boiler 9	20.4	*8.2	*12.3	84.9
		Boiler 7	20.1	*8.3	*11.9	
		Boiler 8	19.5	*7.9	*11.7	
		Boiler 6	12.6	*4.5	*8.2	
		Boiler 5	12.4	*4.3	*8.1	
EMPIRE IRON MINING PARTNERSHIP	NON-EGU	Unit 4	19.4	16.8	2.3	41.5
		Unit 2	12.5	11.3	0.4	
		Unit 3	9.6	8.4	0.4	
*J. H. Campbell Plant	EGU	Boiler 3	20.6	*2.1	*18.4	40.6
		Boiler 1	10	*3.3	*6.7	
		Boiler 2	10	*0.8	*9.1	
St. Marys Cement, Inc. - Charlevoix Plant	NON-EGU	Compiled Kiln	27.5	17.3	9.9	27.5
LAFARGE MIDWEST INC. – Alpena (Now Holcim (US), Inc. DBA Lafarge Alpena Plant	NON-EGU	Kiln 23	7.9	5.9	1.9	25.9
		Kiln 22	8	6.0	2.0	
*DTE - Electric Company TRENTON CHANNEL	EGU	Boiler 9A	24.2	*3.8	*20.3	25.8

Facility Name	Sector	Facility Unit ID	Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)
Verso Escanaba LLC (Now Billerud Escanaba LLC)	NON-EGU	Recovery Furnace 10	7.2	3.1	0.1	22.5
		No. 11 Power Boiler	12.7	3.0	3.4	
NEENAH PAPER – MICHIGAN, INC. - Munising	NON-EGU	Boiler 1	15.5	4.8	10.7	15.5
*B. C. Cobb Plant	EGU	Boilers 4 & 5	10	*1.9	*8.0	10
*DTE - Electric Company RIVER ROUGE	EGU	Unit 3	9.7	*3.9	*5.8	9.7
*LBWL, Erickson Station	EGU	Coal-fired boiler	8.8	*2.6	*6.3	8.8
GRAYMONT WESTERN LIME, INC.	NON-EGU	EU Kiln 1	8.1	7.1	0.5	8.1
*LBWL - Eckert Station	EGU	Coal Fired Boiler	6.4	1.9	4.5	6.4
*Consumers Energy – J.C. Weadock Facility	EGU	Weadock 7 & 8	6.4	*1.5	*4.8	9.8
*Consumers Energy – D.E. Karn Facility		Karn 1 & 2	3.4	*0.6	*0.8	
*MARQUETTE BOARD OF LIGHT & POWER – Shiras	EGU	Boiler 3	5.4	*1.7	*3.7	5.4

3.3 Sources that already have Effective Emission Control Measures

The 2019 Regional Haze Guidance explains that it may be reasonable for a state not to select sources for a four-factor analysis if those sources already have effective emission controls in place. (*See* 2019 Regional Haze Guidance, pg. 22.)

3.3.1 Sources with Retirements

As explained in the 2019 Regional Haze Guidance, under 40 CFR 51.308(f)(1)(iv)(C), states may consider source retirement and replacement schedules in not selecting sources for a four-factor analysis if they have an enforceable commitment to retire by 2028 or soon thereafter. Within the 2021 Clarifications Memorandum, the USEPA articulates that "anticipated source shutdowns could be considered the most stringent on-the-way measure and may be relied upon to forgo a four-factor analysis or shorten the remaining useful life of a source." (*See* 2021 Clarifications Memo, pg. 10.)

Michigan's 2021 Regional Haze SIP submittal discussed plans for upcoming retirements at facilities that were selected for evaluation. Of the sources selected for a possible four-factor analysis under Section 3.2.2 above, this SIP supplement provides confirmation of those sources that have retired as well as those having an enforceable commitment to retire by 2028.

EGLE selected for evaluation the retirements of coal and fossil fuel-fired electrical generation at 30 EGUs at 12 different power plants during the second implementation period. Based on the 2016 emissions inventory, retirements that have already occurred during the second implementation period between 2018 and 2024 account for 17,417 tpy NO_X and 42,655 tpy SO_2. Three additional coal-fired EGUs are required to retire under a settlement agreement by May 31, 2025. These retirements represent additional reductions in emissions of 2,346 tpy NO_X and 12,850 tpy SO_2 based on the 2016 inventory. Together, these reductions represent a historically significant decrease in Michigan's statewide emissions by 30 percent for NO_X and 65 percent for SO_2 from all units in the second implementation period with a sum Q/d of 1.0 or greater.

Two additional coal-fired EGUs will be retired under the same settlement agreement by May 31, 2031, representing additional reductions of 40 tpy of NO_X and 58 tpy of SO_2 in the third implementation period.

Table 10 lists the permanent shutdowns/retirements of 44 units from 18 different Michigan power plants, which occurred during 2016 – 2024. Retirements that occurred during 2016 and 2017 before the beginning of the second implementation period are also included in Table 10 below for completeness given that LADCO's Q/d source selection process and 2028 projection modeling were based on units that were operating in 2016. Other retirements that have occurred since 2016 for sources that were not included in LADCO's Q/d list have also been included in Table 10 below.

The shutdowns/retirements of these units are considered permanent and enforceable. Under EGLE's regulations, when a unit is no longer permitted to operate, the unit cannot resume operation without being considered a "new" unit subject to New Source Review and Prevention of Significant Deterioration (PSD).

USEPA Retired Unit Exemption Forms have been included in the appendices for each unit. (*See* Appendix 33.) With each Retired Unit Exemption Form filed with the USEPA, the owner/operator certifies the date the unit was or will be retired and that the unit shall not emit any NO_X or SO_2 from that date forward.

Although not all the units listed in Table 10 were selected during EGLE's revised source selection process mentioned previously, EGLE is adopting the retirements that occurred during the second implementation period between 2018 to 2024 into the LTS since the retirements are already federally enforceable and permanent.

Table 10: Retirements of Michigan EGUs from 2016 – 2024

Facility Name	Sector	Facility Unit ID	Retirement Date	2016 Emissions (tpy)			
				NH3	NO_X	$PM_{2.5}$	SO_2
ST. CLAIR / BELLE RIVER POWER PLANT	EGU	St. Clair Boiler 7	5/31/2022	0	1046	2.6	5600
		St. Clair Boiler 3	5/31/2022	0	910	0	1780
		St. Clair Boiler 2	5/31/2022	0	913.5	0.4	1763
		St. Clair Boiler 1	3/27/2019	0	1273	0.3	2385.5
		St. Clair Boiler 6	5/31/2022	0	596	0.5	3019.5
		St. Clair Boiler 4	11/13/2017	0	694.5	0	1780.5
WISCONSIN ELECTRIC POWER COMPANY, Marquette – Presque Isle	EGU	Boiler 9	4/8/2019	0.1	926.5	0.6	1386.5
		Boiler 7	4/8/2019	0.1	934	0.6	1344.5
		Boiler 8	4/8/2019	0.1	895.5	0.6	1317.5
		Boiler 6	4/8/2019	0.1	503.5	0.4	921.5
		Boiler 5	4/8/2019	0.1	491.2	0.4	914.5
DTE - Electric Company TRENTON CHANNEL	EGU	Boiler 9A	7/8/2022	0	1763.5	12.1	9395
		Unit 16	4/16/2016				
		Unit 17	4/16/2016				
		Unit 18	4/16/2016		86.2		263
		Unit 19	4/16/2016		286.8		94
B. C. Cobb Plant	EGU	Boiler 4	4/15/2016	0.1	643.5	28.1	2712.5
		Boiler 5	4/15/2016		215.6		1449.6
DTE - Electric Company RIVER ROUGE	EGU	Unit 1	6/7/2021	0	1814	4.5	2723.8
		Unit 2	4/16/2016		0	0	0

Facility Name	Sector	Facility Unit ID	Retirement Date	2016 Emissions (tpy)			
				NH3	NO_X	$PM_{2.5}$	SO_2
		Unit 3	6/1/2021		1859.4	3.6	2805.7
LBWL, Erickson Station	EGU	Unit 1	11/28/2022	0.1	1058.5	1.4	2588.5
LBWL, Eckert Station	EGU	Unit 1	12/31/2020	0.1	785.5	12.4	1858
		Unit 3	12/31/2020				
		Unit 4	5/31/2021				
		Unit 5	12/31/2020				
		Unit 6	12/31/2020				
Consumers Energy – J.C. Weadock Facility	EGU	Weadock 7	4/15/2016	0	510.5	30.9	1635.5
		Weadock 8	4/15/2016				
Consumers Energy – D.E. Karn Facility		Karn 1	6/1/2023	0	213.8	12	283.9
		Karn 2	6/1/2023				
MARQUETTE BOARD OF LIGHT & POWER - Shiras	EGU	Boiler 3	4/29/2019	0	196.7	44.5	419
Michigan Hub Plant	EGU	Unit 1	9/30/2017		132.9	0.8	139.5
DTE – Pontiac North LLC		EUBHB9	1/10/2017	0	0	0	0
Graphic Packing International, Inc. - Kalamazoo		Unit BLR08	10/07/2024		82.1	4.5	0.4
J B Sims		Unit 3	6/1/2020	0	459.4	9.5	364.9
J R Whiting		Unit 1	4/15/2016	0	217.4	18.8	484.7
		Unit 2	4/15/2016	0	178.3	6.1	440.6
		Unit 3	4/15/2016	14.4	589	7.3	527.5
James De Young		Unit 5	6/1/2017		0.1	0	0
Consumers Energy - Thetford		Unit 2	6/1/2019		0		0.6
		Unit 3	4/1/2018		0		0.8
		Unit 4	6/1/2019		0		1.5
Wyandotte		Unit 8	6/30/2016		0	0	0.0

In addition to the retirements that have already occurred, the following units will be retired in the future, although not all were selected for a possible four-factor analysis under Section 3.2.2.

- **Consumers Energy – J.H. Campbell Plant: Units 1, 2, and 3**

  Units 1, 2, and 3 are discussed in detail in Michigan's 2021 Regional Haze SIP submittal on pages 14, 20, and 21 (*See* Appendix 1). This SIP supplement provides further elaboration.

  Consumers Energy – J.H. Campbell Power Plant is subject to a settlement agreement approved by the Michigan Public Service Commission on April 20, 2020, which requires closure/retirement of coal-fired Units 1, 2, and 3 on or before May 31, 2025. *See* April 20, 2022, Settlement Agreement – Michigan Public Service Commission, Case No. U-21090 – In the Matter of the Application of Consumers Energy Company for Approval of and Integrated Resource Plan under MCL 460.6t, certain accounting approvals, and for other relief. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000002gLkGAAU (*See* Appendix 10).

  The settlement agreement was executed by Consumers Energy Company, the Michigan Public Service Commission staff, Michigan Environmental Council, the Natural Resources Defense Council, the Sierra Club, Attorney General Dana Nessel, Environmental Law and Policy Center, Vote Solar, Ecology Center, Union of Concerned

Scientists, Urban Core Collective, Citizens Utility Board of Michigan, Hemlock Semiconductor Operations LLC, Michigan Energy Innovation Business Council, Institute for Energy Innovation, Clean Grid Alliance, Michigan Electric Transmission Company LLC, and Great Lakes Renewable Energy Association.

The settlement agreement was affirmed in the State of Michigan Court of Appeals. *See* No. 362294 Public Service Commission, LC No. 00-021090, March 23, 2023. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000007I2GEAA0 (*See* Appendix 11).

When retired sometime before May 31, 2025, the permanent shutdown of coal-fired Units 1, 2 and 3 at Consumers Energy – J.H. Campbell Power Plant will represent a reduction in emissions of 2,346 tpy NO_X and 12,850 tpy SO_2 based on the 2016 inventory.

- **Consumers Energy – Dan E. Karn, Units 3 and 4**

  Units 3 and 4 are discussed in detail in Michigan's 2021 Regional Haze SIP submittal on pages 14,15, 21, and 22 (*See* Appendix 1). This SIP supplement provides further elaboration.

  Consumers Energy – Dan E. Karn Power Plant is subject to the same settlement agreement mentioned above for the J.H. Campbell Plant that was approved by the Michigan Public Service Commission on April 20, 2022. The settlement agreement requires closure/retirement of coal-fired Units 3 and 4 at Consumers Energy – Dan E. Karn on or before May 31, 2031. *See* April 20, 2022, Settlement Agreement - Michigan Public Service Commission, Case No. U-21090 (*See* Appendix 10). In 2023, Consumers Energy voluntarily converted Units 3 and 4 from coal to natural gas and fuel oil – approximately 8 years ahead of its 2031 retirement deadline. https://www.consumersenergy.com/news-releases/news-release-details/2023/06/14/15/30/consumers-energy-takes-next-step-to-clean-energy-future-by-closing-karn-coal-plants.

  Although 2031 is beyond the end of the second implementation period in 2028, the 2019 Regional Haze Guidance states, "if a source is certain to close by December 31, 2028 (or soon thereafter), under an enforceable requirement, a state can reasonably consider that to be sufficient reason to remove the source from further analysis and reasonable progress consideration" (2019 Regional Haze Guidance, pg. 42).

  Although Units 3 and 4 did not appear on LADCO's list in Table 8 because the Q/d for both units was below 1.0, the emission reductions are still noteworthy. When retired sometime before May 31, 2031, the permanent shutdown of coal-fired Units 3 and 4 at Consumers Energy – Dan E. Karn will represent a reduction in emissions of 40 tpy NO_X and 58 tpy SO_2 based on the 2016 inventory.

3.3.2 Source that is Indefinitely Idled

- **Cleveland-Cliffs, Inc. – Empire Iron Mining Partnership**

  Empire Iron Mining Partnership was among the sources screened in using EGLE's revised Q/d analysis based on emissions from a 2016 base year; however, since 2016, the facility has been idled indefinitely. A recent January 17, 2024, on-site inspection report by EGLE's AQD documented the following conditions:

  > "Production at the facility ceased on August 3, 2016, and the mine was indefinitely idled after the last stockpile of finished pellets were shipped. While there are currently no plans in place to begin production, the facility is being preserved in a care and maintenance mode to preserve its ability to restart when market conditions and pellet pricing support access of remaining ore reserves. The facility would need to undergo significant maintenance to restart production, and a large wastewater treatment plant would need to be constructed in order to treat the water currently in the pit."
  >
  > "Empire is considered a major source and is required to report its annual emissions through the Michigan Air Emissions Reporting System (MAERS). However, the facility has been idled since 2016, so no emissions have been reported since then." *See* EGLE's AQD Activity Report: On-Site Inspection, January 17, 2024. https://www.egle.state.mi.us/aps/downloads/SRN/B1827/B1827_SAR_20240117.pdf (*See* Appendix 12).

  Given the uncertainty of future operations and the significant maintenance and construction that would need to take place to restart production, EGLE did not select this source for an analysis of control measures for the second implementation period. If the facility resumes operations, EGLE will revisit and revise its determination not to select this source for an analysis of control measures.

3.3.3 Sources with Existing Effective Control Measures

The USEPA provided clarification for sources with existing effective control measures in a memorandum entitled, "Clarifications Regarding Regional Haze State Implementation Plans for the Second implementation Period," July 8, 2021 (2021 Clarifications Memo).[3] The USEPA stated that "a source that otherwise would undergo four-factor analysis (e.g., because it exceeds a threshold of emissions divided by distance or Q/d, visibility, or other source-selection threshold) may forgo a full four-factor analysis if it is already 'effectively controlled.'" (*See* 2021 Clarifications Memo, pg. 5.) The 2019 Regional Haze Guidance provided examples to illustrate scenarios in which the USEPA believes it may be reasonable for a state not to select a particular source that is effectively controlled for further analysis. (*See* 2019 Regional Haze Guidance, pages 22-25.)

The USEPA noted in the 2021 Clarifications Memo that after a state first assesses whether a source operates an 'effective control,' a "source's existing measures are generally needed to prevent future visibility impairment; i.e., to prevent future emission increases, and thus

[3] https://www.epa.gov/system/files/documents/2021-07/clarifications-regarding-regional-haze-state-implementation-plans-for-the-second-implementation-period.pdf

necessary to make reasonable progress. Measures that are necessary to make reasonable progress must be included in the SIP. However, there may be circumstances in which a source's existing measures are not necessary to make reasonable progress." (*See* 2021 Clarifications Memo, pg. 9.) To support such a determination, the USEPA described a weight-of-evidence demonstration based on the source's most recent 5-year historical emission rate, projected emissions and emission rate, and enforceable limits related to its existing measures to demonstrate that "the source has consistently implemented its existing measures and has achieved, using those measures, a reasonably consistent emission rate." (*See* 2021 Clarifications Memo, pg. 9.)

EGLE determined that the following sources, identified through EGLE's source selection process in Table 9 above, are effectively controlled, thereby forgoing a full four-factor analysis. Additionally, EGLE demonstrates below that the effectively controlled measures are not necessary to include in the regulatory portion of the SIP to prevent future emission increases and to make reasonable progress during the second implementation period consistent with the 2021 Clarifications Memo in Section 4.1.

To assist in making the determinations, EGLE supplemented LADCO's Q/d analysis and 2028 modeled projections with data from the Michigan Air Emissions Reporting Systems Annual Pollutant Totals Query (https://www.egle.state.mi.us/maers/emissions_query.asp), Clean Air Markets Program Data (Clean Air Markets Program Data (CAMPD) | US EPA), and the USEPA's 2022v1 Emissions Modeling Platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform). The USEPA's 2022v1 Emissions Modeling Platform is based on the most recent 2020 National Emissions Inventory, which was released in the spring of 2023, and provides updated emissions data for 2022, as well as modeling of emissions data on a facility-wide basis for future years of 2026, 2032, and 2038.

Table 11: Units with Existing Effective Control Measures

Facility Name	Sector	Facility Unit ID	Q/d NOX	Q/d SO_2
TILDEN MINING COMPANY LC	NON-EGU	EU Kiln 1–gas fired	37.9	
		EU Kiln 1–coal fired	12.9	
ST. CLAIR / BELLE RIVER POWER PLANT	EGU	Belle River Unit 2	8.2	24.2
		Belle River Unit 1	6.3	19.3
St. Marys Cement, Inc. - Charlevoix Plant	NON-EGU	Compiled Kiln	17.3	9.9
LAFARGE MIDWEST INC. – Alpena (Now Holcim (US), Inc. DBA Lafarge Alpena Plant	NON-EGU	Kiln 23	5.9	
		Kiln 22	6.0	
NEENAH PAPER – MICHIGAN, INC. - Munising	NON-EGU	Boiler 1		10.7

3.3.3.1 TILDEN MINING COMPANY LC

- Kiln 1:
  Q/d NO_X 37.9 – Natural gas-fired
  Q/d NO_X 12.9 – Coal-fired
  Q/d NO_X 50.8 – Overall

Tilden Mining Company LC, Kiln 1 is described in detail in Michigan's 2021 Regional Haze SIP submittal on pages 12 and 19.

Nearly three years after Michigan submitted its 2021 Regional Haze SIP, on April 23, 2024, the USEPA published a proposed settlement agreement in Cleveland-Cliffs, Inc. v. Environmental Protection Agency, Case No. 16-2643, which was published in the Federal Register (89 FR 30360). https://www.govinfo.gov/content/pkg/FR-2024-04-23/pdf/2024-08612.pdf (*See* Appendices 13 and 14).

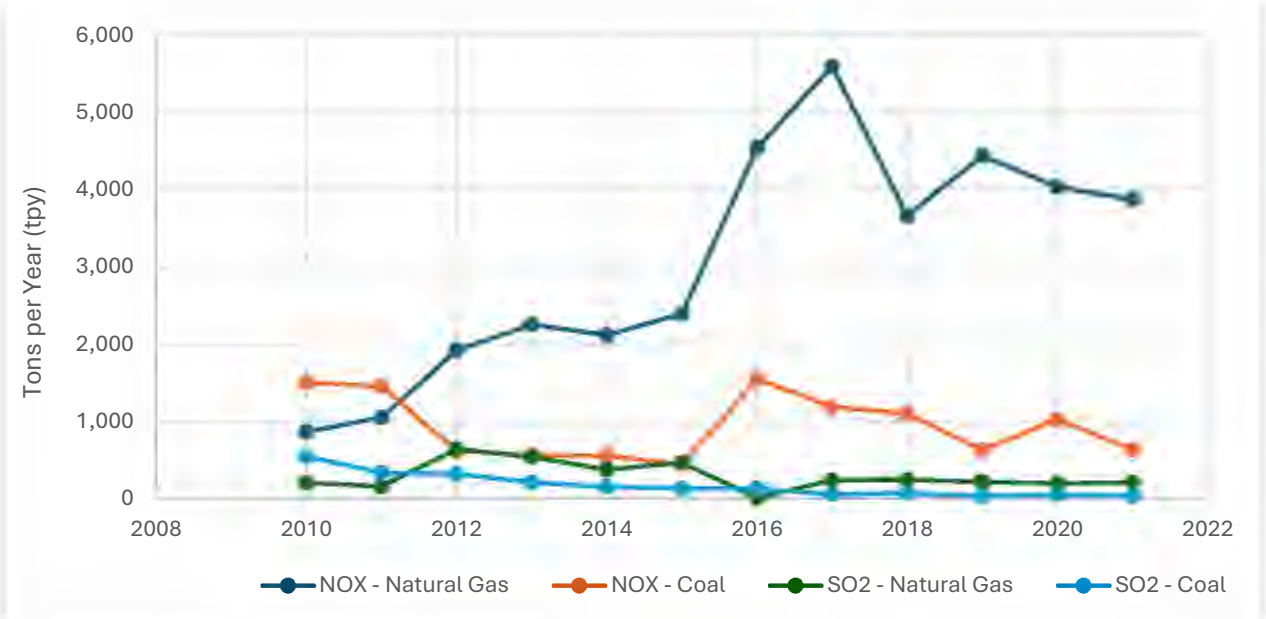
If finalized, the proposed settlement agreement would set forth revised NO_X Best Available Retrofit Technology (BART) limits for Kiln 1 in a Federal Implementation Plan (FIP) that would be incorporated into Tilden's Renewable Operating Permit (ROP) at the state level. On December 4, 2024, the USEPA proposed a revision to the Taconite FIP for Michigan and Minnesota, which includes NO_X and/or SO_2 limits for Kiln 1 based on the conditions within the proposed settlement agreement detailed in the paragraph above.

Despite ongoing litigation surrounding the NO_X/SO_2 BART limits established in the 2015 FIP Rule, Tilden's ROP has been modified to add a condition specifying that the facility must comply with the applicable requirements of 40 CFR Part 52, Approval and Promulgation of Implementation Plans, Subpart X—Michigan, Section 52.1183 Visibility Protection, which would include the newly proposed BART limits for Kiln 1 beginning 30 days after the date of publication in the Federal Register. EGLE would then re-open the ROP and incorporate the FIP BART limits into the ROP in accordance with the renewal schedule.

Given the current situation, it would be illogical for the AQD to pursue further NO_X control measures while previously litigated federal requirements are in the process of being settled at the federal level. When the revised FIP is finalized, the revised limits for Kiln 1 will be federally enforceable, the ROP will incorporate the FIP BART limits, and Kiln 1 will be considered effectively controlled. Until the FIP is finalized, EGLE cannot yet include the revised FIP in Michigan's LTS.

Figure 6 and Table 12 illustrate the annual emissions from Kiln 1 as fired by natural gas and coal from 2010 to 2021.

Figure 6: Tilden Mining Company LC, Kiln 1 - Annual Emissions (in tons) as fired by Natural Gas and Coal (2010 – 2021)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 12: Tilden Mining Company LC, Kiln 1: Annual Emissions (in tons) as fired by Natural Gas and Coal (2010 – 2021)

Year	NOX - Natural Gas	NOX - Coal	SO_2 - Natural Gas	SO_2 - Coal
2010	862	1,498	203	543
2011	1,046	1,453	155	331
2012	1,919	617	639	316
2013	2,250	558	537	205
2014	2,116	551	373	150
2015	2,391	440	462	131
2016	4,545	1,545	4	131
2017	5,595	1,186	237	50
2018	3,663	1,097	240	72
2019	4,438	626	216	31
2020	4,033	1,025	195	50
2021	3,870	631	205	34

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

3.3.3.2 DTE – ST. CLAIR/BELLE RIVER POWER PLANT

- Belle River Unit 1, Q/d NO_X: 6.3; Q/d SO_2: 19.3
- Belle River Unit 2, Q/d NO_X: 8.2; Q/d SO_2: 24.2

DTE – St. Clair/Belle River Power Plant, Belle River Units 1 and 2, are discussed in detail in Michigan's 2021 Regional Haze SIP submittal on pages 13 and 20. This SIP supplement provides further elaboration.

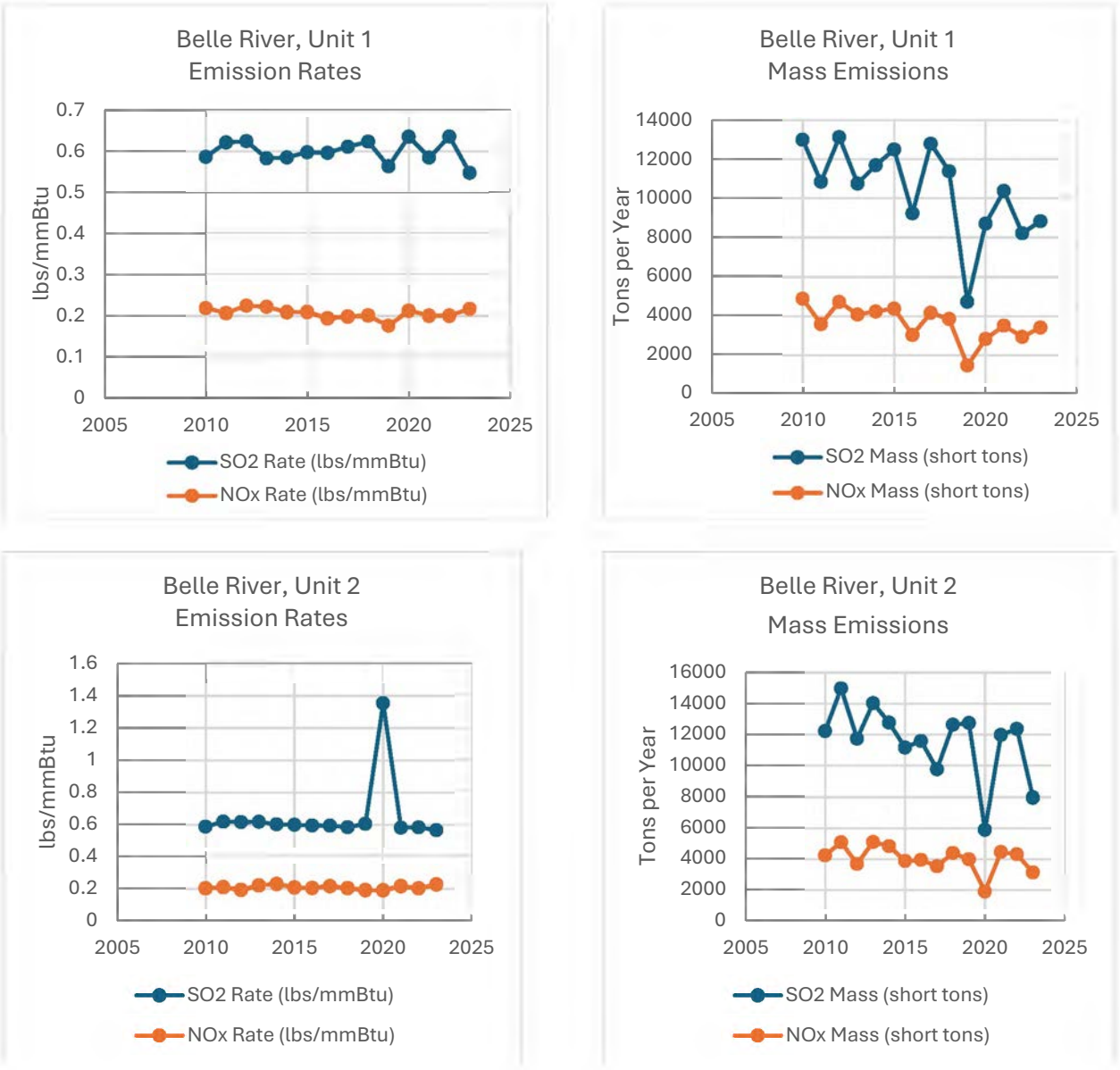
DTE – Belle River, Units 1 and 2 are subject to a federal Consent Decree. *See* United States v. DTE Energy, Case No. 2:10-cv-13101-BAF-RSW (E.D. Mich)., Consent Decree filed May 14, 2020. (*See* Appendix 8, https://www.justice.gov/enrd/consent-decree/file/1276421/download.) The Consent Decree requires DTE to "retrofit, refuel, or repower" Belle River Units 1 and 2 by December 31, 2030. According to news outlets, DTE – Belle River Units 1 and 2 will be converted to natural gas ahead of schedule by December 2025 and December 2026, respectively. (*See* Appendix 9: 12-14-2022 Power Engineering Article: https://www.power-eng.com/coal/dte-energy-officially-retires-two-coal-plants/#gref.) (*See* also Appendix 16: 9-5-2024 WPHM News Article, https://www.wphm.net/2024/09/05/belle-river-gas-conversion-begins-next-year/#:~:text=The%20%24154%20million%20investment%20is,a%20tour%20of%20the%20plant.")

Although the Consent Decree does not require Belle River Units 1 and 2 to retrofit, refuel or repower until December 31, 2030, two years beyond the end of the second implementation period in 2028, the 2019 Regional Haze Guidance notes, "The year 2028 is not a bright line for these considerations, so a state may be able to justify not selecting a source for analysis of control measures because there is an enforceable requirement for the source to cease operation by a date after 2028." (*See* 2019 Regional Haze Guidance, pg. 20.) Although not fully ceasing operation by 2028, in this case, Belle River Units 1 and 2 have an enforceable requirement to cease operation with the use of coal by 2030.

Since Belle River Units 1 and 2 are considered effectively controlled under the Federal Consent Decree and the Consent Decree is already federally enforceable, EGLE is including it in Michigan's LTS for the second implementation period.

Figure 7 and Table 13 depict the SO_2 and NO_X annual emission rates and mass emissions from 2010 – 2023 for Belle River Unit 1 and Unit 2. With the retrofitting, refueling, or repowering under the Consent Decree, emission rates are expected to decrease dramatically, preventing future emission increases and future visibility impairment, leading to reasonable progress.

Figure 7: DTE – St. Clair/Belle River Power Plant: Belle River Units 1 and 2: Emission Rates and Mass Emissions (2010 – 2023)



Source: Clean Air Markets Program Data
https://campd.epa.gov/

Table 13: DTE – St. Clair/Belle River Power Plant, Belle River Units 1 and 2: Emission Rates and Mass Emissions (2010 – 2023)

Unit	Year	SO_2 (lb./MMBtu)	NO_X (lb./MMBtu)	SO_2 (tpy)	NO_X (tpy)
1	2010	0.587	0.218	12992.33	4888.729
	2011	0.6218	0.2063	10844.55	3594.419
	2012	0.6248	0.2239	13127.13	4730.661
	2013	0.5834	0.2209	10752.03	4086.574
	2014	0.5857	0.2088	11691.05	4239.782
	2015	0.5982	0.2091	12495.72	4385.617
	2016	0.5968	0.1938	9235.916	3043.498
	2017	0.6114	0.1981	12793.03	4169.662
	2018	0.6238	0.2007	11384.78	3857.1
	2019	0.5644	0.1768	4739.351	1480.958
	2020	0.6359	0.212	8704.394	2835.029
	2021	0.5853	0.2003	10377.34	3516.849
	2022	0.6361	0.2002	8212.738	2940.672
	2023	0.5483	0.2161	8831.158	3418.006
2	2010	0.5885	0.2029	12229.09	4245.376
	2011	0.6202	0.21	14987.74	5092.765
	2012	0.6171	0.1934	11741.21	3694.442
	2013	0.6194	0.2206	14034.35	5111.914
	2014	0.6026	0.2301	12775.47	4841.232
	2015	0.6002	0.2087	11166.33	3878.082
	2016	0.5962	0.2052	11591.58	3954.595
	2017	0.5951	0.2167	9765.679	3544.41
	2018	0.5854	0.2038	12637.73	4395.036
	2019	0.6063	0.1915	12753.45	3988.847
	2020	1.3551	0.1904	5892.147	1911.493
	2021	0.5823	0.2166	11973.83	4459.964
	2022	0.5846	0.203	12375.95	4313.716
	2023	0.5671	0.2269	7961.242	3142.187

Source: Clean Air Markets Program Data
https://campd.epa.gov/

3.3.3.3 St. Marys Cement, Inc. – Charlevoix Plant

- Compiled Kiln, Q/d NO_X: 17.3; Q/d SO_2: 9.9

St. Marys Cement, Inc. – Charlevoix Plant, Kiln 1 is described in detail in Michigan's 2021 Regional Haze SIP submittal on pages 13, 19, and 20.

NO_X:
In 2012, the USEPA promulgated a FIP for St. Marys Cement, Inc. – Charlevoix Plant. *See* Proposed Rule 77 FR 46912 (8/6/2012), (https://www.govinfo.gov/content/pkg/FR-2012-08-

06/pdf/2012-19039.pdf) and Final Rule 77 FR 71533 (12/3/2012) (https://www.govinfo.gov/content/pkg/FR-2012-12-03/pdf/2012-29014.pdf). Under the FIP, the USEPA provided a BART analysis that required installation of selective non-catalytic reduction (SNCR) system for NO_X.

The Compiled Kiln at St. Marys Cement, Inc. – Charlevoix Plant currently operates an SNCR (post-combustion control), in combination with an indirect fire system, which includes low NO_X burners (LNB), at an average reduction efficiency of 50 percent to meet the two NO_X limits (2.80 lb. per ton of clinker [30-day rolling-average] and 2.40 lb. per ton of clinker [12-month rolling average]) established in the USEPA's 2012 BART FIP for Michigan (per 40 CFR 52.1183(h)). (*See* 77 Federal Register 71533, December 3, 2012.)

Given the federally enforceable requirements under the FIP, EGLE found it was not necessary to evaluate and/or pursue additional NO_X control devices, since the kiln is equipped with both precombustion (LNB) and post-combustion (SNCR) abatement technologies. It would be technically infeasible and cost ineffective to retrofit the kiln with additional pre- or post-combustion controls.

Although coal and petroleum coke are the primary fuels for the kiln, the kiln is designed to use asphalt flakes, plastic, and small quantities of cellulose fiber as alternative fuels. Currently, plastics are the only type of alternative fuel being utilized by the unit. The facility has determined that the use of asphalt flakes as a fuel source for the kiln would negatively impact product quality.

SO_2:
SO_2 emissions for the kiln are limited to 1,175 pounds per hour and 7.5 pounds per ton of clinker produced (per 40 CFR 52.1183(h)). In the USEPA's 2012 BART FIP for Michigan, the USEPA determined that the installation and operation of SO_2 controls is not warranted under "current circumstances" but would be necessary if higher sulfur feed materials were used. Similarly, the USEPA found that removal of SO_2 at normal emission rates for this unit would result in a cost-per-ton value of $4,500 or greater. *See* 77 FR 71533, December 3, 2012, https://www.govinfo.gov/content/pkg/FR-2012-12-03/pdf/2012-29014.pdf .

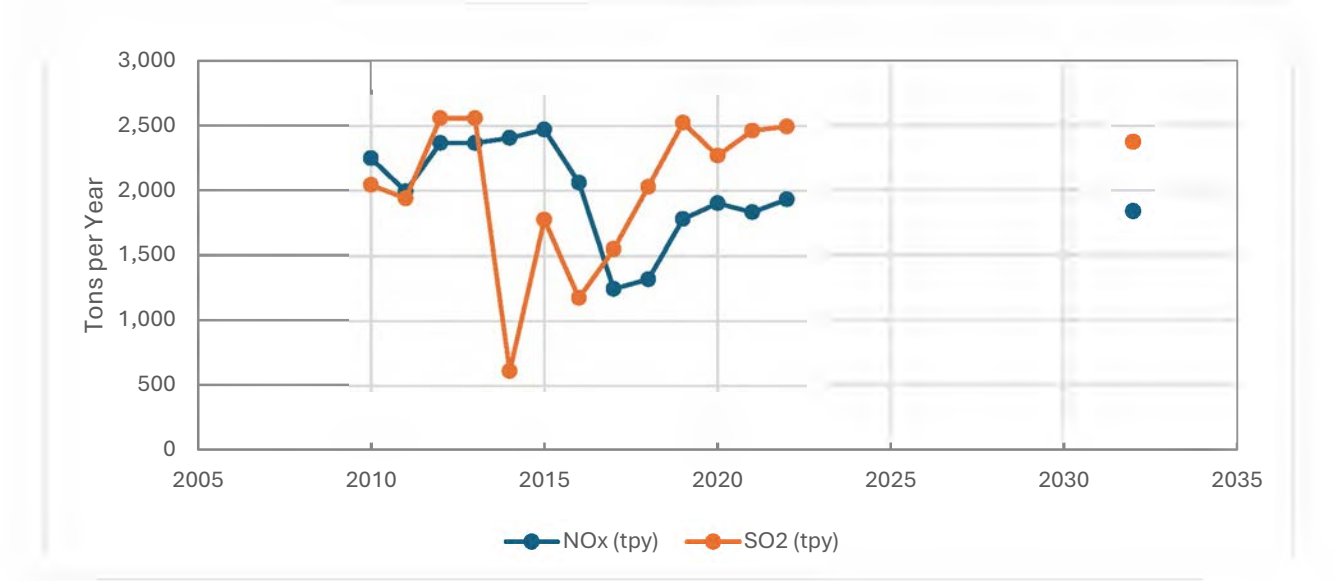
EGLE found that it was not necessary to evaluate and/or pursue SO_2 control devices since the estimated cost-per-ton of SO_2 removal is greater than the cost-effectiveness thresholds (noted in the USEPA's currently implemented rules above) to determine whether a control measure is economically reasonable. Moreover, the facility is not planning to use higher sulfur feed materials that were evaluated by the USEPA under the 2012 BART FIP. Although coal and petroleum coke are the primary fuels for the kiln, the kiln is designed to use asphalt flakes, plastic, and small quantities of cellulose fiber as alternative fuels. Currently, plastics are the only type of alternative fuel being utilized by the unit. The facility has determined that the use of asphalt flakes as a fuel source for the kiln would negatively impact product quality.

Emission Trends:
Table 14 and Figure 8 illustrate the trends in facility-wide actual NO_X and SO_2 emissions for 2010 – 2022 and 2032. The USEPA's 2022v1 Emissions Modeling Platform[4] projects both facility-wide NO_X and SO_2 emissions to be lower for St. Marys Cement – Charlevoix in 2032 than what was reported in 2022. With the BART FIP limits and the 10-year future projections indicating that both NO_X and SO_2 emissions will be reduced source-wide, St. Marys Cement – Charlevoix is projected to continue to implement the existing measures for the kiln and not to

[4] https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

increase its emission rate. As such, EGLE has concluded that the in-line kiln system is "effectively controlled" for both NO_X and SO_2 emissions for the second implementation period, and that the existing control measures are not necessary for reasonable progress to prevent future emission increases and future visibility impairment.

Figure 8: St. Marys Cement, Inc. – Charlevoix Plant: Annual Actual and Projected Emissions (2010 – 2032)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform)

Table 14: St. Marys Cement, Inc. – Charlevoix Plant: Annual Actual and Projected Emissions (2010 – 2032)

Year	NO_X (tpy)	SO_2 (tpy)
2010	2,251	2,045
2011	1,996	1,942
2012	2,369	2,560
2013	2,369	2,560
2014	2,408	614
2015	2,473	1,777
2016	2,063	1,179
2017	1,248	1,551
2018	1,322	2,031
2019	1,782	2,525
2020	1,904	2,271
2021	1,835	2,464
2022	1,934	2,496
2032 (Projected)	1,844	2,380

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform)

3.3.3.4 Holcim (US), Inc. DBA Lafarge Alpena Plant (Formerly Lafarge Midwest, Inc. – Alpena)

- Kiln 22: Q/d NO_X: 6.0
- Kiln 23: Q/d NO_X: 5.9

In 2010, Lafarge Midwest became subject to a Federal Consent Decree that required NO_X and SO_2 controls as well as limits on a facility-wide tons per year limit and 12-month rolling SO_X and NO_X limits at the Alpena Plant. *See* Consent Decree between Lafarge Midwest, Inc., the United States, the State of Michigan and other states and jurisdictions (USA, USEPA, Michigan, et al. v. Lafarge; U.S. District Court Civil Action No. 3:10-cv-00044-JPG-CJP) entered March 18, 2010. A copy of the Consent Decree is available at:
https://www.epa.gov/sites/default/files/documents/lafarge-cd.pdf (*See* Appendix 17).

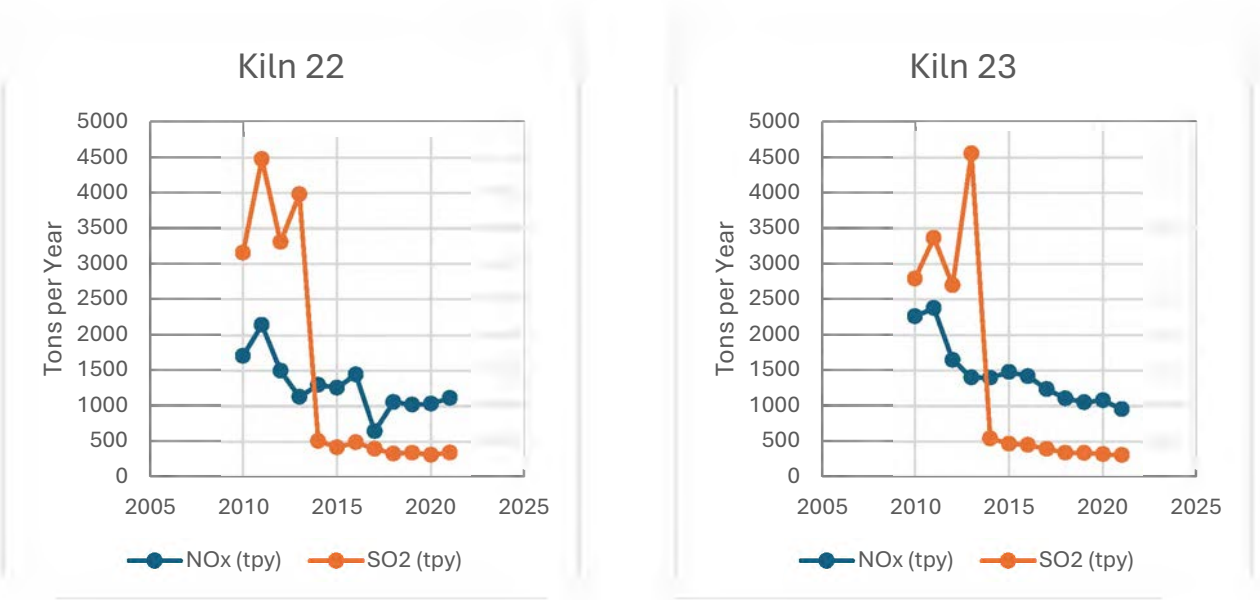
In 2012, Lafarge Midwest was also subject to a BART analysis, which accepted the Consent Decree requirements as BART. *See* 77 FR 46912 (August 6, 2012).
https://www.govinfo.gov/content/pkg/FR-2012-08-06/pdf/2012-19039.pdf.

As described in greater detail in Section 8.3.1 below regarding the Status of Control Strategies, Lafarge installed SNCR NO_X controls on each kiln, along with dry absorbent addition (DAA) for SO_2 control on Kilns 19, 20, 21, and wet flue gas desulfurization (FGD) SO_2 control on Kilns 22 and 23. The limits and other requirements of the Consent Decree and the selected SO_2 and NO_X control systems were incorporated in Permit to Install (PTI) No. 195-10B, issued on September 13, 2013 (*See* Appendix 18).

Based on the requirements and limits set in the federal Consent Decree, the BART analysis, and installation of SNCR controls, as well as an examination of the facility limits, declining

historic emission rate trends and projected emissions, EGLE has concluded that Kiln 22 and Kiln 23 are effectively controlled and that the existing measures are not necessary for reasonable progress for the second implementation period to prevent future emission increases and future visibility impairment.

Figure 9: Holcim (US), Inc. DBA Lafarge Alpena Plant, Kiln 22 and Kiln 23: Annual Emission Rates (2010 – 2021)



Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

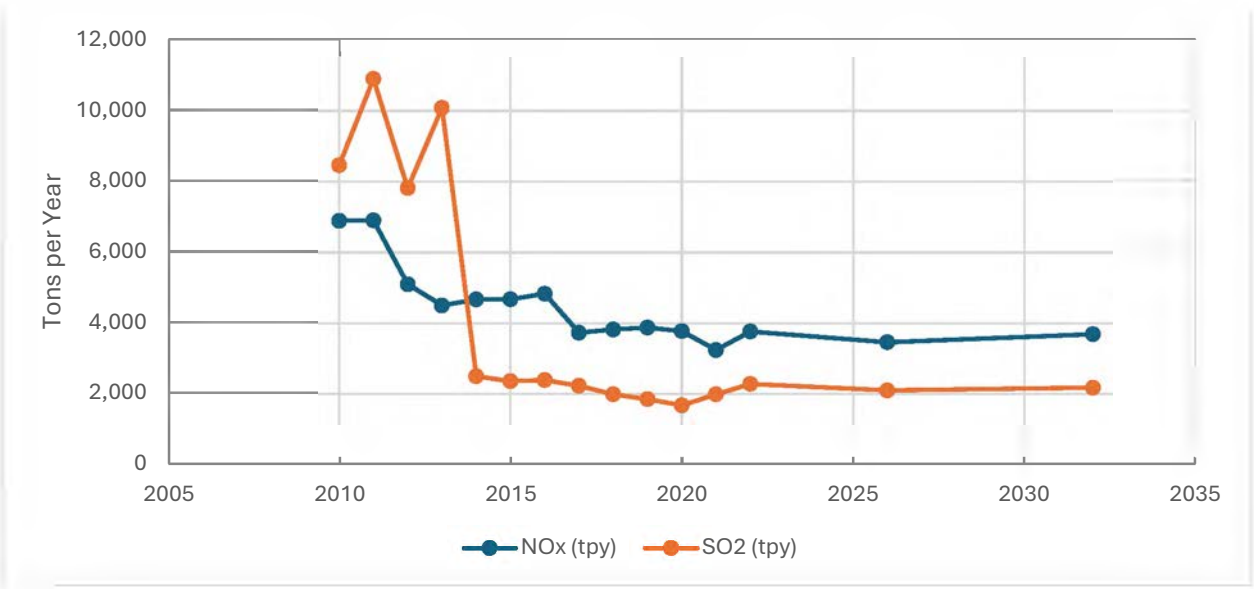
Table 15: Holcim (US), Inc. DBA Lafarge Alpena Plant, Kiln 22 and Kiln 23: Annual Emission Rates (2010 – 2021)

Lafarge Kiln 22		
Year	NO_X (tpy)	SO_2 (tpy)
2010	1710	3156
2011	2147	4479
2012	1499	3310
2013	1132	3983
2014	1301	510
2015	1259	418
2016	1448	490
2017	646	398
2018	1056	331
2019	1021	342
2020	1035	313
2021	1116	345

Lafarge Kiln 23		
Year	NO_X (tpy)	SO_2 (tpy)
2010	2262	2794
2011	2379	3367
2012	1650	2701
2013	1403	4555
2014	1398	543
2015	1480	469
2016	1419	453
2017	1239	396
2018	1106	343
2019	1053	339
2020	1081	321
2021	956	311

Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Figure 10: Holcim (US), Inc. DBA Lafarge Alpena Plant: Facility-wide Actual and Projected Emissions (2010 – 2032)



Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

Table 16: Holcim (US), Inc. DBA Lafarge Alpena Plant: Facility-wide Actual and Projected Emissions (2010 – 2032)

Year	NO_X (tpy)	SO_2 (tpy)
2010	6,894	8,466
2011	6,907	10,905
2012	5,102	7,820
2013	4,504	10,087
2014	4,673	2,504
2015	4,677	2,364
2016	4,834	2,397
2017	3,734	2,232
2018	3,825	1,994
2019	3,880	1,858
2020	3,778	1,681
2021	3,246	1,994
2022	3,767	2,287
2026	3,466	2,104
2032	3,692	2,180

Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

3.3.3.5 Neenah Paper – Michigan, Inc. – Munising

- Boiler 1, Q/d SO_2: 10.7

Neenah Paper – Michigan, Inc. Boiler 1 is described in detail in Michigan's 2021 Region Haze SIP on pages 10, 15, and16. (*See* Appendix 1.)

EGLE examined Boiler 1 from two different angles by providing a demonstration of existing effective controls and by considering the potential exclusion of nearby sources from selection for the sake of reference.

Demonstration of Existing Effective Controls:
Boiler 1 is capable of burning bituminous coal or natural gas. As shown in Table 17 below, SO_2 emissions result primarily from the burning of the bituminous coal compared to natural gas. SO_2 emissions are restricted by the ROP for Neenah Paper (MI-ROP-B1470-2013), which requires that the coal burned in Boiler 1 (Emission Unit ID EU05) shall not exceed a maximum sulfur content of 1.5 percent by weight calculated on the basis of 12,000 BTUs per pound of coal. This condition is federally enforceable and was established pursuant to Michigan Rule 201(1)(a).

In its ROP, Neenah Paper – Michigan, Inc. is also subject to the CAA Section 112 National Emission Standards for Hazardous Air Pollutants (NESHAP) since the facility is a source of HAP emissions. In May 2015, a spray dry absorber (SDA) was installed on Boiler 1 to reduce facility-wide hazardous air pollutants (HAP) to less than major source thresholds, in time to reclassify

the facility as a minor HAP source to comply with the federal Boiler Generally Available Control Technologies (GACT) regulations before the effective date within the GACT regulation. Neenah Paper – Michigan, Inc. requested limits be placed on its HAP potential to emit for the entire mill to levels below the applicable major source thresholds, i.e., less than 10 tpy for a single HAP and less than 25 tpy for all HAPs combined. With the HAP emission limits in place, Boiler 1 has operated as an area source of HAPS since February 2016 and is subject to 40 CFR Part 63, Subpart JJJJJJ, NESHAP: Industrial, Commercial and Institutional Boilers.

The SDA on Boiler 1 is used to reduce HAPs, mainly hydrogen chloride (HCl) acid gas; however, the SDA also provides collateral removal of SO_2. In June 2016, Neenah Paper – Michigan, Inc. submitted a PTI Application to make enhancements to the SDA to improve the operation of the system and the control efficiency. (*See* https://www.egle.state.mi.us/aps/downloads/srn/B1470/B1470_RVN_20170825.pdf.) The permit application stated that SDA performance to date had "proven effective for both HCl and SO_2 removal," but the SDA scrubber modifications would further improve reliability. The enhancements were expected to be complete and ready for stack testing by January 31, 2017, and the permit application noted, "The SDA will effectively reduce SO_2 emissions…" The permit application referenced the restriction in the ROP limiting the sulfur content of the coal and noted, "The SO_2 requirement in Rule 201 also applies to Boiler 1; the use of SDA control technology will enhance Boiler 1's ability to comply with this Rule. Furthermore, the current sulfur content of the coal used in Boiler 1 is less than 1%."

After the SDA system was installed and later enhanced in 2017, SO_2 emissions from Boiler 1 decreased sharply as Neenah Paper – Michigan, Inc. improved the operation and efficiency of the SDA system to better control HAPs, took limits on its HAP potential to emit, and used more natural gas instead of coal. As shown in Table 17 and Figure 11 below, SO_2 emissions from Boiler 1 decreased from 810 tpy in 2010 to 270 tpy in 2021, with a sharp, sustained decrease occurring in 2019, after the SDA enhancements, to half the level it was in 2016.

Neenah Paper – Michigan, Inc.'s strategy to reduce HAP emissions to meet the NESHAPs has also resulted in reduced SO_2 emissions. Calculating a revised Q/d using more recent SO_2 emissions for Boiler 1 from 2019 to 2021, rather than 2016 as used in the LADCO analysis, results in a pollutant specific unit Q/d of 4.9 or less, which would rank it below Michigan's Q/d threshold of 6. With the existing measures resulting in consistent annual SO_2 emissions over the past 5 years of 270 tpy or less, an evaluation would likely result in the conclusion that there is a low likelihood that additional controls would provide further reductions.

The 2019 Regional Haze Guidance provides that, "If a source owner has recently made a significant expenditure that has resulted in significant reductions of visibility impairing pollutants at an emissions unit, it may be reasonable for the state to assume that additional controls for that unit are unlikely to be reasonable for the upcoming implementation period." (*See* 2019 Regional Haze Guidance, pages 22 and 23). As such, the investment by Neenah Paper – Michigan, Inc. in installing the SDA system in 2015 and making enhancements in 2017 to improve the operation of the system and control efficiency, for both HAPs and SO_2, constitutes a significant recent expenditure that has resulted in effective reductions of SO_2 from Boiler 1, such that additional controls are unlikely to provide further reductions.

Based on the Boiler 1's existing measures and enforceable requirements described above, as well as the most recent 5 years of emission rate data available provided below in Figures 11 and 12 and Table 17 and 18, Neenah Paper – Michigan, Inc. is projected to continue to implement the existing measures for Boiler 1 and not to increase its emission rate through 2032. As such, EGLE has determined that the existing measures are not necessary to include in the LTS or the

regulatory portion of the SIP to prevent future emission increases and future visibility impairment.

Consideration for Excluding Nearby Sources from Selection

Boiler 1 was selected for further analysis based on its pollutant specific unit Q/d of 10.7 for SO_2, which was calculated using the 2016 emissions of 588 tons and a 55-km distance to the nearest Class I area: Seney Wilderness Area. The relatively high Q/d compared to other Michigan sources is a result of being located closer to a Class I area. Other Michigan sources with a pollutant specific unit Q/d less than that of Neenah Paper – Michigan Inc.'s Boiler 1 include large power plants because of the nature of their locations farther away from a Class I area. For example, St. Clair Boiler 6 was ranked with a Q/d of 6.3 using the 2016 SO_2 emissions of 3,020 tons, an amount 5 times greater than the 2016 SO_2 emissions from Neenah Paper's Boiler 1, because it is located much farther away – 479 km from the nearest Class I area. Similarly, Presque Isle Boiler 6 emitted 922 tons SO_2 in 2016, nearly 2 times more than Neenah Paper's Boiler 1, resulting in a lower pollutant specific unit Q/d of 8.2 based on its location 113 km from the nearest Class I area.

For the sake of reference, a Q/d screening method for establishing a threshold for excluding nearby sources from source selection has been used to evaluate NAAQS under the USEPA's rules for PSD. (*See* "EPA Nearby Source Selection Guidance," Minnesota Pollution Control Agency, November 2023, https://gaftp.epa.gov/aqmg/SCRAM/conferences/2023_13th_Conference_On_Air_Quality_Modeling/Presentations/1-18_Nearby%20Source%20Selection%20Guidance%20Whitepaper%20MPCA.pdf.)

For the short-term NAAQS, such as the 24-hour NAAQS, the USEPA described an approach for an applicant of a PSD permit to determine the impact of various sources.

> "In determining which emission sources in the screening area should be added to the emissions inventory, the applicant should consider three criteria: (1) annual emissions of the source, (2) degree of ambient impact, and (3) distance from the impact area. For example, a 100-ton-per-year source located 10 kilometers from the impact area generally can be excluded from the inventory because its effect on air quality in the impact area is expected to be insignificant. However, a 10,000-ton-per-year source located 40 kilometers from the impact areas would probably have to be accounted for in the increment analysis." (*See* USEPA's "Prevention of Significant Deterioration Workshop Manual," 450280081. Office of Air, Noise, and Radiation, Office of Air Quality Planning and Standards (Research Triangle Park, NC, 1980): page I-C-18, https://www.epa.gov/sites/default/files/2015-07/documents/1980wman.pdf.)

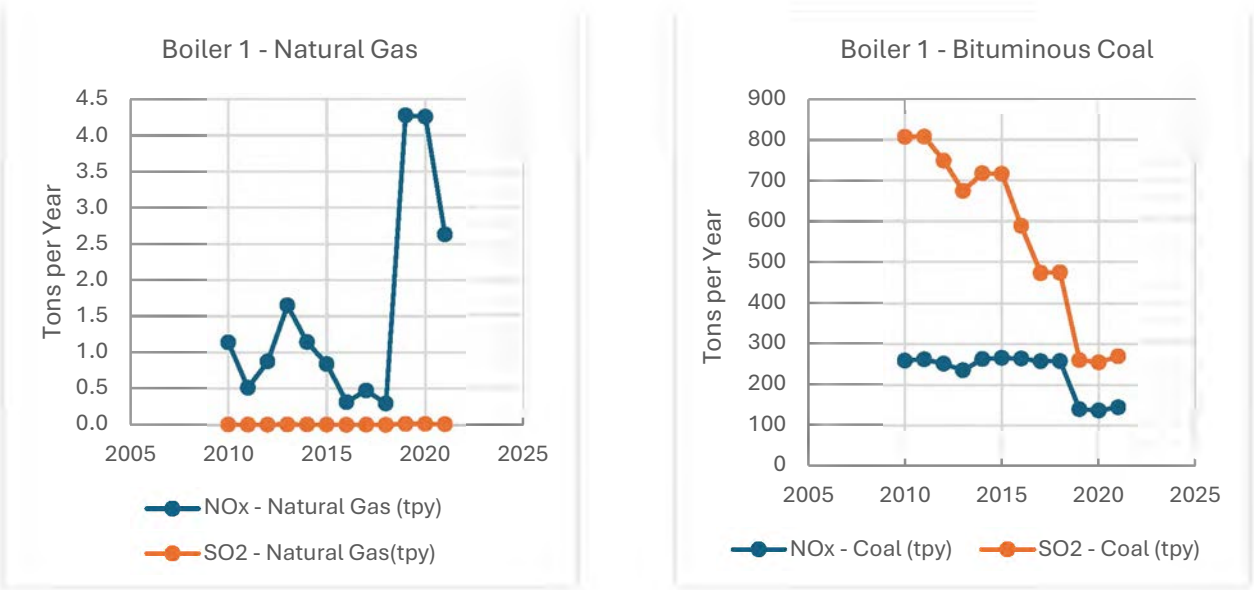
Based on this screening technique, the State of North Carolina's PSD permitting program developed a "20D" threshold, which received USEPA concurrence. For the short-term NAAQS, North Carolina's 20D approach excludes nearby sources that have potential allowable emissions 'Q' in tpy that are less than 20 times the distance 'd' between the nearby source and the source under review. (*See* Eldewins Haynes, Meteorologist, Air Permits Unit, State of North Carolina Department of Natural Resources and Community Development, to Lewis Nagler, Air Management Branch, USEPA Region IV, Atlanta, Georgia, July 22, 1985, A screening method for PSD.)

Although intended for NAAQS and PSD purposes, the 20D approach gives a sense of the magnitude of influence for the sake of nearby source selection for determining impacts at Class I areas. In the case of Neenah Paper – Michigan, Inc., Boiler 1 would be evaluated based on its potential to emit and its distance from the nearest Class I area: Seney Wilderness Area.

The potential of Boiler 1 to emit SO_2 is derived from its 202 MMBtu/hr capacity and its ROP permit limitation on sulfur content of 1.5 percent by weight calculated on the basis of 12,000 BTU/lb coal, resulting in a potential to emit of 1,105 tpy SO_2. The distance to Seney Wilderness Area is 55 km, and 20 times the distance of 55 km would be 1,100 km. Using the 20D approach, this places the potential to emit of 1,105 tpy SO_2 nearly equivalent to the 20D value of 1,100 km, which would be used to exclude this source from consideration in an air quality modeling demonstration for PSD.

Overall Determination:
Based on the recent significant investment in the SDA by Neenah Paper – Michigan, Inc. that has resulted in effective reductions of SO_2, the sulfur and HAP limitations in the ROP permit, Boiler 1's declining SO_2 emission rates over the past 5 years, and the facility's declining projected emissions for SO_2 through 2032, EGLE has concluded that Boiler 1 is effectively controlled and that the existing measures are not necessary for reasonable progress for the second implementation period to prevent future emission increases and future visibility impairment.

Figure 11: Neenah Paper – Michigan, Inc., Boiler 1: Annual Emissions from Natural Gas and Coal (2010 – 2021)



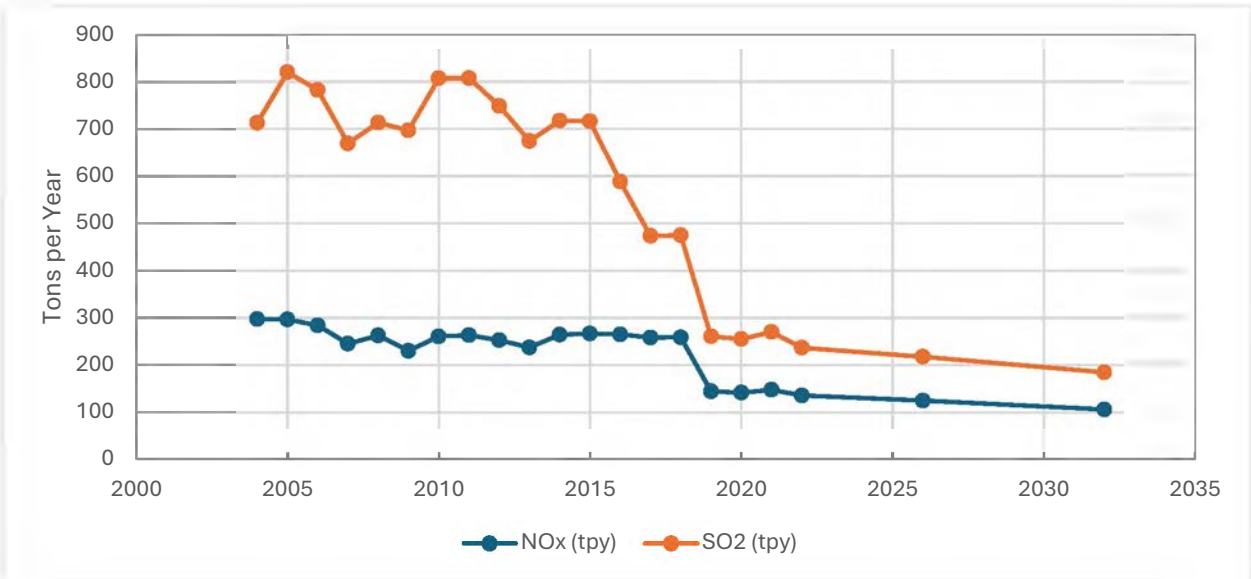
Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 17: Neenah Paper – Michigan, Inc., Boiler 1: Annual Emissions from Natural Gas and Coal (2010 – 2021)

Year	NO_X - Natural Gas (tpy)	SO_2 - Natural Gas (tpy)	NO_X - Coal (tpy)	SO_2 - Coal (tpy)
2010	1.1	0.0	260	807
2011	0.5	0.0	263	808
2012	0.9	0.0	252	748
2013	1.7	0.0	236	674
2014	1.1	0.0	263	718
2015	0.8	0.0	266	716
2016	0.3	0.0	265	588
2017	0.5	0.0	258	474
2018	0.3	0.0	258	475
2019	4.3	0.0	140	261
2020	4.3	0.0	137	255
2021	2.6	0.0	145	270

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Figure 12: Neenah Paper – Michigan, Inc.: Facility-wide Actual and Projected Annual Emission Rates (2004 – 2032)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform)

Table 18: Neenah Paper – Michigan, Inc.: Facility-wide Actual and Projected Annual Emission Rates (2004 – 2032)

Year	NO_X (tpy)	SO_2 (tpy)
2004	297.5	712.7
2005	296.7	819.9
2006	284.2	782.2
2007	245.3	669.4
2008	262.7	713.2
2009	230.3	696.7
2010	260.8	807.1
2011	263.3	807.6
2012	252.8	748.5
2013	237.4	674.3
2014	264.4	717.6
2015	266.9	716.1
2016	264.9	588.4
2017	258.4	473.6
2018	258.8	474.9
2019	144.6	260.9
2020	141.7	255.2
2021	147.9	270.1
2022	135.78	236.84
2026	124.93	217.89
2032	106.26	184.74

Source: MAERS Annual Pollutant Totals Query https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform (https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform)

3.4 Source Flagged by FLMs but not Selected

During the FLM consultation process, the FLMs recommended EGLE also select EES Coke Battery LLC, Midland Cogeneration Venture, L'Anse Warden Electric Company, and US Steel Great Lakes Works for further analysis. As show in Table 8, emissions for these sources were below the pollutant specific unit Q/d>6 threshold and beyond EGLE's 80 percent target. Each of these facilities had Q/d on a facility-wide basis for the sum of NH_3, NO_X, $PM_{2.5}$, and SO_2 of 6.2 or less, except for Midland Cogeneration Venture, which had a facility-wide Q/d of 11.6.

Since the facility-wide Q/d for Midland Cogeneration Venture was higher relative to the other three facilities recommended by the FLMs, EGLE provides additional information below to describe the units, emission rates, and emission controls at Midland Cogeneration Venture without making an assessment as to whether the existing controls or new controls would be necessary to make reasonable progress.

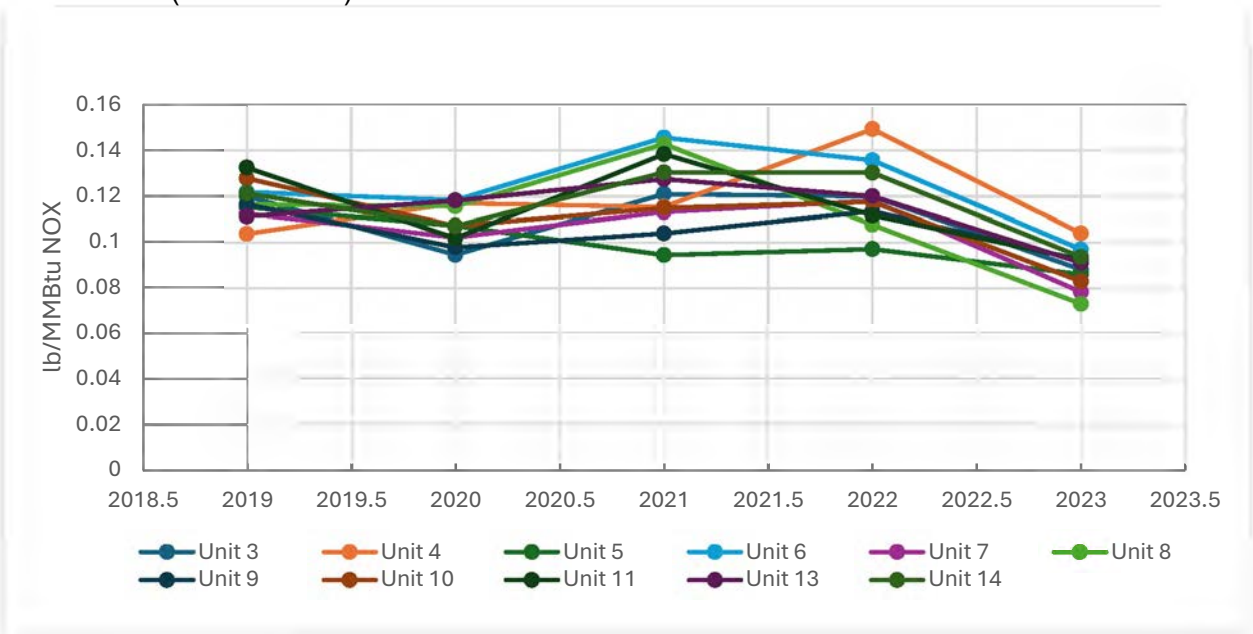
3.4.1 Midland Cogeneration Venture

There are 11 emission units at Midwest Cogeneration Venture that comprise the facility-wide Q/d of 11.6 based on emissions of NH_3, NO_X, $PM_{2.5}$, and SO_2. Each of the emission units has a pollutant specific unit Q/d of 1.0 to 1.1 for NO_X and almost zero for SO_2. These 11 emission units are combined cycle gas turbines fueled by pipeline natural gas.

Each unit uses steam injection to control NO_X emissions in a process where steam is introduced into the combustor, lowering the flame temperature of the combustion reaction and, in turn, lowering the thermal production and output of NO_X.

Over the most recent 5-year period from 2019 – 2023, NO_X emission rates from the USEPA's Clean Air Markets Program Data (CAMPD) are depicted in Figure 13 and Table 19 below.

Figure 13: Midland Cogeneration Venture: Trends in Unit Annual Emission Rates (2019 – 2023)



Source: Clean Air Markets Program Data
https://campd.epa.gov/

Table 19: Midland Cogeneration Venture: Trends in Unit Annual Emission Rates (2019 – 2023)

YEAR	Annual Emission Rate NO_X (lb/MMBtu)										
UNIT ID	3	4	5	6	7	8	9	10	11	13	14
2019	0.120	0.104	0.115	0.122	0.113	0.117	0.117	0.128	0.133	0.111	0.121
2020	0.095	0.117	0.107	0.118	0.102	0.116	0.098	0.107	0.102	0.118	0.107
2021	0.121	0.115	0.095	0.146	0.113	0.143	0.104	0.115	0.138	0.128	0.130
2022	0.120	0.149	0.097	0.136	0.118	0.108	0.114	0.118	0.112	0.120	0.130
2023	0.088	0.104	0.086	0.097	0.079	0.073	0.092	0.083	0.093	0.091	0.094

Source: Clean Air Markets Program Data
https://campd.epa.gov/

3.5 Sources Selected for Four-factor Analysis

As documented in Section 3.3.1 above, using the pollutant specific unit Q/d>6 threshold, EGLE screened out units that had retired or have enforceable mechanisms to retire by 2028. EGLE also addressed a source that has been indefinitely idled in Section 3.3.2. Then, in Section 3.3.3, EGLE screened out units with existing effective control measures. With three remaining sources, EGLE then proceeded with four-factor analysis for specific units at the following three facilities:

Table 20: Units Selected for a Four-factor Analysis

Facility Name	Sector	Facility Unit ID	Q/d Unit (sum)	Q/d NO_X	Q/d SO_2	Q/d Facility (sum)
TILDEN MINING COMPANY LC	NON-EGU	EU Kiln 2–gas fired	42.8	42.3	0.0	108.6
		EU Kiln 2–coal fired	12	11.0	0.9	
Verso Escanaba LLC (Now Billerud Escanaba LLC)	NON-EGU	Recovery Furnace 10	7.2	3.1	0.1	22.5
		No. 11 Power Boiler	12.7	3.0	3.4	
GRAYMONT WESTERN LIME, INC.	NON-EGU	EU Kiln 1	8.1	7.1	0.5	8.1

3.6 Documentation of the Source Selection Process and Result

As described above in Section 2, EGLE identified Class I areas where Michigan contributes more than 1 percent to the 2028 modeled total light extinction based on LADCO's 2028 modeled projections using the 2016 base year and responded to MANE-VU's asks regarding Class I areas affected outside Michigan.

In Section 3.1, EGLE determined which pollutants to consider for an evaluation of control measures based on the analyses in LADCO's 2021 Technical Support Document of the IMPROVE monitoring data, which found that NO_X and SO_2 emissions lead to the formation of the particulate species of nitrate and sulfate that currently contribute more to visibility impairment in the LADCO region Class I areas than $PM_{2.5}$, NH_3, and VOC.

Under Section 3.2, EGLE estimated baseline visibility impacts for source selection by relying on LADCO's Q/d analysis. EGLE identified over 80 units with Q/d of 1.0 or greater using a 2016 base year, including NH_3, NO_X, $PM_{2.5}$, and SO_2 in the summation of 'Q' and the closest Class I area to the sources for the value of 'd.'

As recommended in the 2019 Regional Haze Guidance, EGLE then evaluated Q/d metrics on an individual pollutant basis, since inclusion of the other haze precursors ($PM_{2.5}$, VOC, and ammonia) in the Q/d analysis would not reflect NO_X and SO_2 as the dominant species contributing to visibility impairment in the LADCO Class I areas. Additionally, EGLE relied on a unit pollutant level Q/d approach recognizing that the evaluation of control measures would take place at the unit level and that addressing NOx and SO_2 emissions would entail entirely different control systems.

To capture 80 percent of emissions of NO_X and SO_2 collectively, and to identify units for further evaluation and possible four-factor analyses, an incremental evaluation led to a pollutant specific unit Q/d>6 for NO_X and SO_2 separately. A pollutant specific unit Q/d>6 threshold

captured 70 percent of NO_X and 85 percent of SO_2 emissions, and 79 percent of both NO_X and SO_2, collectively.

Using the pollutant specific unit Q/d>6 threshold, EGLE first screened out units that had retired or have enforceable mechanisms to retire by 2028 as listed in Section 3.3.1. EGLE identified 44 EGUs from 17 different Michigan power plants that retired during 2016 – 2023, as well as units that have enforceable mechanisms under a Consent Decree to retire:

- Consumers Energy – J.H. Campbell Plant: Units 1, 2, and 3 on or before May 31, 2025.
- Consumers Energy – Dan E. Karn: Units 3 and 4 on or before May 31, 2031

In Section 3.3.2, EGLE also addressed a source that has been indefinitely idled. Then, in Section 3.3.3, EGLE screened out units with existing effective controls and provided weight-of-evidence demonstrations in determining whether those measures were necessary for reasonable progress. With three remaining sources identified, EGLE then proceeded with four-factor analysis for specific units at:

- Billerud Escanaba LLC
- Graymont Western Lime, Inc.
- Tilden Mining Company LC

4. Step 4: CHARACTERIZATION OF FACTORS FOR EMISSION CONTROL MEASURES
Identify potential emission control measures for the selected sources, develop data on the four statutory factors and on visibility benefits if they will be considered. See 40 CFR 51.308(f)(2).

The four statutory factors set out in the Regional Haze Rule are:

- Cost of compliance
- Time necessary for compliance
- Energy and non-air environmental impacts
- Remaining useful life of the source

After having re-done the Q/d analysis used to support the source-selection process within the initial 2021 Regional Haze SIP submittal, EGLE found Billerud Escanaba LLC, Graymont Western Lime, Inc., and Tilden Mining Company LC to meet the criteria for requiring a four-factor analysis to determine whether additional control measures should be implemented to achieve reasonable progress during the second planning period.

EGLE submitted Request for Information (RFI) Letters (*attached in* Appendices 19, 20, and 21) to each of the three reselected sources to gather the source specific four-factor analysis information that was needed for EGLE staff to make a decision on whether to adopt a new control measure into its LTS.

Table 21: Units Selected for a Four-factor Analysis, Pollutant Specific Q/d, and Control Measures Considered

Facility Name	Sector	Facility Unit ID	Q/d NO_X	Q/d SO_2	Control Measures Evaluated
Verso Escanaba LLC (Now Billerud Escanaba LLC)	NON-EGU	No. 11 Power Boiler		3.4	• Fuel Substitution • Dry sorbent injection (DSI) • Dry FGD (dry scrubbing) • Wet FGD (wet scrubbing)
GRAYMONT WESTERN LIME, INC.	NON-EGU	EU Kiln 1	7.1		• SNCR • Selective Catalytic Reduction (SCR)
TILDEN MINING COMPANY LC	NON-EGU	EU Kiln 2 gas-fired	42.3		• Low NO_X Burner (LNB) • Over-fire Air System (OFA) • Fuel Substitution
		EU Kiln 2 coal-fired	11.0		

4.1 Four-factor Analysis: Billerud Escanaba LLC, No. 11 Power Boiler

Billerud Escanaba LLC (formerly Verso Escanaba) was described in detail in Michigan's 2021 Regional Haze SIP Submittal on pages 11, 12, 17, and18 (*See* Appendix 1). This SIP supplement provides a full four-factor analysis (*See* Appendix 22) and further elaboration on EGLE's evaluation of potential control measures necessary for reasonable progress during the second implementation period.

Although the No. 11 Power Boiler had a pollutant specific unit Q/d of 3.4 for SO_2 and 3.0 for NO_X, which was under EGLE's threshold of 6, EGLE selected this unit for a four-factor analysis because the FLMs requested it and because the No. 11 Power Boiler is not subject to SO_2 controls or an SO_2 limit that is equal to or more stringent than SO_2 BACT limits for other similar/identical units.

For NO_X, the No. 11 Power Boiler must maintain compliance with PSD emission limits for NO_X (0.70 lb /MMBtu (30-day rolling average, when firing solid fuels)) in its ROP (MI-ROP-A0884-2021b) (per 40 CFR 52.21) and NO_X limitations established in Part 8 of Michigan's Air Pollution Control Rules (R 336.1801). Additionally, in June 2023, the USEPA finalized its "Good Neighbor Rule" FIP for the 2015 Ozone NAAQS, which included NO_X emissions limitations and control requirements for existing large, multi-fueled boilers (>100 MMBtu/hr) at paper mills that are set to become enforceable at the beginning of the 2026 ozone season.

EGLE found that evaluating and/or pursing additional NO_X control devices would not be necessary at this time since the No. 11 Power Boiler is expected to eventually become subject to a more stringent federal NO_X emissions requirements under the Good Neighbor Rule during the second implementation period (2018 – 2028) of the Regional Haze Rule. Although the Supreme Court recently granted a request to stay the Good Neighbor Rule (*See* Ohio et al v. USEPA et al, Case No. 23A349, Supreme Court of the United States, June 27, 2024), EGLE still considers this as the first option, and will revisit the need to evaluate NO_X controls if the more stringent NO_X emission requirements are not implemented at the federal level.
For SO_2, the No. 11 Power Boiler is currently subject to PSD emission limits for SO_2 (1.2 lb/MMBtu (10-day rolling average, when firing solid fuels)) in its (MI-ROP-A0884-2021b) (per 40 CFR 52.21).

EGLE found it necessary to evaluate and/or pursue SO_2 control devices since the No. 11 Power Boiler is not equipped with abatement technology, nor is it subject to an emissions limitation for SO_2 that is equal to or more stringent than SO_2 BACT limits for other similar/identical units. (*See* RACT/BACT/LAER Clearinghouse Basic Information at https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information.)

In an RFI letter sent to Billerud Escanaba LLC on April 24, 2024, EGLE requested that Billerud Escanaba LLC conduct a four-factor analysis, and submit a subsequent report, of four different types of SO_2 control measures for Billerud Escanaba LLC's No. 11 Power Boiler (*See* Appendix 19).

Billerud Escanaba LLC provided a full four-factor analysis as EGLE requested. Table 22 provides a summary of the four-factor analysis, which is attached as Appendix 22.

Table 22: Summary of Four Factor Analysis for Billerud Escanaba LLC, No. 11 Power Boiler, SO_2 Emissions

Verso Escanaba LLC (Now Billerud Escanaba LLC): No. 11 Power Boiler, SO_2 Emissions				
Control Measures Evaluated	**Cost Effectiveness**	**Time for Compliance**	**Energy and Non-Air Impacts**	**Remaining Useful Life of Source**
Fuel Substitution	$5,734/ton SO_2	A few months for sale of remaining fuel plus time for new permits.	Annual Energy Usage: NA	Billerud Escanaba LLC plans to continue operation of the No. 11 Power Boiler for the foreseeable future.
DSI	$10,727/ton SO_2	4 years	Annual Energy Usage: 26,920 MWh/yr New waste streams would result in increased operating costs and additional regulatory requirements.	
Dry FGD (dry scrubbing)	$22,281/ton SO_2	4 years	Annual Energy Usage: 12,798 MWh/yr New waste streams would result in increased operating costs and additional regulatory requirements.	
Wet FGD (wet scrubbing)	$30,082/ton SO_2	4 years	Annual Energy Usage: 14,182 MWh/yr New waste streams would result in increased operating costs and additional regulatory requirements. Wastewater generated by wet FGD systems would likely contain metals associated with wood, such as arsenic, beryllium, cadmium, chromium, mercury, lead, selenium, and copper, as well as other pollutants such as cyanide, ammonia, phosphorus, nitrogen, and total suspended solids. Additional wastewater treatment may be required, and these costs have not been quantified within this analysis.	

4.2 Four-factor Analysis: Graymont Western Lime, Inc., EU Kiln 1 – NOX emissions

Graymont Western Lime, Inc., EU Kiln 1 was described in detail in Michigan's 2021 Regional Haze SIP Submittal on pages 12 and 19 (*See* Appendix 1). This SIP supplement provides a full four-factor analysis (*See* Appendix 23) and further elaboration on EGLE's evaluation of potential control measures necessary for reasonable progress during the second implementation period.

Graymont Western Lime, Inc. operates EU Kiln 1 with LNBs and a Low Excess Air Firing System to comply with BACT-PSD emission limits for NO_X (132.6 lb/hr [24-hour rolling average] and 532 tpy [12-month rolling time period]) specified in its most recent PTI (No. 26-04) (per 40 CFR 52.21).

EGLE selected this unit for a four-factor analysis because EU Kiln 1 had a pollutant specific unit Q/d of 7.1 and because this unit has not undergone a BACT review since 2004.

In an RFI letter sent to Graymont Western Lime, Inc. on April 24, 2024, EGLE requested that Graymont Western Lime, Inc. conduct a four-factor analysis, and submit a subsequent report, of three different types of NO_X control measures for Graymont's line 1 rotary preheater lime kiln (EU-Kiln #1). (*See* Appendix 20.)

Graymont Western Lime, Inc. provided a full four-factor analysis as EGLE requested. Table 23 below provides a summary of the four-factor analysis that was prepared by Trinity Consultants, which is attached as Appendix 23.

Table 23: Summary of Four-Factor Analysis for Graymont Western Lime, Inc., EU Kiln 1, NO_X Emissions

Graymont Western Lime, Inc.: EU Kiln 1, NO_X Emissions				
Control Measures Evaluated	**Cost Effectiveness**	**Time for Compliance**	**Energy and Non-Air Impacts**	**Remaining Useful Life of Source**
Fuel Substitution	NA	NA	NA There is insufficient natural gas supply in the region, and switching fuels would not appreciably improve NO_X emissions.	The remaining useful life of EU Kiln 1 is anticipated to be at least as long as the capital cost recovery period for the measures evaluated.
SCR	$14,433/ton NO_X	3 years	Electricity Cost: $75,821 The additional electrical demand is an energy intensive process that also generates high amounts of greenhouse gases.	
SNCR	$16,372/ton NO_X	3 years	Electricity Cost: $2,517 The additional electrical demand is an energy intensive process that also generates high amounts of greenhouse gases.	

4.3 Four-factor Analysis: Tilden Mining Company LC, EU Kiln 2 – NO_X emissions

Tilden Mining Company LC, Kiln 2 was described in detail in Michigan's 2021 Regional Haze SIP Submittal on pages 12 and 19 (*See* Appendix 1). This SIP supplement provides a full four-factor analysis (*See* Appendices 24 and 25) and further elaboration on EGLE's evaluation of potential control measures necessary for reasonable progress during the second implementation period.

Kiln 2 is identical to Kiln 1; however, it was not subject to the NO_X limits set under the 2016 Revised Taconite BART FIP like Kiln 1. This is due to Kiln 2 being installed in 1978 and therefore not considered as a BART unit during the first planning period. (*See* 81 FR 21672, April 12, 2016: Taconite Federal Implementation Plan Establishing BART for Taconite Plants, https://www.govinfo.gov/content/pkg/FR-2016-04-12/pdf/2016-07818.pdf.)

EGLE selected this unit for a four-factor analysis because EU Kiln 2 had a pollutant specific unit Q/d of 53.3 and because Kiln 2 does not operate NO_X abatement technology and is not subject to NO_X emission limits under PSD, Michigan's Part 8 rules, or any federal program.

In an RFI letter sent to Tilden Mining Company LC on April 24, 2024, EGLE requested that the company conduct a four-factor analysis, and submit a subsequent report, of three different types of NO_X control measures for the company's line 2 indurating (grate/kiln) furnace (EU KILN 2) (*See* Appendix 21).

Tilden Mining Company LC provided a full four-factor analysis as EGLE requested. Table 24 provides a summary of the four-factor analysis that was prepared by Barr Engineering Co., which is attached as Appendices 24 and 25.

Table 24: Summary of Four-Factor Analysis for Tilden Mining Company LC, EU Kiln 2, NO_X Emissions

Tilden Mining Company LC: Kiln 2 – NO_X emissions				
Control Measures Evaluated	**Cost Effectiveness**	**Time for Compliance**	**Energy and Non-Air Impacts**	**Remaining Useful Life of Source**
Fuel Substitution	$2,645/ton NO_X	3 years	The switch from natural gas to coal would result in increased truck traffic and greenhouse gas emissions as well as SO_2 emissions.	The remaining useful life of EU Kiln 2 is anticipated to be at least as long as the control measures evaluated.
LNB	$694/ton NO_X	5 years	LNB can increase CO and VOC emissions.	
OFA	NA	NA	NA OFA is technically infeasible for Kiln 2 as the NO_X formation front is not stationary in an indurating furnace. Therefore, OFA is not included in this analysis.	

5. Step 5: DECISIONS ON WHAT CONTROL MEASURES ARE NECESSARY TO MAKE REASONABLE PROGRESS

Consider the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv) (if not already considered when selecting sources), and, optionally, visibility benefits, and decide on emission controls for incorporation into the LTS. Consider measures adopted by other contributing states, including all measures that have been agreed upon through interstate consultation. See 40 CFR 51.308(f)(2).

5.1 Evaluation of the Four Statutory Factors

The four statutory factors set out in the Regional Haze Rule are:

- Cost of compliance
- Time necessary for compliance
- Energy and non-air environmental impacts
- Remaining useful life of the source.

Of the four statutory factors, characterizing the cost of compliance relied upon previous regulatory impact analyses for both federal and state rules. To facilitate Michigan's decision in considering a cost-effectiveness threshold of potential new add-on controls that would promote Michigan's efforts in setting reasonable progress goals for the second implementation period, past findings of cost-effectiveness thresholds for various emission control technologies were informative. The following sources served as possible reference points from other CAA requirements for similar existing point sources, which included the following cost per ton thresholds for pollutant control, as listed without adjustment for inflation:

- **Revised Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone NAAQS:**
  $1,800/ton

  Source: "Regulatory Impact Analysis for the Final Revised Cross-State Air Pollution Rule (CSAPR Update for the 2008 Ozone NAAQS," EPA-452/R-21-002, March 2021, https://www.epa.gov/sites/default/files/2021-03/documents/revised_csapr_update_ria_final.pdf.

- **Regional Haze – Best Available Retrofit Technology (BART) for SO_2:**
  $400 - $2000/ton

  Source: 70 FR 39132, July 6, 2005, https://www.govinfo.gov/content/pkg/FR-2005-07-06/pdf/05-12526.pdf.

- **Michigan NO_X Reasonably Available Control Technology (RACT):**
  $400 - $1600/ton

  Source: Michigan Office of Administrative Hearings and Rules, Administrative Rules Division, "Regulatory Impact Statement and Cost-Benefit Analysis," regarding Emission Limitations and Prohibitions – Oxide of Nitrogen.

  Source: ARS Public - RFR Transaction

- **EGU NO_X Mitigation Strategies Final Rule:**
  $6,700/ton
  for SNCR retrofit for coal units less than 100 MW lacking post-combustion NO_X control technology.

  Source: Technical Support Document for the Final Federal Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards," USEPA, Office of Air and Radiation, March 2023, https://www.epa.gov/system/files/documents/2023-03/EGU%20NOX%20Mitigation%20Strategies%20Final%20Rule%20TSD.pdf.

- **Good Neighbor Plan for the 2015 8-hour Ozone NAAQS:**
  $1,800/ton ($2016)
  for optimizing existing NO_X Controls and installing state-of-the art combustion controls.
  $11,000/ton ($2016)
  for installation of SCR and SNCR post-combustion controls for coal units of 100 MW or greater capacity that do not have post-combustion NO_X control technology.
  $7,500/ton
  for the purposes of the non-EGU screening assessment.

  Source: 88 FR 36654, June 5, 2023, https://www.govinfo.gov/content/pkg/FR-2023-06-05/pdf/2023-05744.pdf.

  "Economic Impact Assessment for the Proposed Supplemental Federal "Good Neighbor Plan" Requirements for the 2015 8-hour Ozone National Ambient Air Quality Standard," USEPA, Office of Air Quality Planning and Standards, Health and Environmental Impacts Division, November 2023,

https://www.epa.gov/system/files/documents/2024-01/san-11159_gn-plan-supplemental-proposed-eia_231218_eo-12866-clearance2_clean.pdf.

TABLE V.C.2–3—BY INDUSTRY, EMISSIONS UNIT TYPE, ASSUMED CONTROL TECHNOLOGIES, AND ESTIMATED AVERAGE COST PER TON BY CONTROL TECHNOLOGY ACROSS ALL NON-EGU EMISSIONS UNITS

Industry/industries	Emissions unit type	Assumed control technologies that meet final emissions limits	Average cost/ton values (2016$)
Pipeline Transportation of Natural Gas	Reciprocating Internal Combustion Engine	NSCR or Layered Combustion, Layered Combustion, SCR, NSCR.	4,981
Cement and Concrete Product Manufacturing	Kiln	SNCR	1,632
Iron and Steel Mills and Ferroalloy Manufacturing	Reheat Furnaces	LNB	3,656
Glass and Glass Product Manufacturing	Furnaces	LNB	939
Iron and Steel Mills and Ferroalloy Manufacturing	Boilers	SCR or LNB + FGR	8,369
Metal Ore Mining			14,595
Basic Chemical Manufacturing			11,845
Petroleum and Coal Products Manufacturing			14,582
Pulp, Paper, and Paperboard Mills			14,134
Solid Waste Combustors and Incinerators	Combustors or Incinerators	ANSCR or LN™ and SNCR	7,836
Overall Average Cost/Ton			5,339

- On June 27, 2024, the Supreme Court granted states and industry applicants' request to stay the USEPA's Good Neighbor Rule for the 2015 8-hour Ozone NAAQS while legal challenges continue, including arguments from states and industry groups regarding costs. *See* Ohio et al v. USEPA et al, Case No. 23A349, Supreme Court of the United States, June 27, 2024.
  Source:
  https://www.supremecourt.gov/opinions/23pdf/23a349_0813.pdf
  https://www.scotusblog.com/2024/06/supreme-court-blocks-epas-good-neighbor-air-pollution-rule/.

5.1.1 Determination of Measures Necessary to Make Reasonable Progress

When evaluating the results of a four-factor analysis, the 2021 Clarifications Memo explains,

> "When the outcome of a four-factor analysis is a new measure, that measure is needed to remedy existing visibility impairment and is necessary to make reasonable progress. When the outcome of a four-factor analysis is that no new measures are reasonable for a source, the source's existing measures are generally needed to prevent future visibility impairment; i.e., to prevent future emission increases; and thus necessary to make reasonable progress. Measures that are necessary to make reasonable progress must be included in the SIP. However, there may be circumstances in which a source's existing measures are not necessary to make reasonable progress." (2021 Clarifications Memo, Section 4.1.)

As described in Section 3.3 above, to support a determination that a source's existing measures are not necessary to make reasonable progress, the USEPA described a weight-of-evidence approach based on the source's most recent 5-year historical emission rate, projected emissions and emission rate, and enforceable limits related to its existing measures to demonstrate that "the source has consistently implemented its existing measures and has achieved, using those measures, a reasonably consistent emission rate" that will not increase in the future. *See* 2021 Clarifications Memo, Section 4.1.

EGLE's evaluation of each of the four-factor analyses is presented below.

5.1.2 Billerud Escanaba LLC, No. 11 Power Boiler, SO_2

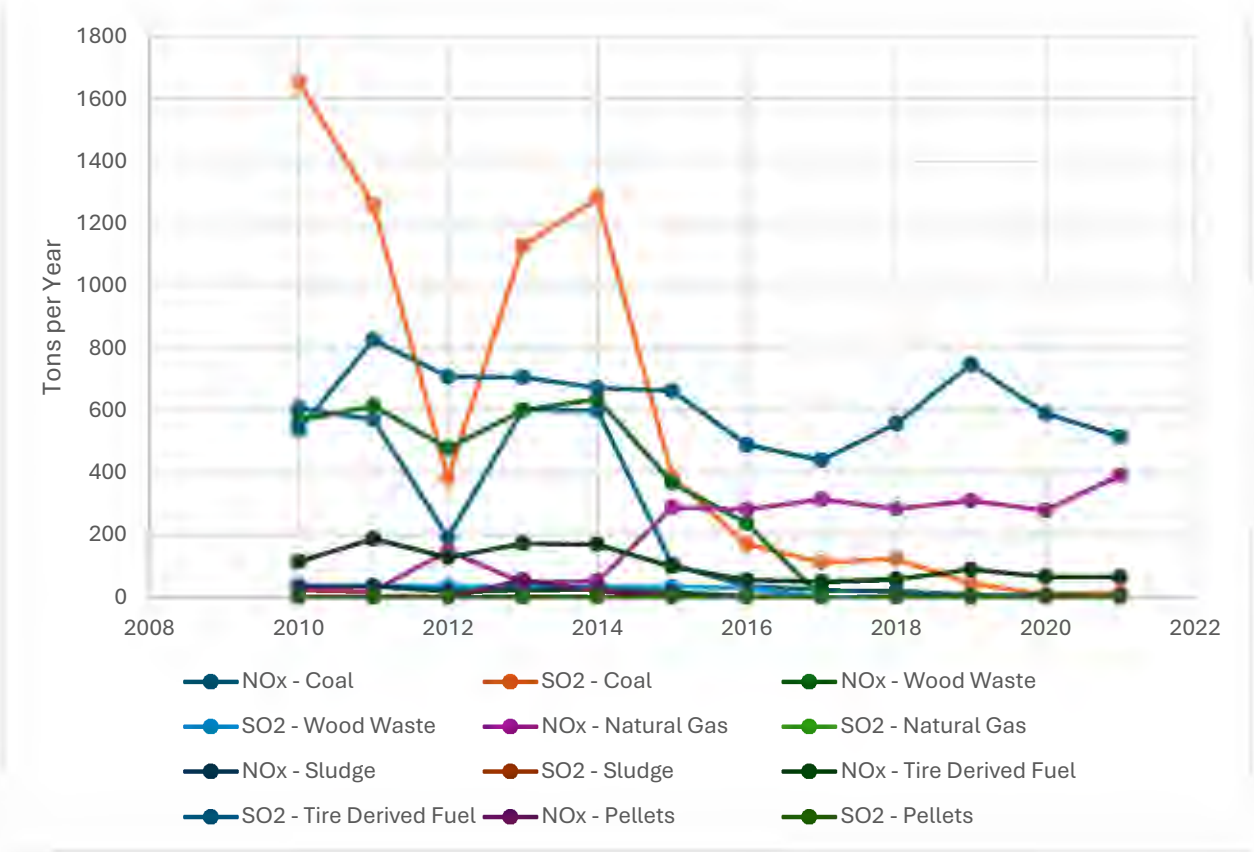
EGLE considered each of the four statutory factors in evaluating the outcome of the four-factor analysis that was performed for Billerud Escanaba LLC, No. 11 Power Boiler. The time to compliance would be achievable by 2028 within the remainder of the second implementation period. The remaining useful life of the No. 11 Power Boiler does not appear to be a limiting factor since Billerud Escanaba LLC plans to continue operation into the foreseeable future. However, the energy and non-air impacts would impose significant drawbacks resulting from additional power consumption, waste production, and wastewater compliance issues, including additional costs not captured in the cost-effectiveness estimations for potential new controls.

The cost-effective values found under the CSAPR, BART, and RACT rulemakings generally establish a lower frame of reference compared to the higher values in the Good Neighbor Rule that was stayed by the Supreme Court. Relying on references to the currently implemented USEPA rules as a rough threshold for what could be considered cost-effective for point sources in Michigan for the second implementation period, the cost-effectiveness values determined in the four-factor analysis for Billerud Escanaba LLC were found to be considerably outside those ranges.

Based on the data pertaining to the cost-effectiveness ($/ton of SO_2 abatement) of implementing and/or retrofitting the No. 11 Power Boiler with the four different SO_2 control mechanisms, it was found that all options surpass the ‘cost-effectiveness’ values under other currently implemented USEPA rules described in Section 5.1 above, which EGLE considered for determining whether a control measure is necessary for reasonable progress. While there are drawbacks to the energy and non-air impacts factor, cost-effectiveness was the most decisive factor, and EGLE was able to eliminate all four SO_2 control options evaluated as being necessary to make reasonable progress through adoption into Michigan’s LTS.

Just as no new measures were found necessary to make reasonable progress, EGLE has found that the existing measures for the No. 11 Power Boiler are also not necessary to make reasonable progress. Consistent with the demonstration described in the 2021 Clarifications Memo in Section 4.1, Tables 25 and 26 and Figures 14 and 15 below illustrate the reasonably consistent and declining trends in facility-wide actual NO_X and SO_2 emissions for No. 11 Power Boiler from 2010 – 2021. Additionally, Figure 15 and Table 26 illustrate the expectation that the unit’s emission rate will not increase in the future based on projected emissions from the facility as a whole through 2032 using the USEPA’s 2022v1 Emissions Modeling Platform. Based on the No. 11 Power Boiler’s existing measures and enforceable requirements described above as well as the most recent 5 years of emission rate data available provided below, Billerud Escanaba LLC is projected to continue to implement the existing measures for the No. 11 Power Boiler and not to increase its emission rate. As such, EGLE has determined that the existing measures are not necessary to include in the LTS or the regulatory portion of the SIP to prevent future emission increases and future visibility impairment.

Figure 14: Billerud Escanaba LLC, No. 11 Power Boiler Annual Emissions (2010 – 2021)



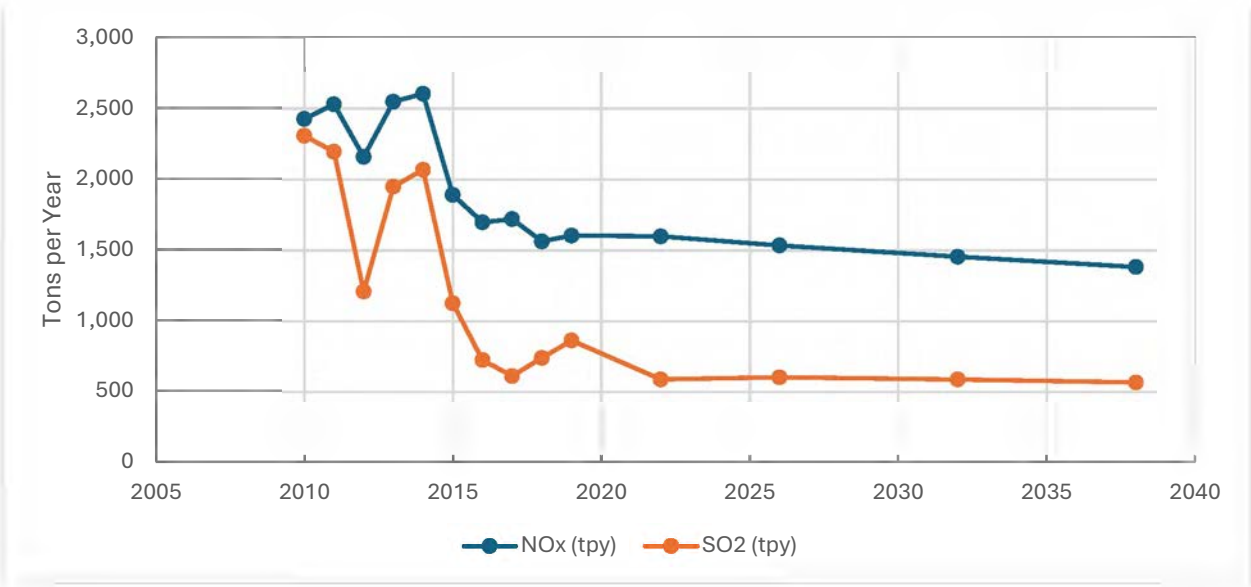
Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 25: Billerud Escanaba LLC, No. 11 Power Boiler: Annual Emissions (2010 – 2021)

Year	NO_X - Coal	SO_2 - Coal	NO_X - Wood Waste	SO_2 - Wood Waste	NO_X - Natural Gas	SO_2 - Natural Gas	NO_X - Sludge	SO_2 - Sludge	NO_X - Tire Derived Fuel	SO_2 - Tire Derived Fuel	NO_X - Pellets	SO_2 - Pellets
2010	606	1657	567	35	24	0	35	2	114	537	0	0
2011	570	1260	614	36	18	0	35	2	187	826	0	0
2012	192	380	478	35	148	0	18	1	127	708	0	0
2013	601	1128	600	33	47	0	24	1	171	705	55	3
2014	599	1281	636	33	51	0	25	1	169	672	21	1
2015	104	386	367	33	288	1	15	1	97	662	1	0
2016	35	170	236	28	281	1	3	0	54	489	0	0
2017	23	111	0	0	314	1	0	0	49	439	0	0
2018	19	122	0	0	283	1	3	0	57	557	0	0
2019	6	43	0	0	309	1	4	1	88	748	0	0
2020	3	9	0	0	278	1	6	1	65	589	0	0
2021	5	14	0	0	391	1	2	0	63	515	0	0

Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Figure 15: Billerud Escanaba LLC: Facility-wide Actual and Projected Emissions (2010 – 2032)



Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

Table 26: Billerud Escanaba LLC: Facility-wide Actual and Projected NO_X and SO_2 Emissions (2010 – 2032)

Year	NO_X (tpy)	SO_2 (tpy)
2010	2,428	2,309
2011	2,530	2,196
2012	2,160	1,210
2013	2,549	1,950
2014	2,605	2,069
2015	1,892	1,127
2016	1,699	727
2017	1,721	614
2018	1,564	742
2019	1,605	865
2022	1,599	591
2026	1,535	605
2032	1,455	590

Source: MAERS Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

5.1.3 Graymont Western Lime, Inc., EU Kiln 1 – NO_X emissions

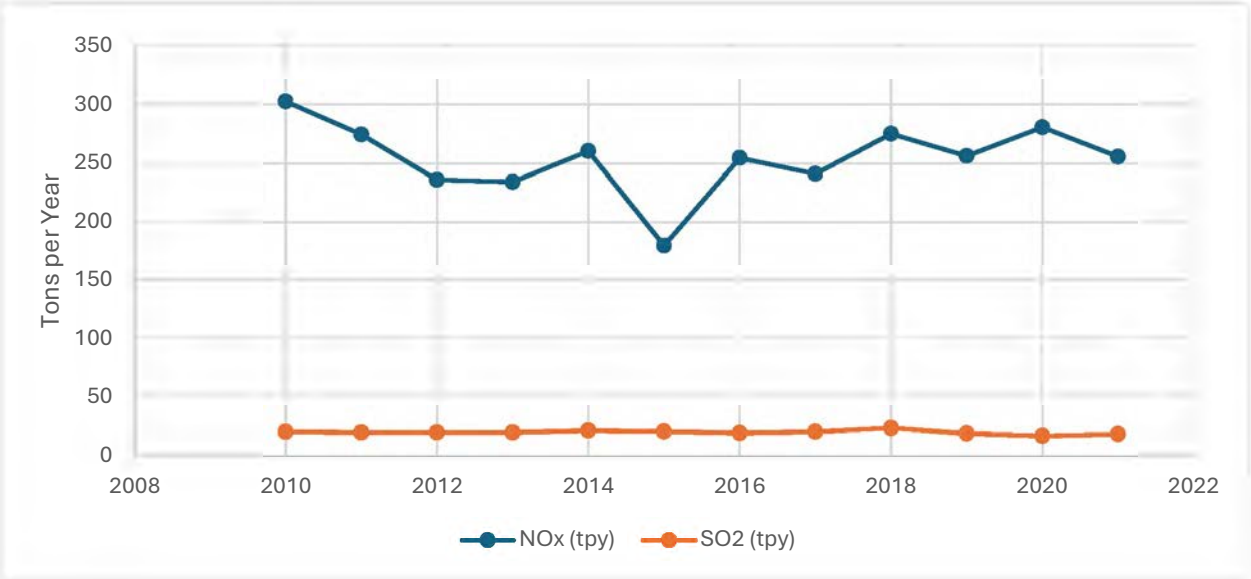
EGLE considered each of the four statutory factors in evaluating the outcome of the four-factor analysis that was performed for Graymont Western Lime, Inc., EU Kiln 1. The time to compliance would be achievable by 2028 within the remainder of the second implementation period. The remaining useful life of the EU Kiln 1 does not appear to be a limiting factor since Graymont Western Lime, Inc. plans to continue operation into the foreseeable future. However, the energy and non-air impacts would impose significant drawbacks resulting from additional power consumption and greenhouse gas production, including additional costs not captured in the cost-effectiveness estimations for potential new controls.

The cost-effective values found under the CSAPR, BART, and RACT rulemakings generally establish a lower frame of reference compared to the higher values in the Good Neighbor Rule that was stayed by the Supreme Court. Relying on references to the currently implemented USEPA rules as a rough threshold for what could be considered cost-effective for point sources in Michigan for the second implementation period, the cost-effective values determined in the four-factor analysis for Graymont Western Lime, Inc., EU Kiln 1 were found to be considerably outside those ranges.

Based on the data pertaining to the cost-effectiveness ($/ton of NO_X abatement) of implementing and/or retrofitting EU Kiln #1 with the three different NO_X control mechanisms, it was found that two options, SCR and SNCR, surpass the ‘cost-effectiveness’ described in Section 5.1 that EGLE considered for determining whether a control measure is necessary for reasonable progress. The remaining control option (fuel substitution from coal to natural gas usage) was determined to have either a minimal, or potentially unfavorable, impact on total annual NO_X emissions. With the drawbacks to the energy and non-air impacts and cost-effectiveness factors as well as the impracticability of fuel substitution, EGLE was able to eliminate all three NO_X control mechanisms as being necessary to make reasonable further progress through adoption into Michigan’s LTS.

Just as no new measures were found necessary to make reasonable progress, EGLE has found that the existing measures for EU Kiln 1 are also not necessary to make reasonable progress. Consistent with the demonstration described in the 2021 Clarifications Memo in Section 4.1, Tables 27 and 28, and Figures 16 and 17 illustrate the reasonably consistent and declining trends in facility-wide actual NO_X and SO_2 emissions for EU Kiln 1 from 2010 – 2021. Additionally, Figure 17 and Table 28 illustrate the expectation that the unit’s emission rate will not increase in the future based on projected emissions from the facility as a whole through 2032 using the USEPA’s 2022v1 Emissions Modeling Platform. Based on EU Kiln 1’s existing measures and enforceable requirements described above as well as the most recent 5 years of emission rate data available provided below, Graymont Western Lime, Inc. is projected to continue to implement the existing measures for EU Kiln 1 and not to increase its emission rate. As such, EGLE has determined that the existing measures are not necessary to include in the LTS or the regulatory portion of the SIP to prevent future emission increases and future visibility impairment.

Figure 16: Graymont Western Lime, Inc., EU Kiln 1: Annual Emission Rates (2010 – 2021)



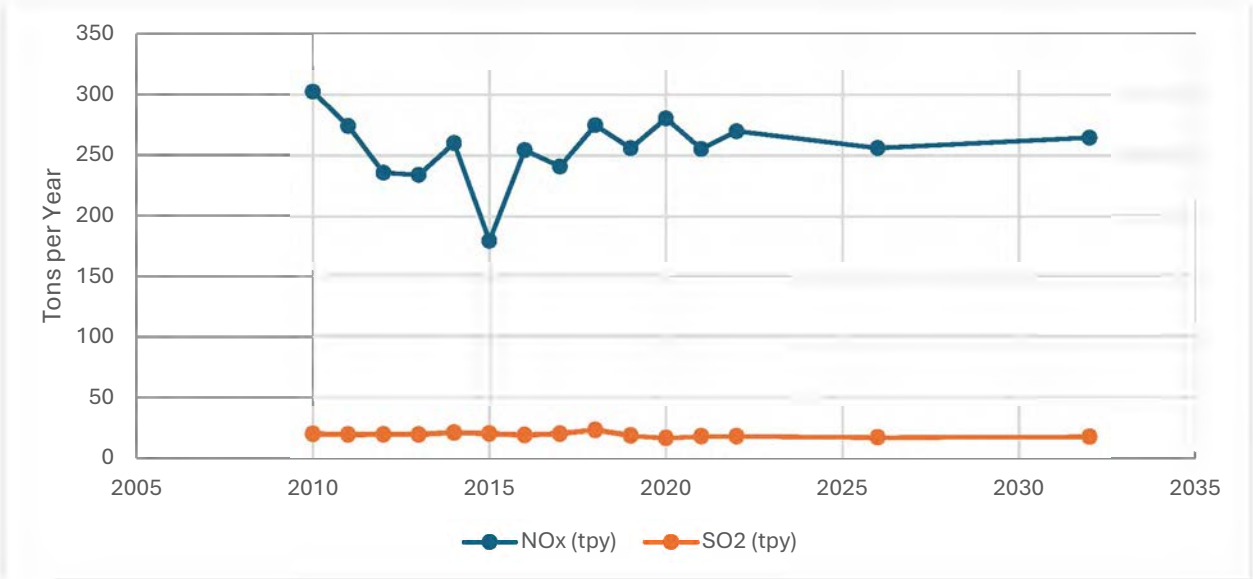
Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 27: Graymont Western Lime, Inc., EU Kiln 1: Annual Emission Rates (2010 – 2021)

Year	NO_X (tpy)	SO_2 (tpy)
2010	302.51	20.58
2011	274.36	19.99
2012	235.97	20.07
2013	234.1955	20.04
2014	260.3325	21.63
2015	180.2	20.76
2016	254.48	19.57
2017	241.09	20.67
2018	274.969	23.721
2019	256.1	19.14
2020	280.5	17.18
2021	255.532	18.616

Source MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Figure 17: Graymont Western Lime, Inc.: Facility-wide Actual and Projected NO_X and SO_2 Emissions (2010 – 2032)



Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

Table 28: Graymont Western Lime, Inc.: Facility-wide Actual and Projected NO_X and SO_2 Emissions (2010 – 2032)

Year	NO_X (tpy)	SO_2 (tpy)
2010	302.5	20.58
2011	274.4	19.99
2012	236	20.07
2013	234.2	20.04
2014	260.3	21.63
2015	180.2	20.76
2016	254.5	19.57
2017	241.1	20.67
2018	275	23.72
2019	256.1	19.14
2020	280.5	17.18
2021	255.5	18.62
2022	270	18.68
2026	256.23	17.73
2032	264.72	18.31

Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

5.1.4 Tilden Mining Company LC, EU Kiln 2

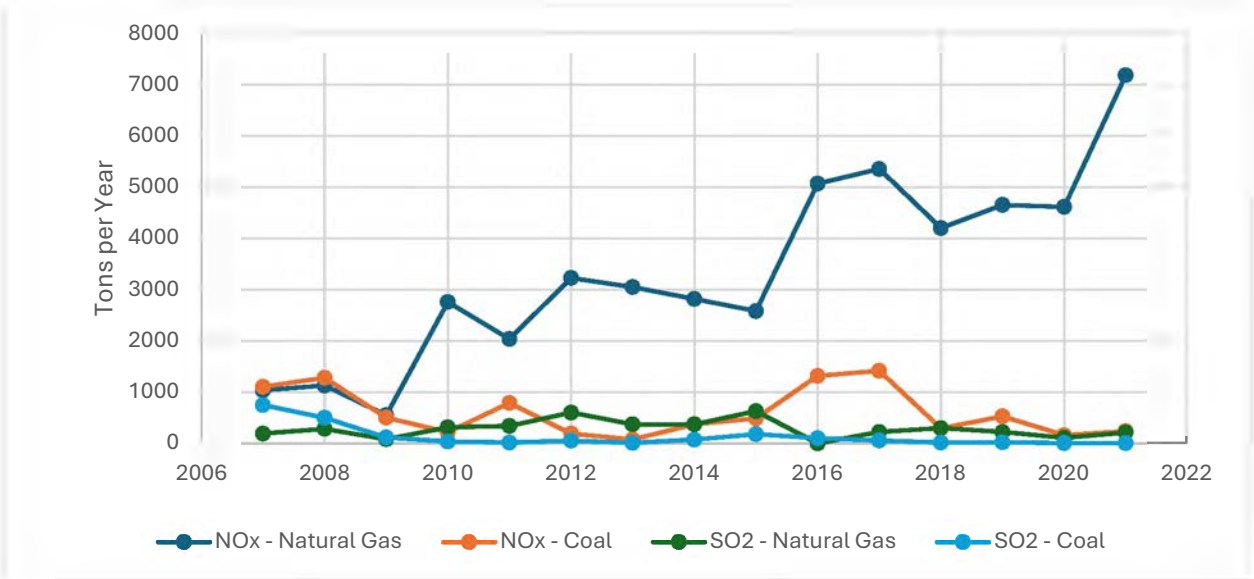
Based on the provided information pertaining to the technical feasibility of implementing and/or retrofitting EU KILN 2 with the three different NO_X control mechanisms, it was found that one option (overfire air system) is technically infeasible for EU KILN 2, as the NO_X formation front is not stationary in an indurating furnace. This option was therefore removed from further analysis. Additionally, the fuel substitution option for EU KILN 2 was found to be inadequate by both Tilden Mining Company LC and EGLE for the purposes of reducing visibility impairment at Michigan's Class I areas considering that natural gas would need to be replaced by solid fuel (coal), which would result in higher SO_2 emissions – although NO_X emissions would be reduced. The remaining control option (low NO_X burner technology) was determined to be technically feasible and cost-effective; however, through a visibility and emissions modeling analysis (as shown on pgs. 17-22 in Appendices 24 and 25), Tilden Mining Company LC concluded that any significant reduction in NO_X emissions from the company's EU KILN 2 would likely result in a negligible visibility improvement at both Isle Royale and Seney. It was also noted in the company's four-factor analysis report that "LNB technology would require significant resources and a time period of approximately five years to engineer, permit, and install the equipment," (as shown on pgs. 14-15 in Appendices 24 and 25). If EGLE were to revise its 2021 Regional Haze SIP to include a more stringent NO_X limit based on the reduction capacity and application of LNB technology to EU KILN 2 and submit this revision to the USEPA in early 2025, EGLE recognizes that the engineering, permitting, and installation of the LNB technology for EU KILN 2 would not be complete until at least 2030 – well into the third planning period of the Regional Haze Program. Through these evaluations and determinations, EGLE was able to eliminate all three NO_X control mechanisms as being necessary to make reasonable further progress through adoption into Michigan's LTS.

EGLE is also relying on the additional justification provided in the following subsection (5.2) to support its determination that LNB technology for EU KILN 2 does not need to be incorporated into Michigan's LTS in order to make reasonable further progress towards "natural visibility conditions" at either Seney National Wildlife Refuge or Isle Royale National Park during the second planning period. The justification (*see* pg. 60) also bolsters EGLE's decision that an additional control measures evaluation (four-factor analysis) for EU KILN 1 would not be appropriate to conduct during this planning period.

The four-factor analysis by Barr Engineering Co. notes, "The estimated 2028 baseline NO_X emissions for this evaluation is 9,005 tpy for Kiln 2. The 2028 baseline emission assumes a production rate of 4,000,000 long-tons of pellets and emissions assuming natural gas firing. Tilden Mining Company LC determined the projected 2028 production rate by reviewing 2000 through 2023 facility-wide (Kiln 1 and Kiln 2) production rates and distributing production equally across each kiln." (*See* Appendices 24 and 25)

Tables 29 and 30 and Figures 18 and 19 below depict the annual emission rates for EU Kiln 2 from 2007 – 2021, as well as the actual and projected emissions for the overall facility from 2010 – 2032.

Figure 18: Tilden Mining Company LC, EU Kiln 2: Annual Emission Rates for NO_X and SO_2 (2007–2021)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 29: Tilden Mining Company LC, EU Kiln 2: Annual Emission Rates for NO_X and SO_2 (2007–2021)

Year	NO_X - Natural Gas	NO_X - Coal	SO_2 - Natural Gas	SO_2 - Coal
2007	1040	1108	195	752
2008	1133	1285	288	504
2009	554	507	84	118
2010	2762	221	317	39
2011	2040	792	344	21
2012	3231	194	605	56
2013	3053	80	375	15
2014	2821	378	375	77
2015	2586	490	633	185
2016	5071	1321	3	105
2017	5357	1419	227	60
2018	4204	297	302	21
2019	4657	531	228	26
2020	4618	164	111	10
2021	7188	241	217	10

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Figure 19: Tilden Mining Company LC: Facility-wide Actual and Projected NO_X and SO_2 Emissions (2007 – 2032)

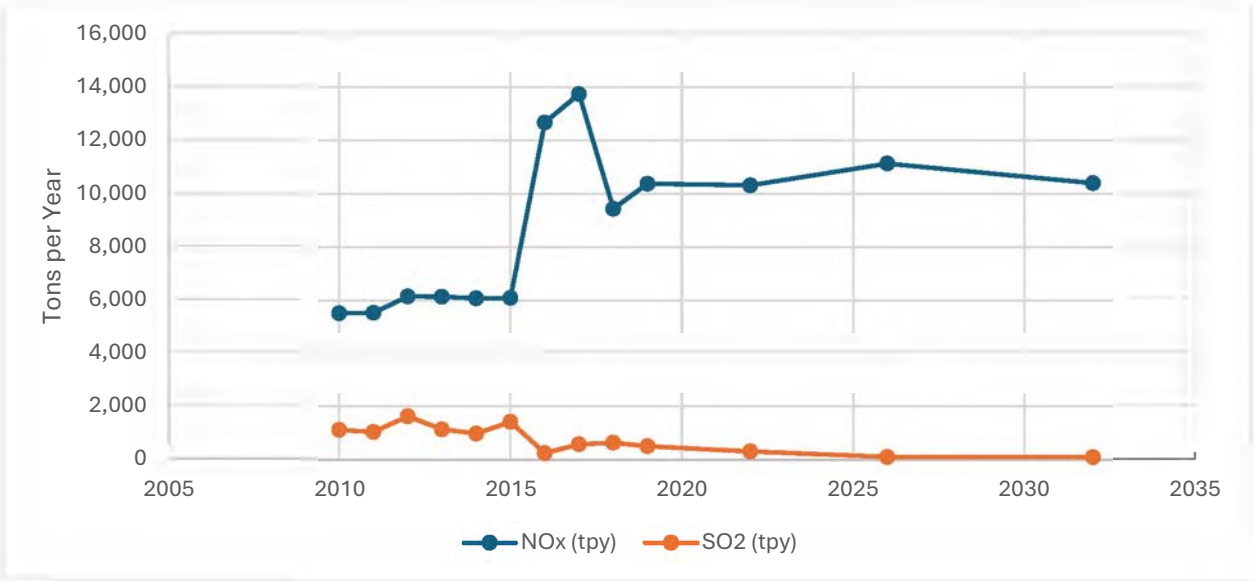


Table 30: Tilden Mining Company LC: Facility-wide Actual and Projected NO_X and SO_2 Emissions (2007–2032)

Year	NO_X (tpy)			SO_2 (tpy)		
	Natural Gas	Coal	Total	Natural Gas	Coal	Total
2007	1039.93	1108.31	2148.24	194.95	751.52	946.47
2008	1133.23	1284.70	2417.93	288.30	503.75	792.05
2009	554.49	506.95	1061.44	84.08	118.48	202.57
2010	2762.09	220.62	2982.71	316.89	39.01	355.90
2011	2040.07	791.87	2831.94	343.87	20.78	364.65
2012	3230.56	193.59	3424.15	605.16	55.89	661.06
2013	3053.04	80.38	3133.42	374.55	15.20	389.75
2014	2821.20	377.71	3198.91	375.33	77.45	452.79
2015	2585.75	490.47	3076.22	633.20	185.12	818.32
2016	5071.28	1320.57	6391.85	3.26	105.44	108.70
2017	5357.45	1419.12	6776.57	227.13	60.17	287.30
2018	4204.20	296.66	4500.86	301.67	21.29	322.96
2019	4656.55	531.35	5187.91	227.57	25.97	253.54
2020	4618.21	163.90	4782.11	111.22	9.89	121.11
2021	7187.87	240.93	7428.80	216.71	9.94	226.65
	TOTAL NO_X (tpy)			TOTAL SO_2 (tpy)		
2022	10,320			310.45		
2026	11,136			101.37		
2032	10,400			94.56		

Source: MAERS Annual Pollutant Total Query
https://www.egle.state.mi.us/maers/emissions_query.asp

USEPA's 2022v1 Emissions Modeling Platform
https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform

5.2 Updates to Michigan's Long-term Strategy: Establishing emission limitations, compliance schedules, and other measures necessary to make reasonable progress

EGLE initially addressed its LTS in Michigan's 2021 Regional Haze SIP submittal on pages 22 – 23 (*See* Appendix 1).

EGLE further developed Michigan's LTS after additional consideration of the ambient data, Michigan's contribution to visibility impairment at Class I areas within and outside of the state, the selection of sources for evaluation, the statutory four factors, and EGLE's determination of control measures necessary to make reasonable progress as documented in this SIP Supplement.

Given these considerations, EGLE concludes that the following on-the-books and on-the-way controls in Table 31 below are the measures necessary to make reasonable progress in the second implementation period. All of these controls are already federally enforceable.

The determination that the vast number of retirements at Michigan EGUs (*as shown* in Table 31) that have occurred - and will occur - during the second planning period are the only measures necessary to make reasonable progress towards "natural visibility conditions" through adoption into Michigan's LTS is supported by the refining language included within the 2021 Clarifications Memo, which states "another potentially reasonable approach might be for a state that identifies cost-effective new controls at a multitude of sources to choose to require controls at only a subset of those sources that constitute the vast majority of the visibility benefit. In this case, the state could rely on visibility benefits to prioritize which sources would receive new controls," (*See* 2021 Clarifications Memo, pg. 13.). Based on the 2016 emissions inventory, Michigan EGU retirements that have already occurred during the second implementation period between 2018 and 2024 account for reductions amounting to 17,417 tpy (NO_X) and 42,655 tpy (SO_2), which Michigan concludes constitutes the vast majority of the visibility benefit that could be achieved even with the application of additional new control measures on units that comprise any individual source category.

At the source category (sector) level, those facilities that can be grouped under code 221112 (Fossil Fuel Electric Power Generation) of the 2022 North American Industry Classification System (NAICS)[5] – also known as Fuel Combustion Electric Utilities (EGUs) – constituted the largest percentage of the total statewide emissions of NOx and SO_2 in 2016 (*see* Table 8). EGLE inferred that, due to the shear amount of NOx and SO_2 emissions from the EGU sector, that the vast majority of the anthropogenic visibility impairment at Seney and Isle Royale measured at the beginning of the second planning period could be attributed to this sector as well. EGLE also determined that out of all sectors classified under the NAICS, the application of control measures to those facilities that fell under the Fossil Fuel Electric Power Generation source category would lead to the greatest overall improvement to visibility at Michigan's

[5] North American Industry Classification System (NAICS) U.S. Census Bureau

Class 1 Areas – compared to all other feasible control measure options that could be applied to the non-EGU source categories.

Through this SIP supplement, EGLE is incorporating the retirements of 31 EGUs from 13 different Michigan power plants (*see* Table 10), which have occurred between 2018 and 2024, into its LTS as on-the-books controls. A Retired Unit Exemption Form filed with the USEPA, certifying the retirement by the owner/operator, has been attached for each unit that EGLE is adopting into the LTS (*See* Appendix 33).

For on-the-way controls, EGLE is also incorporating the Federal Consent Decree for DTE – Belle River, Units 1 and 2, which requires DTE to "retrofit, refuel, or repower" Belle River by December 31, 2030 (*See* Appendix 8).

Table 31: Elements of Michigan's Long-term Strategy for the Second Implementation Period

MICHIGAN CONTROLS

On-the-Books Controls

VOC RACT/Control Techniques Guidelines under Michigan Air Pollution Control Rules

Retirements

Facility Name	Facility Unit ID	Retirement Date
ST. CLAIR / BELLE RIVER POWER PLANT	St. Clair Boiler 7	5/31/2022
	St. Clair Boiler 3	5/31/2022
	St. Clair Boiler 2	5/31/2022
	St. Clair Boiler 1	3/27/2019
	St. Clair Boiler 6	5/31/2022
	St. Clair Boiler 4	11/13/2017
WISCONSIN ELECTRIC POWER COMPANY, Marquette – Presque Isle	Boiler 9	4/8/2019
	Boiler 7	4/8/2019
	Boiler 8	4/8/2019
	Boiler 6	4/8/2019
	Boiler 5	4/8/2019
DTE - Electric Company TRENTON CHANNEL	Boiler 9A	7/8/2022
DTE - Electric Company RIVER ROUGE	Unit 1	6/7/2021
	Unit 3	6/1/2021
Lansing Board of Water & Light (LBWL), Erickson Station	Unit 1	11/28/2022
LBWL, Eckert Station	Unit 1	12/31/2020
	Unit 3	12/31/2020
	Unit 4	5/31/2021
	Unit 5	12/31/2020
	Unit 6	12/31/2020
Consumers Energy – D.E. Karn Facility	Karn 1	6/1/2023
	Karn 2	6/1/2023
MARQUETTE BOARD OF LIGHT & POWER - Shiras	Boiler 3	4/29/2019
Michigan Hub Plant	Unit 1	9/30/2017
DTE – Pontiac North LLC	EUBHB9	1/10/2017
Graphic Packing International, Inc. - Kalamazoo	Unit BLR08	10/07/2024
J B Sims	Unit 3	6/1/2020
James De Young	Unit 5	6/1/2017
Consumers Energy - Thetford	Unit 2	6/1/2019
	Unit 3	4/1/2018
	Unit 4	6/1/2019

On-the-Way Control

DTE – Belle River, Units 1 and 2:
Federal Consent Decree requiring DTE to "retrofit, refuel, or repower" Belle River by December 31, 2030. *See* United States v. DTE Energy, Case No. 2:10-cv-13101-BAF-RSW (E.D. Mich)., Consent Decree filed May 14, 2020. (*See* Appendix 8). https://www.justice.gov/enrd/consent-decree/file/1276421/download)

NATIONAL CONTROLS
On-the-Books Controls
Revised CSAPR Update (40 CFR 97, Subpart GGGGG)
NESHAP for Reciprocating Internal Combustion Engines
Federal Oil and Natural Gas Industry Standards
NESHAPs for Industrial, Commercial, and Institutional Area Source Boilers, Major Source Boilers (40 CFR 63) (Boiler MACT)
New Source Performance Standards (NSPS) for Commercial and Industrial Solid Waste Incinerators (40 CFR 60 Subpart CCCC, 40 CFR 60 Subpart DDDD)
NSPS for New Residential Wood Heaters (40 CFR 60 Subpart AAA)
SO_2 Data Requirements Rule (40 CFR 51)
Control of Hazardous Air Pollutants from Mobile Sources (also known as the Federal Mobile Source Air Toxics Rules, MSAT2)
Federal Onroad Mobile Source Regulations: - Passenger vehicles, SUVs, and light duty trucks (40 CFR 85, and 86) - Light-duty trucks and medium duty passenger vehicles (40 CFR 86) - Heavy-duty highway compression engines (40 CFR 86) - Heavy-duty spark ignition engines (40 CFR 86) - Motorcycles (40 CFR 86) - Mobile Source Air Toxics (40 CFR 59, 80, 85, and 86) - Light-duty vehicle corporate average fuel economy standards
Federal Nonroad Mobile Source Regulations: - Aircraft (40 CFR 87 and 1068) - Compression Ignition (40 CFR 89 and 1039) - Large Spark Ignition (40 CFR 1048) - Locomotive Engines (40 CFR 1033) - Marine Compression Ignition (40 CFR 1042) - Marine Spark Ignition (40 CFR 1045) - Recreational Vehicle (40 CFR 1051) - Small Spark Ignition Engine

6. Step 6: REASONABLE PROGRESS GOALS FOR 2028 AS ESTABLISHED THROUGH REGIONAL SCALE MODELING OF THE LONG-TERM STRATEGY

Determine the visibility conditions in 2028 that will result from implementation of the LTS and other enforceable measures to set the RPGs for 2028. Typically, a state will do this through regional scale modeling, although the Regional Haze Rule does not explicitly require regional scale modeling. See 40 CFR 51 Submittal.*308(f)(3).*

As provided for in Michigan's 2021 Regional Haze SIP Submittal, EGLE's reasonable progress goals were arrived at by implementing the various controls accounted for in the USEPA inventory, which LADCO modeled, providing the 2028 projected visibility levels at the Seney and

Isle Royale Class I areas in Michigan. LADCO's modeling process is described above under Step 2: Determination of Affected Class I Areas in Other States.

The values included in Tables 1 and 2 and Figures 2 and 3 of Michigan's 2021 Regional Haze SIP Submittal were based on LADCO's modeling for 2028 using a 2011 base year. Reflecting LADCO's more recent modeling for the 2028 projections with 2016 base year, updated tables and figures appear below to depict EGLE's 2028 reasonable progress goals for Isle Royale and Seney under the projected 2028 deciviews (dv) on the 20 percent most impaired and clearest days. For Isle Royale, the 2028 reasonable progress goals were 5.23 dv on the 20 percent clearest days, which is 0.07 dv below the observed visibility impairment in 2014 – 2018, and 14.83 dv on the 20 percent most impaired days, which is 0.71 dv less than the observed visibility impairment in 2014 – 2018 and 1.02 dv below the glidepath. For Seney, the 2028 reasonable progress goals were 5.17 dv on the 20 percent clearest days, which is 0.10 dv less than the observed visibility impairment in 2014 – 2018, and 16.67 dv on the 20 percent most impaired days, which is 0.90 dv less than the observed visibility impairment in 2014 – 2018 and 1.92 dv below the glidepath.

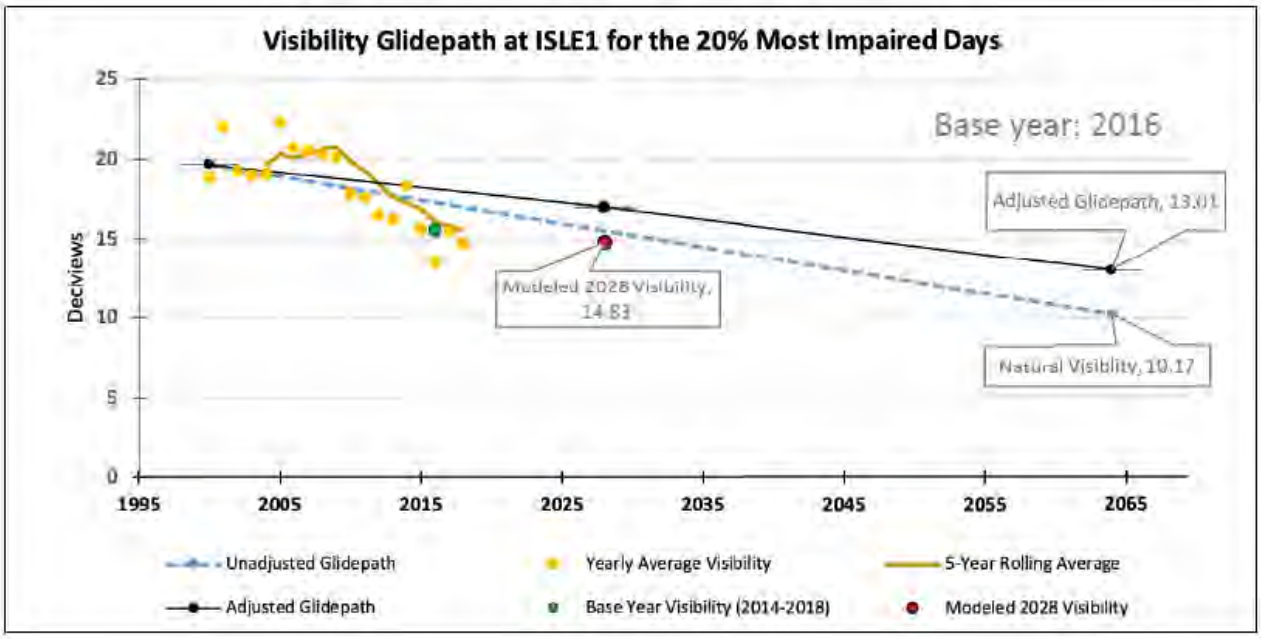
Table 32: Natural Conditions, 2000 – 2004 Baseline Visibility, Observed 2014 – 2018 Visibility, 2028 Projected Visibility, and 2028 Unadjusted Glidepath Value on the 20% Most Impaired Days at Isle Royale and Seney Class I Areas

IMPROVE Site ID	Natural Conditions 20% Most Impaired Days (dv)	Observed 2000-2004 Baseline 20% Most Impaired Days (dv)	Observed 2014-2018 20% Most Impaired Days(dv)	Projected 2028 20% Most Impaired Days (dv) (A)	2028 Unadjusted Glidepath (dv) (B)	2028 Impairment Relative to Unadjusted Glidepath (dv) (A-B)
ISLE1, Isle Royale	10.17	19.63	15.54	14.83	15.85	-1.02
SENE1, Seney	11.11	23.58	17.57	16.67	18.59	-1.92

Table 33: Natural Conditions, 2000 – 2004 Baseline Visibility, Observed 2014 – 2018 Visibility, 2028 Projected Visibility on the 20% Clearest Days at Isle Royale and Seney Class I Areas

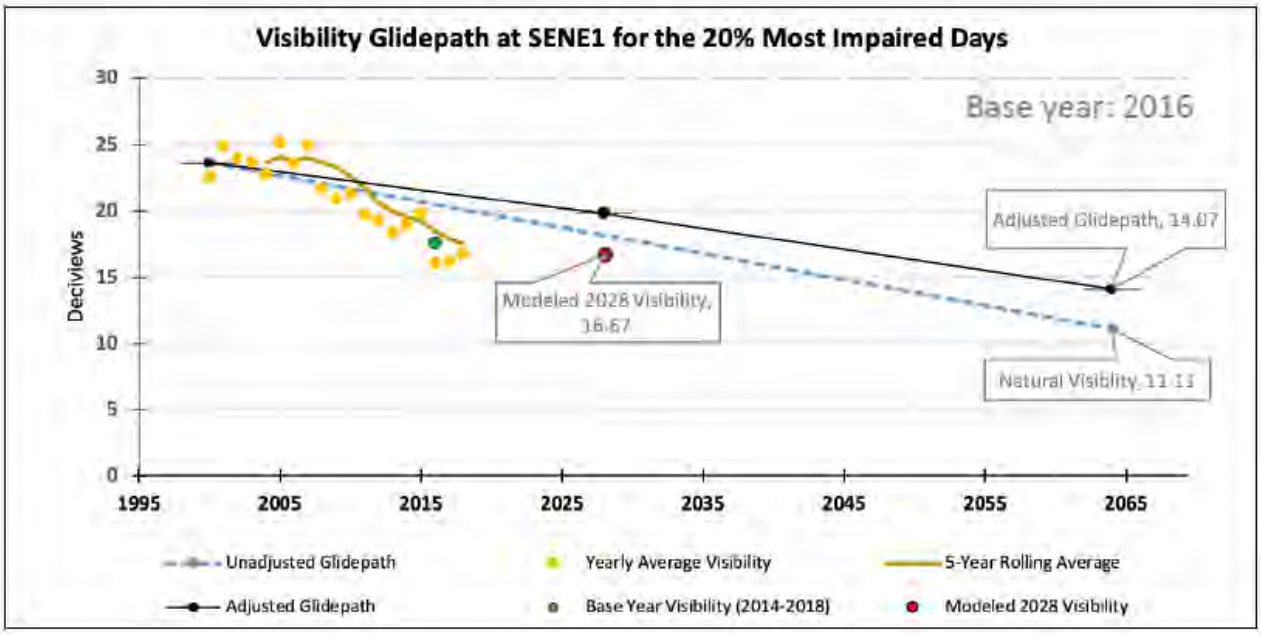
IMPROVE Site ID	Natural Conditions 20% Clearest Days (dv)	Observed 2000-2004 Baseline 20% Clearest Days (dv)	Observed 2014-2018 20% Clearest Days(dv)	Projected 2028 20% Clearest Days (dv) (A)
ISLE1, Isle Royale	3.72	6.77	5.30	5.23
SENE1, Seney	3.74	7.14	5.27	5.17

Figure 20: Visibility Glidepath and 2028 Modeled Visibility at Isle Royale for the 20% Most Impaired Days



Source: LADCO's 2021 Technical Support Document, Figure 7-2

Figure 21: Visibility Glidepath and 2028 Modeled Visibility at Seney for the 20% Most Impaired Days



Source: LADCO's 2021 Technical Support Document, Figure 7-3

7. Step 7: PROGRESS, DEGRADATION, AND URP GLIDEPATH CHECKS

7.1 Checking for improvement in visibility on the 20 percent most impaired days

Demonstrate that there will be an improvement on the 20 percent most anthropogenically impaired days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. See 40 CFR 51.308(f)(3).

This requirement is addressed in Michigan's 2021 Regional Haze SIP submittal on page 25 (*See* Appendix 1).

7.2 Checking for no visibility degradation on the 20 percent clearest days

Demonstrate that there will be no degradation on the 20 percent clearest days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. See 40 CFR 51.308(f)(3).

This requirement is addressed in Michigan's 2021 Regional Haze SIP submittal on page 25 (*See* Appendix 1).

7.3 URP glidepath check

Determine the URP that would achieve natural conditions at the in-state Class I area in 2064. The URP may be adjusted for international anthropogenic impacts and certain wildland prescribed fires subject to USEPA approval as part of USEPA's action on the SIP submission. 40 CFR 51.308(f)(1).

This requirement is addressed in Michigan's 2021 Regional Haze SIP submittal on page 26 (*See* Appendix 1).

7.4 Calculation of the Number of Years it would take to Attain Natural Visibility Conditions

Compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath for the in-state Class I area. If the RPG is above the URP glidepath, demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS. If the RPG is above the URP glidepath, also provide the number of years needed to reach natural conditions. See 40 CFR 51.308(f)(3)(ii)(A).

This requirement is addressed in Michigan's 2021 Regional Haze SIP submittal on page 26 (See Appendix 1).

8. Step 8: ADDITIONAL REQUIREMENTS FOR REGIONAL HAZE SIPs

8.1 Reasonably Attributable Visibility Impairment

Reasonably Attributable Visibility Impairment (RAVI) is defined as visibility impairment that is caused by the emission of air pollutants from one or a small number of sources. In 2017, the USEPA updated and simplified the provisions for RAVI and extended it to all states, not just those with Class I areas. 40 CFR 51.302 provides:

> "The affected Federal Land Manager may certify, at any time, that there exists reasonably attributable visibility impairment in any mandatory Class I Federal area and identify which single source or small number of sources is responsible for such impairment. The affected Federal Land Manager will provide the certification to the State in which the impairment occurs and the State(s) in which the source(s) is located." 40 CFR 51.302

Michigan does not have any sources for which an FLM has provided a RAVI certification.

8.2 Monitoring Strategy and Other Elements

EGLE's monitoring strategy and other elements were addressed in Michigan's 2021 Regional Haze SIP submittal under Section H.3 on page 29 (*See* Appendix 1).

8.3 Five-Year Progress Report for Second Half of First Planning Period

The 1999 Regional Haze Rule required each state to submit progress reports, in the form of SIP revisions, every 5 years after the date of the state's initial SIP submission. *See* 40 CFR 51.308(g). The Regional Haze first implementation period covered the period of 2007 – 2018. Michigan submitted its SIP revision for the first implementation on November 5, 2010, and it was partially approved and partially disapproved on November 26, 2012. *See* 77 FR 71533, December 3, 2012, https://www.govinfo.gov/content/pkg/FR-2012-12-03/pdf/2012-29014.pdf. The USEPA then promulgated a FIP that imposed NO_X and SO_2 limits mandating BART for St. Marys Cement – Charlevoix, controls for SO_2 and NO_X for the Lafarge Midwest – Alpena Plant, and NO_X limits mandating BART for Boilers 8 and 9 at Escanaba Paper (now Billerud – Escanaba LLC). Michigan's BART determination for Tilden Mining taconite plant was addressed in different actions.

Michigan's Regional Haze mid-period progress report for the first half of the first implementation period was submitted on January 12, 2016, and was approved as a SIP revision on May 16, 2018. *See* 83 FR 25375, June 1, 2018, https://www.govinfo.gov/content/pkg/FR-2018-06-01/pdf/2018-11566.pdf.

For the second half of the first implementation period, progress reports are to be submitted as part of the SIP revision for the second implementation period. The 2019 Regional Haze Guidance recommends that the progress report elements cover a time period approximately from the first full year that was not in the previous progress report through a year that is as close as possible to the submission date of the SIP revision. For Michigan, this means that the relevant time period to address for each of the elements of 40 CFR 51.308(g)(1)-(5) is roughly 2015 through 2019. The specific elements of 40 CFR 51.308(g)(1)-(5) are discussed in more detail below.

8.3.1 Status of Control Strategies

40 CFR 51.308(g)(1) requires a description of the status of emission reduction measures:

> *A description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the State.*

Five non-EGU sources in Michigan were identified in the 2010 Regional Haze SIP submittal as being subject to BART. These sources are evaluated below in terms of Haze SIP control measures/limits and status relative to compliance deadlines. This part also describes how three of the five Michigan BART sources are now required to apply additional or more stringent controls beyond those required in the Michigan BART determinations due to USEPA disapprovals of the Michigan BART determinations and issuance of FIPs.

8.3.1.1 Holcim (US), Inc. DBA Lafarge Alpena Plant (referenced in Michigan's 2010 Regional Haze SIP Submittal as Lafarge Midwest, Inc. — Alpena Plant)

A Federal Consent Decree between Lafarge Midwest, Inc., the United States, the State of Michigan and other states and jurisdictions (USA, USEPA, Michigan, et al. v. Lafarge; U.S. District Court Civil Action No. 3:10-cv-00044-JPG-CJP) was entered March 18, 2010, requiring NO_X and SO_2 control for the Alpena plant and other Lafarge plants (*See* Appendix 17) A copy of the Consent Decree is available at: https://www.epa.gov/sites/default/files/documents/lafarge-cd.pdf.

The Consent Decree allowed Lafarge to apply NO_X and SO_2 control measures or to retire or replace any of their five kilns according to a specified schedule to achieve specified facility-wide tpy limits. The control program also set demonstration-phase facility-wide, 12-month rolling limits of 4.89 pounds NO_X per ton of clinker and 3.68 pounds SO_2 per ton of clinker for a period during which individual limits were also to be set for each kiln based on emission testing. These Consent Decree requirements had previously been accepted as BART in the 2010 Regional Haze SIP submittal.

Lafarge opted to install SNCR NO_x control on each kiln, along with DAA for SO_2 control on Kilns 19, 20, 21, and wet FGD SO_2 control on Kilns 22 and 23. The limits and other requirements of the Consent Decree and the selected SO_2 and NO_X control systems were incorporated in PTI No. 95-10B (*copy attached as* Appendix 18), issued on September 13, 2013.

The interim facility-wide, 12-month rolling limits of the Consent Decree are listed below. Annual actual facility-wide emission rates for 2020 (3,778 tpy NO_X and 1,681 tpy SO_2) were well below the Consent Decree 2011 interim 12-month rolling limits.

Consent Decree Deadlines/Limits – USA, USEPA, Michigan, et al. v. Lafarge; U.S. District Court Civil Action No. 3:10-cv-00044-JPG-CJP.

NO_X

- Interim Limit (facility-wide 12-month rolling): 8,650 tons by January 1, 2011
- Install SNCR Control on 3 KG5 Kilns by December 1, 2011
- Install SNCR Control on 2 KG6 Kilns by January 1, 2012.

SO_2

- Interim Limit (facility-wide 12-month rolling): 13,100 tons by January 1, 2011
- Install DAA Control on 3 KG5 Kilns by March 1, 2014
- Install Wet FGD on 2 KG6 Kilns by March 1, 2014.

Compliance Status: Current status as of August 13, 2020, listed in the Michigan Air Compliance and Enforcement System (MACES), indicates compliance with applicable permits, which include the Consent Decree requirements, and Michigan rules. Also, no current enforcement action was found in MACES.

8.3.1.2 Billerud Escanaba LLC

The 2010 Regional Haze SIP submittal indicated that EGLE had accepted Billerud Escanaba LLC's existing PM, NO_X, and SO_2 emission limits as representing BART for their subject equipment. The USEPA later issued a final rule effective on January 2, 2013, disapproving the portion of Michigan's Regional Haze SIP that applied to the BART determination for the company's Boilers 8 and 9 (77 FR 71533, December 3, 2012). The final rule also included a FIP for the company's Boilers 8 and 9 that imposed NO_X BART limits.

The Federal Register publication of the USEPA disapproval action and the FIP can be accessed at: https://www.federalregister.gov/documents/2012/12/03/2012-29014/approval-and-promulgation-of-air-quality-implementation-plans-michigan-regional-haze-state. The USEPA noted in their final rulemaking that Billerud Escanaba LLC had already implemented improvements in combustion control for its boilers and that the limits in the FIP required that the current levels of NO_X control be maintained.

The Boiler 8 NO_X limit was changed by the USEPA to a fixed, rolling 30-day average limit of 0.35 lb. of NO_X per MMBtu, rather than a weighted average of separate limits for oil firing and gas firing. A continuous emission monitor (CEM) system was the required means of compliance determination for Boiler 8. The Boiler 9 NO_X limit was set by the FIP at 0.27 lb. per MMBtu with compliance determination by means of emission testing.

Compliance Status: The most recent inspection that addressed Boilers 8 and 9 was completed on December 11, 2019, through which EGLE's AQD determined Billerud Escanaba LLC to be in compliance with the NO_x FIP limits adopted in PTI No. 127-11D (*copy attached as* Appendix 26), as well as the other applicable Michigan Air Pollution Control Rules.

8.3.1.3 St. Marys Cement – Charlevoix Plant

Michigan's 2010 Regional Haze SIP indicated that EGLE had accepted the St. Marys Cement – Charlevoix Plant existing permitted PM, NO_X, and SO_2 emission limits as representing BART for their subject equipment. The USEPA later issued a final rule effective on January 2, 2013, disapproving the portion of Michigan's Regional Haze SIP that applied to the NO_X and SO_2 BART determination for the cement kiln and associated equipment at St. Marys Cement (77 FR 71533, December 3, 2012). The final rule also included a FIP for this equipment that imposed NO_X and SO_2 BART limits. The Federal Register publication of the USEPA disapproval action and FIP can be accessed at: Federal Register: Approval and Promulgation of Air Quality Implementation Plans; Michigan; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze

The USEPA noted in their final rulemaking, that their BART determination for the facility includes operation of SNCR and a 50 percent reduction in NO_X emissions. The following NO_X emission limits were set in the FIP effective January 1, 2017, along with testing, monitoring, reporting, and recordkeeping requirements:

- 2.80 lbs. NO_X per ton of clinker (30-day rolling average as NO_2);
- 2.40 lbs. NO_X per ton of clinker (12-month average as NO_2); and
- 7.50 lbs. SO_2 per ton of clinker (12-month average).

The USEPA also concluded in the rulemaking that add-on SO_2 control was not warranted as BART set an SO_2 limit of 7.5 lbs. per ton of clinker.

These NO_X and SO_2 BART limits have been federally enforceable through St. Marys Cement – Charlevoix Plant's most recently approved ROP since coming into effect on August 20, 2014 (MI-ROP-B1559-2014) (*copy attached as* Appendix 27).

MI-ROP-B1559-2014 includes a condition that specifies the permittee shall comply with all applicable requirements of the Regional Haze Regulations requiring BART, as specified through 40 CFR 52.1183(h), effective January 1, 2017.

Compliance Status: Through a recent inspection on August 18, 2020, St. Marys Cement - Charlevoix Plant was determined to be in compliance with the applicable NO_X and SO_2 BART conditions under MI-ROP-B1559-2014. No current enforcement action was found in MACES.

8.3.1.4 Smurfit-Stone Container Corporation

Michigan's 2010 Regional Haze SIP indicated that the Smurfit-Stone Container Corporation plant had been shut down since February 2010. The company was listed as American Iron & Metal (SRN A5754) in MAERS as of 2004. No emissions were recorded in MAERS after 2010 and no active permits for the facility were found in the Michigan records of PTIs and ROPs. An inspection on August 27, 2010, indicates the mill had been closed since Autumn 2009. The Smurfit-Stone Ontonagon Mill was sold to Rock-Tenn Company effective May 27, 2011. The name of the new company will be RockTenn CP LLC, per a note in MACES filed by the EGLE District staff. No new air permits were found in the Michigan permit system for the new owner.

As expected, there have been no reported emissions since the shutdown reported for late 2009 or early 2010.

8.3.1.5 Tilden Mining Company LC

Michigan's 2010 Regional Haze SIP submittal indicated that EGLE had accepted the Tilden Mining Company LC existing permitted PM emission limits based on the taconite Maximum Achievable Control Technology (MACT) as representing BART for the indurating furnace/grate-kiln (EU KILN 1), EU PRIMARY CRUSHER, EU COOLER 1, EU DRYER 1, EU BOILER 1, and EU BOILER 2. Michigan's 2010 Regional Haze SIP submittal also accepted the Tilden Mining Company LC cost analysis showing that all technically feasible SO_2 control measures evaluated as BART were not cost-effective. Finally, Michigan's SIP submittal accepted a Tilden Mining Company LC proposal to set a BART NO_X limit for EU KILN 1 before December 31, 2012, based on "good combustion practices" and emission testing.

The USEPA subsequently issued a final rule effective on March 8, 2013, that specified a FIP for certain equipment that imposed NO_X limits for EU KILN 1 (78 FR 8706, February 6, 2013). The Federal Register publication of the USEPA disapproval action and FIP can be accessed at: https://www.federalregister.gov/documents/2013/02/06/2013-01473/approval-and-promulgation-of-air-quality-implementation-plans-states-of-minnesota-and-michigan.

After subsequent litigation, a settlement was entered in April, 2015. These changes to the limits were included in the proposed FIP Rule that was published in the Federal Register on October 22, 2015 (80 FR 64160, October 22, 2015). The Federal Register publication can be accessed at: https://www.govinfo.gov/content/pkg/FR-2015-10-22/pdf/2015-25023.pdf.

On June 8th, 2016, Cliffs Natural Resources, Inc. (owner of Tilden Mining Company LC) petitioned the United States Court of Appeals for review of the final rule ("Air Plan Approval; Minnesota and Michigan; Revision to 2013 Taconite Federal Implementation Plan Establishing BART for Taconite Plants") promulgated by the USEPA and published in the Federal Register on April 12, 2016 (81 FR21672, April 12, 2016). The Federal Register publication can be accessed at: https://www.govinfo.gov/content/pkg/FR-2016-04-12/pdf/2016-07818.pdf. The petition for review was consolidated in the United States Court of Appeals for the Eighth Circuit under lead Case No. 16-2643.

On April 23, 2024, the USEPA published a proposed settlement agreement in Cleveland-Cliffs, Inc. v. Environmental Protection Agency, Case No. 16-2643, which was published in the Federal Register (89 FR 30360), https://www.govinfo.gov/content/pkg/FR-2024-04-23/pdf/2024-08612.pdf (*See* Appendices 13 and 14). If finalized, the proposed settlement agreement would set forth revised NO_X BART limits for EU Kiln 1 in a FIP that would be incorporated into the company's ROP at the state level.

Compliance Status: Although the alternative NO_X and SO_2 BART limits established through the 2015 FIP have not yet come into effect, Tilden Mining Company LC was determined to be in compliance with PTI No. 148-12A (*copy attached as* Appendix 28) and ROP MI-ROP-B4885-2017b *(copy attached as Appendix 29)* through the most recent onsite inspection conducted on August 22, 2019. No current enforcement action was found in MACES.

8.3.2 Emissions Reductions from Regional Haze SIP Strategies

40 CFR 51.308(g)(2) requires a summary of the emissions reductions from regional haze SIP strategies:

> *A summary of the emissions reductions achieved throughout the State through implementation of the measures described in [40 CFR 51.308(g)(1)].*

As in Michigan's 2021 Regional Haze SIP submittal, EGLE continues to believe that SO_2 and NO_X emissions are the most important contributors to haze formation that impact the Class I areas at Isle Royale National Park and Seney Wilderness Area. As illustrated in Figure 5, SO_2 and NO_X emissions lead to the formation of the particulate species of sulfate and nitrate that make up a significant portion of the contribution to visibility impairment at these Class I areas. Accordingly, the following evaluations of emission reductions from SIP and non-SIP LTS control measures and programs have been limited to include only SO_2 and NO_X.

This part of the Progress Report addresses the facility-wide emission reductions from the five first planning period BART sources over the 2015 – 2019 period resulting from the Regional

Haze SIP control measures based on actual emission information and provides a comparison with the emissions from the actual facility-wide emissions from the evaluation done for the 2010 – 2014 period. This type of evaluation is necessary to show the emissions reductions that have occurred since the majority of the compliance deadlines have been reached for the BART FIP limits from the first planning period (except for Tilden Mining Company LC). In the 2016 Progress Report, emissions reductions that were demonstrated for the five first planning period BART sources were not entirely reflective of the BART limits due to the fact that a few of the sources' control measure implementation deadlines had not yet been reached.

8.3.2.1 Holcim (US), Inc. DBA Lafarge Alpena Plant

The interim, facility-wide 12-month rolling limits of the federal/state Consent Decree (Consent Decree Limits – USA, USEPA, Michigan, et al. v. Lafarge; U.S. District Court Civil Action No. 3:10-cv-00044-JPG-CJP) are listed below:

- NO_X
  Interim Limit (facility-wide 12-month rolling): 8,650 tons by January 1, 2011.

- SO_2
  Interim Limit (facility-wide 12-month rolling): 13,100 tons by January 1, 2011.

The actual annual facility-wide emissions for 2010 – 2019 appear in Table 34 below. Annual actual facility-wide emission rates for 2011 (6,907 tpy NO_X and 10,905 tpy SO_2) were well below the Consent Decree 2011 interim 12-month rolling limits. Annual actual facility-wide emission rates for 2014 were further reduced for NO_X (to 4,673 tpy); additionally, 2014 actual SO_2 emissions decreased (2,504 tpy) and continued to remain below the Consent Decree interim limit. In 2015, actual facility-wide NO_X and SO_2 emissions were reported to be 4,677 and 2,364 tpy, respectively. While NO_X emissions decreased by approximately 796 tpy between 2015 (4,677 tpy) and 2019 (3,880 tpy), SO_2 emissions were reduced by approximately 506 tpy over the 5-year time period.

Figure 22: Holcim (US), Inc. DBA Lafarge Alpena Plant: Facility-wide Actual Emissions (2010 – 2019)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 34: Holcim (US), Inc. DBA Lafarge Alpena Plant: Facility-wide Actual Emissions (2010 – 2019)

Year	NO_X (tpy)	SO_2 (tpy)
2010	6,894	8,466
2011	6,907	10,905
2012	5,102	7,820
2013	4,504	10,087
2014	4,673	2,504
2015	4,677	2,364
2016	4,834	2,397
2017	3,734	2,232
2018	3,825	1,994
2019	3,880	1,858

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

8.3.2.2 Billerud Escanaba LLC

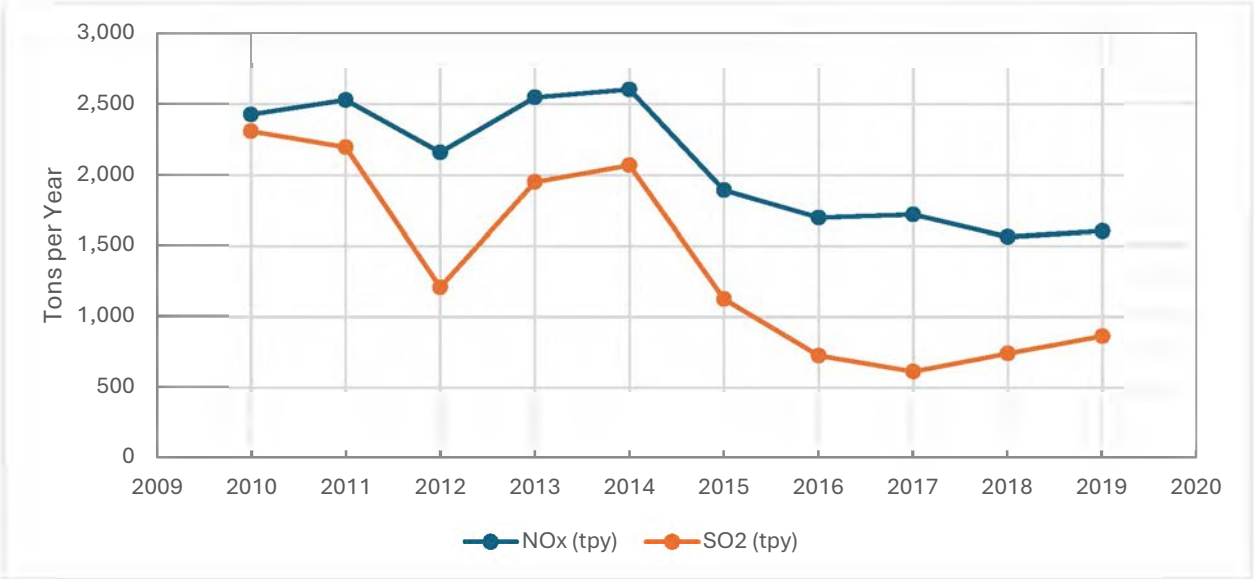
The USEPA issued a final rule effective on January 2, 2013, imposing a FIP for Billerud Escanaba LLC's Boilers 8 and 9 that specified NO_X BART limits (77 FR 71533, December 3, 2012). The Boiler 8 NO_X limit was changed by the USEPA to a fixed, rolling 30-day average limit

of 0.35 lb. of NO_X per MMBtu, rather than a weighted average of separate limits for oil-firing and gas-firing. A CEM system was the required means of compliance determination for Boiler 8. The Boiler 9 NO_X limit was set by the FIP at 0.27 lb. per MMBtu with compliance determination by means of emission testing.

Annual actual facility-wide emission rates for 2010 through 2019, for NO_X and SO_2 are provided in Figure 23 and Table 35. The annual emission data demonstrate significant reductions (on average) for NO_X and SO_2 between 2010 and 2019.

Annual actual facility-wide emission rates for 2013 were reported to be 2,549 tpy for NO_X and 1,950 tpy for SO_2. In 2015, actual facility-wide NO_X and SO_2 emissions were reported to be 1,892 and 1,127 tpy, respectively. While SO_2 emissions decreased by 262 tons between 2015 (1,127 tpy) and 2019 (865 tpy), NO_X emissions were similarly reduced by 287 tpy over the 5-year time period.

Figure 23: Billerud Escanaba LLC: Facility-wide Actual Emissions (2010 – 2019)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 35: Billerud Escanaba LLC: Facility-wide Actual Emissions (2010 – 2019)

Year	NO_X (tpy)	SO_2 (tpy)
2010	2,428	2,309
2011	2,530	2,196
2012	2,160	1,210
2013	2,549	1,950
2014	2,605	2,069
2015	1,892	1,127
2016	1,699	727
2017	1,721	614
2018	1,564	742
2019	1,605	865

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

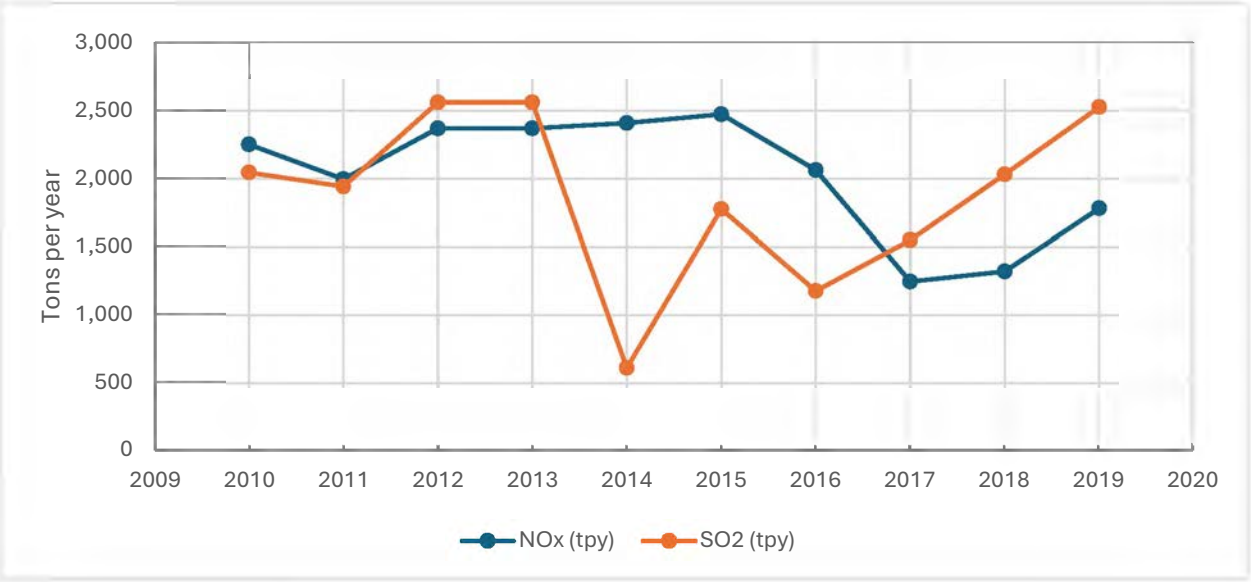
8.3.2.3 St. Marys Cement – Charlevoix Plant

The USEPA imposed a FIP setting BART SO_2 and NO_X limits that became effective on January 1, 2017 (77 FR 71533, December 3, 2012). The ROP was then modified to add a requirement specifying that St. Marys Cement – Charlevoix Plant must comply with applicable BART by the USEPA deadline. Following this, EGLE re-opened the ROP to incorporate the specific FIP BART requirements.

Annual actual facility-wide emission rates for 2010 through 2019 for NO_X and SO_2 are provided in Figure 24 and Table 36.

Annual actual facility-wide emission for 2013 were reported to be 2,369 tpy for NO_X and 2,560 tpy for SO_2. In 2015, actual facility-wide NO_X and SO_2 emissions were reported to be 2,473 and 1,777 tpy, respectively. While SO_2 emissions increased by 748 tons between 2015 (1,777 tons) and 2019 (2,525 tons), NO_X emissions decreased by 691 tons over the 5-year time period.

Figure 24: St. Marys Cement – Charlevoix Plant: Facility-wide Actual Emissions (2010 – 2019)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 36: St. Marys Cement – Charlevoix Plant: Facility-wide Actual Emissions (2010 – 2019)

Year	NO_X (tpy)	SO_2 (tpy)
2010	2,251	2,045
2011	1,996	1,942
2012	2,369	2,560
2013	2,369	2,560
2014	2,408	614
2015	2,473	1,777
2016	2,063	1,179
2017	1,248	1,551
2018	1,322	2,031
2019	1,782	2,525

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

8.3.2.4 Smurfit-Stone Container Corporation

The 2010 Regional Haze SIP indicated that the Smurfit-Stone Container Corporation plant has been shut down since February 2010. No emissions were recorded in MAERS after 2010, and no active permits for the facility were found in the Michigan records of PTIs and ROPs. An inspection on August 27, 2010, indicates the mill had been closed since Autumn 2009.

Smurfit-Stone Container Corporation's annual actual facility-wide emission rates for 2009 through 2010, as well as for 2015 through 2019, for NO_X and SO_2 are provided in Table 37. As expected, there have been no reported emissions since the shutdown reported for late 2009 or early 2010.

Table 37: Smurfit-Stone Container Corporation: Facility-wide Actual Emissions (2009 – 2019)

Year	NO_X (tons/year)	SO_2 (tons/year)
2009	208	1,231
2010	2.23	0.01
2015		
2016		
2017		
2018		
2019		

8.3.2.5 Tilden Mining Company LC

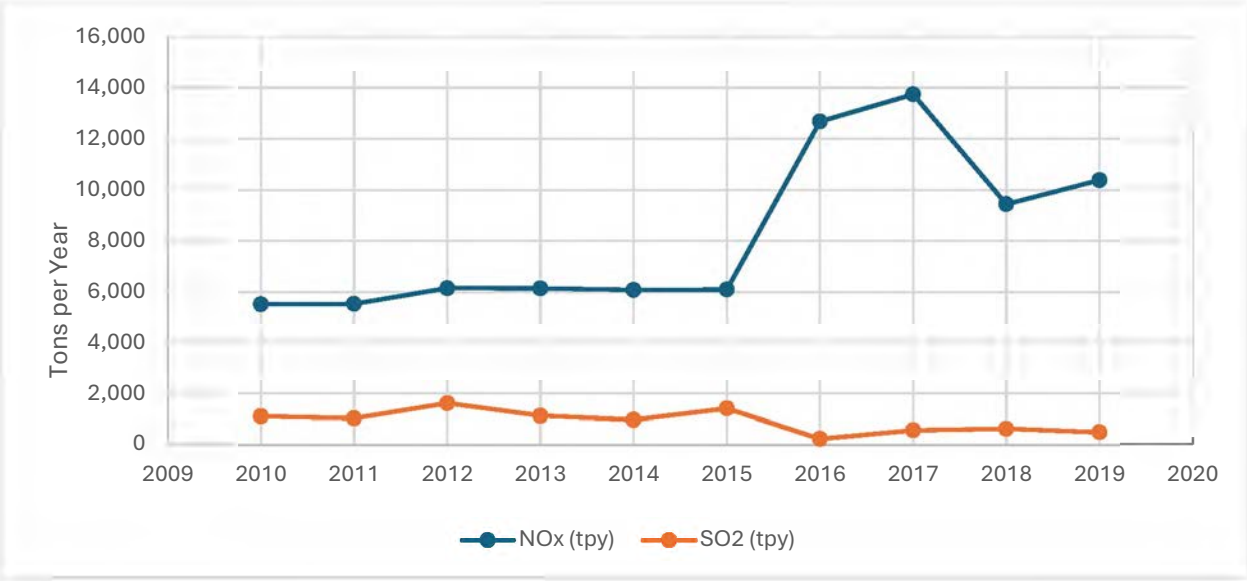
Despite the ongoing litigation surrounding the NO_X/SO_2 BART limits established in the 2015 FIP Rule, Tilden Mining Company LC's ROP has been modified to add a condition specifying that the facility must comply with the applicable requirements of 40 CFR Part 52, Approval and Promulgation of Implementation Plans, Subpart X—Michigan, Section 52.1183 Visibility Protection, which would include the newly proposed BART limits for EUKILN1 beginning 30 days after the date of publication in the Federal Register. EGLE would then re-open the ROP and incorporate the FIP BART limits into the ROP in accordance with the renewal schedule.

Annual actual facility-wide emission rates for 2010 through 2019, for NO_X and SO_2 are provided in Figure 25 and Table 38. The annual emission data demonstrates a relatively significant increase (on average) in NO_X emissions facility-wide, while also showing a reduction (on average) in SO_2 emissions between 2010 and 2019).

Annual actual facility-wide emission rates for 2013 were reported to be 6,142 tons for NO_X and 1,132 tons for SO_2. In 2015, actual facility-wide NO_X and SO_2 emissions were reported to be 6,097 and 1,412 tons, respectively. While SO_2 emissions decreased by 911 tons between 2015 (1,412 tons) and 2019 (501 tons), NO_X emissions increased by 4,282 tons over the 5-year time period. In an effort to understand how NO_X and SO_2 emissions have changed since the implementation of NO_X and SO_2 BART limits for this kiln through the FIP, EGLE calculated the difference between the 5-year annual average NO_X and SO_2 emissions rates for the 2015 – 2019 evaluation period and the 5-year annual average NO_X and SO_2 emissions rates for the 2010 – 2014 evaluation period. This comparison showed the relative change in emissions

from the 2010 – 2014 period to the 2015 – 2019 period with NO_X emissions higher by 4,582 tpy and SO_2 emissions lower by 501 tpy.

Figure 25: Tilden Mining Company LC: Facility-wide Actual Emissions (2010 – 2019)



Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

Table 38: Tilden Mining Company LC: Facility-wide Actual Emissions (2010 – 2019)

Year	NO_X (tpy)	SO_2 (tpy)
2010	5,520	1,112
2011	5,535	1,036
2012	6,149	1,617
2013	6,142	1,132
2014	6,079	976
2015	6,097	1,412
2016	12,677	245
2017	13,741	575
2018	9,440	636
2019	10,379	501

Source: MAERS Annual Pollutant Totals Query
https://www.egle.state.mi.us/maers/emissions_query.asp

8.3.3 Visibility Progress

40 CFR 51.308(g)(3) requires an assessment of visibility conditions and changes for each Class I area within the state:

> *For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired, least impaired and/or clearest days as applicable expressed in terms of 5-year averages of these annual values. The period for calculating current visibility conditions is the most recent 5-year period preceding the required date of the progress report for which data are available as of a date 6 months preceding the required date of the progress report.*
>
> *(i)(A) …the current visibility conditions for the most impaired and least impaired days.*
>
> *(ii)(A) …the difference between current visibility conditions for the most impaired and least impaired days and baseline visibility conditions.*
>
> *(iii)(A) …the change in visibility impairment for the most impaired and least impaired days over the period since the period addressed in the most recent plan required under [40 CFR 51.308(f)].*

For the Isle Royale and Seney Class I area sites, EGLE's AQD acquired the following IMPROVE visibility data from the FLM Environmental Database (https://views.cira.colostate.edu/fed/).

Michigan's most impaired days have continued to improve since the 2016 Progress Report update. In 2019, the IMPROVE monitor at Isle Royale National Park (ISLE1) demonstrated a 5-year average light extinction of 14.9 dv, down from 17.3 dv in 2014. Seney National Wildlife Refuge (SENE1) improved from 19.5 dv to 17.1 dv over the same time period.

Clearest days have also improved during this implementation period. Isle Royale's clearest days have reduced average light extinction from 5.5 dv in 2014 to 5.1 dv in 2019. Seney improved from 5.5 dv to 5.1 dv over the same time period.

8.3.4 Emissions Progress

40 CFR 51.308(g)(4) requires an analysis of emissions changes since the last regional haze SIP revision:

> *An analysis tracking the change over the period since the period addressed in the most recent plan required under [40 CFR 51.308(f)] in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. With respect to all sources and activities, the analysis must extend at least through the most recent year for which the state has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of [40 CFR Part 51, Subpart A] as of a date 6 months preceding the required date of the progress report. With respect to sources that report directly to a centralized emissions data system operated by the Administrator, the analysis must extend through the most recent year for which the Administrator has provided a State level summary of such reported data or an internet-based tool by which*

the State may obtain such a summary as of a date 6 months preceding the required date of the progress report. The State is not required to back cast previously reported emissions to be consistent with more recent emissions estimation procedures and may draw attention to actual or possible inconsistencies created by changes in estimation procedures.

8.3.4.1. NO_X and SO_2 Statewide Point Source Emissions

Statewide point source emissions for Michigan were determined for both 2014 and 2019 for the progress report element of the second planning period SIP. Actual NO_X and SO_2 emission data for this comparison was derived from MAERS, which was accessed at: EGLE - Michigan Air Emissions Reporting System (MAERS) - Annual Pollutant Totals Query

The 2014 and 2019 actual NO_X and SO_2 data is summarized in Table 39. The data indicates substantial reductions over the 6-year evaluation period for both NO_X (33,442 tons) and SO_2 (111,459 tons), representing a decrease in statewide point source emissions over the 6-year period from 2014 to 2019 of 29 percent for NO_X and 63 percent for SO_2.

Table 39: 2014 vs 2019 Statewide Actual NO_X and SO_2 Emissions for All Michigan Point Sources Statewide

Source Category	2014 NO_X Actual Emissions (tons)	2019 NO_X Actual Emissions (tons)	NO_X Emissions Change: 2014 vs 2019 tons	2014 SO_2 Actual Emissions (tons)	2019 SO_2 Actual Emissions (tons)	SO_2 Emissions Change: 2014 vs 2019 tons
All Michigan Point Sources, Statewide*	113,605	80,163	-33,432	176,704	65,245	-111,459

*Does not include transportation, residential, and small stationary sources.

Source: MAERS Annual Pollutant Totals Query https://www.egle.state.mi.us/maers/emissions_query.asp

8.3.4.2 NO_X and SO_2 Total Statewide Emissions

2014 and 2019 statewide emissions trends data for NO_X and SO_2 was acquired from the USEPA Air Emissions Inventories Website at: https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. The emissions data were broken down into 14 emissions source categories that capture point, area, mobile, and event sources.

As expected, and as depicted in Figure 26 and Table 40, total statewide SO_2 emissions decreased by approximately 118,000 tons across the 6-year evaluation period (2014 – 2019), while total statewide NO_X emissions were reduced by approximately 112,000 tons. The most substantial decrease across all emissions source categories is for SO_2 emissions from the Fuel Combustion Electric Utility (EGU) category (103,324 tons) (*as shown in* Table 40). NO_X emissions from Highway Vehicles (*as show in* Table 41) sources also showed a large decrease

across the 6-year timespan (68,411 tons). Across the 14 emissions source categories, 5 saw minimal increases in SO_2 emissions between 2014 and 2019, while 4 demonstrated insignificant increases in NO_X emissions.

Table 40: SO_2 Statewide Emissions Trends by Category (2014 and 2019)

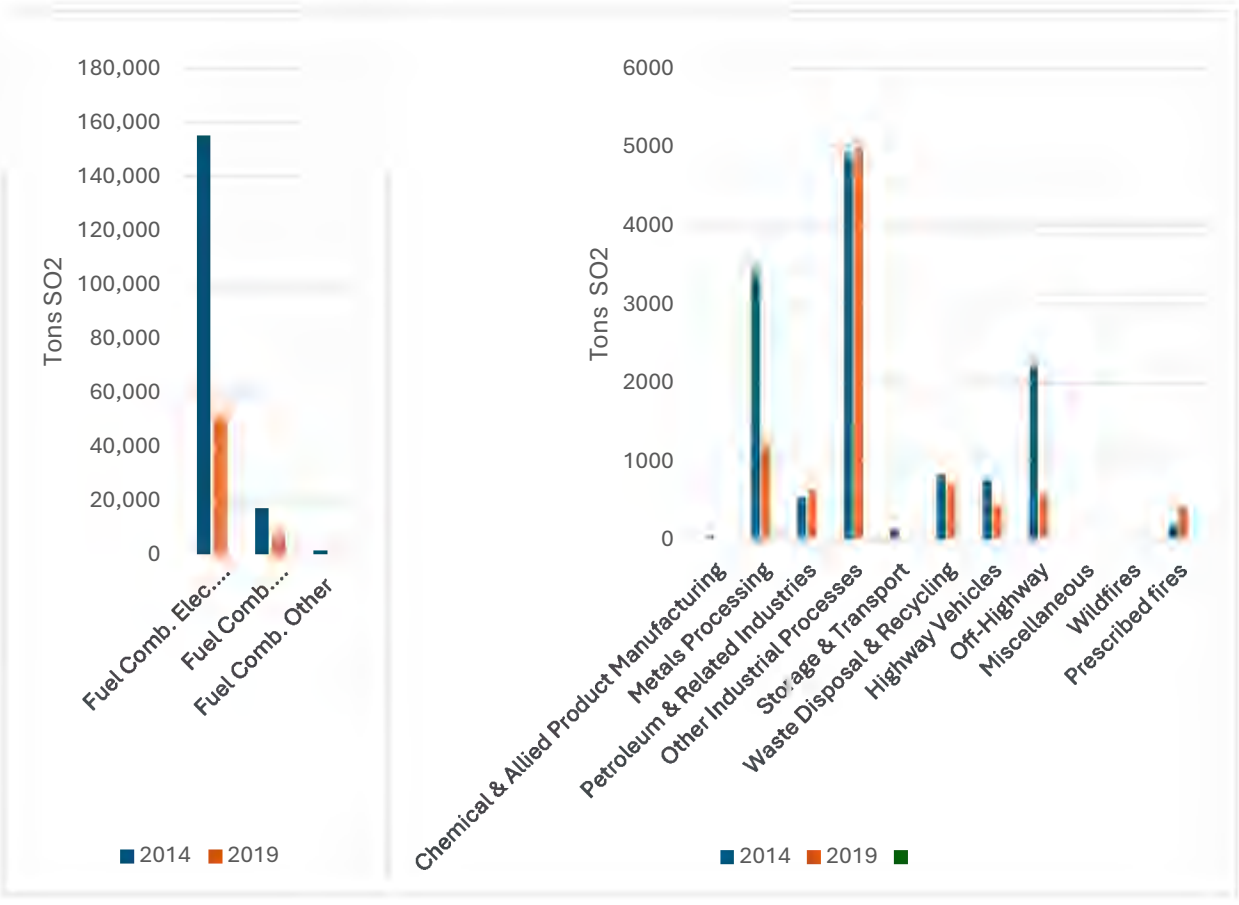
Category	Pollutant	emissions2014 (tons)	emissions2019 (tons)	Change in Emissions (2014-2019) (tons)
Fuel Comb. Elec. Util.	SO_2	155,180	51,856	-103,324
Fuel Comb. Industrial	SO_2	17,323	7,766	-9,557
Fuel Comb. Other	SO_2	1,737	883	-854
Chemical & Allied Product Manufacturing	SO_2	37	10	-27
Metals Processing	SO_2	3,406	1,213	-2,193
Petroleum & Related Industries	SO_2	533	650	117
Other Industrial Processes	SO_2	4,917	4,974	57
Storage & Transport	SO_2	123	0	-123
Waste Disposal & Recycling	SO_2	817	705	-112
Highway Vehicles	SO_2	745	436	-309
Off-Highway	SO_2	2,223	580	-1,643
Miscellaneous	SO_2	6	15	9
Wildfires	SO_2	1	11	10
Prescribed fires	SO_2	196	432	236
Total	SO_2	187,244	69,531	-117,713

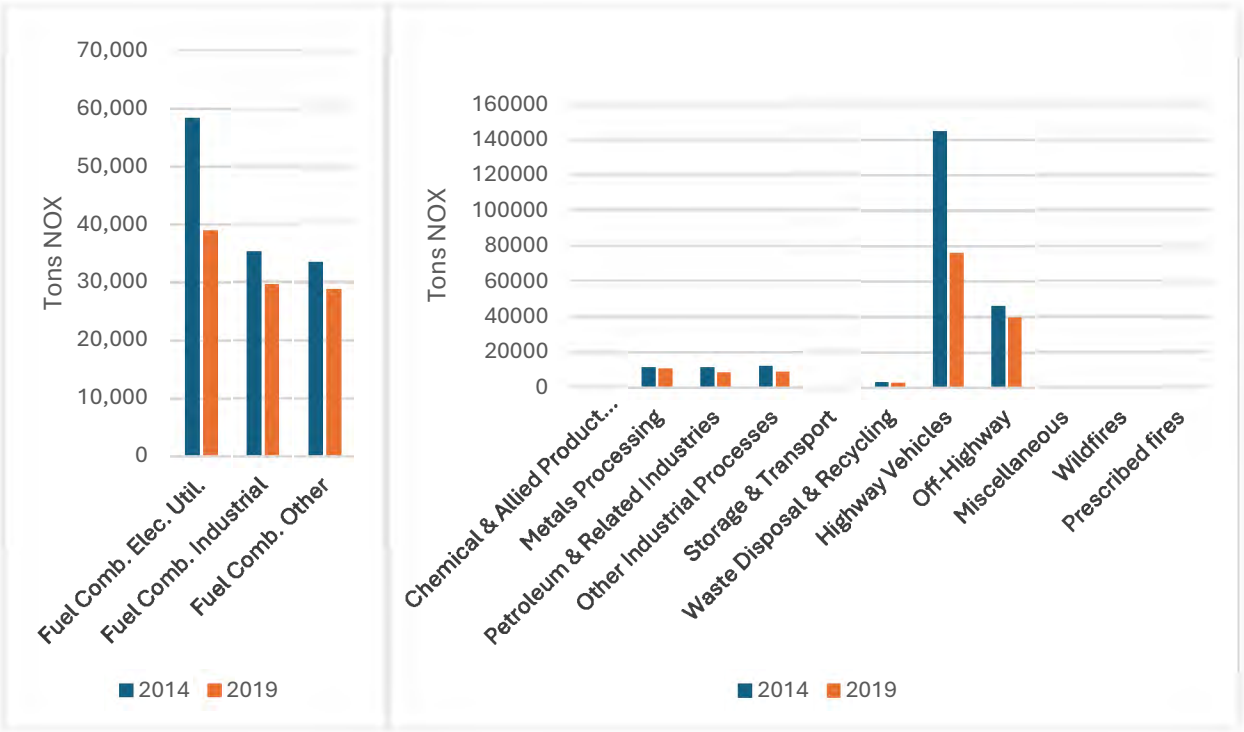
Table 41: NO_X Statewide Emissions Trends by Category (2014 and 2019)

Category	Pollutant	emissions2014 (tons)	emissions2019 (tons)	Change in Emissions (2014-2019) (tons)
Fuel Comb. Elec. Util.	NO_X	58,306	38,911	-19,395
Fuel Comb. Industrial	NO_X	35,227	29,518	-5,709
Fuel Comb. Other	NO_X	33,385	28,741	-4,644
Chemical & Allied Product Manufacturing	NO_X	70	46	-24
Metals Processing	NO_X	11,188	10,660	-528
Petroleum & Related Industries	NO_X	11,480	8,433	-3,047
Other Industrial Processes	NO_X	12,040	8,722	-3,318

Category	Pollutant	emissions2014 (tons)	emissions2019 (tons)	Change in Emissions (2014-2019) (tons)
Storage & Transport	NO_X	12	12	0
Waste Disposal & Recycling	NO_X	3,169	2,518	-651
Highway Vehicles	NO_X	144,675	76,264	-68,411
Off-Highway	NO_X	46,182	39,443	-6,739
Miscellaneous	NO_X	11	62	51
Wildfires	NO_X	1	20	19
Prescribed Fires	NO_X	284	678	394
Total	NO_X	356,030	244,028	-112,002

Figure 26: 2014 vs 2019 Statewide Actual NO_X and SO_2 Emissions by Category





8.3.4.3 Assessment of Changes Impeding Visibility Progress

40 CFR § 51.308(g)(5) requires an assessment of changes impeding visibility progress:

> *An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred since the period addressed in the most recent plan required under [40 CFR § 51.308(f)] including whether or not these changes in anthropogenic emissions were anticipated in that most recent plan and whether they have limited or impeded progress in reducing pollutant emissions and improving visibility.*

Michigan has not identified, nor does it anticipate any significant changes in either in-state or out-of-state emissions that would impede visibility progress at its Class I areas. Although a number of source categories within Michigan and other bordering states (Indiana, Illinois, etc.) demonstrated increases in NO_X and/or SO_2 emissions between 2014 and 2019 (according to the information published to the USEPA's Air Pollutant Emissions Trends Data Webpage (https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data), EGLE does not consider this a significant issue impeding visibility progress for the Michigan Regional Haze SIP given that substantial NO_X and SO_2 reductions have occurred from other anthropogenic sources that vastly outweigh the impacts of these minor NO_X/SO_2 emissions increases within the Midwest region of the United States.

8.4 Consultation and Discussions with Other Parties

8.4.1 FLM Consultation

EGLE facilitated a consultation period with the FLMs from December 19, 2024, to February 14, 2025, to discuss EGLE's draft SIP Supplement, providing at least 60 days before holding a public hearing or announcing a public comment opportunity as required under 40 CFR 51.308(i)(2). Appendix 30 contains the comments received from the FLMs. Appendix 32 contains Michigan's response to all comments received during this process.

8.4.2 Public Comment

After consideration of FLM comments, Michigan provided a comment period and the opportunity for a public hearing on the proposed SIP Supplement for the Regional Haze second implementation period from March 10, 2025 to April 8, 2025. Appendix 31 contains the public notice and comments received during that comment period. Appendix 32 contains Michigan's response to all comments received during this process.

APPENDICES

(Please note: Appendices A – E are contained in Michigan's August 23, 2021 Regional Haze SIP submittal. For reference, Michigan's August 23, 2021 Regional Haze SIP submittal is included in full as Appendix 1 in this SIP Supplement).

Attachment L

MISO Resource Adequacy Business Practices Manual,
BPM-011-r31

Manual No. 011

Business Practices Manual

RESOURCE ADEQUACY

Disclaimer

This document is prepared for informational purposes only, to support the application of the provisions of the Tariff and the services provided thereunder. MISO may revise or terminate this document at any time at its discretion without notice. While every effort will be made by MISO to update this document and inform its users of changes as soon as practicable, it is the responsibility of the user to ensure use of the most recent version of this document in conjunction with the Tariff and other applicable documents, including, but not limited to, the applicable NERC Standards. Nothing in this document shall be interpreted to contradict, amend, or supersede the Tariff. MISO is not responsible for any reliance on this document by others, or for any errors or omissions or misleading information contained herein. In the event of a conflict between this document, including any definitions, and either the Tariff, NERC Standards, or NERC Glossary, the Tariff, NERC Standards, or NERC Glossary shall prevail. In the event of a conflict between the Tariff and the NERC Standards, or NERC Glossary, the Tariff shall prevail until or unless the Federal Energy Regulatory Commission ("FERC") orders otherwise. Any perceived conflicts or questions should be directed to the Legal Department.

Revision History

Doc Number	Description	Revised by:	Effective Date
BPM-011-r31	Included language related to Final PRMR allocation process in Section 5.6 and other editorial changes Updated PRA Formulations in Appendix M	MISO Staff	FEB-21-2025
BPM-011-r30	Annual Review Complete including UCAP/ISAC ratio related process improvement, GADS events/performance submission, timeline change for multiple process such as state notifying MISO on utilizing their own PRM, full responsibility transactions, confirm/convert SAC etc, edits for RBDC (MRI/RBDC curve development, RBDC opt out process, PRMR determinations for PRA and settlements etc)	MISO Staff	OCT-01-2024
BPM-011-r29	Annual Review Complete. Edits include GVTC test extension updates, 31-day rule and ZRC replacement updates, LMR and ER registration updates, OY CIL CEL removal Appendix K timeline updates and Attachment Y updates to schedule 53 resources and the UCAP/ISAC ratio process and timeline.	N. Przybilla	OCT-01-2023
BPM-011-r28	Clarify and add additional context surrounding ZRC replacement and the 31-day outage rule in section 6.4 while ensuring language is consistent with Module E-1 of the MISO Tariff.	N. Przybilla	May-31-2023
BPM-011-r27	Updates to all sections to facilitate the implementation of seasonal auctions & seasonal accreditation (FERC Docket No. ER22-495). Includes updates from annual BPM review	MISO Staff	October-31-2022
BPM-011 r26	Replacement of 4.2.12 Battery Storage Accreditation with Electric Storage Resource. Add Electric Storage Resource to section 4.2.8. BTMG Qualification Requirements. Update Appx K. Correct Appendix N – Demand and Energy Forecast Characteristics.	M. Guerriero	AUG-15-2022
BPM-011-r25	2021 Annual review complete. Edits include: Hybrid resources, detail added to States establishing PRM, detail for 90/120 day outages, clarification for BTMG wind UCAP, Updated to	MISO Staff	JUL-01-2021

	reference new DSRI tool instead of MCS, updated RAN related LMR accreditation (ER20-1846), new DR Test Deferral process, Battery Storage accreditation, reorganized Appx I XEFORd, added Process Load reporting section, updated App K Timeline.		
BPM-011-r24	2020 Annual review complete. Edits include new Appendix W (DR LOLE), Deliverable ICAP (ER20-1942, ER20-2005), GVTC testing clarification, ZDB example, and other minor clarifications.	G. Alexander	DEC-15-2020
BPM-011-r23	Revisions to address treatment of resources on long term outage which FERC approved under Dock No. ER20-129-000.	T. Bachus	MAR-31-2020
BPM-011-r22	2019 Annual Review Complete. Edits include: general clean up, ER19-2559 (PRA Process Timeline) & ER18-2363 (Locational Filing), web links, ER UCAP intermittent qualification, Appx R CONE calculation, removing Att W (ER19-650 RAN Phase 1 LMR filing) by imbedding language into applicable LMR sections.	E. Thoms	OCT-1-2019
BPM-011-r21	Added LMR Registration FAQ to address ER19-650-000	E. Thoms	FEB-20-2019
BPM-011-r20	Multiple updates. Revisions supporting changes to the out-year transfer study process. Additional revisions to support the Module E-1, Locational Tariff update which created External Resource Zones and several other changes.	M. Sutton	NOV-01-2018
BPM-011-r19	Revisions to Section 4.2.8 clarifying language when a Qualifying Facility participates as a BTMG. Addition of SER Type II resource. Annual Review completed.	J. Harmon	SEP-28-2018
BPM-011-r18	Annual Review Complete Includes revisions to Section 4.2.8.5 clarifying deliverability options for BTMG.	J. Harmon	JAN-22-2018
BPM-011-r17	Annual Review Complete	J. Harmon	AUG-25-2017
BPM-011-r16	Several updates. Updated Wind UCAP values; added section regarding Solar capacity credit; Revised provisions for Zonal Deliverability Benefit; Inclusion of Suspended resources in the PRA; Retail Choice coincident load forecast reporting process. Annual Review completed.	J. Harmon	JUL-15-2016

BPM-011-r15	Annual Review completed. Included Inter-zonal replacement, sub regional constraints in PRA, PRMR and LCR relationship, external resource and host BA qualification requirements, GVTC deferral, and refueling versus repowering. Additions to section 5.2.1 for Local Resource Zone reevaluation process and Generation Limited Transfers	J. Milli / M. Sutton / S. Quadri / J. Cole / R. Westphal	SEP-01-2015
BPM-011-r14	Annual Review completed. Remove netting of Demand Response. Update SFT and Transfer Analysis provisions.	J. Milli	SEP-01-2014
BPM-011-r13	Updated LRZ map, timeline, and added catastrophic outage provisions	C. Clark	JAN-01-2014
BPM-011-r12	Annual review and updated to reflect Tariff orders	C. Clark	AUG-01-2013
BPM-011-r11	Updated to reflect Module E-1-1 Tariff	C. Clark	OCT-01-2012
BPM-011-r10	Updated GVTC language for Hydro and ROR.	C. Clark	SEP-28-2012
BPM-011-r9	Annual Review completed and Updated Registration tables and added new section for qualifying PPAs.	C. Clark	APR-15-2012
BPM-011-r8	MISO Rebranding Changes JUL-19-2011	G. Krebsbach	JUN-13-2011
BPM-011-r8	Annual Review and added Dispatchable Intermittent Resource, minor clarifications	C. Clark	JUN-13-2011
BPM-011-r7	Updated UCAP calculations for plan year 2011/2012, undated must offer provisions, updated External Resources cross-border deliverability provisions, updated minor clarifications	M. Heraeus / C. Clark	Dec-1-2010
BPM-011-r6	Corrected errors and added “must offer” language and Units with Low Service Hours	M. Heraeus / C. Clark	JUN-1-2010
BPM-011-r5	Corrected errors and inadvertent omissions	M. Heraeus	MAR-3-2010
BPM-011-r4	Resource Adequacy Improvements Tariff Filing updates. Changed numbering to BPM -011	K. Larson	DEC-21-2009
TP-BPM-003-r3	Removed stakeholder comments from section 6.4 that were provided during drafting of TP-BPM-003-r2. Amended section 4.4.3.14.4.3.1.	T. Hillman	JUN-01-2009
TP-BPM-003-r2	Revised to reflect the December 28th, 2007 (ER08-394) filing and subsequent Commission required compliance filings through May 2009 to revise Module E-1 to comprehensively address long-term Resource Adequacy Requirements	T. Hillman	JUN-01-2009
TP-BPM-003-r1	Revised to reflect Open Access Transmission, Energy and Operating Reserve Markets Tariff for	J Moser	JAN-06-2009

	the Midwest ISO, Inc. (Tariff) relating to implementation of the Day-Ahead and Real-Time Energy and Ancillary Services Markets and to integrate proposed changes to the Balancing Authority Agreement.		
TP-BPM-003	Updated template	J. Moser	APR-01-2008
N/A	Section 3.2.1 Determination of Requirements – Non-valid statements were removed. Section 3.2.3 Default Requirements – Minor revisions were made for clarification. Section 3.2.4 Compliance with the Midwest ISO Requirements – Paragraph on after-the-fact ECAR “must offer” compliance was removed. Section 4.1 Commercial Pricing Node Load Forecast – Minor revisions were made for clarification. Section 5.2.1 Procedure for Designating a Network Resource for Resource Adequacy Purposes – LD Contracts bullet updated to reflect FERC Order 890. Section 5.2.3 Designating Network Resources External to the Midwest ISO – The second bullet point was revised for clarification. Section 5.3 Determination of Compliance with Network Resource Requirements – This section was deleted. Section 5.4 (5.3) Network Resource Must Offer Requirement – Paragraph on after-the-fact ECAR “must offer” compliance was removed. Section 5.5 Financial Transmission Rights – This section was deleted. Section 5.6 (5.4) Updating Network Resource Designations – RE references have been updated to reflect the current NERC Regions. Section 6.1.3 Liquidated Damage and Similar Contracts – Entire section updated to reflect FERC Order 890. Section 6.1.4 Hubbing Transactions – This section was deleted. Section 8 Data Requirements – Entire section updated to reflect FERC order 890		DEC-12-2007

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1 Introduction

This introduction to the Midcontinent Independent System Operator, Inc. (MISO) *Business Practices Manual (BPM)* for Resource Adequacy Requirements includes basic information about this BPM and the other MISO BPMs. The first section (Section 1.1) of this Introduction provides information about the MISO BPMs. The second section (Section 1.2) is an introduction to this BPM. The third section (Section 1.3) identifies other documents in addition to the BPMs, which can be used by the reader as references when reading this BPM.

1.1 Purpose of the MISO Business Practices Manuals

The BPMs developed by MISO provide background information, guidelines, business rules, and processes established by MISO for the operation and administration of the MISO markets, provisions of transmission reliability services, and compliance with the MISO settlements, billing, and accounting requirements. A complete list of MISO BPMs is available for reference through MISO's website.

1.2 Purpose of this Business Practices Manual

This Resource Adequacy Business Practices Manual describes MISO's and other entities' roles and responsibilities related to maintaining Resource Adequacy, which is ensuring that Load Serving Entities (LSE) serving Load in the MISO Region have sufficient Planning Resources to meet their anticipated peak Demand requirements plus an appropriate reserve margin.

The Resource Adequacy BPM will conform and comply with MISO's Energy Markets Tariff, NERC operating policies, and the applicable Regional Entity (RE) reliability principles, guidelines, and standards to facilitate administration of efficient Energy Markets.

This document benefits readers who want answers to the following questions regarding the Resource Adequacy Requirements (RAR).

- How is Resource Adequacy determined?
- How do the multiple state jurisdictions relate regarding Resource Adequacy Requirements (RAR)?
- What are the responsibilities of the different entities regarding Resource Adequacy?
- How are specific resources identified and qualified, including contracted resources, for Resource Adequacy purposes?
- What is a Zonal Resource Credit (ZRC) and how can it be used to comply with RAR?
- What are the deliverability requirements for Planning Resources?

- How are Demand Response Resources (DRR Type I and Type II) incorporated in the Resource Adequacy process?
- How does an LSE comply with its obligations under the changes to Module E-1 of the Tariff?
- What are the procedures for participating in Planning Resource Auctions?
- What are the settlement provisions for the Planning Resource Auctions?
- What are the procedures for tracking and settling retail and wholesale customer switches?

This document provides the necessary detail to aid a MISO Market Participant's (MP) understanding of its primary responsibilities and obligations to the reliable operation of MISO's Balancing Authority Footprint, as a result of MISO's Resource Adequacy Requirements.

1.3 References

Other reference information related to this document includes:

- MISO BPMs
- MISO's Open Access Transmission, Energy and Operating Reserve Markets Tariff
- NERC – Resource and Transmission Adequacy Recommendations, dated June 15, 2004
- Federal Energy Regulatory Commission (FERC) Order Nos. 890, Order 890 - A, and Order 890 -B.
- Module E Capacity Tracking (MECT) tool Users Guide
- LOLE Study Reports
- Wind & Solar Capacity Credit Report
- PowerGADS User's Manual
- CIL/CEL Study Reports

2 Overview of Resource Adequacy

Achieving reliability in bulk electric systems requires, among other things, that the amount of resources exceeds customer Demand by an adequate margin. The margins necessary to promote Resource Adequacy needs to be assessed on both a near-term operational basis and on a longer-term planning basis.

The focus of Resource Adequacy is on the longer-term planning margins that are used to provide sufficient resources to reliably serve Load on a forward-looking basis. In the real-time operational environment, resources committed through the Resource Adequacy Requirements have a capacity obligation to be available to meet real-time customer Demand and contingencies. Therefore, Planning Reserve Margins (PRMs) must be sufficient to cover:

- Planned maintenance
- Unplanned or forced outages of generating equipment
- Deratings in the capability of Generation Resources and Demand Response Resources
- System effects due to reasonably anticipated variations in weather
- Load Forecast Uncertainty

2.1 Planning Reserve Margin Requirement Overview

Each LSE's total obligation will be referred to as the Planning Reserve Margin Requirement (PRMR). Coincident Peak Demand forecasts are submitted by LSEs using a 50%/50% forecast (50% probability the forecast will be over, and 50% probability the forecast will be under, the projected peak Demand) which will include distribution losses. An LSE's Initial Planning Reserve Margin Requirement (Initial PRMR) is described in Section 3 (Establishing Initial Planning Reserve Margin Requirements) of this BPM.

2.2 Planning Resources Overview

The resources used to achieve long-term Resource Adequacy are called Planning Resources, and consist of Capacity Resources, Load Modifying Resources and Energy Efficiency Resources. The relationships and key attributes of the Planning Resource types are as follows:

- Capacity Resources consist of electrical generating units, stations known as Generation Resources, External Resources (if located outside of the MISO Balancing Authority Area), Electric Storage Resources (ESR), Hybrid Resources, and resources that can be dispatched to reduce Demand known as Demand Response Resources that participate in the Energy and Operating Reserves Market

and are available during Emergencies. Thermal Generation Resources are accredited based on the methodology described in Appendix Y (Schedule 53 Resources). Wind Resources will be accredited based on the ELCC study that MISO conducts. Non-wind intermittent generation resources will be accredited based on historical performance during the critical hours within each Season, where new resources will receive the class average for that resource type until enough historical data is accrued. Non-Schedule 53 Capacity Resources that report to GADS are quantified by applying seasonal forced outage rates to Installed Capacity (ICAP) values to calculate the Seasonal Accredited Capacity (SAC) for the resource.

- Load Modifying Resources (LMR) include Behind-the-Meter Generation (BTMG) and Demand Resources (DR) which are available during capacity and transmission Emergencies declared by MISO if used to meet Module E-1 requirements.
- Energy Efficiency Resources include installed measures on retail customer facilities that achieve a permanent reduction in electric Energy usage while maintaining a comparable quality of service.

A Market Participant (MP) can use Capacity Resources, LMRs, and Energy Efficiency Resources, up to their SAC values, to comply with their Resource Adequacy Requirements via a Fixed Resource Adequacy Plan or Reliability Based Demand Curve Opt Out (RBDC Opt Out) as described in Section 5.3 (Pre-PRA arrangement of capacity scheduling) of this BPM, or through self-scheduling their Zonal Resource Credits in the Planning Resource Auction(s) (PRA) as detailed in Section 5.5.6 (Resource Offers) of this BPM. A Market Participant can also sell ZRCs from Capacity Resources, LMRs, and Energy Efficiency Resources bilaterally before the Planning Resource Auction(s) or offer them in the Planning Resource Auction(s) as described in Section 5.5 (Planning Resource Auction) of this BPM.

MISO will determine Seasonal Accredited Capacity (SAC) values for all qualified Capacity Resources, Load Modifying Resources and for all Energy Efficiency Resources for each Season within the Planning Year.

2.3 Resource Adequacy Requirements Overview

Planning Resources that clear the Planning Resource Auction(s) (PRA) or that are designated in a Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out will be obligated to provide capacity in the Day-Ahead and Real Time Markets (DA/RT) for each Season cleared within the Planning Year unless replaced by another Planning Resource, as per Module E-1 Section 69A.3.1.h. Capacity Replacement Non-Compliance Charge(s) (CRNCC) may be applicable as

per Module E-1 Section 69A.3.1h. Load Serving Entities (LSEs) that serve Load during the Planning Year will be obligated to pay for capacity from Planning Resources in the PRA pursuant to the relevant Auction Clearing Price (ACP) for the Local Resource Zone (LRZ) where the Load is located unless the Planning Resource was designated in a FRAP or RBDC Opt Out.

LSEs that have a Planning Reserve Margin Requirement (PRMR) will be obligated to procure capacity equal to their Final PRMR pursuant to the relevant ACP for the LRZ where they have PRMR unless, and to the extent that the LSE meets its Final PRMR via a FRAP or RBDC Opt Out per Section 5.3 of this BPM, or unless and to the extent that the LSE chooses to reduce its Final PRMR that is cleared in a given auction(s) by electing to pay the Capacity Deficiency Charge per Section 5.7 of this BPM.

2.4 Settlements/Performance Requirements Overview

The seasonal Planning Reserve Margin Requirement (PRMR) obligations of LSEs will be established for each Season of the Planning Year and will be settled based upon the applicable Planning Resource Auction(s) (PRA) clearing price for an LSE's Final Planning Reserve Margin Requirement, unless covered by a FRAP or RBDC Opt Out, or unless the LSE elects to pay the Capacity Deficiency Charge. Once each planning period begins, LSEs and MPs will have the corresponding charges and credits from each applicable PRA included on their daily settlement statements for all loads and Planning Resources cleared in a PRA as documented in further detail in the Market Settlements BPM.

LMRs with ZRCs that either cleared the PRA or were used in a FRAP or RBDC Opt Out will have a performance obligation to be available during system Emergencies per section 4.2.7 (Demand Resource Qualification Requirements) iof this BPM.

3 Establishing Initial Seasonal Planning Reserve Margin Requirements

3.1 Overview

The Initial seasonal Planning Reserve Margin Requirement (PRMR) is the number of MWs in ZRCs required to meet an LSE's Resource Adequacy Requirements (RAR). The RAR is established to ensure that LSEs have enough Planning Resources to reliably serve load for the applicable Seasons.

The Initial seasonal PRMR is expressed in the following equation per Load Serving Entity (LSE) per Local Resource Zone (LRZ)

$$Initial\ PRMR_{LRZ} = \sum_{LBA}[(CPDf_{LBA} - FRP_{LBA} + FRS_{LBA}) \times (1 + TL_{LBA}\%) \times (1 + PRM_{RTO})]$$

Where attributes are seasonal for the following:
Initial $PRMR_{LRZ}$ = Initial Planning Reserve Margin Requirement per LRZ
$CPDf_{LBA}$ = Coincident Peak Demand forecast per LBA
FRP_{LBA} = Full Responsibility Purchase per LBA
FRS_{LBA} = Full Responsibility Sale per LBA
$TL_{LBA}\%$ = Transmission Loss Percentage of LBA
PRM_{RTO} = Planning Reserve Margin in Unforced Capacity set by LOLE Studies

3.1.1 Agency Contracts Supporting Resource Adequacy Requirements

An LSE may contract with other entities to comply with RAR. The contracted entity may perform functions on behalf of the applicable LSE including, but not limited to, submitting the LSE's forecasted CPD forecast or share of CPD forecast.

Each individual LSE is ultimately responsible for conformance with the RAR, even if the LSE enters a contract with a third party acting on its behalf. If requested by MISO, each LSE that contracts with another entity to comply with any part of the Resource Adequacy Requirements must notify MISO of the arrangement. The LSE must provide MISO with the name of the organization representing them, primary and alternate contact information for the individuals representing them, and the scope of responsibilities the contracted entity will provide.

3.1.2 Validation of Firm Transmission Service for Load

Each LSE shall document, as described in Module B – Transmission Service, to MISO that the LSE has obtained sufficient firm Transmission Service to serve its load for each Season in the Planning Year. Load not served by Network Integrated Transmission Service (NITS) must have Firm Point-to-Point Transmission Service or a firm Grandfathered Agreement (GFA), when applicable—however, Demand does not require firm MISO Transmission Service when the LSE meets its Initial PRMR using its own Behind-the-Meter Generation (BTMGs), Demand Resources (DRs), and Energy Efficiency Resources, and does not use the MISO Transmission System to serve such Demand.

Additionally, Energy Resource Interconnection Service (ERIS) requires a completed firm Transmission Service Request (TSR) submitted through OASIS OATI that has been approved by the Generation and Interchange team at MISO in order to be considered towards deliverability that is used to convert Seasonal Accredited Capacity (SAC) to Zonal Resource Credits (ZRCs). This information will be entered into the MECT on the Convert SAC screen by Market Participants (and in the Registrations screen, if applicable).

3.2 Demand and Energy Forecasts

MISO collects a variety of load forecasts for Resource Adequacy and other planning processes via the MECT tool. This section describes each of these forecasts and what entity is responsible for providing them. Please See Appendix O for the list of parties responsible for reporting Demand and Energy forecasts.

Demand and Energy forecasts that are not subject to retail choice load switching should be reported by the respective LSE. Demand and Energy forecasts that are subject to retail choice load switching should be reported by the respective Electric Distribution Company (EDC). The EDC calculates a Peak Load Contribution (PLC) MW value for each retail choice LSE that represents a share of the EDC's Initial PRMR. If an LSE disagrees with their PLC value calculated by their EDC, the LSE will work with its EDC to revise the PLC prior to the final EDC forecast submission deadline. See Appendix K for all Demand and Energy forecast deadlines.

All Demand (Energy) forecasts must reflect a 50% probability that the Demand (Energy) will not exceed the forecasted Demand (Energy) for the relevant time period. Any manual or ex-post adjustments to the forecasts derived from the LSE's chosen forecasting method that are offered

due to catastrophic event impacts (such as COVID-19) must be supported analytically and quantitatively.

For a detailed description of each forecast's characteristics refer to Appendix N.

3.2.1 Non-Coincident Peak Demand and Energy for Load Forecasts

Non-Coincident Peak Demand and Energy for Load forecasts are collected for the purposes of facilitating FERC Form 714 and NERC Modeling Data and Analysis (MOD) Standards reporting along with other planning processes at MISO.

The MISO FTR Administration team uses the Non-Coincident Peak forecast value for the upcoming planning year in the annual Auction Revenue Rights (ARR) allocation process. This forecast should not include transmission losses or Grandfathered Agreements (GFAs) but should include Demand Resources and Behind-The-Meter-Generation (BTMG). Load served by GFAs is reported separately via the same MECT section.

Please refer to NERC's Reliability MOD Standards for a complete definition for the non-Coincident Peak Demand forecast and FERC's Form 714 for the Energy for Load forecast. Below are general guidelines; if a conflict should arise between the guidelines below and the respective NERC standards documents, defer to the latter.

The Non-Coincident Peak Demand and Energy for Load forecasts are reported on a monthly basis for forecast years 1 and 2 and on a seasonal basis for forecast years 3 through 10.

Seasons for the purposes of these forecasts are defined as shown below:

Summer: June through August
Fall: September through November
Winter: December through February
Spring: March through May

For seasonal reporting of the Non-Coincident Peak Demand forecast, the single highest peak hour during the Season should be reported in MW. The ARR allocation section of the Non-Coincident Peak Demand Forecast submission screen, should be calculated and submitted on an annual peak for a given Planning Year for use in the FTR annual Auction Revenue Rights process. For Energy for Load forecasts, the summation of each month or season's Energy for load (GWh) should be reported as appropriate.

For all forecasts submitted, each LSE shall ensure that it counts its customer Demand once and only once.

Non-Coincident Peak Demand and Energy for Load forecast must be reported in the MECT by 11:59 pm EST on November 1 prior to the Planning Year.

For a detailed description of each forecast's characteristics refer to Appendix N.

3.2.2 Coincident Peak Demand Forecast

The seasonal Coincident Peak Demand forecasts (CPD forecast) are used as the basis for determining each LSE's seasonal obligation. The seasonal CPD forecasts shall be based upon considerations including, but not limited to, average historical weather conditions, economic conditions and expected Load changes (addition or subtraction of Demand).

For a detailed description of each forecast's characteristics refer to Appendix N.

A document describing the desired approach to be used by LSEs in preparing the seasonal CPD forecasts, the information required in each annual filing, and the process used in reviewing the CPD Forecasts can be found on MISO's website: Peak Forecasting Methodology Review Whitepaper. This document was written for when LSEs submitted an annual Coincident Peak Forecast, but the same methodology described in the paper can be performed at a seasonal level.

The seasonal CPD forecasts must be provided for each Asset Owner/LBA combination. Providing the CPD forecasts by Asset Owner is required by MISO's settlements process. Reporting by LBA allows MISO to apply the appropriate seasonal Transmission Losses towards the Initial PRMR and Final PRMR calculation. Seasonal Transmission Losses will be made available on the public website by MISO for each LBA. For more information on Transmission Losses see Appendix L.

The CPD forecasts must be reported via the MECT tool by 11:59 EST on November 1 prior to the Planning Year.

The CPD forecasts are reported differently in non-retail choice and retail choice areas as described in the following subsections.

3.2.3 Forecast Reporting

LSEs with Demand and Energy that are not subject to retail choice load switching are required to provide MISO with Demand and Energy forecasts no later than 11:59 p.m. EST on November 1 each year, for the following Planning Year. The seasonal CPD forecasts must be reported for each Asset Owner by LBA.

LSEs with Demand and Energy that is subject to retail choice load switching are not required to provide MISO with Demand and Energy forecasts. Electric Distribution Companies (EDCs) are responsible for submitting forecasts in areas that have Demand and Energy that is subject to retail choice load switching.

EDCs are defined as the company that distributes electricity to retail customers through distribution substations and/or lines owned by the company. The EDC of a retail choice area provides MISO with a seasonal peak forecasted Demand coincident with MISO's seasonal peak and must provide this data no later than 11:59 p.m. EST on November 1 prior to the Planning Year.

EDCs must provide both MISO and the respective retail choice LSEs with each retail customer's initial seasonal Peak Load Contribution (PLC) in the EDC's service territory no later than 11:59 p.m. EST on December 15 prior to the Planning Year.

All new EDCs are required to work with the MISO Client Services and Readiness department (https://help.misoenergy.org/) to set up access to the MECT tool and identify the relationships between the EDC and the LSEs in the EDC area. A Help Center ticket will need to be created to detail the access and relationship additions for the new EDC. The MISO Client Services and Readiness team will provide the new EDC with the required registration forms. Once the EDC setup is completed, all MPs with commercial pricing nodes participating in the retail choice load switching program are required to provide the name of the EDC where the commercial pricing node is located.

3.2.3.1 Provider of Last Resort

The Provider of Last Resort (POLR) will be responsible for meeting any Initial PRMR from Demand left unclaimed by retail choice LSEs in the EDC service territory. The Transmission Provider will work with the POLR and EDC to ensure that the POLR will serve any remaining Demand that is not allocated to LSEs.

3.2.4 Wholesale Load Customers

To ensure wholesale customers are accounted for, LSEs serving wholesale customers during the prompt Planning Year must include the Demand and Energy attributed to those wholesale customers in their Demand and Energy forecasts by 11:59 p.m. EST on November 1 prior to the Planning Year via the MECT tool.

An LSE that has previously served a wholesale customer and does not intend on serving that customer for the prompt Planning Year may or may not be required to report that customer in their forecasts.

Case 1: LSE knows the entity that will serve the wholesale customer next Planning Year:
In this case, the existing LSE is not responsible for submitting the Energy or Demand attributed to the wholesale customer in their forecasts. However, they must state the entity responsible for serving the customer in their supporting documentation.

Case 2: LSE does not know who will serve the wholesale customer next Planning Year:
In this case, the existing LSE is responsible for submitting the Energy or Demand attributed to the wholesale customer in their forecasts.

MISO will work with the wholesale customer regarding their forecasts and contact the wholesale customer to determine who the responsible LSE is. Once the responsible LSE is identified, MISO will transfer the Demand from the old LSE to the new LSE prior to the Planning Resource Auction.

3.2.5 Review of CPD Forecasts

Starting November 1, MISO will begin reviewing all forecasts and a randomly chosen set of supporting documentation submitted by LSEs and EDCs in order to give all parties adequate time to resolve any identified forecasting issues with MISO. The review will focus on whether the forecast methodology adequately and reasonably forecasts peak Demand, Energy, and/or Demand reduction capability of the submitting entity. The forecast review process will be completed no later than March 1 of each year prior to the annual PRA. If necessary, MISO may develop the required seasonal CPD forecasts for any Market Participants serving Load in the Transmission Provider Region or serving Load on behalf of a Load Serving Entity or other Market Participants that do not submit CPD forecasts and supporting documentation by the November 1 deadline.

3.3 Full Responsibility Transactions

Full Responsibility Transactions (FRT) are referenced differently depending on which side of the transaction is being addressed. The sale side of an FRT is called a Full Responsibility Sale (FRS) and the purchase side is called a Full Responsibility Purchase (FRP). Both the FRS and FRP are a transfer of Demand. As a result, the seasonal obligation (Initial PRMR and Final PRMR) calculation will reflect the associated transfer of transmission losses and PRM. FRTs may only be entered for Demand that is not subject to retail choice load switching.

The FRS results in an increase in Demand and FRP results in a decrease in Demand. This can be interpreted as the purchaser paying the seller to take on Demand and its associated seasonal Initial PRMR. This transfer of Demand also results in a transfer of the associated transmission losses and PRM.

- The seller of an FRS is contractually obligated to deliver power and Energy to the purchaser with the same degree of reliability as provided to the seller's own native load. With Full Responsibility Service to an LSE within MISO's Region, sellers are responsible for all of that LSE's Initial PRMR associated with the sale.

  Example:

  Asset Owner MM1:
  Seasonal CPDf = 10 MW
  Seasonal PRM = 6.2%
  Seasonal Transmission Loss % = 2%
  Asset Owner MM1 is the Buyer of the FRT for the total amount of 5 MW
  MM1's Initial PRMR = (10 – 5) * (1 + 0.062) * (1 + 0.02) = 5.4 MW

  Asset Owner SS2:
  Seasonal CPDf = 20 MW
  Seasonal PRM = 6.2%
  Seasonal Transmission Loss % = 2%
  Asset Owner SS2 is the Seller of the FRT for the total amount of 10 MW
  SS2's Initial PRMR = (20 + 10) * (1 + 0.062) * (1 + 0.02) = 32.5 MW

  Asset Owner BB3:
  Seasonal CPDf = 50 MW

Seasonal PRM = 6.2%
Seasonal Transmission Loss % = 2%
Asset Owner BB3 is the Buyer of the FRT for the total amount of 5 MW
Asset Owner BB3 is the Seller of the FRT for the total amount of 10 MW
BB3's Initial PRMR = (50 – 5 + 10) * (1 + 0.062) * (1 + 0.02) = 59.6 MW

The LSE (purchaser) may contract with other entities (sellers) to be responsible for capacity payments based upon the ACP for all or part of its load delivered to the purchaser through an FRP/FRS agreement. Each purchaser and seller must agree on which of their transactions are to be reported as an FRP/FRS. If the purchaser and seller cannot agree upon whether a particular transaction is an FRP/FRS agreement, then either party may invoke the dispute resolution procedures in the Tariff. FRP/FRS agreements are treated effectively like a transfer of forecasted Demand and the associated Initial PRMR from one LSE to another. An LSE with an FRP agreement is required to input the forecasted Coincident Peak Demand information for the transferred Demand into the MECT. An MP with a FRS agreement is required to meet the RAR obligation derived from the Demand as though it was their load, as described in Section 3. If the seller under an FRP/FRS agreement is not an LSE subject to the MISO Tariff, then the purchaser under an FRP/FRS agreement will remain responsible for any capacity payments associated with the FRP/FRS agreement.

If the seller under an FRS/FRP agreement is not an LSE subject to the MISO Tariff ("non-jurisdictional"), then the purchaser who is responsible for any RAR deficiencies may coordinate with the non-jurisdictional party to ensure that any RAR obligations associated with transferred Demand are met. A purchaser may request that the seller communicate the proper validations and confirmations to the purchaser or confirm validation of RAR obligations in the MECT to the purchaser. Such purchaser also can request that MISO coordinate with the non-jurisdictional party to intermediate the exchange of information from the seller to the purchaser. Such coordination will not relieve the purchaser from their responsibility for any RAR deficiencies associated with the FRP/FRS agreement.

The LSE with the FRS is responsible for compliance with LSE requirements. The obligation to serve the load is shifted but the obligation to forecast the Demand remains with the original LSE (purchaser). Both the purchasing and selling parties will be required to enter and verify the FRT into the MECT Full Responsibility Transaction screen. The parties must enter an FRT into the MECT along with documentation detailing their contract between the purchasing and selling

parties to enable MISO to track the load and capacity obligations shift. This must be done by the fifth business day of February and the settlement will be between LSEs for all FRTs.

The Initial PRMR cannot be a negative number as a result of the FRT.

3.4 Planning Reserve Margin

This section describes the Loss of Load Expectation (LOLE) study process used by MISO to establish the Planning Reserve Margin (PRM) for each Season of the prompt MISO Planning Year. A MISO Planning Year runs from June 1 through May 31.

3.4.1 Determination of Seasonal Planning Reserve Margin

MISO will perform probabilistic analyses annually to establish the system-wide seasonal PRMs. This probabilistic analysis will utilize a Loss of Load Expectation (LOLE) study which assumes that there are no internal transmission limitations. Additionally, MISO will perform probabilistic analyses to establish the seasonal Local Reliability Requirements (LRRs) for each Local Resource Zone. MISO will publish the results by November 1 preceding the applicable Planning Year.

The LOLE study shall be consistent with Good Utility Practice, the reliability requirements of the Regional Entities (RE), and applicable states in the MISO Region. The PRM analyses shall consider factors including, but not limited to: the Generator Forced Outage rates of Capacity Resources, Generator Planned Outages, expected performance of Load Modifying Resources (LMRs), Intermittent Resources, Energy Efficiency Resources, load forecast uncertainty, and the Transmission System's import and export capabilities with external systems. The seasonal PRMs that are calculated in the LOLE probabilistic modeling software are determined on an ICAP and UCAP basis. The preliminary $PRMR_{ICAP}$ values are the sum of the ICAP ratings of the resources utilized in the simulation to achieve the reliability criteria. Similarly, the sum of the UCAP ratings of these same resources utilized in the simulation to achieve the reliability criteria is the total UCAP-rated MW needed, or the preliminary $PRMR_{UCAP}$ Values. PRMR values are finalized after MISO has received the updated LSE-submitted load forecasts on November 1 and validated the load forecasts.

MISO will calculate and publish on its website the estimated seasonal PRM for each of the nine subsequent Planning Years, to provide information for long-term resource planning, without establishing any enforceable specific resource planning reserve requirements.

See the Resource Adequacy page on MISO's public website for current and previous LOLE study reports.

3.4.2 LOLE Analysis

MISO will determine the appropriate PRM for each Season of the applicable Planning Year based on the probabilistic analyses of being able to reliably serve MISO's forecasted seasonal Coincident Peak Demand. This probabilistic analysis will utilize a LOLE study which assumes that there are no internal transmission limitations.

MISO's LOLE study will first calculate the annual PRM such that the summation of LOLE across the year is one (1) day in ten (10) years, or 0.1 day per year. The minimum PRM requirement will be determined through LOLE analyses by either adding a negative output unit with no outage rates, or by adding increments of a positive output combustion turbine (CT) Planning Resource with nominal capacity values that correspond with the most recent annual calculation of Cost of New Entry (CONE) as described in Section 6.3 and that have class average outage rates, until a 0.1 day per year solution is reached.

A minimum of 0.01 day per Season LOLE will be used to calculate the seasonal PRMs and LRRs in Seasons with less than 0.01 day per year LOLE risk upon the annual summation of LOLE reaching the 0.1 day per year reliability criteria.

The LOLE model will initially be run with no adjustments to the capacity. If the LOLE in a given Season is less than the reliability criteria day per year for that Season, a negative output unit with no outage rates will be added until the LOLE reaches the reliability criteria for that Season. This is comparable to adding Coincident Peak Demand. If the LOLE is greater than the reliability criteria, proxy units based on a unit of typical size and outage rates will be added to the model until the LOLE reaches the reliability criteria.

MISO will also determine the Local Reliability Requirement (LRR) for each LRZ consistent with the LOLE achieving 0.1 day per year for each LRZ. The minimum amount of capacity above seasonal Coincident Peak Demand required to meet the reliability criteria of a 0.1 day per year LOLE value will be utilized to establish the system-wide seasonal PRMs. The minimum amount of capacity above the seasonal Zonal Coincident Peak Demand required to meet the reliability criteria of a 0.1 day per year LOLE value will be utilized to establish the seasonal LRR for each LRZ. When determining LRRs, risk-deficient Seasons will have a minimum reliability criteria of 0.01 LOLE per Season.

3.4.3 Loss of Load Expectation (LOLE) Working Group

MISO establishes seasonal Unforced Capacity requirements applicable in the Planning Resource Auction (PRA) based on LOLE probabilistic analyses conducted by MISO Resource Adequacy and in coordination with members of the LOLE Working Group (LOLEWG). The duties of the working group are to help guide MISO in implementing the study methods outlined in this section. The analyses will conform to the Electric Reliability Organization (ERO) standards, including those established by applicable Regional Entities for reliability and resource adequacy. The LOLEWG will review and provide recommendations to MISO on the methodology and input assumptions to be used in performing the LOLE analyses, as well as reviewing the results of the LOLE analyses and related sensitivity cases. MISO will be the entity ultimately responsible for conducting the LOLE study and determining the seasonal PRMs, except as set forth in Section 3.4.5.

3.4.4 Generator Outage Data for LOLE Study

The probabilistic study will use a LOLE model capable of sequential Monte Carlo simulation. Primary inputs are the generation data submitted to MISO through the PowerGADS tool and forecasted Demands provided as described above in this Section 3. If applicable to the generator type, Asset Owners are obligated to report outage event data as well as Generator Verification Test Capacity (GVTC) for Generation Resources and External Resources through the PowerGADS tool in the MISO Market Portal. Annualized planned outage rates and seasonal forced outage rates are developed for each applicable resource from the submitted outage event data and, together with the capabilities of each resource, are the key generator inputs to the LOLE model. Outage parameters for the LOLE model are established using outage event data from the past five calendar years, as submitted to PowerGADS.

The LOLE study will account for all system-wide forced outage causes captured in the EFORd metric. The EFORd term is defined as:

> Equivalent Forced Outage Rate while in Demand (EFORd): A measure of the probability that a generating unit will not be available for the applicable Season due to forced outages or forced deratings when there is Demand on the unit to generate.

More information on EFORd calculations can be found in Appendix I of this BPM.

3.4.5 State Authority to Set PRM

The only entity other than MISO that may establish a PRM for any Season during the Planning Year is a state regulatory authority regarding those regulated entities under their jurisdiction. If a state regulatory authority establishes a minimum seasonal PRM for the LSEs under their jurisdiction, then that state-set seasonal PRM would be adopted by MISO for jurisdictional LSEs in such state. Other entities, such as reserve sharing groups or NERC regional entities, do not have the authority to establish a seasonal PRM under Module E-1. MISO will translate any state-set seasonal PRM into the same terms as MISO's seasonal PRM (e.g., utilizing a UCAP basis) to facilitate comparison and compliance with PRMR.

MISO will perform the Loss of Load Expectation (LOLE) study to establish the seasonal PRM and publish the results by November 1 preceding the Planning Year. State regulatory authorities choosing to instead elect a state set seasonal PRM must notify MISO in writing by December 1 for the upcoming PRA. The notice shall be from an authorized representative of the state regulatory authority and include the seasonal PRMs, a list of those LSEs to which the seasonal PRMs apply, and a statement that the entities to which the seasonal PRM applies have been duly notified. In scenarios where an LSE crosses state boundaries and one of the states opts to set its own seasonal PRM, the state regulatory authority must work with the impacted LSEs to submit to MISO the pro-rata distribution of seasonal Coincident Peak Forecasts and seasonal Zonal Coincident Peak Forecasts among the states.

Any disputes regarding the applicability of the seasonal PRM information submitted by a state regulatory authority and an affected entity shall be resolved in accordance with applicable dispute resolution measures established by the state regulatory authority. If the state regulatory authority makes any changes to information initially submitted to MISO as a result of such a dispute, the changed information shall be submitted to MISO by the state regulatory authority on or before December 31. If no such changes are submitted, the original information submitted by the state regulatory authority will be used by MISO.

MISO shall update the MECT with the state-set seasonal PRM by January 31.

4 Qualifying and Quantifying Planning Resources

4.1 Overview

This section identifies the qualification requirements for each type of Planning Resource.

All Planning Resources that qualify will have a SAC value determined by MISO. The benefits of SAC include:

- Fair recognition of the contribution each unit provides towards Resource Adequacy;
- Market signals that will promote generating unit availability performance; and in turn, the improved system availability will promote improved regional Resource Adequacy; and
- Supporting bilateral trades by recognizing the SAC value of each resource, while shifting the resource performance risk to owners of Planning Resources, where such risk more properly belongs.

Planning Resources consist of Capacity Resources, Load Modifying Resources, and Energy Efficiency Resources. Capacity Resources consist of Generation Resources, Electric Storage Resources, External Resources, and Demand Response Resources. Load Modifying Resources consist of Behind the Meter Generation and Demand Resources. Energy Efficiency Resources are resources registered with MISO that permanently reduce electricity Demand. A Hybrid Resource may also qualify as a Planning Resource to the extent that such Hybrid Resource is a Generation Resource or Capacity Resource.

Capacity Resources backed by behind-the-meter-generation that have met all requirements to supply capacity in the MISO Resource Adequacy construct will have SAC MWs calculated based on data submitted by the Asset Owner, as described in the Appendix H - Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources - of this document. BTMG, DR, Energy Efficiency Resources, and External Resources must follow the registration procedures documented in the applicable subsections of this document to be eligible to supply capacity in the MISO Resource Adequacy construct.

Generation Resources backed by behind-the-meter-generation that have not provided at least one Season of historical performance data will have their SAC calculated for them after they are registered in MISO's Commercial Model, provided that the Resource meets the Capacity Resource Module E-1 requirements. Planning Resources that are pseudo-tied between MISO Local Balancing Areas will be modeled in the Local Resource Zone based on the LBA in which they are physically located. The following table outlines the relationship and key attributes of the Planning Resource types that are committed to providing capacity.

	Planning Resource				
	Capacity Resource		Load Modifying Resource		Energy Efficiency Resource
	Generation, ESR, and External	Demand Response Resources	BTMG	Demand Resource	
Capacity Verification	X	X	X	X	X
Must Offer	X	X			
GADS Data Entry	X	X	X		
Must Respond to Emergency Operating Procedures	X	X	X	X	

4.2 Planning Resources

4.2.1 Generation Resource, but not Dispatchable Intermittent Resource or Intermittent Generation

4.2.1.1 *Qualification Requirements*

Generation Resources may qualify as Capacity Resources provided that:

- They are registered with MISO as documented in the Market Registration BPM.
- Generation Resources must be deliverable to Load within MISO's Region. The deliverability of Generation Resources to Network Load within MISO's Region shall be determined by System Impact Studies pursuant to the Tariff that are conducted by MISO, which consider, among other factors, the deliverability of aggregate resources of Network Customers to the aggregate of Network Load. Generation Resources that pass the deliverability test receive Network Resource Interconnection Service.
- Generation Resources that do not pass the deliverability test may procure firm Transmission Service (or utilize a GFA) in conjunction with Energy Resource Interconnection Service (ERIS) to meet the deliverability requirements.
    - Firm Transmission Service must either be a Firm Point-to-Point (PTP) Transmission Service Request (TSR) or a Firm Network Integration Transmission Service (NITS) Scheduling Right (SR).
        - NITS SRs should reference the OASIS NITS Application number and Resource Name used in the SR.

  - Firm transmission service (PTP TSR or NITS SR) must cover the entire applicable Season within the Planning Year in total or in aggregate and be submitted in the MECT. The resource is only deliverable to the LBA identified in the Firm Transmission study that grants the NITS SR or PTP TSR.
- Generation Resources with ERIS may participate in MISO's Interim Deliverability Study process as described in BPM-015. The following generic parameters apply for the Interim Deliverability Study:
  - MISO may grant conditional NRIS applicable for the next Planning Year
  - MISO may grant conditional ERIS applicable for the next Planning Year
  - MISO may grant conditional External-NRIS (E-NRIS) applicable for the next Planning Year.
  - MISO may implement a Quarterly Operating Limit (QOL) on a portion of a Generation Resource due to transmission study overloads. MW amount subject to QOL can qualify as capacity in the PRA. The MW amount subject to QOL is not required to procure replacement capacity if the QOL is reduced in a subsequent MISO quarterly study.
- Generation Resources with a Provisional Interconnection Agreement are not qualified to participate in the PRA.
- Generation Resources that were accepted by the Transmission Provider and confirmed by a Network Customer as a designated Network Resource under the OASIS reservation process in place prior to either the initial effective date of the Energy Market in 2005 or that Transmission Owner's integration date are considered as deliverable.
  - This may include Generation Resources that were issued 'local' NRIS through a Generator Interconnection Agreement consistent with Module E-1 Section 69.3.1.g paragraph v. In such instances, 'local' NRIS is processed in similar fashion as ERIS for the purposes of demonstrating deliverability for participation in the Planning Resource Auction. As with resources with ERIS, firm Transmission Service must be demonstrated to cover the entire auction period for the level of participation desired in order to qualify for participation in the PRA.
- Internal purchase power agreements (PPAs) will not be qualified by MISO.
- Generation Resources greater than or equal to 10 MW (based on Generation Verification Tested Capacity (GVTC)) must submit their Generator Availability Data System (GADS) data (including, but not limited to, NERC GADS) into the MISO PowerGADS database through the MISO Market Portal. Quarterly GADS Event and

Performance Data must be submitted by the end of the month following the quarter (April for Q1, July for Q2, October for Q3, and January for Q4). The submitted data must have passed Level 2 Validation without any errors. Units that fail to submit Level 2 Validated quarterly GADS data will be disqualified for participation in the PRA.

- Generation Resources less than 10 MW based upon GVTC are not required to report their GADS data.
- Generation Resources less than 10 MW based upon GVTC that begin reporting GADS data must continue to report GADS data each Planning Year.
- The seasonal XEFORd for new Generation Resources in service less than one full Season will be the seasonal EFORd class average for the resource type. A Generation Resource will use the class average value until 3 consecutive seasonal months of data is available. Forced outage rates are used for the capacity accreditation of non-Schedule 53 Generation Resources.
- Generation Resources that have been retired prior to the Planning Year will not qualify as a Planning Resource.
- Generation Resources that are in approved “Suspension” status qualify as a Planning Resource through the ICAP Deferral process.
- If Generation Resources used to meet Resource Adequacy Requirements retire or suspend during the Planning Year, they must be replaced effective with their change of status date. Generation Resources with approved “Suspension” status must participate as a Planning Resource in the next Planning Year subject to provisions regarding physical withholding in Module D of the Tariff.
- Generation Resources that plan to retire during the Planning Year will be subject to test for Physical Withholding.
- Generation Resources that are or plan to be suspended will be subject to test for Physical Withholding.
- Generation Resources that have been designated as a System Support Resource (SSR) may participate in the PRA.
- Generation Resources must demonstrate capability on an annual basis as described below.
- Generation Resources undergoing conversion to natural gas are not required to submit GVTC prior to returning. Changes in performance will be reflected in the resource’s rolling XEFORd.

When to Perform and Submit a Generation Verification Test Capacity (GVTC)

- Generation Resources, External Resources, ESR, Demand Response Resources backed by behind the meter generation, or Behind the Meter Generation (BTMG) that qualified as Planning Resources for the current Planning Year must submit their GVTC no later than October 31 in order to qualify as a Planning Resource for the upcoming Planning Year. GVTC can be completed by completing a real power test or based on operational data. The GVTC must be completed during the test period of September 1 through August 31 prior to the upcoming Planning Year.
- A real power test is required to demonstrate a modification that increases the rated capacity of a unit, and a revised GVTC should be submitted to MISO no later than March 1 prior to the Planning Year. The initial GVTC, even if a Planning Resource is unable to test and the GVTC is 0, must be submitted by October 31 prior to the Planning Year.
- A real power test is required when returning from a suspended state and the GVTC must be submitted to MISO. A real power test is required when any unit returns to service in MISO after an absence (including but not limited to, catastrophic events, or a period during which it was not qualified as a Planning Resource under Module E-1).
- A real power test is required for Planning Resources in an approved "Suspension" status. If a Planning Resource is unable to complete a real power test, the MP responsible for that Planning Resource must include this item, including timing and cost requirements, when requesting a facility specific reference level.

The GVTC for a new or returning Non-Intermittent Generation resource is due by March 1 prior to the Planning Year unless the GVTC has been deferred via the ICAP Deferral process as described in Section 4.5. See Appendix J **– GVTC Testing Requirements**.

GVTC Test Extension Request

A Market Participant for a Generation Resource required to submit GVTC results must use Reasonable Efforts to submit GVTC results by October 31 prior to the upcoming Planning Year. If circumstances prevent the Market Participant from submitting the GVTC results for the Generation Resource by October 31, the Market Participant must notify the Transmission Provider no later than five (5) Business Days after October 31 and request an extension. The extension request must include a reasonable explanation and justification for missing the deadline, estimated seasonally corrected GVTC values, and an expected completion date prior to the upcoming Planning Year. An extension may also be requested for re-testing and submitting after the October 31 deadline. The

estimated seasonally corrected GVTC values are only an estimate to be used in initial SAC posting and the actual test results will be used for the final SAC posting. The Transmission Provider will review each extension request on a case-by-case basis to determine whether to approve or deny the request to extend the GVTC deadline. Denial of an extension will not preclude the Market Participant for the Generation Resource from utilizing the ICAP Deferral process. Test results for Approved GVTC Test Extension Requests must be submitted by January 15 prior to the upcoming Planning Year.

Reporting is accomplished through MISO's PowerGADS reporting system as described in the Net Capability Verification Test User Manual.

4.2.1.2 *SAC Determination*

The SAC values for a Generation Resource are based on an evaluation of the type and volume of interconnection service, GVTC values, the XEFORd value of non-Schedule 53 Generation Resources as described in Appendix H – Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources and Appendix I – XEFORd Calculation, and SAC value for Schedule 53 Resources as applicable and described in Appendix Y – SAC Calculations for Schedule 53 Resources.

Generation Resources relying either fully or in part on Energy Resource Interconnection Service (ERIS) coupled with firm Transmission Service to demonstrate deliverability must procure firm Transmission Service up to the Resource's ICAP level in order to receive their full SAC allocation.

If a Generation Resource's procured firm Transmission Service coupled with ERIS is less than the Generation Resource's ICAP value, the SAC allocation would be pro-rated based on Tariff Module E-1 Section 69A.4.5.

The SAC methodology is implemented to address the fact that not all Generation Resources contribute equally to Resource Adequacy. By adjusting the capacity rating of a unit based on its availability, SAC provides a means to recognize the relative contribution that each resource makes towards Resource Adequacy. When the PRM requirement is similarly adjusted by the weighted average EFORd of all the pooled resources, the generating units with better than average availability will reflect higher values than units with below average availability.

In order for a Generation Resource to convert its entire calculated Total SAC into Zonal Resource Credits, the Generation Resource must be fully deliverable up to its ICAP. Deliverability is determined by any combination as outlined in Module E-1 Section 69A.3.1.g of the Tariff.

If a Generation Resource is not fully deliverable up to its ICAP, the resource will be eligible to convert a value less than the Total SAC into Zonal Resource Credits as outlined in Appendix H – Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources, as well as in Appendix Y – SAC Calculations for Schedule 53 Resources.

4.2.1.3 *Intermittent Generation and Dispatchable Intermittent Resources - Qualification Requirements*

Intermittent Generation and Dispatchable Intermittent Resources are subclasses of Generation Resources and may qualify as Capacity Resources if they meet the same qualification requirements in Sec. 4.2.1.1 Qualification Requirements and the alternate GADS reporting procedure as described below:

For existing Intermittent Generation and Dispatchable Intermittent Resources (eg. run-of-river hydro, solar, biomass), Market Participants must supply MISO with a minimum of one entire Planning Year of hourly net output data for each season in which the resource would be accredited.

For existing Intermittent Generation and Dispatchable Intermittent Resources not classified as run-of-river hydro or wind, Market Participants may submit up to three (3) Planning Years of hourly net output data, for a total of 9 months considered for each seasonal lookback period, during typical seasonal peak hours, where the typical seasonal peak hours are hours ending in 15, 16, and 17 EST for the Summer, Fall and Spring Seasons, and hours ending in 8, 9, 19, and 20 EST for the Winter Season. Seasonal accreditation for existing Intermittent Generation and Dispatchable Intermittent Resources not classified as run-of-river hydro or wind is determined as an average of the hourly net output.

For Intermittent Generation and Dispatchable Intermittent Resources classified as run-of-river hydro, Market Participants may submit up to fifteen (15) Planning Years of hourly net

output data, for a total of 45 months considered for each seasonal lookback period, during typical seasonal peak hours, where the typical seasonal peak hours are hours ending in 15, 16 and 17 EST for the Summer, Fall and Spring Seasons, and hours ending in 8, 9, 19 and 20 EST for the Winter Season. Seasonal accreditation for fun-of-river hydro resources is determined as a median of the provided hourly net output.

For resources on qualified extended outage where data does not exist for some or all of the previous historical seasonal months, a minimum of 30 consecutive days' worth of historical net output data during the relevant typical seasonal peak hours, must be provided prior to participating in the PRA.

New Intermittent Generation or Dispatchable Intermittent Resources that do not have a minimum of 30 consecutive days' worth of seasonal historical operating data during the typical seasonal peak hours may participate in the PRA and will receive class average accreditation values if the resource will be in operation by the start of a Season in the applicable Planning Year.

4.2.1.4 *Dispatchable Intermittent Resources and Intermittent Generation Resource - SAC Determination*

The Seasonal Accredited Capacity (SAC) for Intermittent Generation and Dispatchable Intermittent Resources will be determined by MISO based on historical performance, availability, and type and volume of Interconnection Service. Examples of SAC calculations for these resources can be found in Appendix V – Solar and Run-of-River Hydro Capacity Credit.

Intermittent Generation and Dispatchable Intermittent Resources that are powered solely by wind will have their SAC values determined based on Interconnection Service volumes and their respective wind capacity credit established via seasonal Effective Load Carry Capacity (ELCC) analyses as described in Appendix A – Wind Capacity Credit.

1.1.1.1.1 4.2.1.5 Wind Capacity Credit

MISO calculates specific wind capacity credit (%) for each wind resource and applies it to its registered maximum capability (MW) in the Commercial Model or its registered Capacity (MW) through the LMR or External Resource registration process. MISO uses historical wind

availability information to calculate a seasonal Effective Load Carrying Capacity (ELCC) to determine a wind capacity credit. Wind capacity credits are determined for each individual wind resource based on its average capacity factor during MISO's top eight (8) coincident peaks that occurred during the Season for the previous three Planning Years.

A new wind resource with no commercial operation history during the Season will receive a wind capacity credit equivalent to the MISO system wide wind capacity credit from the seasonal Effective Load Carrying Capacity (ELCC) analyses for their initial Planning Year, and thereafter metered data will be used to calculate its future resource-specific wind capacity credit.

If an existing wind resource has no historical metered data available, or was inoperable for a Season, then the existing wind resource will receive a seasonal capacity credit of 0%.

An increase in unit capacity for Intermittent Generation and Dispatchable Intermittent Resources that are solely powered by wind after the SAC values have been established will require written notification from the Market Participant to a member of the Resource Adequacy department to update the values. This notification is due by March 1 prior to the applicable Planning Year.

BTMG wind will have their SAC values determined from their historical net output during periods of MISO system peak Demand for the three Planning Years prior.

For more information regarding the methodology for calculating wind capacity credits, see Appendix A – Wind Capacity Credit of this BPM and MISO's wesbite (misoenergy.org / Planning / Resource Adequacy / PRA Documents / select the appropriate Planning Year) for the Wind and Solar Capacity Credit Report. Additionally, Appendix H – Seasonal Accredited Capacity (SAC) Calculations for Planning Resources details the determination of convertible SAC using the deliverability-adjusted capacity factor.

1.1.1.1.2 4.2.1.6 Solar Capacity Credit

Solar resources will have their SAC values determined based on the three (3) most recent Planning Years of historical average net output during typical seasonal peak hours, where the typical seasonal peak hours are hours ending in 15, 16, and 17 EST for the Summer, Fall and Spring Seasons, and hours ending in 8, 9, 19 and 20 EST for the Winter Season.

Solar resources that have been upgraded or returning from extended outages shall submit all operating data for the prior Season with a minimum of 30 consecutive days to have their capacity registered with MISO.

Solar esources with less than 30 days of metered values would receive seasonal class accreditation for their initial Planning Year in operation. Seasonal class accreditation for a new solar resource in the Summer, Fall, and Spring Seasons is 50% and 5% for the Winter Season. Refer to Appendix V - Solar and Run-of-River Hydro Capacity Credit for additional examples and determination of convertible SAC.

4.2.2 Use Limited Resources

4.2.2.1 *Use Limited Resources – Qualification Requirements*

Use Limited Resources are defined as Generation Resources or External Resource(s), that due to design considerations, environmental restrictions on operations, cyclical requirements (such as the need to recharge or refill), or for other non-economic reasons, are unable to operate continuously, but are able to operate for a minimum set of consecutive operating hours. A Capacity Resource may be defined as a Use Limited Resource if it:

- Is capable of providing the Energy equivalent of its claimed Capacity for a minimum of at least four (4) continuous hours each day across MISO's peak;
- Notifies MISO of any outage (including partial outages) and the expected return date from the outage;
- Demonstrates GVTC and submits the results to MISO;
- Is a dispatchable resource(s) in which the unit(s) have physical limitations;
- Identifies the resource as use limited when registering the asset, subject to MISO approval.
    - MISO will review the conditions of the asset or PPA to determine if the resource qualifies as a Use Limited Resource.
    - MISO will consider how the resource has historically operated and any proposed changes in its operation to determine if the resource qualifies as a Use Limited Resource.

Use Limited Resources are a subclass of Generation Resources and may qualify as Capacity Resources if they meet the same qualification requirements in Section 4.2.1.1 Qualification Requirements.

- MISO may qualify a resource classified as a Diversity Contract as a Use Limited Resource seasonally provided the resource meets all of the requirements of both an External and Use Limited Resource.
- Use Limited Resources must demonstrate GVTC on an annual basis as described in Section 4.2.1.1 Qualification Requirements. See Appendix J – GVTC Testing Requirements for additional details.
- Use Limited Resources with any new or untested additional capacity are eligible for the ICAP Deferral Process as described in Section 4.5 ICAP Deferral.

4.2.2.2 *Use Limited Resources – SAC Determination*

The SAC values for a Use Limited Resource are based on an evaluation of the resource type and volume of Interconnection Service, GVTC value, and XEFORd value of such Use Limited Resource as described in Appendix H – Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources.

In addition, a Use Limited Resource with contract provisions that prevent the resource from meeting its Must Offer requirement will have a decrease in the SAC calculation to the extent that the contract provisions are less than the required Must Offer requirement of 4 hours across the forecasted peak for each day during the registered Season. Use Limited Resources unable to meet the Must Offer requirements will have their SAC prorated relative to the percentage of hours meeting the Must Offer requirement and to the must offer hours for the Season.

4.2.3 External Resources

MPs may register an External Resource by providing the information listed below to MISO Resource Adequacy to qualify such resources as Capacity Resources. External Resources are registered through the MECT tool for each Planning Resource Auction and reviewed and approved by MISO Resource Adequacy staff. An MP that owns an External Resource or contracts for an External Resource through a power purchase agreement (PPA) may register its External Resources. An MP must denote within the registration if the External Resource being registered is a Use Limited Resource. External Resources that are also Use Limited Resources must meet all requirements in Section 4.2.2.1 “Use Limited Resources – Qualification Requirements” and be approved by MISO Resource Adequacy.

An MP must submit the completed registration form for existing External Resources in the MECT by February 1 prior to the upcoming Planning Year. New External Resource registrations

or existing registrations with increased capacity are to be submitted in the MECT by March 1 prior to the upcoming Planning Year. Existing registrations with increased capacity are required to submit the original GVTC by October 31 prior to the upcoming Planning Year. The completed registration form requires the MP to certify that the registration information is accurate and that the qualifying MWs from External Resources are not being registered by another party. MISO will notify the MP within 15 days after a completed registration form is received regarding accreditation of the External Resource. MISO will review the External Resource registration form for completeness and accuracy, and will notify the MP when it has been determined whether or not the External Resource qualifies for the applicable Planning Resource Auction, or whether there are any outstanding deficiencies in the registration.

4.2.3.1 *External Balancing Authority Qualification Options*

MISO has established host/external Balancing Authority qualification criteria that applies to Balancing Authorities that could impact Energy schedules associated with qualifying External Resources. The Balancing Authority qualification criteria ensures that Energy schedules corresponding to the qualifying External Resources will only be interrupted in a manner that provides consistency, transparency, and reliability.

An executed PPA or External Resource owned prior to April 3, 2014 will continue to qualify as a Planning Resource for the initial full term of the PPA or ownership of the resource, if it is only interruptible as a last resort under Requirement 2 of NERC Standard EOP-011. A Diversity Contract executed prior to April 3, 2014 will continue to qualify as a Planning Resource, if it is only interruptible as a last resort under Requirement 2 of the NERC Standard EOP-011 between June 1 and September 30.

Resources or PPAs that are submitted to MISO for qualification as External Resources must have their corresponding Energy schedules flow through host/external Balancing Authorities that comply with one of the three options outlined below to qualify.

A. Scheduled Interruption Linked to Performance of a Specific Generator in the External Balancing Authority

In the case of unit specific sales, if the MISO Balancing Authority Area is experiencing an Energy Emergency, the external Balancing Authority will not interrupt the schedule from the External Resource unless the generator being used to serve a unit-specific sale has a forced or planned outage.

This type of External Resource would be treated similarly to internal generation because those internal resources constitute Capacity Resources, even when they can be interrupted for forced or planned outages. This provision ensures that the generator delivering the Energy in support of the PPA can be specifically identified.

B. Slice-of-System Curtailed Pro-Rata with Load in the Source Balancing Authority when Source Balancing Authority is in Emergency Procedures

PPA or External Resource fleets in this category will qualify as Planning Resources, so long as the associated capacity schedule only will be curtailed pro-rata, along with load in the source Balancing Authority, and only when the source Balancing Authority is operating under Emergency Procedures.

Under this situation and as an example, a PPA with a 1,000 MW export schedule from an external Balancing Authority with a 3,000 MW load will be curtailed pro-rata along with the load when the external Balancing Authority is operating under Emergency Procedures. That is, curtailment would take place three-quarters to firm load and one quarter to the firm schedule. This pro-rata treatment is triggered when MISO experiences emergency conditions at the same time as the external Balancing Authority.

C. Slice-of-System in a Balancing Authority that Coordinates Planning Reserve Qualifications and Shares Emergency Responsibilities with MISO's Balancing Authority

In addition to the slice-of-system treatment noted in category B above, a slice-of-system PPA or External Resource fleet can qualify as External Resources under this category, and MISO and the external Balancing Authority will share Load Shedding on a pro-rata basis in proportion to the load in the area under the Capacity Emergency, so long as the requirements of this category are met. This qualification category has several requirements for the host Balancing Authority:

1. It must be in MISO's Reliability Coordination Area.
2. It must share Operating Reserves with the MISO Balancing Authority.
3. It must have a Seams Operating Agreement with MISO containing several features. The Seams Operating Agreement must:
    a. Ensure that the host Balancing Authority has established planning reserve processes and criteria similar to MISO.
    b. Specify the actions that will be taken by both entities, MISO and the host Balancing Authority, during Emergency Procedures prior to implementing Load Shedding.

c. Specify that the host Balancing Authority will submit load estimates to MISO in a similar manner as submitted by other Load Serving Entities under Module E-1, provide generator testing data for all resources used to serve firm requirements of the host Balancing Authority, and provide transparency to such resource plans in the form of a FRAP or RBDC Opt Out, pursuant to Module E-1.

With these requirements in place, when both Balancing Authorities have exhausted other emergency operating actions and are in a firm load shedding event, load shedding is shared on a pro-rata basis in proportion to the load in the area under the capacity emergency.

For example, if the load of an external Balancing Authority in capacity emergency is 3,000 MW, and the load of the area in MISO in capacity emergency is 17,000 MW, then pro-rata load shed is 3/20 of the total for the external Balancing Authority and 17/20 for the area in MISO in the capacity emergency.

4.2.3.2 *External Resources - Qualification Requirements*

The following information will be required to register an External Resource:

- Demonstration of firm Transmission Service from the External Resource to the MISO border, and that;
- Firm Transmission Service has been obtained within MISO to deliver the Capacity Resource MWs seeking to be qualified from the External Resource(s) to the Load Zone CPNode within MISO. The Load Zone CPNode will be interpreted as the Local Balancing Authority (LBA) that MISO's OASIS reservation sinks in for Network Customers, or either;
    - The External Resource has Network Resource Interconnection Service under Attachment X.
    - The External Resource was accepted by the Transmission Provider and confirmed by a Network Customer as a designated Network Resource under the OASIS reservation process in place prior to either the initial effective date of the Energy Market in 2005 or that Transmission Owner's integration date.
- External Resources may procure firm Transmission Service (or utilize a Grandfathered Agreement) to meet the deliverability requirements.
    - Firm Transmission Service must either be in the form of a firm Point-to-Point (PTP) Transmission Service Request (TSR) or firm Network Integration Transmission Service (NITS) Scheduling Rights (SR).

        - NITS Scheduling Rights should reference the OASIS NITS Application Reference number or Assignment Reference number, and Resource Name of the Scheduling Right.
    - Firm Transmission Service (PTP TSR or NITS SR) must cover the entire applicable Season within the Planning Year in aggregate and be submitted in the MECT once approved. The resource is only deliverable to the LBA identified in the firm transmission study that grants the NITS SR or PTP TSR.
- Demonstrates that any External Resources or portions of External Resources being registered as Capacity Resources to serve the Load of the LSE are not otherwise being used as capacity resources in any other RTO/ISO or in another state resource adequacy program, is available in the event of an Emergency, and performs an annual GVTC test and reports the data via MISO's PowerGADS (or alternatively, submits a populated Non-GADS Performance Template to the MECT) by October 31 for returning resources and March 1st for new resources.
- External Resources that have been retired prior to the applicable Planning Year will not qualify as a Planning Resource.
- If External Resources used to meet Resource Adequacy Requirements retire or suspend during the Planning Year, they must be replaced effective with their change of status date.
- External Resources greater than or equal to 10 MW based on their GVTC must submit generator availability data to PowerGADS through the MISO Market Portal. This 10 MW threshold applies to individual generator sizes and not to contracted capacity values in PPAs and does not apply to Intermittent Resources or Intermittent Generation. Quarterly GADS Event and Performance Data must be submitted by the end of the month following the quarter (April for Q1, July for Q2, October for Q3, and January for Q4). The submitted data must pass Level 2 Validation without any errors. Units that fail to submit Level 2 Validated quarterly GADS data will be disqualified for participation in the PRA.
- External Resources less than 10 MW based upon GVTC that begin reporting GADS data must continue to report such information.
- Border External Resources and Coordinating Owner External Resources will be modeled, for LOLE and PRA purposes, in the LRZ where their firm Transmission Service crosses the MISO border. All remaining External Resources will be modeled in an External Resource Zone based on their associated External Balancing Authority.

- A PPA may qualify as a Planning Resource if it is valid for the entire Season or is unavailable for no greater than thirty-one (31) days in total for each Season it is being used. If an amended PPA or interim operating plan exists for the Season in which the MP seeks capacity credit, this will be used in calculating the capacity value provided the PPA or interim operating plan contains a capacity amount.
- For a PPA to qualify as a Capacity Resource, it must demonstrate that it complies with the requirements found in Section 69A.3.1.c of the Tariff.
- External Resources that are in service and registering as a Planning Resource for the first time must submit GVTC, and if greater than or equal to 10 MW based on GVTC must submit GADS data (if applicable) prior to being approved as a Capacity Resource.
- An External Resource registration needs to point to a Load Zone CPNode. Along with firm Transmission Service, this acts as verification of deliverability to the load being served by the External Resource.
- All External Resources being used as a Planning Resource are required to perform a real power test according to MISO's Generator Test Requirements and submit the GVTC data to MISO's PowerGADS no later than October 31 to qualify as a Planning Resource. The test shall be performed between September 1 and August 31 of the prior Planning Year and be corrected to the average temperature of the date and times of MISO's coincident seasonal peaks, measured at or near the generator's location, for the last 5 years, or provide past operational data that meets these requirements to determine its GVTC and submit its GVTC data to MISO's PowerGADS.
    - Resources that do not submit real power tests through GADS must submit a populated Non-GADS Performance Template via MECT as substitute. Existing resources must do this by October 31, while new resources should submit this template by March 1.
- External Resources undergoing gas conversion are not required to submit GVTC prior to returning.
- MPs who register a slice-of-system External Resource are responsible for ensuring proper outage and GVTC data is submitted to MISO through PowerGADS, unless a populated Non-GADS Performance Template is submitted via MECT for the External Resource. This information is due no later than October 31 of the prior Planning Year to qualify as a Planning Resource.

When to Perform and Submit a Generation Verification Test Capacity (GVTC)

- External Resources that qualified as Planning Resources for the current Planning Year shall submit their GVTC data no later than October 31 in order to qualify as a Planning Resource for the upcoming Planning Year. GVTC can be met by a real power test or past operational data must be provided during the test period between September 1 and August 31 prior to the upcoming Planning Year.
- A real power test is required to demonstrate a modification that increases the rated capacity of a unit, and then submit the revised GVTC to MISO by March 1. The initial GVTC should be submitted by October 31 prior to the Planning Year.
- A real power test is required when returning from a suspended state and the results of the GVTC should be submitted to MISO via the PowerGADS system.
- A real power test is required when any unit returns to MISO after an absence (including but not limited to, catastrophic events, or not qualified as a Planning Resource under Module E-1) or being qualified as a Planning Resource for the first time and must be submitted to MISO no later than March 1 prior to the Planning Year.
- The GVTC for a new External Resource is due before a Market Participant registers the new External Resource in the MECT and must be submitted by March 1 prior to the upcoming Planning Year.
- See Appendix J – GVTC Testing Requirements.
- External Resources with any new or untested additional capacity are eligible for the ICAP Deferral process as described in Section 4.5 ICAP Deferral.
- Reporting is accomplished through MISO's PowerGADS reporting system as described in MISO's Capacity Verification Manual, which is located on MISO's PowerGADS > Tools > Guide.

4.2.3.3 *Submission of new External Resource Registrations*

A Market Participant must register their new External Resource via the Registrations screen in the MECT by March 1 prior to the Planning Year. To guarantee new resources can be used in an LSE's FRAP or RBDC Opt Out, registrations must be submitted no later than February 15 prior to the Planning Year. The registering entity must be a Market Participant prior to registering an External Resource. Any entity that is not a Market Participant, but desires to register an External Resource, must contact the Client Services and Readiness team at MISO Help Center (https://help.misoenergy.org/) to become a Market Participant. The resource information submitted through the Registrations screen will require the Market Participant to

certify that the registration information is accurate, complete, and that the qualified MWs from the External Resource are not being registered by another party or used in another Balancing Area for capacity purposes. Appendix F, External Resources, contains the information that must be submitted by an MP through the MECT on the Registrations screen.

4.2.3.4 *Amendments to Accredited External Resource Registration Data*

The Market Participant can amend the registration for an External Resource for an upcoming Planning Year by providing MISO notification no later than March 1 if the original registration was submitted by the deadline.

4.2.3.5 *Renewal of External Resource for Subsequent Planning Years*

Renewed External Resource registrations must be submitted by February 1 prior to the upcoming Planning Year. MISO will review the renewed External Resource registration information for completeness and accuracy and ensure it complies with the qualification requirements for an External Resource. MISO will notify the Market Participant within 15 days after the renewed registration form has been submitted as to whether or not the External Resource has been accredited as an External Resource, or whether there are any deficiencies within the registration that must be corrected. If the External Resource is accredited as an External Resource, it will be given a unique name for tracking purposes and made available in the MECT for use by the MP during the applicable Planning Year.

4.2.3.6 *Review of Power Purchase Agreements*

Market Participants that have entered into power purchase agreement(s) for future Planning Years must provide to MISO the documentation that demonstrates the active power purchase agreement and MISO will make a preliminary determination of whether the agreement(s) would qualify as External Resources from power purchase agreement(s) as set forth in sections 69A.3.1.c.(i) through 69A.3.1.c.(v) of the Tariff. PPAs meeting these requirements are considered conforming. Market Participants must submit this documentation as part of the External Resource registration process and will be reviewed by MISO Resource Adequacy staff.

MISO Resource Adequacy and Legal staff will review the submitted agreement(s) and respond within 60 days of receipt of the request. MISO will provide written confirmation as to whether the contract meets the current Tariff requirements. Any such determination is based upon the existing version of the Tariff, which may be modified from time to time subject to the acceptance of such modifications by the Federal Energy Regulatory Commission. The Market Participant requesting an advanced review of their agreements will need to follow the procedures

applicable to the planning period for which such External Resource is intended to be relied upon to meet capacity requirements. This includes the provision of the appropriate GVTC and GADS data and other requirements then in effect for registering an External Resource as set forth in the Tariff and in Section 4.2.3 External Resources, to have the External Resource modeled in the MECT and qualified as a Capacity Resource. Any subsequent modifications to the PPA will be subject to a new confirmation determined by MISO regarding the portion of the term.

PPAs that do not meet the requirements of Section 69A.3.1.c (i) through (v) of the Tariff are considered non-conforming and must provide MISO with all the following information in order to qualify as a Capacity Resource:

a) The PPA was executed prior to October 20, 2008;
b) NERC regional entity has accredited the PPA to satisfy resource adequacy requirement provisions;
c) The PPA has provided reliable capacity to the Transmission Provider Region;
d) The supplier(s) of capacity in the PPA commit(s) to provide the capacity to an LSE in the Transmission Provider Region in a defined amount at a defined location based upon the supplier(s)' portfolio of generation assets;
e) Energy from the PPA cannot be interrupted for economic reasons and will only be interrupted for force majeure type conditions as a last resort during Emergency conditions;
f) Either the purchaser(s) or the supplier(s) of capacity in the PPA has committed to offer energy into the Day-Ahead Energy and Operating Reserves Market and all pre-Day-Ahead and the first post Day-Ahead Reliability Assessment Commitment processes for all periods for which Energy is available under the PPA, consistent with the must offer provisions in Section 69A.5;
g) The physical resource(s) backing the PPA are identified by the supplier of the PPA;
h) The portion of the physical resources backing the PPA has not otherwise been registered by any other entity as Capacity Resources in the MISO Region or as capacity resources in any other region; and
i) If the PPA is renewed, the PPA will be modified to comply with the terms of Section 69A.3.1.c (i) through (v) and (vii).

4.2.3.7 *External Resources – SAC Determination*

The Seasonal Accredited Capacity (SAC) for External Resources will be accredited based on seasonal GVTC values and seasonal Transmission Service, and seasonal $XEFORd_d$ (where applicable) values of such External Resources, are based on the methodology documented in

Appendix H – Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources. MISO will determine SAC values for External Resources that are Intermittent Generation as described in Section 4.2.1.4 – Dispatchable Intermittent Resources and Intermittent Generation Resource – SAC Determination. External Resources, from PPAs, with varying monthly capacity values will be credited with the monthly capacity value of the contract that corresponds with the seasonal peak Demand month, unless the resource(s) supporting the PPA are considered Intermittent Generation.

4.2.3.8 *Dually Connected Border External Resources*

Border External Resources can have interconnection facilities which connect to multiple LRZs. In those instances, these resources would be modeled in a single Local Resource Zone with which the resource has the greatest connectivity. Connectivity is measured using shift factor analysis that evaluates the generator's impact on flows on the Transmission System. The analysis is performed based on the latest models and input files used in support for the upcoming PRA. The study model is created by ramping the resource up and sinking the output to the MISO footprint. Line loadings in the connected LRZs are compared with those of the base model to determine the impact of the unit. The study will include consideration of tie line flow, impact on historical constraints, and impacts on the connected LRZs as a whole. Results of the analysis will be posted on MISO's website prior to the Planning Resource Auction. Details regarding the resource's impact on individual transmission lines will not be published.

4.2.3.9 *SAC Determination – Fixed Capacity PPA*

Market Participants may register External Resources where the supplier has guaranteed delivery of a fixed MW value of capacity. Market Participants must contact MISO Resource Adequacy for a review of this type of PPA. Subsequent approval of such contracts by MISO results in an accreditation of XEFORd and the SAC will be set equal to the ICAP of the External Resource registered. PPAs backed by an Intermittent Resource do not qualify as this type of PPA.

4.2.3.10 *SAC Determination – Full Requirements PPA*

Market Participants may register External Resources to model a full requirements power purchase agreement with a counterparty. This results in the ICAP of the External Resource being increased for the Planning Reserve Margin, applicable Transmission Losses, and the Forced Outage rating. This adjusted ICAP will be used in the External Resource's SAC and Must Offer calculations. Market Participants must contact MISO Resource Adequacy for a review of these types of contracts.

$$ICAP_{Adjusted} = \sum_{GADS\ Resources} \left(\frac{ICAP_i\ x\ (1 + PRM_{LRZ})\ x\ (1 + TL_{LBA})}{(1 - XEFORd_i)} \right)$$

Where:
$ICAP_{adjusted}$: PPA Percent x Resource ICAP or amount owned by MP
$XEFORd_i$: XEFORd of selected GADS resource
PRM_{LRZ}: Planning Reserve Margin Requirement for the Local Resource Zone that the External Resource will be serving Load in
TL_{LBA}: Transmission Losses for the LBA that the External Resource will be serving load in

4.2.4 DRR Type I and Type II – Qualification Requirements

Demand Response Resources (DRR) Type I and Type II may qualify as Capacity Resources provided that the following criteria are met. (All references to generation availability and testing in this section pertain to DRRs backed by generation.):

- DRR Type I and Type II backed by behind the meter generation (that are not Intermittent Generation and Dispatchable Intermittent Resources) must submit generator availability data (including, but not limited to, NERC GADS) into the PowerGADS tool through the Market Portal.
- DRR Type I and Type II must demonstrate seasonal capability on an annual basis. Verification of DRR Type I and Type II capability will be in accordance with the guidelines established by the applicable Regional Entity, unless superseded by specific verification guidelines set by the applicable state authorities.
- DRRs may qualify as Capacity Resources if they meet the same qualification requirements in Section 4.2.1.1 Qualification Requirements.
- DRRs must demonstrate seasonal corrected GVTC on an annual basis as described in Section 4.2.1.1 Qualification Requirements. See Appendix J – GVTC Testing Requirements for additional details.
- DRRs with any new or untested additional capacity are eligible for the ICAP Deferral Process as described in Section 4.5 ICAP Deferral.

4.2.4.1 *DRR Type I and Type II – SAC Determination*

MISO will determine the SAC value for each Demand Response Resources backed by behind the meter generation based on an evaluation of GVTC value and XEFORd values of such generator. If such behind the meter generation facility is interconnected to the Transmission

System, MISO will consider the type and volume of the interconnection service when determining the Unforced Capacity. If GADS data is not required to be submitted by the MP, then a class average EFORd of the resource type will be used to calculate the forced outage rate (XEFORd) for the resource.

A XEFORd value of zero will be applied to all DRR that interrupts or controls load but is not backed by behind the meter generation.

SAC MW options for units with derates prior to the GVTC test date is further explained in Appendix J.4 – Generation Verification Test Capacity During a Derate.

4.2.5 Load Modifying Resource Obligations and Penalties

Load Modifying Resources (LMRs) consist of Demand Resources (DR) and Behind the Meter Generation (BTMG). A Demand Resource shall mean a resource registered with MISO defined as Interruptible Load or Direct Load Control Management and other resources that result in additional and verifiable reductions in end-use customer Demand during an Emergency.

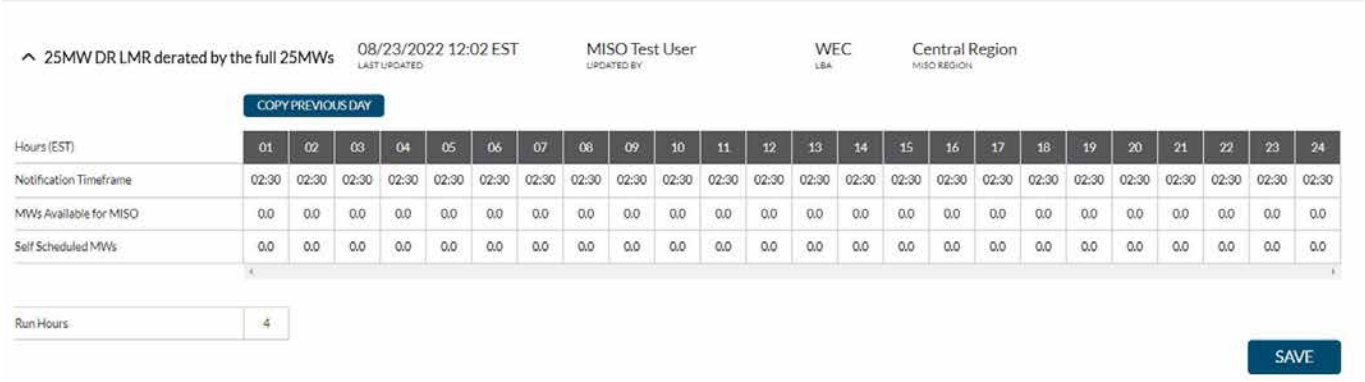
Behind the Meter Generation is defined as a generation resource used to serve wholesale or retail load that is located behind a Load Zone CPNode. BTMG is not included in MISO's Setpoint Instructions. An LMR that exclusively relies only on a generator to accomplish the load reduction and remains synchronously connected to the grid, or injects onto the grid, must register as a BTMG. In scenarios where LMRs represent an interruptible program that disconnects the load from the grid and activates a local backup generator to provide power on an asynchronous island, independent from the grid, a DR registration may be used.

BTMG and DR requirements to qualify as an LMR are covered in Sections 4.2.6 - BTMG Qualification Requirements and 4.2.7 - Demand Resource (DR) Qualification Requirements of this BPM.

LMRs differ from Capacity Resources in that they do not have a must offer requirement, however, they must be available for use within MISO as defined in this BPM during Emergency events (including capacity and transmission events) declared by MISO unless unavailable because of maintenance, Force Majeure or other reasons outlined in this BPM. LMRs communicate to MISO their availability through the Demand Side Resource Interface (DSRI). MPs with LMR assets must provide updates to availability specific to each LMR that is listed in

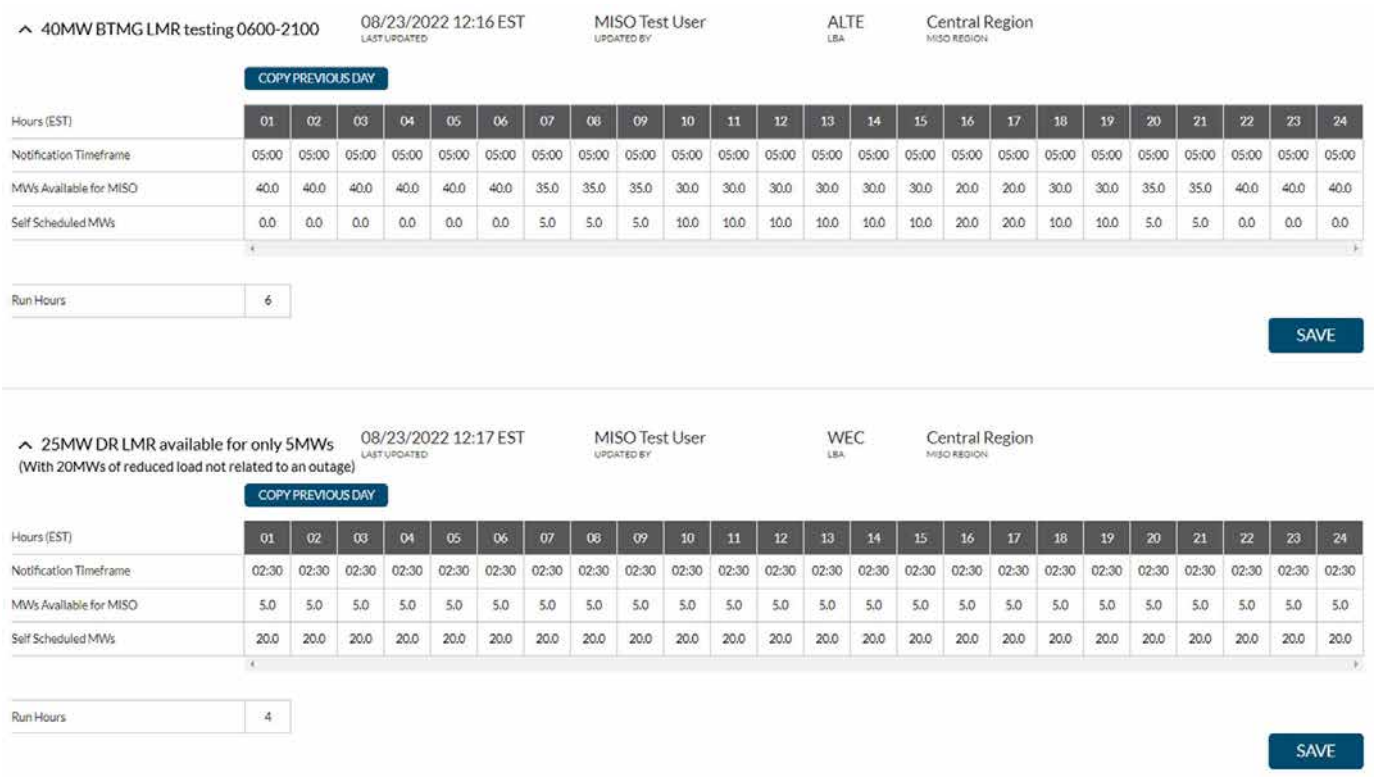
the DSRI. The DSRI is populated with the monthly Demand Reduction Capability Forecast values provided at the time of the LMR registration. If the LMR partially clears, the value in the DSRI will be adjusted by the % of the total seasonal ZRCs a resource clears in a Planning Resource Auction (PRA) or used in a Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out times the Demand Reduction Capability Forecast. If the LMR only partially clears the PRA, MISO will grant an opportunity to adjust the monthly MW values to account for the cleared LMR ZRCs. It is critical that LMR availability always be current as the Scheduling Instructions (dispatch directives) and ultimately performance and availability review will utilize the information in the DSRI at the time the Scheduling Instruction is issued and how the Market Participant responds to the Scheduling Instruction. If the LMR is on any type of derate, outage or otherwise not available, the LMR availability should be adjusted by decrementing the availability in the DSRI by reducing the “MWs available for MISO” for the affected LMR. The following are two examples of a 40 MW BTMG LMR derated by 25 MWs, and a 25 MW DR LMR derated by the full 25 MWs and is completely in outage:





If a BTMG is scheduled to be deployed by the MP, the “Self Scheduled MWs” section in the DSRI should be increased for LMR MWs that are scheduled to be deployed and the “MWs available for MISO” amount should be reduced to reflect the remaining MWs available for additional MISO deployment. If a DR is scheduled to be deployed by the MP, or it simply has

reduced load for the end-use at the facility then the “Self Scheduled MWs” section in the DSRI should be increased for LMR MWs that are scheduled to be deployed or has been already reduced, and the “MWs available for MISO” amount should be reduced to reflect the remaining MWs available for additional MISO deployment. Derates and outages that occur where load is not reduced should not be entered as “MWs available for MISO” or “Self Scheduled MWs”. The following are two examples of a 40 MW BTMG LMR coming online for a test between 0600 – 2100, and a 25 MW DR LMR available for only 5 MWs for MISO because there is reduced load at the facility:



40MW BTMG LMR testing 0600-2100 — LAST UPDATED: 08/23/2022 12:16 EST — UPDATED BY: MISO Test User — LBA: ALTE — MISO REGION: Central Region

COPY PREVIOUS DAY

Hours (EST)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Notification Timeframe	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00
MWs Available for MISO	40.0	40.0	40.0	40.0	40.0	40.0	35.0	35.0	35.0	30.0	30.0	30.0	30.0	30.0	30.0	20.0	20.0	30.0	30.0	35.0	35.0	40.0	40.0	40.0
Self Scheduled MWs	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	20.0	10.0	10.0	5.0	5.0	0.0	0.0	0.0

Run Hours: 6

SAVE

25MW DR LMR available for only 5MWs (With 20MWs of reduced load not related to an outage) — LAST UPDATED: 08/23/2022 12:17 EST — UPDATED BY: MISO Test User — LBA: WEC — MISO REGION: Central Region

COPY PREVIOUS DAY

Hours (EST)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Notification Timeframe	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30	02:30
MWs Available for MISO	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Self Scheduled MWs	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

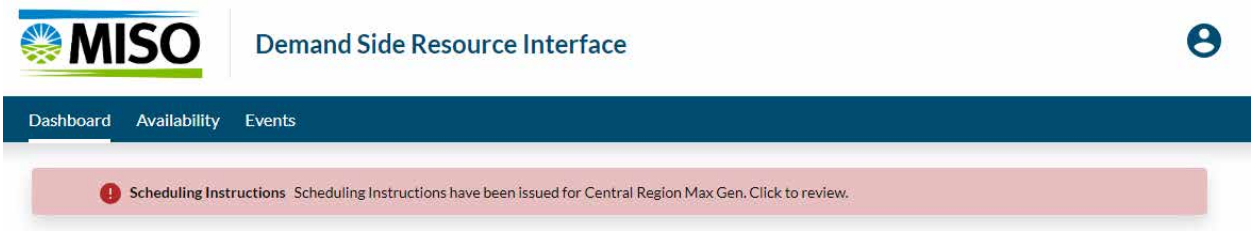
Run Hours: 4

SAVE

For specifics on DSRI functionality, please see the MP LMR Users Guide located in the Learning Center.

If an Emergency is declared by MISO that requires LMR deployment, MISO will issue Scheduling Instructions in the DSRI using the LMR availability information (“MWs available for MISO” and “Self Scheduled MWs”) provided by MPs. Self Scheduled MWs are included in a Scheduling Instruction to ensure that the MW deployed voluntarily by an MP continue to be deployed if required during an Emergency. Self Scheduled MWs are not subject to notification

times because they are already planned to be performing at those levels, as decided by the MP; however, MWs available for MISO are subject to notification times whenever Scheduling Instructions are created. The LBA and the MP will receive a notification of the Scheduling Instructions via a MISO Communications System (MCS) message (LMR Implementation MCS message type). MPs will also receive a Scheduling Instructions event banner within the DSRI application as shown below (with audible alerts until acknowledged).



Market Participants with LMRs must have personnel operating on a 24x7 basis that can receive and respond to MCS messages, Operator Interface Declarations and Messages, and LMR Scheduling Instructions events in the DSRI. The MP will need to acknowledge receipt of the Scheduling Instruction and update the remaining availability, if any, of the LMR(s) being used to meet the Scheduling Instruction in DSRI to reflect the MW amount available in the specified time(s). This update and acknowledgement should be done within one (1) hour of receiving the Scheduling Instruction from MISO. Also, before the Emergency deployment, the MP that registered the LMR(s) should submit the specific designation of LMRs and associated MWs used to meet the total MWs contained in the Scheduling Instruction via the Resource Deployment tab of the LMR Scheduling Instruction Event in the DSRI.

MPs that report LMR availability (including self-scheduled MWs) in the DSRI that is less than the performance obligation based on the MW value that is being used to meet RAR, may be requested to provide documentation and/or metering data to MISO for the dates and hours that MISO declared an Emergency. Meter data for the LMRs used to meet the MWs requested in the Scheduling Instruction mustbe uploaded in the Demand Response Tool within 103 days of the Emergency event or as requested by MISO.

MISO will not violate registration parameters (e.g., notification time) and real time availability updates provided by MPs when issuing a Scheduling Instruction. MISO does, however, rely on real time availability updates provided by MPs when issuing a Scheduling Instruction.

4.2.5.1 *LMRs with Dual Registration*

Market Participants that register LMRs are eligible to also register in the Energy market as Emergency Demand Resources and/or Demand Response Resources.

LMRs that have some capability registered as Emergency Demand Response (EDR) or Demand Response Resource (DRR) should adjust their availability in DSRI to reflect net LMR MWs available to MISO (e.g. decrement total LMR capability by EDR offer amount and DRR cleared Day-Ahead or pending Real Time offer). It is the responsibility of the Market Participant to ensure no double counting of MWs offered across the dual registration types. Double counted MWs may be subject to underperformance penalties.

1.1.1.1.3 4.2.5.1.1 LMRs Also Registered as Demand Response Resource (DRR)

DRR Type I and Type II that have converted SAC to ZRCs which were used to meet seasonal Resource Adequacy Requirements (RAR) are categorized as Capacity Resources under Module E-1 (Section 69A.3.1.b) and therefore are not LMRs. However, a DRR that does not convert all its associated SAC may also register the remaining SAC of the resource as an LMR. In this case, the SAC converted and used to meet RAR under the LMR designation would follow the respective LMR requirements and likewise the DRR SAC if converted and used to meet RAR would carry the must offer requirement. The combined SAC converted to ZRCs between the DRR designation and the LMR designation cannot exceed the assigned SAC value of the singular resource.

1.1.1.1.4 4.2.5.1.2 LMRs Also Registered as an Emergency Demand Resource (EDR)

A resource may qualify as an Emergency Demand Response (EDR) under Schedule 30 to participate in the Energy market regardless of whether it qualifies as an LMR under Module E-1. An LMR may also dually register and qualify as an EDR. In the case of a dual LMR / EDR registration, the resource may be dispatched as an EDR when there is a pending EDR offer (EDR offers are made daily). If the resource is not dispatched as an EDR, it maintains its LMR obligations, and its performance will be evaluated as such. Being dual registered requires the resource to meet the most stringent of the two designations' requirements. Also, the tolerance band allowed for an EDR does not apply when dual registered. MISO will not assign LMR penalties to Emergency Demand Response (EDR) resources that have already been assessed penalties under Schedule 30 of the Tariff.

For more information regarding the dual registration of LMRs as EDRs, please see Section 6.4 of BPM-026 Demand Response.

1.1.1.2 4.2.5.2 LMR Performance Obligations

The registered capacity of accredited LMRs that has been converted to ZRCs and has cleared in the PRA must be available as outlined above for use in the event of an Emergency declared by MISO. MISO will populate the DSRI with the monthly Demand Reduction Capability Forecast values provided at the time of the LMR registration. If the LMR partially clears, the value in the DSRI will be adjusted by the % of the total seasonal ZRCs a resource clears times the Demand Reduction Capability Forecast. MPs should keep these values up to date to ensure the availability is accurate as Scheduling Instructions will be based on the LMR Availability in the DSRI. The Available MWs for MISO should be consistent with the availability indicated in the LMR's registration. A Market Participant utilizing LMRs to meet Resource Adequacy Requirements will be subject to the penalties described in Section 69A.3.9 of the Tariff if the LMR is included in the Market Participant's response to Scheduling Instructions and the LMR fails to respond.

A Demand Resource (DR) must respond with an amount greater than or equal to the target level of load reduction or reduce Demand at or below the registered firm service level. DRs that registered with a Firm Service Level Measurement & Verification methodology that partially clear, will have the uncleared portion of the resource added to their registered firm service level (FSL) when evaluating performance. A BTMG must provide the target level of generation increase as indicated on the Market Participant's Resource Deployment tab of the LMR Scheduling Instruction Event in the DSRI when responding to Scheduling Instructions Combined, the Market Participant's DR and BTMG responses must meet the total MWs contained in their Scheduling Instruction.

This "target" level MW is indicated by the MP via the DSRI's Resource Deployment tab of the LMR Scheduling Instruction Event which outlines which LMRs were utilized and the associated MW levels to meet the total MWs contained in the Market Participant's Scheduling Instruction. An LSE shall be assessed the costs that were otherwise incurred to replace the Energy deficiency at the time the LMR was dispatched.

MISO will not assign LMR penalties to Emergency Demand Response (EDR) resources that have already been assessed penalties under Schedule 30 of the Tariff. LMR values entered in the DSRI availability will also be considered when evaluating whether target levels of generation

increase, or Load reduction have been met. For more information regarding the performance assessment of an LMR, please see BPM-026 Section 6.2.

The operators of LMRs that improperly report to MISO that an LMR is unavailable in the DSRI prior to receiving a Scheduling Instruction or the LMR does not respond when included in a Market Participant's response to Scheduling Instructions will have an opportunity to provide documentation of the specific circumstances that would justify exemption from such penalties. A penalty will not be assessed for any portion of the target level of Load reduction for a DR, or target level of generation increase for a BTMG, which had already been accomplished for other reasons (*i.e.*, for economic considerations, self-scheduling at or above the amount of BTMG committed in a Planning Resource Auction, or local reliability concerns) and properly reflected in the hourly availability in the DSRI for each resource. Likewise, for certain LMRs that are temperature dependent (*e.g.*, a Demand Resource program involving air conditioning load), the target level of Load reduction or target level of generation increase may be adjusted and the hourly availability in the DSRI should be updated to properly reflect the anticipated capability of the resource.

4.2.6 BTMG Qualification Requirements

MPs with BTMGs can qualify as LMRs by:

- Submitting monthly availability (in megawatts) and notification time (in hours) for the upcoming Planning Year.
- Intermittent BTMG (e.g., solar, wind, run-of-river hydro, etc.) are exempt from submitting the additional documentation for monthly availability and notification time as they are not dispatched via the DSRI.
- Confirming through the registration process such BTMG can be available to provide Energy with no more than 6 Hours advance notice from MISO or the LBA and sustain Energy production for a minimum of four (4) consecutive Hours.
- Confirming through the registration process that the BTMG is capable of being interrupted and available at least the first (5) times as needed during the Summer and Winter and at least the first (3) times as needed during the Spring and Fall by MISO or the LBA for emergency event purposes, consistent with the registration information of the physical capability of the BTMG.
- Confirming that the BTMG is equal to or greater than 100 kW (an aggregation of smaller resources that can produce Energy may qualify in meeting this requirement if located in the same LRZ).

- Behind the Meter Generation must demonstrate GVTC on an annual basis as described in Sec. 4.2.1.1 Qualification Requirements. See Appendix J – GVTC Testing Requirements for additional details.
- Behind the Meter Generation with any new or untested additional capacity are eligible for the ICAP Deferral Process as described in Sec. 4.5 ICAP Deferral.
- Submitting generator availability data (including, but not limited to, NERC GADS) into a database through the Market Portal for non-intermittent BTMG greater than or equal to 10 MW based on GVTC. Non-intermittent BTMG less than 10 MW based upon GVTC that begin reporting generator availability data must continue to report such information. Behind the Meter Generation that is an intermittent resource must submit information in accordance with Section 4.2.1.3 Intermittent Generation and Dispatchable Intermittent Resources - Qualification Requirements. Quarterly GADS Event and Performance Data must be submitted by the end of the month following the quarter (April for Q1, July for Q2, October for Q3, and January for Q4). The submitted data must have passed Level 2 Validation without any errors. Units that fail to submit Level 2 Validated quarterly GADS data will be disqualified for participation in the PRA.
- For wind resources being registered as BTMG, the following information is required:
    - Resources with commercial operation history of metered values during at least one Season would submit metered values in MW terms for all Hours in the test period.
    - Resources with no commercial operation history of metered values during the Season would receive class average for each Season within the Initial Planning Year.
- For solar resources being registered as BTMG, the following information is required:
    - Resources with at least 30 consecutive days of metered values for that Season would submit metered values in MW terms for all hours in the test period.
    - Resources with less than 30 consecutive seasonal days of metered values would receive class average for the Seasons within the Initial Planning Year.
- For storage resources that do not report to GADS (including but not limited to, batteries, flywheels, compressed air, and pumped storage) being registered as BTMG, the following information is required:
    - Resources with commercial operation history of metered values during no less than 30 consecutive days in a specific Season would submit historic

availability for the top 8 coincident system peak hours for a minimum of one and a maximum of three of the most recent applicable Planning Years for each Season.

- Resources with less than 30 consecutive days of metered values during a Season would receive class average accreditation for the Initial Planning Year.

- Internal purchase power agreements (PPAs) will not be qualified by MISO.
- BTMGs that have been retired prior to the Season will not qualify as a Planning Resource.
- If BTMGs used to meet Resource Adequacy Requirements retire or suspend during the Planning Year, they must be replaced effective with their change of status date.

4.2.6.1 *Submission of New BTMG Registrations*

An MP must register its new BTMG via the Registration screen in the MECT by March 1 prior to the Planning Year. The registering entity must be an MP prior to registering a BTMG. In order to guarantee new Resources can be used in an LSE's FRAP or RBDC Opt Out, registrations should be submitted no later than February 15 prior to the Planning Year. An entity that is not a MP, but desires to register a BTMG, must contact the Customer Registration team at register@misoenergy.orgMISO Help Center (https://help.misoenergy.org/) to become a MP. During the registration process the MP will be required to certify that the registration information is accurate, complete, and that the qualified MWs from the BTMG are not being registered by another party. Appendix E contains the information that must be submitted by an MP through the MECT registration screens. MISO will review the BTMG registration information for completeness and accuracy and ensure it complies with the qualification requirements for BTMG. MISO will endeavor to notify the MP within 15 days after the registration form was submitted regarding whether the BTMG has been accredited as an LMR, or whether there are any deficiencies that must be corrected. If the BTMG is accredited as an LMR, it will be given a unique name for tracking purposes and made available in the MECT screens for use by the MP.

4.2.6.2 *Termination of BTMG Accredited as LMR*

Because BTMGs need to be accredited seasonally, the "Effective Stop Date" will default to the last day of the applicable Season.

4.2.6.3 *Amendments to Accredited BTMG Registration Data*

The Market Participant can amend the registration for a BTMG for an upcoming Planning Year by providing MISO notification no later than March 1 if the original registration was submitted by February 1.

The Market Participant may modify any of the non-end date information submitted in the registration, which may affect the BTMG's qualification, including, but not limited to, a change in operation, or either an increase or decrease in MW capability. The Market Participant shall submit new or amended registration information in the MECT by March 1 prior to a Planning Year for MISO to determine whether the resource still qualifies as a BTMG. The Market Participant will still need to provide MISO with a GVTC by the original test date as outlined in the BPM. Any modifications in the capability of an existing BTMG must have updated test and registration information submitted to MISO via the MECT by March 1.

Renewal of BTMG for subsequent Planning Years

BTMG must be reviewed for accreditation as an LMR on an annual basis. An MP can request renewal of BTMG accreditation for subsequent Planning Years through the MECT registration screens. Renewal of BTMG must be requested by February 1^{sr} prior to the Planning Year.

NOTE: BTMGs must submit GVTC and/or operational data by the October 31 deadline, per Section 4.3, to have SAC values determined. MISO will review the revised BTMG registration information for completeness and accuracy and ensure it complies with the qualification requirements for BTMG. MISO will endeavor to review the registration for approval within 15 days after the revised registration form was submitted to determine whether the BTMG has been accredited as an LMR, or whether there are any deficiencies that must be corrected. If the BTMG is accredited as an LMR, then it will be given a unique name for tracking purposes and be made available in the MECT screens for use by the MP during the applicable Planning Year.

4.2.6.4 *Behind the Meter Generation (BTMG) – SAC Determination*

The SAC value for a BTMG is based on an evaluation of the applicable type and volume of interconnection service, GVTC (or historical output at peak if intermittent), line losses if not interconnected to MISO, and XEFORd value of such BTMG.

BTMG that are intermittent resources will have their SAC determined consistent with the methodology described for similar resource fuel types as described in Section 4.2.1.3,

Intermittent Generation and Dispatchable Intermittent Resources – Qualification Requirements, through 4.2.1.7, Other Intermittent Generation and Dispatchable Intermittent Resources.

4.2.6.5 *BTMG Deliverability*

Each BTMG resource owner must coordinate with their Distribution Provider (DP) to ensure local distribution service for the BTMG resource to qualify as an LMR type Planning Resource for participation in the PRA. The majority of BTMG is interconnected at distribution-level voltage; however, it is possible for BTMG to be interconnected at transmission-level voltage. Additionally, MPs with BTMG must coordinate with their LSE, DP, and Transmission Owner (TO) to determine eligibility to participate in the PRA. This section will outline the roles and responsibilities of an LSE, DP, TO, and MISO for an individual BTMG to participate in the PRA including specific methodologies available to the BTMG MP to demonstrate deliverability. Responsibilities of an entity may differ depending if the Point of Interconnection is on the distribution system or transmission system and will be noted.

1.1.1.2.1 4.2.6.5.1 Roles and Responsibilities to Determine Eligibility for PRA Participation

Additional descriptions of the role and responsibility of each entity is below. The MP owning a BTMG is responsible for providing an attestation to MISO that proper coordination has occurred with each entity.

Load Serving Entity (LSE): Collaborate with BTMG MP to establish eligibility for a BTMG to participate in the wholesale market (e.g., PRA) in accordance with the relevant state regulatory framework.

Distribution Provider (DP): Ensure reliability of distribution system and assess access to the transmission system. Typically, the DP completes an interconnection study to assess the reliability impacts on the distribution system. The DP is responsible for determining engineering studies, facility upgrades, and/or agreements required to permit access of a BTMG to the transmission system.

Transmission Owner (TO): Determine when the transmission system is utilized by a BTMG to serve load and coordinate with the DP and MISO on engineering and facility studies as appropriate. The TO typically ensures studies are completed, per their direction, to ensure

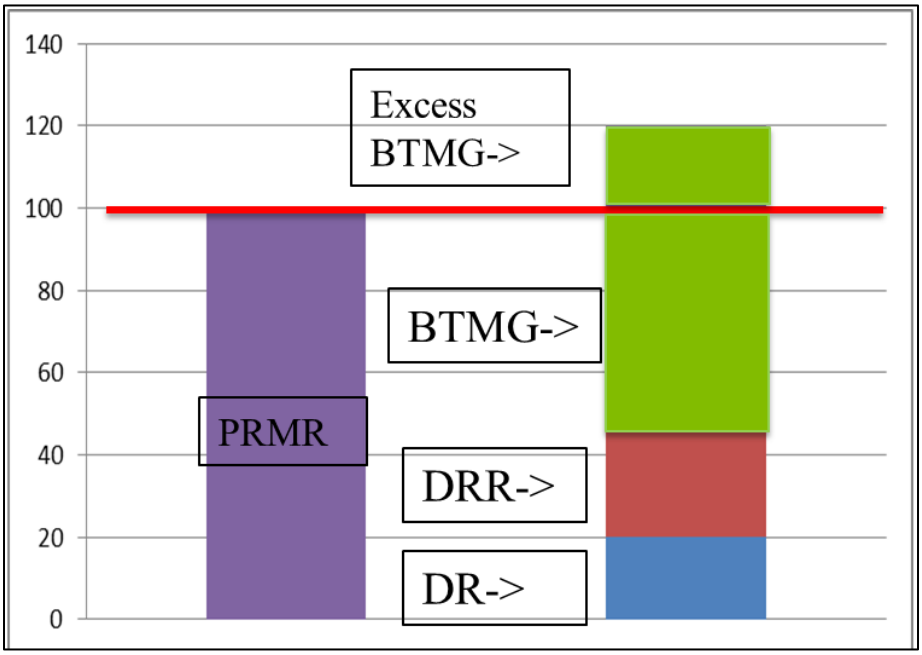
transmission facilities (including other interconnected generators) are not impacted by an additional injection of Energy from a BTMG onto the transmission system. Studies will vary depending on the specific Point of Interconnection.

MISO: Accountable for ensuring BTMG has demonstrated deliverability for use in the PRA (additional details below) and ensuring the BTMG MP has provided attestation of coordination with the LSE, DP, and TO.

1.1.1.2.2 4.2.6.5.2 Definition of "Excess BTMG"

Deliverability of BTMG is established relative to the portfolio of total BTMG assets owned or under contract by an LSE in a singular LBA. A BTMG that utilizes the transmission system or a volume of BTMG exceeding an LSE's "net PRMR" in a singular LBA is considered "Excess BTMG" and will need to demonstrate deliverability utilizing an option described in Sec. 4.2.6.5.3 – Options for BTMG to Demonstrate Deliverability. It is possible for the volume of "Excess BTMG" SAC to be less than the SAC of a singular BTMG. In this instance, the MP is eligible to demonstrate deliverability for a portion of a generator or multiple generators. MISO will collaborate with the BTMG MP to establish the specific Point of Injection onto the Transmission System.

The term "net PRMR" is utilized rather than Initial PRMR because it is possible for an LSE to have a portfolio of ZRCs that include registered Demand Resources (DR) and Demand backed Demand Response Resources (DRR_{demand}) that reduce the expected peak Demand by an LSE and result in a net injection onto the Transmission System. Net injection onto the Transmission System is "Excess BTMG" as represented by the figure below.



1.1.1.2.3 4.2.6.5.3 Options for BTMG to Demonstrate Deliverability

Below are the multiple options for a MP with BTMG to demonstrate deliverability:

Option 1: BTMG utilizing the distribution system to offset Initial PRMR. BTMG used to offset an LSE's load utilizing only the distribution system is considered deliverable up to the volume of "net PRMR" of an LSE in a singular LBA. No additional studies are required.

Option 2: Firm Transmission Service. The MP of the BTMG can apply for Point-to-Point or Network Integration Transmission Service using a type of "Monthly" or "Yearly" depending on the Point of Interconnection (POI). A BTMG with a POI on the distribution system can utilize "Yearly" type firm Transmission Service to facilitate a system impact study, if required. A BTMG with a POI on the Transmission System can use "Monthly" or "Yearly" type of firm Transmission Service since an ERIS study would have been completed. A Network Customer may designate a BTMG as a Network Resource through OATI OASIS utilizing firm Transmission Service.

Option 3: Interconnection Service of NRIS or External NRIS (E-NRIS). The MP of the BTMG can enter the Generator Interconnection Queue and apply for NRIS or E-NRIS. An MP can apply for E-NRIS with a BTMG that has a POI on the distribution system. A BTMG with a POI on the Transmission System is eligible for NRIS. The BTMG would be part of a MISO Definitive

Planning Phase (DPP) study and required to submit an application and deposits as appropriate. Refer to BPM-015 Generation Interconnection for additional details.

Option 4: Historical determination of deliverability. BTMG used to offset an LSE's Initial PRMR located in the same LBA and historically demonstrated deliverability prior to integration with MISO, as accepted by MISO or a Transmission Owner, is considered deliverable. Individual BTMGs may have demonstrated deliverability by confirmation by a Network Customer as a designated Network Resource or completion of a Market Transition Deliverability test prior to an LSE joining MISO.

4.2.6.6 *Measurement and Verification of BTMG*

See Attachment TT of the Tariff and BPM-026 Demand Response.

4.2.7 Demand Resource (DR) – Qualification Requirements

MPs with DR can qualify the DR as an LMR by:

- Submitting monthly availability (in megawatts) and notification time (in hours) for the upcoming Planning Year.
- Registering the reduction capability of the DR excluding transmission losses, consistent with conditions at MISO's seasonal Coincident Peak.
- Confirming through the registration process such DR can be available to reduce Demand with no more than six (6) Hours advance notice from MISO or the LBA and sustain the reduction in Demand for a minimum of four (4) consecutive Hours.
- Confirming through the registration process that the total DR load reduction is not exclusively accomplished and dependent on the dispatch of a BTMG owned or operated by a wholesale or retail customer.
- Confirming through the registration process that the DR is equal to or greater than 100 kW (an aggregation of smaller resources within an LBA that can reduce Demand may qualify in meeting this requirement if they are within the same Load Zone CPNode).
- Confirming through the registration process that the DR is capable of being interrupted at least the first (5) times during the Summer and Winter and at least (3) times as needed during the Spring and Fall as needed by MISO or the LBA for Emergency purposes, consistent with the registration information of the physical capability of the DR.

- Confirming that the Market Participant has the authority to reduce demand using the DR. In the case of an ARC registering a DR, this would include uploading into the MECT registration a copy of the signatory pages between the ARC and the load asset customers. MISO does not accept an attestation by the ARC as an artifact to demonstrate the Market Participant possesses ownership or equivalent contractual rights in a Demand Resource.
- Documenting in the MECT the DR's capability to reduce demand to a targeted Demand reduction level or firm service level at the MISO seasonal Coincident Peak. All DR owners should demonstrate Demand reduction capability of at least 50% of their registered capability via Scheduling Instructions from a MISO Event or conduct a real power test for accreditation and provide a procedure document detailing the steps followed to implement the Demand reduction. Additional details regarding the demonstration of Demand reduction capability are in section 4.2.7.8 below. If a DR opts not to demonstrate Demand reduction capability for accreditation, one of the following options may be used for accreditation:
    - Provide documentation from the state that has jurisdiction accrediting the DR program. Additionally, if not specified in the state documentation, provide documentation supporting the capacity of the DR being registered.
    - Verification from a third-party auditor that is unaffiliated with the MP that documents the DR's ability to reduce to the targeted Demand reduction level or firm service when called upon to perform by MISO or the LBA.
    - If past performance data does not exist to demonstrate Demand reduction capability, then a mock test can be provided. The mock test should show:
        - The Demand resource's seasonal meter data from the previous planning year. New resources can provide documentation supporting estimated seasonal Demand.
        - Documentation showing a mock execution or drill of implementing the Demand resource without implementing the Demand reduction.
    - Accreditation documentation, including past performance data, mock test, third party audit, or state commission documentation, supporting the MW being registered should be from the calendar year (January 1 to December 31) immediately preceding the applicable Planning Year. Renewed registrations must submit revised documentation on an annual basis for accreditation.
- If the DR opts out of demonstrating Demand reduction capability via Scheduling Instruction or a real power test, then the DR will be subject to three (3) times the

underperformance penalties during a MISO Emergency event. Specifically, undelivered MWs will be penalized at a rate of LMP times three (3), rather than LMP. The RSG component of the penalty will not be multiplied times three (3), nor will any capacity penalties or lost capacity revenue. Only a DR with a regulatory restriction will be eligible to waive the penalty.

- Documenting in the MECT the Measurement and Verification (M&V) protocol that will be used to determine if such DR performed when called upon by MISO or the LBA during Emergencies. A DR that is sensitive to temperature changes must identify the extent of such temperature sensitivity with sufficient detail to enable MISO to verify whether the DR would be subject to the penalties set forth in Section 69A.3.9 of the Tariff. Temperature sensitivity must at a minimum include identifying the measure used for temperature changes and elasticity of the LSE's load to weather. An MP that registers a DR as a Planning Resource must confirm that the DR is able to meet all of the requirements in Section 69A.3.5 of the Tariff.
- DR that has been retired prior to the Planning Year will not qualify as a Planning Resource.
- For every season an MP registers a DR, the underlying customer accounts for ARC registrations must be registered under a single DR registration name for every season in which it is registered. The registered capability and tested status can be different for each Season.

4.2.7.1 *Demand Resource Registration Process*

DR can be registered to be used as a Planning Resource and receive SAC MW that can be converted to ZRCs.

Submission of new DR Registrations

An MP may register new DR via the Registration screen in the MECT by March 1 prior to the Planning Year. To guarantee new Planning Resources can be used in an LSE's FRAP or RBDC Opt Out, registrations of a DR intended to be used in a FRAP or RBDC Opt Out should be submitted no later than February 15 prior to the Planning Year. The registering entity must be an MP prior to registering a DR. Any entity that is not a MP, but desires to register a DR, should contact the Customer Registration team at MISO Help Center (https://help.misoenergy.org/) to become a MP. The MP will be required to certify that the registration information is accurate, complete, and that the qualified MWs from the DR are not being registered by another party. Appendix D – Registration of DRs contains the information that must be submitted by an MP through the MECT Registrations screen. MISO will review the DR registration information for

completeness, accuracy, and ensure it complies with the qualification requirements for DR. MISO will endeavor to review the registration within 15 days after the registration was submitted to determine whether the DR has been accredited as an LMR, or whether there are any deficiencies that must be corrected. If the DR is accredited as an LMR, it will be given a unique name for tracking purposes and made available in the MECT screens for use by the MP.

Submission of ARC (Aggregator of Retail Customers) **LMR Registrations**

The LBA and LSE will verify the following:

- LBA name
- LSE name
- RERRA name
- CPNode name
- End use customer account number
- Meter identification number(s)
- Maximum level of participation (MWs)
- Address of the assets in the ARC registration.

The maximum level of participation for each asset within an LMR resource should be no greater than that asset's load as evaluated by the LBA or LSE.

The assets' load should be calculated as the average load of the assets up to the last three years' seasonal MISO system peak hours. One or two years of load data may be used if the full three years is not available, but an explanation must be submitted as to why the full three years are not available. For example, a new facility that has only been in operation for two years would be a reason less than three years of load data is accepted.

It is the responsibility of the Market Participant to provide an explanation which demonstrates why historical average peak load is not representative of expected future peak load for an asset and propose an alternative method of calculating the maximum level of participation for review and approval by MISO and the LSE.

If during registration review, the LBA or LSE is identified to be incorrect for assets in a registration, the registration will be rejected. The Market Participant can submit a new registration once the Market Participant has identified the correct LBA or LSE. This will restart the review timeline for MISO, the LBA, the LSE, and RERRA.

Any modification to the assets during the review will restart the review timeline for MISO, the LBA, the LSE, and RERRA.

Instances where the ARC LMR's customer changes LSEs:

- The LSE identified by the ARC LMR should be correct at the time of the ARC LMR's registration submitted to the Module E Capacity Tracking (MECT) tool. Otherwise, the ARC LMR Registration will be rejected.
- If the ARC LMR's LSE changes during the registration process, the ARC LMR registration can be revised. The date the registration was submitted will be sent along to the LSE for their review.
    - It is the responsibility of the ARC LMR's customers and the ARC to identify LSE changes.
    - It is the responsibility of the ARC LMR to notify MISO, the old LSE, and the new LSE when changes to the ARC LMR's customer's LSE occur.

4.2.7.2 *Termination of Demand Resource Accredited as LMR*

Because DRs need to be accredited annually, the "Effective Stop Date" will default to the last day of the applicable Planning Year.

4.2.7.3 *Amendments to Accredited DR Registration Data*

The Market Participant can amend the registration for a DR for an existing upcoming Planning Year by providing MISO notification no later than March 1, if the original registration was submitted by the February 1 due date.

The MP may modify any of the non-end date information submitted in the registration, which may affect the DR's qualification, including, but not limited to, a change in operation, number of interruptions, advisory notice period, maximum duration, or accreditation amount as either an increase or decrease in either its targeted MW level or firm service level. The MP shall submit registration information in the MECT Registrations screen by March 1 prior to the Planning Year for MISO to determine whether the resource still qualifies as an LMR.

4.2.7.4 *Renewal of DR for subsequent Planning Years*

A DR must be reviewed annually for accreditation as an LMR. A MP can request renewal of DR accreditation for subsequent Planning Years through the MECT Registrations screen. Renewal of DR must be requested by February 1 prior to the Planning Year. MISO will review the renewed DR registration information for completeness and accuracy and ensure it complies with the qualification requirements for DR. MISO will endeavor to notify the MP within 15 days after the renewed registration form was submitted regarding whether the DR has been accredited as an LMR, or whether there are any deficiencies that must be corrected. If the DR is accredited as

an LMR, it will be given a unique name for tracking purposes and made available in MECT for use by the MP during the applicable Planning Year. Section 4.2.7.3 Amendments to Accredited DR Registration Data rules also apply to renewed DRs in subsequent Planning Years.

4.2.7.5 *Demand Resources – SAC Determination*

A Demand Resource must be registered and accredited with MISO and will receive 100 percent of its capacity rating for the Planning Year. Seasonal capacity values for Demand Resources will be based on documentation from the state, third party auditor, past performance, or mock test consistent with their ability at MISO's seasonal Coincident Peak Demand. Since DR is a reduction in Demand, SAC is adjusted upward by applying the MISO PRM and transmission loss percentage for the LBA to the capacity rating.

4.2.7.6 *Demand Resource Deliverability*

The owner of ZRCs converted from DR may use them as part of a FRAP or RBDC Opt Out or offer them into the PRA. The DR ZRCs are considered deliverable regardless of the LRZ where the DR physically resides.

4.2.7.7 *Measurement and Verification of Demand Resource*

See Attachment TT of the Tariff and BPM-026 Demand Response.

4.2.7.8 *Demand Resource – Testing Requirements*

The testing period for a DR to demonstrate Demand reduction capability is the calendar year (January 1 to December 31) immediately preceding the applicable Planning Year unless a test deferral is submitted (see section 4.2.7.9 Demand Response Test Deferral). For example, the testing period for the 2025-26 Planning Year will be January 1, 2024 to December 31, 2024. DR shall demonstrate seasonal Demand reduction capability for a minimum of 1-hour duration with an attestation that the DR can continue the reduction for a minimum of 4 consecutive hours. Results should be submitted in accordance with LMR registration deadlines and attached to the LMR registration.

Test results should be adjusted to MISO seasonal Coincident Peak conditions. Upward adjustments shall not exceed +50% of each DR and may include, but not limited to, factors such as temperature, humidity, and/or other process load variations. Downward adjustments are allowed down to the 100kw minimum total for a DR registration. Adjustments to test results should be documented and submitted with the test results to support the capacity accreditation

for the DR. Adjustments to DR test results are subject to MISO review and approval during the LMR registration process each year.

DR are required to demonstrate performance of at least 50% of their registered seasonal capability via Scheduling Instructions from a MISO Event or conduct a real power test. If a DR is only able to demonstrate at 50% to 80% of their intended registered MW capability, an attestation from an officer of the Market Participant registering the DR, or from a financially responsible entity, must be provided to MISO during the registration process documenting the reasons for the difference between the registered capability and the demonstrated amount (i.e., industrial process, temperature, etc.). If demonstrating greater than 80% of the registered capability, the DR shall need to provide documentation supporting the adjustments made to normalize the MW capability to seasonal peak conditions.

Results may be uploaded to the documentation section of the LMR registration in MECT and may include: (1) test results including the meter data for the entire day of the tests, (2) historical meter data for 10 days around the MISO seasonal Coincident Peak with the MISO seasonal Coincident Peak as a midpoint, to calculate the capacity baseline, and (3) any other supporting documentation necessary for the LMR capability adjustment. The templates used for submitting the requested meter data may be found on the MISO public website under Markets and Operations > Demand Response.

If a DR is unable to demonstrate performance of at least 50% of the registered MW capability of the DR [only partially performs], the DR must retest the underperforming portion(s) of the DR or create separate registrations for the portions of the DR that did not exceed the 50% performance threshold. If the DR is unable to demonstrate performance of at least 50% of the registered MW capability during the testing period, the DR may still qualify for the PRA by opting out of the testing requirement, provided that the DR will then be subject to the three (3) times penalty provisions for underperformance described in Section 4.2.9 Electric Storage Resource.

If a DR underperforms during a MISO Emergency event and that event is chosen by the DR owner to satisfy the testing requirement, the tested portion of the DR will equal the actual reduction achieved during the event. If a DR only partially tests, the entire DR may be registered, however, separate registrations will be required. For example, the tested portion of the DR would be one registration and the untested portion of the DR would be another registration. If a DR is made up of an aggregation of different physical locations, each location can demonstrate performance—or elect not to—separately. Tested locations may be

aggregated together and untested locations may be aggregated together in registrations, as long as all locations are within the same Load Zone CP Node. Separate registrations for tested versus untested resources are required in order for MISO to accurately assess penalties for underperformance during a MISO Emergency event, as the untested DR would be subject to the three (3) times penalty, unless the untested DR is not required to test per qualification requirements in 4.2.9 Electric Storage Resource.

When testing a DR, accurate availability should be reflected in the DSRI by showing the DR as self-scheduled. If an MP plans to test DR greater than 20 MW, the MP should notify MISO operations two (2) Business Days prior to conducting a test by submitting the DR Testing Notification Template to the MISO ITOC (ITNOCRequests@misoenergy.org). The DR Testing Notification Template should include: (1) LMR name, (2) MP, (3) Load Zone CP Node, (4) expected MW reduction, (5) expected reduction date and hour(s), (6) notification time, and (7) operator contact information in case MISO Operations has questions. New DR and DR that did not clear the PRA will not be able to update the DSRI, however, these DR should still notify MISO by utilizing the DR Testing Notification Template.

4.2.7.9 Demand Response Test Deferral

The MP must provide written notification to MISO (https://help.misoenergy.org) of their intention to defer Demand Response testing by February 1 prior to the upcoming Planning Year. This DR Testing Deferral Notice must be from an officer of the company and include the following information:

- Company Name
- NERC ID of Company
- Planning Resource Name
- Local Balancing Authority (LBA) or External Balancing Authority (BA) where located
- Expected DR test value (MW)
- Estimated completion date of DR test

Once the DR test is completed, information pertaining to it must be submitted via written notification to MISO (https://help.misoenergy.org).

A Demand Resource providing such notice must satisfy credit requirements by March 1 prior to the Planning Year totaling the ICAP value registered, but not tested, multiplied by $2,400/MW, where $2,400 is the product of 3 * 4 * $200 to account for the three (3) times Energy penalty assumed under the waiver, the four (4) hours of LMR requirements, and a $200 LMP as a proxy for pricing under emergency conditions.

If the Market Participant submits the real power test results on or before the last business day of the month prior to the Season the DR was used in a FRAP or RBDC Opt Out or cleared the auction within the Planning Year that are equal to or greater than the expected DR test value, then the Transmission Provider will adjust the Market Participant's credit requirement to account for these changes within twenty (20) Business Days after that real power test is submitted.

If SAC associated with a Planning Resource for which DR testing has been successfully deferred are unconverted to ZRCs, the Market Participant may provide notice to the Transmission Provider that it wishes to forfeit the deferred DR value, in which case the Transmission Provider will adjust the Market Participant's DR value and credit requirement within twenty (20) Business Days.

A Market Participant that provides a DR Test Deferral Notice and that either (1) has not submitted any real power test result for such DR by the last business day of the month prior to the Season the DR was used in a FRAP or RBDC Opt Out or cleared the auction within the Planning Year, or (2) has submitted a real power test result by the last business day of the month prior to the Season the DR was used in a FRAP or RBDC Opt Out or cleared the auction within the Planning Year that demonstrates fewer megawatts are available than the expected DR test value submitted in the DR Test Deferral Notice, shall be subject to a penalty equal to three (3) times the Hourly Real-Time Ex Post LMP at the Load CPNode for any such deficiency and distributed pursuant to the Market Participants representing the LSEs in the Local Balancing Authority Area(s) that experienced the Emergency that required the use of an LMR. Such revenues shall be distributed on a Load Ratio Share basis. In addition, such Market Participant shall not have their credit released until a real power test result demonstrating the availability of all megawatts submitted in the DR Test Deferral Notice is submitted and verified by the Transmission Provider, or the end of the Planning Year, whichever is earlier.

4.2.8 Energy Efficiency Resources

Energy Efficiency (EE) Resources are installed measures on retail customer facilities that achieve a permanent reduction in electric Energy usage while maintaining a comparable quality of service. The EE Resource must achieve a permanent, continuous reduction in electric Energy

consumption (during the defined EE Performance Hours) that is not reflected in the peak load forecasts used for the PRA for the Planning Year for which the EE Resource is proposed. The EE Resource must be fully implemented at all times during the Season within the Planning Year, without any requirement of notice, dispatch, or operator intervention. Examples of EE Resources are efficient lighting, appliance, or air conditioning installations; building insulation or process improvements; and permanent load shifts that are not dispatched based on price or other factors.

The reduction in electric Energy consumption due to existing EE programs that is reflected in the CPD forecast cannot qualify as an EE Resource. All the requirements to offer or commit an EE Resource in MISO's capacity planning market are detailed in the sections below. One of the major requirements includes the measurement and verification of the EE Resource's Nominated EE Value for a Season within the Planning Year. The Nominated EE Value is the expected average Demand (MW) reduction, excluding transmission losses, during the defined EE Performance Hours in each Season of the Planning Year. The EE Performance Hours are between the hour ending 13:00 Eastern Prevailing Time (EPT) and the hour ending 19:00 EPT during all days of the applicable Season the EE Resource is seeking capacity accreditation, inclusive, of such Planning Year, that are not a weekend or federal holiday.

A Measurement & Verification (M&V) plan describes the methods and procedures for determining the Nominated EE Value of an EE Resource and confirming that the Nominated EE Value is achieved. The EE Resource provider must submit an initial Measurement & Verification plan for the EE Resource by February 1 prior to the PRA in which the EE Resource is to be initially offered. The EE Resource provider must submit an updated Measurement & Verification plan for the EE Resource by February 1 prior to the next PRA in which the EE Resource is to be subsequently offered. Post-installation of the EE Resource, the EE Resource provider must submit an initial Post-Installation M&V Report for the EE Resource by March 1 prior to the first Planning Year that the EE Resource is committed to PRA. The EE Resource Provider must submit updated Post-Installation M&V Reports by March 1 prior to each subsequent Planning Year that the resource is committed. Failure to submit an updated Post-Installation M&V Report by March 1 prior to a subsequent Planning Year or failure to demonstrate that post-installation M&V activities were performed in accordance with the timeline in the approved M&V Plan will result in a Nominated EE Value equal to zero MWs of seasonal ZRCs for the Planning Year.

The last Post-Installation M&V Report submitted and approved by MISO prior to the Planning Year that the EE Resource is committed will establish the Nominated EE Value that is used to

measure PRA commitment compliance during the Planning Year. Details regarding seasonal PRA commitment compliance and the associated penalty for failure to deliver the unforced value of a seasonal PRA capacity commitment are detailed below.

MISO reserves the right to audit the results presented in an initial or updated Post-Installation M&V Report. The M&V Audit may be conducted at any time, including during the defined EE Performance Hours. If the M&V Audit is performed and results finalized prior to the start of a Planning Year, the Nominated EE Value confirmed by the Audit becomes the Nominated EE Value that is used to measure seasonal PRA commitment compliance during the Planning Year. If the M&V Audit is performed and results are finalized after the start of a Planning Year, the Nominated EE Value confirmed by the M&V Audit becomes the Nominated EE Value prospectively for the remainder of that Planning Year.

Energy Efficiency installations that are installed prior to any given Planning Year are eligible to participate in seasonal PRAs or be used in a FRAP or RBDC Opt Out for that Planning Year and three subsequent Planning Years. For example, an EE Resource installed and qualified prior to June 1, 2013, could participate in the seasonal PRAs or be used in a FRAP or RBDC Opt Out for 2013/14, 2014/15, 2015/16, and 2016/17 Planning Years provided the EE Resource registers and meets the qualification requirements for each Planning Year. After four years, the EE Resource could no longer be used as a Planning Resource but would continue to be included as a reduction in the Demand forecast.

4.2.8.1 *Energy Efficiency Resource – Measurement and Verification*

See Attachment UU of the Tariff.

4.2.9 Electric Storage Resource

An Electric Storage Resource (ESR) is a resource capable of receiving electric Energy from the grid and storing it for later injection of Energy back to the grid. The ESR includes all technologies and/or storage mediums, including but not limited to, batteries, flywheels, compressed air, and pumped storage. The location of an ESR may be at any point of grid interconnection, on either the Transmission System or a local distribution system. An ESR must:

- be capable of injecting a minimum of 100 kW;
- be capable of complying with MISO's Setpoint instructions;
- have the appropriate metering equipment installed; and

- be physically located within the MISO Balancing Authority Area.

4.2.9.1 *Electric Storage Resource - Qualification Requirements*

An ESR may qualify as a Capacity Resource for the Planning Resource Auction (PRA) provided the resource is a Use Limited Resource that is able to continuously discharge for a minimum of 4 hours across the expected peak hour each Operating Day and meets the following criteria:

- An ESR must demonstrate discharge capability during each of the seasonal auctions the ESR will be used to meet RAR.
- Verification of capability will be based on the power (MW) and the Energy rating (MWh) via data included in a populated Non-GADS Performance Template and submitted to MISO through the MECT.
- For an upcoming PRA, the following data for the ESR must be submitted to the MECT by October 31 to qualify for the PRA using the Non-GADS Performance Template: Nameplate Capacity, Net Energy Rating (MWh), and Hourly Equivalent Discharge Amount (MW) from the ESR testing (minimum of 1 hour and a maximum of 4 hours).
- An ESR must demonstrate deliverability in order to qualify as a Capacity Resource for participating in the PRA. If an ESR is interconnected to the MISO Transmission System, the Resource can either obtain Network Resource Interconnection Service (NRIS) under Attachment X or procure Firm Transmission Service in conjunction with Energy Resource Interconnection Service (ERIS). If an ESR is interconnected to the Distribution System, the Resource will be subject to coordination with Distribution Provider, Transmission Owner, and MISO Transmission Service. For more information, see section "4.2.8.5.1 - Roles and Responsibilities to Determine Eligibility for PRA Participation."

4.2.9.2 *Electric Storage Resource - Hourly Equivalent Discharge Amount (MW)*

The Hourly Equivalent Discharge Amount (MW) of an ESR will be calculated as:

$$\frac{Total\ Net\ Energy(MWh)}{Total\ Hours\ tested}$$

where The Total Net Energy Rating (MWh) and the Total Hours tested are based on the data submitted to MISO through a populated Non-GADS Performance Template.

4.2.9.3 *Reporting Historical Data*

Market Participants will use MISO's Non-GADS Performance Template found on the Resource Adequacy page of the MISO website to submit the appropriate unit and operational data for the upcoming Planning Year. A populated Non-GADS Performance Template must be submitted to MISO by October 31 of each year via the Module E Capacity Tracking (MECT) tool to be eligible for accreditation in the Planning Resource Auction applicable to the following Planning Year.

Reporting availability data for an ESR is not required if the ESR has less than 10 MW of nameplate capacity and the Market Participant has never provided such data for the ESR.

4.2.9.4 *ESR Capacity Accredited Value Determination*

MISO will determine the accreditation for each ESR based upon an evaluation of its demonstrated capability, resource availability, and Interconnection Service if applicable. ESRs must demonstrate deliverability prior to participating in the PRA. Deliverability will be demonstrated by the Market Participant and verified by MISO depending upon the Point of Interconnection of the resource. A class average unavailability rate will be applied to an ESR to determine a default class average capacity accreditation value prior to being in service long enough to calculate a unit-specific forced outage rate. A 5% unavailability rate will be assumed until sufficient ESRs exist (30 or more individual units) to come up with an average value. The accreditation of an ESR with sufficient historical data is calculated through the Non-GADS Performance Template.

4.2.10 Qualifying Facilities (QF)

Certain generators may be recognized as a Qualifying Facility under PURPA. MISO offers three modeling options that facilitate market participation for QF generators. Each of the options, described below, are reflected differently in the PRA. Each QF should coordinate with its LSE to determine eligibility.[1]

Gross Modeling: Load and generation associated with a QF are modeled separately in the PRA. Load associated with the QF would be included in the LSE's Demand forecast submitted to MISO and generation is modeled as a Generation Resource with a CPNode. QF generators utilizing this option are required to meet the accreditation requirements for testing and

[1]Additional details can be found in MISO's Qualifying Facilities White Papers on the MISO website. Markets and Operations-> Markets and Operations-> Whitepapers.

deliverability as described in Section 4.2.1 Generation Resource but not Dispatchable Intermittent Resource or Intermittent Generation.

Hybrid Modeling: When QF generation exceeds the associated QF load, both load and generation may be modeled as a single Generation Resource CPNode. The expected net injection onto the transmission system (e.g., QF generation – process load served by QF generation) is modeled as the GVTC. QF generators utilizing this option are required to meet the accreditation requirements for testing and deliverability as described in Section 4.2.1 Generation Resource but not Dispatchable Intermittent Resource or Intermittent Generation.

BTMG Modeling: Load and generation associated with a QF are modeled separately in the PRA. Load associated with the QF would be included in the LSE's Demand forecast submitted to MISO and generation is modeled as a BTMG. QF generators utilizing this option are required to meet the accreditation requirements for testing and deliverability as described in Section 4.2.6 BTMG Qualification Requirements.

4.2.11 Hybrid and Co-Located Resources

For purposes of accreditation, Hybrid Resources and Co-Located Resources will be accredited in two phases: Phase I – Sum of Parts accreditation and Phase II – Availability-based accreditation. Phase I applies in the initial service life of a Hybrid Resource or Co-Located Resource before operating history is available. Phase II applies once a Hybrid Resource or Co-Located Resource has historical operating data. See Appendix X – Hybrid and Co-Located Resource Accreditation for details.

4.3 Confirmation and Conversion of SAC MW

A ZRC represents 1 MW-day of qualified Seasonal Accredited Capacity (SAC) from a Planning Resource for a specific Season of a Planning Year, tracked to the nearest tenth of a MW, pursuant to the applicable ZRC qualification procedures described herein. To create a ZRC, an MP must confirm the SAC MW and then convert SAC MW from each qualified Planning Resource to seasonal ZRCs through the Convert SAC screen in MECT. SAC confirmation and conversion must be completed per the timeline specified in appendix K.

When seasonal ZRCs are converted from SAC by the Asset Owner, the seasonal ZRCs are populated into the available ZRC account for that Asset Owner. MISO will keep track of how many ZRCs the MP has created, and how many remaining SAC MWs for each Planning Resource are available for conversion to ZRCs. Once created, MISO will track ZRCs back to the

specific Planning Resources that they were created from to assist with establishing clearing requirements, the auction clearing process, and market mitigation monitoring.

4.4 ZRC Transactions

4.4.1 Transfer of ZRCs

Available ZRCs can be transferred between MPs using the MECT. This is accomplished in the 'ZRC Transactions' tab in the MECT. Both the 'Buyer' and 'Seller' are required to account for a ZRC transaction in the MECT. The 'Seller' is required to submit the transaction in the MECT and the 'Buyer' is required to confirm the transaction reported. Once the transaction has been submitted and confirmed by both parties, the ZRC transaction volumes will be subtracted from the seller's available ZRC account and added to the buyer's available ZRC account. ZRC transactions are from the transaction date to the end of that Season. In situations where the ZRC transaction is only intended for part of a Season, the ZRCs can be transferred back to the original MP and would be effective for the rest of the Season. The Market Participant that registered the Planning Resource is responsible for complying with all Tariff requirements. The MECT allows transactions based the ZRC balance in the Seller's portfolio. ZRC transactions can occur throughout the PRA auction cycle, including during the Offer window. ZRC transactions can also be utilized during the Planning Year to facilitate ZRC replacement transactions.

a. ICAP Deferral

i. Summary

ICAP Deferrals allow Market Participants (MPs) to participate in the Planning Resource Auction (PRA) using Zonal Resource Credits (ZRCs) that have been credited to the following:

For Schedule 53 Resources:

- an untested new Planning Resource;
- new Schedule 53 Resources that have not or will not achieve the Commercial Operation Date (COD) by March 1 prior to the upcoming Planning Year, an existing Planning Resource that is returning to operation from a catastrophic outage or suspension; an existing Planning Resource where the Market Participant's GVTC extension request was denied or the Market Participant missed the GVTC submittal deadline and failed to request an extension;
- an existing Planning Resource that is returning to the MISO market.
- For Non-Schedule 53 Resources:
- an untested new Planning Resource;

- new Non Schedule 53 Resources that have not or will not achieve the Commercial Operation Date (COD) by March 1 prior to the upcoming Planning Year
- an existing Planning Resource that is returning to operation from a catastrophic outage or suspension;
- an existing Planning Resource increasing its capability through increases to GVTC or Interconnection Service (IS);
- an existing Planning Resource where the Market Participant's GVTC extension request was denied or the Market Participant missed the GVTC submittal deadline and failed to request an extension;
- an existing Planning Resource that is returning to the MISO market.
-

Schedule 53 Resources that submit ICAP Deferral will get SAC class average for the deferred season(s) while non-Schedule 53 Resources will get the lesser of GVTC or IS, multiplied by (1-class average XEFORd).

ii. Requirements and Timeline

The MP must provide written notification to MISO (https://help.misoenergy.org) of its intention to defer ICAP by February 15 prior to the upcoming Planning Year. This ICAP Deferral Notice should state that the Planning Resource will demonstrate deliverability, demonstrate commercial operation including filing a COD Notification (Appendix E to the GIA) with MISO Resource Integration (ResourceIntegration@misoenergy.org), have confirmed Transmission Service , and/or perform a real power test to submit its GVTC after March 1, but before the last Business Day, prior to the start of the deferred Season. The ICAP Deferral Notice can be found in Appendix T of this BPM. The ICAP Deferral Notice must be from an officer of the company and include the following information:

- Company Name
- NERC ID of Company
- Planning Resource Type
- Planning Resource Name/CPNode Name/Unit Number
- Local Resource Zone (LRZ) or External Resource Zone (ERZ) where Planning Resource is located
- Planning Resource Fuel Type
- Estimated ICAP Value in MW
- Estimated Completion Date of ICAP
- Reason for deferring (See Appendix U)Season(s) to be deferred

- Generator Interconnection Agreement (GIA) Number (only necessary if deferral includes upgrades to Interconnection Service)
- Expected NRIS and ERIS values
- GVTC / COD declaration for intermittent resources
- Commercial Operation Date
- TSR Number
- Other ICAP Type

Once the GVTC test is completed, information pertaining to it must be submitted via written notification to MISO (https://help.misoenergy.org/) by the last Business Day prior to a Seasons' start date for all deferred ZRCs that cleared in the PRA or were included as part of a FRAP or RBDC Opt Out. For intermittent resources COD declaration is used to meet the GVTC submittal requirement. For intermittent BTMG an attestation of COD must be submitted to MISO.

New resources must have (i) an executed GIA or an unexecuted GIA accepted by FERC and (ii) be registered in the June Commercial Model prior to the upcoming Planning Year at the time of the ICAP Deferral request. For modeling SAC in the PRA, the resource must be modeled in the March model prior to the PRA in order to offer into the PRA accordingly. For example, the resource needs to be in the March 2025 Commercial Model to participate in the 2025-2026 Planning Resource Auction.

The MP requesting the ICAP Deferral must post 90 days of credit for the ICAP value of the untested ZRCs no later than March 1 prior to the upcoming Planning Year. The credit will be based on the 90 days of daily CONE for the LRZ in which the resource is located.

MISO will adjust the Market Participant's credit requirements within ten (10) Business Days of the full ICAP being met and has been validated by MISO or when the MP provides written notification to MISO Resource Adequacy that a Planning Resource replacement has been completed.

4.5.3 Uncleared ZRCs with ICAP Deferrals

If the untested ZRCs will not be used in a FRAP or RBDC Opt Out or will not be offered into the PRA, the MP that registered the resource may provide notice to MISO by March 1 that it wishes to forfeit the deferred ICAP value. MISO will recalculate the resulting Seasonal Accredited Capacity (SAC) value and will adjust the credit requirements within ten (10) Business Days after

receiving the notice. Furthermore, if the untested ZRCs do not clear the PRA, MISO will release credit back to the MP that submitted the ICAP Deferral Notice.

4.5.4 ICAP Deferral Non-Compliance Charge

The MP that submitted the ICAP Deferral request is responsible for completing ICAP or resource replacement by the last Business Day of prior to a Seasons' start date for all deferred ZRCs that cleared in the PRA or were included as part of a FRAP or RBDC Opt Out. Any ICAP not completed or replaced by the last Business Day prior to a Seasons' start date will be subject to the ICAP Deferral Non-Compliance Charge for each day the ICAP or the Planning Resource replacement is not completed.

The ICAP Deferral Non-Compliance Charge will be based on the sum of the applicable seasonal Auction Clearing Price (ACP) and daily CONE based on the LRZ or ERZ of the Planning Resource, multiplied by the number of ZRCs that have not been replaced or tested.

The distribution of ICAP Deferral Non-Compliance Charge will be allocated pro-rata based on each LSE's share of the total seasonal Final Planning Reserve Margin Requirements (PRMR) in MISO.

Please refer to Appendix U for Examples of ICAP Deferrals.

5 Resource Adequacy Requirements

5.1 Overview

MISO's Resource Adequacy construct ensures that adequate Planning Resources are maintained for each Local Resource Zone (LRZ) to meet the MISO footprint's seasonal Final Planning Reserve Margin Requirement (Final PRMR). An LSE can meet its seasonal Final PRMR by any of the following ways:

1) Self-scheduling of ZRCs
2) Fixed Resource Adequacy Plan (FRAP)
3) Participating in the Planning Resource Auction (PRA)
4) Paying the Capacity Deficiency Charge (CDC)
5) Reliability Based Demand Curve Opt Out (RBDC Opt Out)

5.2 Local Resource Zones

MISO developed Local Resource Zones (LRZ) to reflect the need for an adequate amount of Planning Resources to be in the appropriate physical locations within the MISO Region to reliably meet Demand and LOLE requirements. MISO will provide the details of each LRZ no later than September 1 of the year prior to a Planning Year. The geographic boundaries of each of the LRZs will be based upon analysis that considers: (1) the electrical boundaries of Local Balancing Authorities; (2) state boundaries; (3) the relative strength of transmission interconnections between Local Balancing Authorities; (4) the results of previous LOLE studies; (5) the relative size of LRZs; and (6) market seams compatibility. MISO may re-evaluate the boundaries of LRZs if there are changes within the MISO Region including, but not limited to, any of the preceding factors, significant changes in membership, the Transmission System and/or Resources.

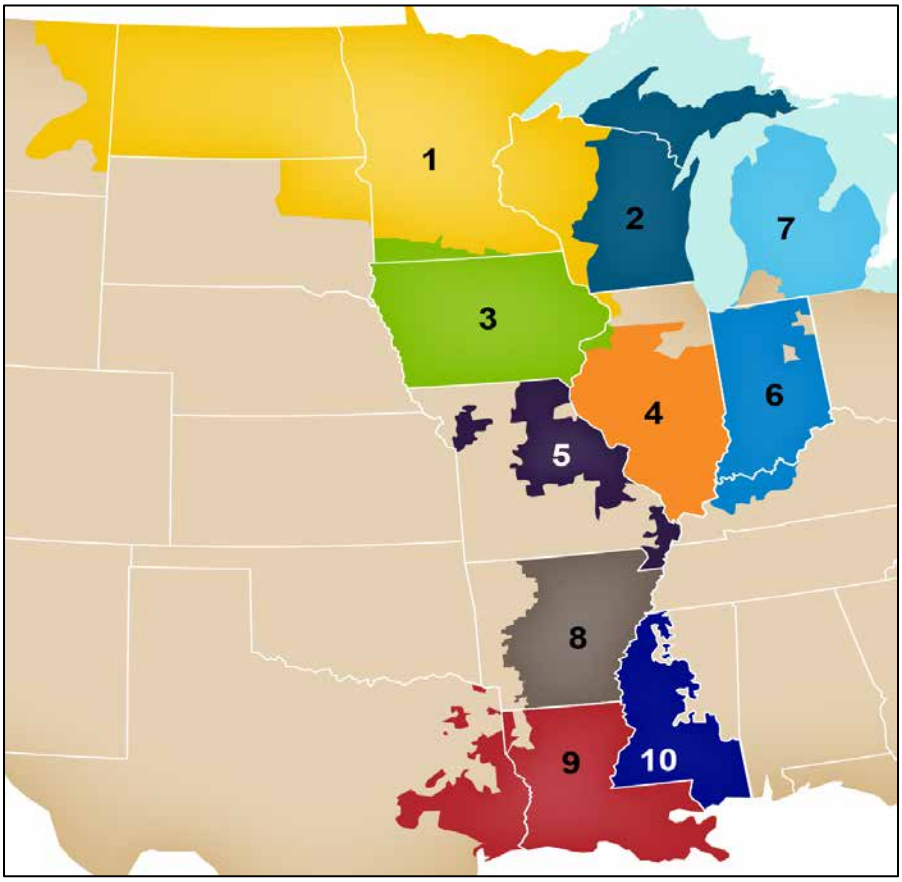


Figure 5: Local Resource Zones Map

5.2.1 Change in LRZ Configuration

MISO, after working with stakeholders and submitting a Tariff revision to Attachment VV that has been accepted by the Federal Energy Regulatory Commission, may change the configuration of the LRZs if a re-evaluation trigger has occurred and after consideration of the criteria outlined for consideration in setting LRZ boundaries. Changes to LRZ configuration will only be applicable to future Planning Years that have not already been cleared through the PRA. MISO will share any re-evaluation triggers and the results of the analysis documenting the impacts of the proposed LRZ boundary changes with stakeholders in an open and transparent manner prior to making any filings to change LRZ boundaries.

Once the boundaries of an LRZ have changed, its boundaries should stay constant for at least three years to provide stable future locational signals.

5.2.1.1 Re-evaluation Triggers

The Transmission Provider may re-evaluate the boundaries of LRZs if there are significant changes in the Transmission Provider Region. Such changes are called re-evaluation triggers, and they include, but are not limited to, the following:

1) Significant changes in membership:
   Re-evaluation may occur for LRZs where there are membership changes in the MISO system or for areas which neighbor the regions where there is a membership change. Re-evaluation may occur prior to or in the cycle immediately following the integration of new members into the MISO system.
2) Significant changes in the Transmission System:
   Transmission infrastructure must be on target to be in-service by June 1 of the year which would follow a filing for an LRZ boundary changes (i.e., the transmission must be in-service for the first summer where the zonal changes will go into effect). The changes to the transmission system should impact transmission constraints represented in the MISO Resource Adequacy construct for the zone(s) being reevaluated.
3) Significant changes in Resources:
   Changes to the resource mix may include the addition of significant new generation or the retirement of significant existing generation. The resource changes should be shown to modify the transmission system flows in the zone(s) being studied, impacting transmission constraints represented in the MISO Resource Adequacy construct.

The existence of a trigger will not guarantee that a zonal change will be implemented; the trigger will allow the analysis to proceed and will be considered as part of the final decision on whether or not to change zonal boundaries.

5.2.1.2 Re-evaluation Considerations

Once a re-evaluation trigger has been met, the geographic boundaries of the zone or zones may be re-evaluated. This re-evaluation will be based upon an analysis that considers the following factors.

1) Electrical Boundaries of Local Balancing Authorities
2) State boundaries
3) Relative strength of transmission interconnection between Local Balancing Authorities

4) Results of LOLE studies
5) Relative Size of LRZs
6) Natural geographic boundaries such as lakes and rivers

The electric boundaries of Local Balancing Authorities, state boundaries, and natural geographic boundaries will be considered by inspection. Additional information on the process used to analyze the other criteria is below.

Relative Strength of Transmission Interconnections between Local Balancing Authorities
Multiple aspects of the transmission system are considered in this portion of the evaluation. These aspects are first investigated individually, and the final assessment considers all of the factors. The assessment includes the following:

- Previously identified LOLE results (Capacity Import and Export Limit constraints)
- Constraint variation(s)
- Transmission projects
- Physical ties including post-contingency connectivity and transmission service

LOLE results identified for Capacity Import and Export Limit analysis before and after the boundary change is applied will be considered. Zonal transfer analysis yields a list of constraints. The most limiting constraint after redispatch determines a zone's limit in the LOLE study. In the re-evaluation analysis, the less limiting constraints are also considered since reconfigurations impact the transfer level at which constraints are limiting. Also, while there can only be one limiting constraint, multiple constraints can be seen at similar transfer levels. For example, assume the most limiting constraint is at a transfer level of 100 MW. There are two additional constraints at 99 MW and one at 90 MW. Since these transfer levels are very close, all four are considered in this evaluation.

Constraint variation is caused by reconfiguration of Local Resource Zones. This variation is caused by changing the generation that is used to create the transfer. Zonal definitions determine which generators are used in the transfer analysis so any change in zonal definition may result in a difference in the impact the transfer has on the constraint. It is possible that a constraint has an impact above the threshold before reconfiguration and less than the threshold afterwards which is considered in this evaluation.

The impact of approved MTEP Appendix A and Target A transmission projects is considered. If a project mitigates a constraint and the project is expected to be in service prior to the Planning

Year under consideration, then the impact of the transmission project to the LOLE results is considered.

MISO will consider the number of ties of any reconfigured zone. Generally, a reconfigured zone should have two or more ties with the rest of MISO. Two or more ties between the zones are optimal when planning for contingencies so the zones are still connected post-contingency. Any LBA being added to an existing LRZ should have two or more ties with an LBA in the new LRZ. Any other impacted LRZs should have contiguous LBAs with two or more ties. Further consideration is needed if an LBA leaving an LRZ results in an LRZ with unconnected LBAs. In addition, confirmed transmission service between zones may be considered when evaluating reconfigurations. Confirmed long-term transmission service indicates transmission capacity between the zones has been previously evaluated.

The Results of LOLE Studies
LOLE studies will be performed with the LRZ configuration being considered. The results of this analysis will be compared with the prevailing LRZ configuration. This LOLE analysis includes a MISO PRM model analysis (Section 3.5), LRZ LRR determination (Section 5.2.2.2), and capacity import and export limit analysis (Section 5.2.2.1) for the LRZ configuration being considered and for the prevailing LRZ configuration. The results of this analysis and comparison with the prevailing system results will be used as one factor in determining whether LRZ changes are warranted, in conjunction with the other LRZ considerations.

Relative size of LRZs
The relative size of an LRZ will contain no less than 2,000 MW of Demand.

5.2.1.3 Determination of LRZ Boundaries

Following the determination of an LRZ re-evaluation trigger, the conclusion of all analysis with consideration of stakeholder feedback will determine whether the LRZ boundaries will be changed. This determination will be based upon the benefits and/or risks that the LRZ boundary changes would present on the system. MISO's final determination will be shared with stakeholders and the changes will be filed with FERC.

5.2.1.4 External Resource Zones

MISO developed External Resource Zones (ERZs) to reflect the physical location of External Resources and establish Auction Clearing Prices for such External Resources (other than

Coordinating Owner and Border External Resources). An ERZ will be created for each External Balancing Authority adjacent to MISO with Planning Resources participating in the MISO PRA. Current External Resource Zones:

ERZ	Area(s)
EZ20	KCPL, OPPD, WAUE
EZ22	PJM
EZ23	OVEC
EZ24	LGEE
EZ26	AECI
EZ27	SPA
EZ28	TVA

External resources ZRCs are counted toward the MISO North/Central region and the MISO South region based on transmission shift factors that are calculated annually.

5.2.1.5 Establishing Sub-Regional Resource Zones (SRRZ)

MISO will also establish SRRZs applicable for each Planning Year. A SRRZ is a zone, comprised of an LRZ or combination of two or more LRZs, to administer constraints in accordance with applicable seams agreements, coordination agreements, or transmission service agreements.

Currently, MISO has two SRRZs: MISO South, defined as LRZs 8, 9 and 10, and MISO Midwest, defined as LRZs 1-7. These SRRZs are a result of the settlement agreement between MISO, SPP, and the other Joint Parties. This agreement established Regional Directional Transfer Limits (RDTL) that limit the amount of total transfer between these two SRRZs in the PRA. The RTDL from South to Midwest is 2,500 MW and the RTDL from the Midwest to South is 3,000 MW.

MISO shall establish the Sub-Regional Export Constraint (SREC) and Sub-Regional Import Constraint (SRIC) for each Season by March 1 prior to the Planning Year. The methodology for determining the SREC and SRIC for each SRRZ is described below.

1.1.1.2.4 5.2.1.5.1 Determination of Seasonal SREC and SRIC

The following steps describe the steps MISO will utilize to calculate the SREC and SRIC.

1. Begin with the Regional Directional Transfer Limits (RDTL) between the two SRRZs

2. Complete a feasibility analysis to review operational events from the previous seasonal peaks to determine if a further reduction to the Regional Directional Transfer Limit is warranted for reliability.
3. Decrement the initial RDTL (from step 1) based upon completed feasibility analysis
4. Subtract from the net RDTL (from step 3) the sum of Firm Reservations on MISO OASIS that utilize the contract path between South and Midwest and are exporting the MISO BA for the applicable Season of the Planning Year. This difference determines the SREC and SRIC to be utilized for that Season of the Planning Year.

Example from the 2016-2017 Planning Year

1. The RDTL from South to Midwest is 2,500 MW and from Midwest to South is 3,000 MW.
2. MISO's feasibility analysis for the 2016-2017 Planning Year determined that no additional reduction of the RDTL was required; 0 MW.
3. The net RDTL for 2016-2017 is equal to the initial RDTL; South to Midwest is 2,500 MW and from Midwest to South is 3,000 MW.

4. The MISO OASIS Reservations, in each direction, that exported from the MISO BA for the 2016-2017 Planning Year were summed:
   South to Midwest Direction: 1,624 MW
   Midwest to South Direction: 206 MW

Final SREC and SRIC applied for the 2016-2017 Planning Year:
South SRRZ SREC: 876 MW
South SRRZ SRIC: 2,794 MW
North SRRZ SREC: 2,794 MW
North SRRZ SRIC: 876 MW

1.1.1.2.5 5.2.1.5.2 Regional Directional Transfer Limit Feasibility Analysis

On an annual basis, prior to administrating the PRA, MISO will review operational data from the previous seasonal peaks to determine if operational events experienced in the past and forecasted expected conditions for the applicable Planning Year Season warrant a reduction in the initial RDTL between the MISO South and Midwest Regions. MISO will review the results of the feasibility analysis with stakeholders prior to implementing in a PRA.

The following data sources are considered for the feasibility analysis:

- Studies that assess MISO transfer capability between Regions
- Studies that assess load diversity between Balancing Authorities
- Transmission system constraints
- Congestion history on relevant transmission constraints
- Capacity or Transmission Emergency alerts, warnings, or events

5.2.2 Local Requirements and Transfer Capability

5.2.2.1 Calculation of Transfer Limits for the Planning Resource Auction(s)

MISO will determine the seasonal import and export limits for each LRZ by performing a transfer analysis study. The study produces Zonal Import Ability (ZIA) and Zonal Export Ability (ZEA) values which represent a zone's ability to import and export capacity in every Season, respectively. The seasonal ZIA and ZEA values are adjusted by the amount of exports (Controllable Exports (CE)) to non-MISO load from the zone to determine a zone's seasonal CIL and CEL. Seasonal CIL and CEL determine the maximum amount of ZRCs that can be imported or exported respectively to/from that zone in that Season. The seasonal ZIA is an input to the calculation of the seasonal Local Clearing Requirement (LCR) for each LRZ, as described in Section 5.2.2.3 (Establishment of Local Clearing Requirement). Seasonal LCR, CEL, and CIL are inputs to the Planning Resource Auction clearing process. Transfer analysis will be performed on seasonal Powerflow models appropriate for the upcoming Seasons in the next planning year.

Transfer analysis is not required to calculate an ERZ CEL; instead, MISO will determine the seasonal CEL of each ERZ by determining the volume of SAC for External Resources within that zone. The seasonal CEL will be set to the MW SAC in the ERZ no later than eight (8) business days before the last business day in March.

Transfer Analysis

Transfer capability is the measure of the ability of interconnected electric systems to reliably transfer power from one area to another under certain system conditions. The incremental amount of power that can be transferred will be determined through First Contingency Incremental Transfer Capability (FCITC) analysis. First Contingency Total Transfer Capability

(FCTTC) indicates the total amount of power able to be transferred before a constraint is identified. FCTTC is the base power transfer plus the incremental transfer capability.

$$Total\ Transfer\ Capability\ (TTC) = Base\ Power\ Transfer + \ FCITC$$

Linear FCITC analysis will identify limiting constraints with a minimum Distribution Factor (DF) cutoff of 3%, meaning the transfer and contingency must increase the loading on the overloaded element by 3% or more. In addition, facilities must have loadings 100% or more of the normal rating for system-intact conditions and loadings 100% or more of the emergency rating for N-1 contingencies.

Export and import capabilities of subsystems will be respected and machine limits are enforced. Exporting an LRZ's available capacity will include offline units. A pro-rata dispatch is used which ensures all available generators will reach their max dispatch level at the same time. The pro-rata dispatch is based on the MW reserve available for each unit and the cumulative MW reserve available in the subsystem. The MW reserve is found by subtracting a unit's base dispatch from its maximum dispatch, which reflects the available capacity of the unit. Refer to Table 2 and the equation below for an example of how one unit's dispatch is set, given all machine data for the source subsystem.

Machine	Base Model Unit Dispatch (MW)	Minimum Unit Dispatch (MW)	Maximum Unit Dispatch (MW)	Reserve MW (Max dispatch – Unit Dispatch)
1	20	20	100	80
2	50	10	150	100
3	20	20	100	80
4	450	0	500	50
5	500	100	500	0
			Total Reserve	310

Table 2: Example Subsystem

$$Machine\ 1\ Post\ Transfer\ Dispatch = \frac{(Machine\ 1\ Reserve\ MW)}{(Source\ Subsystem\ Reserve\ MW} \times Transfer\ Level\ MW$$

$$Machine\ 1\ Post\ Transfer\ Dispatch = \frac{80}{310} \times 100 = 25.8$$

$$Machine\ 1\ Post\ Transfer\ Dispatch = 25.8$$

General Assumptions

Power flow models and input files are required to determine the import and export limits of each LRZ in each Season. Input files (subsystem and contingency) from MTEP studies built for timeframes matching the effective period of the transfer limit study will be used. Single-element contingencies in MISO and seam areas are evaluated. Other than the power flow model, all other input files will be the same across all Seasons within the Planning Year.

Subsystem files will be modified to include required source and sink definitions, details are provided in the next two sections (Import and Export Limit Determination Sections). The monitored file will include all facilities under MISO functional control and Seam facilities 100 kV and above.

Power flow models will contain approved MISO MTEP Appendix A and Target A projects with effective dates on or before the effective date of the study model. Planning Resources, internal and external to MISO will be dispatched in the base model according to the Generator Modeling and Transactions/Interchanges sections of the Transmission Planning Business Practices Manual, or BPM-020. The following generators are excluded from the incremental transfer analysis dispatch:

- Nuclear
- Generators with negative dispatch
- Hydro
- Wind
- Solar

Wind and solar will be ramped down for transfers and will not be ramped up. Maximum wind output will be limited to base dispatch in the power flow model which is set by the wind capacity credit. MISO and external area interchange in the base case will be set to the net of the expected firm transactions with its neighbors.

If a Transmission Owner has identified a zonal import limit that is binding as a result of the exclusion of nuclear (headroom) or other resources in the sink of the transfer study, the TO may inform MISO of the limitation and MISO will evaluate the ZIA and update accordingly, at MISO's sole discretion.

Seasonal Zonal Import Ability (ZIA) and Seasonal Capacity Import Limit (CIL) Determination

To determine an LRZ's seasonal limits, a generation-to-generation transfer is modeled from a source subsystem to a sink subsystem. For import limits, the limit is determined for the sink subsystem. Import limits are found by increasing MISO generation resources in adjacent Local Balancing Authorities (LBAs) while decreasing generation inside the LRZ under study. LBAs that are interconnected with the LRZ under study are considered adjacent. Tiers are used to define the generation pool used for import studies and are comprised of the adjacent systems of the zone being studied.

- Tier 1 – Generation in the MISO LBAs adjacent to the LRZ under study
- Tier 2 – Tier 1 plus generation in MISO LBAs adjacent to Tier 1

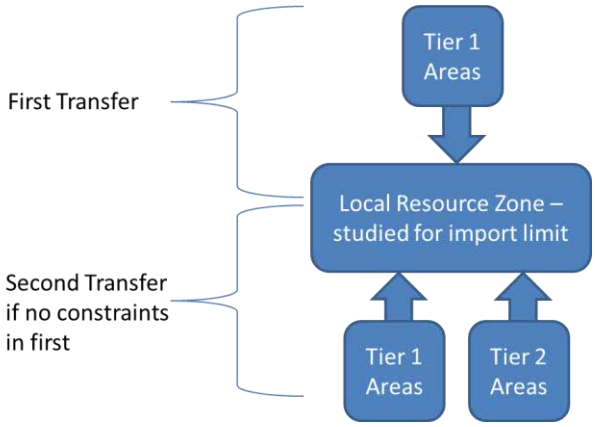


Figure 5.1: Tiered import illustration

Import limit studies are analyzed first using Tier 1 generation only. If no constraint is identified, the source is expanded to include Tier 2 and the transfer is retested. If a constraint is identified, redispatch is tested. If redispatch mitigates the constraint completely and an additional constraint is not identified, the source is expanded to include Tier 2 and the transfer is retested. If constraints are identified using Tier 1 generation, Tier 2 generation is not needed to determine the zone's import limit.

The results of the analysis produce the seasonal Zonal Import Ability. This value will be used to determine the seasonal CIL after accounting for exports to non-MISO load.

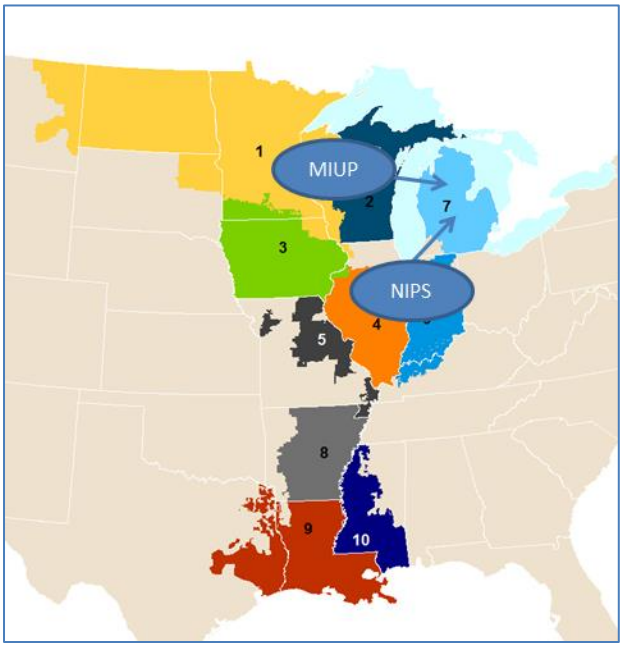


Figure 5.2: Example - MISO LBAs Used for First Test of LRZ 7 import limits

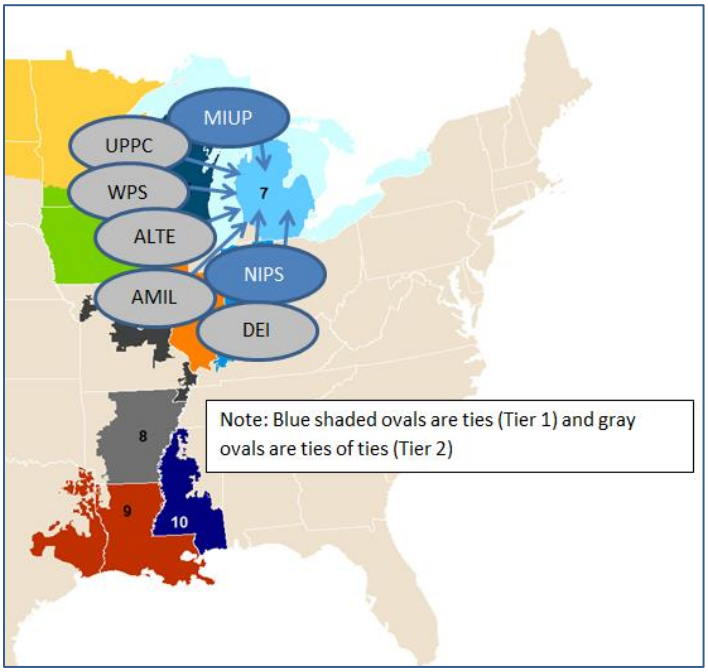


Figure 5.3: Example - MISO LBAs Used for Second Test of LRZ 7 import limits

Seasonal Zonal Export Ability (ZEA) and Seasonal Capacity Export Limit (CEL) Determination

The LRZ being studied for a seasonal export limit, is the source subsystem for the transfer. Available generation within the LBA(s) contained in that particular LRZ is increased proportionately while all generation dispatched, except for nuclear, wind and other intermittent resources, in all other MISO LBAs is decreased proportionately. This method produces the seasonal ZEA which is used to determine the seasonal CEL after accounting for exports to non-MISO load.

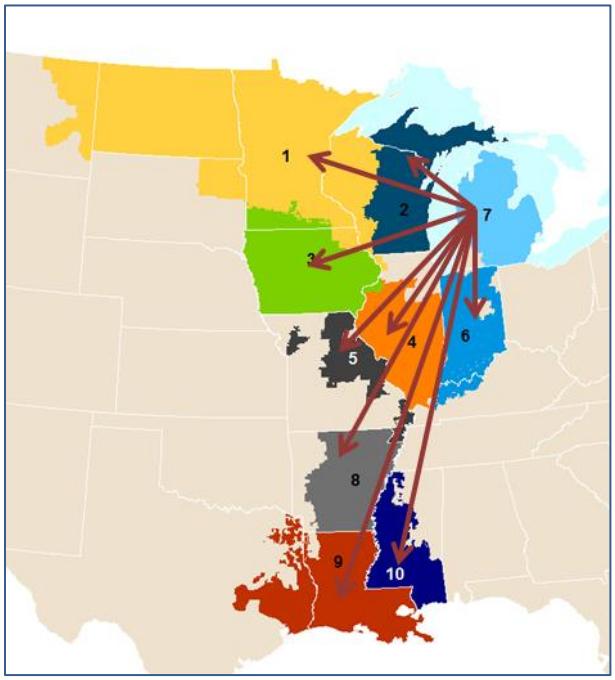


Figure 5.4: Example - MISO LBAs Used for LRZ 7 export limits

Redispatch

LOLE study redispatch is based on prior MTEP study methods. The base assumptions are as follows:

- No more than 10 conventional plants or wind plants will be used
- Redispatch limited to 2,000 MW total (1,000 MW up and 1,000 MW down)
- Nuclear units are excluded
- Wind and other intermittent resources can only be ramped down

For import redispatch scenarios, all generation resources in the zone being studied and adjacent systems (Tier 1 or Tiers 1 & 2) used for the transfer will be eligible to be ramped up. All MISO generation resources will be eligible to be ramped down. If the limiting constraint is a Reciprocal Coordinated Flowgate (RCF), MISO will work with the Seam entity to determine if an adjustment to external dispatch is appropriate and impactful.

For export redispatch scenarios, only MISO generation resources within the zone being studied are eligible to be ramped up. All MISO generation resources are eligible to be ramped down. As with import redispatch, if the limiting constraint is a Reciprocal Coordinated Flowgate (RCF), MISO will work with the Seam entity to determine if an adjustment to external dispatch is appropriate and impactful.

Adjustment for Exports to Non-MISO Load

FERC issued an order on December 31, 2015 which required studies to be neutral to units within MISO areas that are exporting to non-MISO load. MISO identifies and removes the impact of these exporting units on zonal area interchange. These adjustments result in an increase to CIL and decrease to CEL for zones with exports to non-MISO load.

Generation Limited Transfer

When conducting transfer analysis, the source subsystem might run out of generation to dispatch before identifying a constraint caused by a transmission limit. MISO has developed a process referred to as Generation Limited Transfer, or GLT, to identify transmission constraints in these situations.

After running the FCITC analysis to determine import and export limits for each LRZ, MISO will determine whether a zone is experiencing a GLT. If the LRZ is experiencing a GLT, MISO will adjust the base model dependent on whether the analysis is an import or export study and re-run the transfer analysis.

For an export study, when a transmission constraint has not been identified after dispatching all generation within the exporting system (LBAs under study) MISO will decrease load and generation dispatch in the study zone. The objective of the adjustment is to create additional capacity to export from the zone. After the adjustments are complete, MISO will perform transfer analysis on the adjusted model to be in line with section 5.2.2.1 (Calculation of Transfer Limits for the PRA). If a GLT is observed again, further adjustments will be made to the load and generation of the study zone.

For an import study, when a transmission constraint has not been identified after (a) decreasing all generation within the LRZ under study, (b) or dispatching all generation within Tiers 1 & 2, MISO will adjust load and generation in the source subsystem, Tiers 1 & 2. This will increase the capacity available to import into the study zone. After the adjustments are complete, the transfer analysis will be completed on the adjusted model to be in line with section 5.2.2.1. If a

GLT is observed again, further adjustments to the model would be made to the load and generation in Tiers 1 & 2.

FCITC could result in the transmission system supporting large thermal transfers for some zones which might result in some additional considerations. First, large GLT adjustments for export limits could result in reactive-power issues in the zone. Additionally, any load scaling beyond 50% of the zone's load in the base model could result in unrealistic modeling for a summer peak scenario and could lead to unreliable limits and constraints. Therefore, load scaling for both import and export studies will be limited to 50% of the zone's load.

If the GLT does not produce a limit for a zone(s), whether due to a valid constraint not being identified or due to other considerations as listed in the prior paragraph or in the case of a Zone where no valid limit is found in a particular Season, then the seasonal CIL or seasonal CEL will use the following equation where Capacity is the amount available to export or import from Tier 1 & 2 LBA's in the Base Case and where Base Case Flows is the Area Interchange for the study LRZ in the base Powerflow model.

ZIA/ZEA = Capacity + Base Case Flows

MISO shall report that LRZ as having no seasonal CIL/CEL limit and ensure that the transfer amount in the PRA will not bind in the first iteration of the Simultaneous Feasibility Test (SFT).

Voltage Limited Transfer for import studies

Zonal imports may be limited by voltage constraints due to a decrease in the generation dispatch in the zone being studied. Voltage constraints might occur at lower transfer levels than thermal limits that are determined by linear FCITC. As such, LOLE studies may include evaluation of Power-Voltage curves for major disturbances for LRZs with known voltage-based transfer limitations. Known transfer limitations will be identified through existing MISO or member Transmission Owner studies. Additionally, a study could be considered if an LRZ's import reaches a level where the majority of the zone's load would be served using imports from non-zonal resources. MISO will coordinate with stakeholders as these scenarios are encountered.

Processing and Reporting Results

The transfer analysis results for each LRZ consist of a list of constraints and their corresponding FCITC and FCTTC values up to the requested transfer level. The constraint with the smallest

FCTTC will be used to determine each Seasons' ZIA, ZEA, CIL and CEL. The limits are the total transfer capability of the corresponding limiting constraint. Refer to Section 5.2.2.3 Establishment of Local Clearing Requirementregarding how the seasonal ZIA impacts the seasonal Local Clearing Requirement (LCR) calculation. Stakeholder review of the constraints will occur through the LOLE working group.

If a zone's seasonal Local Clearing Requirement (LCR) is greater than the zone's seasonal Initial Planning Reserve Margin Requirement (PRMR) and an existing MTEP project is not expected to increase the seasonal ZIA, MISO will follow the process outlined in section 4.5.1 of the Transmission Planning BPM to identify a project to increase the zone's seasonal CIL.

Timeline and Posting of Results
Posting of power flow models and input files will be completed before analysis begins, if stakeholders have feedback for the models, it should be provided to MISO in a timely manner. The models and associated input files will be made available to the same location where MTEP Powerflow models are shared (https://misoenergy.sharefile.com/).

The outcome of this process will identify a ZIA, ZEA, CEL and CIL for each of the LRZs for each Season within the next Planning Year. MISO will publish the values for each LRZ by November 1 preceding the applicable Planning Year.

5.2.2.2 Establishment of Local Reliability Requirement

Each LRZ's seasonal Local Reliability Requirement (LRR) is the amount of SAC MWs required, located within the specific LRZ, to yield a 0.1-day-per-year LOLE at the load level for the LRZ at the time of the LRZ peak, without assistance from resources outside the respective LRZ (other than Border External Resources and Coordinating Owner External Resources modeled in the zone as described in section 4.2.3.2 (External Resource Qualification Requirements)). The LOLE study process is further described in the annual LOLE Study report posted on MISO's website.

Each Seasons' LRR will be established using the following iterative process:

- Use the LOLE model to determine the resources required in the LRZ to maintain 1 day in 10 years LOLE, representing the LRZ as isolated from the rest of MISO with no transmission ties to the outside world.
- Each LRZ contains the same load and internal resources from the PRM Analysis.

- For each LRZ, the model will initially be run with no adjustments to the capacity. If the LOLE is less than 0.1 day per year, a perfect negative unit with zero forced outage rate will be added until the LOLE reaches 0.1 day per year for the LRZ. This is comparable to adding Coincident Peak seasonal Demand. If the LOLE is greater than 0.1 day per year, proxy units based on a unit of typical size and forced outage rate will be added to the LRZ until the LOLE reaches 0.1 day per year for the LRZ.
- After solving for 0.1 day per year on an annual basis, risk-deficient Seasons will have a minimum reliability criteria set to 0.01 LOLE and adjustments to capacity in the model will be made until the LOLE reaches 0.01 day per Season.

The minimum amount of capacity above the zonal seasonal Coincident Peak Demand required to meet the reliability criterion of a 0.1 day per year LOLE value will be utilized to establish the Local Reliability Requirement (LRR) for each Local Resource Zone for each Season within the Planning Year. The LRR study utilizes the Year 2 zonal seasonal Coincident Peak Demand supplied by LSEs in the prior Planning Year PRA cycle. The per-unit LRR values are annually calculated by MISO and reviewed with stakeholders through the Loss of Load Expectation Working Group. The zonal per-unit seasonal LRR values are multiplied by the total zonal seasonal Coincident Peak Demand forecast (which is the sum of all CPD forecasts submitted by LSEs in each LRZ) for the prompt Planning Year PRA(s), inclusive of transmission losses, to calculate each Local Resources Zone's Local Reliability Requirement that will be enforced in each annual and Transitional Planning Resource Auction.

5.2.2.3 Establishment of Local Clearing Requirement

The final steps in calculating an LRZ's seasonal LCR is to account for the external transmission ties and controllable exports to non-MISO systems, by reducing the seasonal LRR by the seasonal ZIA determined in accordance with Section 5.2.2.1 (Calculation of Transfer Limits for the PRA) and by controllable exports. Controllable exports are firm capacity commitments from MISO units to non-MISO load and may be committed and dispatched by MISO during emergencies. All 10 LRZs have LCRs for each season and they must be met by resources internal to the zone, or by Border External Resources. For example, an LSE with Initial PRMR in LRZ 1, must meet that with ZRCs originated in LRZ1 to meet LRZ1's Local Clearing Requirement. ZRCs from other zones can be used to meet the incremental PRMR greater than LCR up to that zone's Initial PRMR subject to CIL/ CEL and SRIC / SREC.

The formula for determining the seasonal LCR is as follows:

$$\text{Seasonal LCR}_{z1} = \text{Seasonal LRR}_{z1} - \text{Seasonal ZIA}_{z1} - \text{controllable exports}_{z1}$$

MISO will publish preliminary seasonal LCR determinations as part of the preliminary PRA data. These values will be updated no later than mid-March with final, updated controllable export values and seasonal ZIAs.

5.3 Pre-PRA arrangement of capacity scheduling

5.3.1 Fixed Resource Adequacy Plan ("FRAP")

The FRAP will identify resources for which an LSE has ownership or contractual rights that will be relied upon to meet the LSE's Planning Reserve Margin Requirement while also conforming to the Local Clearing Requirement ("LCR") in each LRZ where the LSE has a Initial PRMR in each Season within the Planning Year. An LSE must submit its FRAP for applicable Season(s) via the MECT by the 7th business day of March prior to each Planning Year. MISO will review the FRAP and endeavor to notify the LSE of any issues by March 15. LSEs will have until the PRA(s) offer window opens to resolve any issues identified by MISO.

An LSE can designate its seasonal ZRCs in the FRAP up to the LSE's seasonal Initial PRMR. The seasonal ZRCs used in a FRAP will be deducted from the available seasonal ZRC balance of Planning Resources in the MECT. Any portion of an LSE's seasonal Initial PRMR not covered by the FRAP (or met through paying the Capacity Deficiency Charge) will be cleared in the seasonal PRA.

An LSE submitting a FRAP may be subject to a Zonal Deliverability Charge (ZDC). The ZDC is the difference between the seasonal ACP in the LRZ where the LSE has Initial PRMR obligation and the ACP in the LRZ or ERZ where the ZRC associated with the FRAP is physically located multiplied by the volume of the ZRC associated with the FRAP. An LSE can obtain a ZDC Hedge as a hedge against zonal price differences in each Season within the Planning Year.

Seasonal ZRCs and seasonal obligation included in a FRAP will be modeled in the PRA for the applicable Season.

5.3.2 RBDC Opt Out

An LSE may elect to use the RBDC Opt Out for the upcoming and the next two years' PRAs with an obligation (Final PRMR) that is calculated as shown in section 3.1, and with the RBDC Opt Out Adder determined at the first year of RBDC Opt-Out utilizing the following formula:

$$Final\ PRMR_{LSE} = \sum_{LBA}[(CPDf_{LBA} - FRP_{LBA} + FRS_{LBA}) \times (1 + TL_{LBA}\%) \times \left(1 + PRM_{RTO} + Adder_{RBDC\ Opt\ Out}\right)]$$

Where attributes are seasonal for the following:
Final $PRMR_{LRZ}$ = Final Planning Reserve Margin Requirement per LSE
$CPDf_{LBA}$ = Coincident Peak Demand forecast per LBA
FRP_{LBA} = Full Responsibility Purchase per LBA
FRS_{LBA} = Full Responsibility Sale per LBA
$TL_{LBA}\%$ = Transmission Loss Percentage of LBA
PRM_{RTO} = Planning Reserve Margin in Unforced Capacity set by LOLE Studies
$Adder_{RBDC\ Opt\ Out}$= RBDC Opt Out Adder (Defined in Module A 72.0.0)

In MECT, the LSE's choice of RBDC Opt Out is administrated at the granularity of Asset Owners that have load obligations.

5.3.2.1 Establishment of RBDC Opt Out Adder

MISO will use the systemwide and regional RBDCs, and historical market clearing data (e.g., last three Planning Years's market data) to determine the initial RBDC Opt Out Adder that will be applicable to LSEs that elect the RBDC Opt Out starting with Planning Year 2025-2026. MISO will post the determination of the RBDC Opt Out Adder on the MISO website per the timeline defined in Appendix K.

5.3.2.2 Request for RBDC Opt Out and ZRC designation

A Market Participant representing an LSE that plans to use the RBDC Opt Out must submit its initial intent to do so through the MECT. Such request must include the name and contact information of the RERRA(s) (email, phone number), where its load is subject to jurisdiction, and must be submitted no later than January 15 prior to the upcoming Planning Year. Market Participants representing the LSE need to contact MISO if there are complexities regarding the RERRA-LSE relationship (e.g., an LSE is subject to the jurisdiction of multiple RERRAs). MISO will verify the information and notify the RERRA(s) within five (5) business days following deadline of the LSEs initial submission. The RERRA(s) has up to twenty (20) Business Days to notify MISO whether the requested RBDC Opt Out has been authorized, on or before timeline listed in Appendix K.

If the RERRA(s) notifies MISO that the LSE is not authorized to use the RBDC Opt Out in the upcoming PRA, MISO will deny the LSE's initial submission in MECT. If the LSE is subject to the jurisdiction of more than one RERRA, MISO will deny the LSE's initial submission proposing to use the RBDC Opt Out if any one RERRA indicates that the LSE is not authorized to use the RBDC Opt Out. The LSE may withdraw its initial submission even if it receives authorization from RERRA(s). Otherwise, the LSE must submit its final confirmation to use the RBDC Opt Out in the MECT and must demonstrate that the LSE has designated ZRCs for each Season to meet the LSE's Final PRMR, and its share of LCR, by the 7th business day of March prior to each Planning Year. An LSE that elects the RBDC Opt Out may not use any other options to participate in the PRA (e.g., self schedule, FRAP, participating auction) to meet its Final PRMR, but may offer any ZRCs in excess of its Final PRMR into the PRA that is consistent with Section 64.1.1.d of Module D.

MISO will notify the LSE prior to March 15th before the applicable Planning Year whether the ZRCs submitted for the RBDC Opt Out meets the LSE's final PRMR and share of LCR for each LRZ requirement for each Season during the applicable Planning Year. An LSE that does not demonstrate sufficient ZRCs to meet its seasonal Final PRMR and share of LCR on LRZ basis before the PRA offer window opens will be subject to the Capacity Deficiency Charge based on the amount of shortfall in each Season.

An LSE that elects the RBDC Opt Out may be subject to a Zonal Deliverability Charge (ZDC). The ZDC is the difference between the seasonal ACP in the LRZ where the LSE has Final PRMR obligation and the ACP in the LRZ or ERZ where the ZRC associated with RBDC Opt Out is physically located, multiplied by the volume of the ZRC associated with the RBDC Opt Out. An LSE can obtain a ZDC Hedge as a hedge against zonal price differences in each Season within the Planning Year.

Seasonal ZRCs and associated seasonal obligations related to the RBDC Opt Out will be modeled in the PRA for the applicable Season.

5.3.3 LSE's Local Clearing Requirement for LSE's Using a FRAP or RBDC Opt-Out

LSEs that choose to use a FRAP or RBDC Opt Out must designate a sufficient volume of Planning Resources located in the same LRZ to meet the LRZ's LCR requirement in each Season individually. The amount of resources that must be sourced from within the LRZ to satisfy the LSE's seasonal LCR share is equal to the load ratio share of the LSE multiplied by

the total seasonal LCR for its LRZ. The following formula is used to determine each LSE's FRAP or RBDC Opt Out LCR requirements for each Season.

$$LSE\ LCR = \left[\frac{LSE\ PRMR'}{Zonal\ PRMR'}\right] * Zonal\ LCR$$

$$Minimum\ LSE\ \ ZONE\ = \max\left(0, \left[\frac{LSE\ LCR * LSE\ \ NON\ ZONE}{(LSE\ PRMR' - LSE\ LCR)}\right]\right)$$

$$for\ the\ given\ LSE\ \ NON\ ZONE$$

$$Maximum\ LSE\ \ NON\ ZONE\ = \max\left(0, \left[\frac{LSE\ \ ZONE * (LSE\ PRMR'\ -\ LSE\ LCR)}{LSE\ LCR}\right]\right)$$

$$for\ the\ given\ LSE\ \ ZONE$$

Where:

LSE LCR:	Amount of ZRCs that must be supplied from the same LRZ where the LSE's Initial PRMR is located
LSE ZONE:	ZRCs that are in the same LRZ as the Initial PRMR that is being met through a FRAP or RBDC Opt Out by the LSE
LSE NON ZONE:	ZRCs from an ERZ or that are not in the same LRZ as the Initial PRMR that is being met through a FRAP or RBDC Opt Out by the LSE
LSE PRMR':	Total Initial PRMR the LSE has in the LRZ
ZONAL PRMR':	Total Initial PRMR for all LSEs in the LRZ
Zonal LCR:	The minimum amount of ZRCs that are located within an LRZ that is required to meet the LOLE while fully using the Capacity Import Limit for such LRZ.

EXAMPLE :

All LSE Initial PRMR in following example is calculated based on the MISO-established PRM, even if the LSE is subject to the jurisdiction of a state that has established its own PRM

LSE Initial PRMR = 100 MW in LRZ 1
LSE LCR = 80 MW in LRZ 1

To apply ZRCs from other LRZs or an ERZ in the FRAP (or RBDC Opt Out), the following condition must be satisfied when the LSE LCR≤ LSE Initial PRMR:

$$\left[\frac{(LSE\ ZONE + LSE\ NON\ ZONE)}{LSE\ PRMR}\right] \leq \left[\frac{LSE\ ZONE}{LSE\ LCR}\right]$$

When the LSE LCR>LSE Initial PRMR, the LSE should only use ZRCs inside the resource zone to meet its Initial PRMR:

$$LSE\ NON\ ZONE = 0$$

Substituting the value for *LSE LCR* from above, the above formula can be rearranged and rewritten as:

$$\min(1, \left[\frac{Zonal\ LCR}{Zonal\ PRMR}\right]) \leq \left[\frac{LSE\ ZONE}{(LSE\ ZONE + LSE\ NON\ ZONE)}\right]$$

Where *LSE Total* is simply the sum of the FRAP from within and outside of the zone. To state more simply, an LSE must maintain a balance of FRAP (or RBDC Opt Out) in zone to total FRAP (Or RBDC Opt Out) greater than or equal to the ratio of the zone's LCR and Initial PRMR.

Case 1: LSE ZONE = 40MW in LRZ 1
LSE NON ZONE = 10 MW from LRZ 2

$$\left[\frac{(40+10)}{100}\right] \leq \left[\frac{40}{80}\right] \Rightarrow \left[\frac{1}{2}\right] \leq \left[\frac{1}{2}\right] \Rightarrow Pass: 10\ MW\ of\ ZRCs\ from\ other\ LRZ\ is\ allowed\ for\ the\ given\ LSE\ \ NON\ ZONE\ of\ 10\ MW,$$

$$Minimum\ LSE\ \ ZONE\ = \left[\frac{80 * 10}{(100-80)}\right] = 40\ MW$$

NOTE: 40 MW represents the minimum amount of FRAP (or RBDC Opt Out) that must be fulfilled by the ZRCs in LRZ 1 in this case.

Case 2: LSE ZONE = 60 MW
LSE NON ZONE = 20 MW

$$\left[\frac{(60+20)}{100}\right] \leq \left[\frac{60}{80}\right] \Rightarrow \left[\frac{4}{5}\right] \leq \left[\frac{3}{2}\right] \Rightarrow Fail: 20\ MW\ of\ ZRCs\ from\ other\ LRZ\ is\ not\ allowed$$

for given LSE ZONE of 40 MW,

$$Maximum\ LSE\ \ NON\ ZONE\ = \left[\frac{60 * (100 - 80)}{80}\right] = 15\ MW$$

NOTE: 15 MW represents the maximum amount of ZRCs from other zones which can be used to FRAP or RBDC Opt Out LSE's Initial PRMR in LRZ 1 in this case.

5.4 Hedges and Zonal Deliverability Benefit

5.4.1 Zonal Deliverability Benefit

Price separation between Local Resource Zones (LRZs), External Resource Zones (ERZs), or groupings of LRZs, including Sub-Regional Resource Zone (SRRZs) occurs due to constraints binding in the Planning Resource Auction(s) (PRA). Zonal Resource Credits (ZRC) will receive the Auction Clearing Price (ACP) based upon the LRZ or ERZ where the Planning Resource underlying the ZRC is physically located for each Season within the Planning Year.

As a result of price separation, the Transmission Provider may collect more debits from LSEs than it credits the owners of the seasonal ZRCs. Excess amounts will be distributed as follows:

1. Historical Unit Considerations (HUCs) and Zonal Deliverability Charge (ZDC) Hedges owed payment.
2. Any remaining excess revenue shall be distributed on a *pro rata* basis to Deliverability Benefit Zones (DBZs). A DBZ is a group of one or more LRZs with equal ACPs driven by the same auction constraint.

5.4.1.1 Zonal Deliverability Benefit Pro Rata Allocation Methodology

The *pro rata* distribution is applied to each applicable Season and is based upon the LSE's eligible Adjusted Final PRMR. . Adjusted Final PRMR is the Final PRMR minus HUCs and ZDC Hedges.

MPs with Fixed Resource Adequacy Plans or RBDC Opt Out are eligible to receive ZDB.

The *pro rata* methodology to allocate ZDB uses a weighted average approach to calculate the benefit, in dollars, to importing DBZs of all exports within MISO – a weighted average exporting ACP. This weighted average pool of dollars is then allocated to importing DBZs within MISO on a *pro rata* methodology based upon the difference between the importing DBZ ACP and the

weighted average exporting ACP and the MW amount of imports into a DBZ. The ACP for each LRZ within an importing DBZ is adjusted by dividing the benefit dollars allocated to the DBZ by the total PRMR of all LRZs within a specific DBZ. The specific steps to allocate ZDB are described below.

1. Subtract Final PRMR and ZRCs associated with HUCs and ZDB Hedges to derive an adjusted Final PRMR (Adjusted Final PRMR) and ZRC (Adjusted ZRC).
2. Create a DBZ for each group of LRZs that have equal ACPs which result from the same auction constraint.
3. For each DBZ, subtract the sum of Adjusted Final PRMR for each LRZ within the DBZ from the sum of Adjusted ZRCs for each LRZ within the DBZ. A DBZ will be considered a net importing DBZ if the sum of Adjusted Final PRMR is greater than the sum of Adjusted ZRCs. A DBZ will be considered a net exporting DBZ if the sum of the Adjusted Final PRMR is less than the sum of Adjusted ZRCs. A net exporting DBZ shall not receive any ZDB credit. A net importing DBZ shall receive a ZDB credit allocation based upon this weighted average approach.
4. Calculate the weighted average ACP of all net exporting DBZs (Weighted Average Export ACP) to determine a financial value of export capacity within the Transmission Provider region per the formula below:

$$\text{Weighted Average Export ACP} = \frac{\sum(\text{Net Export}_j \times \text{ACP}_j)}{\sum \text{Net Export}_j}$$

Where j = Each net exporting DBZ

5. Calculate the ZDB credit allocation, in dollars, for each net importing DBZ:

$$\text{ZDB Credit}_k = \text{Net Import}_k \times (\text{ACP}_k - \text{Weighted Average Export ACP})$$

Where k = Each net importing DBZs

6. Distribute the ZDB credit in each DBZk by dividing the ZDB credit by the sum of Adjusted Final PRMR of the LRZs within each DBZk. Subtract this amount from the initial ACP calculated for each LRZ from the PRA.

FRAP or RBDC Opt Out Contribution to ZDB

Furthermore, ZDB includes credits collected from FRAPs or RBDC Opt Out that contain ZRCs located in LRZs that have a greater ACP than the respective PRMR's LRZ. This ZDB will be allocated on a *pro rata* basis by Adjusted Final PRMR to all LSEs within the DBZ where the ZRC associated with the FRAP or RBDC Opt Out is physically located.

Allocation of Zonal Deliverability Charge ("ZDC")

A FRAP will be subject to a ZDC if the ACP of the LRZ where the ZRC is physically located is less than the ACP of the LRZ where the Final PRMR associated with the FRAP or RBDC Opt Out is physically located. ZDC collected by the Transmission Provider that is not associated with a ZDC Hedge will be allocated on a *pro rata* basis by Adjusted Final PRMR to all LSEs within the DBZ where the Final PRMR associated with the FRAP or RBDC Opt Out is physically located.

A detailed example of ZDB *pro rata* allocation methodology is in Appendix P.

5.4.2 Historical Unit Considerations (HUCs)

A HUC is a financial hedge against ACP differentials between LRZs or between an LRZ and an ERZ. HUCs for existing capacity agreements hold LSEs harmless from price separation to the extent that excess auction funds are sufficient. HUCs for existing LSEs will be eligible until the end of the original term of the arrangement, not including any evergreen extensions, or for two years – whichever is longer.

The following criteria must be satisfied for HUC approval:

- LSE must have ownership or contractual rights to the resource
- Must have resource and load located in two different LRZs or a resource located in an ERZ
- Must have either NRIS or firm transmission service from the resource LRZ to the load LRZ
- Contracts and its associated NRIS or firm transmission service must be valid through the entire Planning Year
- Contracts must be a) Grandfathered Agreements, b) arrangements executed and in place on or before July 20, 2011, or c) arrangements that predate March 26, 2018 and pertain to External Resource represented in External Resource Zones
- For both new and existing LSEs, HUCs will expire at the end of the contract term, unit ownership change or unit retirement date, whichever is sooner. Contracts expiring during the upcoming Planning Year are not eligible for a HUC covering the planning year. Contracts that have been renewed by evergreen contract provisions are only valid for two Planning Years from the date of the HUC registration

- A HUC must be registered in the MECT by November 1 prior to each Planning Year[2]. HUC Registrations will need to have all information populated except for the Planning Resource, Asset Owner, Resource Zone and TSR and/or NITS identification number(s). Once the SAC MW for Planning Resources is published, MISO will allow Market Participants to update the Planning Resource, Asset Owner, Resource Zone, and TSR and/or NITS ID number information only. Updates will need to be completed by February 1 prior to the Planning Year
- A separate HUC registration is required for each Planning Resource and load within each LRZ or a resource located in an ERZ
    - One Planning Resource in a registration can only select one LRZ or ERZ
- The MW in HUC registrations that are paid will not exceed the LSE's seasonal Final PRMR minus their LCR.
- If there are more HUCs than a DBZ's Final PRMR minus its LCR, then HUC payments will be pro-rated by multiplying the difference between Final PRMR and LCR divided by the total HUCs.
- If Market Participants enter a seasonal ZRC transaction to fulfill contracts that meet the criteria for a hedge, MISO must be able to determine the source of the ZRCs in order to apply the HUC financial hedge to the auction results
    - ZRCs transacted to fulfill existing contracts will need to have specific unit identifiers from aggregate deliverable generators
- Based on the ZRCs transacted, MISO will work with the MP that qualified the HUC to determine in which LRZ or ERZ the Planning Resource is located

If a Load is in an LRZ with a higher ACP than the LRZ or ERZ where the Resource is located, the MP serving the Load will pay an amount equal to the difference of the ACPs between the LRZ and the LRZ or ERZ where the Resource is located, multiplied by the amount of the unhedged load if a HUC Hedge does not exist. This distribution will be limited by the excess auction revenue collected in a given PRA.

A combination of capacity agreements that require the delivery of capacity throughout the Planning Year will qualify for treatment as HUCs, provided that the agreements otherwise satisfy the criteria.

[2]

Facilities under construction on or before July 20, 2011 that subsequently become Planning Resources will be eligible for the HUC Hedge provided that the HUC criteria is satisfied.

Firm resources that meet HUC Hedge criteria may be included as part of a FRAP or RBDC Opt Out or offered into the annual auction. Any MWs of ZRCs in a FRAP or RBDC Opt Out that are qualified under a HUC will not be subject to a Zonal Deliverability Charge assessment and will not receive a HUC payment

5.4.3 Zonal Deliverability Charge Hedge

LSE can obtain a ZDC Hedge as described herein as a financial protection from zonal price differences. Market Participants will be eligible for a hedge against congestion in the auction if the LSE invests in new or upgraded transmission to serve the LSE's load if located in a different LRZ. Network upgrades made for interconnection service (NRIS/ERIS) do not qualify for a ZDC Hedge. Also, any cost shared upgrades would not be eligible for a ZDC Hedge. The participant that funds the upgrades and submits the transmission service request is the participant who is eligible for the ZDC Hedge. However, Network upgrades associated with a Transmission Service Reservation (TSR) from the new resource to load located in a different LRZ would qualify. The volume of a ZDC Hedge will be the incremental increase in the CIL that resulted from the Network Upgrades identified in the approved firm transmission service request. Market Participants must register the ZDC Hedge and provide supporting documentation in the MECT by November 1 prior to the Planning Year to demonstrate eligibility. ZDC Hedges will be granted only to LSEs that have Planning Resources that cleared in a PRA.

5.5 Planning Resource Auction (PRA)

5.5.1 Timing of Auctions

Seasonal Planning Resource Auctions will be conducted in the first 20 business days of April, with results posted near the end of April which is approximately one month before the beginning of the first Season of the associated Planning Year (PY). All four seasonal (Summer, Fall, Winter and Spring) PRA's will be conducted in April prior to the PY.

5.5.2 Amount of Capacity Cleared in Each Auction

The seasonal PRA(s) and Transitional PRA shall clear seasonal ZRC offers in order to satisfy 100% of the seasonal Final PRMR for each LSE, less the amount of seasonal Initial PRMR associated with the Capacity Deficiency Charge and inclusive of any resources used in a seasonal FRAP or RBDC Opt Out, in each LRZ. For a Season, if the total volume of seasonal

ZRC offers is less than total seasonal Final PRMR, MISO will clear the total volume of offered ZRCs for that Season respecting established CIL, CEL, SRIC and SREC.
For LSEs not selecting the RBDC Opt Out, the Final PRMR is established as a result of the PRA clearing using RBDCs. For LSEs selecting the RBDC Opt Out, Final PRMR is the same as Initial PRMR, which is based on the sum of the applicable PRM plus the applicable RBDC Opt Out Adder, as demonstrated in section 3.1. LSEs under state jurisdiction where the state has elected to establish its own planning reserve margin will have a Final PRMR based on the planning reserve margin established by the state.

5.5.3 Conduct of the PRA

The seasonal Planning Resource Auctions shall be sealed bid auctions, which will determine the seasonal Auction Clearing Prices (ACP) for each Local Resource Zone (LRZ) and External Resource Zone (ERZ) modeled in that auction. The auction shall determine the outcome of all seasonal ZRC offers accepted during the qualification process and submitted during the auction offer window.

Step 1: Compilation of Offers
Offers for each of the seasonal auctions must be submitted in the MECT's Submit Offer screen for each specific seasonal auction during the auction offer window period. The offer window for the auction will be opened during the last four business days in the month of March prior to the start of the new Planning Year. Owners of jointly owned facilities can individually offer their share of any such resources into the seasonal PRAs, either as self-schedule price takers or with specific offers or use their share of such resources as part of a seasonal FRAP or RBDC Opt Out.

MISO shall compile all of the offers for each Season, as follows: The MP acting on behalf of any Planning Resource accepted in the qualification process for participation in the auction may submit an offer consisting of price and quantity pairs, indicating the minimum acceptable price and the associated quantity of seasonal ZRCs that the MP would commit to provide from the Resource in the associated modeled LRZ and/or ERZ during the Season within the Planning Year. An offer shall be defined by the submission of up to five price and quantity pairs, each having a strictly greater price than the previous price in the submission. Each price shall be expressed in dollars per megawatt-day, and each quantity shall be expressed in 0.1 MWs. The MW/Price pairs must be monotonically increasing for each price. Each segment of each offer is separately evaluated.

Step 2: Determination of the Outcome

MISO shall use the seasonal ZRC offers to determine the aggregate supply curves for each MISO modeled LRZ and/or ERZ. MISO will use the seasonal offers in conjunction with the seasonal import and export constraints, seasonal local clearing requirements, and other inputs to determine the least cost set of offers that respects the various constraints expressed as described in the Tariff. The Transmission Provider will clear offers based on the needs of the LRZ and not the size of a Resource (i.e., if an LRZ needs 50 MW, but a Market Participant has a 100 MW Resource; only 50 MW will clear). At any non-zero clearing price, a pro-rated clearing from tied bids will be applied in conjunction with need, location of resources subjected to tied bids, and import and export limits of respective LRZs. At a zero-clearing price, all zero-price and price-taking offers will be accepted.

Inadequate Supply

While the auction process will endeavor to select seasonal ZRC offers sufficient to meet the seasonal requirements of each LRZ, it is possible that sufficient resources are not available in the LRZ and the LRZ would thus be short of Planning Resources for that Season within the Planning Year. In such cases, the auction will clear all seasonal ZRC offers in the LRZ for that Season and, if the LRZ is short ZRC's to meet the seasonal requirements, the entire LRZ will clear at the LRZ's seasonal CONE value. If the LRZ is short of ZRC's to meet the requirements for more than one Season within the Planning Year, then the ACP for such Seasons will be determined as described in section 69A.7.1 of Tariff Module E-1.

5.5.4 Market Monitoring

All participation by Market Participants is subject to the market power mitigation rules regarding physical and economic withholding of capacity as described in Module D of MISO's Open Access Transmission Tariff and Market Monitoring BPM-009. All Planning Resources except for External Resources, Load Modifying Resources, and Energy Efficiency Resources are subject to physical and economic withholding monitoring. Below are additional details regarding the application of these market monitoring provisions. In addition to these details, please refer to Module D and BPM-009 Market Monitoring and Mitigation for additional details.

5.5.4.1 Physical Withholding

Sec. 64.1.1.d of Module D describes the Physical Withholding Provisions in the PRA. The IMM has established a Physical Withholding Threshold Limit of 50 MW per LRZ that is applied as a sum to a Market Participant (MP) and its Affiliates. Thus, there is a total of 50 MW of deliverable

SAC (ZRCs) whose rights are owned by an MP and its Affiliates in each LRZ that are not required to submit an offer into the PRA or be part of a FRAP or RBDC Opt Out. If the sum of deliverable SAC MW withheld exceeds the Physical Withholding Threshold Limit, the MP and its Affiliates would fail for conduct (Conduct Test) for physical withholding and be subject to the Impact Test described in Module D.

5.5.4.2 Economic Withholding

Sec. 64.1.2.d of Module D describes the Economic Withholding Provisions in the PRA. By default, each Planning Resource subject to economic withholding has an initial Reference Level for their PRA offer of $0/MW-Day. A Conduct Threshold equal to 10% of the LRZ Daily CONE (Daily CONE = LRZ CONE / 365) is allowed for a PRA offer without failing conduct (Conduct Test) for economic withholding and be subject to the Impact Test described in Module D.

An MP may submit a request for a Facility Specific Reference Level (FSRL) to the IMM. The request must be accompanied by evidence and documentation of Going Forward Costs (operating and capital) to operate the Planning Resource for the next Planning Year. Going Forward Costs must be sufficient detail to specify costs specific to suspension or retirement. Refer to BPM-009 Market Monitoring and Mitigation for additional details.

Market Participants have the option to use Default Technology Specific Avoidable Costs (DTSAC) calculated by the IMM as specified in Module D for operating cost recovery in lieu of submitting their own documentation for operating costs. The DTSAC values in Module D are broken down by different generator classifications for suspension and retirement requests. Refer to BPM-009 Market Monitoring and Mitigation for additional details.

5.5.5 Target Reliability Value

The resultant target reliability value for each Season for each LRZ will be the greater of the system-wide seasonal Planning Reserve Margin Requirement based on MISO's seasonal PRM or the seasonal LCR value. The sum of these seasonal LRZ target reliability values will be the system's target seasonal reliability value, that is, the amount of SAC MW that must be obtained, if available, from the auction.

5.5.6 Resource Offers

Any seasonal ZRCs that were not used in a FRAP or RBDC Opt Out can be offered into the seasonal PRA during the auction window period. The following business rules are applied to the seasonal ZRC offers for the seasonal PRA:

- Offer cannot be changed or withdrawn after the auction window is closed.
- Smallest Offer MW = 0.1 MW.
- Offer Segment defined as a price-quantity pair.
- Up to 5 Offer Segments per Planning Resource.
- Lowest Offer price is $0.00/MW-Day.
- Highest Offer Price for each Season and zones (LRZ and ERZ) is the annual LRZ/ERZ CONE divided by the total number of days in the Season.
- The Transmission Provider will clear offers based on the needs of the LRZ and not the size of a Resource (i.e., LRZ needs 50 MW, but Market Participant has a 100 MW Resource; only 50 MW will clear). At a zero-clearing price, all zero-price and price-taking offers will be accepted.

Self-Scheduling

LSEs that "self-schedule" ZRCs by submitting offers into the PRA(s) with a price of $0.00 will always clear the auction.

Sub-Regional Constraints

The Sub Regional Import Constraint (SRIC) and the Sub Regional Export Constraint (SREC) for each Sub Regional Resource Zone (SRRZ) are the transmission constraint parameters which must be respected, in addition to CILs and CELs for each LRZ, when conducting the PRA or in the Resource Replacement process. A SRRZ consists of more than one LRZ. The North/Central SRRZ consists of LRZs 1-7, and the South SRRZ consists of LRZ 8-10.

The Transmission Provider will establish and publish, on the Transmission Provider's public website, SRRZs, seasonal SRECs and seasonal SRICs as soon as practical but no later than the first business day of March for the following Planning Year.

5.5.7 Seasonal Simultaneous Feasibility Test (SFT)

Background

The test identifies transmission constraints resulting from power transfers between LRZs and imports to the MISO system from ERZs. To the extent transmission constraints cannot otherwise be mitigated via redispatch of seasonal Planning Resources while holding LRZ imports and exports constant, new seasonal CIL and CEL values (as applicable) are established. Resulting transfers in the auction will be simultaneously reliable and feasible. The seasonal SFT is completed after the seasonal auction clears and is driven by section 69A.7.1 of Tariff Module E-1.

Base Model

Base modeling represents the transmission topology and associated transmission ratings, Demand, and anticipated net interchange for the associated Season: summer, fall, winter, and spring. This is accomplished by the following modeling assumptions:

- Base model
  - Latest available MISO model with expected generation and transmission topology for the effective date of each Season within the Planning Year
- Transmission Topology
  - Includes Appendix A and other Model On Demand projects in-service by the effective date of the specific Season within the Planning Year
- Load
  - Final PRMR cleared through seasonal auction
  - LMRs are modeled as reduction of seasonal Final PRMR where LMRs are physically located
- Dispatch
  - Seasonal FRAP
  - Seasonal RBDC Opt Out
  - Seasonal ZRC offers cleared through the auction
- External representation
  - Latest Eastern Interconnection Reliability Assessment Group Multiregional Modeling Working Group series model matching Planning Year timeframe for each Season where applicable within the Planning Year

The latest seasonal models from the annual MISO series model build provides the best representation of the system and is a better representation than the one-year-old LOLE model used to establish the seasonal CIL and CEL limits. The latest model contains up-to-date topology and has gone through more recent stakeholder review.

Interchange Detail

External units that clear the auction are accounted for by Balancing Authority Area and then the interchange between MISO and the Balancing Authority Areas with cleared units is adjusted to represent the cleared amount. Units within MISO with an external capacity commitment will be dispatched to external load. Interchange will be adjusted to reflect the transaction.

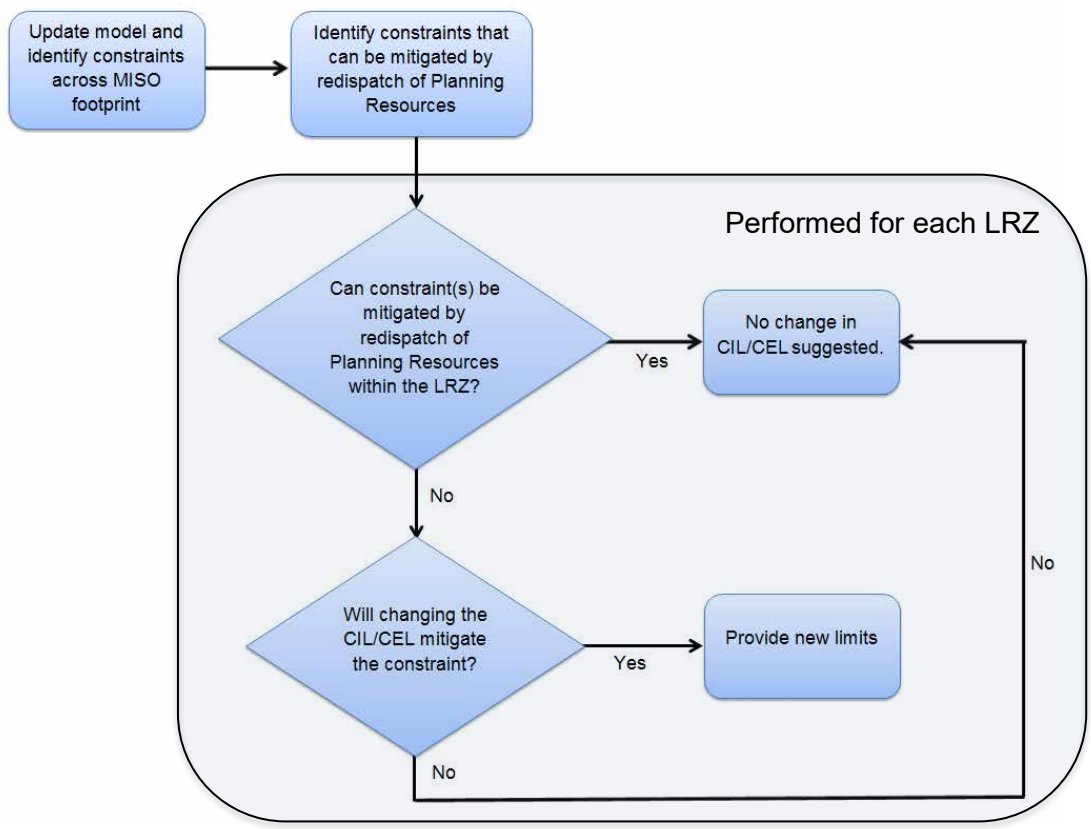
Topology Validation

Model checks are performed prior to the SFTs and PRAs. First, the ratings of facilities found to be limiting in the LOLE study are checked for rating changes. If the facility ratings are updated, the impact on seasonal CEL, CIL and/or ZIA must be determined and included as inputs to the PRAs. Transmission projects included in the LOLE models that were supposed to be in service by the effective date of the model, are validated and updated accordingly if a project's in-service date changes.

Power flow Analysis

The only controllable elements of the auction are the seasonal CIL and CEL. The seasonal SFT determines if any changes to CIL and CEL are required. The initial limits are determined in the annual LOLE study where seasonal CIL and CEL limits are established. These limits are an input to the initial auction clearing process. The SFT process is outlined in Figure 5.5 below.

Figure 5.5: SFT Process Flow



Seasonal CIL and CEL may be modified when the dispatch of Planning Resources within that Season outside the LRZ is the only action to mitigate constraints. To determine if changes are required, it must first be determined if the LRZ is an exporter or importer from the auction results of that Season. If the LRZ is an exporter within the seasonal CEL bounds, no change to limits should cause the LRZ to export more. Similarly, no change to limits should cause an importing LRZ to import more. The changes to limits that are impactful for exporters and importers are outlined as:

- Potential change if Planning Resources outside an LRZ is the only mitigation identified
- Decrease export or import limit if Planning Resources outside LRZ can be ramped up or down respectively to mitigate the constraint
- Decrease limit by MW amount needed to mitigate constraint

The Tariff allows for up to three iterations of the auction clearing process. The first iteration uses the seasonal CIL and CEL values from the LOLE study while the second and third iteration use any updated CIL and CEL values as determined by the seasonal SFT. The second and third iterations are performed only if needed. The clearing iterations are outlined as:

1st Pass

- Inputs to the auction clearing process are seasonal CILs and CELs from LOLE study, seasonal LCR, seasonal SRECs, and seasonal SRICs as applicable
- If all LRZs pass the SFT in that Season, auction results are final and the 2nd and 3rd iteration of auction clearing is not required.

2nd Pass

- Inputs to the auction clearing process are updated. Seasonal CILs and CELs from the 1st Pass and
- If all LRZs pass the SFT, results are final.

3rd Pass

- Inputs to the seasonal auction clearing process are updated. Seasonal CILs and CELs from the 2nd Pass if all zones pass the SFT, results are final. If at least one LRZ does not pass the SFT, the iteration with the fewest MWs of network violations will be deemed as the final auction result.

5.5.8 Auction Results Posting

MISO will post the summary of the Planning Resource Auction results on its website twenty (20) Business Days after the auction offer window is closed. The summary includes the following information for MISO system wide and each LRZ for each Season within the Planning Year: Final PRMR, Total Offer + FRAP+RBDC Opt Out, Offer Cleared + FRAP+RBDC Opt Out, LCR, Import Limit (CIL), Export Limit (CEL), Import/Export amount, ACP, deficient amount, and Total Offer Cleared volume for the system.

One month following the completion of any PRA, MISO will post the ZRC Offers in price/quantity pairs on its website without revealing the names of the Market Participants submitting such offers and the names of the Planning Resources offered.

Resource Adequacy Settlement

Transmission Provider will settle each PRA using the following steps:

1. Determine the ACP for ZRCs within each LRZ for every Season.
2. Determine each LSE's Final PRMR. For details see 5.6.

3. Provide HUC credits equal to the zonal ACP differential to Load subject to HUCs in every Season in the Planning Year.
4. Provide ZDC Hedge credits equal to the zonal Auction Clearing Price differential to ZDC Hedge Load amounts in every Season in the Planning Year.
5. Provide ZDB credits to all remaining Final PRMR in the LRZ. The ZDB is a credit against the ACP paid by LSEs with Final PRMR in each LRZ in every Season in the Planning Year.

Settlement calculations for each Season in the PRA will be conducted on a daily basis and the results will be shown under the Real Time Settlements statement. Please refer to the Market Settlements BPM for further details. Below are charge types under the PRA(s) Settlement:

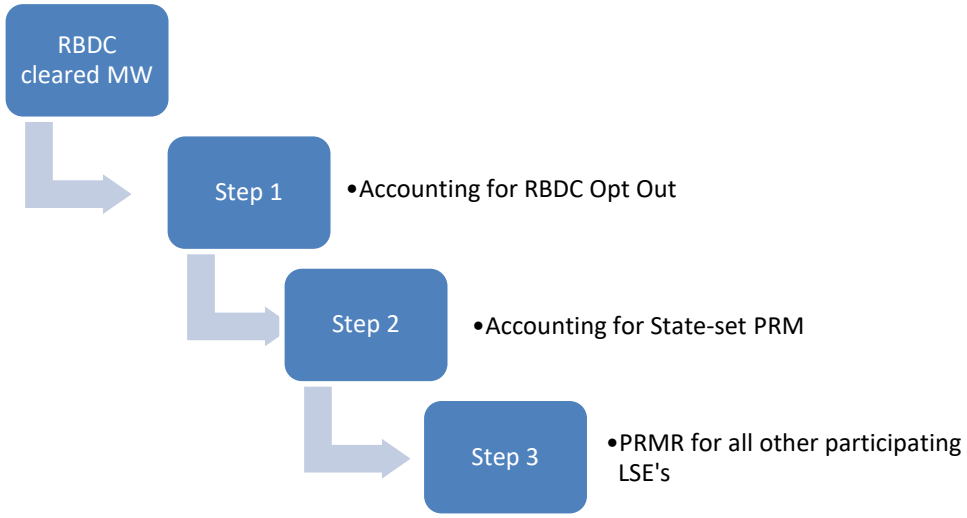
- PRA Charge
- Distribution of PRA Charge
- Zonal Deliverability Charge (ZDC) (*Only applies to the FRAP or RBDC Opt Out)
- Distribution of ZDC
- Capacity Deficiency Charge (Covered outside of the daily settlements)

Cleared seasonal ZRCs from Diversity Contracts that are not self-scheduled or in the LSE's seasonal FRAP or RBDC Opt Out will receive reduced payment based on the total number of days the external resource identified in the Diversity Contract are dedicated to MISO load when an LSE clears more seasonal ZRC in the PRA than its seasonal Final PRMR. The LSEs that converted SAC MW to seasonal ZRCs will receive the seasonal auction clearing price for the entire Season for those seasonal ZRCs that cleared in the seasonal PRA.

5.6 Final PRMR Allocation Process

The Final PRMR of an LSE is determined based on RBDC clearing and the LSE's participation option (such as RBDC Opt Out, market participation, etc.) in the PRA. The RBDC cleared MWs determined during the PRA clearing process will be allocated to determine LSE's Final PRMR using the steps outlined below (Figure 5.6).

Figure 5.6: Overview of Final PRMR allocation process



Step 1: Accounting for RBDC Opt Out

First, determine cumulative MWs corresponding to PRMR obligation of LSEs choosing the RBDC Opt Out option as per Section 5.3.2. Then, deduct this cumulative MWs from the total cleared MW from the PRA clearing. Remaining cleared MWs, if any, are then passed on to step 2.

Step 2: Accounting for State-set PRM

Then, the Final PRMR for LSEs who are under State jurisdiction with the State defined PRM is determined. For such LSEs, their Final PRMR is calculated based on the PRM defined by the respective State. Then, the sum of Final PRMR of LSEs who are under State jurisdiction with the State defined PRM is deducted from the remaining cleared MWs that were calculated in step 1. At the end of step 2, remaining cleared MWs, if any, are determined and then passed on to step 3.

Step3: Determine Final PRMR for other LSEs (Neither RBDC Opt Out nor under State-set PRM)

If the remaining cleared MWs after step 2 of the Final PRMR allocation process are greater than zero, then step 3 of the Final PRMR allocation process will be executed. In this step, remaining cleared MWs, determined in step 2 of the Final PRMR allocation process, will be distributed across remaining LSE's not covered under step 1 or step 2 on a pro-rata basis with respect to their Coincident Peak Load Forecast including transmission losses.

For LSEs participating using FRAP provisions, the quantity that is covered through FRAP provisions will be considered after step 3 of the Final PRMR allocation process. Any additional ZRCs that such LSEs need to procure from the market to meet their share of Final PRMR, will be charged the applicable ACP.

Example 1: RBDC Out Out, No State setting PRM, & Final PRMR higher than Initial PRMR

Consider a system with three LSEs (LSE A, LSE B, and LSE C) and a system peak demand of 100 MW (accounting for the CPD forecast plus transmission losses).

PRA Participation:

- LSE A has a 15MW load and participates in the PRA using RBDC Opt Out provisions.
- LSE B has 50 MW load, and
- LSE C has 35 MW load.

Assumptions:

- No State has defined PRM for its jurisdictional entities
- MISO defined PRM to be 9%
- RBDC Opt Out Adder to be 4%
- Systemwide RBDC clearing in the PRA to be 112 MW (indicating RBDC clearing at 12% above load forecast)
- No SRIC/SREC binding

Final PRMR allocation calculation:

Step 1: Accounting for RBDC Opt Out

In this example, LSE A has 15 MW of load participating in the PRA using RBDC Opt Out provisions. Given a PRM of 9% and an RBDC Opt-Out Adder of 4%, the final PRMR for LSE A will be **16.95 MW**, calculated as 15 * (1 + 9% + 4%). After this allocation, 95.05 MW of cleared RBDC capacity will remain (112 MW - 16.95 MW) for further distribution in the following steps.

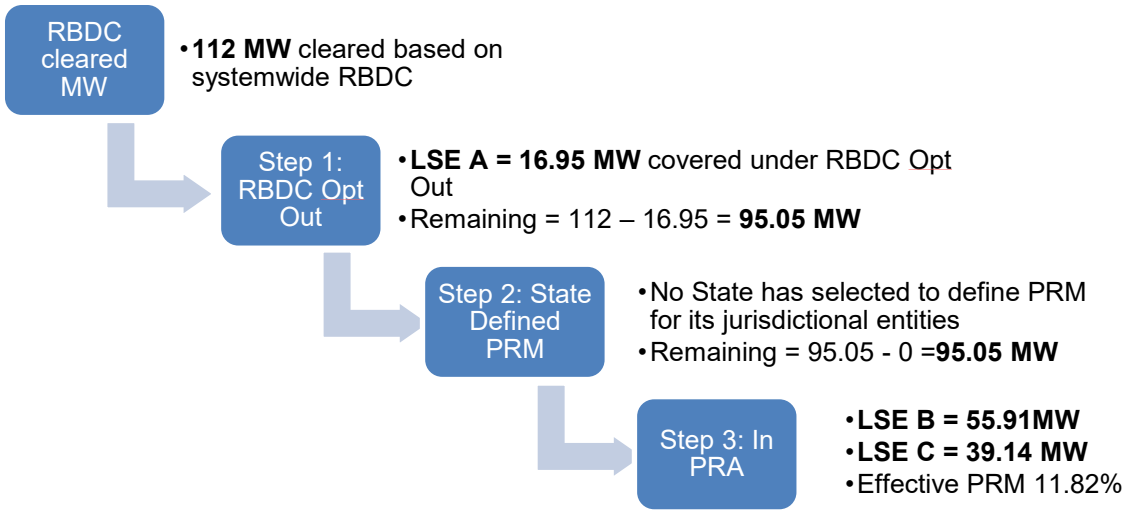
Step 2: Accounting for State-set PRM

In this example, there is no load subjected to State defined PRM. Hence, no Final PRMR is allocated in this step and 95.05 MW of cleared RBDC capacity will still remain (112 MW - 16.95 MW) for further distribution in the following step.

Step 3: Determine Final PRMR for other LSEs (Neither RBDC Opt Out nor under State-set PRM)

In step 3, remaining RBDC cleared 95.05 MW, determined after step 2 of the Final PRMR allocation process, will be distributed across remaining load which is not covered under step 1 or step 2 on a pro-rata basis. In this example, the remaining load after step 1 and step 2 is 85 MW. Hence, the Final PRMR for LSE B will be **55.91 MW**, calculated as 50 * (95.05/85), and the Final PRMR for LSE C will be **39.14 MW**, calculated as 35 * (95.05/85). The effective PRM for load participating in the PRA outside of RBDC Opt Out and State defined PRM is 11.82%.

The example is graphically summarized ahead.



Example 2: RBDC Opt Out, State setting PRM, & Final PRMR higher than Initial PRMR

Consider a system with three LSEs (LSE A, LSE B, and LSE C) and a system peak demand of 100 MW (accounting for the CPD forecast plus transmission losses).

PRA Participation:

- LSE A has a 15 MW load and participates in the PRA using RBDC Opt Out provisions
- LSE B has 50 MW load and subjected to State defined PRM of 10%
- LSE C has 35 MW load

Assumptions:

- MISO defined PRM to be 9%
- RBDC Opt Out Adder to be 4%

- Systemwide RBDC clearing in the PRA to be 112 MW (indicating RBDC clearing at 12% above load forecast)
- No SRIC/SREC binding

Final PRMR allocation:

Step 1: Accounting for RBDC Opt Out

In this example, LSE A has 15 MW of load participating in the PRA using RBDC Opt Out provisions. Given a PRM of 9% and an RBDC Opt-Out Adder of 4%, the final PRMR for LSE A will be **16.95 MW**, calculated as 15 * (1 + 9% + 4%). After this allocation, 95.05 MW of cleared RBDC capacity will remain (112 MW - 16.95 MW) for further distribution in the following steps.

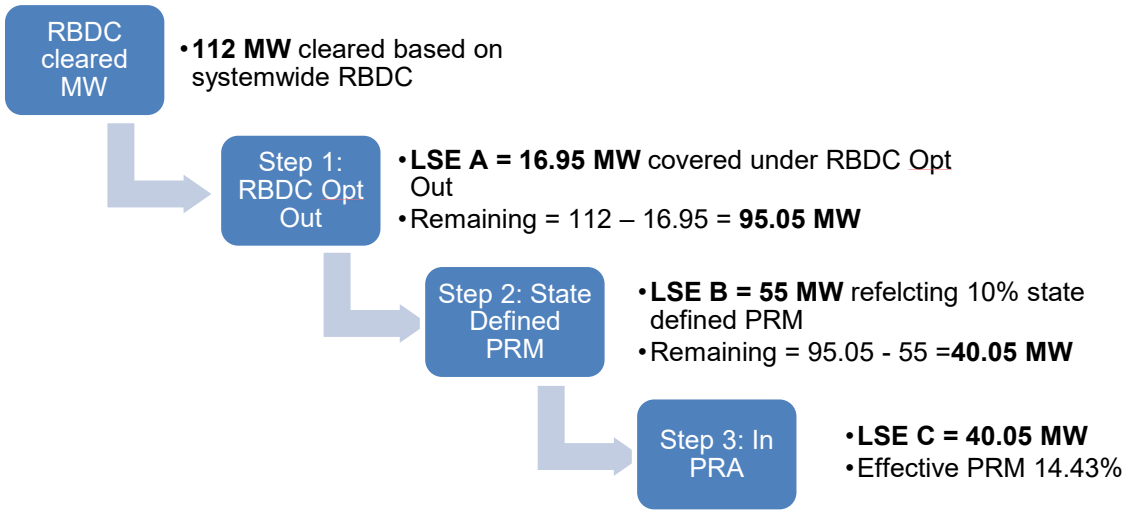
Step 2: Accounting for State-set PRM

In this example, LSE B's load is subjected to State defined PRM of 10%. Hence, the Final PRMR for LSE B is **55 MW**, calculated as 50*(1 + 10%). After this allocation, 40.05 MW of cleared RBDC capacity will remain (95.05 MW – 55 MW) for further distribution in the following step.

Step 3: Determine Final PRMR for other LSEs (Neither RBDC Opt Out nor under State-set PRM)

In step 3, the remaining RBDC cleared 40.05 MW, determined after step 2, will be distributed across remaining load which is not covered under step 1 or step 2 on a pro-rata basis. In this example, the remaining load after step 1 and step 2 is 35 MW. Hence, the Final PRMR for LSE C will be **40.05 MW**, calculated as 35 * (40.05/35). The effective PRM for load participating in the PRA outside of RBDC Opt Out and State defined PRM is 14.43%.

The example is graphically summarized ahead.



Example 3: RBDC Opt Out, State setting PRM, & Final PRMR lower than Initial PRMR

Consider a system with three LSEs (LSE A, LSE B, and LSE C) and a system peak demand of 100 MW (accounting for the CPD forecast plus transmission losses).

PRA Participation:

- LSE A has a 15 MW load and participates in the PRA using RBDC Opt Out provisions.
- LSE B has 50 MW load and subjected to State defined PRM of 10%.
- LSE C has 35 MW load.

Assumptions:

- MISO defined PRM to be 9%
- RBDC Opt Out Adder to be 4%
- Systemwide RBDC clearing in the PRA to be 108 MW (indicating RBDC clearing at 8% above load forecast, lower than PRM)
- No SRIC/SREC binding

Final PRMR allocation:

Step 1: Accounting for RBDC Opt Out

In this example, LSE A has 15 MW of load participating in the PRA using RBDC Opt Out provisions. Given a PRM of 9% and an RBDC Opt-Out Adder of 4%, the final PRMR for LSE A will be **16.95 MW**, calculated as 15 * (1 + 9% + 4%). After this allocation, 91.05 MW of cleared RBDC capacity will remain (108 MW - 16.95 MW) for further distribution in the following steps.

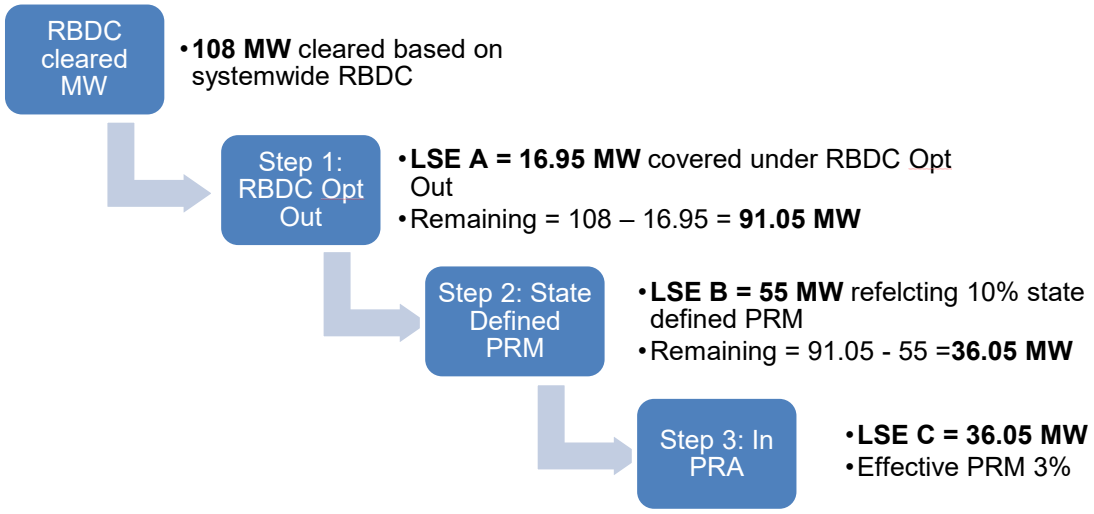
Step 2: Accounting for State-set PRM

In this example, LSE B's load is subjected to State defined PRM of 10%. Hence, the Final PRMR for LSE B is **55 MW**, calculated as 50*(1 + 10%). After this allocation, 36.05 MW of cleared RBDC capacity will remain (91.05 MW – 55 MW) for further distribution in the following step.

Step 3: Determine Final PRMR for other LSEs (Neither RBDC Opt Out nor under State-set PRM)

In step 3, the remaining RBDC cleared 36.05 MW, determined after step 2 of the Final PRMR allocation process, will be distributed across remaining load which is not covered under step 1 or step 2 on a pro-rata basis. In this example, the remaining load after step 1 and step 2 is 35 MW. Hence, the Final PRMR for LSE C will be **36.05 MW**, calculated as 35 * (36.05/35). The effective PRM for load participating in the PRA outside of RBDC Opt Out and State defined PRM is 3%.

The example is graphically summarized ahead.



5.7 Retail and Wholesale Load

Retail and Wholesale Load switching between LSEs can be tracked through the MECT after the start of the in each Season within the new Planning Year. As a result of load switching, the seasonal Final PRMR of the LSEs involved in the load switching will change. Switching of seasonal Retail load will not change an Electric Distribution Company's (EDC) total area

seasonal Final PRMR. Similarly, wholesale seasonal load transaction will not change the total MISO seasonal Final PRMR.

5.7.1 Retail Load Switching

By January 15 11:59 p.m. EST prior to the start of the new Planning Year, retail supplier LSEs will confirm their share (e.g. PLC) of the EDC's area seasonal Initial PRMR. After the Planning Year starts, the Retail LSE's seasonal Final PRMR will change during each Season within the Planning Year when the load from one LSE is switched to another LSE within the EDC area.

Market Participants with Demand in areas subject to retail choice are required to provide the name of the EDC and the CPNode names associated with the LSEs within the EDC area at the time of registration. The CPNode to EDC mapping information is important for determining LSEs' retail load switching method.

EDCs are responsible for updating the seasonal Final PRMR associated with each retail choice LSE in the MECT. The Retail Load screen in the MECT is provided for EDCs in Retail Choice states to track the Retail LSE's day-to-day migration of loads at the Asset Owner (AO) level.

Using the daily retail load switching information in the MECT, MISO Settlements calculates each retail choice LSE's new seasonal Final PRMR. The LSEs' PRMR are subject to resettlement calculations based on the resubmission of load switching information.

The daily retail load switching information includes:

- Name of the EDC
- Name of the LBA
- Operating Date of Retail load switching
- Season (Summer, Fall, Winter or Spring)
- Name of AO(s)
- AO's new Retail MW (with granularity of tenth of a MW)

5.7.2 Wholesale (Non-Retail) Load Switching

A Wholesale Load obligation can be switched from one LSE to another using the Wholesale Load Switching screen in the MECT during each Season of the Planning Year. When Wholesale Load switching occurs, the daily capacity charges of the Wholesale Load will be transferred from the current LSE to the new LSE. The seasonal Final PRMR for affected LSEs will be

decreased or increased, as appropriate, by the amount of the wholesale load plus the seasonal PRM. Procedures for billing, settlement, and credit requirements will be as specified in the appropriate BPMs. LSEs with wholesale contracts that change during the Season within the Planning Year may enter a Wholesale Load switching contract representing seasonal Final PRMR in the MECT.

For the case of Wholesale Load switching, the amount of the seasonal Final PRMR transferred via the wholesale load transaction process will transfer the Final PRMR of the current LSE to the new LSE starting with the effective date specified in the wholesale transaction for the applicable Season. The transaction must be confirmed in the MECT by both parties before the start of the effective date.

5.7.3 Peak Load Contribution (PLC)

The EDC calculates each retail LSE's load ratio share of the retail LSEs peak Demand of the EDC's peak Demand at the MISO seasonal Coincident Peak Load prior to the Planning Year. The aggregate PLCs will be set equal to the seasonal Initial PRMR of the EDC. Specific methods used by the EDC to calculate each Retail LSE's PLC must be provided to both MISO and LSEs no later than December 15 prior to the upcoming Planning Year. LSEs will have until January 15 prior to the upcoming Planning Year to verify the seasonal EDC provided data in the MECT.

5.7.4 Settlements of Wholesale and Retail Switching

All confirmed load switching information submitted by the Settlements deadline (per the Market Settlements BPM) will be transferred to Market Settlements for settlement calculation purposes.

An LSE's seasonal Final PRMR will change based on the information submitted in the MECT for both Wholesale and Retail Load Switching.

MISO will calculate the new charges and credits by applying the seasonal Auction Clearing Price ("ACP") for the applicable LRZ to the new daily seasonal Final PRMR for each AO.

At the end of each weekly billing cycle, MISO will sum up the daily charges for each LSE for the weekly invoicing. The Market Settlements BPM provides more information regarding this process. An LSE's seasonal Final PRMR will change if Retail Load switching information in the

MECT or daily load data for Settlements is resubmitted per the Settlement's rerun process (i.e., S55, S105). Please see Market Settlements BPM for the Market Settlements Timeline.

5.8 Capacity Deficiency Charge

LSEs are allowed to opt out all or a portion of their seasonal Initial PRMR from participating in the auction by paying the Capacity Deficiency Charge. This is achieved by making a voluntary entry into the "Capacity Deficient Amount (MW)" field of the MECT equal to the MW amount of seasonal Initial PRMR opting out of the seasonal auction before the auction window opens. The Capacity Deficiency Charge for an LSE is the MW amount in the "Capacity Deficient Amount (MW)" field multiplied by 2.748 times the seasonal Cost of New Entry ("CONE") which is calculated by Annual CONE/365 multiplied by the days in the Season for the LRZ where the LSE's seasonal Initial PRMR is located.

LSEs that choose the RBDC Opt Out must demonstrate sufficient ZRCs to meet their seasonal Final PRMR (equal to the Initial PRMR) before the PRA auction window opens. Otherwise, the shortfall is subject to the Capacity Deficiency Charge by multiplying 2.748 times the seasonal CONE price.

Capacity Deficiency Charge revenues received by the Transmission Provider will be distributed on a *pro rata* basis based upon the cleared MW of seasonal Final PRMR to other LSEs in the Transmission Provider's footprint who did not opt to pay the Capacity Deficiency Charge. If the LRZ where the LSE opted to pay the Capacity Deficiency Charge failed to meet its seasonal LCR, then seasonal Capacity Deficiency Charge revenues will be allocated solely to LSEs within that LRZ that did not opt out of the seasonal auction by paying the seasonal Capacity Deficiency Charge. MISO will assess the seasonal Capacity Deficiency Charge on the first business day after the results of the seasonal PRA have been published.

6 Performance Requirements

6.1 Must Offer Requirement

The must offer requirement applies to any Market Participant who converts the SAC of a Capacity Resource to seasonal ZRCs, and those ZRCs are used in a seasonal FRAP or RBDC Opt Out or clear in a seasonal auction within the Planning Year. The must offer volume is the effective ICAP times the % of the total seasonal ZRCs a resource clears (for example, a unit eligible for 10 ZRCs that clears 5 will have a must offer of 50% of its ICAP), except for

Intermittent Resources. The effective ICAP equals the lesser of GVTC or Interconnection Service (NRIS+ERIS) for each Season (e.g. effective ICAP = Min(GVTC, IS)). The must offer obligation for Intermittent Resources is based on the cleared seasonal ZRCs, or ZRCs used in a FRAP or RBDC Opt Out, divided by the seasonal Resource credit (e.g. wind capacity credit for a wind resource) as described in Section 4.2.1.5 – Wind and Solar Capacity Credit. Additionally, no must offer requirement will exceed the resource's firm level of transmission service. LMRs do not have a must offer requirement, their obligations are covered in section 4.2.5 - Load Modifying Resource Obligations and Penalties.

6.1.1 Generation Resource but not Dispatchable Intermittent Resource or Intermittent Generation

MPs that own a Capacity Resource with ZRCs that clear in the PRA or are identified in a Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out must offer the ICAP equivalent of the cleared and FRAP or RBDC Opt Out ZRCs into the Day-Ahead Energy Market and the first post Day-Ahead Reliability Assessment Commitment (RAC) for every hour of every day, except to the extent that the Capacity Resource is unable to provide Energy, Contingency Reserve, or Short-Term Reserve due to a forced or planned outage or other physical operating restrictions consistent with MISO's Tariff. Outages and derates must be reported in the MISO Outage Scheduler (CROW).

Compliance with "must offer" requirements will be evaluated by MISO on a non-discriminatory basis. MISO will analyze compliance with "must offer" requirements in both the Day-Ahead and RAC by considering information provided by the MISO Outage Scheduler (CROW) and operational limitations, including, but not limited to, those related to fuel limited, Energy output limited or Intermittent Generation and Dispatchable Intermittent Resources.

6.1.2 Dispatchable Intermittent Resource and Intermittent Generation

An MP that owns a Capacity Resource that has ZRCs identified as part of a Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out or ZRCs which clear in a PRA must submit the ICAP equivalent MW value of the cleared ZRCs into the Day-Ahead Energy Market, and each pre Day-Ahead and the first post Day-Ahead Reliability Assessment Commitment (RAC) for every hour of every day, except to the extent that the Intermittent Resource is unable to provide Energy, Contingency Reserve, or Short-Term Reserve due to a forced or planned outage or other physical operating restrictions consistent with MISO's Tariff.

The must offer requirement applies to the effective ICAP of the Intermittent Generation and Dispatchable Intermittent Resources, and not to the SAC amount. The must offer obligation for Intermittent Resources is replaced with the forecast in the DA market based on the weather forecast and performance of the Intermittent Resources.

For wind resources, the ICAP-equivalent must offer obligation is cleared ZRCs and/or ZRCs used in a Fixed Resource Adequacy Plan divided by the wind capacity credit. For non-wind Intermittent Generation and Dispatchable Intermittent Resources, the XEFORd will be set equal to the SAC divided by the ICAP, where the ICAP shall be the maximum value registered in the Commercial Model. For non-wind Intermittent Resources not modeled in the Commercial Model, the ICAP will be the nameplate capacity value as provided by the MP.

DA Reliability Forecast submissions for Intermittent Generation and Dispatchable Intermittent Resources received by the close of both the DA and Forward Reliability Assessment Commitment (FRAC) market offer periods will be used to monitor compliance with the must offer requirement when the unit's availability is affected by non-mechanical and/or non-maintenance reasons. The must offer monitoring process for Intermittent Generation and Dispatchable Intermittent Resources that submit a DA Reliability Forecast by DA Market close and FRAC close will check that the offers submitted are greater than or equal to the volumes submitted via the DA Reliability Forecast. The same Intermittent Forecast data file used in Day-Ahead Must Offer compliance shall be utilized in FRAC if no further update is provided. If a DA Reliability Forecast is submitted on time and in the correct format, it replaces the cleared Installed Capacity as the mustoffer requirement. Intermittent Resource Generation cannot submit a DA Reliability Forecast if being registered as a Use Limited Resource.

When submitting data to the Intermittent Resource Forecast Update tool, a header row should be included at the beginning of the file in this format; Resource, Day, Hour Ending (HE), and MW. The must offer monitoring process for Intermittent Generation and Dispatchable Intermittent Resources that do not to provide the DA Reliability Forecast by the DA Market close and the FRAC close, will be based on offers submitted and outages or derates submitted in MISO's Outage Scheduler (CROW). The must offer process will be based on the daily and hourly offers submitted by the Asset Owner. Additionally, maintenance and mechanical outages to Intermittent Forecasts will be based on the forecasts only. The thresholds established in Section 6.1 will not be used for Intermittent Generation and Dispatchable Intermittent Resources that provide the DA Reliability Forecast.

6.1.3 Use Limited Resource

An MP that commits a Capacity Resource that has ZRCs which clear in a Planning Resource Auction (PRA) or are used in a Fixed Resource Adequacy Plan must submit the ICAP value of ZRCs which either clear the PRA or is used in a Fixed Resource Adequacy Plan in the Day-Ahead Energy Market, each pre Day-Ahead, and the first post Day-Ahead Reliability Assessment Commitment (RAC) for every hour of every day, except to the extent that the Generation Resource is unable to provide Energy, Contingency Reserve, or Short-Term Reserve due to a forced or planned outage or other physical operating restrictions consistent with MISO's Tariff.

A Use Limited Resource is required to submit into the Day-Ahead Market to satisfy the must offer requirement of at least four (4) continuous hours daily across MISO's forecasted daily peak (including weekends). The must offer period of four (4) hours includes the two (2) hourly intervals prior to the forecasted peak hour, the peak hourly interval, and one (1) hourly interval after the forecasted peak load. This approach enables MISO to have an opportunity to schedule the Resource for the period in which the Use Limited Resource will not be recharging or replacing depleted resources. MISO's peak period will be based on the forecast published one day prior to the operating day in the Market Report section of the MISO website: https://www.misoenergy.org/markets-and-operations/real-time--market-data/market-reports >Select "Summary" under Navigator to find the latest reports.
All outages and derates for Use Limited Resources need to be reflected in MISO's Outage Scheduler (CROW) or SDX. Thresholds for Use Limited Resources will only be applied during the four continuous hours across MISO's peak. MISO will not call upon a Use Limited Resource during its recharge hours, except in the case of an Emergency.

6.1.4 External Resources

The maximum must offer requirement applies to the registered capacity of the External Resource.

An MP that owns a Capacity Resource that has ZRCs which are identified in a Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out or clear in a PRA must submit the ICAP-equivalent value of FRAP or RBDC Opt Out or cleared ZRCs as Energy offers into the Day-Ahead Energy Market for every hour of every day, except to the extent that the Generation Resource is

unavailable due to a full or partial forced scheduled outage or the offers are from a Use Limited Resource. The must offer requirement will be capped at the resource's ICAP value.

Offers in the Day-Ahead Energy Market can only be Normal Energy type, with the transaction type of either fixed or dynamic. Dispatchable and market type of Day-Ahead cleared schedules are accounted for in the first post Energy and Operating Reserve Market. In addition, the Normal Energy type with the transaction type of either Fixed or Dispatchable offers with market type of Real-Time Energy and Operating Reserve Market only will also be considered in Day-Ahead Forward Reliability Assessment Commitment (FRAC).

Therefore, the must offer requirement for External Resources in FRAC is met by being available for declared capacity emergencies via MISO Market Capacity Emergency SO-P-EOP-00-002.

The MP that has either identified ZRCs from a FRAP or RBDC Opt Out or cleared ZRCs in a Planning Resource Auction (PRA) from an External Resource shall ensure the resource operator is reporting its outages and derates with their respective reliability coordinator. External Resources must be available to schedule Energy into MISO during Emergencies if needed by MISO. MISO Market Capacity Emergency SO-P-EOP-00-002 includes a mechanism to schedule all External Resources into MISO's Balancing Authority Area. BPM 007 Physical Scheduling Systems Section 15 explains how External Resources should be identified as Capacity Resources. External Resources should select "YES" in the Miscellaneous (MISC) field of the E-tag and the Token field must contain "MISOCR" in all capital letters with no spaces. In the Value field, the MP should list the Capacity Resource name that matches the Module E External Resource registration name in the MECT.

External Resources that are Use Limited Resources must follow the Day-Ahead must offer requirements for Use Limited Resources as documented in Section 4.2.2.1 of this BPM.

Compliance with must offer requirements will be evaluated by MISO on a non-discriminatory basis. MISO will analyze the compliance with must offers in both the Day-Ahead and RAC by considering information provided by MISO's CROW Outage Scheduler, and operational limitations, including, but not limited to, those related to fuel limited, Energy output limited, or Intermittent Generation.

6.1.5 DRR T*ype I and Type II*

The same must offer requirement described in Sec. 6.1 applies to the Installed Capacity of DRR Type I and Type II, (and not the SAC rating) used to meet Resource Adequacy Requirements. Installed Capacity refers to the amount of ZRCs cleared in an PRA and/or used in a Fixed Resource Adequacy Plan divided by (1 – XEFORd) of the Capacity Resource.

6.2 Must Offer Monitoring

MISO will monitor whether the offers submitted by the Asset Owner of each Capacity Resource in the Day-Ahead Energy and Operating Reserve Market, and first post Day-Ahead RAC process meets the seasonal must offer requirements. The must-offer requirements are in terms of Installed Capacity (ICAP) of the resource, where ICAP is the minimum of GVTC and Total Interconnection Service.

The offers should be greater than or equal to the seasonal must offer requirement minus approved outages or derates minus the applicable threshold as detailed in this section, but not to exceed the firm level of established Transmission Service. This excludes Capacity Resources that submit Intermittent Forecasts that have been accepted by MISO including DIR- registered Hybrid Resources.

[Firm Service] > [Offer] ≥ [Offer requirement] – [Outage or Derate] – [tolerance threshold]

If the offer amount is greater than or equal to the must offer requirement minus the approved outage or derate in CROW minus the appropriate threshold, then the MP will have passed the must offer monitoring check. Otherwise, the MP will not pass the must offer monitoring check. MISO will notify MPs through a report published on the market portal of their must offer status.

Outages & Derates

If the Offers for Day-Ahead and first post Day-Ahead RAC are less than the must offer requirement, then MISO will compare the difference to approved outages or derates in MISO's Outage Scheduler (CROW) for such resources. Approved outages, approved derates, and offers will be captured based on the information provided at both the Day-Ahead Energy Market close and first post Day-Ahead RAC close. DA Market close and first post Day-Ahead RAC close times are addressed in the Energy and Operating Reserve Markets BPM.

Tolerance Threshold

MISO will apply a tolerance threshold to all resources based on the must offer requirement listed in the MECT for the applicable Season. The thresholds were developed to recognize that data entry errors could occur when providing derate volumes through MISO's Outage Scheduler (CROW). Importantly, this does not relieve the MP of the obligation to meet the overall seasonal must offer requirement. The tolerance threshold volume will be applied at the CPNode level except for those resources noted otherwise in this BPM. The thresholds are as follows:

- The lesser of 10 MW or 10% for Capacity Resources greater than or equal to 50 MW
- The greater of 1 MW or 10% for Capacity Resources less than 50 MW

Market Participant Review

If a Market Participant believes there is a discrepancy in their must offer report, the Market Participant can notify MISO via the MISO Help Center of the discrepancy and submit supporting documentation. Outage information should include all revisions from the outage submission to the completion of the outage.

MISO will review the information submitted and notify the Market Participant within seven (7) Business Days via email of the outcome of the review.

IMM Access

The IMM also has access to the reports published on the market portal and may contact Market Participants directly on any compliance issues.

6.3 Annual Calculation of CONE

MISO will work with the Independent Market Monitor (IMM) to recalculate the CONE value for each LRZ annually by September 1 of each year for the following Planning Year. The CONE value for each individual LRZ will be the same in every Season (Summer, Fall, Winter and Spring).

In calculating CONE values, the IMM and MISO will consider the following factors:

- Physical factors: type of resource, location, costs for fuel
- Financial factors: debt/equity ratio, cost of capital, ROE, taxes, interest, insurance
- Other factors: permitting, environmental, Operating and Maintenance costs, etc.

MISO and the IMM will not consider anticipated net revenues from the sale of capacity, Energy, or Ancillary Services as factors in the annual recalculation of the CONE.

Once the IMM and MISO have calculated the CONE for each LRZ, MISO will make a filing with the Commission under Section 205 of the Federal Power Act seeking approval from the Commission for the re-calculated CONE. CONE values approved by FERC are posted on the MISO website.

Net CONE will be determined as per the section 69A.8 of Tariff Module E-1.

6.4 Replacement Resources

6.4.1 Maximum Outage & Derate Threshold (Greater than 31 day rule)

If a Planning Resource for which a Market Participant converts Seasonal Accredited Capacity into ZRCs is unable to meet the applicable performance requirements for the cleared ZRCs as described in Section 69A.5 for greater than thirty-one (31) Days in total due to full or partial Generator Planned Outage during the Season of the Planning Year in which the ZRCs cleared, or for Planning Resources that are subject to Diversity Contracts or Power Purchase Agreements for greater than one (1) Month during any Season of the Planning Year in which the ZRCs cleared, such Market Participant must replace the cleared ZRCs with uncleared ZRCs or new resources per Section 6.4.5 (On Ramping New Resources Mid-Planning Year for ZRC Replacement) to transfer the performance requirements applicable to the planning Resource or pay the Capacity Replacement Non-Compliance Charge (Tariff Module E-1 Section 69A.3.1.h). The CRNCC charge will be calculated after the completion of the season in the timeliest manner by MISO and the IMM.

The Must Offer Monitoring threshold described in section 6.2 (Must Offer Monitoring) will not apply when evaluating charges and ZRC replacement regarding the 31-day outage rule. The performance obligation is in terms of effective ICAP and thus the amount of ZRCs needed to be replaced will back calculate to ZRC values.

For example, a wind resource that has a 100 MW ICAP and 20 MW SAC and clears 20 ZRCs in the market will have a must offer requirement of 100 MW. The forecasts submitted to the DA market will overwrite the 100 MW requirement based on projected wind performance on an hourly basis. If the wind resource undergoes planned maintenance or repowering and planned

derates the facility to 80 MW ICAP for an entire Season, they will need to replace ZRCs when outages in a Season exceed 31 days since derate ICAP (must offer requirement – derates of facility 100-80=20MW) is greater than zero, and the amount of ZRCs to be replaced will be in SAC/ZRC terms. The original ICAP is 100 MW which resulted in 20 MW SAC, the resource is on a derate of 20 MW down to 80 MW, thus resulting in only 4 ZRCs needing replacement. 20 MW SAC / 100 MW ICAP = 20%, 20MW derate ICAP *20% = 4ZRCs. To complete the example, 80 MW ICAP*20% = 16 MW SAC. The cleared SAC obligation is 20 ZRCs, and the derate results in 16 ZRCs, therefore 4 ZRCs must be replaced, or charges assessed for any days over 31 in that Season.

$$\frac{20\ ZRC}{100\ ICAP} = 20\%\ Original; 20MW\ ICAP\ derate * 20\% = 4\ ZRC$$

Similarly, for conventional resources the conversion process is the same. For example, a 100 MW ICAP thermal resource has 50 MW SAC, if they clear all 50 ZRCs in the auction for that Season the must offer obligation is still 100 MW. If the resource is derated to 80 MW, the ZRCs needing to be replaced will be: 80 MW *50% = 40 MW, with a 50 MW SAC obligation, so 10 ZRCs would need to be replaced or charges assessed when the outage exceeds 31 days within that Season.

For resources that are completely offline due to planned or reasonably known outages for greater than 31 days, the penalty would be assessed on the cleared ZRCs of that resource, regardless of resource type. The CRNCC would be charged to the asset owner who converted SAC to ZRCs.

6.4.2 Attachment Y Retirement or Suspend Status

A Planning Resource used to meet seasonal RAR must be replaced by the registering Market Participant prior to the effective date of a status change to ‘retired’ or ‘suspend’ via an Attachment Y filing.

6.4.3 Transfer of Resource Adequacy Requirement and Performance Requirements through ZRC Replacement

ZRC replacement is available for use by Planning Resources that cleared a Season in the Planning Year and that go on suspension, retirement, catastrophic outage, ICAP Deferral, or that experience a Generator Planned Outage or derate greater than 31 days in that Season. Planning Resources already on a forced outage or knowingly offline during the effective date, cannot be used for ZRC Replacement. ZRC replacements are not allowed for any other reason.

In the event of such ZRC Replacement any performance requirements associated with the Resource that is being replaced (e.g., must offer obligation) will be transferred to the substituting Resource(s) for the duration of the ZRC Replacement period. ZRC Replacement is forward looking, MPs cannot replace ZRCs retroactively.

A Resource being used for ZRC replacement must not be on a full or partial Generator Planned Outage during the term of the ZRC replacement and must otherwise meet the applicable performance requirements set forth in section 69.A.3.1.h of Module E-1 of the Tariff.

6.4.4 ZRC Replacement Transactions

Replacement transactions in each Season can be entered at any time during the Planning Year and, unless otherwise modified, are valid through the end of the applicable Season within the Planning Year.

Replacement ZRCs may be sourced from any LRZ or ERZ subject to LCR, CIL, CEL, SREC, and SRIC constraints from the associated seasonal PRA. A replacement calculator is available in the MECT to check for any constraint violation. Planning Resource replacement transactions should be entered into the MECT tool at least seven (7) Calendar Days prior to effective date of replacement to ensure it has been entered and validated properly. This ensures adequate time for MPs and MISO staff to review and confirm accurate and proper entry of the ZRC replacement.

Replacement ZRCs can be from the Market Participant's own Planning Resources or ZRCs procured through a bilateral transaction from another Market Participant in the same seasonal auction These ZRCs can be sourced from other LRZ's provided they do not violate any LCR, CIL, CEL, SRIC or SREC. ZRC replacements from LRZs other than the original resource will be processed in accordance with the following parameters:

- ZRC replacement shall be processed on a first come, first served basis.
- The amount of cleared seasonal ZRCs in each LRZ at the time of a ZRC replacement shall be based upon the current amounts of cleared seasonal ZRCs, including any previous replacement transactions.

Replacement ZRCs should be input in the MECT with an intended effective date. The termination date of a Replacement ZRC transaction will be set as end of the Season by default. Market Participants can update the termination date to a different date before end of the

Season, provided that replacement capacity must be designated for RAR until at least 95% of its ZRCs have been replaced.

ZRC replacement shall have no impact on settlements from the PRA and FRAPs and RBDC Opt Out. The “Replacement Calculator” option is available in the MECT which can be used for verifying if the Planning resource being used for the replacement will meet all of the required LRZ parameters including LCR, CIL and CEL, as well as ERZ CEL.

6.4.5 On Ramping New Resources Mid-Planning Year for ZRC Replacement

If a new resource is expected to be available at the start of a Season within the Planning Year, the preferred course for the Market Participant would be to enter the ICAP Deferral process.

However, if a new resource is unable to utilize the ICAP Deferral Process, the new resource may be eligible to receive uncleared Zonal Resource Credits (ZRCs) in the middle of the Planning Year and prior to the start of a Season only under the following conditions:

i. Market Participant must coordinate with the IMM to obtain confirmation the new resource did not physically withhold capacity from a particular seasonal auction.
ii. The new resource must be in Commercial Model at time of request.
iii. The new resource must submit applicable testing (i.e. GVTC into MISO PowerGADS or Non-GADS Performance Template into MECT, DR tests, etc.).
iv. The new resource must become commercially operable as of date of replacement.
v. Requests must be submitted at least 3 weeks prior to start of replacement.
vi. If the new resource is an LMR no part of the Behind-The-Meter Generation (BTMG) or Demand Response (DR) assets can have been previously registered for the Planning Resource Auction by the registering Market Participant.
vii. If the new resource is an ARC LMR the contract with the customer/asset must have been signed after the March 1 Registration deadline.

6.4.6 MECT ZRC Replacement Calculator

The Replacement Calculator screen in the MECT is used to help MPs assess whether the ZRCs being used for the replacement will meet all of the required parameters including seasonal LCR, CIL, CEL, SREC, and SRIC.

For each Local Resource Zone, the Replacement Calculator screen displays the seasonal Final PRMR, LCR, CIL, CEL, sum of cleared Offers, sum of FRAP and sum of RBDC Opt Out, , Total Import and Total Export for each LRZ, and Total Export for each ERZ from the seasonal PRA.

Import Available and Export Available numbers are updated each time the Resource Replacement process is completed.

- Import Available number represents the maximum ZRCs allowed to import into the LRZ without violating the CIL in that Season. Import Available for the LRZ is calculated as:
  Seasonal Import Available = CIL – Total Import from PRA + (Sum of all Export* - Sum of all Imports*)
- LRZ Export Available number represents the maximum seasonal ZRCs allowed to export out of the LRZ without violating the CEL. Export Available for the LRZ is calculated as:
  LRZ Export Available = CEL – Total Export from PRA + (Sum of all Import - Sum of all Exports*)
  ERZ Export Available represents the maximum ZRCs allowed to export out of the ERZ without violating the CEL. It is calculated as: ERZ Export Available = ERZ CEL – ZRCs cleared, including FRAPs and RBDC Opt Out, in ERZ

Example:

LRZ 1 has an LCR of 15,070 MW; and Import Available of 4,628.7 MW
LRZ 2 has an Export Available of 1,023.7 MW
LRZ 3 has an Export Available of 1,759.4 MW
ERZ 1 has an Export Available of 1,000 MW

Total MW needing replacement in LRZ 1: = 200 MW (Original Resource = AAA1)

Replacement ZRCs from LRZ 1: Of that 200 MW, 100 MW will be replaced by other Planning Resources located in LRZ 1 (Substitution Resource = AAA2)

ZRCs in LRZ 1 (after same LRZ replacement): LRZ 1's total ZRCs from LRZ 1 after replacement = Offers Cleared + FRAP +RBDC Opt Out - Total MW needing replacement + Replacement ZRCs from the same LRZ = 18,522.3 – 200 + 100 = 18,422.3

LCR Test: Since 18,422.3 > LRZ 1's LCR of 15,070, the LCR Test result is "Pass"

Amount Exported: Remaining Replacement ZRCs of 100 MW are imported from LRZ 2 and LRZ 3:

o LRZ 2's Exported ZRCs = 40 MW (Substitution Resource = BBB3)
o LRZ 3's Exported ZRCs = 60 MW (Substitution Resource = CCC4)

Import Test: LRZ 1's total Imported ZRCs = 100 MW (40 MW + 60 MW). Since 100 MW < Import Available of 4,628.7, the Import Test result is "Pass"

Export Test: Since LRZ 2's Export of 40 MW < Export Available of 1,023.7 MW and LRZ 3's Export of 60 MW < Export Available of 1,759.4 MW, the Export Test results for LRZ 2 and 3 are "Pass".

This scenario will require the following 3 separate Resource Substitution Registrations to replace AAA1 for the full amount of 200 MW in LRZ 1:

o First 100 MW of AAA1: replaced by AAA2 for 100 MW from LRZ 1
o Second 40 MW of AAA1: replaced by BBB3 for 40 MW from LRZ 2
o Remaining 60 MW of AAA1: replaced by CCC4 60 MW from LRZ 3
o No change for ERZ 1

6.4.7 Capacity Replacement Non-Compliance Charge and Distribution

Any combination of cleared or replaced ZRCs that are on full or partial Generator Planned Outage for greater than thirty-one (31) Days in total during a Season, or for any other reason including full or partial Generation Outages that were not planned but were known or could have been reasonably anticipated at the time of the PRA, as set forth in the Market Monitoring and Mitigation Business Practices Manual, or unavailable because subject to a Diversity Contract that is not available for greater than one (1) Month during a Season, will be assessed a Capacity Replacement Non-Compliance Charge. The charges will be applied to the asset owner that converted the SAC to ZRCs for the resource . MISO's Control Room Operations Window (CROW) includes the following 4 categories of out of service (OOS) and derates: Planned, Urgent, Emergency and Forced. For purposes of calculating CRNCCs, MISO will use CROW outages prioritized as Planned. In addition, all outages not prioritized as Planned in CROW, but that were: (1) known or reasonably known at the time of the PRA, or (2) were determined by the IMM to be incorrectly prioritized in CROW shall be included in calculation of the CRNCC. See BPM-008 and the CROW users guide for outage prioritization codes and definitions.

Capacity Non-Compliance Charge = [# days failure to comply with replacement] * [# ZRCs failed to be replaced] * [Seasonal Zonal ACP + Daily Zonal CONE]

The number of Days counted will be on an hourly basis (31 days x 24 hours = 744 hours) since outages may only cover a portion of some Days. The number of hours that failed to comply or replace will be determined by ranking generator performance across the Season and applying charges to hours with the least violations in the Season beyond 744 hours. The charges assessed will round down to the number of whole Days in excess of 31 Days. For example, 815 hours minus 744 hours and then divided by 24 hours = 2.96 Days. In this case, the penalty charged for will be for two days.

Capacity Replacement Non-Compliance Charge revenues received by the Transmission Provider will be distributed to Market Participants representing LSEs that have met their Final PRMR during the applicable Season of the Planning Year on a pro rata basis, based upon their respective LSEs' share of total Final PRMR for the Transmission Provider Region.

6.5 LMR performance

6.5.1 BTMG Performance

When a BTMG that either is used in a seasonal FRAP or RBDC Opt Out or cleared in a seasonal PRA fails to perform during an Emergency when included in a Market Participant's Resource Deployment response to a Scheduling Instruction, the penalties are calculated for each hour in which a BTMG fails to respond in an amount greater than or equal to the target level of generation increase entered in the Resource Deployment screen of the LMR Scheduling Instruction Event in the DSRI as the sum of: (1) the product of (a) the amount of increased generation not achieved and (b) the LMP at the CPNode associated with the BTMG; and (2) applicable Revenue Sufficiency Guarantee (RSG) Charges. The amount of increased generation not achieved for BTMG is equal to the greater of: (1) the difference between (a) the target level of generation increases and (b) actual increased generation; and (2) zero. The applicable RSG Charges are equal to the product of: (1) the difference between (a) the target level of increased generation and (b) actual increased generation; and (2) the applicable RSG charges.

If advanced reporting is not entered in response to Scheduling Instructions into the Resource Deployment screen of the LMR Scheduling Instruction Event in the DSRI, then the full amount of Scheduling Instructions will be penalized.

The revenues from charges resulting from BTMGs that fail to respond in an amount greater than or equal to the MP responses to Scheduling Instructions shall be allocated, *pro rata*, to MPs representing LSEs in the LBA area(s) that experienced the Emergency, on a load ratio share basis.

For any situation where a BTMG does not increase generation in response to a Scheduling Instruction or where the resource is claimed to be unavailable as indicated in the DSRI as a result of maintenance requirements or for reasons of Force Majeure, MISO shall initiate an investigation into the cause of the BTMG not being available as needed during Emergency and may, if deemed appropriate, disqualify that resource from receiving ACP payments for that Planning Year. The BTMG may be called but not required to respond if the Emergency call is outside the resource's registration limitations (i.e. less than the registered time to respond, the event lasts longer than the registered duration, is made outside the BTMG's registered availability period; or the resource has reached its registered maximum number of deployments for that Season). However, should a BTMG resource indicate availability in the DSRI at any time in any Season of the Planning Year, it is considered available in the event of an Emergency during that Season and may receive Scheduling Instructions.

In the event the same BTMG does not sufficiently respond or is unavailable, except for reasons of Force Majeure or other acceptable reasons defined in the Tariff or in this BPM on a second occasion during a Season within the Planning Year (with a separation period of at least 24 hours), the MP that registered the BTMG will be subject to the penalties described herein (if that BTMG fails to increase generation to the level instructed). Such BTMG shall be assessed the same penalty as indicated above for its first performance failure, and the BTMG will no longer be eligible to receive ACP payments for the current Planning Year and for the next Planning Year.

If, in review of the BTMG's measurement and verification data following an Emergency, MISO determines that the MP has committed fraud to receive excess payments or to avoid penalties, MISO will have the right to ban the MP or its customers from participation in the wholesale electricity markets, as well as, pursue other legal options at the sole discretion of MISO.

6.5.2 DR Performance

If a DR that either is used in a seasonal FRAP or RBDC Opt Out or cleared in the seasonal PRA fails to perform during an Emergency when included in a Market Participant's Resource

Deployment response to Scheduling Instructions, penalties will be calculated for each hour in which a DR fails to respond in an amount greater than or equal to the target level of Load reduction entered in the Resource Deployment screen of the LMR Scheduling Instruction Event in the DSRI as the sum of: (1) the product of (a) the amount of load reduction not achieved, including Load above the registered firm service level for those DR registered as such and (b) the LMP at the CPNode associated with the DR; and (2) applicable Revenue Sufficiency Guarantee (RSG) Charges. The amount of Load reduction not achieved for DRs is equal to the greater of: (1) the difference between (a) the target level of Load reduction and (b) actual Load reduction; and (2) zero. The RSG Charges are equal to the product of: (1) the difference between (a) the target level of Load reduction and (b) actual Load reduction; and (2) the applicable RSG charges.

If advanced reporting is not entered in response to Scheduling Instructions into the Resource Deployment screen of the LMR Scheduling Instruction Event in the DSRI, then the full amount of Scheduling Instructions will be penalized.

Unless already entered as Self Scheduled for the event, DRs registered with a firm service level must still show a load reduction. Advanced Reporting should reflect the best estimate of load reduction available (i.e. load above the firm service level) during the event. Penalties will still be measured as load above the registered firm service level.

The revenues from charges resulting from DRs that fail to respond in an amount greater than or equal to the MP responses to Scheduling Instructions shall be allocated, *pro rata*, to MPs representing LSEs in the LBA area(s) that experienced the Emergency, on a load ratio share basis.

For any situation where a DR does not respond in an amount greater than or equal to the target level of Load reduction or registered firm service level or the resource is unavailable, including those circumstances where the resource is unavailable for maintenance reasons or Force Majeure, MISO shall initiate an investigation into the cause of the DR not being available when called upon, and may, if deemed appropriate, disqualify that resource from ACP payments for that Planning Year. The DR may be called but not required to respond if the Emergency call is outside the resource's registration limitations (i.e. less than the registered time to respond, the event lasts longer than the registered duration is made outside the DR's registered availability period, or the resource has reached its registered maximum number of deployments for that Season). However, should a Demand Resource indicate availability in the DSRI at any time in a

Season within the Planning Year, it is considered available in the event of an Emergency during that Season and may receive scheduling instructions.

In the event the same DR is not sufficiently responsive, including being unavailable, on a second occasion during a Season within the Planning Year (with a separation period of at least 24 hours) when included in a Market Participant's response to Scheduling Instructions; except when unavailable due to maintenance reasons, Force Majeure or other acceptable reasons as outlined in the Tariff or this BPM, the MP that registered the DR that was used to meet Resource Adequacy Requirements will be subject to the penalties described herein. The MP using the DR shall be assessed the same penalty as indicated above for a first performance failure, and the DR will no longer be eligible to receive ACP payments for the remainder of the current Planning Year and for the next Planning Year (s).

If, in review of the DR's measurement and verification data following an Emergency, MISO determines that the MP has committed fraud to receive excess payments or avoid penalties, MISO will have the right to ban the MP or its customers from participation in the wholesale electricity markets, as well as pursue other legal options at the sole discretion of MISO.

7 Integration of New LSEs

This section serves as a guide for those new Load Serving Entities (LSEs) integrating into MISO's region between the time MISO has completed the PRA(s) and the next Planning Year starts.

Once the integration date is set, MISO will work with both existing and new LSEs to ensure that the newly integrating LSEs have sufficient Planning Resources to meet their anticipated Coincident Peak Load Forecast plus an appropriate planning reserve margin.

To ensure the PRMR for new LSEs is met, MISO may conduct a Transitional PRA following the same registration requirements and auction protocols as the PRA.

MISO may provide the following when integrating new LSEs for applicable Season(s):

1. Define, as needed, new Local Resource Zone and their associated zonal parameters including:
    - Calculate CONE for the LRZ
    - Determine ZIA, ZEA, CIL and CEL

- LOLE Analysis (Section 3.4.2)
- Establishment of Local Reliability Requirement (Section 5.2.2.2)

2. Calculate Seasonal Planning Reserve Margin and Transmission Losses for the new LBAs
    - Determination of Seasonal Planning Reserve Margin (Section 3.4.1)
    - Review of CPD Forecasts (Section 3.2.5)
3. Conduct Transitional Planning Resource Auction
    - Amount of Capacity Cleared in Each Auction (Section 5.5.2)
    - Conduct of the PRA (Section 5.5.3)
    - Auction Results Posting (Section 5.5.8)

MISO may coordinate the proper timing of the data collection effort with the new LSEs for the successful completion of the Transitional PRA. The Transitional PRA will ensure that sufficient Planning Resources are procured to meet the Final PRMR of the newly integrating MISO region for the applicable Seasons in the remaining Planning Year.

The Resource Adequacy Timeline for the seasonal PRAs is shown in Appendix K. MISO will determine the Resource Adequacy timeline for the Transitional PRA and will publish it on the Resource Adequacy webpage under the Planning Section of the MISO public website. The Resource Adequacy timeline for the Transitional PRA will be reviewed by stakeholders prior to publishing on the MISO public website.

8 Testing Procedures and Requirements

8.1 Generator Real Power Verification Testing Procedures

MISO has developed generator test standards as documented in Appendix J that apply for Planning Years 2011-2012 and beyond.

9 Appendices

Appendix A – Wind Capacity Credit

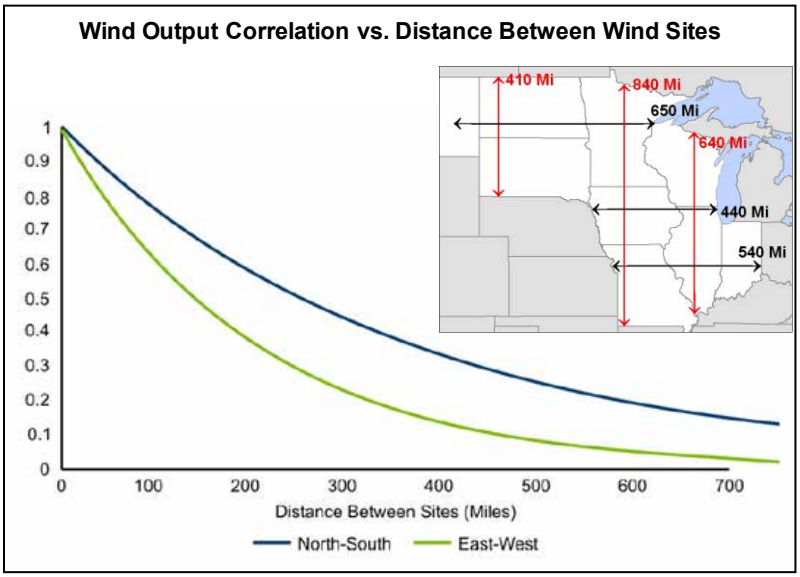
The goal of establishing wind accreditation is to estimate the reliable output of wind as a percentage of the Installed Capacity (ICAP), for each Season, for the MISO system and by Commercial Pricing Node (CPNode). The data driving wind accreditation includes the following:

- The hourly load and the hourly wind output for the sampled peak load period for each Season. This concurrent load and wind data, along with the normal complement of generator data in an LOLE simulation, is essential for determining the system-wide seasonal Effective Load Carrying Capacity (ELCC) of the wind fleet.
- The hourly wind output for the top 8 seasonal MISO coincident daily peak hours for the most recent 3 years' worth of operational data per Season, both for the MISO system and by individual wind CPNodes. The system-wide and individual CPNode performance and ICAP data is used to allocate the system-wide seasonal wind ELCC among the individual wind CPNodes currently in operation.
- The hourly amounts by which individual wind CPNodes are dispatched downward are part of Dispatchable Intermittent Resources (DIR) activity in the market. Non-DIR resources are not required to submit Day-Ahead Energy Market offers—subsequently, curtailments are only considered for DIR wind resources that do offer into the Day-Ahead Energy Market.

Since 2009, MISO has embarked on a process to determine the capacity value for the increasing fleet of wind generation in the system. The MISO wind accreditation process, as developed and vetted through the MISO stakeholder community, consists of a two-step method. The first step utilizes a probabilistic approach to calculate the MISO seasonal system-wide ELCC value for all wind resources in the MISO footprint. The second step employs a deterministic approach using unit-specific metrics to allocate the single seasonal system-wide ELCC value across all wind CPNodes in the MISO system, resulting in an individual wind capacity credit for each wind node in operation for the sampled peak load period for each Season.

As the geographical distance between wind generation increases, the correlation in the wind output decreases. This leads to a higher average output from wind for a more geographically diverse set of wind plants, relative to a closely clustered group of wind plants. Due to the increasing diversity and the inter-annual variability of wind generation over time, the process

needs to be repeated annually to incorporate the most recent historical performance of wind resources into the analysis. For each upcoming Planning Year, the wind capacity credit values in MISO are updated to account for both the stochastic nature of wind generation and the increasing integration of new resources into the system. The sections of this appendix and current results illustrated here are broken down to provide an example detailing the two-step method adopted by MISO for determining wind accreditation from the 2012-13 Planning Year.



Step-1: MISO System-Wide Wind ELCC Analysis

Probabilistic Analytical Approach

The probabilistic measure of load not being served is known as Loss of Load Probability (LOLP) and when this probability is summed over a time frame, e.g. one year; it is known as Loss of Load Expectation (LOLE). The accepted industry standard for what has been considered a reliable system has been the “Less than 1 Day in 10 Years” criteria for LOLE. This measure is often expressed as 0.1 days/year, as one year is the period for which the LOLE index is calculated.

Effective Load Carrying Capability (ELCC) is defined as the amount of incremental load a resource, such as wind, can dependably and reliably serve, while considering the probabilistic nature of generation shortfalls and random forced outages as driving factors to load not being

served. Using ELCC in the determination of capacity value for generation resources has been around for nearly half a century. In 1966, Garver demonstrated the use of loss-of-load probability mathematics in the calculation of ELCC [1].

To measure ELCC of a particular resource, the reliability effects need to be isolated for the resource in question, from those of all the other sources. This is accomplished by calculating the LOLE of two different cases: one “with” and one “without” the resource. Inherently, the case “with” the resource should be more reliable and consequently have fewer days per year of expected loss of load (smaller LOLE).

The new resource in the example shown in Fig. 1 made the system 0.07 days/year more reliable, but there is another way to express the reliability contribution of the new resource besides the change in LOLE. This way requires establishing a common baseline reliability level and then adjusting the load in each case “With” and “Without” the new resource to this common LOLE level. A common baseline that is chosen is the industry accepted reliability standard of 1 Day in 10 Years (0.1 days/year) annual LOLE criteria.

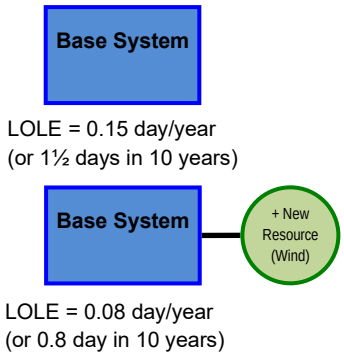


Figure 1: Example System “With” and “Without” New Resource

With each case being at the same reliability level, as shown in Fig. 2, the only difference between the two cases is that the load was adjusted. This difference is the amount of ELCC expressed in load or megawatts, which is 300 MW (100 minus -200) for the new resource in this example. This number may be divided by the ICAP of the new resource and then expressed in percentage form. ICAP for a wind resource is defined as the lesser of a wind resource’s Maximum Output as it is registered in the Commercial Model and its total Interconnection

Service. The new resource in the ELCC example Fig. 2 has an ELCC of 30 percent of the resource's nameplate capacity, assuming nameplate capacity is equivalent to ICAP.

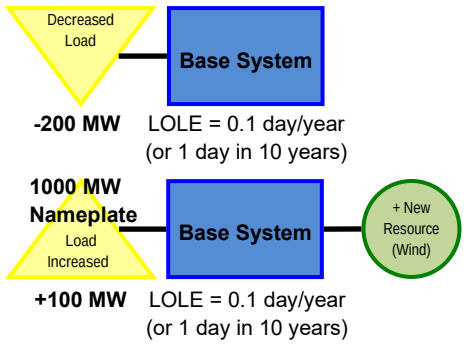


Figure 2: ELCC Example System at the same LOLE

The same methodology illustrated in the simple example of Fig. 2 was utilized as the analytical approach for the determination of the seasonal system-wide ELCC of the wind resource in the much more complex MISO system. For each historic year studied, there were two types of cases analyzed: cases with and cases without the wind resources included in the model. Each case was adjusted to the same common baseline LOLE and the ELCC was measured off those load adjustments. [2]

LOLE Model Inputs & Assumptions

To apply the ELCC calculation methodology, MISO uses an LOLE model capable of sequential Monte Carlo simulation to calculate LOLE values with and without the wind resource modeled. This analysis primarily considers three major inputs:

- Generator Forced Outage Rates (EFORd)
- Actual Historic Hourly Load Values
- Actual Historic Hourly Wind Output Values

Forced outage rates are used for the conventional type of units in the LOLE model. These EFORd are calculated from the Generator Availability Data System (GADS) that MISO uses to collect historic operation performance data for all conventional types units in the MISO system.

To incorporate historical performance, the actual historical hourly concurrent load and wind output at the wind CPNodes is used to calculate the historic seasonal ELCC values for the wind generation in the MISO on a system-wide basis.

Step-2: Wind Capacity Credit by CPNode Calculation

Deterministic Analytical Technique

Since there are many wind CPNodes throughout the MISO system, a deterministic approach involving a historic-period metric is used to allocate the system-wide seasonal ELCC values of wind to all the registered and in-service wind CPNodes. While evaluation of all CPNodes captures the benefit of the geographic diversity, it is important to assign the capacity credit of wind at the individual CPNode locations, because location relates to deliverability due to possible congestion on the transmission system in the MISO market. Also, in a market it is important to convey the correct incentive signal regarding where wind resources are relatively more effective. The location and relative performance are valuable inputs in determining the tradeoffs between constructing wind facilities in high-capacity factor locations, that in the case of the MISO system are located in more remote locations far from load centers, and requiring more transmission investment versus locating wind generating facilities at less effective wind resource locations that may require less transmission build-out.

The fleet-wide wind ELCC value (%) for a particular Season multiplied by the total ICAP for registered and in-service wind resources results in the total seasonal fleet-wide allocatable wind accreditation (MW). The total seasonal fleet-wide wind accreditation is then allocated to the applicable wind CPNodes in the MISO system.

Allocation considers the historic output, both in terms of with and without curtailments, for each wind CPNode over the top 8 daily peak hours for each Season included in the analysis. A capacity factor for each CPNode during all historical daily peak hours is represented in the Wind CPNode Equations contained in this appendix by "$PKmetric_{CPnode}$" for a particular CPNode, which is also referred to as the peak performance capacity factor.

This peak capacity factor for each Season is calculated using two methods:

- one method includes (adds back in) megawatts of a wind resource that were curtailed
- a second method excludes (does not add back in) those same curtailed megawatts

The larger of the two methods above, for each individual resource, forms the basis for allocating the total seasonal fleet-wide wind accreditation to the CPNodes.

New wind CPNodes that do not have sufficient historic output data will receive the seasonal fleet-wide wind capacity credit percentages applied to their ICAP as their default seasonal capacity accreditation for their first year in operation.

Tracking the top 8 daily peak hours in a Season is sufficient to capture the peak load times that contribute to the annual LOLE of 0.1 days/year. For example, in the LOLE run for year 2011, all of the 0.1 days/year LOLE occurred in the month of July, but only 4 of the top 8 daily peaks occurred in the month of July. Therefore, no more than 4 of the top daily peaks contributed to the LOLE. Other years have LOLE contributions due to more than 4 days, however 8 days was found sufficient to capture the correlation between wind output and peak load times in all cases. If many more years of historical data were available, one could simply utilize the single peak hour from each year as the basis for determining the $PKmetric_{CPnode}$ over multiple years.

Wind CPNode Equations

The relationship of the wind accreditation to a CPNode's ICAP and Capacity Credit (%) is expressed as:

$$\left(\text{Wind Capacity Rating}\right)_{\text{CPNode n}} = \text{ICAP}_{\text{CPNode n}} \times \left(\text{Capacity Credit \%}\right)_{\text{CPNode n}} \quad (1)$$

Where $ICAP_{CPnode\ n}$ = Installed Capacity of the wind facility at the CPNode level.

The right most term in equation (1) above, the $(\text{Capacity Credit \%})_{CPNode\ n}$, can be replaced by the expression (2):

$$\left(\text{Capacity Credit \%}\right)_{\text{CPNode n}} = \text{K} \times \left(\text{PKmetric}_{\text{CPNode n}}\%\right) \quad (2)$$

Where "K" for was found by obtaining the PKmetric at each CPNode over the time period, and solving expression (3):

$$K = \frac{ELCC}{\sum_{1}^{n} (ICAP_{CPNoden} \times PKmetric_{CPNoden})} \quad (3)$$

This results in the sum of the Wind Capacity Rating (MW) calculated for the CPNodes approximately equal to the total fleet-wide seasonal wind ELCC.

References

[1] Garver, L.L.; "Effective Load Carrying Capability of Generating Units," Power Apparatus and Systems, IEEE Transactions on, vol. PAS-85, no. 8, pp. 910-919, Aug. 1966

[2] Keane, A.; Milligan, M.; Dent, C.J.; Hasche, B.; D'Annunzio, C.; Dragoon, K.; Holttinen, H.; Samaan, N.; Soder, L.; O'Malley, M.; "Capacity Value of Wind Power," Power Systems, IEEE Transactions on, vol. 26, no. 2, pp. 564-572, May 2011

Appendix B – GADS Events Outside Management Control (OMC Codes)

There are a number of outage causes that may prevent the Energy coming from a power generating plant from reaching the customer. Some causes are due to the plant operation and equipment while others are outside plant management control. Such outages include (but are not limited to) ice storms, hurricanes, tornadoes, poor fuels, interruption of fuel supplies, etc.

A list of GADS causes and their cause codes for OMC events are listed on the following page. MISO has generated a list of OMC codes accepted by MISO for GADS purposes. For more detailed information regarding OMC outages and codes please refer to Appendix K of the NERC GADS Data Reporting Instructions.

The lists of GADS Cause Codes applicable to reporting outages to MISO are as follows:

GADS Cause Codes Outside Plant Management Control (OMC)

3600	Switchyard transformers and associated cooling systems – external
3611	Switchyard circuit breakers – external
3612	Switchyard system protection devices – external
3619	Other Switchyard equipment – external
3710	Transmission line (connected to powerhouse switchyard to 1st Substation)
3720	Transmission equipment at the 1st Substation (see code 9300 if applicable)
3730	Transmission equipment beyond the 1st Substation (see code 9300 if applicable)
9000	Flood
9001	Drought
9010	Fire, not related to a specific component
9015	Pandemic
9020	Lightning
9025	Geomagnetic disturbance
9030	Earthquake
9031	Tornado
9035	Hurricane
9036	Storms (ice, snow, etc.)
9040	Other catastrophe

9130	Lack of fuel (water from rivers or lakes, coal mines, gas lines, etc.) where the operator is not in control of contracts, supply lines, or delivery of fuels
9132	Wet Fuel – Biomass
9135	Lack of water
9139	Ground water or other water supply problems
9150	Labor strikes company-wide problems or strikes outside the company's jurisdiction such as manufacturers (delaying repairs) or transportation (fuel supply) problems
9200	High ash content
9210	Low grindability
9220	High sulfur content
9230	High vanadium content
9240	High sodium content
9250	Low Btu coal due to low BTU vane of coal not expected (Outside Management Control)
9260	Low Btu oil
9270	Wet coal
9280	Frozen coal
9290	Other fuel quality problems
9300	Transmission system problems other than catastrophes (do not include switchyard problems in this category; see codes 3600 to 3629, 3720 to 3730)
9320	Other miscellaneous external problems
9500	Regulatory (nuclear) proceedings and hearings - regulatory agency initiative
9502	Regulatory (nuclear) proceedings and hearings - intervener initiated
9504	Regulatory (environmental) proceedings and hearings - regulatory agency initiated
9506	Regulatory (environmental) proceedings and hearings - intervener initiated
9510	Plant modifications strictly for compliance with new or changed regulatory requirements (scrubbers, cooling towers, etc.)
9520	Oil spill in Gulf of Mexico
9590	Miscellaneous regulatory (this code is primarily intended for use with event contribution code 2 to indicate that a regulatory-related factor contributed to the primary cause of the event)

Appendix C – Registration of Energy Efficiency Resources

Energy Efficiency	
Registration Requirements	**Explanation**
Name	Enter the name of the Energy Efficiency Resource
Plan Year	The Auction you are registering your Energy Efficiency Resource for displays in this field.
Description	Enter type of resources and additional names and sizes if registering more than one unit.
Asset Owner	Select the name of the entity that owns or has rights to this asset.
Local Resource Zone (LRZ)	The LRZ where this Energy Efficiency Resource is located displays once the Asset Owner and LBA is selected and the registration is saved.
Local Balancing Area (LBA)	Select the LBA where this Energy Efficiency Resource is located.
Documentation	Attach supporting documentation.
Program Information	Indicate if this is a new program or previously registered program.
Program Inception Auction	Select auction program began
Program Name	Name of program that is being registered.
Added Capability	Enter MW capability of program for given Auction
Total Capability	Total cumulative MW capability of program.
Eligible Capability	Sum of MW capability of 4 most recent Planning Years.
Forecast Capability	Total Capability minus Eligible Capability.
Energy Efficiency Capability at MISO Peak	MW value of program at MISO Peak.
Certify that registrant possesses ownership or equivalent contractual rights	Indicate whether registrant has all necessary rights to register this resource.
Comments	Submit any comments for this registration.

Appendix D – Registration of DRs

Demand Resource (DR)	
Registration Requirements	**Explanation**
Auction	The Season(s) in the PY you are registering your DR for displays in this field.
Name	Enter Name of the DR.
Description	Enter type of resources, additional names, and sizes if registering more than one unit.
Asset Owner	Select the name of the entity that owns or has rights to this asset.
Local Resource Zone (LRZ)	The LRZ where this DR is located displays once the Asset Owner and LBA is selected and the registration is saved.
Local Balancing Area (LBA)	Select the LBA where this DR asset is located.
Load Zone CP Node	Enter the CP Node where the DR asset is located.
CP Node Override	Check box if the Load Zone CP Node and Asset Owner combination that is needed, is not in the dropdown. MECT would allow then any Load Zone CPNode to be selected for any Asset Owner, assigned to the MP.
Aggregate Retail Customer (ARC)	Check box if resource registered as an ARC and fill out appropriate account and address information.
Retail Choice	Check box if Resource is for Retail Choice and if yes, type in name of Retail Choice Customer.
Accreditation Method	Choose accreditation method and attach supporting documentation.
Demand Reduction Capability Forecast	Monthly values shall be provided for the first two years from the Effective Start Date. Provide monthly MW levels associated with the amount of MW you can reduce in a given month consistent with the actual physical availability of the resource limited by any relevant regulatory or contractual restrictions.

Demand Resource (DR)	
Registration Requirements	**Explanation**
	Seasonal values shall be provided beyond the 2-year monthly window. Provide seasonal (Summer and Winter) MW levels associated with the amount of MW you can reduce in a given month consistent with the actual physical availability of the resource, limited by any relevant regulatory or contractual restrictions.
Operator Contact Name	Enter who to contact for deployment of the DR. The contact should be available 24 x 7 for commitment by MISO or LBA.
Operator Contact Phone Number	Enter phone number for 24 x 7 operator.
Operator Contact Email	Enter email address for 24 x 7 operator.
M&V protocol to be applied to this DR	Select the protocol that should be applied. This is used for determination of whether the LMR performed if called on during a MISO Emergency. If other selected, please describe in box.
Exclude Season	Check this box to exclude the registration from participation in the specified Season.
Capability at MISO Peak	Enter MW capability being registered at MISO's Seasonal Peak.
DRR Registered	Check box if resource is registered as a DRR. If yes, select the name of the DRR CP Node.
Emergency Demand Response (EDR)?	Check box if DR registered as an EDR. If yes, select the name of the EDR resource.
Load Control Method	Select if load is direct control or interruptible load.
Max Interruptions	Select the max interruptions for the resource.
Max duration (hours)	Select the max duration for the resource.
Notification	Enter the notification time required for this DR. Notification time(s) must cover all hours and cannot be more than 6 hours and should be available 24 hours/Everyday (From 0000 to 2300 acceptable for 24 hours). Multiple notification times should start and stop

Demand Resource (DR)	
Registration Requirements	**Explanation**
	with different hours (from 0000 to 0700, 0800 to 1600, 1700-2000, 2100 to 2300).
EP Node Details	Add an appropriate EP Node by clicking “Add EP Node” and upload documentation for details on the EP Node. Note: This is an optional upload on DR Registration
Accept terms and conditions of the MISO Tariff	Indicate whether registrant accepts the terms and conditions of the MISO Tariff applicable to this resource
Certify that registrant holds all permits in place to operate resource	Indicate whether registrant has all necessary permits to operate this resource
Certify that registrant holds all rights in place to operate resource	Indicate whether registrant has all necessary rights to operate this resource
Comments	Submit any comments for this registration

Appendix E – BTMG registration

Behind the Meter Generation (BTMG)	
Registration Requirements	**Explanation**
Auction	The Season(s) within the PY you are registering your BTMG for displays in this field.
Name	Enter Name of the BTMG.
Description	Enter type of resources and additional names and sizes if registering more than one unit.
Asset Owner	Enter the name of the entity that owns or has rights to this asset.
Local Resource Zone (LRZ)	The LRZ where this BTMG is located displays once the Asset Owner and LBA is selected, and the registration is saved.

Behind the Meter Generation (BTMG)	
Registration Requirements	**Explanation**
Local Balancing Area (LBA)	Select the LBA where this BTMG asset is located.
Load Zone CP Node	Enter the CP Node where the BTMG asset is located.
Documentation	Add supporting documentation as necessary.
Demand Reduction Capability Forecast	Monthly values shall be provided for the first two years from the Effective Start Date. Provide monthly MW levels associated with the amount of MW you can inject in a given month consistent with the actual physical availability of the resource, limited by any relevant regulatory or contractual restrictions. Summer and Winter values shall be provided beyond the 2-year monthly window for levels associated with the amount of MW you can inject in the given Summer and Winter Season consistent with the actual physical availability of the resource, limited by any relevant regulatory or contractual restrictions.
Operator Contact Name	Enter who to contact for deployment of DRBTMG. The contact should be available 24 x 7 for commitment by MISO or LBA.
Operator Contact Phone Number	Enter phone number for 24 x 7 operator.
Operator Contact Email	Enter email address for 24 x 7 operator.
M&V protocol to be applied to this BTMG	Select the protocol that should be applied. This is used for determination of whether the LMR performed if called on during a MISO declared Emergency. If other selected, please describe in box provided.
Exclude Season	Check this box to exclude the registration from participation in the specified Season
Generators	Select the name of the Generator(s)
Wind Capacity Factor %	If a wind unit is selected, the Wind Capacity Factor will be displayed.
Transmission Loss %	Indicates the Transmission Loss % to be applied to the UCAP calculation based on the LBA selected.
Capability at MISO Peak	Indicates the calculated MW value for the BTMG resource based on its GVTC

Behind the Meter Generation (BTMG)	
Registration Requirements	**Explanation**
XEFORd	Displays the XEFORd to be applied in the UCAP calculation for the BTMG resource. If multiple Generators are selected, this field will display the weighted average XEFORd.
Emergency Demand Response (EDR)?	Check box if BTMG registered as an EDR and if yes, select the name of the EDR resource
Max Interruptions	Select the maximum interruptions for the resource
Max Duration (hours)	Select the maximum runtime hours for the resource
Startup notification time details (in hours)	Enter the notification time required to deploy this BTMG. Needs to be no more than 6 hours and cover all hours. Needs to be available 24 hours/Everyday (From 0000 to 2300 acceptable). Multiple notification times should start and stop with different hours (from 0000 to 0700, 0800 to 1600, 1700-2000, 2100 to 2300)
EP Node Details	Add an appropriate EP Node by clicking “Add EP Node” and upload documentation for details on the EP Node. Note: This is an optional upload on BTMG Registration
Accept terms and conditions of the MISO Tariff	Indicate whether registrant accepts the terms and conditions of the MISO Tariff applicable to this resource
Certify that registrant holds all permits in place to operate resource	Indicate whether registrant has all necessary permits to operate this resource
Certify that registrant holds all rights in place to operate resource	Indicate whether registrant has all necessary rights to operate this resource
Comments	Submit any comments for this registration

Appendix F – External Resources

External Resources	
Registration Requirements	**Explanation**
Name	Enter name of the External Resource.
Description	Enter type of resources and additional names and sizes if registering more than one unit.
BER/COR	Indicate if this Resource is a Border External Resource or Coordinating Owner Resource by checking this box.
Auction	The Season(s) in the Planning Year you are registering the resource for displays in this field.
Asset Owner	Select the name of the entity that owns or has rights to this asset.
Load Zone CP Node	Select the required Load Zone CP Node where this Resource is serving load.
Local Balancing Area (LBA)	Select the LBA where the External Resource sinks within MISO.
Local Resource Zone (LRZ)	Indicates the Local Resource Zone where the load served by this resource is located.
Ownership	Indicate if the External Resource is directly owned or from a PPA.
Entitled Capacity	Enter MW value the Market Participant can register.
PPA Type	Select whether PPA MWs are defined in MISO ICAP or UCAP.
Generator	Select name of GADS or Non-GADS Generator.
Ownership Share Type	Select Megawatt or Percent to indicate how much capacity corresponds to the registration.
External Balance Area where Resource are located	Enter Balancing Authority where the resource is physically located.

External Resources	
Registration Requirements	**Explanation**
Capacity at MISO Peak (Calculated)	The amount of seasonal capacity on a megawatt basis corresponding to the registration in terms of NRIS and ERIS.
Interface CPNode	Select Interface Load Zone CPNode.
XEFORd	The seasonal forced outage rate associated with the Generator(s) from GADS, excluding Outside Management Control (OMC) events. Can be overridden by the Market Participant.
NERC Regional Entity	Select NERC Regional Entity where the resource is located.
Use-Limited Resource Qualification	Indicate if this resource meets all Use Limited Resource qualification requirements.
Diversity Contract	Indicate whether this resource is part of a Diversity Contract exchange.
IDC Name	Indicate the IDC name used for entering outages via the SDX. List separate IDC name for each unit being registered. This is used for the must offer requirement.
Documentation	If Resource is not owned directly, attach supporting PPA or other pertinent documentation here.
Firm transmission to the MISO Border	Input effective date and OASIS reservation number and select Transmission Provider.
Firm transmission within the MISO Transmission System	Input effective date and OASIS Reservation number.
Have you accepted the terms and conditions of the MISO Tariff ?	Indicate whether registrant accepts the terms and conditions of the MISO Tariff applicable to this Resource.
Have you notified the host BA?	Indicate if you have contacted your host BA of this registration.
Will this External Resource be used exclusively as a Capacity Resource for MISO?	Indicate that you certify that this External Resource is being used as a Capacity Resource exclusively for MISO.
Is this External Resource available the entire auction?	Indicate if this External Resource is available for the entire Season within the upcoming Planning Year.

External Resources	
Registration Requirements	**Explanation**
Have all other requirements been met?	Indicate if all other requirements have been met.
Resource Operator Contact Name (24x7)	Enter who to contact for deployment of External Resource. The contact should be available 24x7 for commitment by MISO or LBA.
Resource Operator Contact Phone Number (24x7)	Enter phone number for 24x7 operator.
Resource Operator Contact Email (24x7)	Enter email address for 24x7 operator.
Season(s) registration is being submitted for	Summer ☐ Fall ☐ Winter ☐ Spring☐
Comments	Submit any comments for this registration.

Appendix G – Reliability Based Demand Curve

Overview

The key features of the Reliability Based Demand Curve include:

- Target point defined by: (a) x-axis centered on MISO's reliability requirement at a loss of load expectation (LOLE) of 0.1 days per year; and (b) y-axis centered on the estimated Net CONE that would be needed to attract new resources. This target point reflects the central concept that price levels must be consistent with achieving system reliability objectives.
- Curve proportional to incremental reliability value, such that prices decline with increasing quantities of capacity, and such that pricing levels are rationalized against reliability risk across each of the four seasons.
- Price cap at 1 × Cost of New Entry (CONE, or Gross CONE) in each season, and 4 × CONE in total across the four seasons.

RBDCs are developed for the entire MISO system as well as for the two subregions (North/Central & South) of the MISO system, utilizing the same reliability-based concept. The demand curves for the subregions will reflect the additional reliability value that capacity resources can contribute by being located in a subregion with more acute reliability needs than the broader system. The total reliability value (and price) awarded to capacity in a particular subregion will reflect the sum of its contribution to avoiding system-wide reliability events (reflected in the system-wide RBDC) plus its contribution to avoiding additional reliability events that would occur in the subregion (reflected by the subregional RBDC).

In total, MISO utilizes twelve (12) RBDCs for any particular Planning Year: four (4) seasonal curves for the system-wide RBDC, four (4) seasonal curves for the North/Central subregion, and four (4) seasonal curves for the South subregion.

RBDCs are drawn in proportion to reliability value at each quantity point and are drawn through the target point at the reliability requirement and Net CONE.

System-wide Reliability Based Demand Curves

The system-wide RBDC is defined in proportion to system-wide Marginal Reliability Impact (MRI), which is measured as avoided Expected Unserved Energy (EUE), or the reductions

to load shedding that would be achieved by adding one more MW of perfect capacity (or UCAP) to the system. This is derived from the seasonal Loss of Load Hours (LOLH) predicted at a specific quantity of supply, and the observation that 1 MW of perfectly-available UCAP supply would have avoided 1 MW-hour of outages across all of the simulated events. Mathematically, MRI is defined as:

MRI = Avoided EUE from Incremental Capacity = LOLH x 1 MW UCAP

Where:

- MRI (MWh per UCAP MW) is the incremental reliability value of adding 1 UCAP MW of capacity to the system.
- Avoided EUE (MWh per season) is the reduction in expected involuntary load shedding caused by adding incremental capacity.
- Incremental Capacity (UCAP MW) is the volume of perfectly-available capacity added.
- LOLH (hours per season) is the number of shortage hours predicted in reliability simulations across the season in question, in correlation with a specific quantity of UCAP MW available in that season.

To calculate MRI as a function of capacity, MISO utilizes the same resource adequacy model used in the determination of resource adequacy Requirements.

MRI curves are convex and monotonically downward-sloping, reflective of the declining marginal reliability value of capacity when supply is abundant, as well as the increasing marginal reliability value of capacity when supply is scarce. MRI is calculated above and below the reliability requirement by first establishing the supply quantity at which the system achieves the reliability target, and then adding/subtracting perfectly-available UCAP MW (in equal increments of no less than 50 MW and no more than 250 MW) to determine the marginal reliability value of the incremental capacity.

EUE is calculated at consistent variances in incremental and decremental amounts of capacity in the model for each season. The starting point for the seasonal MRI curves is the amount of capacity (in terms of UCAP) that results in the LOLE criteria corresponding with the demonstrated risk for each season. The Monte Carlo modeling for the system-wide MRI curve is copper plate, which assumes no internal transmission limitations within the MISO system.

Subregional Reliability Based Demand Curves

The development of subregional MRI curves follows the same process used for developing the system-wide curves—however, with the addition of bi-directional subregional transfer limits in the resource adequacy model that exists between the two subregions.

The starting point for each subregion's MRI curve is the PRMR from the system-wide analysis. Decrease/increase capacity in one region and simultaneously increase/decrease capacity in the other by the same amount and record reliability metrics for each region individually and MISO as a whole.

Subregion-specific Net CONE values are used to calculate subregional scaling factors, which are multiplied by the subregional MRI curves in each season to calculate the subregional RBDCs. Subregional RBDCs reflect the additional reliability value associated with capacity that can avoid reliability events that occur only in that subregion due to import limits, but that are not experienced system-wide.

Beyond the import capability, only capacity located in that subregion can help to avoid those localized shortfall events, so the incremental reliability and pricing value awarded would only apply to local capacity resources. The subregional RBDCs are calculated considering only local outage events, not considering system-wide outage events that are driven by system-wide supply shortfalls. Therefore, the subregional RBDCs are defined as additive in nature to the system-wide RBDCs.

The role of the system-wide demand curve is to signal the value of adding more capacity in total in MISO, regardless of where it is located. The role of the subregional RBDCs is to signal where within the system capacity is most needed (and where additional capacity cannot be as effectively utilized).

The steps for calculating subregional RBDCs include:

1. Initialize the resource adequacy model with each subregion at a target of 0.1 days per year: Beginning with the system-wide resource adequacy model, apply subregional transfer limits. Then subtract capacity in each season until each subregion is at a minimum seasonal LOLE criteria of 0.01 days/season for seasons demonstrating minimal risk. This reliability target reflects the subregional interpretation resource adequacy criteria in the MISO Tariff used as the basis for setting starting points in the subregional RBDCs.

2. Calculate Subregional Seasonal resource adequacy metrics Across Reserve Margins for Each Subregion: From this starting point, add (or subtract) perfectly-available UCAP MW
   capacity to the subregion in each season. Adding capacity to the system and the relevant subregion and observing the change in LOLE, LOLH, and EUE measures the incremental value of locating capacity in that region. When the subregion in question becomes highly import-dependent, events in that subregion will become large (even though the broader system will maintain similar levels of reliability). When the region becomes a large exporter of capacity, local events will drop to zero (even though system-wide events will not drop to zero given that the maximum capacity limit will be enforced more often and local excess supply will not be possible to export in all cases).
3. Calculate Seasonal Subregional MRI Curves: The subregional MRI curve has a somewhat different meaning as compared to the system-wide MRI curve, in that the subregional MRI curve aims to measure the additional value achieved by locating capacity within a particular import-constrained region (beyond the value already reflected by the system-wide curve). Subregional MRI will be positive when the region is import-constrained and zero when the subregion has excess capacity. Therefore, the MRI curve for each subregion is first calculated as the total MRI including both system-wide and subregional events (the direct model result), and then the share of system-wide events is subtracted out. The resulting MRI curve reflects subregional events only.
4. Calculate the Subregional Scaling Factor: Calculate the subregional scaling factor from the subregional Net CONE value, divided by the subregional MRI at a quantity consistent with the resource adequacy target LOLE of 0.1 days/year from Step 1.
5. Calculate Seasonal Subregional RBDCs: Calculate the RBDCs for capacity in each subregion based on the MRI curve times the Subregional Scaling Factor from Step 4. The
   resulting subregional RBDC will produce a positive price whenever the subregion is anticipated to be import constrained during times of potential shortage, and incremental capacity in that subregion would help to alleviate the shortfall.

Translating MRI Curves to RBDC

Translating the MRI curves (in units of incremental EUE per MW) into a capacity demand curve (in units of dollars per MW-day) requires a system scaling factor. The system scaling factor is calculated so as to support annual average prices at annualized Net CONE when the system is at the annual LOLE requirement of 0.1 days/year. If more than one season shares a meaningful portion of the LOLE risk, the LOLE risk could be summed from the estimated values across 2–4 seasons. Mathematically, system scaling factor is defined as:

System Scaling Factor = Average System Annual Net CONE ÷ System MRI @ 0.1 LOLE

Where:

- System Scaling Factor ($/MWh) is the payment rate at which the system-wide Reliability Based Demand Curves would incentivize investment in additional supply.
- System Annual Net CONE ($/UCAP MW-year) is the administrative estimate of the net
annualized cost to develop new capacity resources (i.e., the long-run marginal cost of supply) on a system-wide basis.
- System MRI @ 0.1 LOLE (MWh/UCAP MW-year) is the marginal impact of additional capacity, as estimated on a system-wide copper-sheet basis (i.e., without considering transmission constraints) when the system is at the annual LOLE requirement of 0.1 days/year.

The prices on all the curves are derived by multiplying the MRI curves by the uniform system scaling factor (in $/MWh of EUE avoided) given by the annual break-even revenue requirement from the capacity market at the LOLH corresponding to a LOLE of 0.1 days/year.

Once the System Scaling Factor is calculated, the same value is utilized to calculate the RBDCs across all four seasons. The four RBDCs reflect a set of economic parameters that signal the relative value of capacity across each season. These four RBDCs will therefore support differentiated prices in each season that are always consistent with the level of events that are likely to be faced in each season given its respective supply-demand balance. The curves are all of a convex shape, reflective of the diminishing value of reliability at higher quantities but have different horizontal placements relative to peak load and different rates of diminishing return that reflect the unique system challenges faced across each season.

Summer has the highest peak load, so the curve is at the highest overall quantity in the summer—however, the other seasons face more uncertainty in net load across weather years and so their curves are more right-shifted compared to seasonal peak load. A season that faces
greater variability and uncertainties in outage and resource availability risks may also produce a
somewhat flatter curve (e.g., Winter and Summer), while a season facing fewer such uncertainties may produce a steeper curve (e.g., Spring).

Similar to System Scaling Factor, scaling factor to scale subregional MRI curve is determined as follows.

Subregional Scaling Factor = Average respective subregion Annual Net CONE ÷ subregional MRI @ 0.1 LOLE

Where:

- Subregional Scaling Factor ($/MWh) is the payment rate at which the Subregional Reliability Based Demand Curves would incentivize investment in additional supply.
- Subregional Annual Net CONE ($/UCAP MW-year) is the administrative estimate of the net annualized cost to develop new capacity resources (i.e., the long-run marginal cost of supply) on a subregional basis.
- Subregional MRI @ 0.1 LOLE (MWh/UCAP MW-year) is the marginal impact of additional capacity, as estimated on a subregional basis when the system is at the annual LOLE requirement of 0.1 days/year.

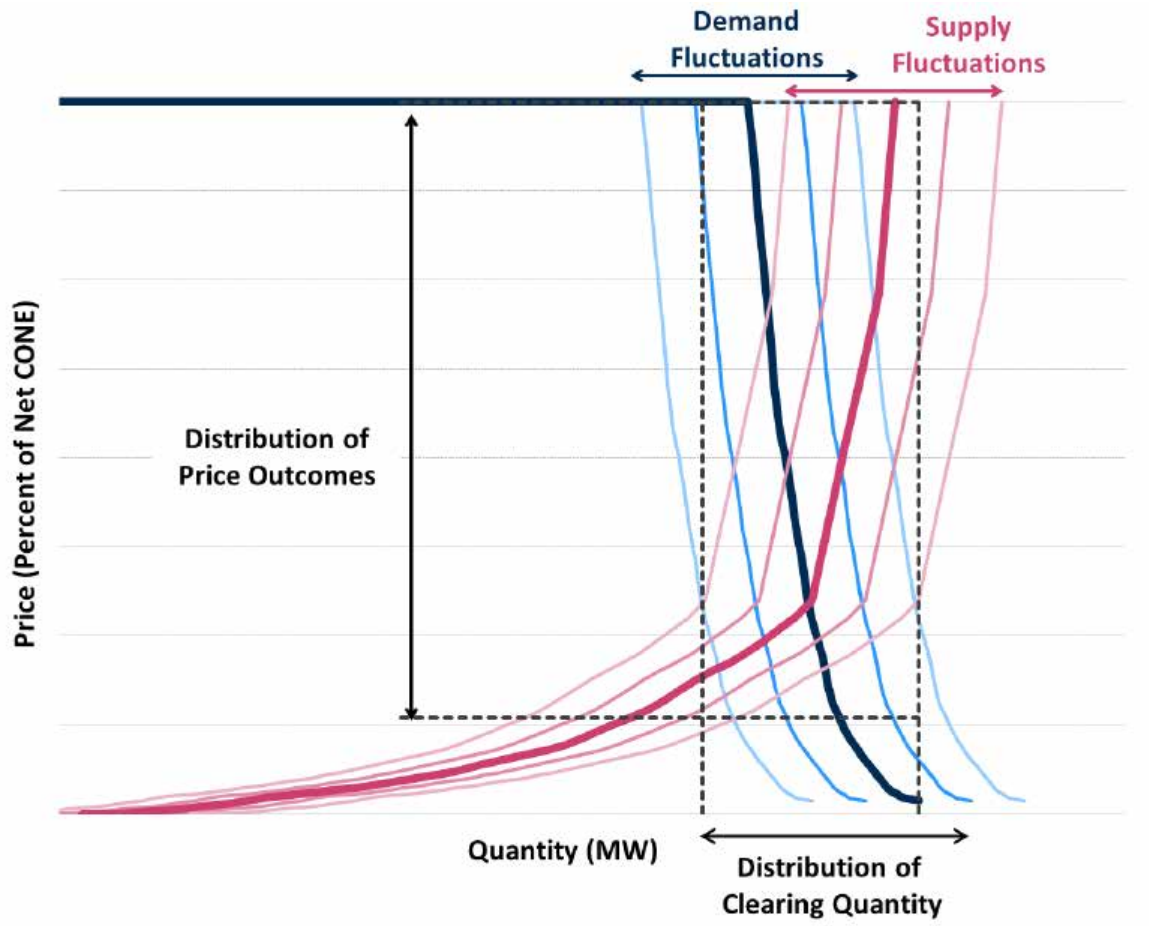
Once the Subregional Scaling Factor is calculated, the same value is utilized to calculate the RBDCs across all four seasons. The four RBDCs reflect a set of economic parameters that signal the relative value of capacity across each season. On subregion basis, these four RBDCs will therefore support differentiated prices in each season that are always consistent with the level of events that are likely to be faced in each season given its respective supply-demand balance. The curves are all of a convex shape, reflective of the diminishing value of reliability at higher quantities but have different horizontal placements relative to peak load and different rates of diminishing return that reflect the unique system challenges faced across each season.

Summer has the highest peak load, so the curve is at the highest overall quantity in the summer—however, the other seasons face more uncertainty in net load across weather years and so their curves are more right-shifted compared to seasonal peak load. A season that faces greater variability and uncertainties in outage and resource availability risks may also produce a somewhat flatter curve (e.g., Winter and Summer), while a season facing fewer such uncertainties may produce a steeper curve (e.g., Spring).

Long-run Equilibrium Analyses

Monte Carlo simulations are performed on supply curves and potential RBDCs to assess the achievement of long-run equilibrium conditions where the objective is for the average of all seasonal prices to be equivalent to Net CONE. Seasonal ACP and supply quantity outcomes are modeled in the simulations to account for variability in supply curve shapes, supply quantity, demand quantity, and opt out quantity. All model inputs are derived from historic MISO market data. Long-run equilibrium analyses should result in an expected distribution of price, quantity, and reliability outcomes that, when compared to the design objectives of RBDC, achieve the reliability objectives, produce better capacity market price signaling, and accurately recognize the reliability value of incremental capacity.

The long-run equilibrium analyses involve separate Monte Carlo simulations and will be performed every three (3) Planning Years.



In-market supply curves consist of three (3) component pieces:

6. Price Offers: supply offers at prices above zero, shape based on historic MISO offer curves, and independent of demand curve shape.
7. Year-to-Year Variability in Supply: zero-priced supply block, quantity varies with each draw to generate variability in supply offers, and tuned to true historic availability in supply.
8. Market Entry and Exit: zero-priced annual supply block with seasonal capacity ratings proportional to a combustion turbine reference resource, quantity varies across draws so that the average of seasonal clearing prices across all seasons is equal to the annual net CONE.

Appendix H – Non-Schedule 53 Seasonal Accredited Capacity (SAC) Calculations for Planning Resources

The following sets of equations establish how the SAC values (NRIS SAC, including E-NRIS SAC, and ERIS SAC) are determined for Planning Resources to account for resource performance and availability. Schedule 53 resource accreditation is outlined in Appendix Y.

H.1 Planning Resource SAC calculation for a Generation Resource, a Demand Response Resource backed by a generator, or a Behind-the-Meter Generator, with a Point of Interconnection on MISO's Transmission System

The Seasonal Accredited Capacity (SAC) calculation is based on resource type and volume of seasonal Interconnection Service, seasonal GVTC, and seasonal forced outage rate (XEFORd).

H.1.1 Planning Year SAC Calculation for each Season

The following steps are used to calculate NRIS SAC and ERIS SAC for each Planning Resource.

Determine ICAP:

The first step is to determine the Installed Capacity (ICAP) that the Planning Resource can reliably provide, which is equal to the lesser of its GVTC or its total volume of Interconnection Service (Network Resource Interconnection Service and/or Energy Resource Interconnection Service) granted either through MISO's Generation Interconnection Procedures or through a market transition deliverability test. The equation is shown below.

$$ICAP = \begin{cases} Total\ Interconnection\ Service,\ If\ GVTC > Total\ Interconnection\ Service \\ GVTC,\ If\ GVTC \leq Total\ Interconnection\ Service \end{cases}$$

Determine Total SAC:

The next step is to convert the resultant ICAP value into a Total SAC value by applying its seasonal forced outage rate (XEFORd).

A forced outage rate class average for each Season is used if the Planning Resource has a GVTC < 10 MW and has not submitted generator availability data or does not have sufficient generator availability data to calculate a forced outage rate specific to the Planning Resource. A

Planning Resource has sufficient generator availability data when it has a minimum of 12 months of generator availability data between September 1 and August 31 for the previous 3 years. The applicable class average for a Planning Resource is based on its unit size and type.

$$Total\ SAC = ICAP \times (1 - XEFOR_d)$$

If the Planning Resource has provisional Interconnection Service, then the Planning Resource will receive zero Interconnection Service and therefore the calculated Total SAC will be zero.

If the Planning Resource does not report historical outage data to GADS, its historical performance during seasonal peak hours should be provided to MISO through the Non-GADS Performance Template, which will leverage prior performance to establish seasonal GVTC values indicative of typical seasonal capabilities. In this case, XEFORd would not be used to reduce Total SAC. This process excludes Demand Response Resources.

Allocate Total SAC into NRIS SAC and ERIS SAC based on Interconnection Service:

The Resource's Total SAC is allocated into NRIS SAC and ERIS SAC based upon its type of Interconnection Service.

$$Total\ SAC = NRIS\ SAC + ERIS\ SAC$$

To the extent the Planning Resource has Network Resource Interconnection Service (NRIS) or was determined to be aggregate deliverable through the market transition deliverability test, then that quantity will be allocated first to calculate the NRIS SAC.

$$NRIS\ SAC = \begin{cases} ICAP * (1 - XEFORd), & If\ ICAP = NRIS \\ \big(Minimum\ of\ (NRIS, GVTC)\big) * (1 - XEFORd), & If\ ICAP > NRIS \end{cases}$$

The remaining balance of Total SAC is allocated to ERIS SAC (i.e. ERIS SAC = Total SAC – NRIS SAC.

$$ERIS\ SAC = \begin{cases} 0, & If\ ICAP = NRIS \\ Total\ SAC - NRIS\ SAC, & If\ ICAP > NRIS \end{cases}$$

Eligibility of NRIS SAC and ERIS SAC Conversion into seasonal Zonal Resource Credits

The NRIS SAC represents capacity in MW that is eligible to be converted into seasonal Zonal Resource Credits.

Effective ICAP

In determining the amount of ERIS SAC eligible for conversion into seasonal ZRCs, the deliverability of any ERIS must be determined prior to ERIS SAC conversion. ERIS must be paired with firm Transmission Service that covers the entire Season to be considered deliverable. NRIS is automatically considered deliverable and does not require an additional Transmission Service Request. The full amount of ERIS SAC can be converted to ZRCs if the resource is fully deliverable to its ICAP amount.

Total SAC which can be converted into seasonal ZRCs are the summation of the Planning Resource's NRIS SAC plus the lesser of the resource's ERIS with firm Transmission Service.

$$Total\ SAC\ Eligible\ for\ ZRC\ Convsersion\ = (NRIS\ SAC) + (ERIS\ SAC\ with\ TSR)^{*}$$

*Amount of TSR needed is dependent on ICAP amount

Ex	Size	NRIS	SAC	Total IS	GVTC	ICAP	Total SAC	NRIS SAC	ERIS SAC	TSR	ZRC
1	100	**100**	0	100	100	**100**	**75.0**	75.0	0.0	0.0	**75.0**
2	100	**50**	50	100	100	**100**	**75.0**	37.5	37.5	50.0	**75.0**
3	100	**50**	50	100	75	**75**	**56.3**	37.5	18.8	25.0	**56.3**
4	100	**0**	100	100	100	**100**	**75.0**	0.0	75.0	100.0	**75.0**

Examples for Illustrative Purposes

In example 3 above, a 100 MW Resource with 50 MW NRIS and 50 MW ERIS submitted a GVTC value at 75.

The ICAP will be 75 MW because the GVTC is less than the Interconnection Service of 100 MW.

Since the 50 MW NRIS is less than the Resource's ICAP, the Total SAC value of 56.3 MW of the Resource is not fully allocatable to NRIS SAC.NRIS SAC in example 3 was determined to be 37.5 MW. The remaining Total SAC minus the NRIS SAC is allocated into the resource's ERIS SAC. Thus, ERIS SAC level is 56.3 MW – 37.5 MW = 18.8 MW.

The resource would be credited with 56.3 MW of Total SAC which is comprised of 37.5 MW NRIS SAC + 18.8 MW ERIS SAC with firm Transmission Service for the corresponding seasonal PRA.

The resource was able to convert its entire Total SAC into seasonal ZRCs because the resource obtained full deliverability up to its ICAP, where 50 MW of NRIS plus 25 MW of firm Transmission Service is equal to its ICAP of 75 MW.

H.2 SAC calculation for a GADS-reporting External Resource that qualified as a Capacity Resource

The External Resource Capacity Resource SAC calculation is based on its seasonal GVTC and seasonal forced outage rate (XEFORd). The ERIS SAC is calculated by applying its seasonal XEFORd to its seasonal GVTC.

$$ERIS\ SAC = GVTC \times (1 - XEFOR_d)$$

A seasonal forced outage rate class average is used if the Capacity Resource has a GVTC < 10 MW and has not submitted generator availability data or does not have sufficient generator availability data to calculate a Planning Resource specific forced outage rate. A Planning Resource has sufficient generator availability data when it has a minimum of 12 months of generator availability data between September 1 and August 31 for the previous 3 years. The applicable class average for a Planning Resource is based on its unit size and type.

The ERIS SAC represents the capacity in MW that are eligible to be converted into seasonal Zonal Resource Credits with valid transmission service.

H.3 SAC calculation for a Planning Resource that is classified as Intermittent Generation and Dispatchable Intermittent Resources

For resources that don't report outage data to GADS, MISO calculates the Total SAC based on the past historical season-specific output assessing either the median for Run-of-River Hydro or

average for all other intermittent resources that are not wind resources. The calculation requires a minimum of 30 consecutive seasonal days of output for a unique seasonal accreditation value. If that is not available, a class average seasonal accreditation value will be applied to the nameplate of the resource. A capacity factor adjusted by the resource's deliverability is applied to the resource's Total SAC to determine the amount of Total SAC eligible to be converted into seasonal ZRCs.

For wind resources, MISO produces an annual wind capacity credit study for every Season in the upcoming Planning Year using the Effective Load Carrying Capability (ELCC) methodology, as described in Appendix A, to determine a fleet-wide SAC value to be allocated across all in-front-of-the-meter wind resources in that Season. Deterministic allocation of the total fleet-wide wind SAC across the studied wind resources is dependent on the reliability value of the entire wind fleet (as determined through probabilistic modeling) at the aggregate level and the historical performance history of the wind resources at the unit level during specific historical MISO system Coincident Peak Demand hours.

A capacity factor adjusted by the resource's deliverability is applied to the resource's Total SAC to determine the amount of Total SAC eligible to be converted into seasonal ZRCs.

BTMG wind Resource owners are required to submit the historical performance history of their BTMG wind Resources during specific historical MISO system Coincident Peak Demand hours for the purpose of accrediting these resources with a SAC value based on their performance during periods of MISO system seasonal peak Demand for the three prior applicable years for each Season. This results in resource-specific SAC values for each BTMG wind Resource in operation.

> *BTMG Wind SAC = [capacity factor over the 8 seasonal peaks over the past 3 years] * [k] * [ICAP]*
>
> *Where k = [seasonal MISO Fleet ELCC] / Sum of [Fleet ICAP * PKmetric] (see BPM-011 Appendix A)*

New wind Resources that do not yet have historical performance history for an entire Season would receive the class average wind capacity credit for that Season (as determined by the Wind and Solar Capacity Credit study produced every year) applied to the wind Resource's ICAP to derive an appropriate Total SAC value. Please reference Appendix A for more details regarding the accreditation procedure for wind Resources.

The amount of SAC eligible to be converted into seasonal Zonal Resource Credits will be based on the application of a deliverability-adjusted capacity factor.

H.3.1 Intermittent Generation and Dispatchable Intermittent Resources with a Point of Interconnection on MISO's Transmission System

The following sections establish how SAC values (NRIS SAC and ERIS SAC) are determined for Intermittent Generation and Dispatchable Intermittent Resources that have a Point of Interconnection on MISO's Transmission System to account for resource performance and deliverability.

H.3.1.1 Planning Year SAC Calculation for Wind Resources

The first step is to determine the total installed capacity of the wind Planning Resource, which is the Installed Capacity (ICAP). It is equal to the lesser of its seasonal GVTC (Registered maximum output in the Commercial Model) or its total volume of Interconnection Service (Network Resource and Energy Resource Interconnection Service) granted either through MISO's Generation Interconnection Procedures or through a market transition deliverability test.

The next step is to determine the resource's total SAC. MISO determines a unit-specific seasonal wind capacity credit, by CPNode, for each Planning Resource that is fueled by wind by allocating the total fleet-wide seasonal ELCC capacity. The wind capacity credit is determined by applying the larger of two allocation methodologies, as noted in Appendix A:

- one method which includes (adds back in) megawatts for wind resources that were curtailed (applies to DIR wind resources only)
- a second method excludes (does not add back in) those same curtailed megawatts

The larger of the two results becomes the individual resource's Total SAC.

$$Total\ \ SAC = GVTC \times (Wind\ Capacity\ Credit_{CPNode})$$

Determining Convertible SAC based on a Deliverability Adjusted Capacity Factor

The next step is to determine how much of the total SAC is eligible to be converted into seasonal ZRCs.

The total SAC for a wind resource is distributed into two categories for the purpose of determining the amount of Capacity eligible for conversion into seasonal ZRCs, either convertible SAC or undeliverable ERIS SAC.

To calculate convertible SAC, which is eligible to be converted into seasonal ZRCs, a Deliverability Adjusted Capacity Factor is first applied. The Deliverability Adjusted Capacity Factor uses historical seasonal peak observances of an intermittent resource and is calculated by 'capping' historical intermittent output during seasonal peak load observances to the resource's demonstrated deliverable amount divided by the resource's ICAP. Whereas a peak performance capacity factor also uses the same historical seasonal peak observances divided by the resource's ICAP but does not cap those observances.

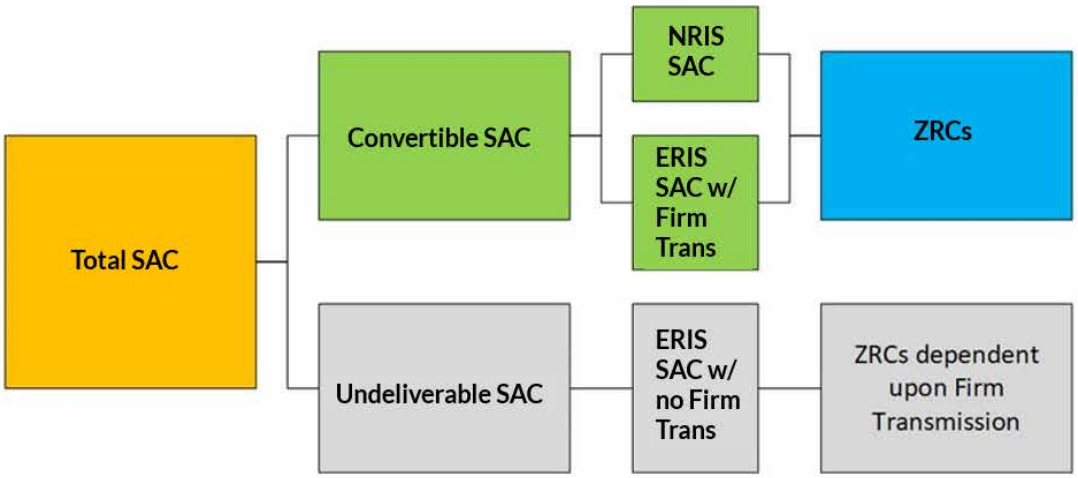
Formula for determining Convertible SAC

$$Convertible\ SAC = Total\ \ SAC * \frac{Deliverability\ Adjusted\ Capacity\ Factor}{Peak\ Capacity\ Factor}$$

The remaining Total SAC that is left after calculating Convertible SAC is considered the undeliverable ERIS SAC.

$$ERIS\ SAC = \begin{Bmatrix} 0, Total\ Interconnection\ SAC = \ Convertible\ SAC \\ Total\ Interconnection\ SAC - Convertible\ SAC, Total\ Interconnection\ SAC > Convertible\ SAC \end{Bmatrix}$$

Optionally, the classified undeliverable ERIS SAC can become eligible to be converted into seasonal ZRCs by procuring firm Transmission Service.

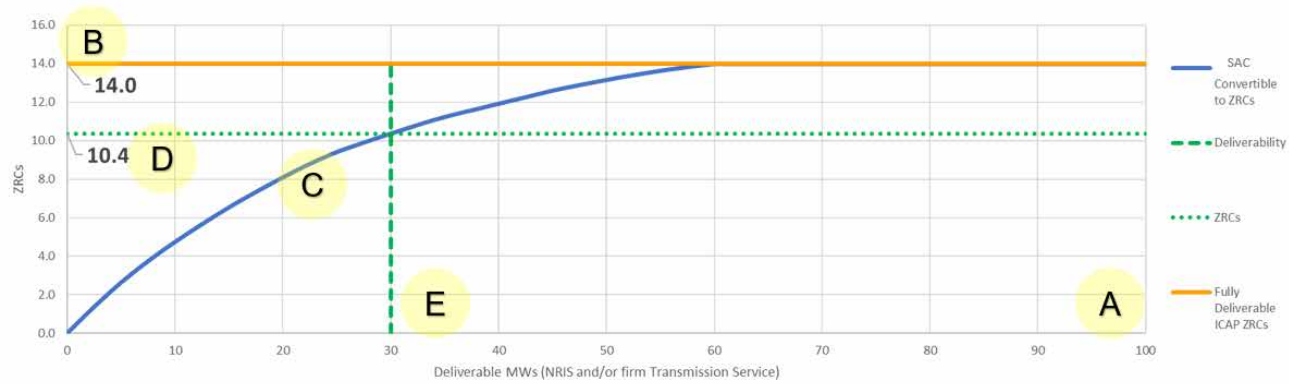


Converting ERIS SAC to Convertible SAC using the Resource's Deliverability Adjusted Historical Performance

ERIS SAC is not generally convertible to seasonal ZRCs at a one-to-one MW ratio. Each resource will have unique conversion data generated based on its past seasonal performance and deliverability which indicates the level of firm Transmission Service necessary to be obtained to gain a given level of seasonal ZRCs.

An example and further explanation is shown in the figure below:

ZRC Deliverability Curve Chart



Where:

A: Equals the maximum output of resource (RMax). In this example, this resource is 100 MW.

B: Total SAC, or SAC (Max) that can potentially be converted into seasonal ZRCs. This also represents the share of the total fleet-wide seasonal ELCC capacity. This value is based on the size and performance of the resource.

C: This is the Convertible SAC function which is the resource's Total SAC multiplied by the ratio of its Deliverability Adjusted Capacity Factor divided by its Peak Capacity Factor. Convertible SAC varies depending on the amount of Deliverability of the resource.

D: This is the resulting Convertible SAC value for a corresponding Deliverable amount in MW.

E: This is the amount of Deliverable MWs, or Deliverability. The point at which E intersects C provides the amount of seasonal ZRCs the Market Participant would obtain based on the size, performance, and deliverability of the resource.

H.3.1.2 Non-wind Intermittent Generation and Dispatchable Intermittent Resources

The first step is to determine the Total Installed Capacity that the Planning Resource can reliably provide, which is the Installed Capacity (ICAP). It is equal to the lesser of its GVTC, or its total volume of Interconnection Service (Network Resource and Energy Resource Interconnection Service) granted either through MISO's Generation Interconnection Procedures or through a market transition deliverability test.

The next step is to allocate the Total SAC based upon its type of Interconnection Service. To the extent the Planning Resource has Network Resource Interconnection Service (NRIS) or was determined to be deliverable through the market transition deliverability test then that quantity will be allocated first to NRIS SAC. The remaining Total SAC will then be allocated to ERIS. If the Planning Resource has provisional Interconnection Service, then the Planning Resource will receive zero Interconnection Service and therefore the calculated SAC will be zero.

$$NRIS\ SAC = \begin{cases} Total\ SAC, & Total\ SAC \leq NRIS \\ NRIS, & Total\ SAC > NRIS \end{cases}$$

$$ERIS\ SAC = \begin{cases} 0, & Total\ SAC \leq NRIS \\ Total\ SAC - NRIS, & Total\ SAC > NRIS \end{cases}$$

Determining Convertible SAC based on a Deliverability Adjusted Capacity Factor

The total SAC for an intermittent non-wind resource is distributed into two categories for the purpose of determining the amount of Capacity eligible for conversion into seasonal ZRCs. This would be considered Convertible SAC, either NRIS SAC or ERIS SAC coupled with firm Transmission, or undeliverable ERIS SAC (no associated firm Transmission).

To calculate convertible SAC, which is eligible to be converted into seasonal ZRCs, a Deliverability Adjusted Capacity Factor is first applied. The Deliverability Adjusted Capacity Factor uses historical summer peak observances of an intermittent non-wind resource and is calculated by 'capping' historical intermittent output during peak load observances to the

resource's demonstrated deliverable amount divided by the resource's ICAP. (See Appendix V for examples)

H.3.2 Intermittent Generation and Dispatchable Intermittent Resources that does not have Point of Interconnection on MISO's Transmission System

The following sections apply to Intermittent Generation and Dispatchable Intermittent Resources that do not have a Point of Interconnection on MISO's Transmission System. The ERIS SAC represents the capacity in MWs that are eligible to be converted into seasonal ZRCs.

Appendix I – XEFORd Calculation

XEFORd is equivalent forced outage rate Demand excluding events outside of management control (OMC). XEFORd will be calculated on a seasonal basis. A description and list of the MISO OMC events can be found in Appendix B. The MISO equation is:

$$\frac{(FOHd + EFDHd)}{(FOHd + SH + Synch\ Hours)} * 100\%$$

where:

SH = service hours
Synch Hours = synchronous hours
RSH = reserve shutdown hours

FOH_d = forced outage hours Demand = f_f x FOH
f_f = full forced outage Demand factor = $\frac{(\frac{1}{r}+\frac{1}{T})}{(\frac{1}{r}+\frac{1}{T}+\frac{1}{D})}$
r = average forced outage duration = (FOH)/(# of FO occurrences)
D = average Demand time = (SH + Synch Hours)/(# of unit actual starts)
T = average reserve shutdown time = (RSH)/(# of unit attempted starts)
FOH = forced outage hours

$EFDH_d$ = (f_p x EFDH)
AH = available hours
f_p = partial forced outage Demand factor = (SH + Synch Hours)/AH
EFDH = equivalent forced derated hours

Special cases are evaluated in the following order:

If reserve hours < 1, then f_f =1,
then if (SH + Synch hours) = 0, then f_f = 1,
then if (1/r + 1/T + 1/D) = 0, then f_f = 0,
then if # of FO occurrences = 0 or FOH = 0, then 1/r = 0,
then if RSH = 0 or # of unit attempted starts = 0, then 1/T = 0,
then if # of unit actual starts = 0 or (SH + Synch Hours) = 0, then 1/D = 0,
then if (SH + RSH + Synch Hours) = 0, then f_p = 0,
then if ((FOHd + SH + Synch Hours) = 0, then EFORd = 0

SH, RSH and Synch Hours are reported through the MISO Market Portal in the PowerGADS application by the users in their Performance data. The rest of the statistics are calculated by PowerGADS based on the user submitted Event data. Forced outage rates for each unit can be found in the Generator Outage Rate Program (GORP) report. The statistics used in calculating forced outage rates can be found in the Statistics Report, Performance Report, and the Seasonal XEFORd Report.

The MISO calculation is based on the EFORd equation defined in the NERC Generating Availability Data System Data Reporting Instructions Appendix and the IEEE Standard No. 762-2006 Standard *Definitions for Use in Reporting Electric Generating Unit Reliability, Availability and Productivity*. The MISO XEFORd calculation differs as follows:

- The NERC and IEEE EFDH formula is (Derated Hours * Size of Reduction)/Net Max Capacity while the MISO formula uses net dependable capacity rather than net max capacity and is (Derated Hours * Size of the Reduction)/Net Dependable Capacity. The size of the reduction is the Net Dependable Capacity minus the Net Available Capacity.
- MISO also includes synchronous hours in the XEFORd, average Demand time (D), and the partial Demand factor (f_p) calculations while NERC and IEEE do not.

Example XEFORd Calculations

Raw Data									
Unit	SH	Synch Hours	RSH	AH	Actual Starts	Attempted Starts	EFDH	FOH	FO Events
1	4,856	0	2,063	6,919	34	34	146.99	773	12
2	4,556	0	1,963	6,519	31	31	110.51	407	5
3	3,942	132	3,694	7,768	36	36	19.92	504	11
4	6,460	0	516	6,976	17	18	131.03	340	14
5	6,904	0	62	6,966	16	16	35.81	138	12

Calculated Values								
Unit	**1/r**	**1/T**	**1/D**	**f_f**	**FOHd**	**f_p**	**EFDHd**	**XEFORd**
1	0.0155	0.0165	0.0070	0.8205	634.25	0.7018	103.16	13.43%
2	0.0123	0.0158	0.0068	0.8049	327.61	0.6989	77.23	8.29%
3	0.0218	0.0097	0.0088	0.7813	393.78	0.5245	10.45	9.05%
4	0.0412	0.0349	0.0026	0.9666	328.63	0.9260	121.34	6.63%
5	0.0870	0.2581	0.0023	0.9933	137.08	0.9911	35.49	2.45%

Unit 3 Example XEFORd Calculation Detail

r = average forced outage duration = $\frac{FOH}{FO\ events} = \frac{504}{11} =$ 45.82 hours, then 1/r = 0.0218

T = Average reserve shutdown time = $\frac{RSH}{attempted\ starts} = \frac{3694}{36}$ = 102.61 hours, then 1/T = 0.0097

D = average Demand time = $\frac{(SH+synch\ hours)}{actual\ starts} = \frac{3942+132}{36} = 113.17$ hours, then 1/D = 0.0088

f_f = full forced outage Demand factor = $\frac{(\frac{1}{r}+\frac{1}{T})}{(\frac{1}{r}+\frac{1}{T}+\frac{1}{D})} = \frac{(0.0218+0.0097)}{(0.0218+0.0097+0.0088)} = 0.7816$

FOHd = forced outage hours Demand = f_f x FOH = 0.7813 x 504 = 393.78 hours

f_p = partial forced outage Demand factor = $\frac{(SH+synchhours)}{AH} = \frac{(3942+132)}{7768}$ = 0.5245

EFDH = fp x EFDH = 0.5245 x 19.92 = 10.45 hours

XEFORd = $\frac{(FOHd+EFDHd)}{(FOHd+SH+synch\ hours)} * 100 = \frac{(393.78+10.45)}{(393.78+3942+132)} * 100 = 9.05\%$

Units with 12 or more consecutive months of actual data: The XEFORd of a unit in service twelve or more full calendar months prior to the calculation month will be based on the number of consecutive months that that unit has data for up to 36 months.

Units with less than 12 consecutive months of actual data: The XEFORd of a unit in service less than twelve full calendar months shall be determined by the class average rate for units of the same type and within the same range of capability. A unit will use the class average value until 12 consecutive months of data is obtained and a new Planning Year begins. The class average will be the 5-year forced outage rate from the latest Loss of Load Expectation (LOLE) Study.

Units with Low Service Hours

Units with an average of less than 20 service hours per Season and attempted starts greater than zero will have their service hours adjusted if the unit has at least 12 consecutive seasonal months of GADS data. The adjusted service hours will be based on 60 service hours (20 service hours x 3 Seasons) or a fraction of 60 if there is less than 9 consecutive seasonal months of GADS data. This adjustment will be performed in the MECT. The calculation for the adjustment is as follows:

MO = consecutive seasonal months in operation
If SH = Service Hours < (MO/9*60) and attempted starts is greater than zero, then

SH' = seasonal adjusted low service hours = $\left[\left(\frac{actual\ starts}{atempted\ starts}\right) * \left(\frac{MO}{9} * 60 - SH\right)\right] + SH$

External Resources

Market Participants are responsible for making sure that GADS data is submitted for the External Resources that they are seeking qualification as ZRCs. The Market Participant can submit this data to MISO's GADS tool for the external resource or they can have the external resource submit the data. If an external resource is going to submit the GADS data, then they must receive access to the MISO Market Portal through their Local Security Administrator. If an External Resource does not have a Local Security Administrator, then it is the Market Participant's responsibility to receive and submit this data for the External Resource.

Catastrophic Outages

Catastrophic Outages are defined as forced outages that result in a unit being unavailable for a minimum of six (6) continuous months. A catastrophic outage may be a forced full or partial (forced derating) outage. A scheduled outage (planned, planned extension, maintenance, or maintenance extension) cannot be a catastrophic outage. For an outage to be considered catastrophic, the MP must notify the MISO Resource Adequacy team in writing within 75 days of determining the outage is a Catastrophic Outage, including a description of the Catastrophic Outage, start date of outage, expected return date, etc.

If the MP chooses not to replace a Planning Resource that suffers a Catastrophic Outage, then the XEFORd will be based on actual GADS data.

If the MP chooses to replace a Planning Resource that suffers a Catastrophic Outage, the XEFORd will be based on class average when the unit returns to service. The class average value will be used until 12 consecutive months of data is obtained and a new Planning Year begins.

Resource replacement must be completed within 75 days of catastrophic outage.
Resource replacement must be in accordance with section 6.4 of this BPM.
Once the unit returns from Catastrophic Outage, Planning Resource qualification requirements still apply. Partial replacements are allowed.

If the outage is a forced derate with total or partial replacement, or a full forced outage with partial replacement, the resources XEFORd upon returning to service will be the class average for the portion of the resource replaced and the actual XEFORd for the remainder of the unit. A blended XEFORd will be calculated by MW weighting the class average and actual XEFORd values.

For Schedule 53 resources that experience a catastrophic outage and replaced the ZRCs accordingly during the time the resource was unavailable, the time it is out will be considered non-RAR and would not be counted in the SAC calculation consistent with ZRC replacement section of this BPM and Appendix Y. In situations where this leads the resource to have less than 60 days of RAR performance history during the 3-year lookback period, the Schedule 53 resource would be granted Schedule 53 class averages for the impacted seasons.

Fleet Weighted Average Forced Outage Rates

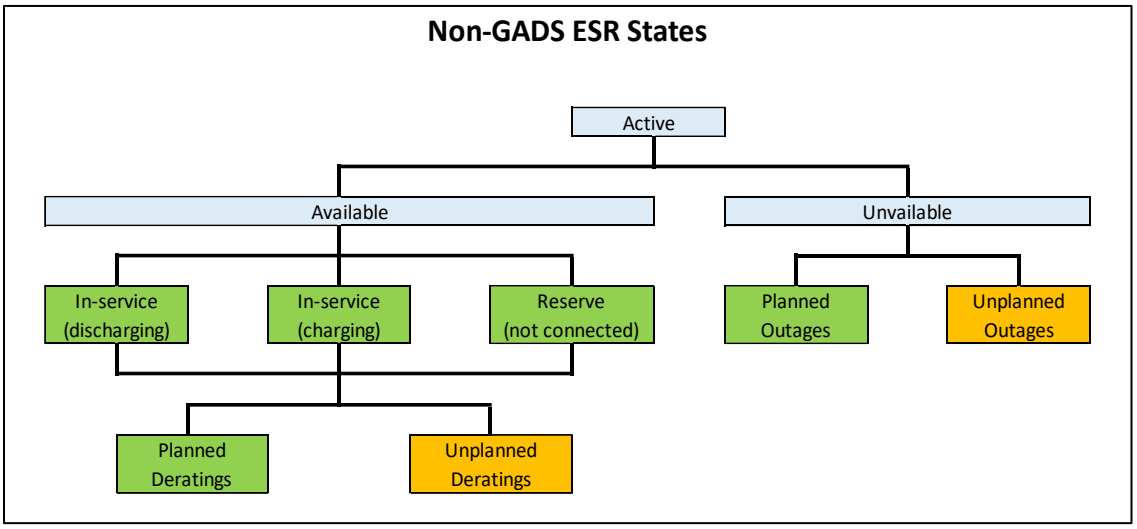
External Resources may participate using a fleet of resources. A weighted average forced outage rate is calculated using the individual unit forced outage rates and GVTC values. The resulting rate is applied to the total fleet GVTC to determine the fleet UCAP. See Appendix Q for more information regarding the Fleet XEFORd Calculation.

XEFORd for Non-GADS Electric Storage Resources (ESR)

The XEFORd for a non-GADS ESR is its Forced Unavailability and will be determined as follows.

A non-GADS ESR is forced unavailable when it is in an unplanned outage or an unplanned derating (see oranges boxes). All other states are unforced availability and include in-service

(discharging or charging), reserve (not connected), planned outages, or planned deratings (see green boxes).



An available resource that is not derated is 100% available. If a resources availability changes during an hour, the Forced Availability should be pro-rated. For example, if a 10 MW resource experiences a 23-minute Unplanned Outage during the hour, its equivalent Forced Unavailability would be (23 min/60 min) * 10 MW = 3.8 MW or 38%. Similarly, for an Unplanned Derating of 2.4 MW for 47 minutes of the hour the equivalent Forced Unavailability would be (47 min/60 min) * 2.4 MW = 1.9 MW or 19%.

Examples for a 10 MW resource	Unforced Availability (MW)	Forced Unavailability (MW)	Unforced Availability (%)	Forced Unavailability (%)
The resource is 100% available and in-service discharging	10.0	0.0	100.0%	0.0%
The resource is 100% available and charging	10.0	0.0	100.0%	0.0%
The resource is 100% available and in reserve not discharging	10.0	0.0	100.0%	0.0%
A portion of the resource is unavailable due to a planned derating and the remainder is available	10.0	0.0	100.0%	0.0%
4 MW of the resource is unavailable due to an unplanned derating and 6 MW is available	6.0	4.0	60.0%	40.0%
4.5 MW of the resource is unavailable due to a planned derating and 5.5 MW is unavailable due to an unplanned	4.5	5.5	45.0%	55.0%
The resource is unavailable due to a planned outage	10.0	0.0	100.0%	0.0%
The resource is unavailable due to a unplanned outage	0.0	10.0	0.0%	100.0%
23 minutes unplanned outage	6.2	3.8	62.0%	38.0%
2.4 MW unplanned derate for 47 minutes	8.1	1.9	81.0%	19.0%

Additional information:

- Pumped Storage Resources submit their availability and GVTC data through the MISO PowerGADS application.
- All other ESR types must submit their availability and GVTC (Hourly Equivalent Discharge Amount) data using the Non-GADS Performance template.
    - The template provides the 8 MISO coincident peak hours per Season for the last three years.
    - The average of these 24 seasonal unforced availability values is divided by the Hourly Equivalent Discharge Amount (MW) to calculate a seasonal unavailability factor.
    - Market Participants with less than 8 availability values in a Season will be given the default unavailability factor.
- Availability Reporting is optional for resources less than 10 MW. Resources that choose not to report, will be given the default unavailability factor. Once a resource chooses to report for the first time, they will be required to report every year thereafter.

Appendix J – GVTC Testing Requirements

J.1 Overview

All Generation Resources, External Resources, Behind the Meter Generation (BTMG) and Demand Response Resources backed by BTMG that intend to qualify as a Planning Resource are required to perform a real power test or provide past operational data. This test, or past operational data, shall be used to determine a planning resource's GVTC value. GVTC data is submitted through the MISO Market Portal into MISO PowerGADS.

Each seasonal corrected net test capability is the gross output (MW) that a planning resource can sustain averaged over the test period, if there are no equipment, operating, or regulatory restrictions, less station service and process load served, corrected to MISO coincident seasonal peak conditions.

			(A)	(B)	(C)	(D)= (A)-(B)-(C)	(E)	(F)	(G)	(H)= (D)+(E)+(F)+(G)
NERC Unit Type		Example Unit	Gross (MW)	Station Service (MW)	Process Load Served (MW)	Net Test Capacity (MW)	Air Temperature Correction (MW)	Relative Humidity Correction (MW)	Cooling Water Temperature Correction (MW)	Net Corrected (MW)
Combined Cycle	CC	CT1	95.0	1.0	0.0	94.0	-15.0	-0.1	N/A	78.9
Combined Cycle	CC	ST1	300.0	15.0	0.0	285.0	N/A	N/A	-1.0	284.0
Combined Cycle	CC	Unit 4	250.0	5.0	100.0	145.0	-3.5	-0.1	-0.5	140.9
Combustion Turbine	CT	CT3	50.0	0.1	0.0	49.9	3.0	0.1	N/A	53.0
Diesel	DS	Diesel 5	2.5	0.0	0.0	2.5	N/A	N/A	N/A	2.5
Fluidized Bed Combustion	FB	Unit 4	200.0	10.0	0.0	190.0	N/A	N/A	-2.0	188.0
Hydro	HD	Hydro 12	10.0	0.0	0.0	10.0	N/A	N/A	N/A	10.0
Nuclear	NU	Unit 1	1,000.0	50.0	0.0	950.0	N/A	N/A	-1.5	948.5
Pumped Storage	PS	Unit 5	300.0	1.0	0.0	299.0	N/A	N/A	N/A	299.0
Fossil Steam	ST	Unit 2	600.0	30.0	0.0	570.0	N/A	N/A	-3.0	567.0

GVTC Table J.1 – Examples of net corrected net test capability for different unit types. **Examples may not be representative of your situation. If you have unit specific questions, please contact Resource Adequacy.

If a Planning Resource fails to perform a real power test and report the test data to MISO's PowerGADS byOctober 31 prior to the start of the planning year t, it will result in the Planning Resource not qualifying as a Planning Resource and will receive zero SAC MWs for the upcoming Planning Year.

J.1.1 Test Period and Reporting Deadline

The real power test shall be performed between September 1 and August 31 prior to the upcoming planning year. The test data shall be submitted no later than October 31.

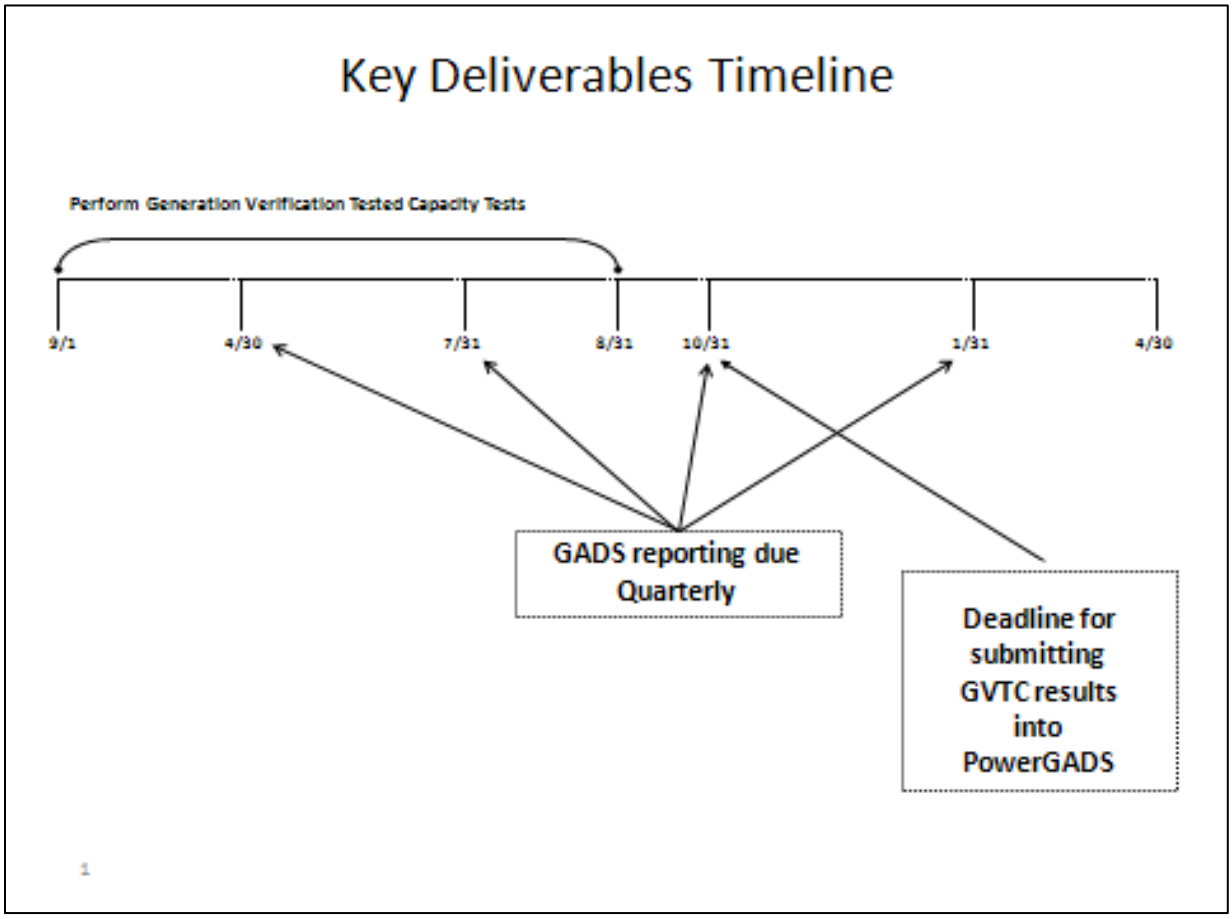
Example: For the 2023-2024 planning year (June 1, 2023 through May 31, 2024), the test must be conducted between September 1, 2021 and August 31, 2022, and submitted no later than October 31, 2022 to qualify as a Planning Resource for the upcoming Planning Year.

J.2 When to Perform and Submit a Generation Verification Test Capacity

Generation Resources, External Resources, Demand Response Resources backed by behind the meter generation, or Behind the Meter Generation that qualified as Planning Resources for the current Planning Year shall submit their GVTC no later than October 31 to qualify as a Planning Resource for the upcoming Planning Year. A real power test shall be performed, or past operational data may be used, during the period between September 1 and August 31 prior to the upcoming Planning Year. In addition to performing and submitting GVTC data to qualify as a planning resource for the annual capacity auction, a planning resource must conduct a test and submit data when:

- a modification that changes, increases, or decreases, the rated capacity of a unit is completed,
- returning from a suspension,
- returning to MISO after an absence including but not limited to, catastrophic events,
- not qualifying as a Planning Resource under Module E-1
- being qualified as a Planning Resource for the first time
- or for a Planning Resources in an approved “Suspension” status.

If a Planning Resource is unable to complete a real power test, the responsible MP must include the timing and cost requirements to complete a test when requesting a facility specific reference level.



J.3 Corrections to Establish GVTC

The GVTC shall be corrected to the average conditions of the date and times of MISO's four seasonal coincident Peaks, measured at or near the generator's location, for the last 5 years. MISO publishes the date and time of the past 5 seasonal coincident Peaks. When local weather records are not available at the plant site, the values shall be determined from the best data available (i.e., local weather service, local airports, river authority, etc.).

The corrections required to establish the GVTC of a unit include, as appropriate for each electric generating technology, dry air temperature, relative humidity, cooling water temperature, fuels, steam heating loads, reservoir level, nuclear fuel management programs and scheduled reservoir discharge.

J.3.1 Process Load Reporting in MISO PowerGADS to Establish GVTC

The Generator Owner shall forecast the maximum process load (PL) expected to be present at the time of the upcoming MISO seasonal peaks. MISO publishes the date and time of past coincident seasonal peaks as a reference for predicting the PL that is forecasted to be present at the time of the upcoming MISO peaks.

For calculating GVTC, the PL being forecasted and reported by the Generator Owner is allocated to the underlying generating unit of the Planning Resource and deducted from a unit's gross MW unless provisions are in place to curtail the load in the event of a MISO Capacity Emergency, or for electric load, is included in an LSE forecast. If such provisions for curtailment are in place or, for electric load, it is included in an LSE forecast, the PL is non-firm for the purpose of calculating GVTC.

Process Load can be electric load or thermal load in the case of a Combined Heat and Power (CHP) facility. Thermal PL is converted to units of MW by determining the reduction of power output caused by serving that load. Thermal loads can be PL because steam that would have otherwise been used to drive turbines to produce electricity may have been diverted to support process load, thus reducing the electrical capacity of the overall plant relative to the MISO system.

Thermal load that causes an increase in power output, as served from a back-pressure turbine for example, is not a PL for these purposes. However, the GVTC test should be performed or corrected for conditions that are a conservative expectation of the amount of thermal load that would be present coincident with MISO peak load conditions.

PL can be firm or non-firm. The following criteria should be applied to determine whether the PL is firm or non-firm:

- PL is firm if it continues to exist when one or more of the underlying generating units of the Planning Resource are derated or out of service. Such firm PL would be served by one or more of the underlying generating units of the Planning Resources at the same location or from the MISO system.
- PL is non-firm if it does not continue when the underlying generating unit of the Planning Resource is out of service.
- To the extent that PL that continues to exist when the underlying generating unit of the Planning Resource is out of service is served by resources that are not Planning Resources, such as auxiliary boilers, that portion of the PL is non-firm.

The amount of firm PL will be adjusted by multiplying by (1+PRM) and dividing by (1-XEFORd). The sum of the firm and non-firm PL will be reported in PowerGADS.

PL = (adjusted firm PL) + (non-firm PL)

Adjusted firm PL = firm PL * (1 + PRM) / (1 - XEFORd)

PL calculations are performed outside of PowerGADS and the MECT. PL is only deducted from an underlying generating unit of the Planning Resource's gross MWs one time. PL is part of the GVTC calculation that is entered into PowerGADS. MISO performs a PowerGADS integration that retrieves the GVTC value from the PowerGADS data base and populates the MECT. A Planning Resource may be comprised of one or more underlying PowerGADS units.

The UCAP PRM is from the most recent LOLE Study Report. The XEFORd is the appropriate value for the 36-months ending on August 31 proceeding the planning year, which can be found in PowerGADS.

J.4 Generation Verification Test Capacity During a Derate

A Market Participant that performs a GVTC when a unit has a documented derate in MISO PowerGADS can request MISO to adjust its GVTC if the documented derate in MISO PowerGADS lasted a minimum of 90 consecutive days prior to the test date and generator availability data has been reported to MISO prior to any adjustments to the GVTC. The Market Participant shall contact MISO's Resource Adequacy Department for a review of its request.

J.4.1 Interconnection Service Limitations

All Planning Resources GVTC are subject to Interconnection Service limitations to the bus to which the facility is currently or about to be connected to as verified by the Transmission Service Planning Department of MISO.

J.5 GVTC Real Power Test Requirements by NERC Unit Type

J.5.1 Fossil Steam (FS), Fluidized Bed Combustion (FB), and Nuclear (NU)

The test shall be at least two (2) continuous hours and data shall be averaged over the test period.

The impact of the observed steam turbine exhaust pressure will be corrected to the past five years average rated daily maximum circulating water temperature measured at the unit location, at the date and time of MISO's coincident peaks.

J.5.2 Combined Cycle (CC)

The determination of the GVTC of a combined-cycle unit will depend on the structure of the unit and its components. The steam turbine and combustion turbine(s) shall adhere to the guidelines in this manual. In the case of thermally dependent components the determination of the GVTC shall require the operation of both combustion and steam turbine components simultaneously. The output of the components can be netted to determine the combined-cycle unit GVTC.

The test shall be at least two (2) continuous hours and data shall be averaged over the test period.

For each Season, the impact of the observed steam turbine exhaust pressure will be corrected to the past five years average daily maximum circulating water temperature measured at the unit location on the day of MISO's Coincident Peak.

The impact of the observed ambient air temperature and relative humidity on combustion turbine performance will be corrected to the past five years average rated conditions experienced at the unit location measured at the date and time of MISO's Coincident Peaks. Where inlet cooling is used to reduce inlet air temperature, the temperature at the discharge of the inlet coolers shall be the basis for ambient temperature adjustment.

J.5.3 Miscellaneous (MS)

The test shall be at least two (2) continuous hours and data shall be averaged over the test period.

The test will be seasonally corrected per J.3 Corrections to Establish GVTC.

J.5.4 Combustion Turbine (CT)

The test shall be at least one (1) continuous hour and data shall be averaged over the test period.

The impact of observed dry air temperature and relative humidity on combustion turbine performance will be corrected, for each Season, to the past five years average rated conditions experienced at the unit location measured at the date and time of MISO's seasonal coincident

peaks. Where inlet cooling is used to reduce turbine inlet air temperature, the temperature at the discharge of the Inlet coolers shall be the basis for air temperature correction.

J.5.5 Hydro (HD) and Pumped Storage (PS)

The test shall be at least one (1) continuous hour and data shall be averaged over the test period.

The GVTC established for hydroelectric plants shall recognize the head available considering environmental, operational, and regulatory restrictions and ambient conditions such as forecasted reservoir levels or water flow conditions. The test capability shall be corrected to historic median head conditions as specified below.

The seasonal historic median head shall be determined as the median of all head measurements from the most recent five (5) years up to the most recent fifteen (15) years. If 15 years of historic data is not available for this period when the 15-year time period is chosen, or is no longer relevant due to environmental, operational, regulatory or other restrictions, all available relevant data shall be used and accumulated until the 15-year requirement is met. The hours ending 1500, 1600, and 1700 EST apply to all days of the Summer (June, July, August), Fall (September, October, November), and Spring (March, April, May). The hours ending 0900, 1000, 1900, and 2000 EST apply to all days of the Winter (December, January, February).

Once the number of years and methodology is chosen and submitted as GVTC requirements, the same number of years must be submitted in future GVTC data collection.

Each hydro unit shall be verified individually.

The entire hydro plant shall be verified if the sum of individual unit capabilities is greater than the total plant capability.

MISO PowerGADS does not accept seasonal corrections for Hydro and Pumped Storage resources. If a Generation Operator (GO) elects to submit seasonal corrections they can use the Hydro and Pumped Storage GVTC Corrections template which can be found at https://www.misoenergy.org/planning/resource-adequacy/#nt=/planningdoctype:RA%20Guides%20and%20References/raguidetype:GVTC. If a GO elects to submit seasonal corrections, they must submit a test in MISO PowerGADS and

the Hydro and Pumped Storage GVTC Corrections template to the MISO Help Center help.MISOEnergy.org.

J.5.6 Diesel (DS)

The test shall be at least one (1) continuous hour and data shall be averaged over the test period.

No corrections apply to this unit type.

J.5.7 Electric Storage Resources (ESR)

This section is for all ESR except Pumped Storage. For pumped storage see J.5.5.

The test shall be at least one (1) continuous hour and data shall be averaged over the test period. The test shall be conducted at the discharge rate that would be expected if the ESR were dispatched for four (4) continuous hours. The test results must be submitted in the Module E Capacity Tracking (MECT) tool (Planning Resources > Non-GADS Resource Registration) using the Non-GADS Performance Template posted on the MISO Website.

J.5.8 General Requirements

If a generating unit has not been in operation for five years, then as many years as the unit has been in operation shall be used. The GVTC for new generating units will be corrected based on estimated average daily maximum circulating water temperature measured at the date and time of MISO's Peaks.

The unit shall be operated with the regularly available type and quality of fuel.

The Station Service shall be representative of the conditions expected to occur during MISO's coincident peaks.

For facilities consisting of multiple units, shared station power and process load served shall be allocated to the individual units to compute unit net capability.

J.6 Reporting

The following information shall be reported to MISO's PowerGADS as described in MISO's *Net Capability Verification Test User Manual*. Certain data will be reported or calculated for each of the 4 Seasons – summer, fall, winter and spring.

CARD	Must be "90"
Utility	Required

Unit	Required
Year	Required
Test Index	Must be a "1"
REVISIONCODE	Must be "0" for initial upload, "R" to Revise, or "D" to Delete
Corrected Net - Seasonal	Calculated by PowerGADS
Test Start Date	Required
Test End Date	Required
Gross MW	Required
Station Service	Required
Process Load Served	Required
Net Test Capability	Required, Gross MW – Station Service – Process Load Served
Reactive Generation MVAR	Optional
Total Power MVA	Calculated by PowerGADS if Reactive Generation MVAR entered
Power Factor	Calculated by PowerGADS if Reactive Generation MVAR entered
Dry Air Temperature Observed - Seasonal	Required for certain unit types
Dry Air Temperature Rated - Seasonal	Required for certain unit types
Air Temperature Correction	Required, may be zero
Relative Humidity Observed - Seasonal	Required for certain unit types
Relative Humidity Rated - Seasonal	Required for certain unit types
Relative Humidity Correction	Required, may be zero
Cooling Water Temperature Observed - Seasonal	Required for certain unit types
Cooling Water Temperature Rated - Seasonal	Required for certain unit types
Cooling Water Temperature Correction	Required, may be zero
STANDARD	Must be "MISO"

Appendix K – Resource Adequacy Timeline for activities for the Planning Year 2025-2026

Please check for the latest online version posted on the Resource Adequacy webpage of MISO's corporate website.

Date	Process and Notes	Responsible Entity	Tariff Reference
Sep 01, 2024	Start Cost of New Entry (CONE) calculation in coordination with IMM.	MISO/IMM	69A.8(a)(3)
Sep 09, 2024	MISO to publish historical monthly and seasonal Coincident Peak Load hours and LRZ seasonal coincident factors.	MISO	69A.1.1.(c)
Oct 01, 2024	Last day to submit outage exemption related resolution requests regarding Schedule 53 resources through the MISO Help Center.	Resource Owner	
Oct 01, 2024	MISO opens the new Planning Year in the MECT for all 4 Seasons. (1st Business Day - October)	MISO	
Oct 01, 2024	Transmission losses by Local Balancing Authority are posted by MISO. (1st Business Day - October)	MISO	69A.1.1(b)
Oct 15, 2024	MISO posts RA hours to be used for accreditation calculation	MISO	
Oct 31, 2024	Generation Verification Test Capacity (GVTC) due. Resource Owners submit operational data or real power test for September 1 - August 31 period.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
Oct 31, 2024	Populated Non-GADS Performance Templates due in MECT.	Resource Owner	69A.3.1.a(1)(d)
Oct 31, 2024	Generator availability data due in GADS for resources required to report for Q3. Resource Owners must ensure at least 36 months of data is provided.	Resource Owner	69A.3.1.a(1)(c)
Nov 01, 2024	Seasonal Coincident and Non-Coincident Peak Demand forecasts by LSE/EDC, monthly peak Demand, seasonal peak Demand and energy-for-load forecast values by LSE due. No action needed by Retail Choice LSEs.	LSE, EDC	69A.1.1(a)
Nov 01, 2024	Loss of Load Expectation study results published by MISO.	MISO	68A.2 68A.4 68A.5

Date	Process and Notes	Responsible Entity	Tariff Reference
Nov 07, 2024	MP must request an extension from within 5 business days after October 31 deadline.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
Nov 15, 2024	Review list of units with conditional Interconnection Service for results of annual study. Units may have NRIS/ERIS balance re-allocated.	MISO	
Dec 01, 2024	For individual States establishing their own seasonal PRM, submission of written letter by authorized State regulatory authority representative notifying MISO.	State Regulatory Authority	68A.1
Dec 15, 2024	RBDC opt out adder % posted on MISO website	MISO	69A.9.1 (l)
Dec 15, 2024	Initial UCAP/ISAC ratio, initial Seasonal Capacity accreditation values and validation files are published by MISO.Resources that do not meet the October 31 deadline will have their initial capacity accreditation calculated using estimated capacity submitted along with GVTC extension requests. MP may begin submitting resolution requests though the MISO Help Center.	MISO	
Dec 15, 2024	PLC submissions by EDC due. EDC will send the details of the PLCs to the respective LSEs and to MISO for review. The EDC-provided PLC data will be the default value for the LSE's Retail Choice Coincident Peak.	Retail Choice EDCs	69A.1.1(e)
Dec 15, 2024	Last day for MPs to submit to March Network & Commercial Model changes to qualify for ICAP Deferral.	Resource Owner	
Jan 15, 2025	LSE submit initial RBDC Opt Out Plan in MECT, including its RERRA contact	LSE	69A.9.1 (c)
Jan 15, 2025	Generation Verification Test Capacity (GVTC) due for generators that requested an extension.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
Jan 15, 2025	LSEs confirm the seasonal Retail Choice PLC in the MECT. LSEs should have all PLC questions resolved by this date. If an LSE desires a change in their PLC value, the appropriate EDC should be contacted directly.	LSEs, Retail Choice EDC	69A.1.1.1
Jan 15, 2025	Evidence for seasonal HUC/ZDC hedges due.	LSE	69A.7.7(b)

Date	Process and Notes	Responsible Entity	Tariff Reference
Jan 20,2025	MISO notifies RERRA its regulating LSE's initial plan for opting out RBDC	MISO	69A.9.1 (d)
Jan 31, 2025	Default technology-specific avoidable costs posted by the IMM. Resource owners may use the default costs in lieu of submitting facility specific operating costs for a facility specific Reference Level request. (59 days prior to deadline for offers)	IMM	64.1.4(f)(ii)
Jan 31, 2025	Generator availability data due in GADS for resources required to report for Q4.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
Feb 01, 2025	Last day to submit non-exemption related resolution requests on ISAC posted for Schedule 53 resources through the MISO Help Center.	Resource Owner	
`Feb 01, 2025	Existing Load Modifying Resource, Energy Efficiency, and External Resource registrations due for prompt Planning Year.	LMR/EE/ER Owner	
Feb 01, 2025	Loss of Load Expectation study begins for next Planning Year.	MISO	
Feb 01, 2025	Evidence of Demand Resource testing due. Last day to submit evidence. DR testing or performance must take place during the calendar year prior to the upcoming Planning Year.	DR Owner	69A.3.5
Feb 01, 2025	Written letter from officer of company stating intention to leverage DR testing deferral provisions due.	DR Owner	69A.3.5(l)
Feb 07, 2025	Last day to submit a Full Responsibility Transaction. (due the 5th business day of February)	LSE	
Feb 14, 2025	If utilizing FSRL, last day to submit request to IMM regarding Going-Forward Cost determination. Submit data for facility ZRC reference levels to IMM. (45 days prior to close of PRA offer deadline)	Generation Owner	64.1.4.f.iii.b
Feb 15, 2025	Final UCAP/ISAC ratio and SAC values for Schedule 53 resources will be posted on MECT. Schedule 53 resource owners can start confirming SAC and converting SAC into ZRCs.	MISO	
Feb 15, 2025	New Load Modifying Resource, Energy Efficiency Resource, and External Resource registrations must be submitted for approval to be considered for inclusion in seasonal FRAP or RBDC Opt Out.	LSE	69A.9(a)

Date	Process and Notes	Responsible Entity	Tariff Reference
Feb 15, 2025	LSEs submit request to revise seasonal Coincident Peak Demand forecast originally submitted on November 1. MISO will review and either approve or deny request.	LSE	
Feb 15, 2025	Written letter from officer of company stating intention to leverage ICAP Deferral provisions.	Resource Owner	69A.7.9(a)
Feb 17, 2025	Last day that RERRA notifies MISO if it denies any of the LSE's plan for opting out RBDC	RERRA	69A.9.1 (d)
Feb 28, 2025	Capacity accreditation updated for resources granted ICAP Deferral.	MISO	
Mar 01, 2025	Seasonal Generator Verification Test Capacity and generator availability data for new resources or resources with increased capacity due for prompt Planning Year.	Generation Owner	69A.3.1.a(d)
Mar 01, 2025	New Load Modifying Resource, Energy Efficiency Resource, and External Resource registrations must be submitted for approval in the MECT for the prompt Planning Year.	LMR/EE/ER Owner	69A.9(a)
Mar 01, 2025	Deadline to satisfy credit requirements for DRs opting out of or deferring testing. Credit posting only required if DR doesn't have regulatory restrictions or contractual obligations that preclude testing.	DR Owner	69A.3.5 (j)(2)&(l)
Mar 01, 2025	MISO to complete its seasonal Coincident Peak Demand forecast review process.	MISO	69A.1.1(c)
Mar 01, 2025	Satisfy credit posting requirement for seasonal capacity accreditation issued from resources granted ICAP Deferral.	Resource Owner	69A.7.9(b)
Mar 01, 2025	Resource Owners submit Attachment Y requests for units scheduled for retirement/suspension between 3/30 and 5/31 to receive exemption from physical withholding.	Resource Owner	38.2.7.a.(i)
Mar 03, 2025	Publish seasonal Sub Regional Import Constraint (SRIC) and seasonal Sub Regional Export Constraint (SREC) for each Sub Regional Resource Zone (SRRZ) no later than first business day in March.	MISO	68A.3.1
Mar 10, 2025	Finalize and submit HUC registrations in the MECT.	LSE	
Mar 11, 2025	Seasonal Fixed Resource Adequacy Plan due by LSE. (7th Business Day of March)	LSE	69A.9(a)
Mar 11, 2025	LSE confirms its RBDC Opt Out Plan in MECT (7th Business Day of March)	LSE	69A.9.1(c)
Mar 14, 2025	Last day to notify IMM of deliverable resources requesting to be excluded from offering into seasonal PRAs or included in a FRAP or RBDC Opt Out.	Generation Owner	
Mar 15, 2025	Fixed Resource Adequacy and RBDC Opt Out Plan review completed by MISO. The LSE will have until the auction	MISO(LSE)	69A.9(a) 69A.9.1(c)

Date	Process and Notes	Responsible Entity	Tariff Reference
	offer window opens to remedy any deficiencies in their FRAP or RBDC Opt Out.		
Mar 19, 2025	Final date to update seasonal CIL and CEL values for each LRZ prior to the Planning Resource Auction. Changes due to firm capacity commitments from MISO resources to neighboring regions established prior to the PRA.	MISO	68A.4
Mar 19, 2025	CEL determined for each ERZ. Equal to the ZRC quantity of the External Resources registered to participate in the PRA. (8th business day in March prior to the last business day)	MISO	68A.4
Mar 19, 2025	Final posting by MISO of preliminary seasonal PRA data, reflective of updated information from LSEs, Resource Owners and PJM auction results. Coincides with seasonal CIL/CEL calculations.	MISO	
Mar 27, 2025	Provide Facility Specific Resource Level(s) to MPs 5 days prior to the close of the PRA offer window.	IMM	64.1.4.f
Mar 25, 2025	Final day for confirming/converting SAC in MECT.	Resource Owner	
Mar 26, 2025	Planning Resource Auction offer window is opened for all Seasons. Auction Offer window is opened at 8:00 AM EPT, 3 business days prior to the last business day in March.	MISO	69A.7.1(a)
Mar 31, 2025	Planning Resource Auction offer window is closed for all Seasons. Auction Offer window is closed at 6:00 PM EPT on the last business day of March.	MISO	69A.7.1(a)
Apr 01, 2025	Iterations of seasonal auction runs with adjusted seasonal CILs and CELs may be required to ensure that a network loading is not violated. Additionally, MISO will work with the IMM to evaluate potential withholding. The reference levels are used to determine financial withholding. The mitigation of financial withholding can be expected to reduce the Auction Clearing Price. (First 20 Business Days of April)	MISO/IMM*	69A.7
Apr 28, 2025	Seasonal Planning Resource Auctions results posted. (20th Business Day of April)	MISO	69A.7
Apr 30, 2025	Generator availability data due in GADS for resources required to report for Q1.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
May 01, 2025	MISO to assess seasonal Capacity Deficiency Charges for applicable LSEs.	MISO	69A.10(a)

Date	Process and Notes	Responsible Entity	Tariff Reference
May 8, 2025	MISO sends Capacity Deficiency Charges to applicable LSEs 5 business days after assessment.	MISO	
May 19, 2025	Capacity Deficiency Charge payments distributed to MPs. Payment made within 7 business days of receipt.	MISO	
May 28, 2025	Publish details of the seasonal ZRC offers submitted in the PRA. Market Participant IDs are not revealed. (One month after PRA)	MISO	69A.7.4
May 28, 2025	MISO publishes cleared LMRs to DSRI. MISO publishes must offer performance requirements in the applicable Operations tool.	MISO	
May 30, 2025	Information due to satisfy ICAP Deferral must be submitted to MISO to avoid ICAP Deferral Non-Compliance Charge for Summer Season. (Last business day of Planning Year)	LSE	69A.7.9(a) (2)
May 30, 2025	Information due to satisfy DR Deferral Notice must be submitted to MISO in order to release credit requirements and avoid LMP performance penalties.	DR Owner	69A.3.5
Jun 01, 2025	Summer Season in new Planning Year starts.	All	69A.7
Jun 01, 2025	Daily settlements for the Summer Season starts.	All	
July 31, 2025	Generator availability data due in GADS for resources required to report for Q2.	Resource Owner	69A.3.1.a, b, & c, 69A.3.6
August 29, 2025	Information due to satisfy ICAP Deferral must be submitted to MISO to avoid ICAP Deferral Non-Compliance Charge for Fall Season. (Last business day)	LSE	69A.7.9(a) (2)
Sep 01, 2025	Fall Season in new Planning Year starts.	All	69A.7
Sep 01, 2025	Daily settlements for the Fall Season starts.	All	
November 26, 2025	Information due to satisfy ICAP Deferral must be submitted to MISO to avoid ICAP Deferral Non-Compliance Charge for Winter Season. (Last business day)	LSE	69A.7.9(a) (2)
Dec 01, 2025	Winter Season in new Planning Year starts.	All	69A.7
Dec 01, 2025	Daily settlements for the Winter starts.	All	

Date	Process and Notes	Responsible Entity	Tariff Reference
February 27, 2026	Information due to satisfy ICAP Deferral must be submitted to MISO to avoid ICAP Deferral Non-Compliance Charge for Spring Season. (Last business day)	LSE	69A.7.9(a) (2)
Mar 01, 2026	Spring Season in new Planning Year starts.	All	69A.7
Mar 01, 2026	Daily settlements for the Spring Season starts.	All	

Appendix L – Transmission Losses Calculation

The Transmission Provider will calculate the seasonal LBA Transmission loss percentages using the process described as follows:

1. The Transmission Provider's State Estimator calculates transmission losses (MW) as part of the solution output process every five (5) minutes.
2. The transmission losses (MW) are computed on all transmission lines and transformers by summing up real power at both ends for each transmission element (retaining the convention for flow direction) or as the difference in real power (without the sign convention for flow direction) for each State Estimator solution.
3. The individual transmission losses (MW) for each element are summed to a total transmission value for each Local Balancing Authority (LBA) level.
4. These LBA transmission loss values are then integrated across each hour to calculate an hourly transmission loss value (MW) for each LBA.
5. The total transmission loss value (MW) for each LBA will be the hourly integrated transmission losses value (MW) for the hour of the Transmission Provider's system peak during each of the four previous Seasons.
6. The LBA transmission loss percentages are calculated as the total LBA transmission losses divided by the total LBA load, at each seasonal MISO peak hour.

The seasonal LBA transmission loss percentage calculated by the Transmission Provider will apply to the LSE's applicable seasonal LBA Coincident Peak Demand forecast to determine the LSE transmission losses for the calculation of the seasonal Initial PRMR. The LBA transmission loss percentage calculated by the Transmission Provider coincident with each LRZ’s seasonal Peak Demand forecast will determine the LSE transmission losses for the calculation of LRR. Both the MISO and Zonal Transmission Losses will be posted on the MISO public website by November 1 before the upcoming Planning Year.

Initial PRMR met with Behind-the-Meter-Generation Resources that are interconnected to the Transmission System shall be treated like other Resources with respect to transmission losses. Initial PRMR met with Behind-the-Meter-Generation Resources that are not interconnected to the Transmission System shall be adjusted to account for serving load without incurring transmission losses by grossing up the MW quantity of such resources by (1.0 + the appropriate LBA transmission loss percentage).

APPENDIX M: PLANNING RESOURCE AUCTION FORMULATION WITH RELIABILITY-BASED DEMAND CURVES

Disclaimer

This document is prepared for informational purposes only and is intended to help the user understand how the MISO Tariff provisions relating to Resource Adequacy Requirements and Reliability-Based Demand Curves are implemented in MISO's Planning Resource Auction (PRA). MISO may revise or terminate this document at any time at its discretion without notice. However, every effort will be made by MISO to update this document and inform its users of changes as soon as practicable. Nevertheless, it is the user's responsibility to ensure you are using the most recent version posted on the MISO website. In the event of a conflict between this document and the Tariff, the Tariff will control, and nothing in this document shall be interpreted to contradict, amend or supersede the Tariff. MISO owns the intellectual property of this document and content.

Purpose of this document

MISO's Resource Adequacy construct provides LSEs in the MISO footprint an ability to procure planning resources through a PRA for each Season within the Planning Year (PY). A Linear Programming (LP) based optimization tool has been developed to clear the auction and calculate Auction Clearing Prices (ACP). This document provides a detailed mathematical representation of the constrained optimization formulation that is used for clearing the seasonal PRA and explains how the zonal Auction Clearing Prices are calculated for each Season within the PY.

1 Overview of Auction Clearing Processes

MISO is introducing sloped demand curves in its Resource Adequacy construct through the implementation of Reliability-Based Demand Curve (RBDC) in the 2025 PRA. Specifically, MISO utilizes distinct sloped demand curves at both the systemwide and sub-regional levels: one systemwide RBDC and separate subregional RBDCs for the North/Central (N/C) and South subregions (also called planning areas). The systemwide RBDC addresses overall reliability needs across the entire system, while the subregional RBDCs capture additional reliability requirements specific to each subregion. As a result, for each season, MISO will utilize one systemwide RBDC and two sub-regional RBDCs in the PRA, totaling twelve RBDCs over the course of a Planning Year.

A subregional RBDC acknowledges the specific reliability needs of each sub-region. It is crucial to provide a price signal that reflects this regional diversity to promote efficient capacity pricing, resource planning, and grid reliability across MISO. Since MISO's footprint is divided into two subregions, each subregion will have two obligations to meet for resource adequacy: one from its share of the systemwide RBDC and the other from its own subregional RBDC. The share of systemwide RBDC is the systemwide RBDC weighted by the coincident peak demand share (with transmission losses) of the subregion. To ensure resource adequacy, the higher of these two obligations should be prioritized; meeting the higher obligation will automatically satisfy the lower one. The method for PRA clearing and pricing is outlined below.

Step 1 (RBDC identification): For each subregion, identify the RBDC curve between (i) share-of-systemwide RBDC and (ii) subregional RBDC that produces higher MW obligation in the neighborhood of the intersection of supply and demand curves.

Step 2 (Clearing and pricing): Use specific RBDCs identified in step 1 for each subregion and solve the clearing and pricing problem.

This solution methodology is summarized in **Error! Reference source not found.**.

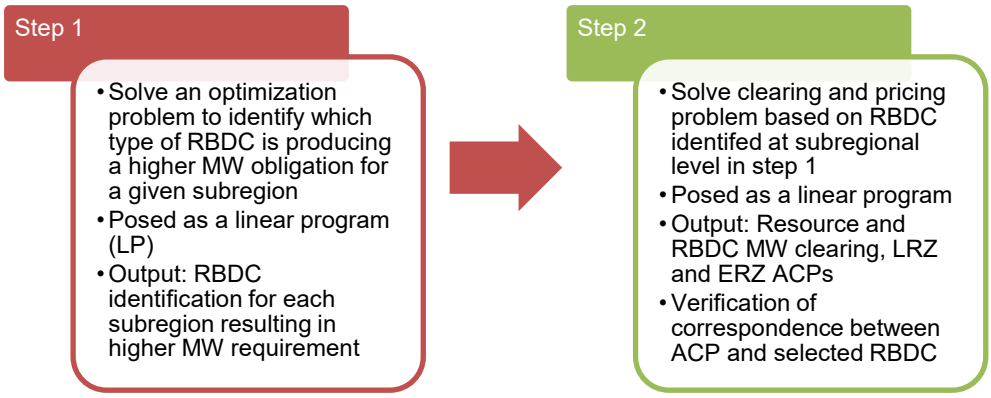


Figure 1. Overview of solution methodology

2 Preliminaries

This section defines the notation used in the optimization problem. In cases of ambiguity, we use the superscript SR to denote parameters or decision variables associated with subregional RBDC clearing, while the superscript SYS is used in reference to systemwide RBDC clearing. The optimization variables are in orange font.

2.1 Sets

Set DC = {Systemwide RBDC (SYS-RBDC), North/Central subregion RBDC (NC-RBDC), South subregion RBDC (S-RBDC)}

Set R = {North/Central subregion (NC), South subregion (S)}

Set Z = {All local resource zones (LRZs) in the transmission planning area}

Set Z_r = {All local resource zones (LRZs) in the subregion $r \in R$}

Set Z_n = {All North/Central subregion LRZs (LRZ 1 through 7)}

Set Z_s = {All South subregion LRZs (LRZ 8 through 10)}

Set E = {All external resource zones (ERZs) participating in the PRA}

Set F = {All resource offers in the system including LRZs and ERZs}

Set G = {All resources in LRZs}

Set G_k = {All resources in LRZ k}

Set G_r = {All resources in the LRZs within subregion $r \in R$}

Set H = {All resources in external zones (including dual connected external zones)}

Set H_e = {All resources in external zone *e*}

Set J_{dc} = {All demand segments in RBDC $dc \in DC$}

Set J_r = {All demand segments in subregional RBDC for subregion $r \in R$}

Set MC = {All resources which are part of fixed resource adequacy plans (FRAPs), or self-scheduled resources ($0 offer price), or resources covered by RBDC Opt Out}

2.2 Parameters

The following parameters are used to set up the constrained optimization problem for the PRA:

$INITIALPRMR_k$	Initial Planning Reserve Margin Requirement (PRMR) for LRZ *k*. Initial PRMR refers to PRMR for achieving the seasonal systemwide LOLE target (1-day-in-10 for Summer and 1-day-in-100 for other seasons)
$CPDF_k$	Coincident Peak Demand Forecast (CPDF) for LRZ *k*
LCR_k	Local Clearing Requirement for LRZ *k*
CIL_k	Capacity Import Limit for LRZ *k*
CEL_k	Capacity Export Limit for LRZ *k*
CEL_e	Capacity Export Limit for external zone *e*
$SREC_r$	Subregional export constraint (SREC) for subregion $r \in R$
$SRIC_r$	Subregional import constraint (SRIC) for subregion $r \in R$
$OFFERPRICE_i$	The offer price for resource *i*[3]
$OFFERMW_i$	Offered MW value for resource *i*
$SF_{r,e}$	Shift Factor ∈[0, 1] to subregion *r* for resources in external zone *e*[4]

ACP_k	Auction Clearing Price for Zone k
$CONE_k$	Annualized cost of new entry (CONE) for LRZ *k*
$CONE_n$	Average annualized CONE for LRZs in the North/Central subregion
$CONE_s$	Average annualized CONE for LRZs in the South subregion
$CONE_{SYS}$	Average annualized CONE for all LRZs in MISO
$SEASONALCONE_k$	Annualized CONE for LRZ *k* divided by number of days in the season
$SEASONALCONE_e$	For dual connected ERZ e: maximum annualized CONE of all LRZ*s* divided by number of days in the season. For ERZ e connected to a single subregion: maximum annualized CONE of all LRZ*s* in that subregion divided by number of days in the season.
$DAILYCONE_k$	Annualized CONE for LRZ *k* divided by number of days in the planning year
$RBDCPRICE_{j,dc}$	RBDC Price ($/UCAP MW-day) for demand curve segment $j \in J_{dc}$ for demand curve version $dc \in DC$
$RBDCSTEP_{j,dc}$	RBDC Step Size (UCAP MW) for demand curve segment $j \in J_{dc}$ for demand curve version $dc \in DC$
u_r	Binary parameter for MISO subregion $r \in R$ indicating the RBDC selected for step 2 of the solution methodology: 0 refers to share-of-systemwide RBDC, and 1 refers to the subregional RBDC
α_k^{SYS}	CPDF share of LRZ *k* with respect to all the LRZs in the system given by the following equation: $$\alpha_k^{SYS} \overset{def}{=} \frac{CPDF_k}{\sum_{k \in Z} CPDF_k} \in [0,1]$$
α_r	CPDF share of region $r \in R$, given by: $$\alpha_r \overset{def}{=} \sum_{k \in Z_r} \alpha_k \in [0,1]$$
α_k^r	CPDF share of LRZ *k* in subregion $r \in R$ with respect to all the LRZs in that subregion, given by:

$$\alpha_k^r \overset{def}{=} \frac{\alpha_k}{\alpha_r} \in [0,1]$$

2.3 Decision Variables

The optimization variables for the two linear programs are as follows (**all variables are non-negative**):

$clearedMW_i^{SYS}$	Cleared MW value of offer *i* to meet systemwide RBDC demand in step 1
$clearedMW_i^{SR}$	Cleared MW value of offer *i* to meet systemwide RBDC demand in step 1
$clearedMW_i$	Cleared MW value of offer *i* to meet selected RBDC demand in step 2
$clearedDemand_{j,r}^{SYS}$	Cleared MW value of systemwide RBDC segment *j* for subregion $r \in R$ [5]
$clearedDemand_{j,r}^{SR}$	Cleared MW value of subregional RBDC segment *j* for subregion $r \in R$
S_k^{SYS}	MW amount by which LRZ *k* is short of its local clearing requirement (LCR) or initial PRMR - CIL while meeting systemwide RBDC demand in step 1
S_k^{SR}	MW amount by which LRZ *k* is short of its local clearing requirement (LCR) or initial PRMR - CIL while meeting subregional RBDC demand in step 1
S_k	MW amount by which LRZ *k* is short of its local clearing requirement (LCR) or initial PRMR - CIL in step 2

3 Step 1: RBDC identification

The objective of the RBDC identification procedure is to determine which RBDC between share-of-systemwide RBDC and subregional RBDC is producing a higher MW requirement for each subregion. The requirements are determined through a solution to a linear program.

The identification of the RBDC producing a higher requirement is challenging, a priori. This difficulty is illustrated via the two plots on the first row of **Error! Reference source not found.** c orresponding to the summer season in the MISO N/C region and MISO South region, respectively: on the left, the subregional RBDC will always result in a higher MW requirement as compared to the share-of-systemwide RBDC for any clearing price point. However, on the right, both RBDCs are intertwined and depending on supply and demand curve intersection either systemwide or subregional RBDC could result in a higher MW requirement. This systemwide

and the subregional RBDC interaction increases the complexity of the PRA clearing process. To address this, an LP based optimization approach is utilized for the determination of the correct RBDC (higher MW requirement) for each subregion in a given season; this selected RBDC is used for the optimization in step 2.

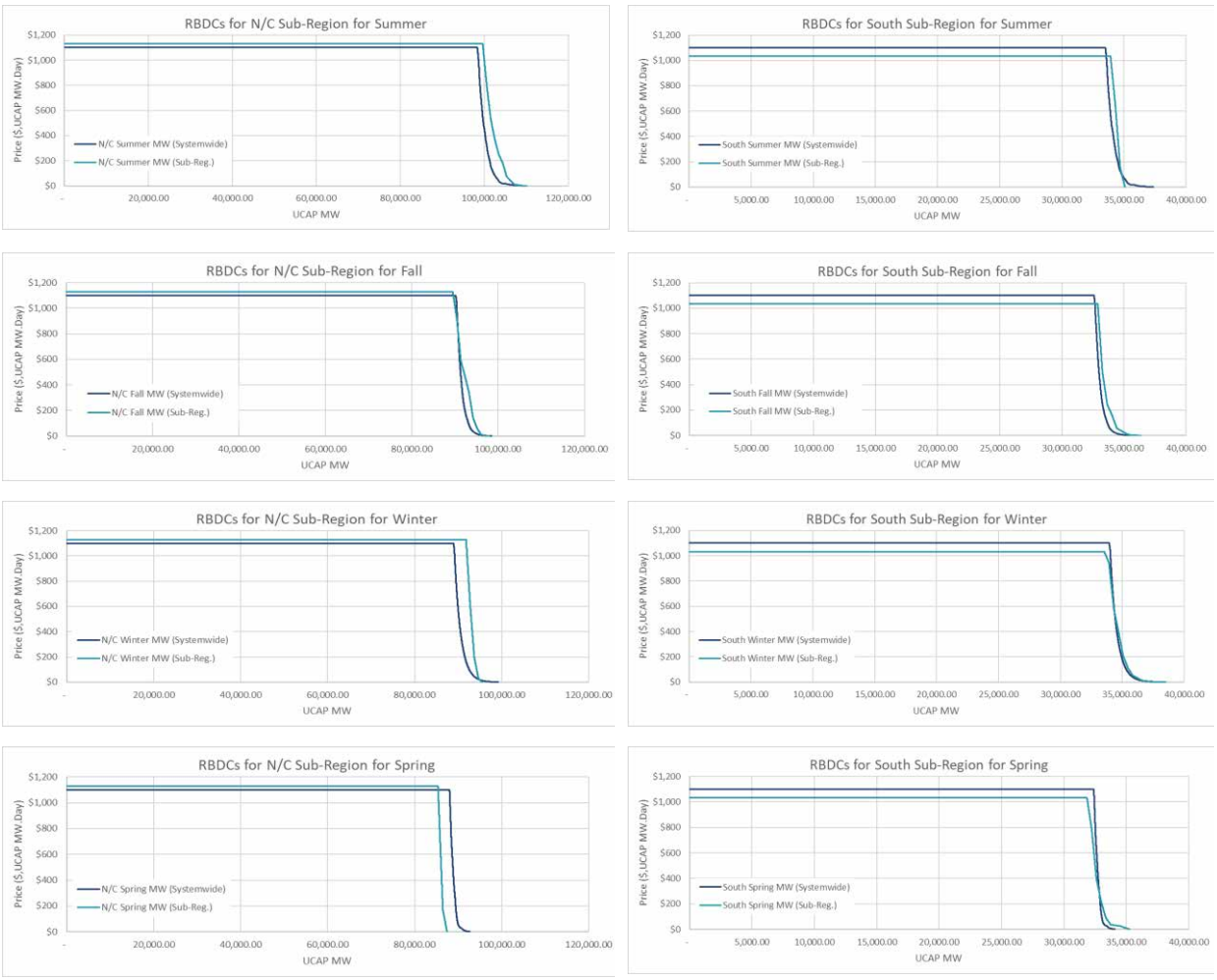


Figure 2. Indicative seasonal RBDC curves for N/C and South subregions, also showing the load-share-based projection of systemwide RBDC on to the sub-region.

3.1 Step 1 Formulation

The optimization problem for the RBDC identification step is posed as a linear program with the objective to minimize the cost of balancing capacity & demand for two scenarios: (i) demand is from share-of-systemwide RBDC in each subregion, and (ii) demand is from subregional RBDC

in each subregion. In this formulation, these two scenarios are enforced independently. Subregional power balancing constraints and zonal clearing constraints are also enforced independently for each scenario.

After solving the LP, the demand cleared on the basis of share-of-systemwide RBDC is compared with the demand cleared on the basis of the subregional RBDC clearing for both N/C and south subregions: for each subregion, the type of RBDC (share-of-systemwide RBDC or subregional RBDC) which produces the higher MW requirement is identified and selected for use in step 2 of the clearing process. The optimization formulation for step 1 is presented in the following.

3.1.1 Objective Function

The linear minimization objective is as follows:

$$\text{Minimize } f \stackrel{\text{def}}{=} SC - (SB + RB) + \Lambda, \tag{3.1.a}$$

with SC referring to the supply cost which is the area under the offer curve, SB and RB referring to the reliability benefits from the systemwide and subregional RBDCs which are the areas under the systemwide RBDC and subregional RBDCs, respectively, and Λ as the shortage penalty for zonal LCR shortage or initial PRMR shortage beyond the capacity import limit (CIL) of the zone. These terms are expressed as follows:

$$SC \stackrel{\text{def}}{=} \sum_{i \in F} OFFERPRICE_i \times (clearedMW_i^{SYS} + clearedMW_i^{SR}) \tag{3.1.b}$$

$$SB \stackrel{\text{def}}{=} \sum_{j \in J_{SYS-RBDC}} \sum_{r \in R} \alpha_r \times RBDCPRICE_j \times clearedDemand_{j,r}^{SYS} \tag{3.1.c}$$

$$RB \stackrel{\text{def}}{=} \sum_{r \in R} \sum_{j \in J_r} RBDCPRICE_j \times clearedDemand_{j,r}^{SR} \tag{3.1.d}$$

$$\Lambda \stackrel{\text{def}}{=} \sum_{k \in Z} SEASONALCONE_k \times (S_k^{SYS} + S_k^{SR}) \tag{3.1.e}$$

3.1.2 Constraints

The optimization constraints are based on system, subregional, and zonal balancing requirements, in addition to bounds on resource and segment clearing. Note that all decision variables are restricted to be in the domain of non-negative real values.

3.1.2.1 Resource Offer Bounds

Resource clearing should not exceed the MWs offered by the resources

$$clearedMW_i^{SYS} \leq OFFERMW_i, \quad \forall i \in F \tag{3.2.a}$$

$$clearedMW_i^{SR} \leq OFFERMW_i, \quad \forall i \in F \tag{3.2.b}$$

3.1.2.2 RBDC segment bounds

Price sensitive demand, characterized by different RBDCs, has limits based on the segments of the RBDC; MWs cleared in RBDC segments should not exceed the RBDC segment limits:

$$clearedDemand_{j,r}^{SYS} \leq RBDCSTEP_j, \quad \forall j \in J_{SYS-RBDC}, \quad \forall r \in R \tag{3.3.a}$$

$$clearedDemand_{j,r}^{SR} \leq RBDCSTEP_j, \quad \forall j \in J_r, \quad \forall r \in R \tag{3.3.b}$$

3.1.2.3 Power balance constraints

Systemwide supply-demand balance constraints. To properly value the reliability given the clearing outcome, the supply-demand balance equations enforce the condition that cleared supply is greater than or equal to cleared demand.

In step 1, the supply-demand balance must hold for both the system and subregional RBDC curves: the cleared quantity of demand from each RBDC curve must be met by corresponding supply-side variables.

$$\sum_{i \in F} clearedMW_i^{SYS} \geq \sum_{j \in J_{SYS-RBDC}} \sum_{r \in R} \alpha_r \times clearedDemand_{j,r}^{SYS} \tag{3.4.a}$$

$$\sum_{i \in F} clearedMW_i^{SR} \geq \sum_{r \in R} \sum_{j \in J_r} clearedDemand_{j,r}^{SR} \tag{3.4.b}$$

Subregional supply-demand balance constraints. These constraints ensure that the difference between the cleared supply available within a subregion and the cleared demand associated with the subregion is within the subregional import and export limits (SRIC and SREC, respectively). In step 1, the constraints are imposed for clearing associated with both systemwide and subregional RBDCs as follows, respectively:

$$-SRIC_r \leq \sum_{i \in G_r} clearedMW_i^{SYS} + \sum_{e \in E} SF_{r,e} \times \sum_{k \in H_e} clearedMW_k^{SYS} - \sum_{j \in J_{SYS-RBDC}} \alpha_r \times clearedDemand_{j,r}^{SYS} \leq SREC_r, \quad \forall r \in R \tag{3.5.a}$$

$$-SRIC_r \leq \sum_{i \in G_r} clearedMW_i^{SR} + \sum_{e \in E} SF_{r,e} \times \sum_{k \in H_e} clearedMW_k^{SR} - \sum_{j \in J_r} clearedDemand_{j,r}^{SR} \leq SREC_r, \quad \forall r \in R \tag{3.5.b}$$

3.1.2.4 Zonal Clearing Constraints

Local Clearing Requirement (LCR) and Capacity Import Limit (CIL) constraints ensure that the quantity of cleared supply in the zone must exceed the minimum of the LCR and the share of Initial PRMR that cannot be met by imports. If the quantity of cleared supply falls short of either of these limits, the shortfall variable is penalized at the zone's seasonal CONE value in the objective function (3.1.a). In Step 1, the LCR and CIL are enforced for both the systemwide and subregional RBDC clearing outcomes. The LCR constraints are as follows:

$$\sum_{i \in G_k} clearedMW_i^{SYS} + S_k^{SYS} \geq LCR_k, \quad \forall k \in Z \tag{3.6.a}$$

$$\sum_{i \in G_k} clearedMW_i^{SR} + S_k^{SR} \geq LCR_k, \quad \forall k \in Z \tag{3.6.b}$$

The quantity of imports in the zone to meet initial PRMR requirements must be below CIL. Only the tighter of the LCR and CIL constraints will bind, so we can use the same shortage variables for both LCR and CIL constraints. The CIL constraints are as follows:

$$INITIALPRMR_k - \sum_{i \in G_k} clearedMW_i^{SYS} - S_k^{SYS} \leq CIL_k, \quad \forall k \in Z \tag{3.7.a}$$

$$INITIALPRMR_k - \sum_{i \in G_k} clearedMW_i^{SR} - S_k^{SR} \leq CIL_k, \quad \forall k \in Z \tag{3.7.b}$$

Capacity Export Limit (CEL) constraints ensure that the quantity of exports for the zone does not exceed the available transfer capabilities (CEL). The exports are the difference between the cleared supply in the LRZ and the load obligations of the LRZ. The load requirement for an LRZ is calculated based on the CPDF share of the LRZ with respect to the cleared demand in the subregion. Consequently, the LRZ obligations based on systemwide RBDC clearing and subregional RBDC clearing are given by, respectively,

$$LRZReq_k^{SYS} = \sum_{j \in J_{SYS-RBDC}} \alpha_k^{SYS} \times clearedDemand_{j,r}^{SYS}, \quad \forall k \in Z_r, \forall r \in R \tag{3.8.a}$$

$$LRZReq_k^{SR} = \sum_{j \in J_r} \alpha_k^{r} \times clearedDemand_{j,r}^{SR}, \quad \forall k \in Z_r, \forall r \in R \tag{3.8.b}$$

The CEL constraints for each LRZ corresponding to the systemwide RBDC and the subregional RBDCs are given by, respectively,

$$\sum_{i \in G_k} clearedMW_i^{SYS} - LRZReq_k^{SYS} \leq CEL_k, \quad \forall k \in Z \tag{3.9.a}$$

$$\sum_{i \in G_k} clearedMW_i^{SR} - LRZReq_k^{SR} \leq CEL_k, \quad \forall k \in Z \tag{3.9.b}$$

Since ERZs have no load obligations, their CEL constraints for systemwide RBDC and subregional RBDCs are given by, respectively,

$$\sum_{i \in H_e} clearedMW_i^{SYS} \leq CEL_e, \quad \forall e \in E \tag{3.9.c}$$

$$\sum_{i \in H_e} clearedMW_i^{SR} \leq CEL_e, \quad \forall e \in E \tag{3.9.d}$$

4 Step 2: Clearing and Pricing

Following step 1: RBDC identification, the effective RBDCs for each subregion are established. In step 2, these identified RBDCs are used to determine resource and RBDC MW clearing along with the Auction Clearing Prices (ACPs). This clearing and pricing optimization problem is an LP problem.

In the social welfare optimization problem in step 2, for each subregion, we select the RBDC (between share-of-systemwide RBDC and subregional RBDC) that resulted in a higher requirement in that subregion. This selection is done via parameter u_r: for a given subregion $r \in R$, the parameter u_r is a binary parameter which is determined based on the clearing results of step 1. Parameter u_r is set to 0 if share-of-systemwide RBDC resulted in a higher clearing in step 1 (i.e., share-of-systemwide RBDC is selected for step 2), while it is set to 1 if the subregional RBDC resulted in a higher clearing in step 1 (i.e., subregional RBDC selected for step 2). The parameter selection for each subregion is given by the following equation:

$$u_r = 1\left(\left\{\sum_{k\in Z_r} LRZReq_k^{SYS} \leq \sum_{k\in Z_r} LRZReq_k^{SR}\right\}\right), \qquad \forall r \in R, \tag{4.1}$$

where 1 is the indicator function[6], and the LRZ clearing requirements are from step 1 as defined in (3.8).

4.1 Step 2: Formulation

Since we are selecting the RBDCs using the parameter u_r, step 2 does not require separate supply variables or constraint equations to distinguish between systemwide RBDC and subregional RBDCs. The details of the LP formulation for the clearing-and-pricing step 2 are as follows.

4.1.1 Objective Function

The linear minimization objective is given by the following equations, with the same terminology as defined in Section 3:

$$\text{Minimize } f \stackrel{\text{def}}{=} SC - (SB + RB) + \Lambda, \tag{4.2.a}$$

$$SC \stackrel{\text{def}}{=} \sum_{i\in F} OFFERPRICE_i \times clearedMW_i \tag{4.2.b}$$

$$SB \stackrel{\text{def}}{=} \sum_{j\in J_{SYS-RBDC}} \sum_{r\in R} (1-u_r) \times \alpha_r \times RBDCPRICE_j \times clearedDemand_{j,r}^{SYS} \tag{4.2.c}$$

$$RB \stackrel{\text{def}}{=} \sum_{r\in R} \sum_{j\in J_r} u_r \times RBDCPRICE_j \times clearedDemand_{j,r}^{SR} \tag{4.2.d}$$

$$\Lambda \stackrel{\text{def}}{=} \sum_{k\in Z} SEASONALCONE_k \times S_k \tag{4.2.e}$$

4.1.2 Constraints

In step 2, the power balancing constraints and the segment bounds are imposed for the selected RBDC using the parameter u_r. This subsection provides expression for the constraints in the LP.

4.1.2.1 Resource Offer Bounds

Resource clearing should not exceed the MWs offered by the resources

$$clearedMW_i \leq OFFERMW_i, \qquad \forall i \in F \tag{4.3}$$

4.1.2.2 RBDC segment bounds

MWs cleared in RBDC segments should not exceed the RBDC segment limits:

$$clearedDemand_{j,r}^{SYS} \leq (1-u_r) \times RBDCSTEP_j, \ \forall j \in J_{SYS-RBDC}, \qquad \forall r \in R \tag{4.4.a}$$

$$clearedDemand_{j,r}^{SR} \leq u_r \times RBDCSTEP_j, \qquad \forall j \in J_r, \qquad \forall r \in R \tag{4.4.b}$$

The multiplication involving the parameter u_r in the above equation ensures that the segment-wise clearing variables are allowed to take non-zero values only for the selected RBDC; the segment-wise clearing variables will be zero for the non-selected RBDC.

4.1.2.3 Power balance constraints

The system power balance constraint is represented below: the cleared systemwide supply should exceed the total system cleared demand from the selected RBDCs.

$$\sum_{i \in F} clearedMW_i \geq \sum_{r \in R} \sum_{j \in J_r} u_r \times clearedDemand_{j,r}^{SR} + \sum_{r \in R} \sum_{j \in J_{SYS-RBDC}} (1-u_r) \times \alpha_r \times clearedDemand_{j,r}^{SYS} \tag{4.5}$$

The subregional power balancing constraints ensure that the difference between the selected RBDC cleared demand and subregion cleared supply, including external resources clearing for the subregion, respects the subregional import and export constraints, as follows:

$$-SRIC_r \leq \sum_{i \in G_r} clearedMW_i + \sum_{e \in E} SF_{r,e} \times \sum_{k \in H_e} clearedMW_k - \sum_{j \in J_r} u_r \times clearedDemand_{j,r}^{SR} - \sum_{j \in J_{SYS-RBDC}} (1-u_r) \times \alpha_r \times clearedDemand_{j,r}^{SYS} \leq SREC_r, \qquad \forall r \in R \tag{4.6}$$

4.1.2.4 Zonal Clearing Constraints

The LCR and CIL are requirements that need to be met with local resources or penalized in cases of shortage. These constraints are represented as follows, respectively,

$$\sum_{i \in G_k} clearedMW_i + S_k \geq LCR_k, \ \forall k \in Z \tag{4.7}$$

$$INITIALPRMR_k - \sum_{i \in G_k} clearedMW_i - S_k \leq CIL_k, \quad \forall k \in Z \tag{4.8}$$

The CEL constraints are imposed with respect to the load obligation for each LRZ. The load obligation for LRZs is expressed as the zonal CPDF share of the cleared demand from the selected RBDC. This is given by,

$$LRZReq_k = \sum_{j \in J_{SYS-RBDC}} (1 - u_r) \times \alpha_k^{SYS} \times clearedDemand_{j,r}^{SYS} + \sum_{j \in J_r} u_r \times \alpha_k^r \times clearedDemand_{j,r}^{SR}, \quad \forall k \in Z_r, \forall r \in R \tag{4.9}$$

The difference between the zonal cleared supply and the LRZ load requirement should be below CEL:

$$\sum_{i \in G_k} clearedMW_i - LRZReq_k \leq CEL_k, \quad \forall k \in Z \tag{4.10.a}$$

Since ERZs do not have load obligations, their CEL constraints are given by:

$$\sum_{i \in H_e} clearedMW_i \leq CEL_e, \quad \forall e \in E \tag{4.10.b}$$

4.2 Verification of selected RBDC for Step 2

For a given subregion, if both the share-of-systemwide RBDC and the subregional RBDC are intertwined near the intersection of the supply and demand curves, then the RBDC producing higher requirement may be inconsistent between step 1 and step 2. Therefore, additional verification is performed to ensure that the curve selected for step 2 results in an appropriate requirement. This verification process is described below.

Verification step 1: Determine the subregional clearing price for subregion $r \in R$ as the sum of the shadow prices corresponding to the system and subregional power balancing constraints, i.e., the sum of the shadow prices (which are the dual variables) for the constraints (4.5) and (4.6).

Verification step 2: For the subregional clearing price calculated in verification step 1, determine the associated UCAP MW for the share-of-systemwide RBDC and the subregional RBDC for each subregion *r*. Note the RBDC that results in the higher requirement.

Verification step 3: For a given subregion, if the RBDC with the higher UCAP MW as determined in verification step 2 matches with the RBDC selected via the binary parameter u_r (0 implies selection of share-of-systemwide RBDC and 1 implies selection of subregional RBDC), then the PRA clearing solution is valid and we can proceed with the computation of clearing prices and obligations for the market participants.

If the verification fails for a given subregion, then this failure implies that the RBDC with the higher UCAP MW as determined in verification step 2 is different from the type of RBDC (share of systemwide or subregional) selected via the parameter u_r; hence, the PRA clearing solution is not valid. In such a case, the value of the parameter u_r for the subregion is switched to its complement (0 to 1, or 1 to 0), and step 2 of the PRA clearing process is solved again with this updated parameter.

4.3 Auction clearing Price calculations

Following the PRA clearing solution obtained in the step 2 optimization problem, the clearing prices are calculated for every LRZ and ERZ. This section describes the methodology for computing the auction clearing price (ACP).

4.3.1 ACP determination

The initial auction clearing price is calculated using the shadow prices (SP) of the system, subregional, and zonal power balancing constraints, which are defined below. All prices in this document are in units of $/MW-day.

$systemBalanceSP$ — Non-negative shadow price corresponding to the systemwide supply demand balancing constraint (4.5). This SP applies to all LRZs and ERZs.

$SRICSP_r$ — Non-negative shadow price corresponding to the subregional import constraint: left-hand side inequality of (4.6). A positive shadow price implies that the imports for subregion *r* are equal to the SRIC limit. The shadow price applies to all local zones in the respective subregion *r*. For external zones, the shadow price is assigned proportionally based on the respective subregional shift factors.

$SRECSP_r$ — Non-positive shadow price corresponding to the subregional export constraint: right-hand side inequality of (4.6); a negative value implies that the exports for subregion *r* are equal to the SREC limit. The shadow price applies to all local zones in the respective subregion *r*. For external zones, the shadow price is assigned proportionally based on the respective subregional shift factors.

$LCRSP_k$ — Non-negative SP for the LCR constraint (4.7) for LRZ $k \in Z$. This only applies to LRZs. A positive SP for the LRZ implies that the total cleared generation in LRZ *k* is either exactly equal to the LCR for *k*, or that the total generation offered in LRZ *k* is short of the LCR for *k* (in which case, seasonal CONE pricing is used as a shortage penalty).

$CILSP_k$ — Non-negative SP for the CIL constraint (4.8) for LRZ $k \in Z$. This only applies to LRZs. A positive SP implies that the difference between the initial PRMR and the total cleared generation in the LRZ is either exactly equal to CIL or is more than CIL in case of a shortage.

$CELSP_k$ — Non-positive SP for the CEL constraint (4.10) for zone $k \in Z \cup E$. This applies to both LRZs and ERZs.

The ex-ante ACP for an LRZ $k \in Z_r$ in subregion $r \in R$, prior to the calculation of LCR price adder is the minimum of (i) seasonal CONE of the LRZ and (ii) the sum of shadow prices corresponding to the LRZ (for zones without multi-season shortage, the ex-ante ACP will also be the ex-post ACP for the LRZ):

$$ACP_k^{EA} = min\{SEASONALCONE_k, systemBalanceSP + SRICSP_r + SRECSP_r + LCRSP_k + CILSP_k + CELSP_k\} \quad (4.11.a)$$

The ACP for an ERZ $e \in E$ is the minimum of (i) the maximum seasonal CONE of all the LRZs in the subregion to which the ERZ is connected (for dual connected ERZs, this is the maximum seasonal CONE of all LRZs in the entire transmission area; and (ii) the sum of the shadow prices corresponding to the ERZ:

$$ACP_e = min\{SEASONALCONE_e, systemBalanceSP + CELSP_e + \sum_r SF_{r,e} \times (SRICSP_r + SRECSP_r)\} \quad (4.11.b)$$

4.3.2 ACP under multi season LRZ shortages, or near-shortages, on local clearing requirement

When an LRZ has more than one season in any combination of ZRC shortage conditions and/or ZRC near-shortage conditions, the final Auction Clearing Price (ACP) for the LRZ will be determined as follows.

Let $\tilde{Z}$ the set of all LRZs with multi-season LCR or CIL shortage or near-shortage conditions. Let N_k^S denote the total number of shortage or near-shortage days for the LRZ $k \in \tilde{Z}$ across the entire planning year. Then, the LCR price adder for LRZ k is given by,

$$LCRPRICEADDER_k = CONE_k / N_k^S \quad (4.12)$$

The ex-post ACP for an LRZ k with multi-season shortage or near-shortage is,

$$ACP_k^{EP} = min\{SEASONALCONE_k, systemBalanceSP + SRICSP_r + SRECSP_r + LCRPRICEADDER_k\}, \quad \forall k \in \tilde{Z} \quad (4.13)$$

5 Final Auction Clearing Quantities for LRZs

The Final PRMR of an LSE is determined based on RBDC clearing in the corresponding subregion and the LSE's participation option (such as RBDC Opt Out, market participation, etc.)

in the PRA. The detailed procedure to determine Final PRMR is presented in Section 5.6 of this Business Practice Manual.

6 Examples

6.1 Small System Examples

Assume a system as shown in **Error! Reference source not found.** below. It consists of two L RZs and two subregions. There is a limited transfer capability between the subregions, and it is reflected in the subregional power balance constraint limit (SRPBC): the SRPBC limit in the following examples is a simplified representation of the SRIC/SREC constraints included in the preceding mathematical formulation.

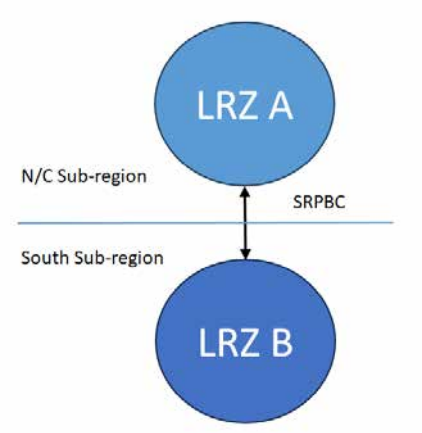


Figure 3. System setup for clearing examples: Two LRZ system with two subregions

Case 1: Regional RBDCs in both subregions are resulting in higher requirements than the share-of-systemwide RBDC, and there are no binding subregional import/export constraints. The offer and RBDC information along with the optimal clearing are shown in the following figure.

Systemwide RBDC

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

N/C Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	20
$18	25
$12	28

South Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	13
$15	23
$7	31

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	100MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$14	25 (sub-regional RBDC)	0	$14
LRZ B	$14	23 (sub-regional RBDC)	48	$14

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$14	40	0
R2	N/C Sub-region	$14	40	0
R3	South Sub-region	$14	40	8
R4	South Sub-region	$14	40	40

Case 2: Regional RBDCs in both subregions are resulting in higher requirements than the share-of-systemwide RBDC, and the subregional import/export constraints are binding. The offer and RBDC information along with the optimal clearing are shown in the following figure.

Systemwide RBDC

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

N/C Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	20
$18	25
$12	28

South Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	13
$15	23
$7	31

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	5 MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

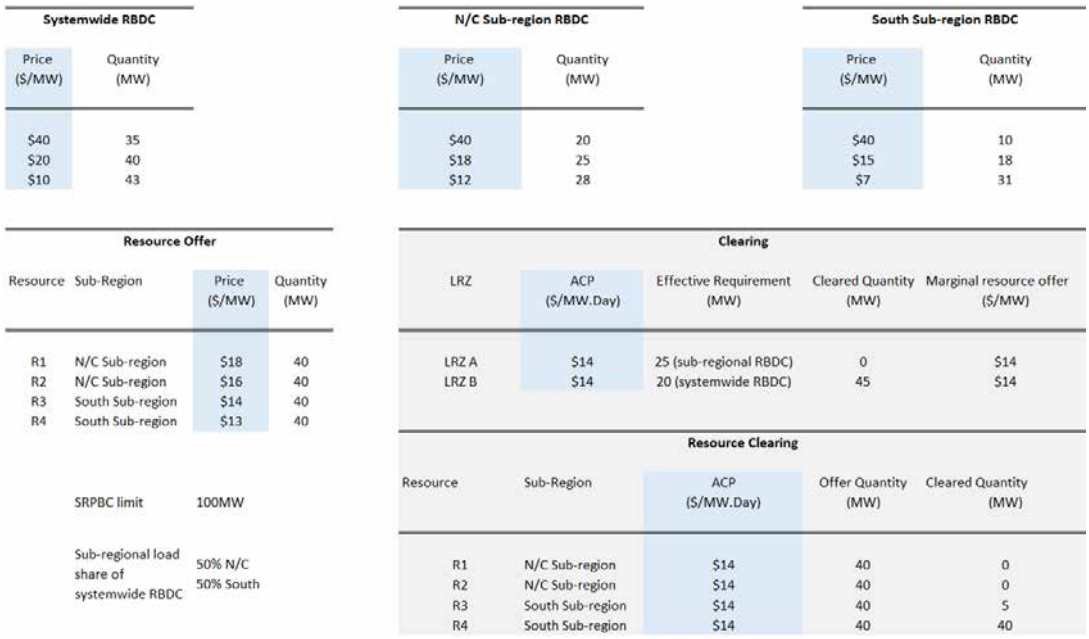
Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$16	25 (sub-regional RBDC)	20	$16
LRZ B	$13	23 (sub-regional RBDC)	28	$13

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$16	40	0
R2	N/C Sub-region	$16	40	20
R3	South Sub-region	$13	40	0
R4	South Sub-region	$13	40	28

Case 3: In one subregion, share-of-systemwide RBDC is resulting in a higher requirement than subregional RBDC, while in the other subregion, the subregional RBDC results in a higher requirement as compared to the share-of-systemwide RBDC. SRIC/SREC are not binding. The offer and RBDC information along with the optimal clearing are shown in the following figure.



Systemwide RBDC

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

N/C Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	20
$18	25
$12	28

South Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	10
$15	18
$7	31

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	100MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$14	25 (sub-regional RBDC)	0	$14
LRZ B	$14	20 (systemwide RBDC)	45	$14

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$14	40	0
R2	N/C Sub-region	$14	40	0
R3	South Sub-region	$14	40	5
R4	South Sub-region	$14	40	40

Case 4: In one subregion, share-of-systemwide RBDC is resulting in a higher requirement than subregional RBDC, while in the other subregion, the subregional RBDC results in a higher requirement as compared to the share-of-systemwide RBDC. SRIC/SREC are binding. The offer and RBDC information along with the optimal clearing are shown in the following figure.

Systemwide RBDC

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

N/C Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	20
$18	25
$12	28

South Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	10
$15	18
$7	31

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	10MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$16	25 (sub-regional RBDC)	15	$16
LRZ B	$13	20 (systemwide RBDC)	30	$13

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$16	40	0
R2	N/C Sub-region	$16	40	15
R3	South Sub-region	$13	40	0
R4	South Sub-region	$13	40	30

Case 5: Systemwide RBDC results in a higher requirement in both subregions, and no SRIC/SREC binding. Offer, RBDC, and clearing details are in the following figure.

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

Price ($/MW)	Quantity (MW)
$40	10
$18	15
$12	20

Price ($/MW)	Quantity (MW)
$40	3
$15	13
$7	21

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	500 MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$13	20 (system RBDC)	0	$13
LRZ B	$13	20 (system RBDC)	40	$13

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$13	40	0
R2	N/C Sub-region	$13	40	0
R3	South Sub-region	$13	40	0
R4	South Sub-region	$13	40	40

Case 6: Systemwide RBDC results in a higher requirement in both subregions, and SRIC/SREC are binding. Offer, RBDC, and clearing details are in the following figure.

Systemwide RBDC

Price ($/MW)	Quantity (MW)
$40	35
$20	40
$10	43

N/C Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	10
$18	15
$12	20

South Sub-region RBDC

Price ($/MW)	Quantity (MW)
$40	3
$15	13
$7	21

Resource Offer

Resource	Sub-Region	Price ($/MW)	Quantity (MW)
R1	N/C Sub-region	$18	40
R2	N/C Sub-region	$16	40
R3	South Sub-region	$14	40
R4	South Sub-region	$13	40

SRPBC limit	5 MW
Sub-regional load share of systemwide RBDC	50% N/C 50% South

Clearing

LRZ	ACP ($/MW.Day)	Effective Requirement (MW)	Cleared Quantity (MW)	Marginal resource offer ($/MW)
LRZ A	$16	20 (system RBDC)	15	$16
LRZ B	$13	20 (system RBDC)	25	$13

Resource Clearing

Resource	Sub-Region	ACP ($/MW.Day)	Offer Quantity (MW)	Cleared Quantity (MW)
R1	N/C Sub-region	$16	40	0
R2	N/C Sub-region	$16	40	15
R3	South Sub-region	$13	40	0
R4	South Sub-region	$13	40	25

6.2 PRA Clearing Examples using Indicative RBDCs

This section provides an illustrative graphical representation of the auction clearing with RBDCs: the plots representing the PRA clearing outcomes with indicative RBDCs for PY 24-25 Summer Season are presented in **Error! Reference source not found.**. The indicative RBDCs are d eveloped based on PY 24-25 loss-of-load study and the associated models. Resource offers submitted for the PY 24-25 Summer Season are used for the supply curves. The parameters for the zonal CIL, CEL, and LCR constraints are the same as those used in the PY 2024/25 PRA. The solution to the linear programming-based formulation results in an Auction Clearing Price of about $140/MW-day with no subregional or zonal price separation. The systemwide RBDC is setting up the requirement in both subregions with a total cleared demand of 140.1GW, because the share-of-systemwide RBDCs are to the right of the subregional RBDCs in both subregions.

The SREC limit from the south subregion to the north/central subregion is 1,900 MW; the capacity exports from the south subregion to the north/central subregion are 1,581 MW as reflected in **Error! Reference source not found.**. The RBDCs shown in the dashed lines for t

he exporting subregion (south) have been shifted to **the right by the export quantity**, while those for the importing subregion (N/C) have been shifted to **the left by the same quantity**. The original RBDCs are in solid lines.

The horizontal line represents the ACP, which is set at the intersection of the supply curve and import/export-shifted RBDC for each subregion (red dot in the figure). The Final PRMR for an importing subregion (N/C) is to the **right** of the intersection of the supply curve and the import-shifted RBDC by the import quantity (1,581 MW in the figures below). Similarly, for the exporting subregion (south), the final PRMR is to the **left** of the intersection of the supply curve and the export-shifted RBDC by the export quantity of 1,581 MW. The Final PRMR is shown by the dotted dark-gray vertical line passing through the intersection of the horizontal ACP line and the requirement-setting RBDC (share-of-systemwide RBDC for Summer 2024 in both subregions—plots in orange solid lines).

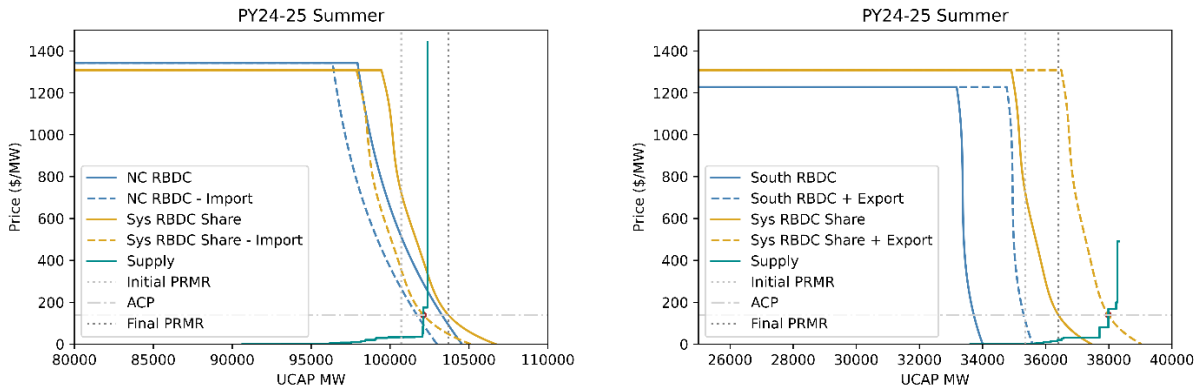


Figure 4. PRA clearing with indicative RBDCs representing PY24-25 Summer season with actual offers submitted for PY24-25 Summer season.

For completeness, the zoomed-in version of PRA clearing presented in **Error! Reference source not found.** is shown below in **Error! Reference source not found.**.

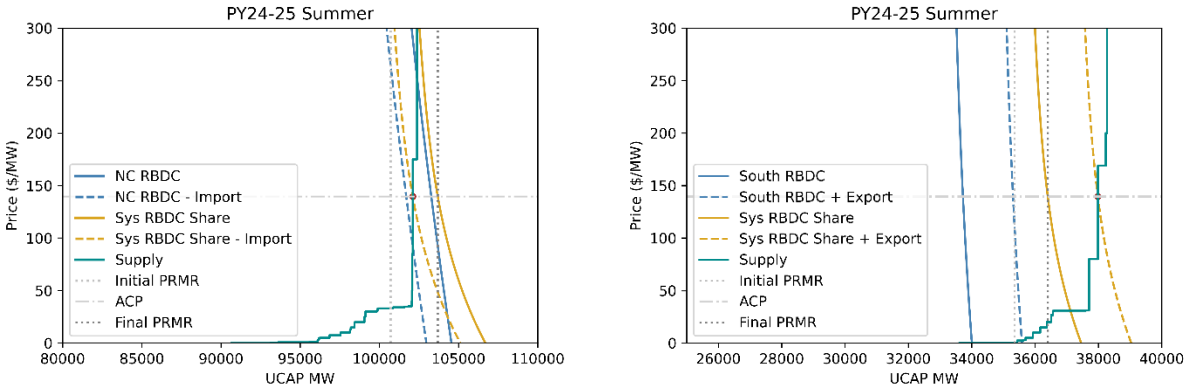


Figure 5. Zoomed in version of illustrative PY 24-25 Summer season PRA clearing

Appendix N – Seasonal Demand and Energy Forecast Characteristics

Forecast Criteria	Coincident Peak Demand and Zonal Coincident Peak Demand Forecasts	Non-Coincident Peak Demand Forecast	Energy for Load Forecast
Includes Demand Served by Energy Efficiency Planning Resources	Yes	Yes	Yes
Includes Demand Served by Energy Efficiency Programs	No	No	No
Includes Demand Served by Demand Resources	Yes	Yes	Yes
Includes Demand Served by BTMG Planning Resources	Yes	Yes	Yes
Includes Demand Served by resources that are not qualified as Planning Resources	Yes	No	No
Includes Demand Pseudo-Tied Out of MISO BA and Included Subject to other RAR	No	Yes	Yes
Includes Transmission Losses	No	No	Yes
Coincident with reporting Load Serving Entities' system	No	Yes	No
Demand reported at Physical LBA Location	Yes	Yes	Yes
Include Demand from Power Plant Station or Auxiliary Needs	No	No	No

Appendix O – Parties Responsible for Reporting Seasonal Demand and Energy Forecasts

Data	EDC	Retail Choice LSE	Non-Retail Choice LSE
MISO Coincident Peak (Total CPF)	No	No	Yes
MISO Non-Coincident Peak (Total NCPF)	No	No	Yes
Zonal Coincident Peak (Total CPF)	No	No	Yes
RC Coincident Peak (Total CPFEDC Area)	Yes	No	No
RC Coincident Peak (Total NCPF) Load Contribution	Yes	No	No
RC Zonal Coincident Peak (Total CPFEDC Area)	Yes	No	No
Non-Coincident Peak	Yes	No	Yes
RC Non-Coincident Peak	No	Yes	No
Energy for Load	Yes	No	Yes
Retail Choice (MISO Peak)	Yes	No	No
Retail Choice (Zonal Peak)	Yes	No	No

Appendix P – Zonal Deliverability Benefit *Pro Rata* Allocation

This Appendix is an illustrative example of the ZDB *pro rata* allocation methodology in the presence of Historical Unit Considerations (HUC) and Fixed Resource Adequacy Plan (FRAP) or RBDC Opt Out. The results from the Planning Resource Auction for the 2020/2021 Planning Year are used in this example to educate Market Participants. The resulting Auction Clearing Prices illustrated here are different than those settled for the 2020/2021 Planning Year. Starting in Planning Year 2023-2024, the ZDB calculation will be performed separately for each Season in which the ZDB calculation is required.

Step 1Subtract PRMR and ZRCs associated with HUC Hedges to derive an adjusted Final PRMR (Adjusted Final PRMR) and ZRC (Adjusted ZRC). ZRCs are FRAP + RBDC Opt Out + Self-scheduled offers + cleared Non-self-scheduled offers.

RZ	ACP	Final PRMR	ZRC	HUC (MW)	ZDC Hedges (MW)	Adjusted Final PRMR	Adjusted ZRC
Z1	$5.00	18,476.0	18,742.0	191.7	0	18,284.3	18,550.3
Z2	$5.00	13,728.2	13,590.0	0	0	13,728.2	13,590.0
Z3	$5.00	10,129.1	10,551.0	0	0	10,129.1	10,551.0
Z4	$5.00	9,794.6	8,462.1	0	0	9,794.6	8,462.1
Z5	$5.00	8,456.3	7,952.8	0	0	8,456.3	7,952.8
Z6	$5.00	18,720.6	17,054.6	0	0	18,720.6	17,054.6
Z7	$257.53	21,945.3	21,727.5	0	0	21,945.3	21,727.5
Z8	$4.75	7,986.9	10,183.1	0	0	7,986.9	10,183.1
Z9	$6.88	21,711.7	20,893.7	107.3	0	21,604.4	20,786.4
Z10	$4.75	5,030.6	5,244.2	0	0	5,030.6	5,244.2
E20	$4.90	0.0	347.2	0	0	0.0	347.2
E22	$5.00	0.0	633.8	0	0	0.0	633.8
E23	$5.00	0.0	30.1	0	0	0.0	30.1
E24	$5.00	0.0	148.4	0	0	0.0	148.4
E26	$4.92	0.0	24.0	0	0	0.0	24.0
E27	$4.89	0.0	168.3	0	0	0.0	168.3
E28	$4.90	0.0	226.5	0	0	0.0	226.5

Step 2: Create a DBZ for each group of LRZs that have equal ACPs which result from the same auction constraint. In this example, Zone 7 is a DBZ because the PRA bound on its LCR.

RZ	ACP	Adjusted Final PRMR	Adjusted ZRC	**DBZ Grouping**
Z1	$5.00	18,284.3	18,550.3	Zone A
Z2	$5.00	13,728.2	13,590.0	Zone A
Z3	$5.00	10,129.1	10,551.0	Zone A

Z4	$5.00	9,794.6	8,462.1	Zone A
Z5	$5.00	8,456.3	7,952.8	Zone A
Z6	$5.00	18,720.6	17,054.6	Zone A
Z7	$257.53	21,945.3	21,727.5	Zone B
Z8	$4.75	7,986.9	10,183.1	Zone D
Z9	$6.88	21,604.4	20,786.4	Zone C
Z10	$4.75	5,030.6	5,244.2	Zone D
E20	$4.90	0.0	347.2	Zone E
E22	$5.00	0.0	633.8	Zone A
E23	$5.00	0.0	30.1	Zone A
E24	$5.00	0.0	148.4	Zone A
E26	$4.92	0.0	24.0	Zone F
E27	$4.89	0.0	168.3	Zone G
E28	$4.90	0.0	226.5	Zone E

Step 3: For each DBZ, subtract the sum of Adjusted Final PRMR for each LRZ within the DBZ from the sum of Adjusted ZRCs for each LRZ within the DBZ. A DBZ will be considered a net importing DBZ if the sum of Adjusted Final PRMR is greater than the sum of Adjusted ZRCs. A DBZ will be considered a net exporting DBZ if the sum of the Adjusted Final PRMR is less than the sum of Adjusted ZRCs. A net exporting DBZ shall not receive any ZDB credit. A net importing DBZ shall receive a ZDB credit allocation based upon this weighted average approach.
In this example, Zones A, B, and C are net importing DBZ's and Zones D, E, F and G are net exporting DBZs.

DBZ	Adjusted Final PRMR	Adjusted ZRC	Difference	Result
Zone A	79,113.1	76,973.1	-2140.0	Net Importer
Zone B	21,945.3	21,727.5	-217.8	Net Importer
Zone C	21,711.7	20,893.7	-818.0	Net Importer
Zone D	13,017.5	15,427.3	2,409.8	Net Exporter
Zone E	0.0	573.7	573.7	Net Exporter
Zone F	0.0	24.0	24.0	Net Exporter
Zone G	0.0	168.3	168.3	Net Exporter

Step 4: Calculate the weighted average ACP of all net exporting DBZs (Weighted Average Export ACP) to determine a financial value of export capacity within the Transmission Provider region per the formula below:

$$\text{Weighted Average Export ACP} = \frac{\sum(\text{Net Export}_j \times \text{ACP}_j)}{\sum \text{Net Export}_j}$$

Where j = Each net exporting DBZ

DBZ	Net Export	ACP	Net Export*ACP
D	2409.8	$4.75	$11,446.55
E	573.7	$4.90	$2,811.13
F	24	$4.92	$118.08
G	168.3	$4.89	$822.99
Total of Exporting Zones	3175.8		$15,198.75
Weighted Average Export ACP =(Total Net Export*ACP)/(Total Net Export)			$4.79

Step 5: Calculate the ZDB credit allocation, in dollars, for each net importing DBZ:

$$\text{ZDB Credit}_k = \text{Net Import}_k \times (\text{ACP}_k - \text{Weighted Average Export ACP})$$

Where k = Each net importing DBZs

DBZ	Net Import	ACP ($/MW-day)	Weighted Average Export ACP	ZDB Credit ($/day)
A	2140.0	$5.00	$4.79	$458.39
B	217.8	$257.53	$4.79	$55,047.69
C	818.0	$6.88	$4.79	$1,713.05
Total of Importing Zones	3175.8			

Step 6: Distribute the ZDB credit in each DBZk by dividing the ZDB credit by the sum of Adjusted Final PRMR of the LRZs within each DBZk. Subtract this amount from the initial ACP calculated for each LRZ from the PRA.

DBZ	ZDB Credit ($/day)	RZ	Adjusted Final PRMR	ZDB Rate ($/MW-day)	ACP	Net ACP
A	$458.39	1	18,284.3	$0.01	$5.00	$4.99
		2	13,728.2			
		3	10,129.1			
		4	9,794.6			
		5	8,456.3			
		6	18,720.6			
		Total DBZ A	79,113.1			
B	$55,047.69	7	21,945.3	$2.51	$257.53	$255.02
C	$1,713.05	9	21,604.4	$0.08	$6.88	$6.80

Appendix Q – Fleet XEFORd Calculation

This appendix walks through the process for calculating fleet XEFORd. This process is used for External Resources that participate in the PRA as one MECT resource which represents the aggregate of a fleet of units. In order to qualify, resource owners must submit help tickets to help.misoenergy.org to let MISO know which resources to be included in your fleet by November 15, otherwise the resource will not be able to participate in the PRA. For example, an external area might have 100 units in its fleet with a total capacity of 10,000 MW of which it plans to commit 1,000 MW on an installed capacity basis to MISO. MISO will then calculate a seasonal SAC based on a seasonal weighted average forced outage rate of all units in the fleet. Intermittent and class average units are excluded from the fleet XEFORd calculation. This appendix will walk through a weighted average example calculation for a set of fleet units.

Utility	Unit	Unit Name	GVTC (MW)	XEFORd (%)	Weighted XEFORd (%)
99A - Midwest ISO	101	Carmel 1	100.0	15.0%	4.5%
99A - Midwest ISO	102	Carmel 2	120.0	10.0%	3.6%
99A - Midwest ISO	601	Eagan 1	65.0	7.5%	1.5%
99A - Midwest ISO	602	Eagan 2	50.0	5.0%	0.7%
99A - Midwest ISO	501	Little Rock 1	20.0	Intermittent	Excluded
99A - Midwest ISO	502	Little Rock 2	25.0	Intermittent	Excluded
99A - Midwest ISO	401	Metarie 1	5.0	Class average	Excluded
99A - Midwest ISO	402	Metarie 2	3.0	Class average	Excluded
		Fleet Total	388.0		
		Fleet Total included in Fleet XEFORd Calculation	335.0		10.3%

Formulas

- Unit Weighted Average XEFORd = (Unit GVTC (MW)) / (Total GVTC (MW)) * (Unit XEFORd)

  (for Carmel 1 weighted XEFORd is 100.0/335.0*15.0% = 4.5%)

- Fleet Total GVTC (MW) = Sum of GVTC (MW) for all units

  (100.0 + 120.0 + 65.0 + 50.0 + 20.0 + 25.0 + 5.0 +3.0 = 388.0)

- Fleet GVTC w/ XEFORd = Sum of GVTC for all units with an XEFORd value

  (100.0 + 120.0 + 65.0 + 50.0 = 335.0)

- Fleet Weighted XEFORd = Sum of Weighted XEFORd for all units

  (4.5% + 3.6% + 1.5% + 0.7% = 10.3%)

Appendix R – Annual CONE Calculation

MISO calculates gross Cost of New Entry (CONE) values for each LRZ for each Planning Year. This CONE value will be used for all Seasons within the entire Planning Year. MISO calculates CONE for each LRZ based upon the costs associated with an advanced combustion turbine generator (CT). MISO uses the following approach:

1. MISO begins with an estimate of a CONE value not specific to an LRZ,
2. MISO uses "the law of one price" where applicable (e.g., turbines that are sold competitively),
3. MISO develops zonal differences to reflect different locational costs (e.g., labor, technical enhancements and others) using the most recent United States Energy Information Administration (EIA) document, and
4. MISO uses the Net Present Value (NPV) algorithm to calculate CONE values for each LRZ.

MISO allows factors such as the weighted average cost of capital, escalation rates, and other factors where global competition drives prices to have no locational differences to be constant.

In order to determine the appropriate CONE value for each LRZ, MISO relies upon the most recent EIA report on "Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies (EIA Report)". The EIA Report contains detailed specifications for a hypothetical advanced CT, including information regarding the differences in project costs for an advanced CT with a nominal capacity of 237 MW, based upon the state where the facility is constructed. The report is available at: https://www.eia.gov/analysis/studies/powerplants/capitalcost/.

MISO uses an NPV analysis to determine an appropriate CONE value for hypothetical advanced CTs located in each LRZ. In accordance with Section 69A.8.a of Module E-1, MISO considers many factors in its calculation of the CONE value, including the following: (1) physical factors (such as, the type of Generation Resource that could reasonably be constructed to provide Planning Resources, costs associated with locating the Generation Resource within the Transmission Provider Region, the estimated costs of fuel for the Generation Resource); (2) financial factors (such as, the hypothetical debt/equity ratio for the Generation Resource, the cost of capital, a reasonable return on equity, applicable taxes, interest, insurance); and (3) other costs (such as, costs related to permitting, environmental compliance, operating and

maintenance expenses). MISO does not consider the anticipated net revenue from the sale of capacity, Energy or Ancillary Services.

CONE values for each Planning Year are based, in part, upon data supplied by the EIA, which are adjusted using the implicit price deflator from the Bureau of Economic analysis in order to convert EIA cost data into present value dollars. In order to produce the annualized CONE value for each LRZ from these cost numbers, for the 2023/2024 Planning Resource Auction MISO assumed: (i) a 55/45 debt to equity ratio; (ii) a 20-year project life and loan term; (iii) a 5.16 percent debt interest rate; (iv) a 2.2 percent Operation and Maintenance escalation factor; (v) a 2.2 percent GDP deflator; (vi) a 25-31 percent combined effective federal and state tax rate; (vii) property tax and insurance costs of 1.5 percent of the capital costs; (viii) a calculated weighted average cost of capital of 7.99 to 8.17 percent; (ix) and a 13.4 percent after tax internal rate of return on equity. None of these factors vary by LRZ to any significant degree that is discernible in available data. MISO will continue to examine these factors in the future to determine if any LRZ specific modifications are indicated. These factors and assumptions are comparable to those used by other RTOs in the development of CONE estimates.

Steps for calculating CONE

1. Obtain latest 'Base Project Cost $/kW'
   Obtain the latest Energy Information Administration (EIA) report for *EIA,* Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies. It provides the following data:

   - Plant Capital Cost in $/kW. MISO currently uses the number for advanced CT.
   - Location Based Costs Table: Location Percent Variation, Delta Cost Difference and Total Location Project Cost columns

2. Use Bureau of Economic Analysis (BEA) data to calculate implicit price deflator
   Use Table 1.1.9 - Implicit Price Deflators for Gross Domestic Product from NIPA data. Using the table, calculate the *Escalation Rate* from base year to planning year, based on historical and projected quarterly PCE deflator values. Use this Escalation Rate to calculate "Total Location Project Cost" in current year dollars.

3. Calculate LRZ and Base total capital costs, adjusted by multiplying with the Escalation Rate
   For LRZs - Use averages of adjusted project costs for locations (for which data is available) in each zone.

4. Calculate the after-tax weighted average cost of capital (WACC)

$WACC = (E * R_e) + (D * R_d * (1 – T_c))$.

Where E = Equity Fraction of Project

R_e = Cost of Equity. Assume as the after-tax IRR

D = Debt Fraction of Project

R_d = Cost of Debt (20-year BB corporate bond rate)

T_c = Combined effective federal and state tax rate

5. Calculate estimated annualized costs for each LRZ and also for the Base.

- Calculate annualized capital costs using total capital costs, after-tax WACC and assuming the project lifespan. (Use PMT function)
- Calculate the O&M costs based on O&M data, project lifespan, WACC and US GDP Deflator (Use PMT and NPV functions)
  - Assume suitable O&M escalation factor
  - Assume/Update US GDP Deflator
- Assume insurance and property tax costs.

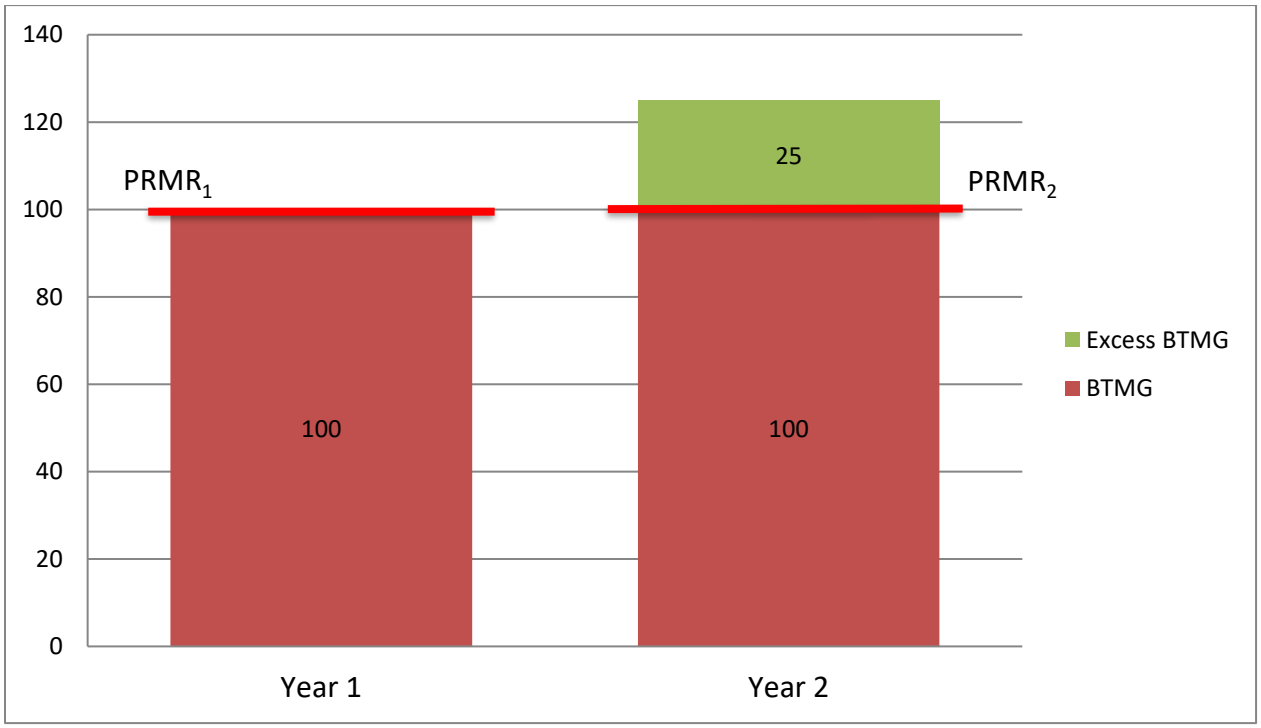
Appendix S – Example Scenarios of "Excess BTMG"

This Appendix shares a few illustrative examples of how BTMG may change to "Excess BTMG" from one year to the next. The examples below show how some specific factors may cause BTMG to be classified as "Excess BTMG" from one year to the next. Below are four examples of "Excess BTMG".

(All PRMR being referred in this appendix are Final PRMR cleared through PRA auction)

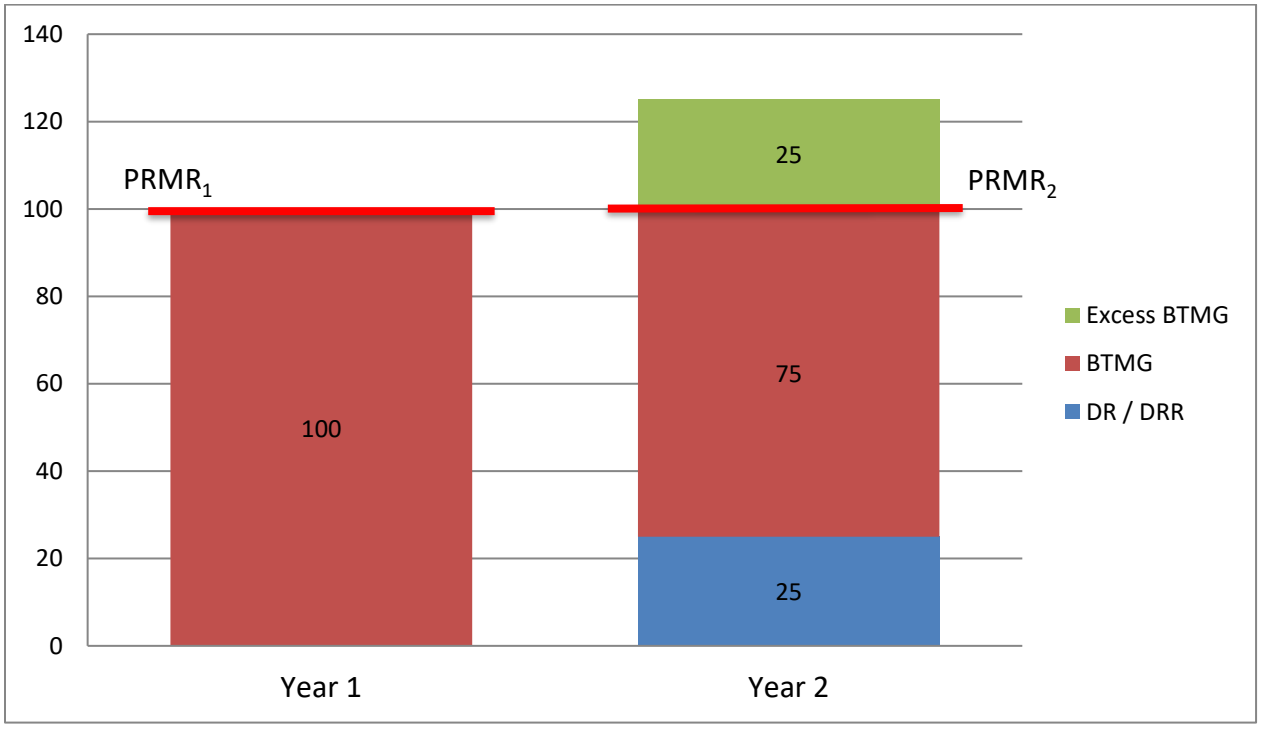
1. Increase in BTMG and No Change to Seasonal PRMR

The chart below illustrates the scenario in which a Market Participant experiences an increase in BTMG SAC from one year to the next while PRMR remains unchanged. In Year 1, the chart shows that the BTMG SAC is 100 MW and the seasonal PRMR is 100 MW; therefore, the Market Participant has no "Excess BTMG" in Year 1. Between Year 1 and Year 2, the Market Participant experiences an increase in BTMG of 25 MW—however, seasonal PRMR remains unchanged. In Year 2, the chart shows that BTMG SAC is 125 MW and the seasonal PRMR is 100 MW; therefore, the Market Participant has 25 MW of "Excess BTMG" in Year 2.



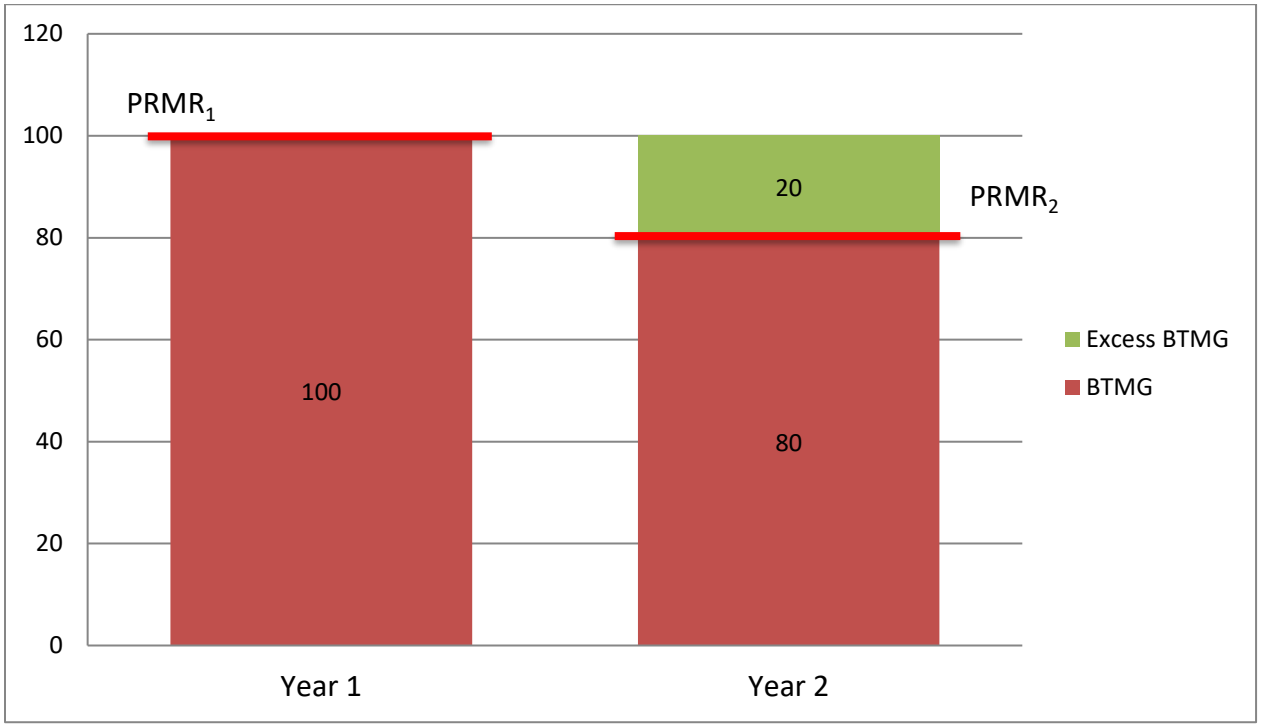
2. Increase in Demand Resources and/or Demand Response Resources and No Change to PRMR

The chart below illustrates the scenario in which a Market Participant experiences an increase in DR / DRR SAC from one year to the next while seasonal PRMR remains unchanged. In Year 1, the chart shows that the BTMG SAC is 100 MW and the seasonal PRMR is 100 MW; therefore, the Market Participant has no "Excess BTMG" in Year 1. Between Year 1 and Year 2, the Market Participant experiences an increase in DR / DRR SAC of 25 MW, however, seasonal PRMR remains unchanged. In Year 2, the chart shows that DR / DRR is 25 MW and BTMG is 100 MW and the seasonal PRMR is 100 MW. Since DR / DRR is netted against seasonal PRMR, the BTMG is stacked on top of the DR / DRR; therefore, the Market Participant has 25 MW of "Excess BTMG" in Year 2.



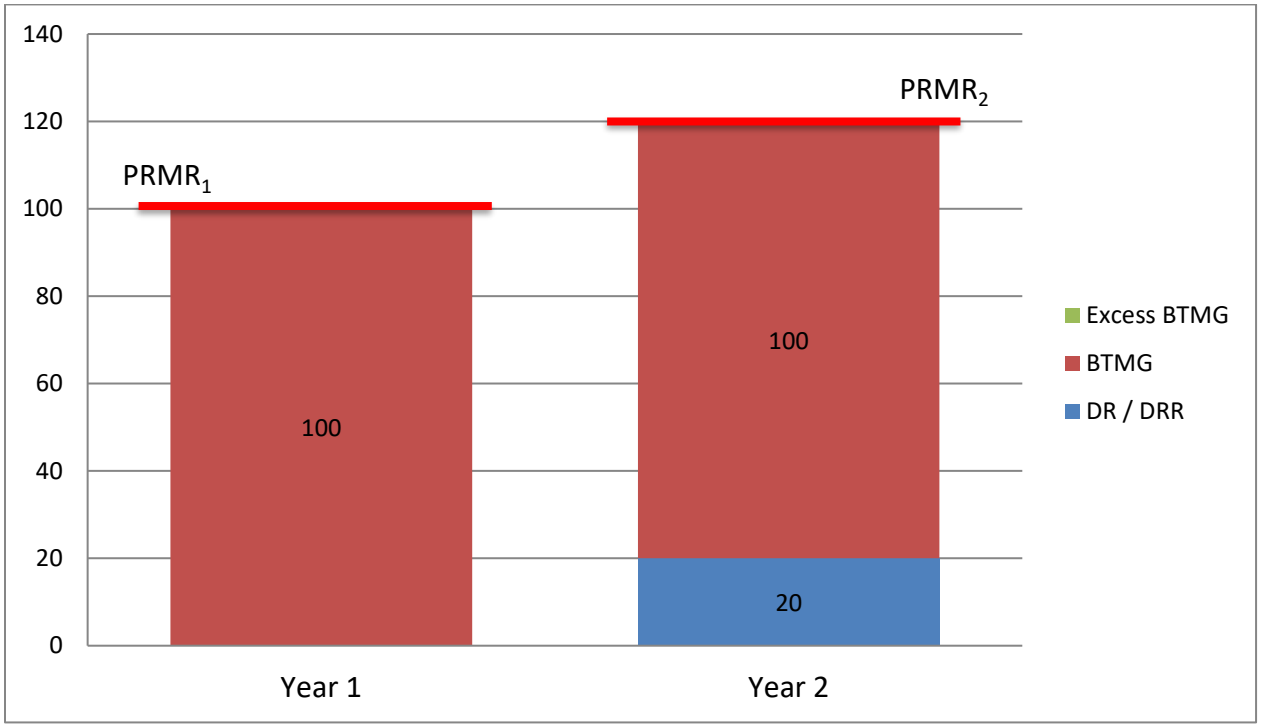
3. No Change to BTMG and Decrease to Seasonal PRMR

The chart below illustrates the scenario in which a Market Participant experiences a decrease in seasonal PRMR from one year to the next while BTMG SAC remains unchanged. In Year 1, the chart shows that the BTMG is 100 MW and the seasonal PRMR is 100 MW; therefore, the Market Participant has no “Excess BTMG” in Year 1. Between Year 1 and Year 2, the Market Participant experiences a decrease in seasonal PRMR of 20 MW, however, BTMG SAC remains unchanged. In Year 2, the chart shows that BTMG is 100 MW the seasonal PRMR is now 80 MW; therefore, the Market Participant has 20 MW of “Excess BTMG” in Year 2.



4. Equal Amount Increase in DR / DRR and Seasonal PRMR

The chart below illustrates the scenario in which a Market Participant experiences an equal increase in DR / DRR SAC and seasonal PRMR from one year to the next while BTMG SAC remains unchanged. In Year 1, the chart shows that the BTMG is 100 MW and the seasonal PRMR is 100 MW; therefore, the Market Participant has no “Excess BTMG” in Year 1. Between Year 1 and Year 2, the Market Participant experiences an equal increase in DR / DRR and seasonal PRMR of 20 MW each, however, BTMG remains unchanged. In Year 2, the chart shows that DR / DRR is 20 MW, BTMG is 100 MW and the seasonal PRMR is 120 MW. Since DR / DRR is netted against seasonal PRMR, the BTMG is stacked on top of the DR / DRR, however, due to the equal increase in DR / DRR and seasonal PRMR there is no “Excess BTMG” in Year 2.



Appendix T – ICAP Deferral Notice

ICAP Deferral Notice
Midcontinent Independent System Operator
720 City Center Drive
Carmel, IN 46032-7574
Attn.: Resource Adequacy
(Delivered via email to help@misoenergy.org)

[Current Date]

[Insert Company Name] ICAP Deferral Notice – [Planning Resource Name/CPNode Name, if applicable]
Select Planning Resource being deferred:
☐Generation Resource – [Insert CPNode Name, Unit Number]
☐Dispatchable Intermittent Resource (DIR) – [Insert Name]
☐Demand Response Resource (DRR) – [Insert Name]
☐External Resource – [Insert Name]
☐Behind the Meter Generation (BTMG) – [Insert Name]

Dear Resource Adequacy,

[Insert Company Name] is providing this written notification in accordance with Section 69A.7.9 of the Midcontinent Independent System Operator (MISO) Tariff, Module E-1 Resource Adequacy regarding an Installed Capacity (ICAP) Deferral for the Planning Resource selected above. [Insert Company Name] intends to increase ICAP between March 1 and the last Business Day of the applicable Season(s) for the [Insert Planning Year] Planning Year.

[Contact Name, Phone Number and Email]	Planning Resource Type
MISO MP ID/NERC ID of Company	
Planning Resource Name	
Local or External Resource Zone (LRZ or ERZ) where located	
Planning Resource Fuel Type	
Estimated ICAP Value (MW) *Note: this is the total ICAP value not the incremental increased value from a prior ICAP*	Summer
	Fall
	Winter
	Spring
Check applicable deferred Season(s)	Summer [ ], Fall [ ], Winter [ ], Spring [ ]
Estimated completion date of ICAP	
Reason for deferring (See Appendix U)	
Please fill out the following that is applicable to the Planning Resource being deferred:	
Generation Interconnection Agreement (GIA) Number and expected contract execution date *Note: only necessary if deferral includes upgrades to Interconnection Service*	

Expected NRIS and ERIS values with Interconnection Service upgrades	
Commercial Operation Date	
TSR Number	

Sincerely,
[Name], [Title – must be an officer], [Company Name], [Contact Information]

Appendix U – ICAP Deferral Examples

- Deliverability

Example 1: Unit is capable of testing at 150 MW, but currently only has 100 MW of NRIS with MISO. The unit is in the queue to have its NRIS increased to 150 MW by the last Business Day prior to the start of a Season in the upcoming Planning Year. Although the difference is 50 MW, the MP would submit an ICAP Deferral Notice for the total ICAP amount of 150 MW. For a Schedule 53 resource, even though the ICAP will increase, SAC will not. For a non-Schedule 53 resource, both ICAP and SAC will increase.

- Increased GVTC and Deliverability

Example 1: Unit currently tested for 100 MW and has 100 MW of NRIS. The unit is in the queue to have NRIS increased to 150 MW and plans to retest after upgrades are in place. Although the difference is 50 MW, the MP would submit an ICAP Deferral Notice for the total ICAP amount of 150 MW. Please note that the current unit should already submit a GVTC test of 100 MW by October 31.

- Commercial Operation

Example 1: The unit currently is subject to an environmental regulation that prevents the unit from operating. The unit is in the process of installing additional equipment to comply with the new environmental regulation. Thus, the unit is deferring GVTC until after all necessary approvals are completed.
Example 2: A resource that is a Dispatchable Intermittent Resource (DIR) would not submit GVTC, but instead receives capacity accreditation based on past historical data. If a DIR is new and is not expected to have Commercial Operation approved until after March 1, then it would be eligible to qualify for capacity credit by submitting an ICAP Deferral for Commercial Operation if Commercial Operation is expected before the last Business Day of prior to the deferred Season.
Example 3: The unit is currently waiting for upgrades to existing Interconnection Service and the upgrades have been completed, however, the unit has yet to be declared Commercial with MISO. The resource owner needs to file an Exhibit E with MISO Resource Integration to finalize the Commercial Operation of the unit. The unit must be in the March Commercial Model prior to the start of the Planning Year. Once this has been done, the Commercial Operation deferral will be considered complete. The resource owner should assist with coordination with MISO Resource Adequacy and MISO Resource Integration throughout the process.

- Suspension of Catastrophic Outage

Example 1: A unit is planning to return from suspension in August and will submit a new GVTC for the upcoming Fall Season prior to the last Business Day of the summer Season. Units returning from suspension are required to retest. The MP may defer the retested value.

- TSR Number

Example 1: A unit is planning to participate in the upcoming Planning Year; however, the unit does not have a Transmission Service Request (TSR) or NITS Scheduling Rights (SR) on the MISO OASIS with a status of "Confirmed" by March 1 to convert the SAC to ZRC to offer into the Auction. The unit expects to have its TSR or SR Confirmed by MISO prior to the last Business Day of prior to the start of the deferred Season. Once the TSR achieves "Confirmed" status on the MISO OASIS, the MP should reach out to help.misoenergy.org. If the TSR or SR status is "Confirmed" prior to June 1, the deferral requirement has been met.

- Additional GVTC Examples

Example 1: The unit defers 100 MW and the test submitted is for 80 MW. The unit is required to replace the UCAP value of 20 ICAP MW. For example, if the XEFORd for the unit is 25%, then the deferred ZRCs is 75 and the submitted test ZRCs is 60. The MP is required to replace the difference of 15 ZRCs through Resource Replacement, Interconnection Service, Cleared Volumes, Bi-lateral ZRC transactions, etc.

Appendix V – Solar and Run-of-River Hydro Accreditation

This appendix walks through examples for calculating solar and run-of-river hydro accreditation. For existing solar resources, the total Seasonal Accredited Capacity (SAC) is determined by the historical average output of the resource during the Summer, Fall, and Spring Seasons for the hours ending 15, 16, and 17 EST and for hours ending 8, 9, 19, and 20 EST for the Winter Season. Existing run-of-river hydro resources can submit up to 15 years of output data over the same hours as for solar resources, with total SAC determined by the median of that data. Market Participants will use the Non-GADS Performance Template found on the MISO website to submit the appropriate historical data for the upcoming Planning Year. The Non-GADS Performance Template can be found on the MISO website under Planning > Resource Adequacy > PRA Documents > PY (Current Plan Year). The populated template should be submitted to MISO by October 31 of each year via the Module E Capacity Tracking (MECT) tool.

For new solar resources, the maximum SAC that can be accredited is 50% for summer, fall, and spring and 5% for winter of the unit's registered maximum output or nameplate capacity. To convert all SAC to seasonal ZRCs, the resource would need to show firm deliverability through NRIS or ERIS with a firm TSR equaling the resource's ICAP value.

For existing solar resources, the historical performance used to calculate the resource's total SAC for a given Season is based on their average output over the defined seasonal peak hours for the last 3 years.

- The amount of total SAC that is convertible into ZRCs is based on the amount of deliverability (NRIS or ERIS with a firm TSR)
- Convertible SAC = total SAC * (deliverability-adjusted capacity factor / peak performance capacity factor)
- Where:
    - Peak performance capacity factor is calculated is calculated by taking an average of the resource's output and then dividing by nameplate capacity.
    - Deliverability-adjusted capacity factor is calculated by adjusting the adjusting output across the seasonal peak hours so that it is capped to the resource's deliverability, taking an average of the resource's output, and then dividing by nameplate capacity.

The examples below show how solar capacity credit is calculated for new resources in the Summer Season only—however, the examples may also be applied to run-of-river hydro resources as well. For the purposes of the examples, the following information will be used in each:

Solar Nameplate = 10 MW
Transmission Losses (vary by LBA) = 5%
Solar Class Average Summer Capacity Credit = 50%
Year 1 Average Historical Summer Output = 6.5 MW (Year 1 data only)
Year 2 Average Historical Summer Output = 7.0 MW (Average of Years 1 and 2 data)

Example 1: New solar (or run-of-river hydro) resources with less than 30 consecutive Summer days or no Summer data

In this example, the new solar resource does not have any historical Summer performance data to submit. Thus, the solar resource will receive the solar class average accreditation for the initial Summer Season in the Planning Year. In Year 2, the resource will use the average (run-of-river hydro resources use a median value) historical Summer performance from Year 1 to determine the accredited amount. In Year 3, the resource will use the average historical Summer performance from Years 1 and 2. In Year 4, the resource will use the average historical Summer performance from Years 1, 2, and 3. In Year 5, the average historical Summer performance from Year 1 will be replaced by Year 4 and the cycle will continue to repeat year-over-year using the 3 most recent years of average historical Summer performance. Below are examples of how both BTMG and CPNode solar resources will be accredited.

BTMG

Year 1 → SAC_{BTMG} = Nameplate capacity * seasonal class credit * (1 + Transmission Losses)
→ SAC_{BTMG} = 10 * 50% * (1 + 5%)
→ SAC_{BTMG} = 5.25

Year 2 → SAC_{BTMG} = 10 * (65%) (1 + 5%)
→ SAC_{BTMG} = 6.8 (rounded to tenth decimal place)

Year 3 → SAC_{BTMG} = 10 * (70%) (1 + 5%)
→ SAC_{BTMG} = 7.4 (rounded to tenth decimal place)

CPNode

Year 1 → Total SAC_{CPNode} = Nameplate capacity * seasonal class credit

→ Total SAC_{CPNode} = 10 * (50%)
→ Total SAC_{CPNode} = 5.0

Year 2 → Total SAC_{CPNode} = 10 * (65%) = 6.5

Year 3 → Total SAC_{CPNode} = 10 * (70%) = 7.0

Example 2: New solar resource with at least 30 consecutive Summer days

In this example, the new solar resource has at least 30 consecutive Summer days of performance. Thus, the solar resource will not receive the solar class average for the initial Planning Year. In Year 1, the average historical Summer performance from Commercial Operation data will be used to determine the accredited amount. In Year 2, the resource will use the average historical Summer performance from Year 1 and 2. In Year 3, the resource will use the average historical Summer performance from Years 1, 2, and 3. In Year 4, the average historical Summer performance from Year 1 will be replaced by Year 4 and the cycle will continue to repeat year-over-year using the 3 most recent years of average historical Summer performance.

BTMG

Year 1 → SAC_{BTMG} = Nameplate capacity * seasonal class credit * (1+ Transmission Losses)
→ SAC_{BTMG} = 10 * (65%) * (1 + 5%)
→ SAC_{BTMG} = 6.8 (rounded to tenth decimal place)

Year 2 → SAC_{BTMG} = 10 * (70%) * (1 + 5%)
→ SAC_{BTMG} = 7.4 (rounded to tenth decimal place)

CPNode

Year 1 → Total SAC_{CPNode} = Nameplate capacity * seasonal class credit
→ Total SAC_{CPNode} = 10 * (65%)
→ Total SAC_{CPNode} = 6.5

Year 2 → Total SAC_{CPNode} = 10 * (70%)
→ Total SAC_{CPNode} = 7.0

Once the total SAC value for a resource has been determined, it is compared with the Interconnection Service assigned to that resource. Resources that are fully deliverable are eligible to convert all of their total SAC to ZRCs with no further action needed.

For resources that are not fully deliverable, having either partial or no deliverability, the following steps would be used:

1) MISO calculates a deliverability-adjusted capacity factor for the resource.

2) For SAC not considered convertible, the Market Participant may choose to obtain firm Transmission service in some level to convert some or all of the undeliverable SAC to Convertible. MISO supplies documentation to the MP on the MECT tool that can be used to determine the level of SAC that can be converted given some level of firm Transmission obtained.

3) Subsequently, the MP uses the Confirm SAC function to move the desired Convertible SAC amount to the Convert SAC MECT page. Once there, the associated firm Transmission information is entered after selecting the ERIS SAC value.

4) After MISO approval of the firm Transmission data that was entered by the MP, the SAC may then be converted to ZRCs for use in the PRA.

SAC is allocated by type of Interconnection Service (NRIS or ERIS with a TSR). SAC associated with ERIS may be converted into Zonal Resource Credits for use in the PRA with an approved Transmission Service Request.

Appendix X – Hybrid and Co-Located Resource Accreditation

This appendix describes the accreditation process for Hybrid Resources and Co-Located Resources. A Hybrid Resource is defined as a resource that is comprised of two or more separate Electric Facilities that share a single Point of Interconnection and that provides a single energy offer in the MISO DA/RT Energy Markets. A Co-Located Resource is defined as a resource that is comprised of two or more separate Electric Facilities that share a single Point of Interconnection where each separate Electric Facility provides separate energy offers in the MISO DA/RT Energy Markets.

Hybrid Resources and Co-Located Resources will be accredited in one of two phases depending on how much operating data is available. The Phase I – Sum of Parts approach will apply default class accreditation values for each separate Electric Facility comprising the Hybrid Resource or Co-Located Resource. The Phase II – Availability-based approach will consist of tracking the historic availability of each separate Electric Facility of the Hybrid Resource or Co-Located Resource. A Hybrid Resource or Co-Located can be Phase I for a Season and then get Phase II for a subsequent Season that it has operational data for. Once a Hybrid Resource begins receiving Phase II availability-based accreditation, the resource will continue to receive Phase II availability-based accreditation.

For Co-Located Resources, allocation of total Interconnection Service at the shared Point of Interconnection among the separate Electric Facilities must be provided to MISO Resource Adequacy staff by the incumbent Asset Owner, or the Market Participant(s) representing the incumbent Asset Owner, prior to conversion of Seasonal Accredited Capacity (SAC) to Zonal Resource Credits (ZRCs).

Phase I – Sum of Parts

Each Hybrid Resource or Co-Located Resource may be operating in very different ways from other Hybrid Resources or Co-Located Resources with a similar configuration depending on the goals of the resource owner and operator. Until historical operating data exists, default class accreditation values for each separate Electric Facility comprising the Hybrid Resource or Co-Located Resource will be applied. Co-Located Resource owners must inform MISO how the total Interconnection Service granted at the shared Point of Interconnection should be allocated among each separate Electric Facility for conversion purposes. Phase I accreditation will apply for each Season until a minimum of 30 consecutive historical days of operation for the corresponding Season have been observed.

For Phase I, Market Participants must submit a populated Non-GADS Performance Template to MISO through the MECT for each separate Electric Facility that includes the nameplate capacity (or registered maximum output from the Commercial Model) and resource type of each Electric Facility, unless the Electric Facility qualifies as a Schedule 53 resource.

Phase II – Availability-based

Phase II accreditation will apply after a Hybrid Resource or Co-Located Resource has sufficient operating history to determine a resource-specific seasonal accreditation value.

Availability is measured as historical net output (exception for ESR below) and will be determined in the following ways:

- For Hybrid Resources, the combined historical net output of each Electric Facility, provided via a single populated Non-GADS Performance Template.
- For Co-Located Resources, the separate historical net output of each Electric Facility, provided via several populated Non-GADS Performance Templates.
- For the ESR component of a Hybrid Resource or Co-Located Resource, availability for a given hour will be measured as the maximum of the net output or the output potential on that hour. Output potential should be determined as the minimum of the Hourly Equivalent Discharge Amount or the state of charge minus the Emergency Minimum Energy Storage Limit for a given hour.

Market Participants must submit Non-GADS Performance Templates to MISO through the MECT. In addition to historical operating performance, populated Non-GADS Performance Templates must include nameplate capacity (or registered maximum output from the Commercial Model) and resource type.

Appendix Y – SAC Calculations for Schedule 53 Resources

This appendix describes the process of calculating Seasonal Accredited Capacity (SAC) for Schedule 53 Resources.

1. Identification of Resource Adequacy Hours

Resource Adequacy (RA) Hours represent the periods of highest risk and greatest need during a Season and throughout the year. They include Emergency Declaration periods and the hours when the operating margin, a measure of available supply capacity above Demand and reserve requirements, is at its lowest. RA Hours are determined seasonally and at a subregional level (North/Central and South) based on emergency events, the tightest operating margin hours (65 hours per Season), and a maximum operating margin threshold established at 25 percent.

RA Hours will be used to determine each resources' availability for calculating its seasonal accreditation. The number of RA Hours in a Season can exceed the target when a high number of hours during declared system or subregional emergencies occurs.

Provisions also ensure Seasons have a minimum target number of RA Hours by supplementing any deficient hours with Annual Average Offered Capacity (AAOC) over all RA hours across the year. The RA Hours used for determining the AAOC (or AAOC Hours) are the hours with emergency events and the tightest 3 percent of operating margin hours below the 25% threshold for each year, up to 260 hours per year. The AAOC Hours are determined on a sub-regional (North/Central and South) basis. Not all AAOC Hours are RA hours.

1.1 **Definition and Identification of RA Hours**

RA Hours are defined over the three most recent historical years from September - August, based on declared MaxGen alert, warning and event hours supplemented by the tightest 3 percent of hours per Season where the realized operating margin for the region is at or below the threshold of 25 percent.

1.1.2 Hourly Operating Margin Calculation

The Operating Margin is determined using historical information to identify RA Hours and AAOC Hours within the three (3) most recent periods beginning September 1 and ending August 31.

We first express the power balance between load and supply, where:

$$Load = Thermal\ Resource\ Energy + Renewable\ Energy + Net\ Scheduled\ Interchange \quad (1)$$

$$Supply = Thermal\ Resource\ EmergencyMax + Renewable\ Energy + Net\ Scheduled\ Interchange - Operating\ Reserve \quad (2)$$

Substituting (1) into (2), we have

$$Margin(MW) = [Thermal\ EmergencyMax + Renewable\ Energy + Net\ Scheduled\ Interchange\ (NSI)] - [Thermal\ Energy + Renewable\ Energy + Net\ Scheduled\ Interchange] - Operating\ Reserve = Thermal\ Resource\ EmergencyMax - Thermal\ Resource\ Energy - Operating\ Reserve$$

The power balance between equation (1) and (2) suggests the renewable Energy and net-scheduled interchange have been implicitly reflected in the margin calculation but has no impact on the overall margin calculation used for RA hour identification as in the steps below.

By re-arranging the $Margin(MW)$ and broken down to online and offline components, we re-express the Operating Margin Equation as below

$$Operating\ Margin\ (\%)_j = \frac{Online\ margin\ (MW)_j + offline\ margin\ (12\ hour\ leadtime)(MW)_j}{Real\ Time\ (RT)Load\ (MW)_j}$$

Where:

$$Online\ margin\ (MW)_j = \sum_{unit\ i\ in\ region\ j} (EmergencyMax_i - EnergyMW_i - cleared\ operating\ reserve_i)$$

for all Resources that are online and under normal dispatch control; and

$$Offline\ margin\ (MW)_j = \sum_{unit\ i\ in\ region\ j} (EmergencyMax_i - cleared\ offline\ supplement\ reserve_i)$$

for Resources where all of the following is true: (i) Resource is Offline; (ii) its cold-start lead-time is less than or equal to 12 hours; and (iii) it is not on outage.

Load Modifying Resource (LMR), and Emergency Demand Response (EDR) are excluded in the Online margin (MW) and Offline margin (MW) calculations because they require emergency declarations in order to access.

1.1.2 Selection of RA Hours

Hours during which MaxGen declarations are in effect automatically become RA Hours, including all MaxGen Alert, Warning, or Event hours declared in each Season within each of the three (3) most recent September-August periods.

For non-MaxGen declaration hours in each of the 12 Seasons of the past three-year period, additional RA Hours with the tightest margin will be identified until reaching the (65 hours) for

each Season; if a Season already has more than 65 hours because of MaxGen declaration, this step will be skipped.

Finally, a maximum margin threshold is applied to exclude hours with an operating margin greater than 25 percent.

Going through the steps above, some Seasons will have more than 65 hours because of MaxGen declarations, while some other Seasons may have less than 65 hours if there are hours excluded based on the 25 percent maximum margin threshold criterion and a low number of hours with MaxGen declarations, reflecting underlying Demand, supply and weather conditions. The deficiency from the 65 target hours leads to the need for AAOC Hour as described in the next section.

Additionally, each individual resource will have its own set of RA hours that are dependent on outage exemptions and whether it was designated for Resource Adequacy Requirements (RAR) in previous year's seasonal auctions. Like the system-wide RA hours, if a resource has deficient RA hours in a Season, that resource's AAOC will be supplemented for the deficient hours.

Non-RAR resources are not subject to SAC calculation using seasonal RA and AAOC hours.

If the unit was designated as RAR within the 3-year lookback period, the following logic will apply.

- When a unit is RAR and has 60 days or more during the 3-year lookback period of that particular Season's operational data, for that Season SAC will be calculated with that historical operational data. Operating days that a unit was in full outage will be excluded from the statistics.
- If the unit has less than 60 days of data designated as a RAR for that Season over the 3-year lookback period they will receive Schedule 53 seasonal class average SAC accreditation. Operating days that a unit was in full outage will be excluded from the statistics.
- For resources that have a generation capacity change due to upgrades or seasonalization that had a non-zero offer historically, the RT EmerMax will be prorated based on the capacity change/ICAP% of the historical offers, capped at the new GVTC of the resource.
- For resources that have a generation increase due to upgrades or seasonalization, that have zero historical offer information, will receive Schedule 53 seasonal class average SAC accreditation for that Season

- In the case where a schedule 53 generator was derated due to transmission limitations imposed by the incumbent Transmission Operator, the MP can work with MISO to determine if any exemptions for those hours can be granted
- Exemption status for a unit's outage should be validated and resolved with MISO if needed, per timeline defined in BPM-008 (Business Manual -- Outage Operations)

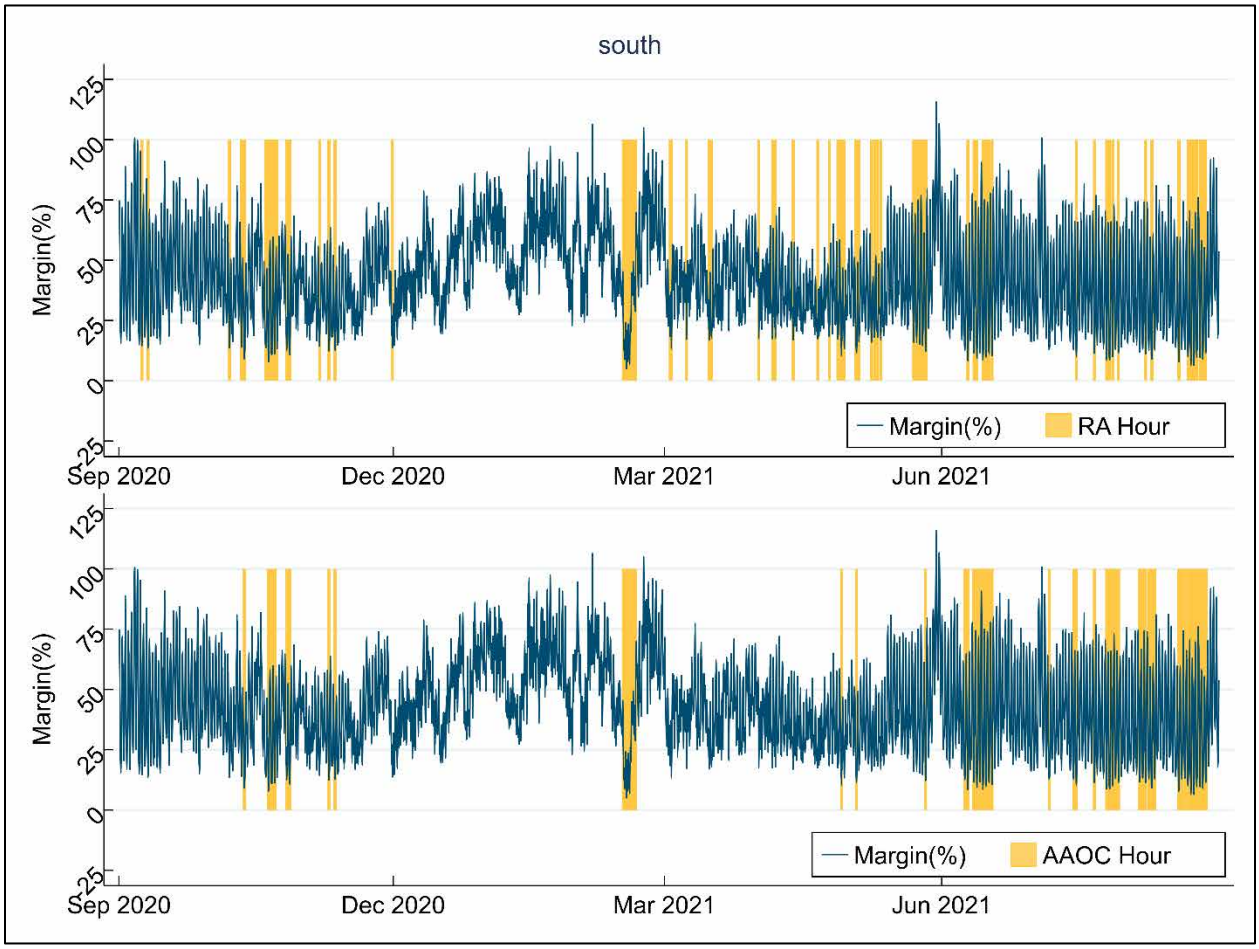
1.1.3 Selection of AAOC RA Hour

Hours where MaxGen declarations are in effect automatically become AAOC RA Hours, including all MaxGen Alert, Warning, or Event hours declared in each Season within the three (3) most recent periods.

For the rest of non-MaxGen declaration hours in each year of the past three-year periods, additional AAOC RA Hours with the tightest margin will be identified until reaching the (260 hours) for each year. For a unit to receive exemption for an AAOC hour they must have Tier 2 exemption during that hour.

1.1.4 Illustration of Selected RA Hour

The figure below, using South region as example, illustrates the variation of hourly Margin (%) between September 1, 2020, and August 31, 2021, and labels the selected RA Hour / AAOC Hour. In this example, there are 65 RA Hours identified in each of the four Seasons, hence the AAOC Hour will not be needed for backfilling any deficiency hour.



1.2 **Seasonal Accredited Capacity Calculation**

Resource Accreditation should reflect the anticipated capability and availability of Planning Resources during times when they are most needed. The following sections illustrate the two-tiered weighting structure to calculate Intermediate Seasonal Accredited Capacity (ISAC) reflecting general availability while emphasizing availability during times of greatest need. Each Resource will have its ISAC determined based on its Real-Time offered availability (Emergency Maximum Limit) during seasonal RA Hours (Tier 2) as described in Section 1.1 and Non-RA Hours (Tier 1).

1.2.1 Prepare Hourly Real-Time Offered Availability Dataset

The first step is to prepare the hourly Real-Time Offered Availability dataset for a Resource, including (1) hourly timestamp (EST); (2) offered Real-Time availability (EmerMax MW); (3) lead time(Start up time + Start up notification time) (in hours); (4) binary indicator if a resource is in outage from either the commit status or from records in Control Room Operations Window (CROW) Outage Scheduler; (5) binary identifier indicating if a Resource is online.; (6) ICAP (MW); and (7) binary indicator if a resource has received outage exemption.

Figure below provides a sample screenshot of the dataset, using a sample Resource located in Central/North region. If a Resource is in Derated status but not in outage, its offered availability already accounts for the impact of derates.

season	timeest	RT Offer EmerMax (MW)	Cold Leadtime (hours)	Outage Identifier (1=Out-of-Service)	Online Identifier (1=online)	ICAP	Outage Exemption Identifier (1=Exemption)
summer	2020-07-29 00:00:00	76	1	0		71.6	0
summer	2020-07-29 01:00:00	76	1	0		71.6	0
summer	2020-07-29 02:00:00	77	1	0		71.6	0
summer	2020-07-29 03:00:00	77	1	0		71.6	0
summer	2020-07-29 04:00:00	77	1	0		71.6	0
summer	2020-07-29 05:00:00	77	1	0		71.6	0
summer	2020-07-29 06:00:00	77	1	0		71.6	0
summer	2020-07-29 07:00:00	77	1	0	1	71.6	0
summer	2020-07-29 08:00:00	76	1	0	1	71.6	0
summer	2020-07-29 09:00:00	75	1	0	1	71.6	0
summer	2020-07-29 10:00:00	75	1	0	1	71.6	0
summer	2020-07-29 11:00:00	75	1	0	1	71.6	0
summer	2020-07-29 12:00:00	75	1	0	1	71.6	0
summer	2020-07-29 13:00:00	75	1	0	1	71.6	0
summer	2020-07-29 14:00:00	75	1	0	1	71.6	0
summer	2020-07-29 15:00:00	75	1	0	1	71.6	0
summer	2020-07-29 16:00:00	75	1	0	1	71.6	0
summer	2020-07-29 17:00:00	75	1	0	1	71.6	0
summer	2020-07-29 18:00:00	75	1	0	1	71.6	0
summer	2020-07-29 19:00:00	75	1	0	1	71.6	0
summer	2020-07-29 20:00:00	75	1	0	1	71.6	0
summer	2020-07-29 21:00:00	75	1	0	1	71.6	0
summer	2020-07-29 22:00:00	75	1	0	1	71.6	0
summer	2020-07-29 23:00:00	76	1	0	1	71.6	0

In sample data above, the outage indicator is set to 1 (outage) either if there is a valid full outage ticket in CROW or the unit was offered as outaged in real time for the specific hour. The online indicator is based on unit's control mode from ICCP data as described in 2.4.7 in BPM-031 (ICCP Data Requirement).

1.2.2 Prepare Calculation for Annual Average Offered Capacity (AAOC)

If a Resource does not have 65 RA hours in a Season, AAOC is needed for backfilling the availability during deficiency hours in later steps. To calculate AAOC, the RT Offer EmerMax data is paired with AAOC hours by timestamp. Availability (MW) during AAOC hour is then generated through these following steps:

(1) Set availability = Min (ICAP, Real-Time Offer EmerMax) during AAOC hour; this step caps RT Offer EmerMax at ICAP;

(2) Set availability = zero if a Resource is in outage (based on outage identifier) during AAOC Hour;

(3) Set availability = zero if a Resource is not online and not in outage and has lead time (Start up time + Start up notification time) greater than 24 hours during AAOC Hour.

(4) Set availability = NULL if a Resource has been granted outage exemption during AAOC Hour.

Figure below shows the sample dataset fragment after generating the availability (MW) during AAOC hour through the steps described above.

season	timeest	RT Offer EmerMax (MW)	Cold Leadtime (hours)	Outage Identifier (1=Out-of-Service)	Online Identifier (1=online)	ICAP	Outage Exemption Identifier (1=Exemption)	Annual RA Hour Identifier (Classic)	Availability in AAOC Hour (MW) after Outage Exemption
summer	2020-07-29 00:00:00	76	1	0		71.6	0		
summer	2020-07-29 01:00:00	76	1	0		71.6	0		
summer	2020-07-29 02:00:00	77	1	0		71.6	0		
summer	2020-07-29 03:00:00	77	1	0		71.6	0		
summer	2020-07-29 04:00:00	77	1	0		71.6	0		
summer	2020-07-29 05:00:00	77	1	0		71.6	0		
summer	2020-07-29 06:00:00	77	1	0		71.6	0		
summer	2020-07-29 07:00:00	77	1	0	1	71.6	0		
summer	2020-07-29 08:00:00	76	1	0	1	71.6	0		
summer	2020-07-29 09:00:00	75	1	0	1	71.6	0		
summer	2020-07-29 10:00:00	75	1	0	1	71.6	0		
summer	2020-07-29 11:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 12:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 13:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 14:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 15:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 16:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 17:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 18:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 19:00:00	75	1	0	1	71.6	0	1	71.6
summer	2020-07-29 20:00:00	75	1	0	1	71.6	0		
summer	2020-07-29 21:00:00	75	1	0	1	71.6	0		
summer	2020-07-29 22:00:00	75	1	0	1	71.6	0		
summer	2020-07-29 23:00:00	76	1	0	1	71.6	0		

1.2.3 Prepare Calculation for Intermediate Seasonal Accredited Capacity (ISAC)

To calculate SAC, the RT Offer EmerMax data is paired with RA Hour by timestamp. Availability (MW) during RA Hour is then generated through these following steps:

For availability during Tier 1 Non-RA Hour:

(1) Set availability = Min (ICAP, Real-Time Offer EmerMax) during Tier 1 Non-RA hour; this step caps RT Offer at ICAP;

(2) Set availability = zero if a Resource is in outage (based on outage identifier) during Tier 1 Non-RA Hour;

(3) Set availability = NULL if a Resource has been granted outage exemption during Tier 1 Non-RA Hour.

For availability during Tier 2 RA Hour:

(1) Set availability = Min (ICAP, Real-Time Offer EmerMax) during Tier 2 RA hour; this step caps RT Offer at ICAP;

(2) Set availability = zero if a Resource is in outage (based on outage identifier) during Tier 2 RA Hour;

(3) Set availability = zero if a Resource is not online and not in out-of-service outage and has lead time (start up time + Start up notification time) greater than 24 hours during Tier 2 RA Hour;

(4) Set availability = NULL if a Resource has been granted outage exemption during Tier 2 RA Hour.

Figure below shows the sample dataset fragment after generating the availability (MW) during seasonal Tier 1 and Tier 2 RA hour through the steps described above.

season	timeest	RT Offer EmerMax (MW)	Cold Leadtime (hours)	Outage Identifier (1=Out-of-Service)	Online Identifier (1=online)	ICAP	Outage Exemption Identifier (1=Exemption)	Seasonal RA Hour Identifier (Classic)	Availability in Seasonal Tier 1 (non-RA) Hour (MW) after Outage Exemption	Availability in Seasonal Tier 2 RA Hour (MW) after Outage Exemption
summer	2020-07-29 00:00:00	76	1	0		71.6	0		71.6	
summer	2020-07-29 01:00:00	76	1	0		71.6	0		71.6	
summer	2020-07-29 02:00:00	77	1	0		71.6	0		71.6	
summer	2020-07-29 03:00:00	77	1	0		71.6	0		71.6	
summer	2020-07-29 04:00:00	77	1	0		71.6	0		71.6	
summer	2020-07-29 05:00:00	77	1	0		71.6	0		71.6	
summer	2020-07-29 06:00:00	77	1	0		71.6	0		71.6	
summer	2020-07-29 07:00:00	77	1	0	1	71.6	0		71.6	
summer	2020-07-29 08:00:00	76	1	0	1	71.6	0		71.6	
summer	2020-07-29 09:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 10:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 11:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 12:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 13:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 14:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 15:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 16:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 17:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 18:00:00	75	1	0	1	71.6	0	1		71.6
summer	2020-07-29 19:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 20:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 21:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 22:00:00	75	1	0	1	71.6	0		71.6	
summer	2020-07-29 23:00:00	76	1	0	1	71.6	0		71.6	

1.2.4 Calculation of Annual Average Offered Capacity (AAOC)

For each of the past three years, the AAOC is calculated as the sum of availability over AAOC hours, divided by the total number of AAOC hours (excluding outage exemption hours) in each year, as shown in the table below for a sample resource.

CY	# AAOC Hours	Sum of Availability (MW) over AAOC Hours	Annual Average Offered Capacity (MW)
Formula Key	A	B	B/A
CY17Sept18Aug	260	15,990	62
CY18Sept19Aug	260	17,444	67
CY19Sept20Aug	243	17,171	71

1.2.5 Calculation of Intermediate Seasonal Accredited Capacity (ISAC)

For Non-RA Hours (Tier 1), Intermediate Seasonal Accredited Capacity is calculated as the sum of availability over seasonal Tier 1 Non-RA hours, divided by the total number of seasonal Tier 1 Non-RA hours across the past three years.

CY	Season	# of Tier 1 non-RA Hours after outage exemption	Sum of Availability (MW) over Tier 1 non-RA Hours after outage exemption	Tier 1 3-year average ISAC after outage exemption
Formula Key		A	B	C=SUM(B1, B2, B3)/SUM(A1, A2, A3)
CY17Sept18Aug	fall	2,119	3,509	
CY18Sept19Aug	fall	2,119	128,215	44
CY19Sept20Aug	fall	1,731	129,457	
CY17Sept18Aug	winter	2,095	131,376	
CY18Sept19Aug	winter	2,095	89,229	61
CY19Sept20Aug	winter	2,091	163,989	
CY17Sept18Aug	spring	2,143	147,505	
CY18Sept19Aug	spring	2,142	151,993	72
CY19Sept20Aug	spring	2,192	164,796	
CY17Sept18Aug	summer	2,143	154,731	
CY18Sept19Aug	summer	2,143	149,724	71
CY19Sept20Aug	summer	2,143	154,375	

For RA Hour (Tier 2), its Intermediate Seasonal Accredited Capacity is calculated as the sum of availability over seasonal RA hours and AAOC multiplied by the deficient RA hours, then averaged over total number of Tier 2 RA hours across the past three years. A particular Season will be excluded from a unit's tier 1 and tier 2 ISAC calculation if either condition is met: 1) a unit has not been designated as RAR for the Season or 2) it has not been offering into Real-Time market due to an exempt outage for the whole Season.

CY	Season	# of Tier 2 RA Hours after outage exemption	Sum of Availability (MW) over Tier 2 RA Hours after outage exemption	Deficient # of Tier 2 hours	Annual Average Offered Capacity (MW) after outage exemption	Sum of Availability (MW) over Deficient hours	Sum of total Availability (MW)	Sum of Tier 2 hours	Tier 2 3-year average ISAC after outage exemption
Formula Key		A	B	C = Max((65 hours-A), 0)	D	E=C*D	F=B+E	G=A+C	H=SUM(F1, F2, F3)/SUM(G1, G2, G3)
CY17Sept18Aug	fall	65	0	0	62	0	0	65	
CY18Sept19Aug	fall	65	4,788	0	67	0	4,788	65	47
CY19Sept20Aug	fall	31	1,949	34	71	2,402	4,352	65	
CY17Sept18Aug	winter	65	5,348	0	62	0	5,348	65	
CY18Sept19Aug	winter	65	3,274	0	67	0	3,274	65	68
CY19Sept20Aug	winter	4	321	61	71	4,310	4,631	65	
CY17Sept18Aug	spring	65	4,784	0	62	0	4,784	65	
CY18Sept19Aug	spring	55	3,256	10	67	671	3,927	65	68
CY19Sept20Aug	spring	16	1,178	49	71	3,462	4,640	65	
CY17Sept18Aug	summer	65	4,683	0	62	0	4,683	65	
CY18Sept19Aug	summer	65	4,678	0	67	0	4,678	65	72
CY19Sept20Aug	summer	65	4,674	0	71	0	4,674	65	

1.2.6 Tier Weighting of ISAC

The final Intermediate Seasonal Accredited Capacity (ISAC) value is the weighted averaged over its values from two tiers as calculated from steps above. The corresponding tier weightings are:

	Weighting by Planning Year		
Tier	2023- 2024 Planning Year	2024-2025 Planning Year	2025-2026 Planning Year and beyond
$ISAC_{Tier1\_weighting}$	40%	30%	20%
$ISAC_{Tier2\_weighting}$	60%	70%	80%

$$ISAC = ISAC_{Tier\ 1\ MW} \times ISAC_{Tier\ 1\ weighting} + ISAC_{Tier\ 2\ MW} \times ISAC_{Tier\ 2\ weighting}$$

The table below illustrates the ISAC of a sample resource.

WEIGHTED ISAC by SEASON with outage exemption	Season	ISAC
	fall	46
	winter	67
	spring	69
	summer	72

1.2.7 Final conversion to SAC

Lastly, the ISAC is converted back to SAC in UCAP term using the formula and as illustrated in the sample table below. The Conversion Ratio is calculated for each Season on a system-wide basis for all Schedule 53 resources.

$$SAC = ISAC \times Conversion\ Ratio_{UCAP/ISAC}$$

Conversion Ratio UCAP / ISAC	Season	SAC
1.1754	fall	54
1.131	winter	75
1.152	spring	80
1.068	summer	77

The following rules are applied for determining units to be included/excluded in ratio calculations.

1. Only resources are included in both LOLE study and SAC calculations for the same Season of planning year are included in the UCAP/ISAC ratio calculation.2. Resources that are granted with a class average for one or multiple Seasons, are not included in ratio calculation for the Season(s)

1.2.8 SAC calculation for Combined Cycle (CC)units

Due to complicated nature of modeling and market participation options for combined cycle units, MISO will calculate their ISAC/SAC values based on how they are modeled and historically been offered into the Real-Time market, and how the combined cycle units submit their test capacity (GVTC) data in MISO GADS data:

1. If the owner of combined cycle unit submits GVTC data on the parent CP node only, MISO will calculate the SAC value on the parent node, by combining the Real-Time children's offer data if needed and capped at the latest GVTC. MISO will only provide planned outage exemptions for the SAC calculation, if all of the children units are fully outaged with valid exempt outage requests.

2.If the owner of combined cycle unit submits GVTC data on the children's CP nodes, or submits GVTC data on the parent node, but with specified % split of each children node, MISO will calculate SAC values for each children CP node. MISO may need to split the Real-Time offer (Emergency Max) based on the % ratios of all the children's GVTC data, if needed. In this scenario, each children's exempt outage will be reflected in their own SAC calculations.

1.2.9 SAC calculation for Jointly Owned Units (JOU)

Jointly Owned Units (JOUs) SAC values will be calculated the same way as regular units as long as the owners submit their separate GVTC data in the MISO GADS system. For units that have experienced ownership and/or share percentage changes within the last 3 years where Real-Time offer data is used, MISO may need to combine all the owner's Real-Time offers, capped by their total GVTC and then split again based on the latest GVTC ratios among ownerships before calculating each owner's SAC values.

1.3 **Class Average based SAC calculation**

New Schedule 53 Resources or existing Resources that do not have at least 60 days of Real-Time offered availability when designated for RAR over the last three (3) years for each Season (Summer, Fall, Winter, Spring) will have a SAC based on the class average SAC to ICAP Ratio for its Resource type. MISO will calculate Schedule 53 class averages based on existing GADS fuel type categories from the existing MISO Schedule 53 fleet.

Per MISO's discretion and agreement with the resource owner, MISO may grant the unit class average, if a unit's operation and offer history no longer represents its future economical and physical characteristics.

Class averages (% values) are calculated based on units with sufficient Real-Time offer in each resource type by dividing their total seasonal ISAC values divided by total effective ICAP (lesser of GVTC or interconnection service):

$$Class\ Average\ \%_{type\ of\ resource} = \sum_{type\ of\ resource} ISAC \Big/ \sum_{type\ of\ resource} Effective\ ICAP$$

For units whose SAC is calculated based on a class average, their class average % is applied to the unit's ICAP (lesser of GVTC or Interconnection Service) to determine the ISAC. The UCAP/ISAC ratio per Season will then be applied to identify the final SAC for the Season

1.4 SAC conversion to ZRC

1.4.1 Allocate Total SAC into NRIS SAC and ERIS SAC based on Interconnection Service:

Schedule 53 Resource's Total SAC is allocated into NRIS SAC and ERIS SAC based upon its type of Interconnection Service.

$$Total\ SAC = NRIS\ SAC + ERIS\ SAC$$

To the extent the Planning Resource has Network Resource Interconnection Service (NRIS) or was determined to be aggregate deliverable through the market transition deliverability test, then that quantity will be allocated first to calculate the NRIS SAC as defined in Module E 69A.4.5

$$NRIS\ SAC = \min(NRIS, ICAP) \times \frac{Total\ SAC}{ICAP}$$

The remaining balance of Total SAC is allocated to ERIS SAC with following formula:

$$ERIS\ SAC = \max\big(0, (ICAP - NRIS)\big) \times \frac{Total\ SAC}{ICAP}$$

1.4.2 Eligibility of NRIS SAC and ERIS SAC Conversion into seasonal Zonal Resource Credits

The NRIS SAC represents capacity in MW that is eligible to be converted into seasonal Zonal Resource Credits.

In determining the amount of ERIS SAC eligible for conversion into seasonal ZRCs, the deliverability of any ERIS must be determined prior to ERIS SAC conversion. ERIS must be paired with firm Transmission Service that covers the entire Season to be considered deliverable. NRIS is automatically considered deliverable and does not require an additional Transmission Service Request. The full amount of ERIS SAC can be converted to ZRCs if the resource is fully deliverable to its ICAP amount.

Total SAC which can be converted into seasonal ZRCs are the summation of the Planning Resource's NRIS SAC plus the lesser of the resource's ERIS with firm Transmission Service. .

Attachment LL

2025-08-21 Modified Attachment Y Notice

VIA EMAIL

Andrew Witmeier
Director of Resource Utilization
Midcontinent Independent System Operator, Inc.
720 City Center Drive
Carmel, IN 46032

August 21, 2025

Re: Modified Suspension Date for Campbell Units 1, 2, & 3

Mr. Witmeier:

On December 14, 2021, Consumers Energy Company ("Consumers Energy") submitted an Attachment Y Notice to the Midcontinent Independent System Operating, Inc. ("MISO") for the suspension of Units 1, 2, and 3 at the J.H. Campbell Generation Complex ("Campbell Plant"), effective June 1, 2025. After reviewing for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ("Tariff"), MISO determined the suspension of Campbell Plant Units 1, 2, and 3, would not result in violations of applicable reliability criteria, as outlined in the Tariff. On March 11, 2022, MISO approved the suspension of Campbell Plant Units 1, 2, and 3 without the need for the generators to be designated as System Support Resource units as defined in the Tariff.

On May 23, 2025, the U.S. Department of Energy ("DOE") issued Order No. 202-25-3 (the "Order"), requiring the Campbell Plant to be available to MISO through August 20, 2025. On May 28, 2025, consistent with Section 38.2.7(d)(ii)(1) of the Tariff, Consumers Energy notified MISO of its intent to modify the Attachment Y Notice suspension date from June 1, 2025, to August 21, 2025.

On August 20, 2025, the DOE renewed the Order, requiring the Campbell Plant to be available to MISO through November 19, 2025. In order to comply with the Order, Consumers Energy hereby provides notice to MISO, consistent with Section 38.2.7(d)(ii)(1) of the Tariff, of its intent to modify the current Attachment Y Notice such that the Campbell Plant will now suspend on December 3, 2025, to account for the DOE Order period plus a reasonable ramp down period at the close of the DOE Order.

As noted in Consumers Energy's original Attachment Y Notice, Campbell Unit 3 is jointly owned by Consumers Energy (93.3%), CPNode CONS.CAMPBELL3, Michigan Public Power Agency (4.8%), CPNode CONS.CA3.MPPA, and Wolverine Power Supply Cooperative (1.9%), CPNode CONS.CA3_WPSC. The Company attests that it has notified all Campbell Unit 3 owners of this submittal.

In the event you have any questions regarding this matter, please contact Derek Anspaugh at (517) 788-1869.

Regards,



Sri Maddipati
VP Electric Supply
1945 W. Parnell Rd
Jackson, MI 49901

Attachment M

MPSC Case No. U-21775, Capacity Demonstration Results Report, May 12, 2025

MPSC
MICHIGAN PUBLIC SERVICE COMMISSION

Capacity Demonstration Results

Planning Year 2028/29

Case No. U-21775

May 12, 2025

MPSC Staff

LARA
LICENSING AND REGULATORY AFFAIRS

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Executive Summary

All Michigan load serving entities (LSE)s required to file capacity demonstrations with the Michigan Public Service Commission (MPSC) for planning year 2028/29 pursuant to MCL 460.6w and the Commission Order in Case No. U-21775 have filed. Staff has audited the filings, contracts, and other materials and finds that all Michigan LSEs have satisfied the capacity demonstration requirements and have procured appropriate levels of resources for planning year 2028/29, except one agency representing municipalities which will be discussed further below.

Staff projects that the Midcontinent Independent System Operator, Inc. (MISO) Local Resource Zone (LRZ) 7, which consists of Michigan's lower peninsula excluding the southwest corner of the state located in Indiana Michigan Power Company's (I&M) service territory, will have sufficient resources to meet its planning reserve margin requirements and local clearing requirements (LCR) in all four seasons for the compliance year (2028/29).[1]. For MISO LRZ 1 and LRZ 2, the majority of which are in other states not subject to MCL 460.6w, Staff does not have sufficient detail to project the capacity positions of these zones. Staff projects that the I&M service territory in Michigan will have sufficient capacity to meet PJM's requirements for the prompt and compliance years.

The most recent OMS-MISO Survey results indicate that MISO will have an 11.8GW deficit to a 2.4 GW surplus by Summer 2028, depending on the amount of potential new capacity able to be added each year (the low projection assumes 2.3 GW/year and the high projection assumes 6.1 GW/year). Projections for other seasons of 2028/29 Planning Year are as follows: Fall ranges from .9 GW deficit to 14.3 GW surplus, Winter ranges from .4 to 15.6 GW surplus, and Spring ranges from 8.8GW deficit to 6.4GW surplus. In addition, projections for each subregion in Summer and Winter were published, showing the North/Central subregion ranging from a 10.4 GW deficit to 0.6 GW surplus in Summer 2028 and 0.3 to 11.3 GW surplus in Winter 2028/29[2] The MISO-OMS Survey no longer projects future capacity positions for individual LRZs, however the survey does show individual LRZ's potential to meet their LCR in each season of the prompt year. Both LRZ 1 and 2 show sufficient capacity to meet obligations in Planning Year 2025/26.

MISO's 2025/26 Planning Resource Auction (PRA) results indicated sufficient capacity at the regional, subregional, and zonal levels, with the summer price reflecting the highest risk and a tighter supply-demand balance. Systemwide surplus (above the target Planning Reserve Margin or PRM) offered into the auction dropped 43%

[1] This projection is based on the filed capacity demonstrations and information from MISO available at the time of this report and is dependent on several variables including but not limited to: load growth, delays in completion of planned resources, and changes to MISO's resource adequacy construct.

[2] 2024 OMS-MISO Survey Results, June 20, 2024.

compared to last summer, despite the lower target PRM (7.9% vs 9.0% last year). In terms of GW, the systemwide surplus capacity in the summer has reduced from ~6.5 GW in 2023, to 4.6 GW in 2024, to 2.6 GW this Planning Year.

MISO noted in its 2025 PRA Results[3] that new capacity additions did not keep pace with the capacity lost due to retirements/suspensions, decreased accreditation of certain resources, and fewer available external resources. MISO continues to reform its resource adequacy construct under the Reliability Imperative to address emerging risks due to fleet transition, new load additions, and retirements of dispatchable units.

[3] MISO 2025/26 PRA Auction Results

Background

On September 15, 2017, in Case No. U-18197, the Commission directed all Michigan LSEs to file capacity demonstrations annually pursuant to MCL 460.6w. This report outlines the results of the capacity demonstrations filed for planning year 2028/29 as directed by the Commission in Case No. U-21775 and represents the eighth annual capacity demonstration report. Prior year capacity demonstration reports can be found in the following dockets:

- 2021/22: Case No. U-18441
- 2022/23: Case No. U-20154
- 2023/24: Case No. U-20590
- 2024/25: Case No. U-20886
- 2025/26: Case No. U-21099
- 2026/27: Case No. U-21225
- 2027/28: Case No. U-21393

In Case No. U-21775, for the 2028/29 planning year, the Commission ordered[4] investor-owned utilities with one million or more customers[5] to file capacity demonstrations by February 24, 2025, investor-owned utilities with less than one million customers[6] by March 3, 2025, and alternative electric suppliers (AES),[7] cooperatives (co-ops), and municipal utilities on or before March 17, 2025.

The purpose of these demonstrations is to ensure that each electric utility owns or has contractual rights to capacity sufficient to meet its capacity obligations as set by the MISO, PJM, or the Commission, as required by MCL 460.6w.

Pre-Demonstration Process

As with previous years, Staff offered LSEs the opportunity to meet with Staff to discuss the capacity demonstration requirements and review relevant materials prior to the

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[4] August 22, 2024 Order in Case No. U-21775.

[5] Consumers Energy Company, DTE Electric Company.

[6] Alpena Power Company, Indiana Michigan Power Company, Northern States Power Company-Wisconsin, Upper Michigan Energy Resources Corporation, and Upper Peninsula Power Company.

[7] AEP Energy Inc, American Rural Cooperative, BP Energy Retail Company, LLC, Calpine Energy Solutions LLC f/k/a Noble Americas Energy Solutions LLC, CMS ERM Michigan LLC, Constellation NewEnergy Inc, Dillon Power LLC, Direct Energy Business f/k/a NRG Energy Inc., Direct Energy Services LLC, Energy Harbor LLC, Energy International Power Marketing Corporation, Energy Services Providers Inc., ENGIE Power & Gas f/k/a Plymouth Rock Energy LLC, Interstate Gas Supply LLC, Just Energy Solutions Inc, MidAmerican Energy Services LLC, Nordic Energy Services LLC, Spartan Renewable Energy, Texas Retail Energy, LLC U.P. Power Marketing LLC, and Wolverine Power Marketing Cooperative Inc.

final filing deadlines. Several LSEs met with Staff remotely and clarified the process before filing reports in the docket. Staff found that the pre-filing consultations were helpful in resolving questions prior to filing. Staff will continue to offer pre-filing consultations each year to resolve potential issues prior to the filing deadlines.

Capacity Demonstration Filings

On or before February 24, 2025, capacity demonstrations were received from DTE Electric Company and Consumers Energy Company. On or before March 3, 2025, capacity demonstration filings were received from Alpena Power Company, Indiana Michigan Power Company, Northern States Power Company, Upper Michigan Energy Resources Corporation (UMERC), and Upper Peninsula Power Company (UPPCO). Many LSEs filed confidential information under seal as part of the electric utilities' filings. Staff reviewed this information and met with LSEs as needed.

On or before March 17, 2025, capacity demonstration filings were received from American Rural Cooperative, Bayfield Electric, Calpine Energy Solutions, LLC., City of Escanaba, City of Stephenson, City of Wakefield, Cloverland Electric Cooperative, CMS ERM, Constellation New Energy Inc., Croswell Light and Power, Daggett Electric Department, NRG Energy f/k/a Direct Energy Business, LLC, Energy Harbor, Michigan Public Power Agency, Michigan South Central Power Agency (MSCPA), Newberry Water and Light Board, Union City Electric Department, Wolverine Power Supply Cooperative, and WPPI Energy.

Several AESs filed letters in Case No. U-21775 indicating that they are currently not serving customers in Michigan.[8]

All LSEs, apart from MSCPA (see below), were able to procure the necessary capacity to demonstrate compliance for the current planning year in all four seasons. Two LSEs' filings indicated a shortage of capacity in the compliance year compared with projections of forecasted growth. MCL 460.6w requires all LSEs to demonstrate enough resources to cover *prompt* year obligations, and both entities met this requirement. After reviewing these filings, staff has determined that these entities have demonstrated sufficient capacity, and notes that both entities are in negotiations to acquire the appropriate amount of capacity needed to meet their forecasted growth.

Staff conducted an audit for each capacity demonstration filing received and requested additional information from the LSEs when necessary. Staff has reviewed all contracts included in capacity demonstrations from AESs as well as most of the contracts from co-ops, electric utilities, and municipalities. In addition to the required

[8] AEP Energy Inc., BP Energy Retail Company, LLC, Dillion Power LLC, Direct Energy Services LLC, Energy Services Providers, Inc., Interstate Gas Supply LLC, Just Energy, ENGIE Power and Gas, Energy International Power Marketing, MidAmerican Energy Services LLC, Nordic Energy Services LLC, Texas Retail Energy, LLC, and UP Power Marketing.

compliance year (PY 2028/29), most demonstrations included updates for the 2025/26 planning year through the 2028/29 planning year.[9] The order opening the docket in U-21775 directed all entities to file data for the prompt and interim years, as well as the compliance year. Most entities complied but some of the municipal and cooperative utilities continued to only provide information for the compliance year (PY 2028/29). For these entities, Staff was able to estimate the amount of capacity available for the prompt year and interim years by projecting the amount included for planning year 2028/29 backwards for three years.

Staff recommends the Commission continue to direct all LSEs to include updated prompt year and interim year capacity obligation and resource information in future filings. Staff uses this information to help track changes in load and resources and to project the zonal resource adequacy more closely in these years. In addition, Staff recommends the Commission direct LSEs to provide MECT screenshots of their load obligations (PRMR/PLC) to facilitate the Storage Target calculation used to comply with Public Act 235.[10]

At the time of this report MSCPA[11] did not have rights to sufficient capacity to meet its obligations. MSCPA is in the process of negotiating a bilateral contract to meet the deficiency with the intent to submit a revised capacity demonstration filing by the self-imposed deadline of September 1, 2025, showing that MSCPA has sufficient resources to meet its requirements. Staff meet with MSCPA on April 30, 2025 to discuss and to urge MSCPA to complete the process as soon as possible. Staff is prepared to review any future filings by MSCPA and file a memo to this docket updating the Commission on the issue following MSCPAs revised filing.

[9] The required demonstrations for planning years 2026/2027 and 2027/28 were made in the 2023 capacity demonstration (Case No. U-21225) and the 2024 capacity demonstration (Case No. U-21393).

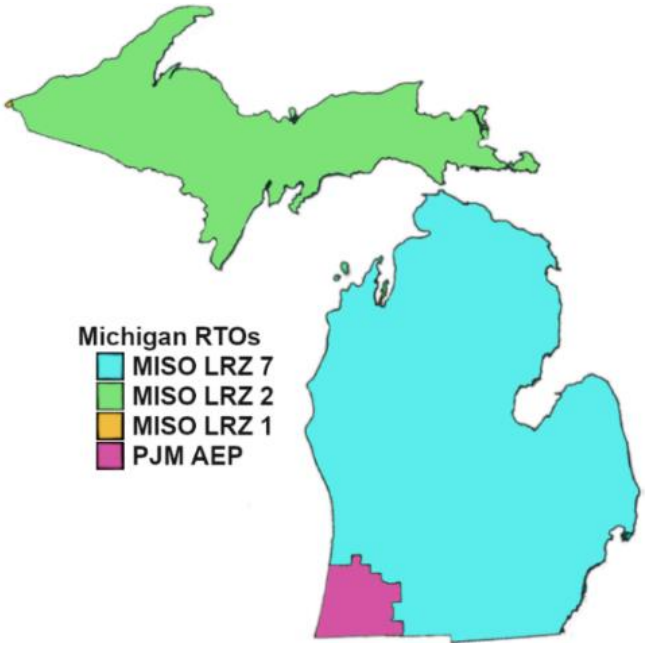
[10] See January 23, 2025 Order in Case No. U-21571

[11] MSCPA member municipal utilities include Clinton, Coldwater, Hillsdale, and Marshall.

Overview of Zonal Adequacy

Michigan contains load that spans two regional transmission operators (RTO)s: MISO and PJM. The majority of Michigan's load is located within MISO and is split between several LRZs. The exception is the Southwest corner of the Lower Peninsula which is located within the PJM RTO through I&M's service territory. PJM and MISO have different resource adequacy constructs and capacity obligations. The different RTO regions in Michigan are illustrated in Figure 1.

Figure 1: RTO Zonal Regions in Michigan



MISO Resource Adequacy

Michigan LSEs serve load in MISO Local Resource Zones 1, 2, and 7. MISO's capacity construct is for the upcoming year (prompt year) only. LSEs must demonstrate sufficient resources to meet their current prompt year requirement four years forward to comply with MCL 460.6w.

MISO establishes capacity obligations for all LSEs based on peak load forecasts and a planning reserve margin percentage (PRM) necessary to meet the North American Electric Reliability Corporation's (NERC) Loss of Load Expectation (LOLE) standard of 1 day in 10 years. LSEs within MISO can meet their capacity requirements either through a Fixed Resource Adequacy Plan (FRAP), self-schedule, Reliability Based Demand Curve (RBDC) opt-out (new this planning year, see more detail below), paying the capacity deficiency charge, or through the Planning Resource Auction (PRA). The PRA is a residual market for LSEs that choose not to utilize other participation options or do not have enough capacity resources, either owned or purchased bilaterally, to satisfy their capacity obligations, and thus need to purchase additional resources.

Within MISOs resource adequacy construct, the Planning Reserve Margin Requirement (PRMR) and the Local Clearing Requirement (LCR) must be satisfied to meet the LOLE standard. The Initial PRMR is determined through LOLE modeling based on the coincident MISO peak forecast and resources adjusted as necessary to meet the standard. PRMR resources are not location specific, i.e. they can come from outside an LSE's zone. Individual LSEs are responsible for their own share of the zone's PRMR. The ability to use imports to meet PRMR makes it likely all zones will meet this requirement. Failure to meet PRMR would only occur if there were not enough resources available within all of MISO's footprint or in the subregion (MISO North/Central or MISO South) given subregional transmission constraints

The LCR is the minimum capacity for a zone required to be located within the zone to meet the LOLE standard, while accounting for the LRZ's ability to import. The LCR is for the entire zone collectively, and not a requirement for individual LSEs; there is currently no LCR requirement applicable to individual LSEs in Michigan pursuant to MCL 460.6w. The LCR is determined by performing a LOLE analysis on each zone individually, to determine the Local Reliability Requirement (LRR), or the resources a zone would need to meet the loss-of-load standard if it were separated from MISO. Separately, MISO determines the import and export limits for each zone by performing a seasonal transfer analysis study. The study produces Zonal Import Ability (ZIA) and Zonal Export Ability (ZEA) values, which are then adjusted by the amount of controllable exports to non-MISO load to determine Capacity Import Limits (CIL) and Capacity Export Limits (CEL). The ZIA is an input to the LCR calculation, and the LCR, CEL, and CIL, and subregional constraints are inputs to the PRA clearing process.

In Planning Year 2023/24, MISO implemented a seasonal resource adequacy requirement for each summer, fall, winter and spring season and a seasonal accredited capacity (SAC) methodology for certain resources participating in MISO's

PRA to align with real time availability and planned outages. Staff reviewed these changes with participants in its 2022 and 2023 technical conferences as a part of the Commission's June 22, 2022 Order in U-21099, and results of these activities included requiring entities to file capacity demonstrations showing resources to meet obligations in all four seasons, modifications to the filing timeline, and adoption of ISO-neutral language into the process and requirements. Commencing PY 2024/25, the Commission's July 26, 2023 Order in U-21393 directed LSEs in MISO to demonstrate seasonal capacity obligations based on the MISO seasonal resource adequacy construct. LSEs are obligated to demonstrate enough capacity (owned or contracted) to meet that LSE's capacity obligation for each season. The specific capacity obligation for each season will be the LSE's prompt year (upcoming year) Initial Planning Reserve Margin Requirement for each respective season.

On June 27, 2024, the FERC accepted MISO's Reliability-Based Demand Curve (RBDC) tariff revision to incorporate sloped demand curves into the PRA. The vertical demand curve used in the PRA since the 2009/2010 Planning Year failed to properly value incremental capacity, did not facilitate efficient investment and retirement decisions necessary to maintain the resources needed to meet system reliability, and was inefficient at pricing capacity accurately.[12]

If a LRZ does not have sufficient resources to meet its seasonal requirements, the entire LRZ clears at the LRZ's seasonal Cost of New Entry (CONE) value. If a LRZ does not have sufficient resources to meet its seasonal requirements in more than one season, the PRA clearing price would be determined as described in section 69A.7.1 of Tariff Module E-1. CONE varies from zone to zone and changes from year to year but for reference, for 2025/26 CONE is $130,930/MW-year ($358.71/MW-day) in Zone 7.[13] The PRA clearing price being set at CONE would have economic ramifications and should provide a signal to entities with responsibilities regarding resource adequacy within the zone. However, it is important to note that MISO's resource adequacy construct is based on probabilistic determinations and failure to meet the requirements of the resource adequacy construct would not mean that the LRZ in question will experience a loss of load event. It simply means the probability of such a loss of load event would exceed the generally accepted criteria that govern the resource adequacy planning process.

Details on the Reliability-Based Demand Curve Tariff Revision

MISO introduced sloped demand curves in its resource adequacy construct through the implementation of RBDCs in the 2025 PRA. Specifically, MISO utilizes distinct sloped demand curves at both the systemwide and subregional levels. The systemwide RBDC addresses overall reliability needs across the entire system, while the subregional RBDCs capture additional reliability requirements specific to each subregion. As a result, for each season, MISO develops one systemwide RBDC and two

[12] Direct Testimony of Todd Ramey, FERC ER23-2977, p.8
[13] MISO Cost of New Entry (CONE) and Net CONE Calculation for PY 2025/2026

subregional RBDCs, one for each subregion aka Planning Area (MISO North/Central and MISO South). Ultimately, MISO seeks to develop and employ RBDCs at the LRZ level; however due to the complexity of developing another ten curves for each season, they have delayed this effort until a later date. Each sloped demand curve is developed using its respective Marginal Reliability Impact (MRI) Curve, expressed in MWh/UCAP MW-year, which provides information about the value of the reliability improvements brought about by additional capacity, and a Scaling Factor to support annual revenue prices driving toward annualized Net CONE when the system is at the reliability requirement in all four seasons. Net CONE, expressed in $/UCAP MW-year, is the net annualized cost to develop new capacity resources. For more information and detail on development of RBDCs, see the Reliability-Based Demand Curves Conceptual Design White Paper.[14]

The RBDCs fundamentally change the objective function of the PRA, from minimizing as-offered costs to minimizing the difference between supply offers and demand offers to maximize social surplus. The clearing quantities may vary from the initial PRMR, but the value of the reliability contribution of any additional MWs cleared must be greater than or equal to the cost of procuring those MWs. The PRA is conducted using an optimization to simultaneously complete the following tasks: (1) meet the supply demand balance both for MISO and for each of the two Planning Areas (MISO North/Central and MISO South); (2) meet the LCR for each LRZ; (3) efficiently use transmission transfer capability between LRZs; and (4) respect the Sub-Regional Power Balance Constraint. Step 1 of the auction clearing process solves an optimization problem to identify which type of RBDC produces a higher MW obligation for a given subregion, share-of-Systemwide or Subregional. Step 2 of the process solves the clearing and pricing problem based on the RBDC identified in step 1 and outputs both the resource clearing (Final PRMR) and the auction clearing price (ACP) for each LRZ and External Resource Zone. A final step verifies the solution found in step 2. The auction clearing price is determined by where the supply offer curve meets the applicable RBDC, and is equal to the marginal cost of capacity, the regional marginal cost of capacity, the marginal cost of financially binding LCR, CEL, and CIL for an LRZ, and the marginal cost of financially binding Subregional Export Constraints and Subregional Import Constraints. For more information on auction clearing under RBDC see Appendix M of MISO's Business Practice Manual 11.[15]

Within the RBDC proposal, MISO established the RBDC Opt-Out mechanism, which allows an LSE to opt out of the PRA if the Relevant Electric Retail Rate Authority (RERRA) does not deny the opt out plan. LSEs who choose the RBDC Opt-Out provision cannot include a partial opt-out, shall be locked-in for three consecutive years, and must include the RBDC Opt-Out Adder % in their obligation. The RBDC Opt-Out Adder % is based on a seasonal average of RBDC clearing for the prior three

[14] Reliability-Based Demand Curves Conceptual Design White Paper
[15] MISO BPM-011-r31 Appendix M

planning years, or a simulated PRA clearing if prior year RBDC-based PRA clearing is not available. In PY 2025/26, no LSEs chose to opt out in any LRZ in MISO.

Future Resource Adequacy Construct Changes

MISO has recently filed or is currently working on FERC filings to address issues and challenges related to demand side resources, including Demand Response Participation Rules Enhancements, Elimination of Dual Registration, DR and ER reforms (formerly known as LMR reforms). Also, MISO aims to implement enhanced resource adequacy risk modeling and a Direct Loss-of-Load (DLOL) accreditation methodology (FERC Docket ER24-1638-000 filed 3/28/2024) beginning in planning year 2028/29. MISO has committed to publishing indicative accreditation results based on the DLOL methodology prior to each Planning Resource Auction, starting with Planning Year 2025-2026[16]. These reforms will align PRMR with accreditation of all resource classes. MISO continues its work on the PRMR piece of the reforms, therefore indicative PRMR values under DLOL are not yet available. Several LSEs inquired whether DLOL accreditation methodology should be used in this case since the demonstration year aligns with the first year of DLOL implementation. Staff recommended and continues to recommend that demonstrating LSEs follow the prompt year MISO resource adequacy construct. The Commission should determine a timeline to implement MISO's DLOL accreditation changes into the state capacity demonstration process if it deems it necessary to implement prior to MISO tariff changes effective PY 2028-29.

The compliance year capacity obligations (PY 2028/29) that are demonstrated for in this case are based off an LSE's prompt year (PY 2025/26) requirement. Changes to load, resources, and MISO procedures in the upcoming years can lead to discrepancies between an LRZ having sufficient capacity to meet its four-year forward Michigan requirements and not having enough capacity to meet MISO's requirements when the prompt year arrives.

MISO – Local Resource Zone 7

Figure 2 shows historical annual MISO capacity requirements for LRZ 7. This data is taken from the respective annual MISO LOLE Study Reports.

[16] Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results

Figure 2: Annual MISO LOLE Report Data LRZ 7

Planning Year	Source	LRR[17]	CIL[18]	LCR (ZRCs)[19]
2013/14	MISO 2013 LOLE Report	25,305	4,576	20,729
2014/15	MISO 2014 LOLE Report	24,815	3,884	20,931
2015/16	MISO 2015 LOLE Report	24,710	3,813	20,897
2016/17	MISO 2016 LOLE Report	24,715	3,813	21,309
2017/18	MISO 2017 LOLE Report	24,654	3,320	21,334
2018/19	MISO 2018 LOLE Report	24,545	3,785	20,760
2019/20	MISO 2019 LOLE Report	24,845	3,211	21,634
2020/21	MISO 2020 LOLE Report	25,370	3,200	22,170
2021/22	MISO 2021 LOLE Report	25,054	4,888	20,166
2022/23	MISO 2022 LOLE Report	24,115	3,749	20,366
2023/24[20]	MISO 2023 LOLE Report	24,428	5,087	19,341
2024/25	MISO 2024 LOLE Report	24,558	4,500	19,271
2025/26	MISO 2025 LOLE Report	23,250	3,569	19,681

These numbers typically change slightly between the LOLE Study and the PRA, primarily due to updated load forecasting used in the PRA but can be used to see how the capacity requirements have changed over time. Changes in these requirements can have economic and reliability impacts and will continue to be monitored.

In its seasonal construct, MISO includes an LRR, ZIA, and PRMR for each zone for each season. The current year MISO requirements are shown in comparison with Planning Year 2024-25 requirements in Appendix B.

The difference between a zone's PRMR and its LCR is sometimes referred to as Effective Capacity Import Limit (ECIL). The ECIL is not a MISO defined term and is not representative of a physical import limitation. To meet the loss of load standard and avoid the auction clearing price being set at CONE, a zone must have enough resources located within the zone to meet its LCR even if the LCR exceeds the PRMR. Note the year-over-year decrease in CIL in PY 2025/26. This decrease is driven by generation and transmission changes in LRZ 7 Local Balancing Authorities (LBAs), their neighboring LBAs, and the LBAs adjacent to

[17] **Local Reliability Requirement**. Representative of the resources required for LRZ 7 to meet the LOLE standard when modeled as an island (no imports). MISO Loss of Load Expectation Study Report, Table 2-1 through 2-4.
[18] **Capacity Import Limit**. Representative of the ability of an LRZ to import capacity from areas outside of that LRZ. MISO Loss of Load Expectation Study Report, Tables ES-3 through ES-6.
[19] **Local Clearing Requirement**. Representative of the minimum resources that must be located within a specific zone for that zone to meet the reliability standard. Calculated as shown in Table 1.1 of MISO Loss of Load Expectation Study Report.
[20] Values for summer season starting Planning Year 2023/24. Other seasons shown in Appendix C.

these neighbors. Historically, Michigan utilities have assumed a CIL of approximately 3200 MW for input in capacity expansion modeling conducted during the development of Integrated Resource Plans and other planning exercises.

Figure 3 shows a comparison of LRZ 7 aggregated resources demonstrated, plus known undemonstrated resources likely to still be available, for each season in the 2028/29 planning year and MISO's resource adequacy requirement for PY 2025/26. Appendix C contains seasonal capacity position tables for the prompt, interim, and demonstration years. These numbers represent Staff's current projection based on the capacity demonstration filings and MISO publications at the time of this report although the information is subject to change for all forward years. Unless otherwise noted, resources and resource requirements in this report are in Unforced Capacity (UCAP) Megawatts (MW), equal to Zonal Resource Credits (ZRCs).

Figure 3: U-21775 Results – PY 2028/29 LRZ 7 Capacity Position (ZRCs)

Line #		Summer	Autumn	Winter	Spring
1	Planning Reserve Margin Requirements (PRMR)	21,228	20,494	16,124	19,853
2	Local Reliability Requirement (LRR)	23,250	23,312	20,262	21,619
3	Capacity Import Limit (CIL)	3,569	5,115	4,762	5,166
4	Zonal Import Ability (ZIA)	3,569	5,115	4,762	5,166
5	Local Clearing Requirement (LCR) (L1-L4)	19,681	18,197	15,500	16,453
6	Total Owned	17,981	16,378	14,542	16,263
7	Total PPA Contracts	4,321	4,086	2,981	4,175
8	Total ZRC Contracts	610	573	309	543
9	Total Qualified Demand Response	1,502	845	793	879
10	Total Resources (sum of L6 through L9)	24,415	21,883	18,624	21,860
11	LCR Demonstrated Position (L10-L5)	4,734	3,686	3,124	5,406
12	PRMR Demonstrated Position (L10-L1)	3,187	1,389	2,501	2,006
13	Net Undemonstrated Capacity	241	264	538	323
14	Anticipated LCR Position (L11+L13)	4975	3950	3662	5729
15	Anticipated PRMR Position (L12+L13)	3428	1653	3039	2329

(1) PY 2025 PRMR from PRA Data and held constant at prompt year value.

(2) PY 2025 LRR from PRA Data and held constant at prompt year value (LRR=LCR+ZIA).

(3) PY 2025 CIL from PRA Data and held constant at prompt year value.

(4) PY 2025 LCR from PRA Data and held constant at prompt year value.

(5-9) Zone 7 resources included in capacity demonstrations sorted by resource type.

(10) LCR position based on demonstrated resources only.

(11) PRMR position based on demonstrated resources only.

(12) Net Undemonstrated Zone 7 Capacity is Staff's attempt to reconcile the capacity demonstration resources with the MISO PRA. There are resources located in Zone 7 that Staff anticipates will be in the PRA that were not included in any capacity demonstration as well as a small number of resources included in the capacity demonstration that are no longer available due to recent events.

(13) LCR Position after accounting for undemonstrated Zone 7 Capacity.

(14) PRMR position after accounting for undemonstrated Zone 7 capacity. A negative value means the Zone will need to import resource to meet its requirement. A positive value means the Zone may import resources based on economics but will not need to meet its PRMR.

Prompt Year (PY 2025/26) and Compliance Year (PY 2028/29)

For the prompt year (PY 2025/26), based on the PRA Results posted April 28, 2025,[21] LRZ 7's summer Initial PRMR is 21,228 ZRCs and the LCR is 19,681 ZRCs. The total LRZ 7 resources offered in the PRA for the summer season in the prompt year is 20,884 ZRCs, which exceeds the anticipated LCR by 2,203 ZRCs, however falls short of the zone's portion of PRMR. The zone relied on 785.5 ZRCs of external resources to meet its resource adequacy requirement target. Other seasons' data is shown in Appendix C.

All resources offered into the North/Central subregion were cleared, and the final PRMRs as determined through auction clearing were greater than the initial targets (Initial PRMRs) in all seasons. In other words, the auction cleared above seasonal reliability targets, representing additional reliability value at cost-competitive prices. The "effective" PRMs are calculated from the Final PRMRs (determined by auction clearing):

2025 PRA Results	Initial PRM	Final Cleared PRM
Summer	7.9%	9.8%
Fall	14.9%	17.5%
Winter	18.4%	24.5%
Spring	25.3%	26.8%

Based on the resources included in the capacity demonstration filings for PY 2028/29 Staff projects LRZ 7 to have a surplus of resources compared to the projected LCR in all four seasons, as shown in Figure 4. It is important to note that these projections are subject to change. A few examples of things that could change include load forecasts, resource availability and performance, and MISO policies and practices.

MISO has previously provided projections of both PRMR and LRR into the compliance year from the prompt year. These calculations were not available to Staff at the time of its report. In absence of projected PRMR/LRR values, Staff has assumed these values remain constant for the purposes of this comparison.

Interim Years (PY 2026/27 & PY 2027/28)

Appendix C also includes data and projections for each season in the interim years, PY 2026/27 & PY 2027/28. This information is derived using the same methodology as described for the compliance year. Comparing those projected requirements to the demonstrated and undemonstrated resources in LRZ 7, results in a capacity surplus for both years compared to the projected LCRs. This information is based on the best information currently available to Staff, but includes several assumptions and, again, is subject to change. Similar to the

[21] 2025 MISO PRA Results, accessed May 2, 2025

compliance year, likely changes include new forecasts, unknown resource additions or subtractions, changes in generator performance, increased or decreased zonal import ability, seasonal variability, and/or changes to MISO requirements. It is also worth noting that the capacity margin looks to be tight in 2026/27 across all four seasons with the tightest capacity position in the Fall season.

MISO – Local Resource Zone 2

MISO's LRZ 2 encompasses almost the entire upper peninsula of Michigan as well as northern and eastern Wisconsin. MISO LRZ 2 has seasonal CILs of 4,370 MWs in Summer, 6,537 MWs in Fall, 6,522 MWs in Winter, and 6,439 MWs in Spring.[22] MISO does not define MW capacity imports or export limits between states within the boundaries of the same MISO LRZ. Considering LRZ 2 includes LSEs from Wisconsin (not subject to MCL 460.6w), the data available to Staff for LRZ 2 from capacity demonstration filings is not comprehensive enough to project a zonal capacity position as Staff did in its analysis of LRZ 7. Nevertheless, all Michigan LSEs serving load within MISO LRZ 2 demonstrated sufficient resources to meet their requirements.

The 2025 MISO PRA results indicate an installed capacity surplus in the 2025/26 planning year for LRZ 2.[23]

MISO – Local Resource Zone 1

A very small fraction of Michigan's upper peninsula load is located in LRZ 1. Northern States Power, Bayfield Electric Cooperative, and the City of Wakefield municipal utility have less than 37 MW combined in MISO LRZ 1. All LSEs in LRZ 1 demonstrated sufficient capacity to meet their obligations for PY 2028/29. The 2025/26 MISO PRA results show sufficient capacity for each season in the 2025/26 planning year, relying on a small amount of imports to meet their resource adequacy target in Winter and Spring. [24]

[22] Id
[23] Id
[24] Id

PJM Resource Adequacy

A few LSEs in Michigan serve load within the PJM RTO. These LSEs are still subject to the requirements of MCL 460.6w requiring sufficient capacity for four years forward in planning year 2028/29. PJM LSEs demonstrate sufficiency by providing evidence that the LSE complies with its PJM obligations.

LSEs in the PJM service territory must meet capacity obligations either through participation in PJM's Reliability Pricing Model (RPM) Base Residual Auction (BRA) or through PJM's Fixed Resource Requirement (FRR) plan. The FRR plan is an alternative to the RPM, where an LSE must demonstrate to PJM that it has enough resources to cover its projected load plus an additional reserve requirement. Both the RPM and the FRR resources are subject to monetary penalties if they fail to maintain PJM's reliability standard. PJM's resource adequacy construct is based on annual requirements.

The largest LSE in PJM is Indiana Michigan Power Company (I&M).[25] I&M elects to file an FRR plan each year. I&M's most recent capacity demonstration indicates that the company plans to continue with the PJM FRR plan barring any major FERC-ordered changes. Staff reviewed I&M's filing and finds that they have sufficient resources to meet its obligations at PJM.

In addition to I&M's capacity demonstration, Staff also reviewed information of cooperative and municipal utility obligations in the Michigan portion of PJM's territory for planning year 2028/29. The results are displayed in the table below.

Figure 4: PJM Capacity Demonstration Summary

Item	PY 2025/26	PY 2026/27	PY 2027/28	PY 2028/29
Utility Total Planning Resources, MW	3825	4462	4695	4359
Other PJM Resources, MW	295.2	336.8	350.8	321.8
Total PJM Resources, MW	4120.2	4798.8	5045.8	4680.8

Staff expects that the LSEs in the Michigan portion of PJM will continue to meet the PJM capacity obligations based on information included in individual capacity demonstrations. If PJM LSEs were to encounter an unanticipated shortfall in the immediate future, Staff expects that it would be accommodated through the procurement of reserve resources by market purchases. As market conditions may change over time, Staff will continue to monitor the resource adequacy of the PJM

[25] Indiana Michigan Power Company is an electric operating company of American Electric Power Company, Inc. (AEP). I&M is a wholly owned subsidiary of AEP and is operated as a single utility in the American Electric Power System (AEP System).

region and the capacity plans of Michigan LSEs located within the PJM territory. As reaffirmed in the Company's most recent IRP, filed in Case No U-21189,[26] Staff does not anticipate I&M to have any issues meeting capacity obligations.

The Commission order in Case No. U-16090 set I&M's customer choice cap amount to zero, and was subsequently reset to ten percent on February 1, 2019, pursuant to the Commission order and MCL 460.10a(1)(c). On February 1, 2019, I&M began enrolling customers in its choice program and is now fully subscribed at the cap. Currently I&M is responsible for the capacity of its choice load in its FRR plan under the PJM RAA. If suppliers were to choose to self-supply capacity, then that capacity would also need to be included in I&M's FRR plan.

The North American Electric Reliability Corporations 2024 Long-Term Reliability Assessment categorizes PJM as having elevated risk level post 2026, with resource additions not keeping up with generator retirements and demand growth, and winter season replacing summer as the higher-risk period due to generator performance and fuel supply issues.[27]

The PJM Base Residual Auction (BRA) schedule has experienced delays awaiting FERC action on capacity auction related issues. The following timeline shows the published BRA schedule of auctions every six months until they can get back to the original schedule (every May, three years in advance of the delivery year):

- July 2025 2026/27 BRA
- December 2025 2027/28 BRA
- June 2026 2028/29 BRA
- December 2026 2029/30 BRA

Commencing in Planning Year 2025/26, PJM has introduced a more robust risk model while simultaneously implementing the Effective Load Carry Capability (ELCC) methodology for all assets. These changes are expected to result in lower accreditation amounts for demand-side resources and lower load obligations for every entity.

LSE Capacity Demonstration Results (PY 2028/2029)

Staff appreciates the time and effort made by all Michigan LSEs to comply with the provisions of MCL 460.6w, as well as to comply with the questions, audits, contract reviews, and requests for additional information throughout this process. The LSE capacity demonstration results are reported for planning year 2028/2029 because, following the initial capacity demonstration which covered four years, only the fourth year forward is required for compliance. As previously described in its September 15, 2017 order in Case No. U-18197, the Commission requested a table be included in this

[26] MPSC Case No. U-21189, Direct Testimony of Stephan F. Baker, p. 7, February 28, 2022.
[27] NERC 2024 Long-Term Reliability Assessment

report that identifies the capacity by type for each individual electric provider without revealing the identity of any specific electric provider. The requested table with a breakdown for each electric provider that filed a capacity demonstration is included as Appendix A. In addition to the breakdown by individual supplier, Staff reports the following aggregate results in Figure 5 below.

Figure 5: Resource Breakdown (%) by Supplier Type Planning Year 2028/29 - Summer

Supplier Type	Owned	DR	Contract – PPA	Contract - ZRC	Auction
Muni/Co-Op Aggregate	58.5%	0.3%	29.3%	8.9%	3.0%
AES Aggregate	0.7%	0.2%	2.1%	96.5%	0.5%
Utility Aggregate	71.8%	5.3%	16.1%	1.8%	5.0%

Demand Response

As part of its analysis, Staff reviewed the LSEs' demand response (DR) programs as an optional source of capacity. When used by a LSE, a reduction in demand through DR programs offsets a portion of their capacity needs. LSEs can utilize interruptible DR during critical peak times to quickly respond to bulk electric system needs which can delay future capital investment in new generation. Behavioral DR programs allow the utility to lower its peak demand forecast, thus mitigating the need for an equal of amount supply side resources.

Demand response played a prominent role in LSEs' integrated resource plan filings, where DR is required to be considered along with traditional supply side resources for meeting capacity needs. MCL 460.6t directs Staff to complete a statewide study of DR potential in Michigan every five years, and the most current Michigan Demand Response Potential Study was issued on September 24, 2021.[28] In addition, the Commission approved Michigan Integrated Resource Planning Parameters on November 21, 2017 in Case No. U-18418 that include provisions regarding including DR options in future integrated resource plans and Staff is currently working to update those parameters.

The DR levels assumed in both Consumers Energy's and DTE Electric's current integrated resource plans[29] are reflected in their capacity demonstration filing. Staff will continue to monitor these plans and the use of DR in Michigan for the foreseeable future.

[28] Michigan Demand Response Statewide Potential Study (2021-2040), Guidehouse, September 24, 2021.

[29] DTE's current IRP filed and approved in MPSC Case No. U-21193.
CE's current IRP filed in MPSC Case No. U-21090.

Demand Response Aggregation

Pursuant to the September 15, 2017 Order in Case No. U-18369, the Commission affirmed that AESs may offer DR programs to their customers through a curtailment service provider (CSP) or third-party aggregator. The Commission made this determination in the context of finding that it will continue to review DR programs offered by AESs as part of the capacity demonstration process.

As the Relevant Electric Retail Regulatory Authority (RERRA), the Commission is aware of aggregation of approximately 85 ZRCs of DR offered into the 2025 MISO capacity market. Staff continues to work with CSPs, ARCs and MISO to ensure that aggregated DR's load modifications are accounted for when dispatched on MISO's coincident peak and continues to monitor the discussions taking place regarding FERC Order 2222.

ZRC Contracts

Staff recommended that forward ZRC contracts be used for capacity demonstration purposes to specify delivery of the ZRCs in the MISO Module E Capacity Tracking (MECT) tool prior to the applicable PRA auction. This year's demonstration shows an increase in the percentage of ZRC contracts utilized this year by the utilities, municipal utilities and cooperatives compared to last year.

An important thing to note is that ZRCs are defined in MISO's tariff and are created in the prompt year when UCAP for supply-side and demand-side resources are converted into ZRCs in the MISO MECT. ZRCs for any year further out than the prompt year are projected and don't become ZRCs until the prompt year. ZRCs are fungible products that can be sold or transferred, and in some cases, sold more than once. The characteristics of ZRCs allow for them to be easily traded and tracked within the MISO MECT. MISO has a view into the source and transfers of those ZRCs that occur prior to the PRA in the prompt year, and those ZRC transfers are audited by Staff as a secondary check on the ZRC contracts utilized in the capacity demonstrations.

At this point in time, the overall amount of ZRC contracts included in capacity demonstration filings do not impact Staff's ability to continue to make forward resource adequacy projections on a zonal basis. Staff will continue to monitor and audit ZRC contracts and ZRC transfers within the MECT going forward.

AES Load Switching

Staff requested that any AES who experienced load switching during this time provide a signed affidavit confirming the increase or reduction in their load compared to the PLC data provided by the utility with their capacity demonstration that contained the amount of load switching for each planning year. Each supplier contracting for additional customer load provided a copy of its affidavit confirming this transaction to the supplier that was losing the load to

be accounted for in both suppliers' demonstrations. The load switching process was made more complex with the change to a seasonal construct.

Staff continues to see an increase in the amount of load switching among entities. To better organize and facilitate the filing process, Staff recommends that filing entities who include load switching information in their filing include it within the Contracted Resources on the spreadsheet templates provided for the capacity demonstration for the demonstration years as well as the interim years. Staff also recommends that both the losing and the gaining suppliers have copies of the load switching affidavits in each of their filings, so Staff is able to easily cross check that the load is being accounted for.

Capacity Retirements and Additions

NERC's 2024 Long Term Reliability Assessment shows added resource capacity on the Bulk Power System (BPS) falling short of industry projections the year prior[30], illustrating an over-projection of natural gas, solar PV, and wind resources and giving evidence to project delays. The Lawrence Berkeley National Laboratory published results of an interconnection queue study in April 2024 assessing that only 19% of the projects (and just 14% of capacity) that submitted interconnection requests from 2000 to 2018 reached commercial operations by the end of 2023.[31] In recognition of the interconnection backlog risk, some RTOs have taken steps to address these issues, including PJM's Reliability Resource Initiative, MISO's work to reduce queue cycle times through automation, and MISO's Expedited Resource Addition Study (ERAS) process which is currently awaiting FERC approval.

The state of Michigan continues to follow national trends showing a tightening capacity position due to the scheduled retirements outpacing the buildout of replacement capacity. Staff had the opportunity to meet with several LSEs to discuss their filings and many expressed concerns about the dwindling amount of capacity available in the compliance year, especially season-specific contracts and bilateral contracts in general. Various factors could cause delays for new additions, including broad economic factors such as supply chain constraints, labor shortages, high component prices, etc., as well as delays associated with obtaining permitting, regulatory approval, or interconnection queue delays. The issue may be further exacerbated should demand increase faster than expected due to unanticipated loads such as data centers, as well as electrification of the building and transportation sectors. Staff has noted a significant number of planned resources used as demonstrated capacity in this case and recent previous cases that have not come to fruition in the demonstration year as planned, with estimates in the range of 900-1000MW/year removed from the list of planned resources due to delays or cancellations. There are many instances of

[30] NERC 2024 LTRA, p.24.
[31] Queued Up: 2024 Edition, Lawrence Berkely National Laboratory, April 2024.

this occurring with IRP-identified resources, consequently Staff met with both large investor-owned utilities to discuss this issue in depth and determine what actions can be taken to overcome the delays. One of these utilities indicated they are in the process of quantifying project delays and terminations, and early estimates showed an average delay of ~1.5 years past Commercial Operation Date (COD) and a project failure rate greater than 25%.

A portion of the capacity from the Palisades Nuclear Power Plant was included as demonstrated capacity starting in Spring 2026. The remainder of the capacity from Palisades is being contracted by an LSE in Indiana. However, all the capacity from Palisades would provide resource adequacy benefits to MISO LRZ 7 and be counted towards meeting the LCR for LRZ 7. Re-opening of this plant is conditional on approval from the Nuclear Regulatory Commission (NRC).

Conclusion and Recommendations

All Michigan LSEs required to file capacity demonstrations with the Michigan Public Service Commission for planning year 2028/29 pursuant to MCL 460.6w and the August 22, 2024 Commission Order in Case No. U-21775 have filed. Staff has audited the filings, contracts and other materials and finds that all Michigan LSEs have satisfied the capacity demonstration requirements and have procured appropriate levels of resources for planning year 2028/29, with the exception of one agency representing municipalities, as previously described.

Staff appreciates the cooperation of all Michigan LSEs with respect to this process and the willingness to provide data and answer questions necessary for Staff to complete its review.

A summary of recommendations included in this report is below:

1. Staff recommends the Commission continue to direct all LSEs to include updated prompt year and interim year capacity obligation and resource information in future filings.
2. Staff recommends the Commission direct all LSEs to provide MECT screenshot of their prompt load obligations (PRMR/PLC) to facilitate the Storage Target calculation used to comply with Public Act 235.
3. The Commission should determine a timeline to implement MISO's DLOL accreditation changes into the state capacity demonstration process if it deems it necessary to implement prior to MISO tariff changes effective PY 2028-29.
4. Staff recommends that filing entities who include load switching information in their filing include it within the Contracted Resources on the spreadsheet templates provided for the capacity demonstration for the demonstration years as well as the interim years. Staff also recommends that both the losing and the gaining suppliers have copies of the load switching affidavits in each of their filings, so Staff is able to cross check that the load is being accounted for.

Appendix A

Planning Year 2028/29 Resource Breakdown (%) by Individual Supplier[32]

LSE	Owned	DR	Contract - PPA	Contract - ZRC	Auction
Supplier 1	30%	0%	63%	0%	7%
Supplier 2	0%	24%	0%	76%	0%
Supplier 3	0%	0%	100%	0%	0%
Supplier 4	0%	0%	0%	100%	0%
Supplier 5	61%	8%	30%	0%	0%
Supplier 6	55%	0%	21%	18%	6%
Supplier 7	0%	0%	0%	100%	0%
Supplier 8	49%	51%	0%	0%	0%
Supplier 9	0%	0%	0%	100%	0%
Supplier 10	0%	0%	0%	100%	0%
Supplier 11	0%	0%	0%	100%	0%
Supplier 12	9%	9%	81%	0%	0%
Supplier 13	0%	0%	100%	0%	0%
Supplier 14	0%	0%	100%	0%	0%
Supplier 15	49%	4%	6%	1%	41%
Supplier 16	0%	0%	100%	0%	0%
Supplier 17	0%	0%	0%	100%	0%
Supplier 18	87%	6%	6%	0%	0%
Supplier 19	67%	0%	35%	-2%	0%
Supplier 20	51%	8%	41%	0%	0%
Supplier 21	44%	25%	32%	0%	0%
Supplier 22	73%	0%	21%	6%	0%
Supplier 23	100%	0%	0%	0%	0%
Supplier 24	0%	0%	0%	100%	0%

[32] Suppliers (municipal and cooperative electric utilities) that combined their capacity resources are shown as one supplier in the above figure. The total number of suppliers may vary from year to year based on changes to which suppliers combine their capacity demonstrations as well as new suppliers or suppliers no longer serving load in Michigan.

Appendix B

LRZ 7 Local Clearing Requirement								
	A	B	C=A+B	D	E=C*D	F	G	H=E-F-G
	Zonal Coincident Peak Forecast (ZCPF)	Transmission Losses	LRZ Peak Demand	LRR UCAP/LRZ Peak Demand from LOLE	Local Reliability Requirement (LRR)	Zonal Import Ability (ZIA)	Controllable Exports	**Local Clearing Requirement (LCR)**
Summer								
2025	19791.9	638.8	20430.7	1.138	23250.1	3569	0	19681.1
2024	19867.5	606.7	20474.2	1.161	23770.5	4490	10	19270.5
Δ (MW)			-43.5		-520.4	-921		410.6
Δ (%)			-0.2%		-2.2%	-20.5%		2.1%
Fall								
2025	17957.3	617.6	18574.9	1.255	23311.5	5115	0	18196.5
2024	17752.9	434.2	18187.1	1.311	23843.3	4390	10	19443.3
Δ (MW)			387.8		-531.8	725		-1246.8
Δ (%)			2.1%		-2.2%	16.5%		-6.4%
Winter								
2025-26	13626.6	376.2	14002.8	1.447	20262.1	4762	0	15500.1
2024-25	13542	305	13847	1.607	22252.1	4656	10	17586.1
Δ (MW)			155.8		-1990.1	106		-2086.1
Δ (%)			1.1%		-8.9%	2.3%		-11.9%
Spring								
2026	15983.2	407.5	16390.7	1.319	21619.3	5166	0	16453.3
2025	15702	376	16078	1.322	21255.1	4883	10	16362.1
Δ (MW)			312.7		364.2	283		91.2
Δ (%)			1.9%		1.7%	5.8%		0.6%

Appendix C

U-21775 Results - LRZ 7 Summer Capacity Position (ZRCs)					
Line #	Summer Values	PY 2025	PY 2026	PY 2027	PY 2028
1	Planning Reserve Margin Requirements (PRMR)	21228	21228	21228	21228
2	Local Reliability Requirement (LRR)	23250	23250	23250	23250
3	Zonal Import Ability (ZIA)	3569	3569	3569	3569
4	Local Clearing Requirement (LCR)	19681	19681	19681	19681
5	Total Owned	15782	16271	17086	17981
6	Total PPA Contracts	3015	3336	4284	4321
7	Total ZRC Contracts	829	507	800	610
8	Total Qualified Demand Response	1208	1308	1463	1502
9	Total Resources (Line 5 + Line 6 + Line 7 + Line 8)	20834	21422	23633	24415
10	LCR Demonstrated Position (Line 9 - Line 4)	1153	1741	3952	4734
11	PRMR Demonstrated Capacity Position (Line 9 - Line 1)	-394	194	2405	3187
12	Net Undemonstrated Zone 7 Capacity	-18	347	-112	241
13	Anticipated LCR Position (Line 10 + Line 12)	1135	2088	3840	4975
14	Anticipated PRMR Capacity Position (Line 11 + Line 12)	(412)	541	2293	3428
(1) PY 2025 PRMR from PRA Data and held constant at prompt year value.					
(3) PY 2025 ZIA from PRA Data and held constant at prompt year value.					
(4) PY 2025 LCR from PRA Data and held constant at prompt year value.					
(5-9) Zone 7 resources included in capacity demonstrations sorted by resource type.					
(10) LCR position based on demonstrated resources only.					
(11) PRMR position based on demonstrated resources only.					
(12) Net Undemonstrated Zone 7 Capacity is Staff's attempt to reconcile the capacity demonstration resources with the MISO PRA. There are resources located in Zone 7 that Staff anticipates will be in the PRA that were not included in any capacity demonstration as well as a small number of resources included in the capacity demonstration that are no longer available due to recent events.					
(13) LCR Position after accounting for undemonstrated Zone 7 Capacity.					
(14) PRMR position after accounting for undemonstrated Zone 7 capacity. A negative value means the Zone will need to import resource to meet its requirement. A positive value means the Zone may import resources based on economics but will not need to meet its PRMR.					

U-21775 Results - LRZ 7 Autumn Capacity Position (ZRCs)					
Line #		PY 2025	PY 2026	PY 2027	PY 2028
1	Planning Reserve Margin Requirements (PRMR)	20494	20494	20494	20494
2	Local Reliability Requirement (LRR)	23312	23312	23312	23312
3	Zonal Import Ability (ZIA)	5115	5115	5115	5115
4	Local Clearing Requirement (LCR)	18197	18197	18197	18197
5	Total Owned	14996	15318	16797	16378
6	Total PPA Contracts	2802	3113	4083	4086
7	Total ZRC Contracts	936	569	759	573
8	Total Qualified Demand Response	793	780	816	845
9	Total Resources (Line 5 + Line 6 + Line 7 + Line 8)	19526	19780	22458	21883
10	LCR Demonstrated Position (Line 9 - Line 4)	1330	1583	4261	3686
11	PRMR Demonstrated Capacity Position (Line 9 - Line 1)	-968	-556	1964	1389
12	Net Undemonstrated Zone 7 Capacity	-130	263	-70	264
13	Anticipated LCR Position (Line 10 + Line 12)	1200	1846	4191	3950
14	Anticipated PRMR Capacity Position (Line 11 + Line 12)	(1097)	(452)	1893	1653

(1) PY 2025 PRMR from PRA Data and held constant at prompt year value.

(3) PY 2025 ZIA from PRA Data and held constant at prompt year value.

(4) PY 2025 LCR from PRA Data and held constant at prompt year value.

(5-9) Zone 7 resources included in capacity demonstrations sorted by resource type.

(10) LCR position based on demonstrated resources only.

(11) PRMR position based on demonstrated resources only.

(12) Net Undemonstrated Zone 7 Capacity is Staff's attempt to reconcile the capacity demonstration resources with the MISO PRA. There are resources located in Zone 7 that Staff anticipates will be in the PRA that were not included in any capacity demonstration as well as a small number of resources included in the capacity demonstration that are no longer available due to recent events.

(13) LCR Position after accounting for undemonstrated Zone 7 Capacity.

(14) PRMR position after accounting for undemonstrated Zone 7 capacity. A negative value means the Zone will need to import resource to meet its requirement. A positive value means the Zone may import resources based on economics but will not need to meet its PRMR.

U-21775 Results - LRZ 7 Winter Capacity Position (ZRCs)					
Line #		PY 2025	PY 2026	PY 2027	PY 2028
1	Planning Reserve Margin Requirements (PRMR)	16124	16124	16124	16124
2	Local Reliability Requirement (LRR)	20262	20262	20262	20262
3	Zonal Import Ability (ZIA)	4762	4762	4762	4762
4	Local Clearing Requirement (LCR)	15500	15500	15500	15500
5	Total Owned	15568	15313	15954	14542
6	Total PPA Contracts	2307	2521	3177	2981
7	Total ZRC Contracts	857	510	630	309
8	Total Qualified Demand Response	730	738	769	793
9	Total Resources (Line 5 + Line 6 + Line 7 + Line 8)	19461	19082	20530	18624
10	LCR Demonstrated Position (Line 9 - Line 4)	3961	3582	5029	3124
11	PRMR Demonstrated Capacity Position (Line 9 - Line 1)	3338	2958	4406	2501
12	Net Undemonstrated Zone 7 Capacity	-65	306	90	538
13	Anticipated LCR Position (Line 10 + Line 12)	3896	3887	5120	3662
14	Anticipated PRMR Capacity Position (Line 11 + Line 12)	3272	3264	4496	3039

(1) PY 2025 PRMR from PRA Data and held constant at prompt year value.

(3) PY 2025 ZIA from PRA Data and held constant at prompt year value.

(4) PY 2025 LCR from PRA Data and held constant at prompt year value.

(5-9) Zone 7 resources included in capacity demonstrations sorted by resource type.

(10) LCR position based on demonstrated resources only.

(11) PRMR position based on demonstrated resources only.

(12) Net Undemonstrated Zone 7 Capacity is Staff's attempt to reconcile the capacity demonstration resources with the MISO PRA. There are resources located in Zone 7 that Staff anticipates will be in the PRA that were not included in any capacity demonstration as well as a small number of resources included in the capacity demonstration that are no longer available due to recent events.

(13) LCR Position after accounting for undemonstrated Zone 7 Capacity.

(14) PRMR position after accounting for undemonstrated Zone 7 capacity. A negative value means the Zone will need to import resource to meet its requirement. A positive value means the Zone may import resources based on economics but will not need to meet its PRMR.

U-21775 Results - LRZ 7 Spring Capacity Position (ZRCs)					
Line #		PY 2025	PY 2026	PY 2027	PY 2028
1	Planning Reserve Margin Requirements (PRMR)	19853	19853	19853	19853
2	Local Reliability Requirement (LRR)	21619	21619	21619	21619
3	Zonal Import Ability (ZIA)	5166	5166	5166	5166
4	Local Clearing Requirement (LCR)	16453	16453	16453	16453
5	Total Owned	14609	15739	16992	16263
6	Total PPA Contracts	2861	3711	4213	4175
7	Total ZRC Contracts	931	584	771	543
8	Total Qualified Demand Response	802	802	847	879
9	Total Resources (Line 5 + Line 6 + Line 7 + Line 8)	19203	20837	22823	21860
10	LCR Demonstrated Position (Line 9 - Line 4)	2749	4383	6369	5406
11	PRMR Demonstrated Capacity Position (Line 9 - Line 1)	-651	983	2969	2006
12	Net Undemonstrated Zone 7 Capacity	-99	282	-50	323
13	Anticipated LCR Position (Line 10 + Line 12)	2650	4665	6319	5729
14	Anticipated PRMR Capacity Position (Line 11 + Line 12)	(750)	1265	2919	2329

(1) PY 2025 PRMR from PRA Data and held constant at prompt year value.

(3) PY 2025 ZIA from PRA Data and held constant at prompt year value.

(4) PY 2025 LCR from PRA Data and held constant at prompt year value.

(5-9) Zone 7 resources included in capacity demonstrations sorted by resource type.

(10) LCR position based on demonstrated resources only.

(11) PRMR position based on demonstrated resources only.

(12) Net Undemonstrated Zone 7 Capacity is Staff's attempt to reconcile the capacity demonstration resources with the MISO PRA. There are resources located in Zone 7 that Staff anticipates will be in the PRA that were not included in any capacity demonstration as well as a small number of resources included in the capacity demonstration that are no longer available due to recent events.

(13) LCR Position after accounting for undemonstrated Zone 7 Capacity.

(14) PRMR position after accounting for undemonstrated Zone 7 capacity. A negative value means the Zone will need to import resource to meet its requirement. A positive value means the Zone may import resources based on economics but will not need to meet its PRMR.

Attachment MM

2025 NERC Winter Reliability Assessment

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

2025–2026 Winter Reliability Assessment

November 2025



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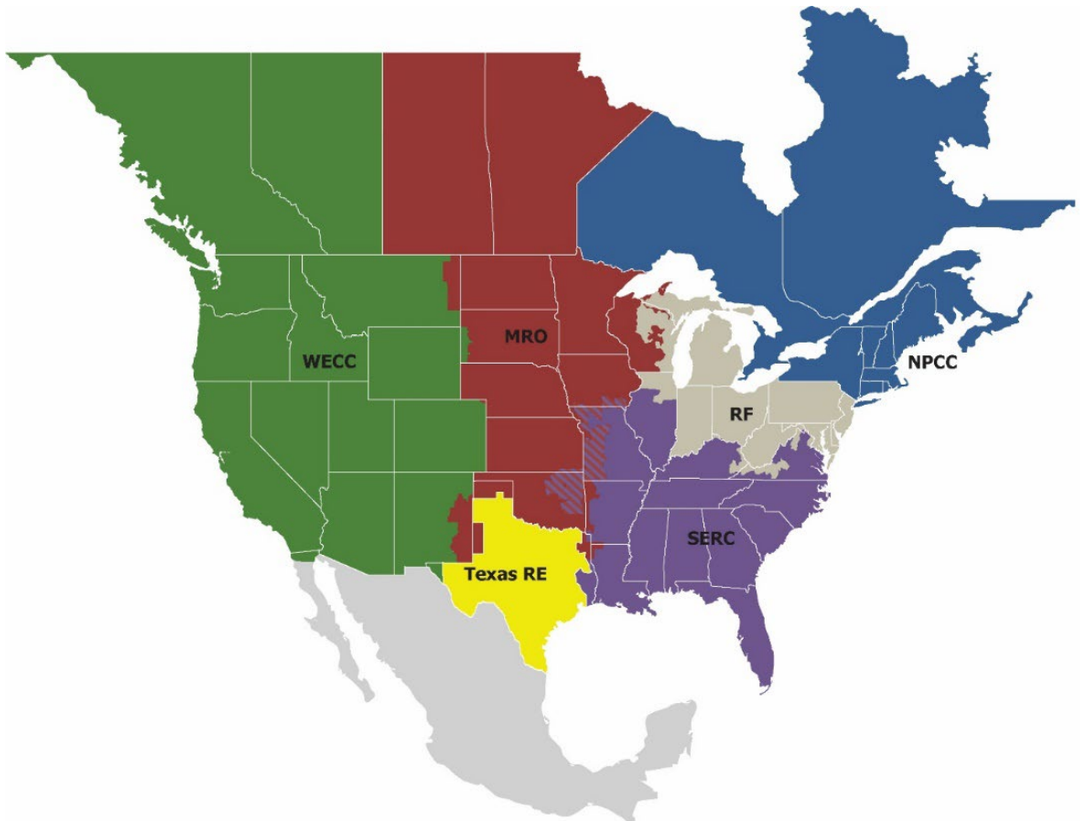
Preface

Electricity is a key component of the fabric of modern society, and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable, resilient, and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security

Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six Regional Entities as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	Western Electricity Coordinating Council

About this Assessment

NERC's *2025–2026 Winter Reliability Assessment* (WRA) identifies, assesses, and reports on areas of concern regarding the reliability of the North American BPS for the upcoming winter season. In addition, the WRA presents peak electricity demand and supply changes and highlights any unique regional challenges or expected conditions that might affect the reliability of the BPS.

The reliability assessment process is a coordinated evaluation between the Reliability Assessment Subcommittee, the Regional Entities, and NERC staff with demand and resource projections obtained from the assessment areas.

This report reflects an independent assessment by the ERO Enterprise (i.e., NERC and the six Regional Entities) and is intended to inform industry leaders, planners, operators, and regulatory bodies so that they are better prepared to ensure BPS reliability. This report also provides an opportunity for industry to discuss plans and preparations to ensure reliability for the upcoming winter period.

Key Findings

This WRA covers the upcoming three-month (December–February) winter period, providing an evaluation of the generation resource and transmission system adequacy necessary to meet projected winter peak demands and operating reserves. This assessment identifies potential reliability issues of interest and regional risks. The following findings are the ERO Enterprise's independent evaluation of electricity generation and transmission capacity as well as the potential operational concerns that may need to be addressed for the upcoming winter.

Two trends affecting resource adequacy across the BPS for the upcoming winter are rising electricity demand forecasts and a continued shift in the resource mix characterized by the retirement of thermal generators and growth in battery resources. After years of flat or low (~1%) peak demand growth, the aggregate peak demand for all NERC assessment areas has risen by 20 GW (2.5%) since the previous winter. Nearly all assessment areas are reporting year-on-year demand growth; some are forecasting increases near 10%. Total BPS resources have also increased since last winter, but by a smaller amount of 9.4 GW. This number includes the net change in generating capacity as well as additional demand response. These demand and resource changes are described in **Escalating Winter Demand** and **Resource Trends** sections.

The following findings are derived from NERC and the ERO Enterprise's independent evaluation of electricity generation and transmission capacity as well as potential operating concerns that should receive attention for Winter 2025–2026:

1. **All areas are assessed as having adequate resources for normal winter peak-load conditions (i.e., the area's 50-50 peak forecast). However, more extreme winter conditions extending over a wide area could result in electricity supply shortfalls.** Prolonged, wide-area cold snaps can drive sharp increases in electricity demand and threaten reliable BPS generation and the availability of fuel supplies for natural-gas-fired generation. Four severe arctic storms have descended to cover much of North America since 2021, causing regional demand for electricity and heating fuel to soar and exposing generation and fuel infrastructure in temperate areas to freezing conditions.[1] The following areas face risks of electricity supply shortfalls during periods of more extreme conditions this winter (see **Figure 1**):

    - **NPCC-Maritimes**: The peak demand forecast has fallen slightly (-1.6%) in the NPCC-Maritimes assessment area, contributing to higher reserves compared to the 2024–2025 winter. Maritimes is projected to have an Anticipated Reserve Margin (ARM) of 16.9%, which is 270 MW below the area's Reference Margin Level of 20% . New Brunswick has long-term energy contracts that can be used to mitigate resource adequacy challenges through the purchase of energy on a day-ahead basis. NPCC's all-hours probabilistic assessment for the NPCC Region included the simulation of both a base case (i.e., normal 50/50 demand) and highest peak load scenario (having an approximate 7% chance of occurring), for both an expected and a low-likelihood, reduced-resource condition. The preliminary results of this assessment indicate that operators in Maritimes are likely to require emergency operating mitigations and/or energy emergency alerts (EEA) during above-normal demand or low-resource output conditions.
    - **NPCC-New England**: A lower peak demand forecast and additional resources from demand response and firm imports offset recent generator retirements, resulting in little change to the NPCC-New England ARM for this winter. New England continues to closely monitor regional energy adequacy, particularly during extended cold snaps where constrained natural gas pipelines contribute to rapid depletion of stored fuel supplies. ISO-NE's deterministic winter scenario analysis shows limited exposure to energy shortfalls this winter. In New England, winter energy concerns are highest in scenarios when stored fuels are rapidly depleted; during these periods, timely replenishment is critical to minimizing the potential for energy shortfalls.
    - **SERC-East**: The winter peak demand forecast has increased by 700 MW (1.6%) since last winter, while winter firm capacity has declined, resulting in lower reserves. SERC-East has changed from a summer-peaking area to potentially peaking during both summer and winter. This is due to the continued addition of solar photovoltaic (PV) generation that shaves off summer peak demand and a trend toward electrification of heating that drives up winter peak demand. All-hours probabilistic analysis from SERC found some load-loss hours (<0.1 hrs) and small amounts of expected unserved energy, with the highest risk occurring during above-normal peak demand and early morning hours when solar output is absent.
    - **SERC-Central:** Additional demand response and flat load growth since last winter is offsetting declining resource capacity (down 1,120 MW), resulting in little change to the ARM at 30.5%. There are adequate resources for normal winter peak demand; however, higher levels of demand that can occur during extreme cold temperatures can result in insufficient reserves that operators would need to manage with non-firm imports and potential energy emergencies.
    - **Texas RE-ERCOT:** Strong load growth from new data centers and other large industrial end users is driving higher winter electricity demand forecasts and contributing to continued risk of supply shortfalls. For the upcoming winter season, Texas RE-ERCOT is expected to continue facing reserve shortage risks during the peak load hour and high-

[1] See detailed reports on the January 2024 and January 2025 Arctic Storms, Winter Storm Elliott, and Winter Storm Uri.

net-load hours, particularly under extreme load conditions that accompany freezing temperatures. Elevated forced outage of thermal resources and reduced output from intermittent resources during these conditions exacerbates the risk of supply shortfalls. In winter, peak demands typically occur before sunrise and after sunset coinciding with the unavailability of solar generation making the system dependent on wind generation and dispatchable resources. Data centers are altering the daily load shape due to their round-the-clock operating pattern, lengthening peak demand periods. Additional battery storage and demand-response resources since last winter help mitigate shortfall risks. However, with the continued flattening of the load curve, maintaining sufficient battery state of charge will become increasingly challenging for extended periods of high loads, such as a severe multi-day storm like Winter Storm Uri.

- **WECC-Basin**: There is sufficient capacity in the area for expected peak conditions; however, Balancing Authorities (BA) are likely to require external assistance during extreme winter weather that causes thermal plant outages, adverse wind turbine conditions, and natural gas fuel supply issues for area internal resources. External assistance may not be available during region-wide extreme winter conditions. With an expected winter peak demand of 11.1 GW, under an extreme combination of generator derates and outages, the region could be short 1.6 GW before imports. Forecasted net internal demand has increased 1% since last year, with little change in winter capacity. Note that the WECC-Basin assessment area includes Utah, southern Idaho, and a portion of western Wyoming. In prior WRA reports, this part of the BPS was included as part of the WECC-NW assessment area. The *2025–2026 WRA* includes a new assessment area map for the Western Interconnection. The new assessment area boundaries provide reliability risk information in more geographic detail for the United States and Mexico.
- **WECC-NW**: Like WECC-Basin, there is sufficient capacity in the area for expected peak conditions; however, BAs are likely to require external assistance during extreme winter weather that causes thermal plant outages and adverse wind turbine conditions for area internal resources. External assistance may not be available during region-wide extreme winter conditions. Winter peak demand for the area is forecast to be 2.9 GW higher (9.3%) compared to last year. Over 3 GW of new resources have been in development for the assessment area this year, primarily battery storage, solar PV, and wind resources. Delays that threaten timely completion of these resource additions will make the area more reliant on imports to meet peak demand.

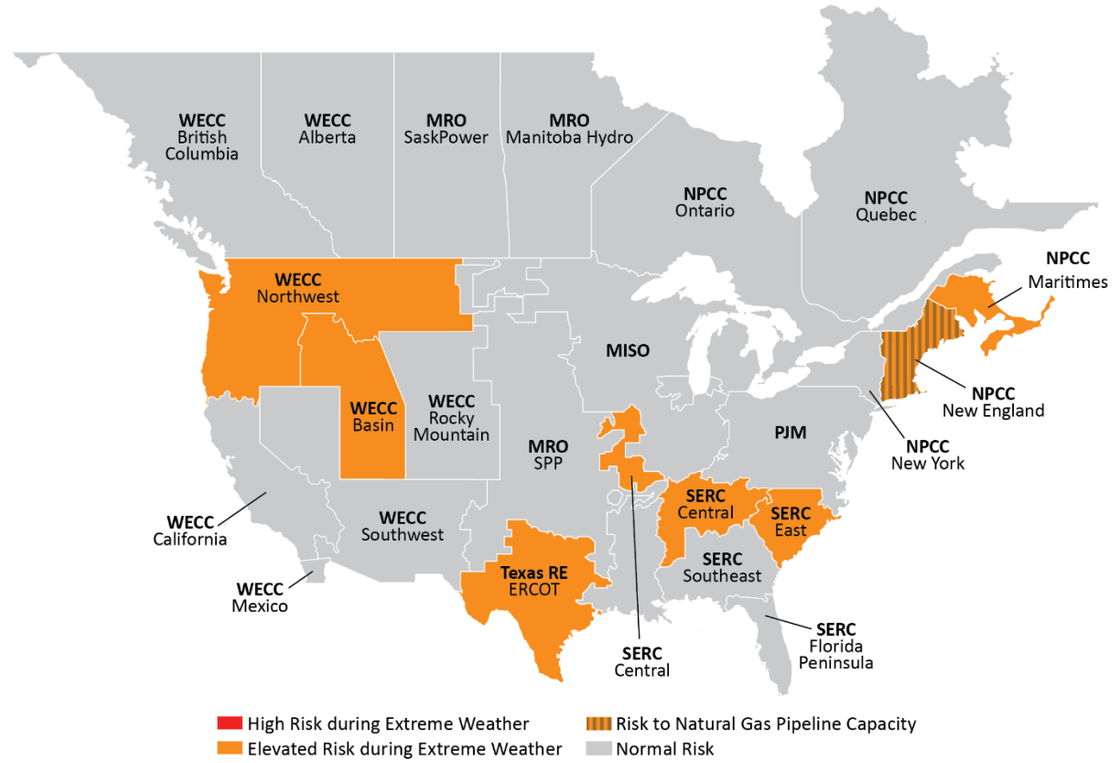


Figure 1: Winter Reliability Risk Area Summary

2. **The performance of natural gas production and supply infrastructure during peak winter conditions will again have a significant effect on BPS reliability.** Natural gas is an essential fuel for electricity generation in winter. Winter fuel supplies for thermal generators must be readily available during the periods of high electricity and natural gas demand that accompany extreme cold weather. Yet these periods are the most challenging for natural-gas-fired Generator Operators to obtain sufficient fuel and delivery. Natural gas production often falls off in extreme winter temperatures as supply infrastructure is affected by freezing issues, and Generator Operators that fail to secure firm fuel delivery are frequently unable to access fully subscribed pipelines. Evidence from the past two winters indicates notable improvement in the delivery of natural gas to BPS generators since winter storms Elliott and Uri with overall less natural gas production decline during cold weather and fewer natural gas infrastructure

force majeures.[2] Still, natural gas infrastructure freeze protection mitigations are voluntary for the natural gas industry in most of North America, resulting in uneven application of protections and continued supply risks during extreme conditions. Furthermore, timing misalignments between the natural gas and electric markets continue to challenge generator fuel procurement in advance of severe winter conditions that occur over winter holiday weekends. As winter approaches, NERC encourages all entities across the gas-electric value chain—from production to the burner tip—to take all necessary preparations for extreme cold and keep natural gas flowing and the lights on.

3. **Cold weather Reliability Standards first introduced in 2023 have been improved prior to the upcoming winter and address recommendations from winter storms Elliott and Uri.** In September 2025, the Federal Energy Regulatory Commission (FERC) approved EOP-012-3 with an effective date of October 1, 2025, concluding the development of Reliability Standards for generator cold weather preparedness.[3] The EOP-012 Reliability Standard contains requirements for generator freeze protection measures, cold weather preparedness plans, and operator training. Among the improvements in the new version are enhanced and expanded requirements to ensure that Generator Owners (GO) are implementing corrective actions to address known issues affecting their ability to operate in cold weather in a timely manner. NERC collects data on the winterization of generating units, which, in conjunction with NERC's monitoring of BPS performance and analysis of cold weather events, helps determine the effectiveness of Reliability Standards. NERC submitted to FERC its first annual *Cold Weather Data and Analysis* informational filing in October 2025.[4] Based on the data reported this year, 96% of the total net winter capacity reported extreme cold weather temperatures (ECWT) at or below 32 degrees Fahrenheit, triggering winter preparedness measures under the Cold Weather Preparedness Standard, and 99% of total net winter capacity in the continental US reporting the ability to operate at the calculated ECWT. As the first such report, this *Cold Weather Data and Analysis* filing provides a benchmark for future analysis.

Recommendations

To reduce the risks of energy shortfalls on the BPS this winter, NERC recommends the following:

- Reliability Coordinators (RC), BAs, and Transmission Operators (TOP) in the elevated risk areas identified in the key findings should review seasonal operating plans and the protocols for communicating and resolving potential supply shortfalls in anticipation of potentially high generator outages and extreme demand levels. Operators should review NERC's Resources on Cold Weather Preparations.
- GOs should complete winter readiness plans and checklists prior to December, deploy weatherization packages well in advance of approaching winter storms, and frequently check and maintain cold weather mitigations while conditions persist.
- BAs should be cognizant of the potential for short-term load forecasts to underestimate load in extreme cold weather events and be prepared to take early action to implement protocols and procedures for managing potential reserve deficiencies. Proactive issuance of winter advisories and other steps directed at generator availability contributed to improved reliability during cold weather events of the past two winters.
- RCs and BAs should implement generator fuel surveys to monitor the adequacy of fuel supplies. They should prepare their operating plans to manage potential supply shortfalls and take proactive steps for generator readiness, fuel availability, load curtailment, and sustained operations in extreme conditions.
- Generator Owners/Operators of natural-gas-fired units should maintain awareness of potential extreme cold weather developing over holiday weekends and the implications for fuel planning and procurement that may result given the natural gas purchase close dates that precede long holiday weekends.
- State and provincial regulators can assist grid owners and operators in advance of and during extreme cold weather by maintaining awareness of BA, natural gas pipeline, and gas local distribution company (LDC) operational public announcements and notices, amplifying public appeals for electricity and natural gas conservation, and supporting requested environmental and transportation waivers.

[2] See *January 2025 Arctic Events | A System Performance Review*, April 2025
[3] See NERC's Statement on FERC September Open Meeting for summary and link to FERC's order.
[4] See 2025 Cold Weather Data Collection and Analysis Informational Filing

Risk Highlights

Escalating Winter Demand

Winter electricity demand is rising at the fastest rate in recent years, particularly in areas where data center development is occurring. After several years of low (~1%) growth, total internal demand for the BPS is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. The changes in forecasted net internal demand for each assessment area are shown in **Figure 2** below.[5] Assessment areas develop these forecasts based on historical load and weather information as well as future projections. Most assessment areas are projecting an increase in peak demand. SaskPower, PJM, the U.S. Southeast, and parts of the U.S. West have the largest increase in peak demand forecasts.

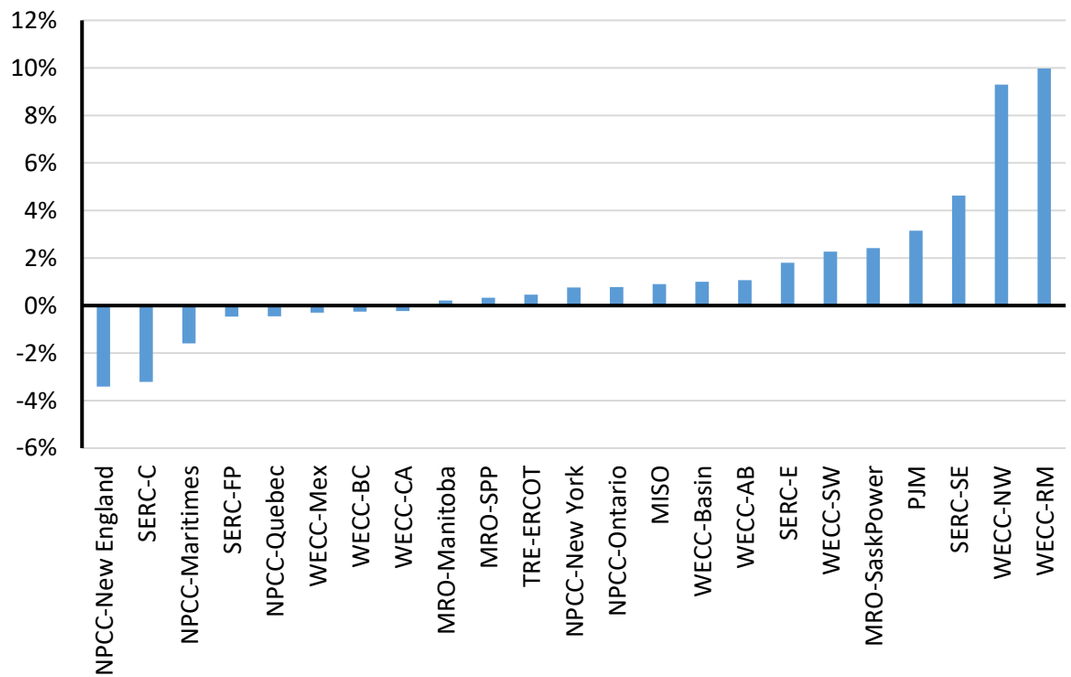


Figure 2: Change in Net Internal Demand—Winter 2025–2026 Forecast Compared to Winter 2024–2025 Forecast

[5] See **Data Concepts and Assumptions** section for demand definitions.

Resource Trends

BPS resources are growing, but at a slower rate than demand is rising. Battery and solar facilities were the leading resource types added to the BPS since last winter. Solar resources, however, often do not supply output during hours of peak winter demand. Growth in demand response is also contributing to BPS resources for the upcoming winter. **Table 1** shows the total change in BPS resources since last winter. For battery, solar, and wind resources, the table includes change in both nameplate (installed) capacity as well as the change in on-peak demand capacity, which is the capacity that resources are expected to provide in their area during the time of peak demand. For assessment-area specific information see **Variable Energy Resource Contributions** section.

Table 1: BPS Resource Change from Winter 2024–2025 to Winter 2025–2026

Resource	Net Change Nameplate Capacity (MW)	Net Change Peak Demand Capacity (MW)
Total Generator Capacity		1,335
Battery	19,659	11,121
Solar	11,097	1,176
Wind	-562	-14,238
Thermal and Hydro		3,276
Demand Response		8,112
Total Resources		9,447

Total BPS resources for serving winter peak demand, including generating capacity and demand response, have increased since last winter by 9,447 MW. Sizeable additions in battery resources and some new natural gas-fired generators contribute to the increase in resource capacity. However, the increase is offset by lower on-peak capacity values for wind resources, which are the result of revised valuations of wind resource capability at peak demand hours in some areas.[6] As a result, BPS generator capacity for winter peak demand makes up only a small portion of the total BPS increase. Generation accounts for 1,335 MW of the total 9,445 MW increase, while the larger share comes from demand response programs. Area specific information on demand response is provided in the **Demand and Resource Tables**.

The recent trend in resource additions is contributing to higher risk of electricity supply shortfalls in winter. BA operators are likely to face higher winter demand without a comparable increase in supply resources. Furthermore, the types of resources that are growing the most-- battery resources and

[6] Since last winter, ERCOT and MISO have implemented new methods for determining capacity contributions that result in lower wind and solar resources contributions at peak demand. See ERCOT's Resource Adequacy page and MISO's *Planning Year 2025-2026 Wind and Solar Capacity Credit Report*.

demand response—have unique characteristics that operators will need to account for and could limit the use of these resources in extreme winter conditions. Battery energy is reliable when it can be dispatched and has sufficient charge for the period it is needed, yet little time to recharge can be expected during extreme winter weather. System operators will need good visibility on battery state of charge and should anticipate that some extreme winter events will cause these resources to become depleted when needed. Demand response is limited by contract terms, which typically specify how often and for how long the resource may be used. Other resource types are also challenged in winter (see **Thermal Generator Fuel Adequacy and Security**). As BAs grapple with higher demand in most parts of the BPS, they will do so with resources that are becoming increasingly complex to dispatch especially in winter.

Thermal Generator Fuel Adequacy and Security

The performance of the thermal generator fleet remains critical to winter BPS operations. Winter fuel supplies for thermal generators must be readily available during periods of high demand and extreme cold weather. Generally, fuel adequacy for the thermal generating fleet is bolstered through strategic infrastructure investments and fuel stockpiling that increases the certainty of having fuel on hand that can be converted to electricity when needed. Because of this, winter performance of thermal generators is inextricably linked to extraction, processing, storage, and delivery infrastructure for a variety of fuels. Fuel supply risks have been noted in recent years' WRAs related to coal and natural gas availability and illustrate the interconnected nature of these critical energy infrastructure systems.

BPS stakeholders across North America note multiple fuel-related issues that are being monitored entering the winter season. For example, while coal represents a waning share of the overall resource mix, it continues to play an important role in meeting demand during extreme winter weather events, and oil inventories at dual-fuel gas-oil generators lessen risks related to natural gas deliverability in infrastructure-constrained regions, especially during the winter. Notably, it is infeasible or prohibitively costly to stockpile natural gas locally at power plants, and this exposes the BPS to the risk profile of the constituent systems that comprise the supply and delivery of this just-in-time fuel.

Natural Gas Generator Fuel Supplies

Natural gas generators remain a crucial part of on-peak resources meant to meet winter electricity demand across much of North America. While many Generator Owners and Operators secure backup fuel supplies at critical gas-fired generators, particularly in the northeastern United States and Florida, large contributions to the on-peak winter resource mix by single-fuel natural-gas-fired generators remain across North America (see **Figure 3**).

Natural gas generator performance can be threatened when natural gas supplies are insufficient or when natural gas infrastructure is unable to maintain the flow of fuel to critical generators. Grid operators continue to acknowledge and enhance their winter planning processes to firm up their fuel supplies and guard against natural gas disruptions, but winter storms Uri and Elliott demonstrated that combinations of natural gas flow restrictions and supply insufficiency can occur regardless of whether cold temperatures are common or uncommon in the region and can affect more than one BA area concurrently.

Many BPS areas that regularly experience cold weather events, like New England, have adopted mitigating technologies to lessen the impact of natural gas shortages through generator dual-fuel capability and stored backup fuel. In those areas, prolonged cold weather events present a risk of rapid depletion of stored backup fuel. Robust regional and distributed storage investments and winter planning for timely fuel replenishment are critical to minimizing potential energy shortfalls in the operational time frame in these areas.

Natural gas and electricity infrastructures have the added complexity of interdependence. Electricity is used to power some facilities, such as compressor stations and processing plants that make up natural gas infrastructure. These interdependencies mean that reliability events that originate on one system have the potential to affect the other and worsen the overall event magnitude or duration.

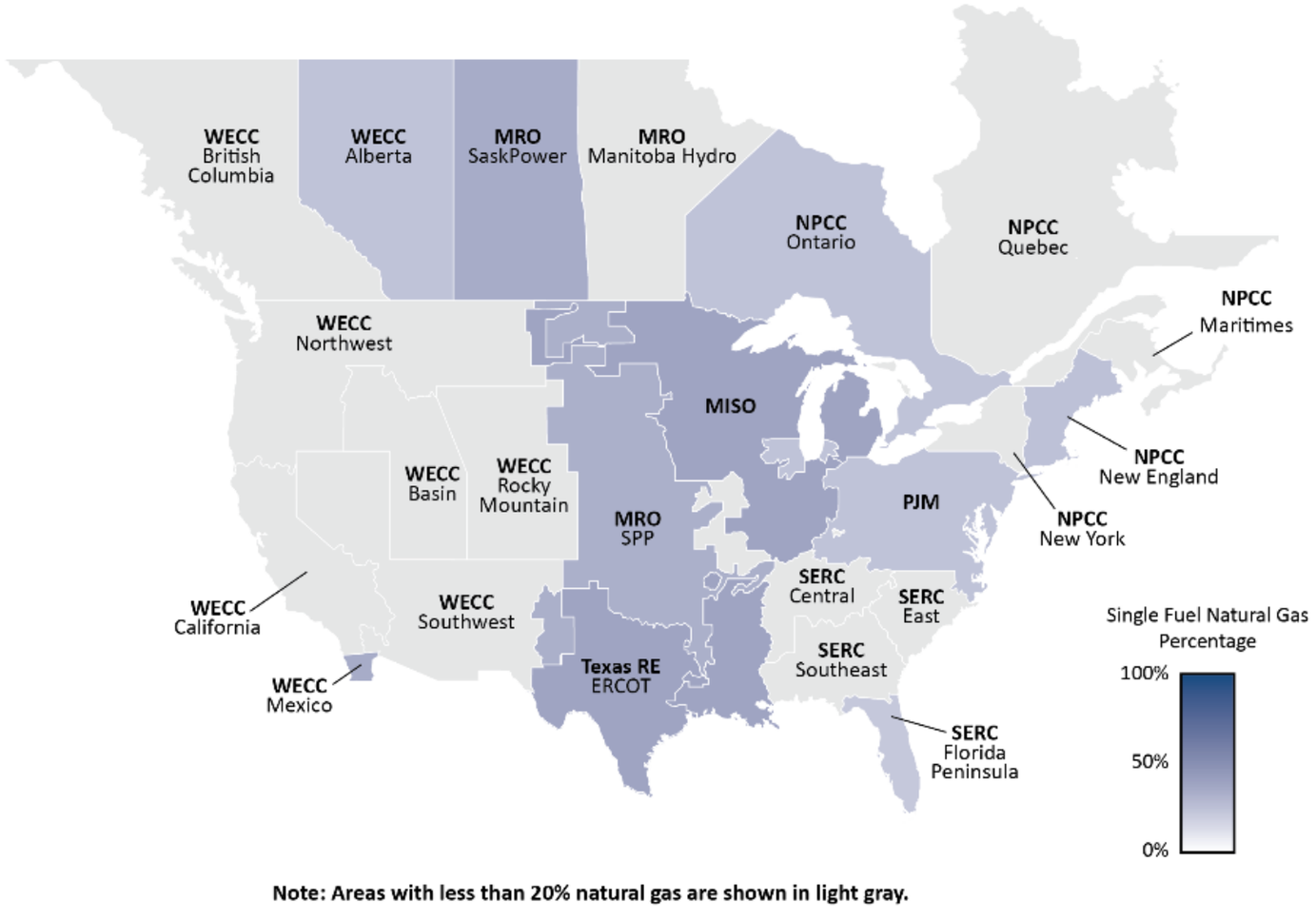
Natural gas infrastructure freeze protection mitigations are voluntary for the natural gas industry in most of North America. Texas is an exception, where the Railroad Commission of Texas adopted rules to require critical natural gas facilities to implement weather-related emergency preparation measures.[7] Lack of consistent standards for natural gas infrastructure protections will result in uneven application of freeze protections and continued supply risks during extreme conditions in many areas.

These considerations have driven higher levels of coordination to ensure sustained reliable operation of the natural gas and electricity systems. While a FERC and ERO staff review of system performance during the January 2025 arctic events[8] details improvements in electric and natural gas coordination since winter storms Uri and Elliott, the review also identifies continuing gaps between the electricity and natural gas industries that remain entering the 2025–2026 Winter season. These include natural gas scheduling challenges during winter holiday weekends, market time frame and process incompatibility, and electric power entities' lack of visibility into operational impact data from natural gas producers and suppliers.

[7] See Railroad Commission of Texas weatherization rule.

[8] FERC, NERC Issue Report on System Performance During the January 2025 Arctic Weather | Federal Energy Regulatory Commission

The U.S. Energy Information Administration (EIA)[9] anticipates a slightly milder winter than last year across much of the United States, especially in the Northeast, leading to a projection that households will consume approximately 2% less natural gas than last winter. Working natural gas storage inventories are about 5% above the previous five-year average in the United States heading into the winter season. The EIA attributes this relative surplus in part to robust production this summer and lower-than-expected natural gas consumption by power generators.



Single-Fuel Natural-Gas-Fired Generation

	Winter Capacity (GW)	Contribution to Total Winter Resource Mix
MISO	63.9	38%
TRE-ERCOT	53.0	38%
WECC-MX	2.2	34%
MRO-SaskPower	2.5	34%
SPP	33.4	32%
NPCC-New England	12.1	24%
PJM	60.9	23%
WECC-AB	13.9	23%
NPCC-Ontario	8.0	23%
SERC-FP	45.6	21%
WECC-CA	35.9	18%
WECC-SW	21.5	17%
WECC-Basin	4.9	16%
WECC-RM	6.2	14%
SERC-C	17.0	13%
SERC-SE	21.5	13%
WECC-NW	8.7	12%
SERC-E	11.3	9%
NPCC-New York	5.0	8%
NPCC-Maritimes	0.5	7%
MRO-Manitoba	0.3	4%
WECC-BC	0.1	1%
NPCC-Quebec	0.0	0%

Figure 3: Single-Fuel Natural-Gas-Fired Generation Capacity Contribution to the 2025–2026 Winter Generation Mix

[9] See the U.S. Energy Information Administration's Winter Fuels Outlook 2025–26

Risk Assessment Discussion

NERC assesses the risk of electricity supply shortfall in each assessment area for the upcoming season by considering Planning Reserve Margins, seasonal risk scenarios, probability-based risk assessments, and other available risk information. NERC provides an independent assessment of the potential for each assessment area to have sufficient operating reserves under normal conditions as well as above-normal demand and low-resource output conditions selected for the assessment. A summary of the assessment approach is provided in Table 2.

Table 2: Seasonal Risk Assessment Summary

Category	Criteria[1]
High Potential for insufficient operating reserves in normal peak conditions	• Planning Reserve Margins do not meet Reference Margin Levels (RML); or • Probabilistic indices exceed benchmarks, e.g., loss of load hours (LOLH) of 2.4 hours over the season; or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand and outage scenarios**[2]
Elevated Potential for insufficient operating reserves in above-normal conditions	• Probabilistic indices are low but not negligible (e.g., LOLH above 0.1 hours over the season); or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **extreme peak-day demand with normal resource scenarios** (i.e., typical or expected outage and derate scenarios for conditions);[2] or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand with reduced resources** (i.e., extreme outage and derate scenarios)[3]
Normal Sufficient operating reserves expected	• Probabilistic indices are negligible • Analysis of the risk hour(s) indicates resources will be sufficient to meet operating reserves under normal and extreme peak-day demand and outage scenarios[4]

Table Notes:
[1]The table provides general criteria. Other factors may influence a higher or lower risk assessment.
[2]**Normal resource scenarios** include planned and typical forced outages as well as outages and derates that are closely correlated to the extreme peak demand.
[3]**Reduced resource scenarios** include planned and typical forced outages and low-likelihood resource scenarios, such as extreme low-wind scenarios, low-hydro scenarios during drought years, or high thermal outages when such a scenario is warranted.
[4]Even in normal risk assessment areas, extreme demand and extreme outage scenarios that are not closely linked may indicate risk of operating reserve shortfall.

Assessment of Planning Reserve Margins and Operational Risk Analysis

Anticipated Reserve Margins (ARM), which provide the Planning Reserve Margins for normal peak conditions, as well as reserve margins with typical forced outage levels and for the most extreme seasonal risk scenarios are provided in Table 3.

Table 3: Seasonal Risk Scenario On-Peak Reserve Margins

Assessment Area	Anticipated Reserve Margin	Reserve Margin with Typical Outages	Reserve Margin with Higher Demand, Outages, Derates in Extreme Conditions
MISO	49.5%	22.3%	3.7%
MRO-Manitoba	13.7%	11.4%	6.1%
MRO-SaskPower	35.1%	29.0%	16.1%
MRO-SPP	56.5%	29.4%	16.9%
NPCC-Maritimes	16.9%	12.5%	-4.7%
NPCC-New England	58.9%	45.4%	8.7%
NPCC-New York	78.2%	52.4%	16.2%
NPCC-Ontario	28.6%	21.8%	13.2%
NPCC-Québec	15.2%	15.1%	5.0%
PJM	35.6%	24.8%	15.6%
SERC-C	30.5%	22.4%	-0.9%
SERC-E	21.9%	17.5%	3.0%
SERC-FP	41.7%	28.3%	25.6%
SERC-SE	39.7%	24.7%	17.7%
TRE-ERCOT	36.0%	25.2%	-20.0%
WECC-AB	35.2%	32.4%	10.0%
WECC-Basin	29.6%	19.7%	-21.1%
WECC-BC	25.9%	25.8%	15.4%
WECC-CA	82.3%	73.7%	57.9%
WECC-Mex	83.1%	79.4%	52.9%
WECC-NW	30.9%	29.5%	-8.5%
WECC-RM	61.7%	53.2%	10.0%
WECC-SW	104.4%	90.1%	50.1%

Seasonal risk scenarios for each assessment area are presented in the **Regional Assessments Dashboards** section. The on-peak reserve margin and seasonal risk scenario charts in each dashboard provide potential winter peak demand and resource condition information. The reserve margins on the right side of the dashboard pages provide a comparison to the previous year's assessment. The seasonal risk scenario charts present deterministic scenarios for further analysis of different demand and resource levels with adjustments for normal and extreme conditions. The assessment areas determined the adjustments to capacity and peak demand based on methods or assumptions that are summarized in the seasonal risk scenario charts; more information about these dashboard charts is provided in the **Data Concepts and Assumptions** section.

The seasonal risk scenario charts can be expressed in terms of reserve margins: In **Table 3**, each assessment area's ARMs are shown alongside the reserve margins for a typical generation outage scenario (where applicable) and the extreme demand and resource conditions in their seasonal risk scenario.

Areas highlighted in orange in **Figure 1** above have been identified as having resource adequacy or energy risks for the winter and are included in the **Key Findings** section's discussion that follows. The typical outage reserve margin includes anticipated resources minus the capacity that is likely to be in maintenance or forced outage at peak demand. If the typical maintenance or forced-outage margin is the same as the ARM, it is because an assessment area has already factored typical outages into the anticipated resources. The extreme conditions margin includes all components of the scenario and represents the most severe operating conditions of an area's scenario. Note that any reserve margin below zero indicates that the resources fall below demand in the scenario.

In addition to the peak demand and seasonal risk hour scenario charts, the assessment areas provided a resource adequacy risk assessment that was probability-based for the winter season. Results are summarized in **Table 5**. The risk assessments account for the hour(s) of greatest risk of resource shortfall. For most areas, the hour(s) of risk coincides with the time of forecasted peak demand; however, some areas incur the greatest risk at other times based on the varying demand and resource profiles. Various risk metrics are provided and include loss of load expectation (LOLE), loss of load hours (LOLH), expected unserved energy (EUE), and the probabilities of energy emergency alert (EEA) declarations (see **Table 4** for a description of EEA levels).

Table 4: Energy Emergency Alert Levels

EEA Level	Description	Circumstances
EEA 1	All available generation resources in use	• The BA is experiencing conditions in which all available generation resources are committed to meet firm load, firm transactions, and reserve commitments and is concerned about sustaining its required operating reserves. • Non-firm wholesale energy sales (other than those that are recallable to meet reserve requirements) have been curtailed.
EEA 2	Load management procedures in effect	• The BA is no longer able to provide its expected energy requirements and is an energy-deficient BA. • An energy-deficient BA has implemented its operating plan(s) to mitigate emergencies. • An energy-deficient BA is still able to maintain minimum operating reserve requirements.
EEA 3	Firm load interruption is imminent or in progress	• The energy-deficient BA is unable to meet minimum operating reserve requirements.

Energy Emergency Alerts

The combination of above-normal generation outages, low resource output, and peak loads as occurred during the extreme cold weather events of Winter Storm Uri in 2021 and Winter Storm Elliott in 2022 are ongoing winter reliability risks. When supply resources in an area fall below expected demand and operating reserve requirements, BAs may need to employ EEAs to maintain balance between available capacity and energy and real-time demand. A description of each EEA level is provided above.

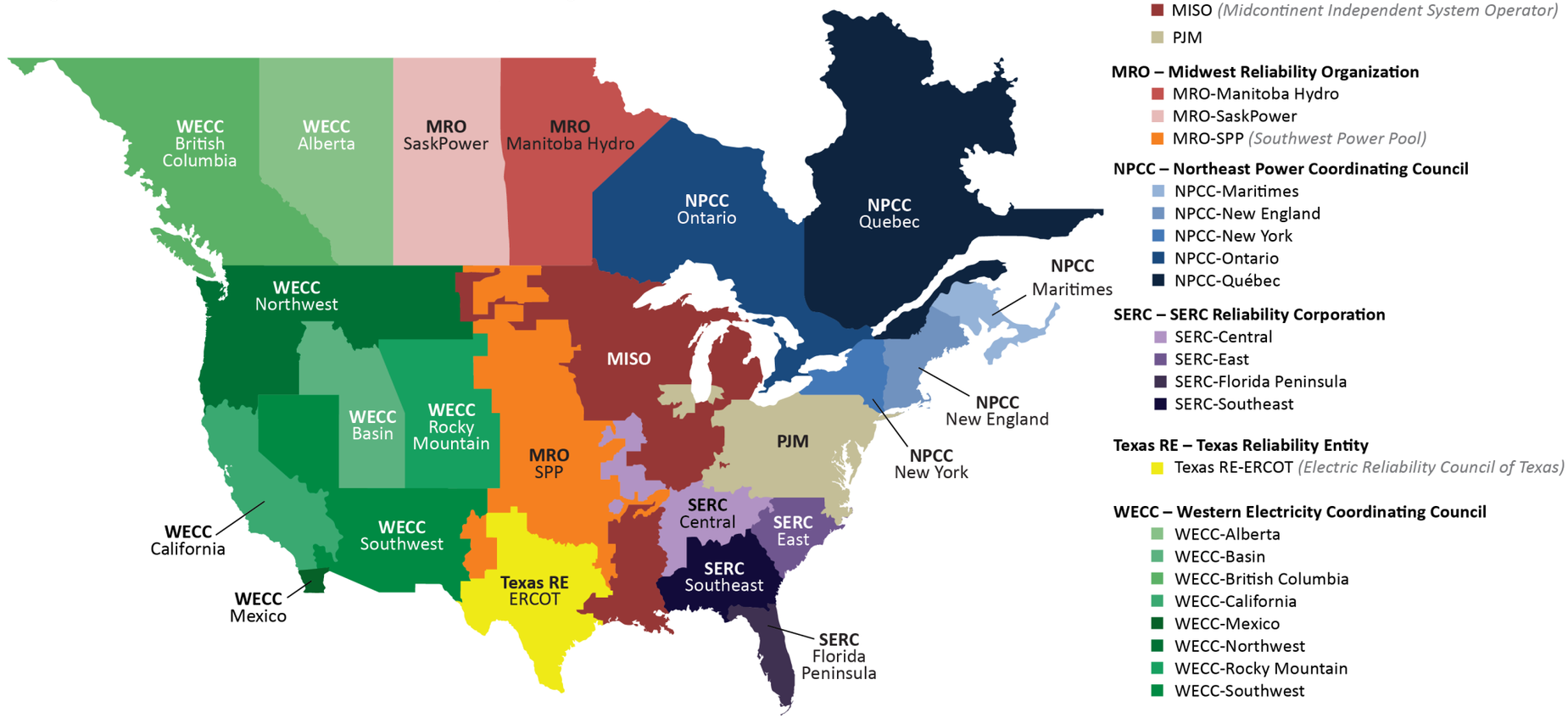
Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
MISO	Deterministic	MISO does not provide a probabilistic assessment for the WRA. MISO applies a deterministic look at expected system conditions, looking at generation availability under typical and extreme outages and looking at a typical 50/50 load forecast and an extreme 90/10 load forecast. For the upcoming winter season, under an extreme outage and extreme 90/10 load forecast, this is the riskiest scenario for the MISO footprint. This scenario produces the shortest actual reserve margin for January.
MRO-Manitoba	Probabilistic study for the NERC Probabilistic Assessment (ProbA)	Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 *Long-Term Reliability Assessment* (LTRA) found no load-loss or unserved energy hours for 2026.
MRO-SaskPower	Probability-based capacity adequacy assessment	SaskPower's probabilistic assessment for the 2025–2026 Winter indicates that risk of shortfalls is lower than the previous winter. LOLH for an elevated risk scenario for the 2025–2026 Winter season is 0.08 hours. The month with the highest LOLH is December (0.05 hours).
MRO-SPP	NERC 2024 ProbA	Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
NPCC	NPCC conducted an all-hour probabilistic reliability assessment that included detailed neighbor modeling and consisted of a base case and severe case examining low resources, reduced imports, and higher loads. The assessment evaluates the probabilistic indices of LOLE, LOLH, and EUE. The highest peak load scenario has an approximately 7% probability of occurring.	
NPCC-Maritimes	The Maritimes Area low-likelihood resource case assumed: wind derated by 50% for every hour in December through February and a 50% natural gas capacity curtailment for December through February (dual-fuel units assumed reverting to oil) and reduced transfer capabilities.	The preliminary assessment indicates that established operating procedures are not sufficient to maintain a balance between electricity supply and demand. Under highest peak load levels, the Maritimes Area shows a notable likelihood of utilizing its operating procedures such as reducing 30-minute reserves, initiating interruptible loads, and reducing 10-minute reserves to maintain system reliability during the upcoming winter period.
NPCC-New England	The New England Area low-likelihood resource case assumed: 500 MW of additional maintenance outages, ~4,513 MW of gas-fired generation unavailable due to fuel supply constraints, and 50% reduced import capabilities of external ties.	The preliminary results of this assessment indicate that operating procedures were not needed to maintain a balance between electricity supply and demand
NPCC-New York	The New York Area low-likelihood resource case assumed: ~500 MW of extended maintenance in southeastern New York, 600 MW of cable transmission reduction across HVdc facilities, and ~5,000 MW of generation unavailable due to fuel delivery issues.	The preliminary results of this assessment indicate that operating procedures were not needed to maintain a balance between electricity supply and demand. No cumulative LOLE, LOLH or EUE risks were indicated over the December–February winter period, for all the scenarios modeled.
NPCC-Ontario	An energy assessment for the Ontario Assessment Area was conducted for two scenarios: firm resources and firm demand with expected weather, and planned resources with planned demand with expected weather.	No cumulative LOLH or EUE risks were identified over the entire November-to-April winter season for both scenarios modeled.

Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
NPCC-Québec	The Québec Area low-likelihood resource case assumed 1,000 MW of generation reductions.	The preliminary results of this assessment indicate that established operating procedures are sufficient to maintain a balance between electricity supply and demand if needed. No cumulative LOLE, LOLH or EUE risks were indicated over the December–February winter period for all the scenarios modeled
PJM	Probabilistic study for the NERC Probabilistic Assessment (ProbA)	Probabilistic study for 2025–2026 Winter is not provided for the WRA. PJM performed probabilistic analysis for 2026-2027 winter as part of the 2024 ProbA summarized in NERC's 2024 LTRA. The results of this study indicate risk of load loss (<0.1 hours) and unserved energy during winter months. For the upcoming winter, load-loss hours are expected to be less than this value because forecasted load is lower and anticipated resource capacity is higher than the case studied for the 2024 ProbA.
SERC	Based on the 2024 NERC Probabilistic Assessment (ProbA) base-case result. SERC's assessment used 38 years of historical load shapes to assess the resource adequacy of years 2026 and 2028, primarily based on data from the 2024 Long Term Reliability Assessment (LTRA).	
SERC-Central		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
SERC-East		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found a small number of load-loss hours (<0.1) and EUE (61 MWh / 1 ppm) for 2026.
SERC-Florida Peninsula		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found negligible load-loss hours and EUE.
SERC-Southeast		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
Texas RE-ERCOT	ERCOT Probabilistic Reserve Risk Model	ERCOT's probabilistic risk assessment indicates a 2% probability of having to declare EEAs during the January forecasted winter peak day (which coincides with the highest reserve shortage risk) and a controlled load shed probability of 1.8%. ERCOT defines low-risk hours as when the probability of an EEA is less than 10%.
WECC	The resource adequacy work performed at WECC used the Multi-Area Variable Resource Integration Convolution (MAVRIC) model for the 2025 LTRA. The MAVRIC model is a convolution-based probabilistic model and is WECC's chosen method for developing probability metrics used for assessing demand and variable resource availability in every hour. In the resource adequacy environment, the reports produced support NERC's seasonal assessments, LTRA, and ProbA.	
WECC-AB		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Basin		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-BC		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.

Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
WECC-CA		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Mexico		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Rocky Mountain		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-NW		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026. Results for a case where new resource additions are not completed for the upcoming winter found some EUE and LOLH.
WECC-SW		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.

Regional Assessments Dashboards

The following assessment area dashboards and summaries were developed based on data and narrative information collected by NERC from the six Regional Entities on an assessment area basis. Guidelines and definitions are in the **Data Concepts and Assumptions** table. On-Peak Reserve Margin bar charts show the ARM compared to a reference margin level (RML) that is established for each area to meet resource adequacy criteria. Prospective Reserve Margins can give an indication of additional on-peak capacity but are not used for assessing adequacy. The operational risk analysis shown in the following regional assessments dashboard pages provides a deterministic scenario for understanding how various factors that affect resources and demand can combine to impact overall resource adequacy. For each assessment area, there is a risk-period scenario graphic; the left blue column shows anticipated resources (from the **Demand and Resource Tables**), and the two orange columns at the right show the two demand scenarios of the normal peak net internal demand (from the **Demand and Resource Tables**) and the extreme winter peak demand determined by the assessment area. The middle red or green bars show adjustments that are applied cumulatively to the anticipated resources. Adjustments may include reductions for typical generation outages (maintenance and forced not already accounted for in anticipated resources) and additions that represent the quantified capacity from operational tools (if any) that are available during scarcity conditions but have not been accounted for in the WRA reserve margins. Resources throughout the scenario are compared against expected operating reserve requirements that are based on peak load and normal weather. The cumulative effects from extreme events are also factored in through additional resource derates or low-output scenarios. In addition, results from a probability-based resource adequacy assessment are shown in the Highlights section of each dashboard. Methods vary by assessment area and provide further insights into the risk conditions forecasted for this upcoming winter period.



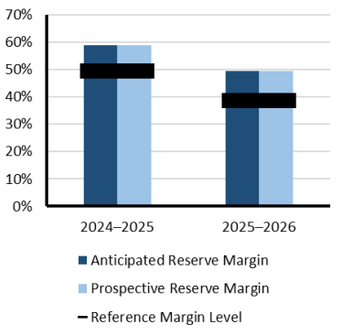


MISO

The Midcontinent Independent System Operator, Inc. (MISO) is an independent, not-for-profit organization responsible for operating the bulk electric power system and administering wholesale electricity markets across 15 U.S. states and the Canadian province of Manitoba. MISO ensures the reliable delivery of electricity to approximately 45 million people by managing regional transmission operations as well as energy and ancillary services markets and advising on long-term resource planning. The MISO footprint includes 39 Local BAs and more than 550 market participants. MISO operates one of the world's largest organized electricity markets, with its members operating a system that consists of over 77,000 miles of transmission lines and approximately 1,888 generating units. The peak electricity demand on the MISO system currently occurs during the summer season. MISO's footprint lies across three regional entities (MRO, RF, and SERC), but MRO is responsible for coordinating data and information submitted for NERC's reliability assessments.

- MISO expects limited risk in the 2025–26 Winter season as MISO was able to procure 6.1% more resources through the annual planning reserve auction than required by its minimum resource adequacy target. A further 3.3 GW of resources were available but not chosen to be committed for the winter season.
- Some risk has been identified for this upcoming winter season. In a high generation outage and high winter load scenario reliability is expected to be maintained by reliance upon operational mitigations that include non-firm energy transfers into the system, energy-only resources not subject to a must-offer requirement that may still offer into the energy markets, load-modifying resources, and internal transfers that exceed the Sub-Regional Import/Export Constraint (SRIC/SREC) between the MISO North/Central and South areas.
- MISO continues to coordinate with neighboring RCs and BAs to improve situational awareness and vet any needs for energy transfers to address extreme system conditions.
- MISO continues to survey and coordinate with its members on winter preparedness and fuel sufficiency.
- MISO has implemented a seasonal resource adequacy construct and seasonal unit accreditation to better affirm adequate supply in all seasons.

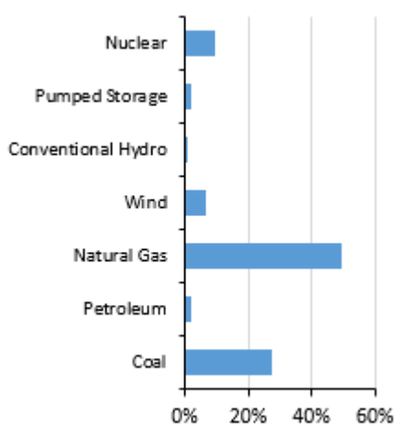
On-Peak Reserve Margin[10]



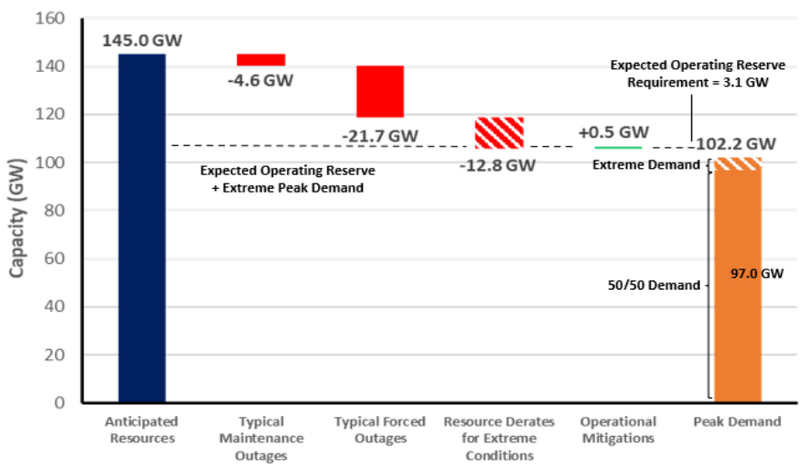
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed demand scenarios. Above-normal winter peak load combined with generator outages from freezing or fuel supply issues and low wind output result in the need to employ operating mitigations (i.e., demand response and transfers).

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: 50/50 net internal demand and additional demand during extreme weather conditions (e.g., Winter Storm Enzo) using member submitted data and historical load data

Typical Maintenance Outages: Rolling three-year winter average of peak-day maintenance and planned outages

Typical Forced Outages: Three-year average of all peak-day outages that were not planned

Resource Derates for Extreme Conditions: Represents derates aligning with the most extreme hour of each of the past 3 years,

Operational Mitigations: Non-firm energy transfers into the system, energy-only resources that do not have a must-offer requirement, or internal transfers that exceed the SRIC/SREC between the MISO North/Central and South regions

[10] The MISO Risk Scenario Assessment for the 2025-26 Winter Season is not directly comparable to that for the 2024-25 Winter Season as methodology improvements have been implemented.



MRO-Manitoba Hydro

Manitoba Hydro is a provincial Crown corporation and one of the largest integrated electricity and natural gas distribution utilities in Canada. Manitoba Hydro is a leader in providing renewable energy and clean-burning natural gas. Manitoba Hydro provides electricity to approximately 608,500 electric customers in Manitoba and natural gas to approximately 293,000 customers in southern Manitoba. Its service area is the province of Manitoba, which is 251,000 square miles. Manitoba Hydro is winter-peaking. Manitoba Hydro is its own Planning Coordinator (PC) and Balancing Authority (BA). Manitoba Hydro is a coordinating member of MISO, which is the RC for Manitoba Hydro.

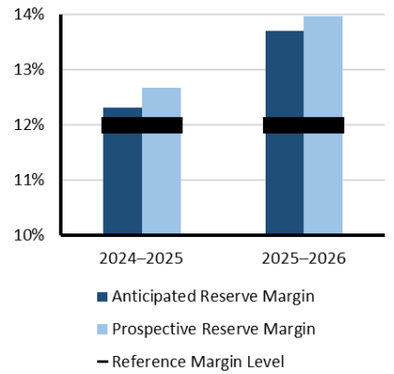
Highlights

- Manitoba Hydro is not anticipating any operational challenges and/or emerging reliability issues in its assessment area for Winter 2025–2026.
- Manitoba Hydro expects to reliably supply its internal demand and export obligations even under continued drought conditions.
- Manitoba Hydro is experiencing well below-average water supply conditions; however, the Manitoba Hydro system is designed and operated such that reliable operations can be maintained under extreme drought.
- The ARM for Winter 2025–26 exceeds the 12% RML.

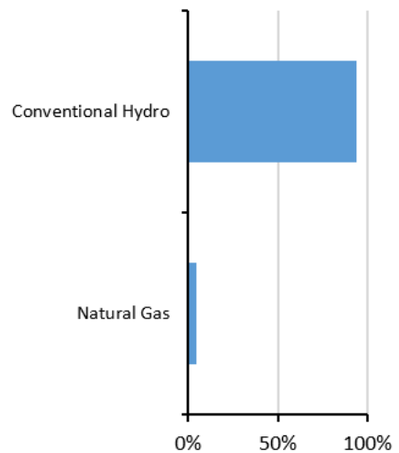
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

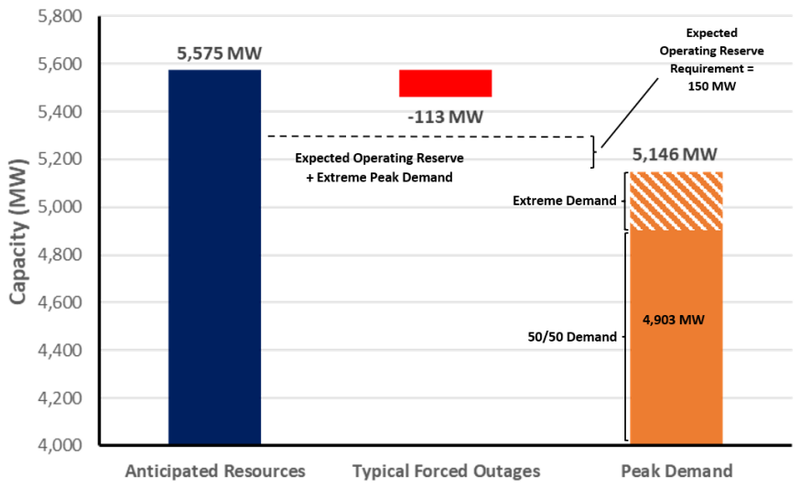
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of weather data

Typical Forced Outages: Accounts for average forced outages



MRO-SaskPower

MRO-SaskPower is an assessment area that covers the Canadian province of Saskatchewan. The province has a geographic area of 651,900 square kilometers (251,700 square miles) and a population of just over 1.1 million people. The Saskatchewan Power Corporation (SaskPower) is the PC and RC for the province of Saskatchewan and is the principal supplier of electricity in the province. SaskPower is a provincial Crown corporation and, under provincial legislation, is responsible for the reliability oversight of the Saskatchewan Bulk Electric System (BES) and its interconnections. Overall, SaskPower operates nearly 14,816 circuit-km of transmission lines, 65 high-voltage switching stations, and 191 distribution substations. Peak electricity demand on the SaskPower system currently occurs during the winter season.

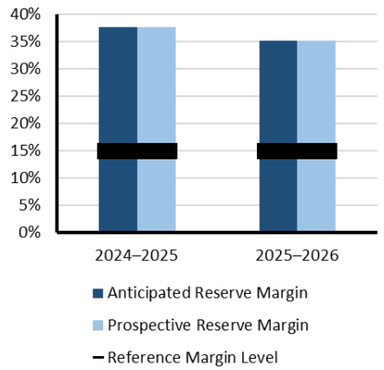
Highlights

- Saskatchewan experiences its peak load during the winter months due to extreme cold weather.
- Based on the planned maintenance, typical forced outages from historical data, and expected renewable generation under the normal and extreme demand conditions, SaskPower does not anticipate any reliability issues during the 2025–2026 Winter.
- During extreme winter conditions, SaskPower would utilize available demand-response programs, short-term power transfers from neighboring utilities, maintenance rescheduling, and/or short-term load interruptions to manage the situation.

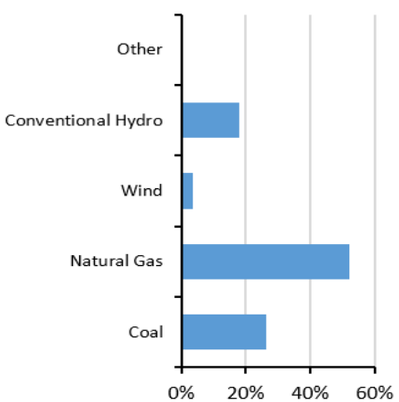
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

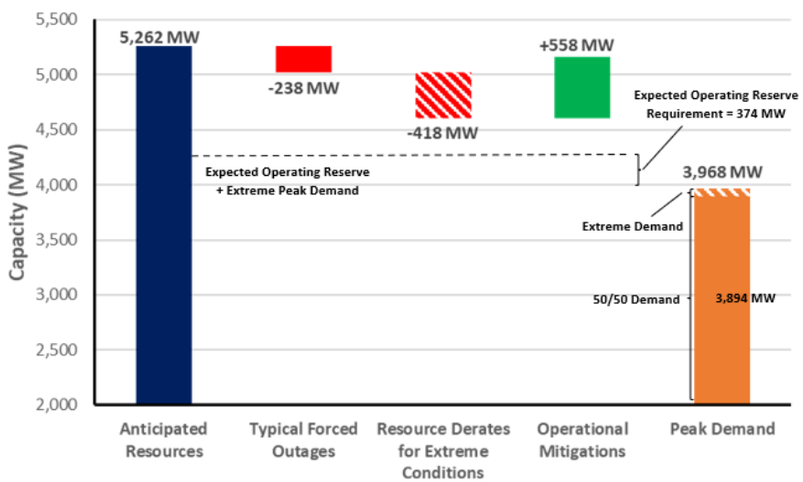
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Based on the historical load variability, SaskPower calculates a probability density function for load to simulate various scenarios that include extreme conditions.

Typical Forced Outages: Estimated using SaskPower forced outage model

Resource Derates for Extreme Conditions: Wind capacity is derated by 96% due to the cut-out of most wind farms below -30°C. Solar generation is expected to be fully unavailable under extreme conditions.

Operational Mitigations: Includes the non-firm import capability (360 MW) and generators in layup status (167 MW) that can be brought online with one to five days' notice; additional demand-side resources are estimated based on other demand response programs and non-firm loads that require 15 minutes to 2 hours of notification



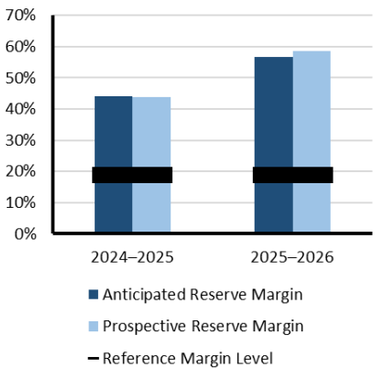
MRO-SPP

SPP's footprint covers 546,000 square miles and encompasses all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. The SPP long-term assessment is reported based on the PC footprint, which touches parts of the MRO Regional Entity and the WECC Regional Entity. The SPP assessment area footprint has approximately 61,000 miles of transmission lines, 756 generating plants, and 4,811 transmission-class substations, and it serves a population of more than 18 million.

Highlights

- SPP anticipates that planning reserves are adequate for the upcoming winter season even as SPP continues to set new winter season load records.
- SPP does not anticipate any emerging reliability issues impacting the area for the 2025–2026 Winter season but realizes that interruptions to fuel supply combined with higher penetration of variable energy resources could create unique operation challenges.
- SPP continues to work at enhancing communications and operator preparedness with neighboring regions to address potential electric deliverability issues associated with extreme weather events.
- To minimize conservative operations, EEAs, and mid-range forecast error uncertainty response in wind forecasts, SPP implemented several new operational mitigation processes and procedures to deal with high-impact real-time areas of reliability concern.
- SPP has proposed numerous resource adequacy initiatives, including addressing EUE standards, fuel assurance, winter planning reserve margins, outage policies, demand response, and accreditation; all were recently approved by FERC.

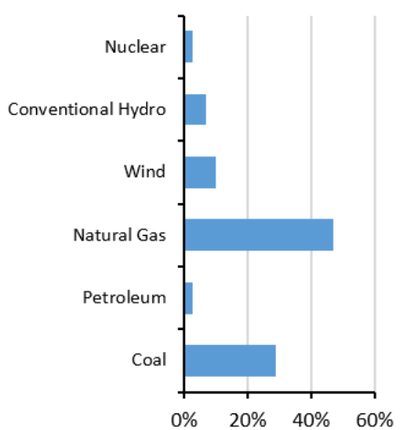
On-Peak Reserve Margin



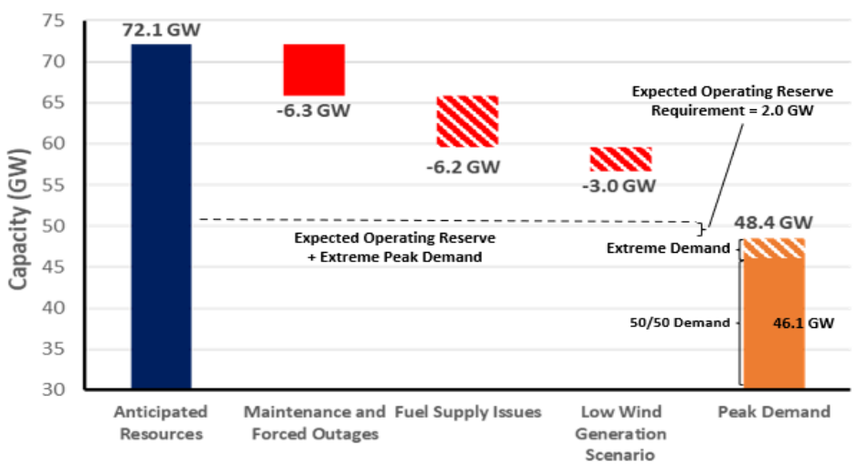
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast using historical data

Maintenance and Forced Outages: A capacity derate of 6.3 GW for maintenance outages, forced outages, and performance in extreme weather based on historical data

Fuel Supply Issues: BA derate of 6.2 GW based on MW capacity of gas-fired generators experiencing fuel supply issues in winter storm Elliott.

Low Wind Generation Scenario: 3 GW of wind potentially off-line when temperatures fall below their cold weather performance packages



NPCC-Maritimes

NPCC-Maritimes is an assessment area that covers the Canadian Maritime provinces—New Brunswick, Nova Scotia, and Prince Edward Island—and the northernmost portion of the U.S. state of Maine. The area covers approximately 150,000 square kilometers (58,000 square miles) and has a total population of nearly 1.9 million people. The New Brunswick Power Corporation (NB Power) is the balancing authority for New Brunswick, Prince Edward Island, and the northern portion of Maine. Nova Scotia Power Inc. (NSPI) is the balancing authority for Nova Scotia. NB Power's system is electrically interconnected with NPCC-Québec and NPCC-New England, and the electric systems in the provinces of Nova Scotia and Prince Edward Island have ties with New Brunswick but no direct ties with other assessment areas. Peak electricity demand in NPCC-Maritimes occurs during the winter season.

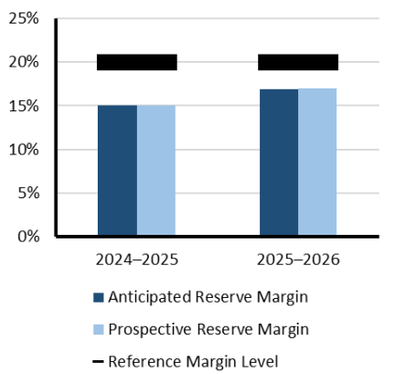
Highlights

- The Maritimes has a diversified mix of capacity resources fueled by oil, coal, hydro, nuclear, natural gas, wind, dual-fuel oil/gas, tie benefits, and biomass with no one type making up more than about 27% of the total capacity in the area.
- The Maritimes has long-term energy contracts in place for its winter supply and can purchase additional energy in the day-ahead and in real time as required.
- As part of the winter planning and preparation process, dual-fueled units will have sufficient supplies of heavy fuel oil stored on site to enable sustained operation in the event of natural gas supply interruptions.

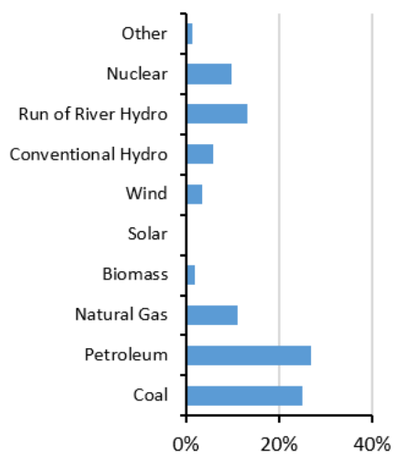
Risk Scenario Summary

Expected resources do not meet operating reserve requirements under normal peak-demand scenarios. Normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response, transfers, appeals) and EEAs. NPCC probabilistic analysis indicates some risk of unserved energy and LOLH under high demand or low resource scenarios.

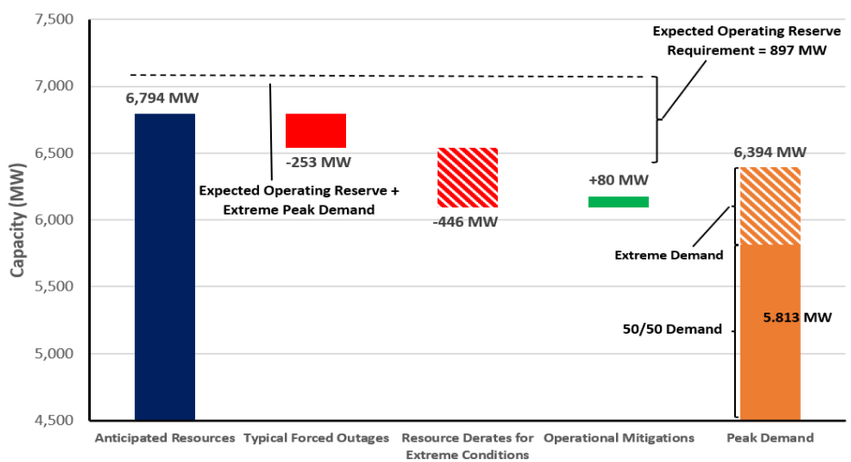
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Scenario peak load with adjustment calculated by adding a 10% margin of error to the peak internal demand forecast taken from the *Long-Term Reliability Assessment* (LTRA) for the 2025–2026 Winter period (aligns with the all-time winter peak, which occurred on February 4, 2024)

Typical Forced Outages: Based on historical operating experience

Resource Derates for Extreme Conditions: Based on ambient temperature thermal derates, wind derated to zero, as well as natural gas capacity derated by 50% due to supply issues

Operational Mitigations: Based on emergency operations and planning procedures in place including fuel switching



NPCC-New England

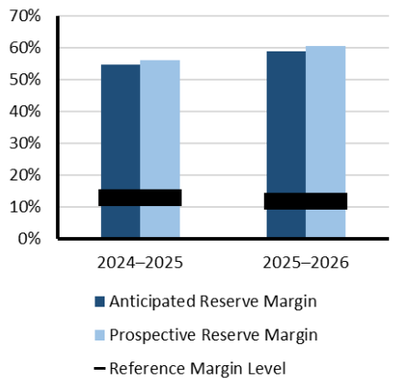
NPCC-New England is an assessment area consisting of the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont that is served by ISO New England (ISO-NE) Inc. ISO-NE is a regional transmission organization that is responsible for the reliable day-to-day operation of New England's bulk power generation and transmission system, administration of the area's wholesale electricity markets, and management of the comprehensive planning of the regional BPS.

The New England BPS serves approximately 14.5 million customers over 68,000 square miles.

Highlights

- ISO-NE expects to meet its regional resource adequacy requirements this 2025–2026 Winter operating period without calling upon operating procedures to maintain a balance between electricity supply and demand.
- A standing concern is whether there will be sufficient energy available to satisfy electricity demand during an extended cold spell given the existing resource mix, fuel delivery infrastructure, and expected fuel arrangements without considerable effort to replenish stored fuels (i.e., fuel oil and liquefied natural gas (LNG)).
- ISO-NE expects to have sufficient capacity resources to meet the 2025–2026 50/50 and 90/10 winter peak demand forecast of 19,616 MW and 21,125 MW, respectively, for the weeks beginning January 10, January 17, and January 24.
- ISO-NE has recently developed the Regional Energy Shortfall Threshold (REST) as an effort to quantify the tolerable risk of energy shortfall during extreme events. Within the 0.25% highest-risk scenarios, the REST thresholds are 3.0% normalized EUE over 72-hour periods and 18.0 hours over 21-day periods.
    - ISO-NE does not anticipate exceeding the REST criteria for Winter 2025–2026.

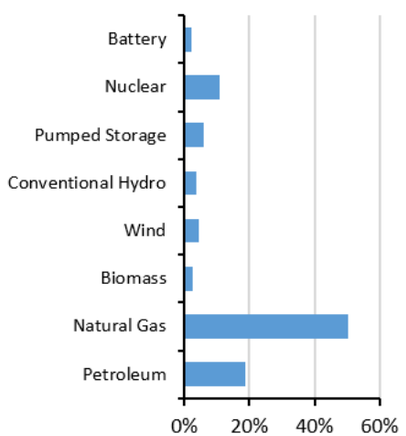
On-Peak Reserve Margin



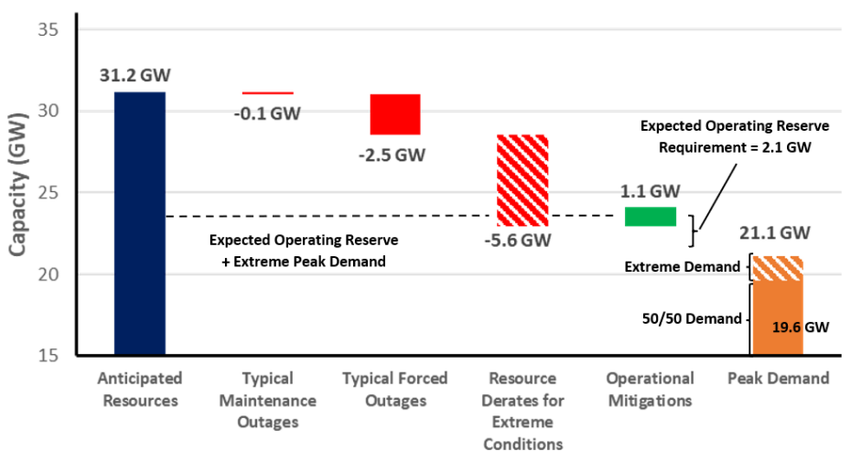
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed demand scenarios. Above-normal winter peak load combined with high generator outages could result in the need for operating mitigations (i.e., demand response and transfers). Prolonged extreme cold weather events that result in depletion of stored fuels can lead to resource shortfalls.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Peak net internal demand (50/50) and (90/10) extreme demand forecast capturing the region's coldest day in the last 30 years using current and future load models

Typical Maintenance Outages: Based on historical weekly averages

Typical Forced Outages: Based on seasonal capacity of each resource as determined by ISO-NE

Resource Derates for Extreme Conditions: Represent a case that is beyond the (90/10) conditions based on historical observation of force outages and additional reductions for generation at risk due to natural gas supply and cold weather-related outages

Operational Mitigations: Based on load and capacity relief assumed available from invocation of ISO-NE operating procedures



NPCC-New York

NPCC-New York is an assessment area consisting of the New York ISO (NYISO) service territory. NYISO is responsible for operating New York's BPS, administering wholesale electricity markets, and conducting system planning. NYISO is the only BA within the state of New York. The BPS in New York encompasses over 11,000 miles of transmission lines and 760 power generation units and serves 20.2 million customers. For this WRA, the established RML is 15%. Wind, grid-connected solar PV, and run-of-river totals were derated for this calculation. However, New York requires load-serving entities to procure capacity for their loads equal to their peak demand plus an Installed Reserve Margin (IRM). The IRM requirement represents a percentage of capacity above peak load forecast and is approved annually by the New York State Reliability Council. The council approved the 2025–2026 IRM at 24.4%.

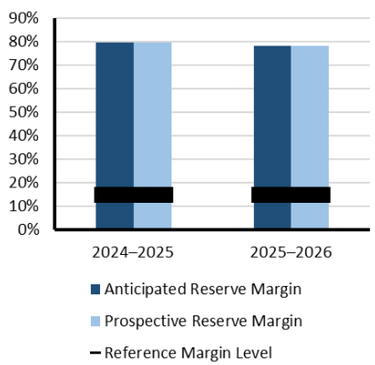
Highlights

- New York is presently a summer-peaking area, and no emerging reliability issues are anticipated during the 2025–26 Winter assessment period.
- Expected resources meet operating reserve requirements under the assessed demand and resource scenarios. A scenario involving an extended cold snap that causes above-normal demand and diminished natural gas supplies would result in low but sufficient reserves.
- The preliminary results of the NPPCC winter probabilistic assessment indicate that operating procedures are not needed to maintain a balance between electricity supply and demand. No cumulative LOLE, LOL,H or EUE risks were indicated over the December–February winter period for all the scenarios modeled.

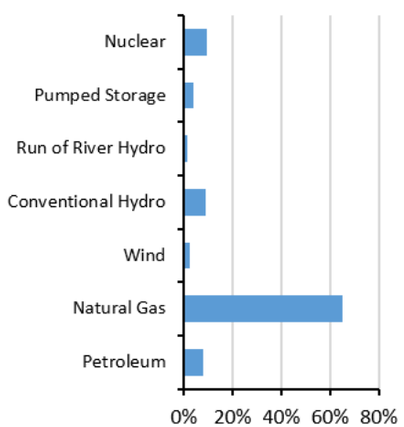
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed demand and resource scenarios.

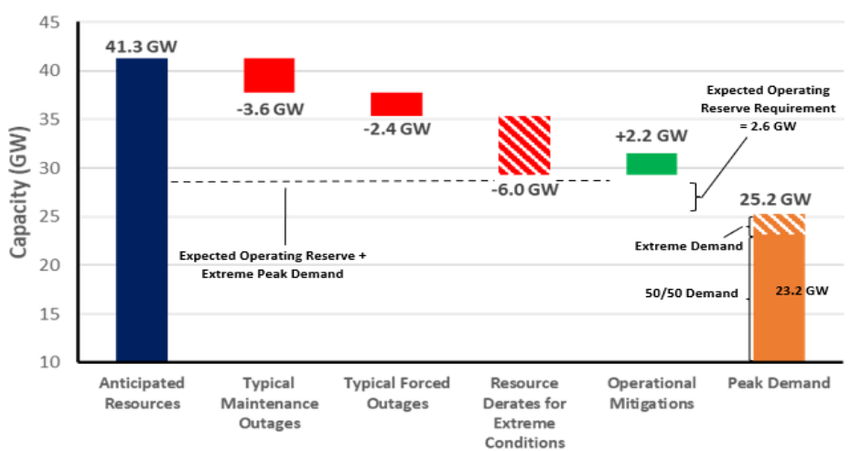
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Maintenance Outages: Based on planned scheduled maintenance

Typical Forced Outages: Based on 5–year averages from GADS data.

Resource Derates for Extreme Conditions: Potential natural gas generation at risk if non-firm supply is unavailable in a period of extended cold weather. Based on a 2025 analysis, approximately 6,307 MW of gas generation with non-firm fuel supplies could be unavailable.

Operational Mitigations: Based on NYISO operating procedures



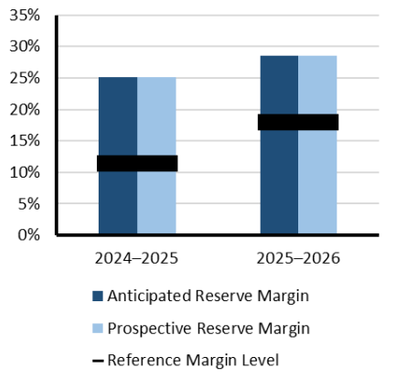
NPCC-Ontario

NPCC-Ontario is an assessment area that covers the Canadian province of Ontario. The province of Ontario covers more than 1 million square kilometers (415,000 square miles) and has a population of almost 16 million people. The Independent Electricity System Operator (IESO) is the balancing authority for the province of Ontario. NPCC-Ontario is electrically interconnected with NPCC-Québec, MRO-Manitoba, MISO, and NPCC-New York. Peak electricity demand in NPCC-Ontario occurs during the summer season.

Highlights

- As Ontario is a summer-peaking province, there is typically a lower risk of reliability issues during the winter than the summer. However, Ontario regularly experiences extreme cold weather in the winter.
- NPCC-Ontario is well prepared for Winter 2025–2026, and IESO expects that the electric system will remain reliable with reserve margins well above required levels.
- Operators and forecasters in Ontario work closely with neighboring jurisdictions to manage extreme weather events.
- Natural-gas-fired generators in Ontario are supplied by pipelines with access to the Enbridge Gas Dawn Hub and its associated storage facilities, which significantly reduces natural gas deliverability and reliability concerns by connecting those systems to several major gas transportation corridors, enabling access to multiple supply basins.

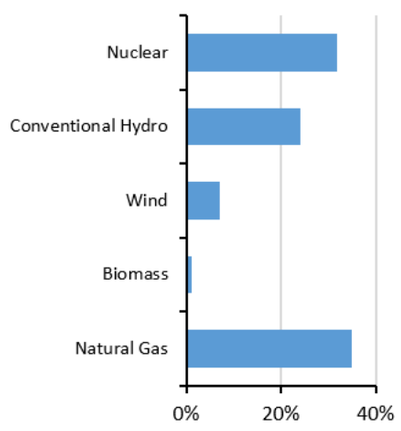
On-Peak Reserve Margin



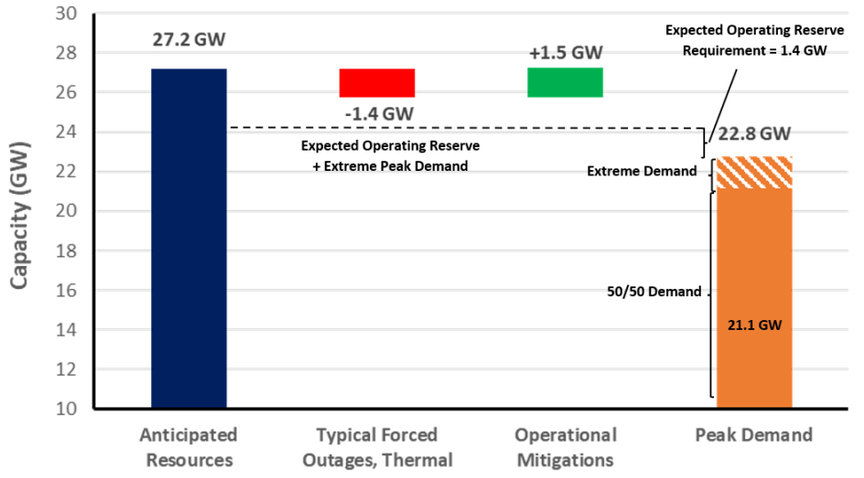
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50 forecast) and highest weather-adjusted daily demand from 31 years of winter demand history

Typical Forced Outages, Thermal: Based on analysis of a rolling five-year history of actual forced outage data.

Operational Mitigations: Imports anticipated from **neighbors** during emergencies



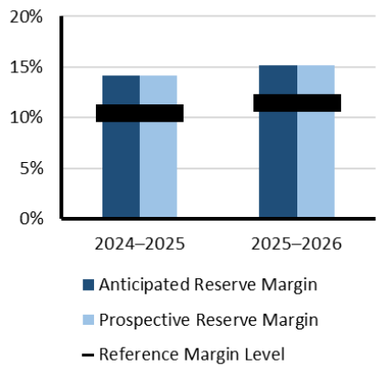
NPCC-Québec

NPCC-Québec is an assessment area that covers the Canadian province of Québec. The province of Québec covers over 1.5 million square kilometers (nearly 600,000 square miles) and has a population of 9 million people. Hydro-Québec is the BA for the province of Québec. The Québec BPS is one of the four electric Interconnections in North America. It is a predominately hydroelectric-generation-based system that is electrically interconnected with NPCC-Ontario, NPCC-New York, NPCC-New England, and NPCC-Maritimes. Peak electricity demand in NPCC-Québec occurs during the winter season.

Highlights

- NPCC-Québec projects adequate capacity margins above its reference reserve requirements and that system resource adequacy will be maintained for the province for the 2025–26 Winter assessment period.
- No hydropower performance issues are expected during extreme cold because of design criteria for cold weather.
- No fuel supply or transportation issues are anticipated for the upcoming winter season.
- While a slight decrease in net firm transfers has occurred since last winter (-89 MW), significant increases in demand-side management programs (+450 MW year-over-year) have been realized over the same period and are expected to compensate for this winter's modest expected load growth.

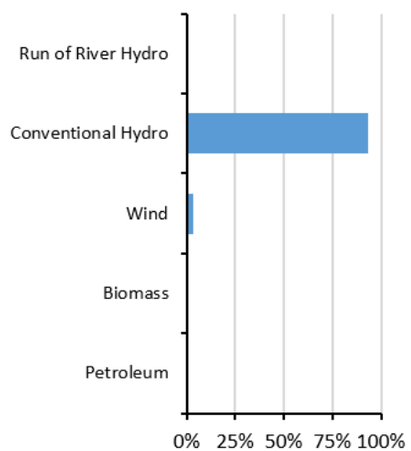
On-Peak Reserve Margin



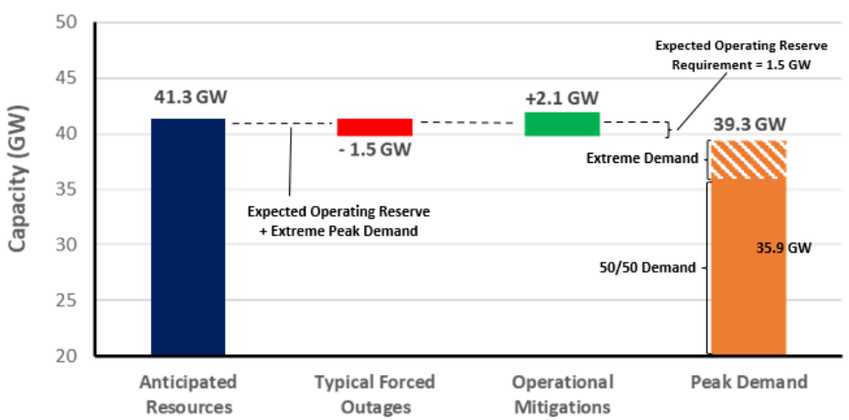
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at hour ending 8:00 a.m.

Demand Scenarios: Demand forecasts include demand-side resources. The demand side resources are the same for the 50/50 and extreme demand scenarios. The extreme load forecast is determined at two standard deviations higher than the mean, which has a 6.06% probability of occurrence.

Extreme Derates: Maintenance outages and other deratings are already included in existing-certain capacity calculation. Wind capacity is 64% derated

Typical Forced Outages: Unplanned outages are 1,500 MW.

Operational Mitigations: Operational mitigations include imports from neighboring areas and reduction of reserves



PJM

PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. PJM's footprint covers approximately 369,054 square miles and with an approximate population of 67 million people. PJM is the area's BA, Transmission and Resource Planner, interchange authority, TOP, transmission service provider, and RC. PJM is electrically interconnected with MISO, NPCC-New York, SERC-Central, and SERC-East. Peak electricity demand in PJM occurs during the summer season.

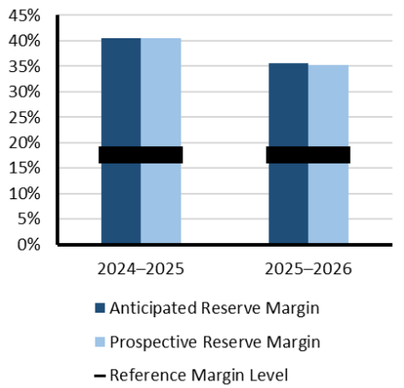
Highlights

- Due to the low penetration of limited and variable resources in PJM relative to PJM's peak load, the hour with highest loss-of-load risk remains the hour with highest forecasted demand.
- PJM is expecting little capacity adequacy risk during Winter 2025–2026 and expects around 35% installed reserves, which is above the target IRM of 17.7% necessary to meet the 1-day-in-10-years LOLE criterion.
- Last winter, PJM hit a new all-time winter peak, but generator preparations anticipating congestion and tight capacity projections led to sufficient reserves throughout the demand event and PJM's transmission system performed well.
- The decrease in reserves from Winter 2024–2025 is due to load increases and retirement of generation without like (non-solar dispatchable) replacement generation.

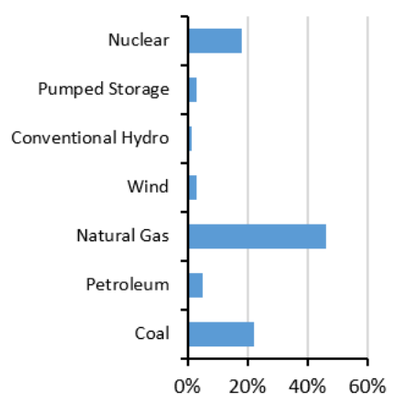
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

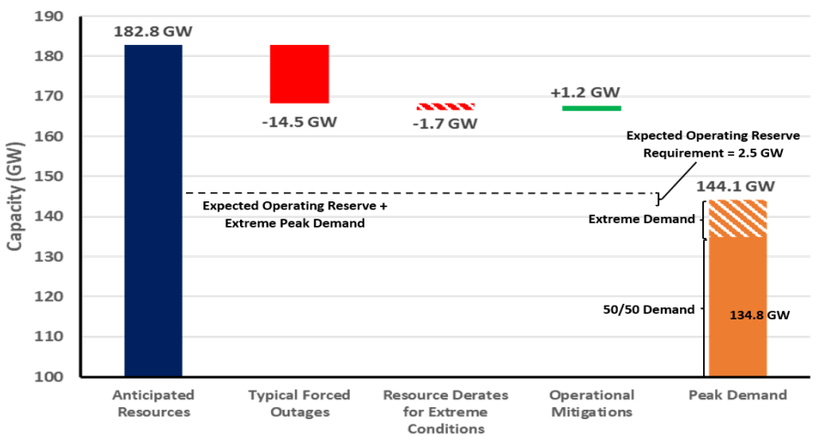
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Forced Outages: Based on historical data and trending

Resource Derates for Extreme Conditions: Reduced thermal capacity contributions due to performance in extreme conditions

Operational Mitigations: accounts for an estimated value based on operational / emergency procedures



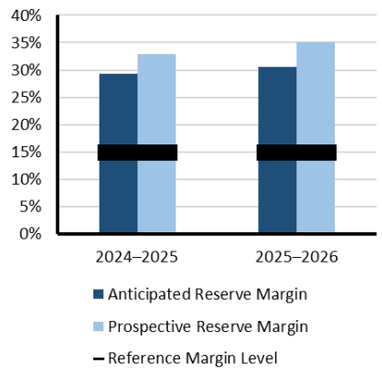
SERC-Central

SERC-Central is an assessment area within the SERC Regional Entity. SERC-Central includes all of Tennessee and portions of Georgia, Alabama, Mississippi, Missouri, and Kentucky. Historically a summer-peaking area, SERC-Central is beginning to have higher peak demand forecasts in winter. SERC is one of the six companies across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC-Central is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

Highlights

- SERC-Central is transitioning from a summer-peaking area to a dual-peaking system.
- For the 2025–2026 Winter, SERC-Central projects a sufficient level of resources to serve the expected load under median weather and typical system operating conditions, based on the 2024 NERC ProbA base-case results.
- Most entities across SERC-Central report that fuel security is strong since it is supported by firm natural gas contracts, storage resources, and reliable pipeline capacity. Coal inventories are projected to remain within operational ranges necessary to meet winter demand.
- Following lessons from Winter Storm Elliott, one SERC-Central entity raised its winter Planning Reserve Margin target to 26% and updated preparedness programs with improved heat trace capabilities.

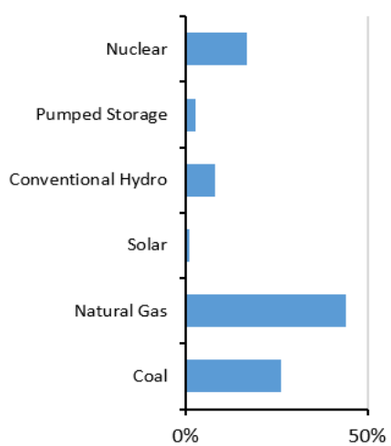
On-Peak Reserve Margin



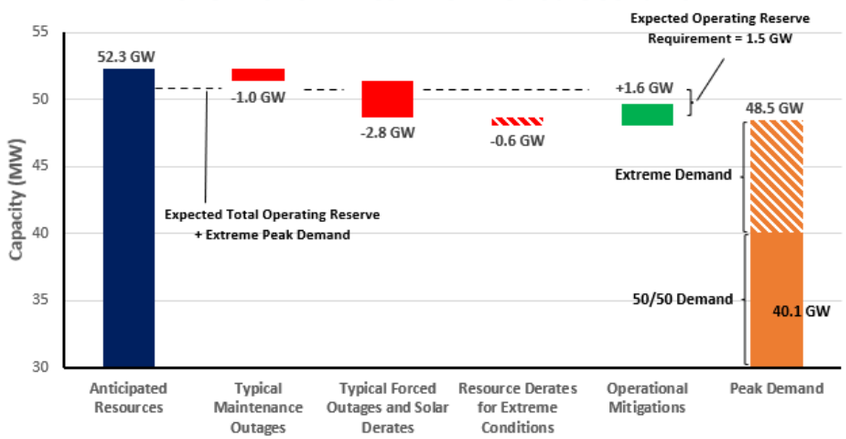
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand. A severe cold weather event that extends to the south could lead to energy emergencies as operators face sharp increases in generator forced outages and electricity demand. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for expected outages during December through February

Typical Forced Outages and Solar Derate: Includes any weighted average forced-outage rates on-peak that are not factored into the anticipated resources calculation . Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Entity-provided values for low likelihood extreme conditions

Operational Mitigations: A total of over 1.6 GW based on operational/emergency procedures



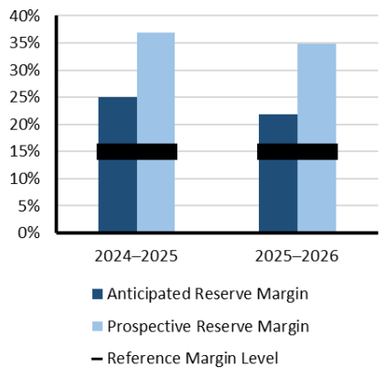
SERC-East

SERC-East is an assessment area within the SERC Regional Entity. SERC-East includes North Carolina and South Carolina. Historically a summer-peaking area, SERC-East is beginning to have higher peak demand forecasts in winter. SERC is one of the six Regional Entities across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 Planning Authorities (PA), and 6 RCs.

Highlights

- SERC-East is transitioning from a summer-peaking area to potentially peaking during both summer and winter. This shift is attributed to the continued addition of solar PV generation, which reduces summer peak demand, and a trend toward electrification of heating, which drives up winter peak demand.
- For the 2025–2026 Winter, the SERC-East region projects a sufficient level of resources to serve the expected load under median weather and typical system operating conditions, based on the 2024 NERC ProbA base-case results.
- Fuel supplies and transportation remain stable, and entities anticipate maintaining adequate coal and oil inventories with no reported changes to fuel procurement or operator plans for the upcoming winter.
- Probabilistic Base Case Results (Median Weather): EUE is 61.95 MWh and LOLH is 0.06 hours/year. EUE values are likely due to higher winter peaks and/or lower supply of capacity that can meet early winter morning demand.
- Mitigation measures for extreme conditions include voltage reduction (25–50 MW) and load-shedding programs that cover up to 30% of system load.

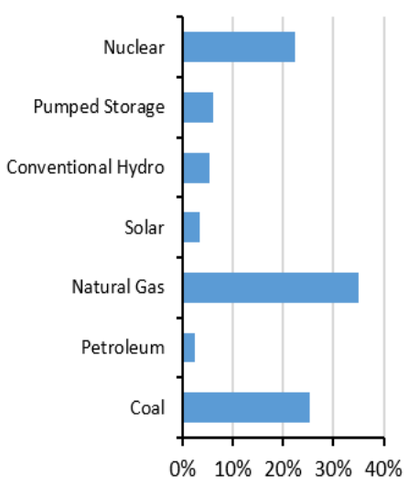
On-Peak Reserve Margin



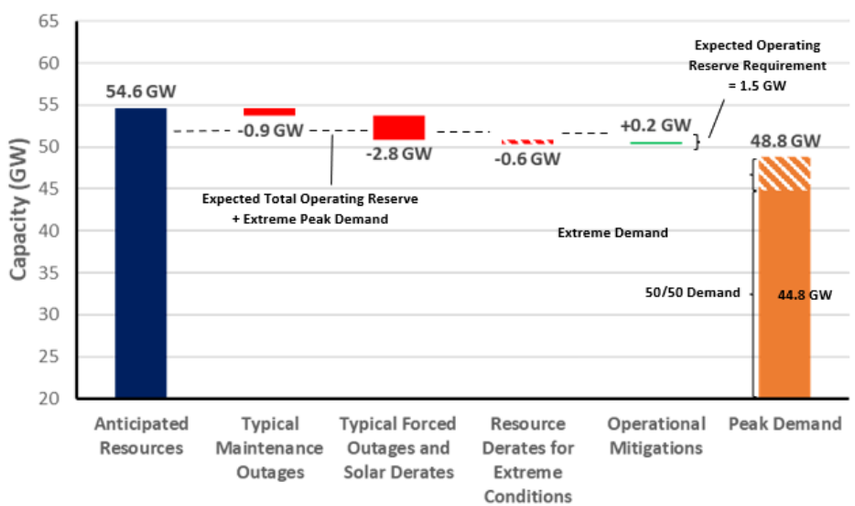
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal demand scenarios. A severe cold weather event extending to the south could lead to energy emergencies as operators face sharp increases in generator forced outages and electricity demand. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Maximum historical generation outages (excluding 2022–2025)

Operational Mitigations: A total of 0.2 GW based on operational/emergency procedures



SERC-Florida Peninsula

SERC-Florida Peninsula is a summer-peaking assessment area within SERC. SERC is one of the six Regional Entities across North America that is responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity area covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 PAs, and 6 RCs.

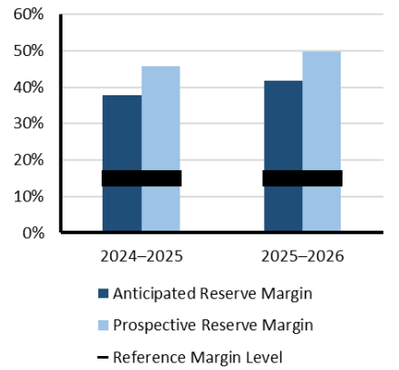
Highlights

- SERC-Florida Peninsula is a summer-peaking assessment area.
- Florida Peninsula entities have not identified any emerging reliability issues for the upcoming 2025–26 Winter season with an ARM projected at 39%, well above the RML, while the 2024 NERC ProbA base-case results project a sufficient level of resources to serve the expected load under median weather and typical system operating conditions (EUE is 1.09 MWh and LOLH is 0.00 hours/year).
- Many entities report strong fuel security, supported by firm natural gas contracts, storage resources, reliable pipeline capacity, and actively managed coal and oil inventories, which are projected to remain within operational ranges to meet winter demand.
- Florida Peninsula entities do not assume non-firm external assistance from neighboring areas during extreme conditions.

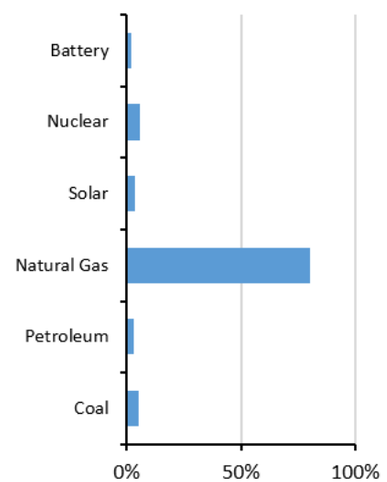
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

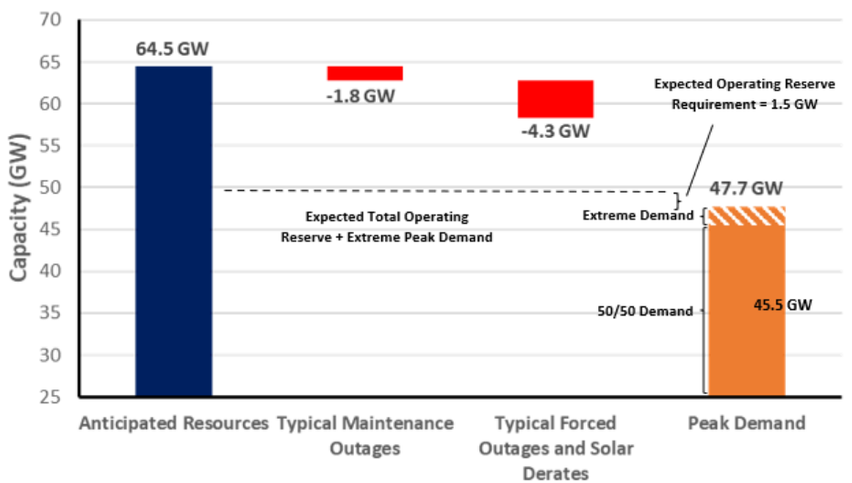
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Entity-provided values for low likelihood extreme conditions



SERC-Southeast

SERC-Southeast is a summer-peaking assessment area within the SERC Regional Entity. SERC-Southeast includes all or portions of Georgia, Alabama, and Mississippi. SERC is one of the six Regional Entities across North America that is responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 PAs, and 6 RCs.

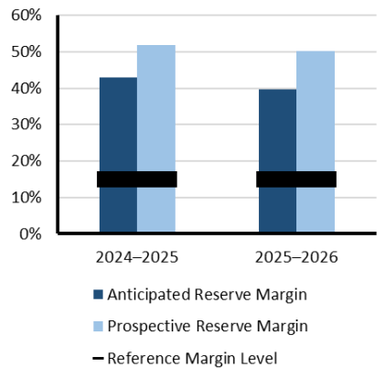
Highlights

- SERC-Southeast is trending towards becoming slightly winter-peaking.
- For the 2025–2026 Winter, SERC-Southeast entities report no emerging reliability concerns and expect to have adequate resources, supported by firm natural gas transportation contracts, diverse fuel portfolios, and sufficient on-site coal inventories to serve the expected load under typical system operating conditions. The 2024 NERC ProbA base-case results in EUE and LOLH are both 0.00.
- While most SERC-Southeast BAs expect to have adequate resources, supported by firm natural gas transportation contracts, diverse fuel portfolios, and sufficient on-site coal inventories, one BA highlights potential risks related to natural gas transportation capacity, citing high pipeline utilization, competition for delivered gas, and ratable flow requirements. Mitigation strategies include securing third-party gas supply, adding dual-fuel capability, and implementing coal inventory management.
- Entities have made refinements such as replacing specific 230 kV circuit breakers and increasing monitoring frequencies for critical plant systems after January 2025 winter events.

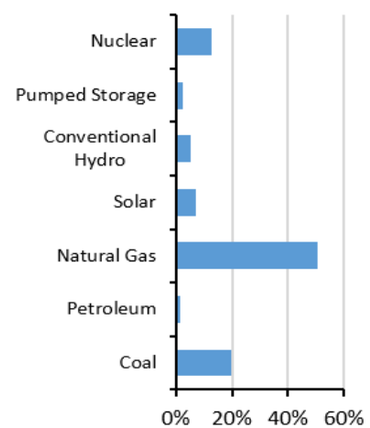
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

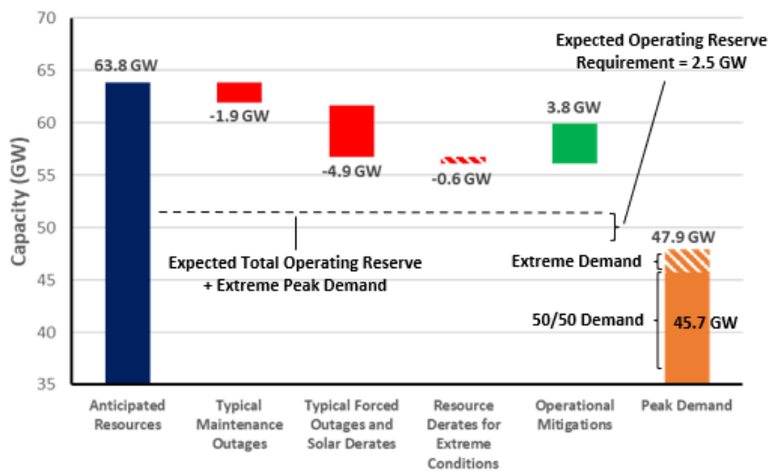
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Maximum historical generation outages

Operational Mitigations: A total of 3.8 GW based on operational/emergency procedures



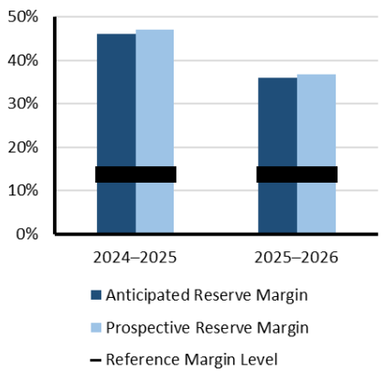
Texas RE-ERCOT

ERCOT is the ISO for the ERCOT Interconnection and is located entirely in the state of Texas; it operates as a single BA. It also performs financial settlement for the competitive wholesale bulk-power market and administers retail switching for nearly 8 million premises in competitive choice areas. ERCOT is governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas Legislature. ERCOT is summer-peaking and covers approximately 200,000 square miles, connects over 54,100 miles of transmission lines, has over 1,250 generation units, and serves more than 27 million customers. Texas RE is responsible for the Regional Entity functions described in the Energy Policy Act of 2005 for ERCOT. On November 3, 2022, the Public Utility Commission of Texas issued an order directing ERCOT to assume the duties and responsibilities of the reliability monitor for the Texas power grid.

Highlights

- Given expected system conditions, an ARM of 36% and RML of 13.75%, ERCOT expects to have sufficient operating reserves for the peak hour ending 8:00 a.m.
- ERCOT does not expect any significant fuel supply issues for the winter.
- ERCOT has conducted 2,028 generation resource and transmission service provider (TSP) winter weatherization inspections since Winter 2021–2022.
- Winter peak demands typically occur before sunrise and after sunset when solar generation is not available. Significant battery storage mitigates these risks.
- ERCOT's probabilistic risk assessment indicates a 2% probability of having to declare EEAs during the January forecasted winter peak day (which coincides with the highest reserve shortage risk) and a controlled load shed probability of 1.8%. ERCOT defines low-risk hours as when the probability of an EEA is less than 10%.
- Increased load growth in west Texas combined with "no solar" and low wind conditions can cause transmission lines into this area to become heavily loaded. ERCOT has introduced improved dynamic line ratings that allow for greater transfers at colder temperatures and periods of low irradiance.

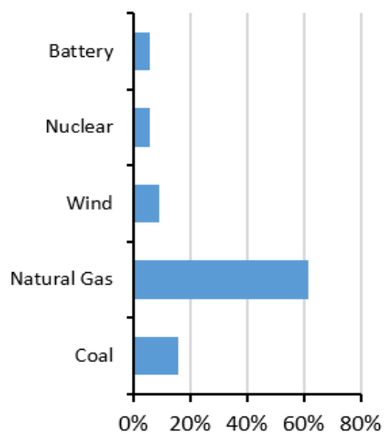
On-Peak Reserve Margin



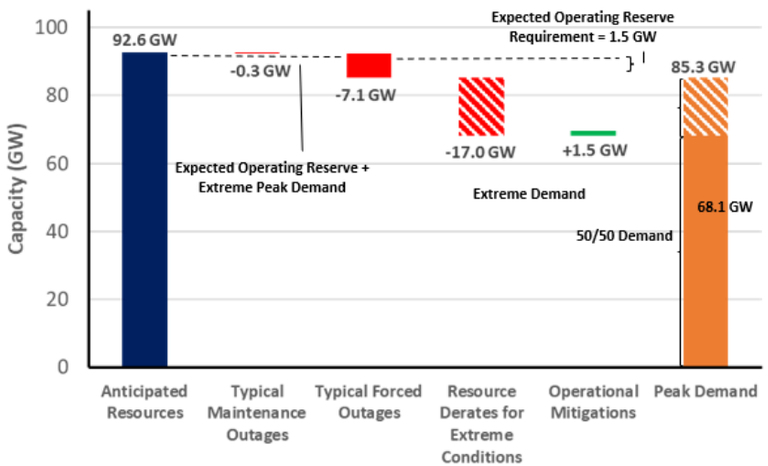
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak-demand scenarios. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Presumes weather conditions comparable to Winter Storm Uri. The adjustment is calculated as the difference between the 100th percentile and 50th percentile values from ERCOT's Probabilistic Reserve Risk Model (PRRM) simulated load outcome distribution for hour ending 8:00 a.m.

Typical Maintenance Outages: Based on historical winter data and consideration of ERCOT's allowed maximum system daily planned outage capacity

Typical Forced Outages: Based on a probability distribution created using historical ERCOT Outage Scheduler data for the last three Januarys.

Resource Derates for Extreme Conditions: Weather-related thermal and wind outages based on Winter Storm Uri levels, adjusted for reductions due to weatherization standards. Also includes high non-weather-related outages.

Operational Mitigations: Additional potential capacity from switchable generation and imports



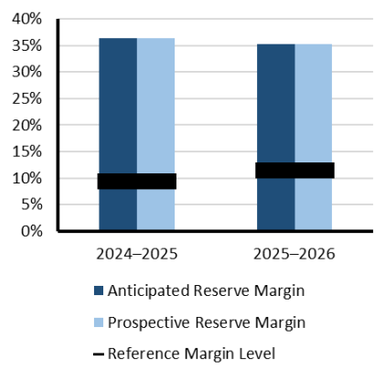
WECC-Alberta

WECC-Alberta is an assessment area that covers the Canadian province of Alberta. The province has a geographic area of 661,848 square kilometers (255,541 square miles) and a population of almost 5 million people. The Alberta Electric System Operator (AESO) is the province's Planning Entity and RC responsible for safe, reliable, and economic operation of the Alberta Interconnected Electric System. AESO is a non-profit corporation that operates a system that includes approximately 26,000 kilometers of transmission lines and connects approximately 426 qualified generating units and nearly 250 market participants through a wholesale market. Alberta's transmission system has three interties with neighboring areas: Saskatchewan (see MRO-SaskPower), British Columbia (see WECC-British Columbia), and Montana (see WECC-Northwest). Peak electricity demand on the AESO system currently occurs during the winter season.

Highlights

- At an extreme winter peak of 12,982 MW, with extreme forced outages at 530 MW and derates for extreme conditions bringing wind energy availability down by 1,800 MW and hydroelectricity by 88 MW, the required reserves are 759 MW and are sufficiently met, even with low availability.
- Demand is expected to increase 1.1% from last winter with the existing-certain installed capacity having increased 23%.
- Solar availability is down because 1,000 MW of PV moved from originally expecting to come on-line in 2024 as Tier 1 resources to Tier 2s mostly anticipated to come on-line in 2025, but with less certainty.

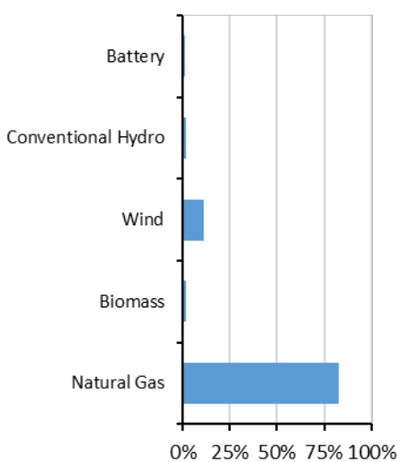
On-Peak Reserve Margin



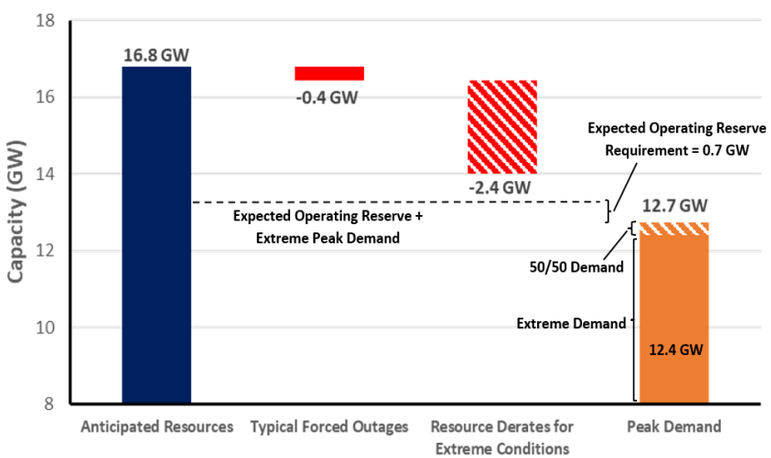
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS data

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-Basin

WECC-Basin is a summer-peaking assessment area in the WECC Regional Entity that includes Utah, southern Idaho, and a portion of western Wyoming, covering Idaho Power and PacifiCorp's eastern BA area. The population of this area is approximately 5.4 million. It has 15,910 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025-26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA*.

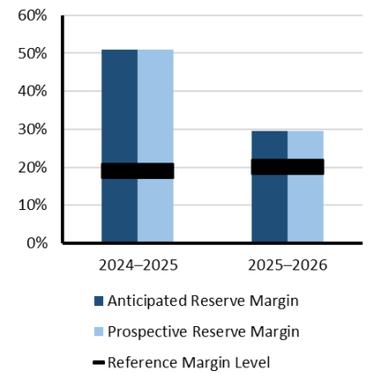
Highlights

- At an extreme winter peak of 11.1 GW under an extreme combination of derates and outages, the region could be short 1.0 GW before imports and is expected to need to rely on transfers.
- Net internal demand is expected to increase 1% since last year, with total internal demand up 1.8% being offset by a doubling of controllable and dispatchable demand response.
- Tier 1 resources have declined and do not appear to be offset by increases in existing-certain generation resource capacity. Nameplate wind has increased by almost 18% and solar by almost 30%. Hydro is also up over 7% in total installed capacity.
- Reliance on imports is expected to be required to maintain resource adequacy during extreme peak demand and extreme derate conditions.

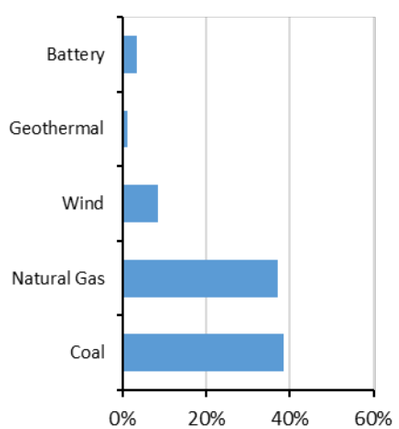
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand scenarios. Above-normal peak demand combined with high generator outages in extreme conditions results in the need for external assistance to maintain reserves.

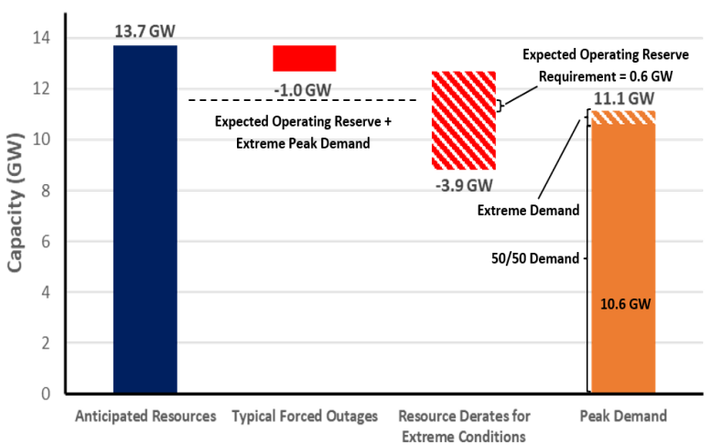
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Extreme Derates: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



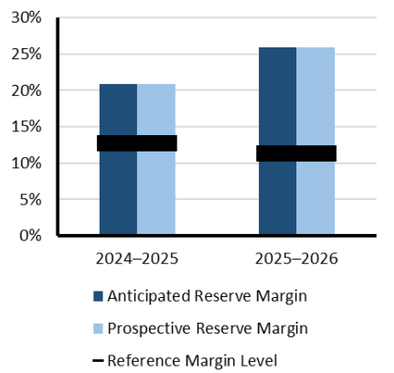
WECC-British Columbia

WECC-British Columbia is an assessment area that covers the Canadian province of British Columbia. The province has a geographic area of 944,735 square kilometers (364,764 square miles) and a population of just over 5 million people. BC Hydro is the Planning Entity and RC for the province of British Columbia and is the principal supplier of electricity for the province. BC Hydro is a provincial Crown corporation and, under provincial legislation, is responsible for the oversight of the British Columbia BES and its interconnections. BC Hydro operates an integrated system supported by 30 hydroelectric plants, approximately 80,000 kilometers of transmission and distribution lines, and 125 contracts with independent power producers. BC Hydro's transmission system has two interties with neighboring areas: the U.S. state of Washington (see WECC-Northwest) and Alberta (see WECC-Alberta). Peak electricity demand on the BC Hydro system currently occurs during winter.

Highlights

- Peak demand is expected to remain about the same as last winter.
- There are about 200 MW more (47%) planned Tier 1 resources for this winter than last.
- Solar nameplate capacity has increased from 2 MW to 17 MW since last winter and hydroelectric nameplate capacity is up more than 5%, or 1,366 MW.

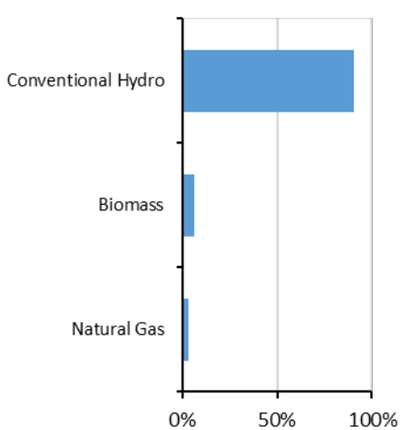
On-Peak Reserve Margin



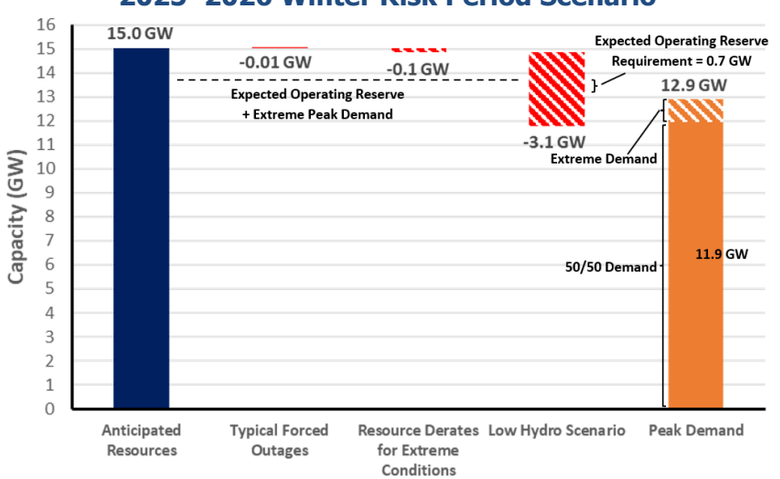
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal and extreme demand scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period

Low Hydro Scenario: Estimated derate for lower hydro output



WECC-California

WECC-California is a summer-peaking assessment area in the Western Interconnection that includes most of California and a small section of Nevada. The assessment area has a population of over 42.5 million people. The area includes the California ISO, the Los Angeles Department of Water and Power, the Turlock Irrigation District, and the Balancing Area of Northern California. It has 32,712 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

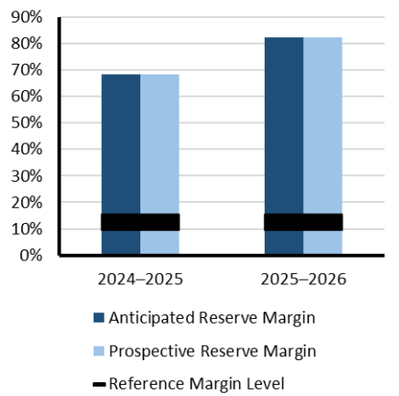
Highlights

- Operating reserve margins are met before imports in all winter resource availability scenarios.
- On-peak demand is expected to remain about the same as last winter. Demand-side management is down about 10%.
- Existing-certain capacity is up almost 5%, while planned Tier 1 resources are up more than 2 GW. The total wind nameplate capacity is up almost 27% and solar almost 13%. Hydro is down 4%.
- No reliance on imports is expected to be required to maintain resource adequacy for Winter 2025–2026.

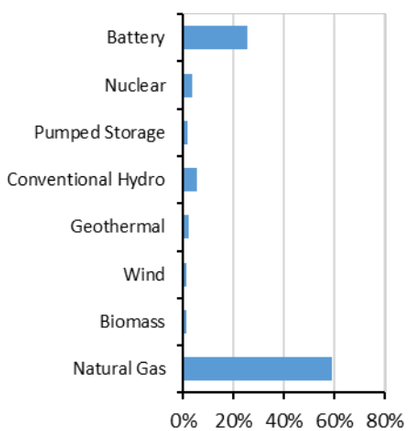
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

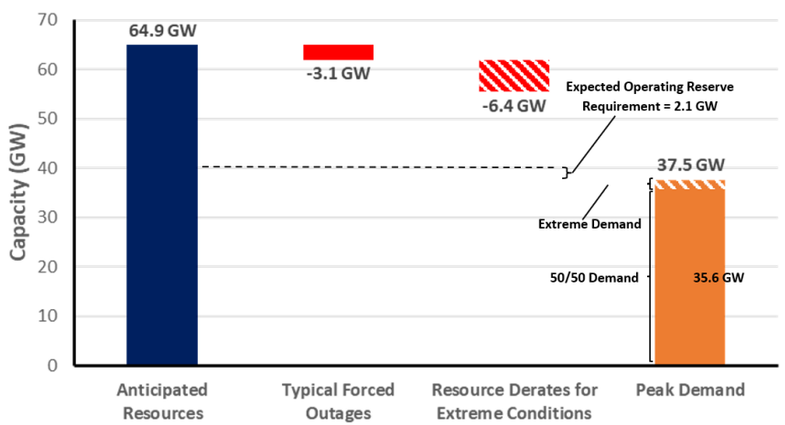
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



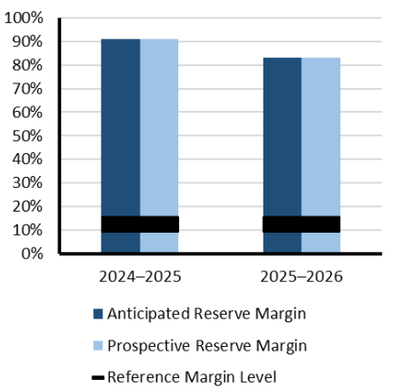
WECC-Mexico

WECC-Mexico is a summer-peaking assessment area in the Western Interconnection that includes the northern portion of the Mexican state of Baja California, which has a population of 3.8 million people and includes CENACE. It has 1,568 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

Highlights

- As a summer-peaking region, operating reserve margins are met before imports in all scenarios.
- Planned Tier 1 resources are down 100% to zero as expected resources have either been brought on-line to move into existing or, in the case of some natural gas, have been delayed until 2026 and moved into Tier 2.
- The existing-certain on peak reserve margin is down by 5.2%, and the anticipated and prospective reserve margins are down by 7.8%; however, since Mexico is heavily summer-peaking, the 83% reserve margin still exceeds the RML of 12.5%, which remains unchanged.

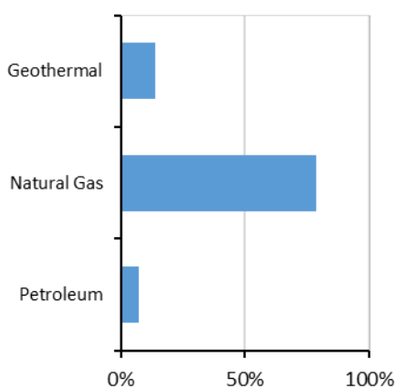
On-Peak Reserve Margin



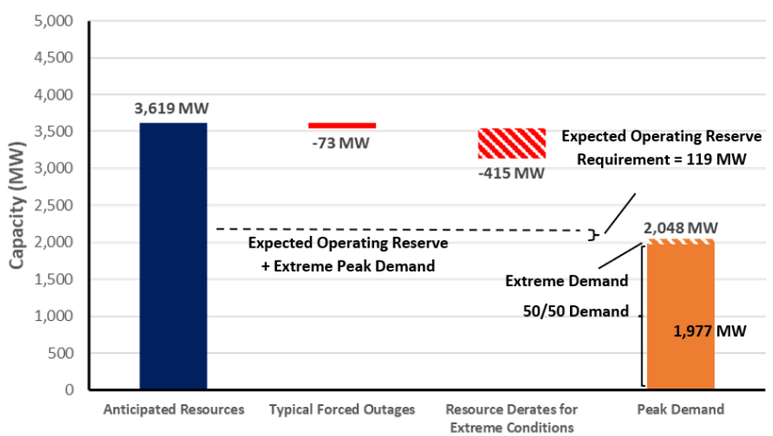
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-Northwest

WECC-Northwest is a winter-peaking assessment area in the WECC Regional Entity. The area includes Montana, Oregon, and Washington and parts of northern California and northern Idaho. The population of the area is approximately 13.6 million. It has 32,751 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

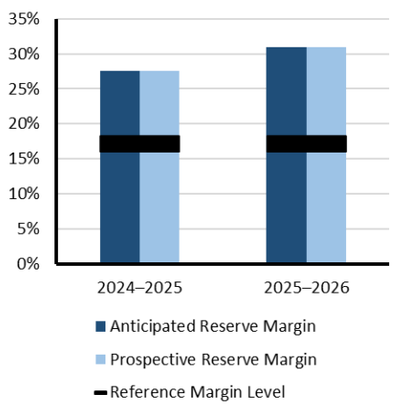
Highlights

- The Northwest has historically been a mixed season-peaking region.
- Operating reserve margins are expected to be met after imports in all winter scenarios.
- Total and net internal demand are up 9.3% with the primary drivers being data centers, residential electrification, transportation electrification, and semiconductor manufacturing.
- Large coal unit retirements and conventional hydro unit retirements are attributable to the reduction in existing certain capacity of 10.5%; however, planned Tier 1 resources have soared over 580%, from 463 MW to over 3 GW.
- Nameplate wind capacity is up over 3 GW (26%) and solar nameplate capacity is up nearly 2,690 MW (134%), which has also increased the solar availability on the peak hour.
- An increase in firm imports is seen in the model, 6.1 GW, absorbing the reduction in existing certain capacity of 4 GW.

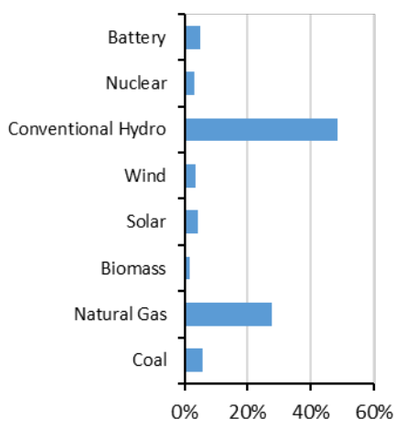
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand scenarios. Above-normal peak demand combined with high generator outages in extreme conditions results in the need for external assistance to maintain reserves.

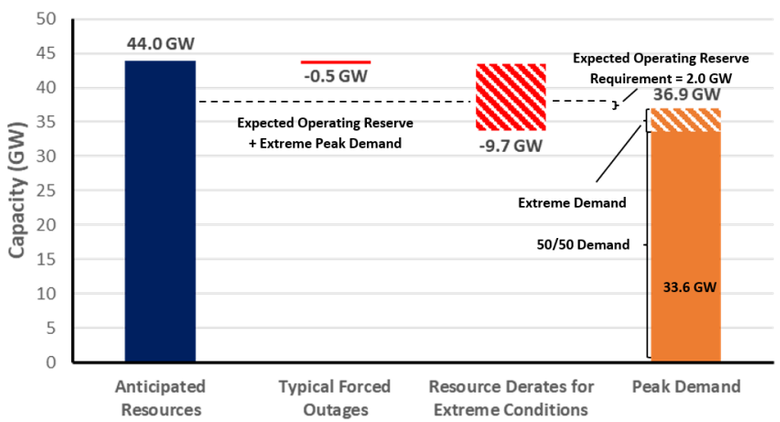
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period. This value includes 6.8 GW of hydro derates.



WECC-Rocky Mountain

WECC-Rocky Mountain is a summer-peaking assessment area in the Western Interconnection that includes Colorado, most of Wyoming, and parts of Nebraska and South Dakota. The population of the area is approximately 6.7 million. It covers the balancing areas of the Public Service Company of Colorado and the Western Area Power Administration's Rocky Mountain Region. It has 18,797 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

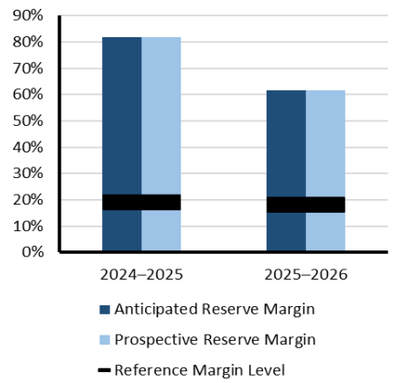
Highlights

- In Rocky Mountain, operating reserve margins are expected to be met before imports in all winter scenarios.
- Total and net internal demand are up almost 1%. The primary drivers are data centers and commercial and industrial customer growth.
- Planned Tier 1 resources are up over 84%, from almost 200 MW to over 365 MW. Solar nameplate capacity is up 27%; however, on-peak solar energy availability is down 100% due to the shift to after sunset. Expected hydro on peak energy availability is also down by around a quarter on the peak hour. Existing-Certain, Anticipated, and Prospective Reserve Margins are all down by over 20% on the peak hour; however, the region still maintains resource adequacy with margins hovering around 60% compared to the RML of 18%.
- No reliance on imports is expected to be required to maintain resource adequacy under combined extreme peak and extreme derated conditions.

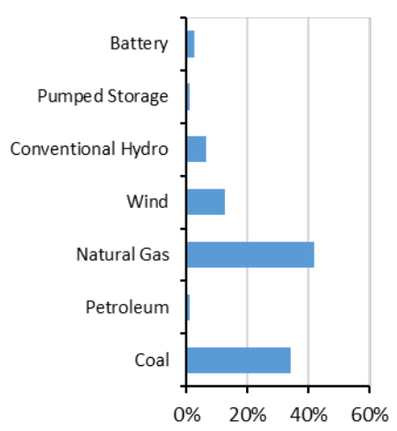
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

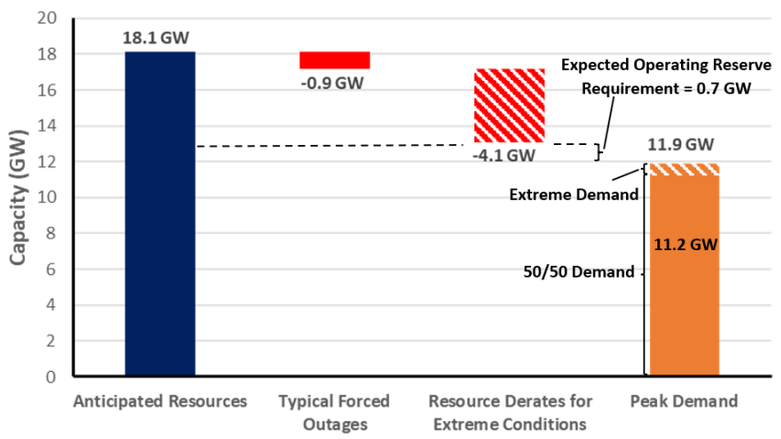
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-Southwest

WECC-Southwest is a summer-peaking assessment area in the Western Interconnection that includes all of Arizona and New Mexico, most of Nevada, and small parts of California and Texas. The area has a population of approximately 13.6 million. It has 23,084 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

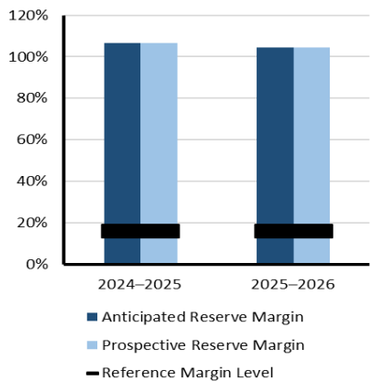
Highlights

- The Southwest is anticipated to be resource adequate under all winter expected and extreme energy availability and demand scenarios before imports.
- Total internal demand is expected to be up 1.5% and net internal demand up 2.3% since last winter. The primary drivers for load growth are data centers and industrial and residential electrification. Controllable and dispatchable demand response is down nearly half, by 163 MW.
- Planned Tier 1 resources are down over 19% as some have moved into existing certain, which is up almost 3%, over 1 GW, and other projects have experienced delays.
- Wind nameplate is up 12%, 470 MW, correlating to on-peak energy availability from wind increasing almost 11%, by 114 MW, while solar nameplate is up 27% or over 2.5 GW.

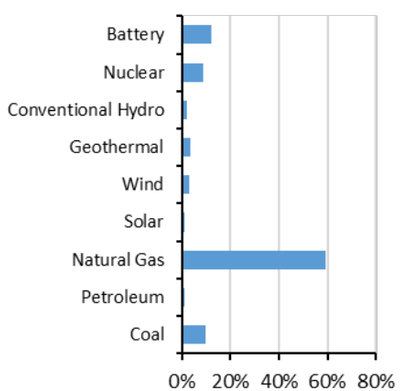
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

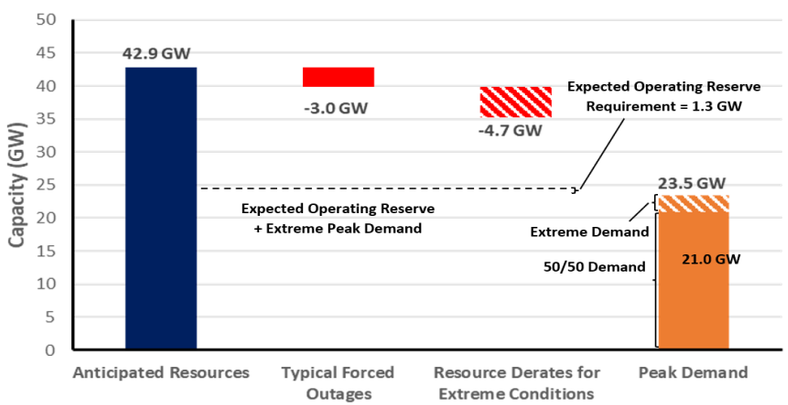
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period

Data Concepts and Assumptions

The table below explains data concepts and important assumptions used throughout this assessment.

General Assumptions
• Reliability of the interconnected BPS is comprised of both adequacy and operating reliability:
▪ Adequacy is the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times while taking into account scheduled and reasonably expected unscheduled outages of system components.
▪ Operating reliability is the ability of the electric system to withstand sudden disturbances, such as electric short-circuits or unanticipated loss of system components.
• The reserve margin calculation is an important industry planning metric used to examine future resource adequacy.
• All data in this assessment is based on existing federal, state, and provincial laws and regulations.
• Differences in data collection periods for each assessment area should be considered when comparing demand and capacity data between year-to-year seasonal assessments.
• A positive net transfer capability would indicate a net importing assessment area; a negative value would indicate a net exporter.
Demand Assumptions
• Electricity demand projections, or load forecasts, are provided by each assessment area.
• Load forecasts include peak hourly load[11] or total internal demand for the summer and winter of each year.[12]
• Total internal demand projections are based on normal weather (50/50 distribution)[13] and are provided on a coincident[14] basis for most assessment areas.
• Net internal demand is used in all reserve margin calculations, and it is equal to total internal demand then reduced by the amount of controllable and dispatchable demand response projected to be available during the peak hour.
Resource Assumptions
Resource planning methods vary throughout the North American BPS. NERC uses the categories below to provide a consistent approach for collecting and presenting resource adequacy. Because the electrical output of variable energy resources (VER) (e.g., wind, solar PV) depends on weather conditions, their contribution to reserve margins and other on-peak resource adequacy analysis is less than their nameplate capacity.
Anticipated Resources: • **Existing-Certain Capacity**: Included in this category are commercially operable generating units or portions of generating units that meet at least one of the following requirements when examining the period of peak demand for the summer season: unit must have a firm capability and have a power purchase agreement with firm transmission that must be in effect for the unit; unit must be classified as a designated network resource; and/or, where energy-only markets exist, unit must be a designated market resource eligible to bid into the market. • **Tier 1 Capacity Additions**: This category includes capacity that either is under construction or has received approved planning requirements. • **Net Firm Capacity Transfers (Imports minus Exports)**: This category includes transfers with firm contracts.
Prospective Resources: Includes all anticipated resources plus the following: **Existing-Other Capacity**: Included in this category are commercially operable generating units or portions of generating units that could be available to serve load for the period of peak demand for the season but do not meet the requirements of existing-certain.

[11] https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf used in NERC Reliability Standards

[12] The summer season represents June–September and the winter season represents December–February.

[13] Essentially, this means that there is a 50% probability that actual demand will be higher and a 50% probability that actual demand will be lower than the value provided for a given season/year.

[14] Coincident: This is the sum of two or more peak loads that occur in the same hour. Noncoincident: This is the sum of two or more peak loads on individual systems that do not occur in the same time interval; this is meaningful only when considering loads within a limited period of time, such as a day, a week, a month, a heating or cooling season, and usually for not more than one year. SERC calculates total internal demand on a noncoincidental basis.

Reserve Margin Descriptions

Planning Reserve Margin: This is the primary metric used to measure resource adequacy; it is defined as the difference in resources (anticipated or prospective) and net internal demand then divided by net internal demand and shown as a percentage.

Reference Margin Level: The assumptions and naming convention of this metric vary by assessment area. The RML can be determined using both deterministic and probabilistic (based on a 0.1/year loss-of-load study) approaches. In both cases, this metric is used by system planners to quantify the amount of reserve capacity in the system above the forecasted peak demand that is needed to ensure sufficient supply to meet peak loads. Establishing an RML is necessary to account for long-term factors of uncertainty involved in system planning, such as unexpected generator outages and extreme weather impacts that could lead to increase demand beyond what was projected in the 50/50 load forecasted. In many assessment areas, an RML is established by a state, provincial authority, ISO/Regional Transmission Organization (RTO), or other regulatory body. In some cases, the RML is a requirement. RMLs may be different for the summer and winter seasons. If an RML is not provided by an assessment area, NERC applies 15% for predominantly thermal systems and 10% for predominantly hydro systems.

Seasonal Risk Scenario Chart Description

Each assessment area performed an operational risk analysis that was used to produce the seasonal risk scenario charts in the **Regional Assessments Dashboards**. The chart presents deterministic scenarios for further analysis of different resource and demand levels: The left blue column shows anticipated resources, and the two orange columns at the right show the two demand scenarios of the normal peak net internal demand and the extreme summer peak demand—both determined by the assessment area. The middle red or green bars show adjustments that are applied cumulatively to the anticipated resources, such as the following:

- Reductions for typical generation outages (i.e., maintenance and forced outages that are not already accounted for in anticipated resources)
- Reductions that represent additional outage or performance derating by resource type for extreme, low-probability conditions (e.g., drought condition impacts on hydroelectric generation, low-wind scenario affecting wind generation, fuel supply limitations, or extreme temperature conditions that result in reduced thermal generation output)
- Additional capacity resources that represent quantified capacity from operational procedures, if any, that are made available during scarcity conditions

Not all assessment areas have the same categories of adjustments to anticipated resources. Furthermore, each assessment area determined the adjustments to capacity based on methods or assumptions that are summarized below the chart. Methods and assumptions differ by assessment area and may not be comparable.

The chart enables evaluation of resource levels against levels of expected operating reserve requirement and the forecasted demand. Furthermore, the effects from extreme events can also be examined by comparing resource levels after applying extreme scenario derates and/or extreme summer peak demand.

Resource Adequacy

The ARM, which is based on available resource capacity, is a metric used to evaluate resource adequacy by comparing the projected capability of anticipated resources to serve forecast peak demand.[15] Large year-to-year changes in anticipated resources or forecast peak demand (net internal demand) can greatly impact Planning Reserve Margin calculations. NPCC-Maritimes marginally does not meet its RML for the upcoming winter. Other than NPCC-Maritimes, all assessment areas have sufficient ARMs to meet or exceed their RML for the 2025 winter as shown in **Figure 4**.

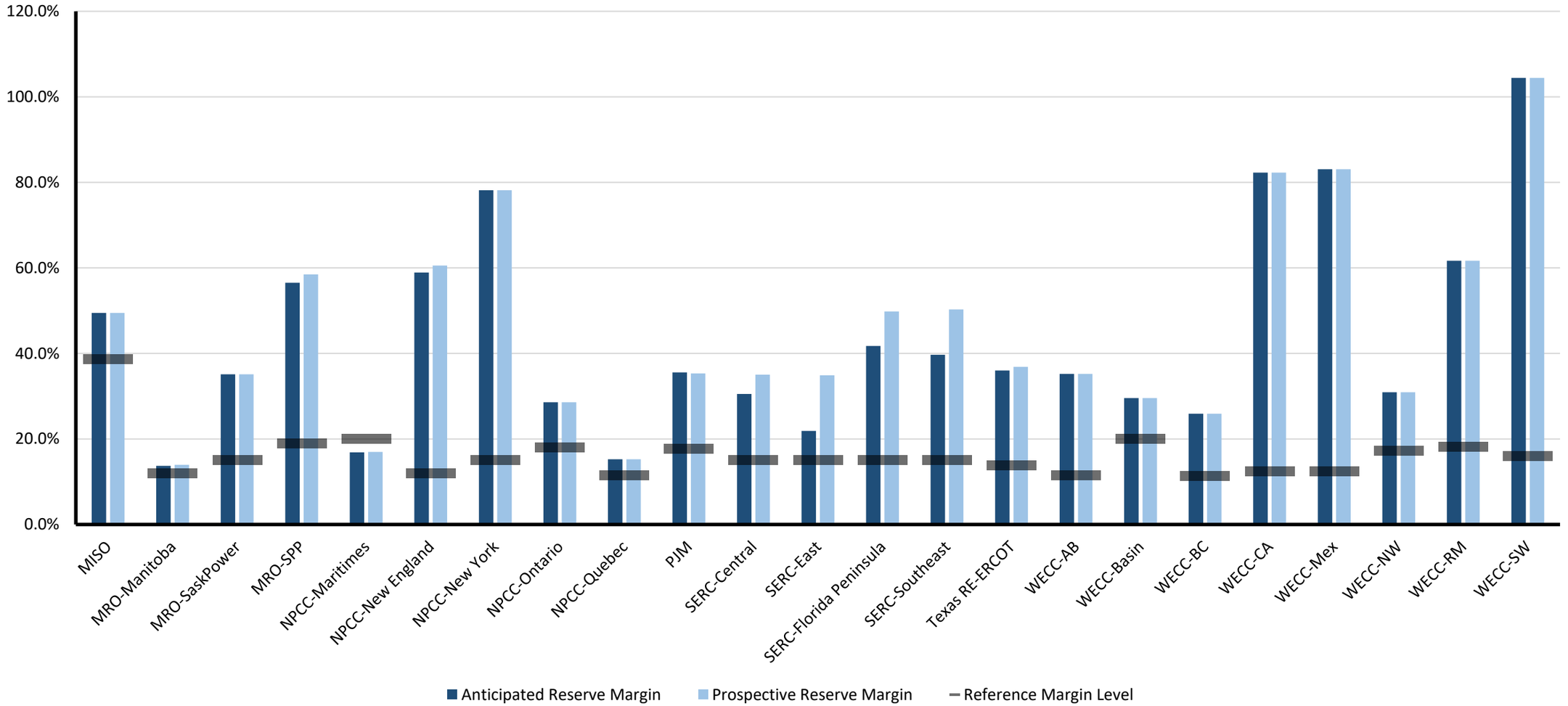


Figure 4: Winter 2025–2026 Anticipated/Prospective Reserve Margins Compared to Reference Margin Level

[15] Generally, anticipated resources include generators and firm capacity transfers that are expected to be available to serve load during electrical peak loads for the season. Prospective resources are those that could be available but do not meet criteria to be counted as anticipated resources. Refer to the **Data Concepts and Assumptions** section for additional information on Anticipated/Prospective Reserve Margins, anticipated/prospective resources, and RMLs.

Changes from Year-to-Year

Figure 5 provides the relative change in the forecast ARMs from the 2024–2025 Winter to the 2025–2026 Winter. All areas except NPCC-Maritimes remain above their RMLs for 2025–2026 Winter. The Canadian winter-peaking systems, which include MRO-Manitoba, MRO-SaskPower, NPCC-Maritimes, NPCC-Québec, WECC-Alberta, and WECC-British Columbia, may have reserve margins that are near RMLs but are unlikely to experience high outage rates from their winterized generators. Additional details are provided in the Data Concepts and Assumptions section.

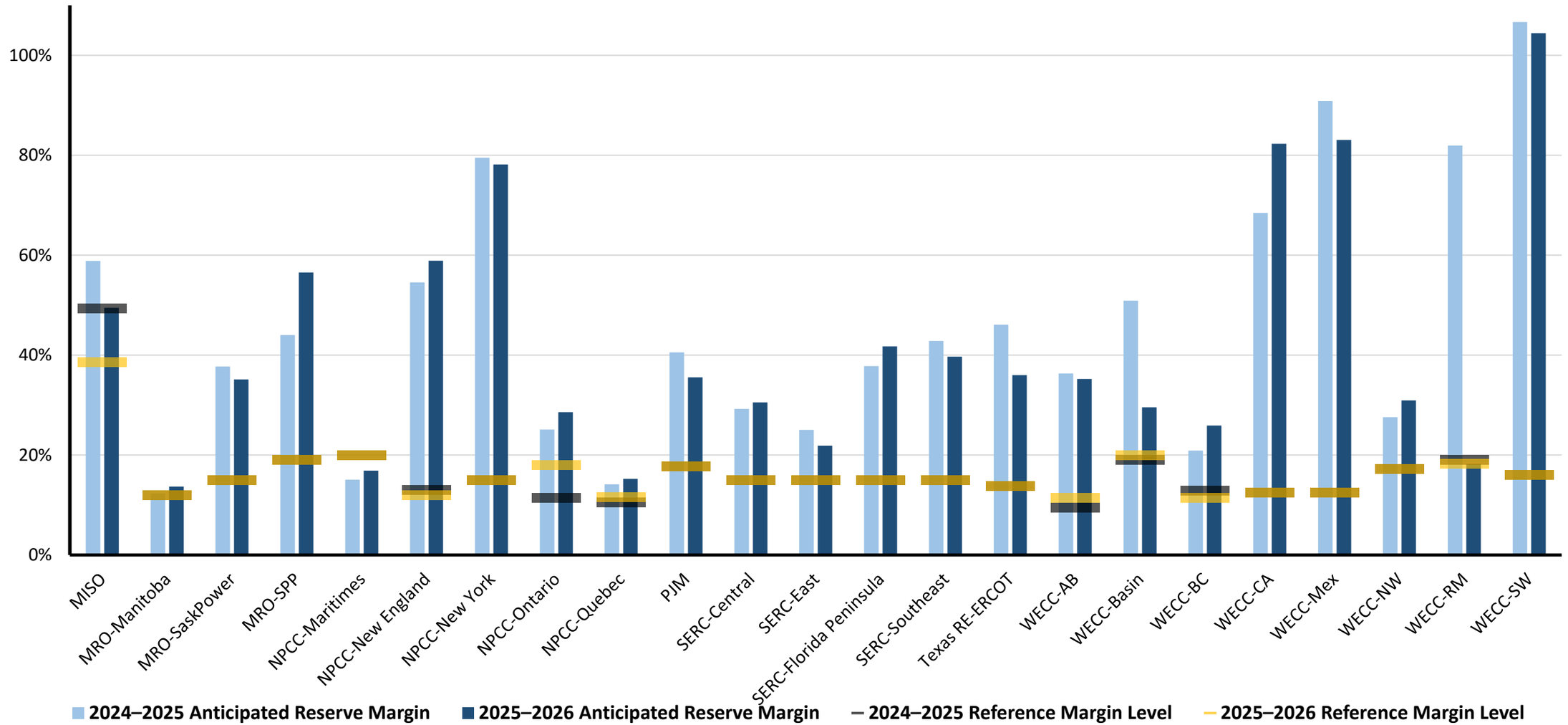


Figure 5: Winter 2024–2025 and Winter 2025–2026 Anticipated Reserve Margins Year-to-Year Change

Demand and Resource Tables

Peak demand and supply capacity data (i.e., resource adequacy data) for each assessment area are as follows in each table.

MISO			
Demand, Resource, and Reserve Margins	**2024–2025 WRA[16]**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	102,353	105,249	2.8%
Demand Response: Available	6,219	8,250	32.7%
Net Internal Demand	96,134	96,999	0.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	150,407	142,880	-5.0%
Tier 1 Planned Capacity	122	0	0.0%
Net Firm Capacity Transfers	2,310	2,113	-8.5%
Anticipated Resources	152,717	144,993	-5.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	152,839	144,993	-5.1%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	58.9%	49.5%	-9.4
Prospective Reserve Margin	59.0%	49.5%	-9.5
Reference Margin Level	49.4%	38.6%	-10.8

MRO-SPP			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,788	47,168	3.0%
Demand Response: Available	1,128	1,091	-3.3%
Net Internal Demand	45,926	46,077	0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	67,252	71,074	5.7%
Tier 1 Planned Capacity	0	1087	0.0%
Net Firm Capacity Transfers	-1,116	-32	-97.1%
Anticipated Resources	66,136	72,129	9.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	66,090	73,029	10.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	44.0%	56.5%	12.5
Prospective Reserve Margin	43.9%	58.5%	14.6
Reference Margin Level	19.0%	19.0%	0.0

MRO-SaskPower			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,852	3,944	2.4%
Demand Response: Available	50	50	0.0%
Net Internal Demand	3,802	3,894	2.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	4,946	4,972	0.5%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	290	290	0.0%
Anticipated Resources	5,236	5,262	0.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	5,236	5,262	0.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	37.7%	35.1%	-2.6
Prospective Reserve Margin	37.7%	35.1%	-2.6
Reference Margin Level	15.0%	15.0%	0.0

MRO-Manitoba Hydro			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	4,814	4,903	1.8%
Demand Response: Available	0	0	0.0%
Net Internal Demand	4,814	4,903	1.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	5,924	5,688	-4.0%
Tier 1 Planned Capacity	10	0	-100.0%
Net Firm Capacity Transfers	-527	-113	-78.5%
Anticipated Resources	5,407	5,575	3.1%
Existing-Other Capacity	18	13	-26.8%
Prospective Resources	5,425	5,588	3.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	12.3%	13.7%	1.4
Prospective Reserve Margin	12.7%	14.0%	1.3
Reference Margin Level	12.0%	12.0%	0.0

[16] MISO-provided updated data post 2024-25 WRA publication.

NPCC-Maritimes			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	6,167	6,061	-1.7%
Demand Response: Available	259	248	-4.4%
Net Internal Demand	5,907	5,813	-1.6%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	6,647	6,704	0.9%
Tier 1 Planned Capacity	6	88	0.0%
Net Firm Capacity Transfers	145	1	-99.0%
Anticipated Resources	6,798	6,794	-0.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	6,798	6,800	0.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	15.1%	16.9%	1.8
Prospective Reserve Margin	15.1%	17.0%	1.9
Reference Margin Level	20.0%	20.0%	0.0

NPCC-New England			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	20,651	20,056	-2.9%
Demand Response: Available	343	440	28.2%
Net Internal Demand	20,308	19,616	-3.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	30,030	29,935	-0.3%
Tier 1 Planned Capacity	194	0	-100.0%
Net Firm Capacity Transfers	1,161	1,235	6.4%
Anticipated Resources	31,385	31,170	-0.7%
Existing-Other Capacity	306	322	5.2%
Prospective Resources	31,691	31,492	-0.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	54.5%	58.9%	4.4
Prospective Reserve Margin	56.1%	60.5%	4.5
Reference Margin Level	13.0%	12.0%	-1.0

NPCC-New York			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	23,800	24,200	1.7%
Demand Response: Available	802	1,027	28.1%
Net Internal Demand	22,998	23,173	0.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	40,522	40,080	-1.1%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	759	1,203	58.5%
Anticipated Resources	41,281	41,283	0.0%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	41,281	41,283	0.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	79.5%	78.2%	-1.3
Prospective Reserve Margin	79.5%	78.2%	-1.3
Reference Margin Level	15.0%	15.0%	0.0

NPCC-Ontario			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	21,898	22,013	0.7%
Demand Response: Available	915	868	-5.2%
Net Internal Demand	20,982	21,146	0.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	26,652	27,319	2.5%
Tier 1 Planned Capacity	0	294	#DIV/0!
Net Firm Capacity Transfers	-450	-420	-6.7%
Anticipated Resources	26,202	27,193	3.8%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	26,202	27,193	3.8%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	25.1%	28.6%	3.5
Prospective Reserve Margin	25.1%	28.6%	3.5
Reference Margin Level	11.5%	18.0%	6.5

NPCC-Québec			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	40,512	40,799	0.8%
Demand Response: Available	4,451	4,902	10.9%
Net Internal Demand	36,061	35,897	-0.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	41,560	41,698	0.3%
Tier 1 Planned Capacity	73	61	0.0%
Net Firm Capacity Transfers	-479	-390	-18.6%
Anticipated Resources	41,154	41,368	0.5%
Existing-Other Capacity	-479	0	0.0%
Prospective Resources	41,154	41,368	0.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	14.1%	15.2%	1.1
Prospective Reserve Margin	14.1%	15.2%	1.1
Reference Margin Level	10.5%	11.5%	1.0

PJM			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	136,328	140,827	3.3%
Demand Response: Available	5,616	5,998	6.8%
Net Internal Demand	130,712	134,829	3.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	179,216	178,335	-0.5%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	4,502	4,448	-1.2%
Anticipated Resources	183,718	182,783	-0.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	183,718	182,452	-0.7%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	40.6%	35.6%	-5.0
Prospective Reserve Margin	40.6%	35.3%	-5.2
Reference Margin Level	17.7%	17.7%	-12.3

SERC-Central			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	42,895	42,875	0.0%
Demand Response: Available	1,497	2,809	87.6%
Net Internal Demand	41,397	40,067	-3.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	51,578	50,454	-2.2%
Tier 1 Planned Capacity	0	0	0%
Net Firm Capacity Transfers	1,922	1,847	-3.9%
Anticipated Resources	53,500	52,301	-2.2%
Existing-Other Capacity	1,498	1,810	20.8%
Prospective Resources	54,998	54,111	-1.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	29.2%	30.5%	1.3
Prospective Reserve Margin	32.9%	35.1%	2.2
Reference Margin Level	15.0%	15.0%	0.0

SERC-East			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,005	45,703	1.6%
Demand Response: Available	982	888	-9.6%
Net Internal Demand	44,023	44,815	1.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	54,379	54,460	0.1%
Tier 1 Planned Capacity	72	11	-84.3%
Net Firm Capacity Transfers	593	150	-74.7%
Anticipated Resources	55,045	54,622	-0.8%
Existing-Other Capacity	5,209	5,832	12.0%
Prospective Resources	60,254	60,453	0.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	25.0%	21.9%	-3.2
Prospective Reserve Margin	36.9%	34.9%	-2.0
Reference Margin Level	15.0%	15.0%	0.0

SERC-Florida Peninsula			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	48,494	48,628	0.3%
Demand Response: Available	2,780	3,127	12.5%
Net Internal Demand	45,714	45,501	-0.5%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	62,579	63,502	1.5%
Tier 1 Planned Capacity	15	692	4510.0%
Net Firm Capacity Transfers	400	300	-25.0%
Anticipated Resources	62,994	64,494	2.4%
Existing-Other Capacity	3,673	3,671	0.0%
Prospective Resources	66,667	68,165	2.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	37.8%	41.7%	3.9
Prospective Reserve Margin	45.8%	49.8%	4.0
Reference Margin Level	15.0%	15.0%	0.0

SERC-Southeast			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,308	47,056	3.9%
Demand Response: Available	1,638	1,365	-16.7%
Net Internal Demand	43,670	45,691	4.6%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	62,805	63,339	0.9%
Tier 1 Planned Capacity	765	0	-100.0%
Net Firm Capacity Transfers	-1,192	489	-141.0%
Anticipated Resources	62,378	63,828	2.3%
Existing-Other Capacity	3,920	4,847	23.7%
Prospective Resources	66,298	68,675	3.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	42.8%	39.7%	-3.1
Prospective Reserve Margin	51.8%	50.3%	-1.5
Reference Margin Level	15.0%	15.0%	0.0

Texas RE-ERCOT			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	73,193	77,387	5.7%
Demand Response: Available	5,447	9,330	71.3%
Net Internal Demand	67,746	68,057	0.5%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	98,712	89,977	-8.8%
Tier 1 Planned Capacity	239	1351	464.9%
Net Firm Capacity Transfers	20	1,235	6075.0%
Anticipated Resources	98,971	92,562	-6.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	99,691	93,137	-6.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	46.1%	36.0%	-10.1
Prospective Reserve Margin	47.2%	36.9%	-10.3
Reference Margin Level	13.75%	13.8%	0.0

WECC-AB			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	12,280	12,411	1.1%
Demand Response: Available	0	0	0.0%
Net Internal Demand	12,280	12,411	1.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,535	16,658	23.1%
Tier 1 Planned Capacity	3206	124	-96.1%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	16,740	16,782	0.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	16,740	16,782	0.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	36.3%	35.2%	-1.1
Prospective Reserve Margin	36.3%	35.2%	-1.1
Reference Margin Level	9.5%	11.5%	2.0

WECC-Basin			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	10,568	10,758	1.8%
Demand Response: Available	85	170	100.0%
Net Internal Demand	10,483	10,588	1.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,213	13,183	-0.2%
Tier 1 Planned Capacity	2,605	533	-79.5%
Net Firm Capacity Transfers	0	0	0%
Anticipated Resources	15,817	13,717	-13.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	15,817	13,717	-13.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	50.9%	29.6%	-21.3
Prospective Reserve Margin	50.9%	29.6%	-21.3
Reference Margin Level	19.0%	20.0%	1.0

WECC-CA			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	36,441	36,281	-0.4%
Demand Response: Available	743	666	-10.4%
Net Internal Demand	35,698	35,615	-0.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	55,380	57,923	4.6%
Tier 1 Planned Capacity	4,757	6,997	47.1%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	60,138	64,920	8.0%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	60,138	65,920	8.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	68.5%	82.3%	13.8
Prospective Reserve Margin	68.5%	82.3%	13.8
Reference Margin Level	12.5%	12.5%	0.0

WECC-BC			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	11,966	11,936	-0.3%
Demand Response: Available	0	0	0.0%
Net Internal Demand	11,966	11,936	-0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,870	14,389	3.7%
Tier 1 Planned Capacity	433	637	47.0%
Net Firm Capacity Transfers	164	0	-100.0%
Anticipated Resources	14,467	15,026	3.9%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	14,467	15,026	3.9%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	20.9%	25.9%	5.0
Prospective Reserve Margin	20.9%	25.9%	5.0
Reference Margin Level	12.8%	11.4%	-1.5

WECC-Mexico			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	1,983	1,977	-0.3%
Demand Response: Available	0	0	0%
Net Internal Demand	1,983	1,977	-0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	3,733	3,619	-3.0%
Tier 1 Planned Capacity	52	0	-100.0%
Net Firm Capacity Transfers	0	0	0%!
Anticipated Resources	3,784	3,619	-4.4%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	3,784	3,619	-4.4%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	90.8%	83.1%	-7.8
Prospective Reserve Margin	90.8%	83.1%	-7.8
Reference Margin Level	12.5%	12.5%	0

WECC-Northwest			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	30,748	33,604	9.3%
Demand Response: Available	30	30	0.0%
Net Internal Demand	30,718	33,574	9.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	38,729	34,671	-10.5%
Tier 1 Planned Capacity	463	3,152	581.5%
Net Firm Capacity Transfers	0	6,136	100%!
Anticipated Resources	39,192	43,959	12.2%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	39,192	43,959	12.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	27.6%	30.9%	3.3
Prospective Reserve Margin	27.6%	30.9%	3.3
Reference Margin Level	17.2%	17.2%	0.0

WECC-Rocky Mountain			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	10,481	11,501	9.7%
Demand Response: Available	282	285	1.1%
Net Internal Demand	10,199	11,216	10.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	18,356	17,768	-3.2%
Tier 1 Planned Capacity	199	366	84.3%
Net Firm Capacity Transfers	0	0	0%
Anticipated Resources	18,555	18,134	-2.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	18,555	18,134	-2.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	81.9%	61.7%	-20.3
Prospective Reserve Margin	81.9%	61.7%	-20.3
Reference Margin Level	19.0%	18.2%	-0.8

WECC-Southwest			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	20,844	21,147	1.5%
Demand Response: Available	340	177	-47.9%
Net Internal Demand	20,504	20,970	2.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	38,991	40,135	2.9%
Tier 1 Planned Capacity	3,381	2,733	-19.2%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	42,372	42,868	1.2%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	42,372	42,868	1.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	106.6%	104.4%	-2.2
Prospective Reserve Margin	106.6%	104.4%	-2.2
Reference Margin Level	16.0%	16.0%	0.0

Variable Energy Resource Contributions

Because the electrical output of VERs (e.g., wind, solar PV) depends on weather conditions, on-peak capacity contributions are less than nameplate capacity and may vary widely year to year based on the identified risk hour. In many areas, winter demand peaks in the early morning hours or early evening resulting in little or no electrical resource output from solar PV resources and wide variability in wind availability. The following table shows the capacity contribution of existing wind and solar PV resources at the identified risk hour for each assessment area. Resource contributions are also aggregated by Interconnection and across the entire BPS.

BPS Variable Energy Resources On-Peak Capacity Contributions by Assessment Area									
	Wind			Solar			Hydro		
Assessment Area/Interconnection	Nameplate Wind (MW)	Expected Wind (MW)	Expected Share of Nameplate (%)	Nameplate Solar PV (MW)	Expected Solar (MW)	Expected Share of Nameplate (%)	Nameplate Hydro (MW)	Expected Hydro (MW)	Expected Share of Nameplate (%)
MISO	30,247	8,772	29%	13,726	686	5%	9,103	5,354	59%
MRO-Manitoba Hydro	259	52	20%	0	0	0%	6,288	5,676	90%
MRO-SaskPower	816	433	53%	30	0	13%	884	703	80%
MRO-SPP	35,714	7,198	20%	1,197	457	38%	5,602	5,521	99%
NPCC-Maritimes	1,635	241	15%	155	10	6%	1,357	1,283	0%
NPCC-New England	2,675	455	17%	3,620	0	0%	3,742	1,453	39%
NPCC-New York	2,586	737	29%	627	0	0%	6,357	5,283	83%
NPCC-Ontario	4,943	1,971	40%	478	0	0%	8,763	6,824	78%
NPCC-Québec	4,024	1,426	35%	10	0	0%	41,014	39,501	96%
PJM	13,318	5,463	41%	15,732	1	0%	8,134	7,900	97%
SERC-Central	1,324	370	28%	1,576	455	29%	4,991	4,027	81%
SERC-East	0	0	0%	7,068	1,792	25%	3,010	2,951	98%
SERC-Florida Peninsula	0	0	0%	12,058	2,151	18%	0	0	0%
SERC-Southeast	0	0	0%	8,670	4,461	51%	3,258	3,258	100%
Texas RE-ERCOT	40,629	7,833	19%	35,609	660	2%	579	566	98%
WECC-AB	5,712	1,919	34%	2,206	0	0%	1,788	570	32%
WECC-Basin	5,932	1,148	19%	3,853	62	2%	5,334	2,946	55%
WECC-BC	747	85	11%	17	0	0%	35,504	27,119	76%
WECC-CA	9,382	682	7%	28,328	0	0%	31,479	9,143	29%
WECC-Mex	40	4	11%	350	0	0%	0	0	0%
WECC-NW	14,744	1,319	9%	4,695	1,556	33%	65,830	37,005	56%
WECC-RM	5,681	2,265	40%	3,521	0	0%	6,502	2,654	41%
WECC-SW	4,303	1,182	27%	12,139	391	3%	6,234	1,896	30%
EASTERN INTERCONNECTION	93,517	25,692	27%	64,937	10,013	15%	61,489	50,233	82%
QUÉBEC INTERCONNECTION	4,024	1,426	35%	10	0	0%	41,014	39,501	96%
TEXAS INTERCONNECTION	40,629	7,833	19%	35,609	660	0%	579	566	98%
WECC INTERCONNECTION	46,541	8,605	19%	55,108	2,008	4%	152,671	81,333	53%
INTERCONNECTION TOTAL:	**184,711**	**43,556**	**23%**	**155,664**	**12,685**	**8%**	**255,753**	**171,633**	**67%**

Review of Winter 2024–2025 Capacity and Energy Performance

The meteorological winter across the contiguous United States had an average temperature of 34.1 degrees F—1.9 degrees above average—ranking in the warmest third of NOAA's historical record. Total winter precipitation in the US was 5.87 inches, 0.92 of an inch below average, ranking in the driest third of the December–February climate record.[17] Most of Canada experienced temperatures at least 2°C above the baseline average with the Maritime provinces, southern Ontario, and the Canadian west coast recording temperature departures nearer the baseline average while a small region in southern Saskatchewan recorded temperatures just slightly below the baseline average.[18]

In February 2025, FERC and NERC and its Regional Entities launched a joint review of the BPS' performance during the January 2025 arctic events, which comprised Winter Storms Blair, Cora, Demi, and Enzo.[19] The week of January 19–25, 2025 was the third coldest winter week (spanning Sunday through Saturday) across the United States since 2000. Between January 21 and 22, 2025, natural gas demand peaked at 150 Bcf/day, electric demand peaked at 683 GW, and unplanned outages peaked at 71,022 MW. Nevertheless, during the January 2025 arctic events, manual load shed was not required. The January 2025 arctic events had lower observed hourly wind chill temperatures in pockets of the Northeast, the Louisiana Gulf, California, and the Southwest compared to Winter Storms Uri, Elliott, Gerri, and Heather. During the January 2025 arctic events, the most extreme storm relative to typical weather was Winter Storm Enzo—a Gulf and Southern storm. On January 20, 2025, a burst of snow, sleet, and freezing rain developed across Texas and Louisiana late in the day. A mixture of sleet and freezing rain fell from Austin to San Antonio and to the southernmost point of Texas. By the early morning hours of January 21, 2025, for the first time in history, a blizzard warning was issued for southwest Louisiana and the southeastern-most point of Texas. Snow fell in Gulf cities in Texas, southern Mississippi, southern Alabama, and western Florida. On January 21, 2025, Baton Rouge recorded 7.6 inches of snowfall, making it the city's snowiest day since recordkeeping began in 1892, while New Orleans saw its snowiest day on record, with a total of 8.0 inches. Temperatures plunged to single digits in Louisiana. Temperatures in some parts of the state fell to levels not seen in more than 125 years.

The review team engaged with 10 electric entities across the Eastern and Texas Interconnections to gather the information necessary to provide a high-level overview of the BPS' performance during the cold weather events. Based on the data and interviews that the team reviewed, electric generators appear to have performed better during the January 2025 arctic events because of additional generator commitments, improved preparedness, increased situational awareness, and the implementation of lessons learned from previous extreme cold weather events and prior report recommendations. The natural gas system also performed better overall, serving record levels of natural gas demand and experiencing only minor production declines and short-duration force majeure events.

On October 1, 2025, NERC submitted to the Federal Energy Regulatory Commission its first *Cold Weather Data Annual Report*. This report includes a review of forced outage data from GADS for the winter 2024–2025 period indicating performance consistent with historical performance as reported in NERC's annual *State of Reliability* report. This is within the normal range of capacity that occurs across the fleet. During the Winter 2024–2025 period, the highest amount of capacity in a forced outage state for all reasons occurred on January 20, 2025, with 68,519 MW across all regions. The outages occurring over January 20, 2025, were analyzed as part of the joint FERC, NERC, and Regional Entity *2025 System Performance Review*. The joint FERC, NERC, and Regional Entity *2025 System Performance Review* found a reduction in peak coincident unplanned generator outages for the four 2025 winter storms reviewed compared to past winter storms; however, this review also noted that it was not an exact comparison due to prior winter storms having different characteristics.

Eastern Interconnection–Canada and Québec Interconnection

No EEAs were needed during the previous winter season. One entity plans to make a slight increase to the demand-response program based on last winter's operations.

[17] Despite Arctic air outbreaks, U.S. had warm, dry winter on average | National Oceanic and Atmospheric Administration
[18] Climate Trends and Variations Bulletin – Winter 2024/2025 - Canada.ca
[19] https://www.ferc.gov/media/report-january-2025-arctic-events-system-performance-review-ferc-nerc-and-its-regional

Eastern Interconnection–United States

Several entities indicated that generators performed better during the January 2025 arctic events than in previous winter storms. For example, TVA stated that generator performance within its footprint was stable, with minimal natural gas delivery issues. Southeastern RC detailed that no major fuel-related outages occurred. FRCC noted that generator performance was strong during this period. The significant characteristics of Winter Storm Enzo in the Southern and Gulf states were freezing precipitation and snow accumulation, especially in regions where those conditions rarely occur. In FRCC, only the northern portion of Florida experienced severe arctic weather including freezing precipitation and snowfall (record-setting, in some cities) that were abnormal for the region even though certain northern cities have faced cold temperatures in the past. In Florida, entities experienced energy emergencies caused by extended generation outages from hurricanes Milton and Helene, compounded by unusually high loads from cold weather. Entities were able to serve native load and firm delivery obligations, though non-firm sales were curtailed during certain events. ISO-NE, NYISO, and PJM all generally described the January 2025 arctic events as having cold temperatures but overall weather conditions that were similar to a winter without a major storm.

MISO emerged from Winter 2024–2025 without turning to emergency procedures despite the wide-ranging winter storms from January 6 to 9 and again from January 20 to 22. Generators continue to prioritize scheduling planned or maintenance outages to the shoulder seasons of fall and spring to maximize unit availability for the winter season. Also, extreme cold weather outage adders were added to the LOLE model to make sure that winter storm risks are included in planning. In PJM, demand reached a new all-time winter peak on January 22, 2025, of 143,714 MW with sufficient reserves. PJM did call an EEA1 on January 22, 2025, however reserves remained adequate. PJM had less than 3% load forecast error over the peak days of the January cold weather events. Reliability cases were conducted, and units with extended start times were evaluated and started early to ensure units were on-line before extreme cold weather settled in. PJM had a 9.24% forced outage rate on the peak day, a relatively low forced outage rate for the weather experienced. There were also very few gas production problems; however, market issues prevented proper scheduling because of the four-day holiday weekend.

In SERC-Central, entities reported only limited impacts from Winter 2024–2025 coldest weather and made minor adjustments. One entity declared conservative operations ahead of peak conditions but experienced no emergencies. One entity raised its winter Planning Reserve Margin target to 26% following lessons learned from Winter Storm Elliott. Corrective actions were implemented due to isolated equipment issues, including improved heat trace capabilities and adding heat trace equipment to the cold weather critical component list. During the previous winter season, some SERC-Florida Peninsula entities experienced energy emergencies caused by extended generation outages from hurricanes Milton and Helene, compounded by unusually high loads from cold weather. Despite these challenges, entities were able to serve native load and firm delivery obligations, though non-firm sales were curtailed during certain events.

Texas Interconnection–ERCOT

There were no energy emergencies for the Texas RE-ERCOT region last winter and no conditions that prompted changes in operating procedures. Winter Storm Kingston, which occurred in February 2025, was the only storm where ERCOT utilized firm fuel supply service resources (FFSS), a firm-fuel product that provides additional grid reliability and resiliency during extreme cold weather and compensates generation resources that meet a higher resiliency standard. A maximum FFSS deployment of 470 MW occurred on February 19 between the hours 13:10 and 17:02. Two other storms, Enzo and Cora, impacted ERCOT in January 2025, but these storms did not cause any system reliability issues.

Western Interconnection

Between January 11 and 17, 2024, a prolonged Arctic outbreak impacted British Columbia, Alberta, and the U.S. Pacific Northwest, driving record electricity demand and widespread reliability challenges. Four U.S. Northwest BAs and one Canadian BA declared energy emergencies, underscoring two core vulnerabilities: Inadequate capacity during evening peak hours (4 to 8 p.m.) and Insufficient fuel supply (limited hydro availability) across multiple days.

Although temperatures were comparable to the December 2022 cold snap, WECC-Northwest peak demand rose two percentage points to 6% over then, with BC Hydro and AESO both setting new all-time records. The U.S. Northwest relied heavily on imports—averaging 4,745 MW during peaks and 5,241 MW across all hours, mostly from the Southwest and Rockies. California remained a net importer, providing little relief. Market prices in the Northwest reached or neared caps across most hours, indicating persistent scarcity rather than short-term peaks. Overall, the January 2024 event illustrated capacity alone does not ensure resilience. Sustained energy availability with interregional flexibility (both physical and market-based) will be key to maintaining reliability through the 2025–2026 and future winter seasons.

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
MISO	Jan. 21	18:00	108,888*	96,134 100,395	101,655	-977	18,468	16,761	0	519	17,010
MRO-Manitoba Hydro	Jan. 20	08:00	5,132	4,814 5,060	5,292	-277	142	52	N/A	0	146
MRO-SaskPower	Dec. 18	18:00	3,785	3,802 3,897	3,641	-231	664	368	0	3	0
MRO-SPP	Feb. 20	08:00	47,981	45,926 47,054	40,898	-1,424	4,886	4,783	255	36	9,272
NPCC-Maritimes	Jan. 22	07:00	5,810	5,907 6,498	4,266	-1,174	368	261	3	5	*
NPCC-New England	Jan. 21	18:00	19,607	20,308 21,814	17,686	-1,896	285	329	4	23	624
NPCC-New York	Jan. 22	19:00	23,521	22,998 24,023	18,932	-4,589	654	728	0	0	4,835

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
NPCC-Ontario	Jan. 22	18:00	21,940	20,951 22,179	24,250	2,990	3,693	1,914	0	0	*
NPCC-Québec	Jan. 22	08:00	37,178	36,061 39,545	39,514	-766	1,463	1,449	0	0	*
PJM	Jan. 22	09:00	144,420	130,712 144,939	152,142	7,731	3,704	3,620	3,076	1	8,663
SERC-C	Jan. 22	08:00	47,815	41,397 47,062	40,898	-6,921	563	176	214	455	1,538
SERC-E	Jan. 23	08:00	47,130	44,023 47,662	41,810	-5,323	0	0	145	2,526	1,830
SERC-FP	Jan. 25	08:00	43,974	45,714 54,239	41,702	-557	0	0	362	1,684	2,824
SERC-SE	Jan. 22	08:00	46,490	43,670 45,116	48,227	1,741	0	0	592	3,861	2,210

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
TRE-ERCOT	Feb. 20	08:00	80,560	73,193[5] 90,405[5]	79,960	-191	9,397	15,697	1,586	15	5,742
WECC-AB	Dec. 18	17:00	12,241	12,280 12,635	12,711	-470	3,175	1,867	4	0	*
WECC-BC	Feb 3	18:00	11,359	11,996 12,749	11,415	44	70	279	0	0	839
WECC-CA/MX	Dec. 12	15:00	35,555	35,359 36,823	31,925	-4,669	4,021	569	11,547	0	1,627
WECC-NW	Feb. 12	08:00	54,278	58,001 62,230	48,437	-920	2,607	7,876	1,494	2,198	3,281
WECC-SW	Feb. 13	16:00	22,969	16,177 17,777	25,087	2,117	2,741	1,065	1,599	182	1,496
Highlighting Notes:			Actual peak demand in the highlighted areas met or exceeded extreme scenario levels				Actual wind output in highlighted areas was significantly below seasonal forecast.		Actual solar output in highlighted areas was significantly below seasonal forecast.		Actual forced outages above or below forecast by factor of two

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
Table Notes: [1] Actual demand, wind, and solar values for the hour of peak demand in U.S. areas were obtained from EIA From 930 data. For areas in Canada, this data was provided to NERC by system operators and utilities. [2] See NERC *2024–2025* WRA demand scenarios for each assessment area. Values are the normal winter peak demand forecast and an extreme peak demand forecast that represents a 90/10, or once-per-decade, peak demand. Some areas use other basis for extreme peak demand. [3] Expected values of wind and solar resources from the *2024–2025 WRA*. [4] Values from NERC Generator Availability Data System for the 2024–2025 winter hour of peak demand in each assessment area. Highlighted areas had actual forced outages that were more than twice the value for typical forced outage rates used in the 2024–2025 winter risk period scenarios in the *2024–2025 WRA*. [5] Texas RE-ERCOT peak demand scenarios are obtained by adding expected demand response (5.4 GW for winter 2024-2025) to the demand scenarios found on p. 29 of the 2024-2025 WRA. *Canadian assessment areas report to the NERC Generator Availability Data System on a voluntary basis, which can contribute to the absence of some values in certain assessment areas.										

Attachment N

NERC Probabilistic Assessment Technical Guideline, August 2016

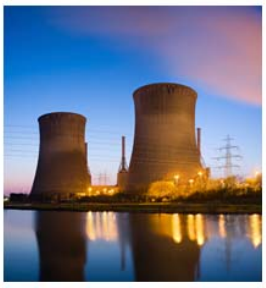
NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Probabilistic Assessment

Technical Guideline Document

August 2016

RELIABILITY | ACCOUNTABILITY



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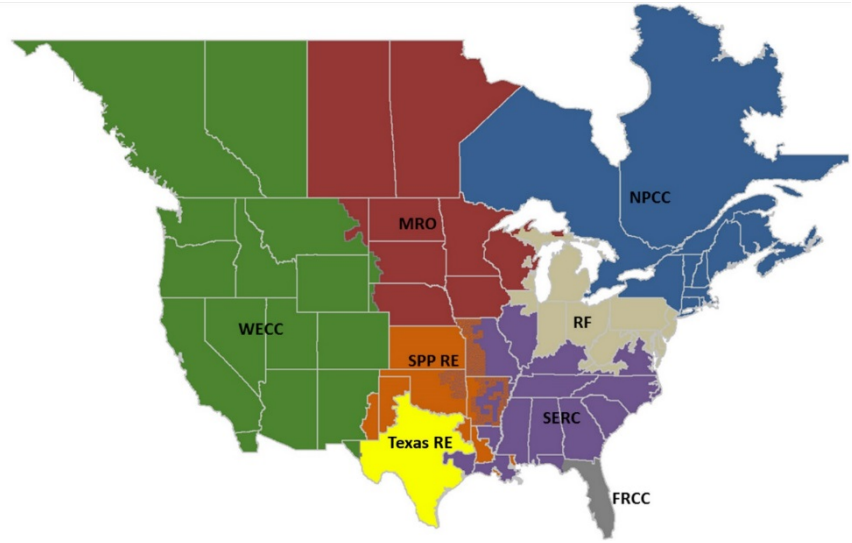
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Preface

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the reliability of the bulk power system (BPS) in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the BPS through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California in Mexico. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the BPS, which serves more than 334 million people.

The North American BPS is divided into eight Regional Entity (RE) boundaries as shown in the map and corresponding table below.



The Regional boundaries in this map are approximate. The highlighted area between SPP and SERC denotes overlap as some load-serving entities participate in one Region while associated transmission owners/operators participate in another.

FRCC	Florida Reliability Coordinating Council
MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
SPP RE	Southwest Power Pool Regional Entity
Texas RE	Texas Reliability Entity
WECC	Western Electricity Coordinating Council

Executive Summary

In an effort to improve NERC's continuing probabilistic assessments, the NERC Planning Committee (PC) tasked the Probabilistic Assessment Improvement Task Force (PAITF) with seeking enhancements to the existing Probabilistic Assessment (ProbA). The intent of the ProbA is to probabilistically evaluate resource adequacy based upon current reserve margin projections and emerging risks that have been identified in the Long-Term Reliability Assessment (LTRA).

This Probabilistic Technical Guideline Document serves as a platform for detailing probabilistic analytical enhancements that apply to resource adequacy. It provides guidance for NERC and its Regions and Assessment Areas to improve consistency in conducting probabilistic studies for Assessment Areas, and to establish consistent measures and metrics for monitoring potential resource adequacy trends. In addition, the Probabilistic Assessment Technical Guideline Document outlines suggestions for performing probabilistic analyses and common methods used by different entities while incorporating PAITF's recommendations for enhancing NERC Regions and Assessment Areas' modeling approaches at the time of publication. The Probabilistic Technical Guideline Document may be updated as deemed necessary, per a recommendation by the PC or its subgroups to reflect current modeling practices. The Probabilistic Assessment Technical Guideline Document is not applicable to individual entities or the resource planning activities they conduct for their specific jurisdictional authorities.

Primary Objectives

Under the guidance of the NERC Reliability Assessment Subcommittee (RAS), PAITF has created this Technical Guideline Document to identify and document enhancement opportunities for NERC's Regions and Assessment Areas.

The enhancements put forth by this Probabilistic Technical Guideline Document seek to:

- Identify practices, requirements, and recommendations needed to perform high-quality probabilistic resource adequacy assessments
- Complement reserve margin analyses in NERC's Long-Term Reliability Assessment by producing enhanced resource adequacy metrics and modeling approaches
- Provide NERC and policy makers with greater insight, understanding, and perspective on BPS reliability
- Support regional scenarios to study resource adequacy issues identified in the Long-Term Reliability Assessment

Enhancement Recommendations

The following section highlights major recommendations for enhancement of the ProbA Furthermore, Appendix C of this document provides a full list of recommendations.

- **NERC to develop and maintain documentation describing the establishment of Assessment Areas.** Assessment Areas are established through the NERC Reliability Assessment process. These areas are used for reporting probabilistic metrics. The ERO-RAPA, with input from RAS is to develop and maintain documentation describing the establishment of Assessment Areas. The ERO-RAPA, with input from NERC RAS annually to assess the need to revise the Assessment Areas based on boundary changes as market participation and planning responsibilities change over time. NERC staff, with input from NERC RAS, to provide a supplemental mapping document of changes to Assessment Areas over time.
- **Regions and Assessment Areas need to estimate or calculate monthly resource adequacy metrics.** As resource and demand characteristics change over time, annual loss of load may start accruing during historically off-peak months. Therefore, the monthly aggregation of these metrics [Loss of Load Hours

(LOLH) and Expected Unserved Energy (EUE)] will better inform industry of potential resource adequacy risks throughout the year.

- **Regions and Assessment Areas need to model seasonal load forecast uncertainty.** Current models incorporate some level of load forecast uncertainty, primarily around the annual peak; however, this recommendation seeks incremental improvements in load modeling to capture a reasonable expectation of seasonal load variability around the load forecast. Each Assessment Area is to incorporate both annual and seasonal peak uncertainty influenced by weather, economic, and other drivers in their load modeling.
- **Regions and Assessment Areas need to incorporate seasonal variations in their modeling of resource outages.** Current models incorporate some level of seasonal variation of resource outages through annual average forced outage rates; however, this recommendation seeks incremental improvements in outage modeling to capture a reasonable expectation of seasonal outages for the study years. Each Assessment Area to incorporate seasonal forced outage impacts by utilizing forced-outage rates, deration with load or temperature, varying transition rates, etc. Model modifications may be needed to accommodate this improvement.
- **Assessment Areas need to coordinate with neighboring areas and document coordination and modeling activities.** Each Assessment Area to provide and document further detail probabilistic modeling and coordination efforts with their neighboring entities. This is an incremental improvement to the narratives for increased awareness of Assessment Areas' methods. In addition, Assessment Areas to coordinate and document modeling differences and similarities from the LTRA data in terms of on-peak capacity transfer obligations and seasonal, weekly, or daily variations in the probabilistic model.
- **Assessment Areas to perform the sensitivity modeling within the Core Probabilistic Assessment framework**. NERC RAS identifies the variable data elements relevant to each sensitivity modeling.
- **Assessment Areas to address the reliability issues identified within the LTRA that impact resource adequacy, within the Special-Coordinated Probabilistic Assessment framework**. NERC ERO-RAPA and the PC identify reliability risk issues for scenario analysis, and NERC RAS evaluates input parameters relevant to each candidate scenario.

Introduction

Probabilistic analysis describes events in terms of how probable they are, and requires knowledge of the performance characteristics of bulk power system (BPS) components. These performance characteristics may include but not limited to generator outage rates, resource realizations in terms of energy produced, load characteristics, transmission congestions and constrains, etc.,. Measurement of past performance of the BPS can be expressed precisely in terms of frequency, duration, and the number of elements affected in past events. Prediction of future reliability must be expressed in terms of the expected performance of the system components, and of the uncertainty in those expectations. These characteristics can be brought together to derive various measures of the reliability of the BPS. Probabilistic methods typically rely on either statistical analysis of historical performance or enumeration techniques which are capable of simulating large numbers of contingencies. However, the choice of methods and selection of acceptable reliability levels are still matters of judgment and differ from Region to Region (and from utility to utility in some cases).

Probabilistic Modeling Overview

In addition to defining various technical considerations for probabilistic modeling, the PC PAITF Technical Guideline report identifies potential practices, requirements, and recommendations needed to ensure BPS reliability.

The PAITF 2015 ProbA Improvement Plan—Summary and Recommendations report reviewed recent key findings in the 2015 LTRA and ProbA reports resulting in the following conclusions:[1]

- The PAITF to prepare a Probabilistic Assessment Technical Guideline document to address consistency issues by recommending specific modeling guidelines to be used by the individual Assessment Areas.
- NERC and the Regions to take the lead in developing and evaluating additional scenarios to study resource adequacy issues related to resource risk areas identified in LTRAs.
- There are additional reliability issues, not directly related to resource adequacy, to be addressed using different probability analysis techniques. The review of methods and techniques for these non-resource adequacy issues should be identified in a separate report.

The Improvement Plan outlined two approaches that will increase NERC's ability to identify reliability trends as well as assess and evaluate resource adequacy concerns:

- **Core Probabilistic Assessment:** this approach is a continuation of the individual area probability assessments that will be an enhanced version of the current ProbA. Modeling consistency will be improved by following a Probabilistic Assessment Technical Guideline document.
- **NERC-Regional Coordinated Special Assessment:** this approach will expand the probabilistic study efforts through NERC and the Regions taking the lead in developing and evaluating additional scenario studies on resource adequacy concerns related to the BPS identified in LTRAs.

Guidelines for these approaches are demonstrated in this document, and highlight possible enhancements recommended by the PAITF. Each probabilistic enhancement or recommendation in this Technical Guideline Document is tied to one of four improvement areas: 1) process and coordination, 2) data needs and data collection, 3) assumptions criteria and modeling requirements, and 4) modeling software requirements.

[1] NERC Probabilistic Assessment Improvement Plan – Summary and recommendations Report, December 2015, http://www.nerc.com/comm/PC/Reliability%20Assessment%20Subcommittee%20RAS%202013/ProbA%20%20Summary%20and%20Recommendations%20final%20Dec%2017.pdf

Core Probabilistic Assessment

Metric Reporting Areas

The term "metric reporting area" (MRA) is synonymous with the areas of the BPS which report resource adequacy metrics, such as loss-of-load hours (LOLH). MRAs are meant to be flexible in order to address individual assessment objectives. For the purpose of the Core Probabilistic Assessment, MRAs are synonymous with the reporting Assessment Areas of LTRA.

One key to delivering credible and meaningful Core Probabilistic Assessments is the establishment of Assessment Areas that accurately represent the current and future operations of the system. The intent of establishing these Assessment Areas is to report on the same basis as entities plan and operate their respective system(s).

Assessment Areas are established through the NERC Reliability Assessment processes, and these areas will be used for reporting probabilistic metrics for the Core Probabilistic Assessment under this PAITF recommendation, provided the following:

1. The ERO RAPA, with input from NERC RAS, develops documentation describing the establishment of Assessment Areas.
2. The ERO RAPA, with input from NERC RAS, maintains this documentation and annually assesses the need to revise the Assessment Areas based on boundary changes over time as market participation and planning responsibilities change.
3. NERC staff, with input from NERC RAS, provides a supplemental mapping document of Assessment Areas boundary changes over time.

Metrics Description

Resource adequacy metrics describe the occurrence, frequency, and duration of risk throughout the planning year for an Assessment Area. The LTRA is a peak-driven deterministic approach to gage resource adequacy. However, a compliment to the LTRA's reported reserve margins is the associated probability of loss of load hours and/or unserved energy at the respective reserve margins. Even if from a deterministic view an hour's demand is below the expected peak demand, other factors may drive that hour to be more at risk for loss of load than the peak hour due to scheduled and forced outages, transmission constraints, etc. Previous LTRAs have highlighted the need to evaluate more granular metric reporting in order to provide better risk-informed recommendations and leading edge indicators—given an evolving BPS. Probabilistic Assessment indicates trends in risks for any hour of the year, and it provides a trigger for further investigation that may be needed. The monthly aggregation of risk across 8,760 hours of the year may be more suitable to indicate the duration or occurrence of resource adequacy risks in some areas of the BPS.

Historically, the focus of the Core Probabilistic Assessment has been around annual indicators of risk to resource adequacy.

The following and other probabilistic metrics may be produced for different time intervals:

- Loss of Load Probability (LOLP)
- Expected Unserved Energy (EUE)
- Loss of Load Hours (LOLH)
- Loss of Load Expectation (LOLE)
- Loss of Load Event (LOLEV)

Although classic reliability metrics such as LOLE, LOLP and LOLEV have been used for a long time, they are not metrics used in the Core Probabilistic Assessment to avoid potential conflicts with regional practices based on different methods.

Loss-of-Load Probability (LOLP)

This is defined as the probability of system daily peak or hourly demand exceeding the available generating capacity during a given period. The probability can be calculated either using only the daily peak loads (or daily peak variation curve) or all the hourly loads (or the load duration curve) in a given study period.

Expected Unserved Energy (EUE)

This is defined as a measure of the resource availability to continuously serve all loads at all delivery points while satisfying all planning criteria. The EUE is energy-centric and analyzes all hours of a particular year. Results are calculated in megawatt hours (MWh). The EUE is the summation of the expected number of megawatt hours of load that will not be served in a given year as a result of demand exceeding the available capacity across all hours. Additionally, this measure can be normalized based on various components of an Assessment Area (i.e., total of peak demand, Net Energy for Load, etc.). Normalizing the EUE provides a measure relative to the size of a given Assessment Area. One example of calculating a Normalized EUE is defined as [(Expected Unserved Energy) / (Net Energy for Load)] x 1,000,000 with the measure of per unit parts per million.

Loss-of-Load Hours (LOLH)

This is generally defined as the expected number of hours per year when a system's hourly demand is projected to exceed the generating capacity. This metric is calculated using each hourly load in the given period (or the load duration curve) instead of using only the daily peak in the classic LOLE calculation. To distinguish this expected value from the classic calculation, the hourly LOLE is often called LOLH. It must be noted that the classic LOLE in days per year is not interchangeable with the LOLH in hours per year (i.e., LOLE of 0.1 days per year is not equivalent to a LOLH of 2.4 hours per year.) Unlike the classic LOLE metric, there is currently no generally acceptable LOLH criterion.

Loss-of-Load Expectation (LOLE)

This is generally defined as the expected number of days per year for which the available generation capacity is insufficient to serve the daily peak demand. This is the original classic metric that is calculated using only the peak load of the day (or the daily peak variation curve). However, this metric is not being reported as part of this assessment. Currently some Assessment Areas also calculate the LOLE as the expected number of days per year when the available generation capacity is insufficient to serve the daily load demand (instead of the daily peak load) at least once during that day.

Loss-of-Load Events (LOLEV)

This is defined as the number of events in which some system load is not served in a given year. A LOLEV can last for one hour or for several continuous hours and can involve the loss of one or several hundred megawatts of load. Note that this is not a probability index, but a frequency of occurrence index.

Metric Calculations

The PAITF recommends calculations of the following metrics for each Assessment Area and study period evaluated for all hours per year:

- Annual LOLH
- Monthly LOLH
- Annual EUE—both actual and normalized

- Monthly EUE—both actual and normalized

Probabilistic Study Reporting

Assessment Areas will perform a probabilistic assessment and report the results to NERC on a biennial basis for study years two and four of the LTRA. The purpose of the duplicate study year from assessment-to-assessment is to track and trend resource adequacy in the near term for each Assessment Area.

Simulation Software

A common software requirement is not necessary. Different models may be used at the discretion of the Assessment Areas. However, these models must be capable of performing the computations required as delineated in the Probabilistic Resource Adequacy Metrics Computations section of this document.

It is recommended that these models utilize a load-generation-transmission simulation software or another type that is appropriate for the Assessment Area for computing the forward-looking probabilistic metrics. The PAITF does not propose a common simulation software requirement in order to allow flexibility at the Assessment Area level. However, the PAITF does recommend that the G&T RPMTF's Assessment Area Simulation Software requirement be adhered to, which states "Each Assessment Area will utilize a load-generation-transmission simulation software for computing forward-looking probabilistic metrics."

It is at the discretion of each Assessment Area to select their solution tool, provided that metrics are calculated through simulation (e.g., Monte Carlo or convolution), while also adhering to all load, generation, and transmission modeling requirements/criteria/guidelines.

Specific Modeling Requirements for Core ProbA

Included Generation Categories

Existing generating resources

Existing generation is all generating resources that are capable of supplying BPS demand. This resource must be in commercial service or be expected to be in commercial service by the end of the current calendar year This includes steam generators, combustion turbine generators, combined cycle generators, wind turbine generators, hydro generators, and generation from various types of energy storage facilities. The characteristics of these resources align with the LTRA Data Form Instructions for existing resources. [2]

Load as a Capacity Resource: Demand that can be curtailed or interrupted under a contractual arrangement can be included as an existing resource from the perspective of capacity modeling. Since these resources are predetermined reductions in demand, they must also satisfy the applicable modeling rules for Demand Side management (DSM).

Future generating resources

For any scenario that includes future time periods, additional capacity is included that meets the requirements as identified in the 2016 LTRA Data Instructions to be a LTRA Tier 1 designated unit.

Excluded Generation Categories

[2] NERC 2016 LTRA Data Form Instructions
http://www.nerc.com/comm/PC/Reliability%20Assessment%20Subcommittee%20RAS%202013/2016LTRA_Data_Instructions.pdf

Any existing generating resource that supplies non-BPS demand is excluded. Any generating resource that is backup or standby generation that is not obligated to supply BPS demand as instructed by the BPS system operator (direct or indirect instruction) is also excluded.

Scheduled generator retirement: An existing generator with a known retirement date should be removed from the existing resources in applicable study years.

Future generating resources

The Core Probabilistic Assessment determines the amount of additional capacity needed to supply future demand forecasts. Excluded future capacity falls under Tier 2 and Tier 3 generation units' categories identified in the LTRA Data From Instructions.

General Modeling Assumptions

Load Modeling

Load modeling to include the following: 1) Peak load projection and forecast uncertainty, 2) A total of 8,760 hourly annual load profile(s) and their associated probabilistic weightings, 3) Load correlation within each Assessment Area incorporating weather and economic parameters.

In the most generic terms, an hourly (usually an 8,760 hourly annual load shape) load model that includes load forecast uncertainty (LFU) to be used for probabilistic assessments. Fundamentally, the load used in the analysis should describe a reasonable expectation of variability of the load forecast for the study year. It is important to represent the correlation across Assessment Area of load and weather parameters.

LFU models the forecast peak load differently from the actual load to provide uncertainty bands around load shapes. Weather, economic variability and forecast modeling errors are key components in establishing these acceptable bands around the 50/50 load shape projections. Each Assessment Area's narrative should address how the load shape is expected to change prospectively.

The general principles for both single and multi-area analysis are described in NERC's Reliability Assessment Guidebook.[3]

PAITF recommends the following for Assessment Areas with respect to load modeling:

- Each Assessment Area should incorporate both annual peak uncertainty and seasonal variation in their load modeling.
- Each Assessment Area should submit a narrative describing their load modeling assumptions.
- Narratives should also include assumptions made on Demand-Side Management (DSM) modeling within the load shapes and forecasts. The DSM section highlights requirements and DSM modeling improvements.
- Load Forecast Uncertainty (LFU) must be incorporated into the ProbA models at a minimum. The industry standard for LFU modeling is to calculate the probability of load exceeding or falling below the forecast. LFU application can be conducted as a multiplier to the load shape(s), captured in multiple weather years modeling, or a combination thereof.
- This LFU should capture the uncertainty due to weather and economics.
- Weather, economic and forecast trend uncertainty include:
  - Conservation and energy efficiency
  - Historic and future embedded variable generation (wind and solar mainly)
  - Controllable or dispatchable demand response
  - Other load shapes within the Assessment Area (among internal transmission zones)
  - Load shapes of outside areas (external Assessment Areas)
- What is included or excluded from the 50/50 base forecast should be detailed in each Assessment Area's narrative. This narrative should also include the methodology to calculate the 50/50 forecasted load for the study years and how that applies to the load shapes within the model.

[3] NERC Reliability Assessment Guidebook http://www.nerc.com/files/Reliability%20Assessment%20Guidebook%203%201%20Final.pdf

Demand-Side Management

The general issues related to the DSM description, data and modeling are extensively discussed in Chapter 3 of the NERC Reliability Assessment Guideline. In this section of this Technical Guideline Document we will concentrate specifically on the modeling of DSM in probabilistic assessments.

As with any analysis the first concern is to ensure that the DSM is being counted exactly once. If the DSM is modeled as an Emergency Operating Procedure (EOP) or as a dispatchable resource, it must be assured that the load shape and load forecast were constructed to include the demand from the loads that the DSM act on. This often means actively adjusting historic information to add the effect of the DSM back in because historic metered load is often load after the impact of the DSM.

The DSM contains all activities or programs undertaken by an entity to achieve a reduction in Demand. The DSM is often understood to include three components: 1) conservation, 2) energy efficiency (EE), and 3) controllable and dispatchable demand response (DR).[4]

EE resources may be classified into two groups: permanent and user controlled.

Permanent EE is the installations and process improvements that lead to the permanent efficiency of devices, buildings, etc.

User Controlled EE is the implementation of end use customer controlled devices and choices that may shift energy usage at the discretion of the end use customer (i.e., thermostat controls). User controlled EE to be implicitly modeled in the ProbA through load shape(s) and LFU, since one factor in the variability from the 50/50 demand is end-use customer activities. However, permanent EE to be modeled explicitly in the ProbA, at least to the extent that its impacts are known.

The PAITF recommends the following requirements for Assessment Areas with respect to permanent EE modeling:

- Assessment Areas should provide a narrative on their methodology to determine the impact of permanent EE on the historical demand series used for the ProbA model.
- Assessment Area's should provide a narrative on their methodology to determine the impact of permanent EE on the load growth rate(s) used in the ProbA model.
- If an Assessment Area utilizes permanent EE within an organized market, the Assessment Area must ensure that its impact is removed from the historical demand series and also ensure that the future impact on load is explicitly modeled as either a load modifier or as a resource with some defined level of uncertainty applied to its load reduction capability.

DR resources may be classified into two categories: controllable (or dispatchable) and non-controllable (or non-dispatchable).

- Controllable DR is any DSM activities or programs that are directly controlled or dispatched by the System Operator or Load-Serving Entity to influence the amount of electricity used.

- Non-controllable DR is not controlled or dispatched by the System Operator or Load-Serving Entity (such as Time-of-Use, Critical Peak Pricing, Real Time Pricing and System Peak Response Transmission Tariffs). Much like user controlled EE, non-controlled DR should be modeled implicitly in the ProbA through load shape(s) and LFU. However, controllable DR should be modeled both explicitly.

[4] 2016 Long Term Reliability Assessment –Data Form Instructions
http://www.nerc.com/comm/PC/Reliability%20Assessment%20Subcommittee%20RAS%202013/2016LTRA_Data_Instructions.pdf

Only controllable DR shall be modeled explicitly in the ProbA. To further expound upon the definition of controllable DR given above, It is useful to consider three different types of DR differentiated by who controls it—customer, distributor/micro-grid, or grid/market authority/system operator.

- **Customer controlled DR** includes such things as price response (especially to real time rates) and building automation. They are considered to be DSM because they respond to lower demand when price is high which may be triggered by a high expectation or actual loss of load. This DSM is not activated because load is high, but rather is price driven. These tend to be correlated but loss of load does not only occur at high loads especially if it is triggered by generator outages or transmission limitations. The big problem with this type of DSM is lack of available data which lead to incomplete models. This is similar to user controlled EE, and for purposes of the ProbA falls outside the scope of controllable DR.
- **Dispatchable** DSM is fairly simple to directly model either as an EOP or as a grid controlled resource. The data is usually readily available and it is, in practice, directly dispatched as needed by the system operator. It has unique features of weather and time-of-day correlations, often a maximum number of occurrences limit and there may be a maximum period over which it may be used. These may need some special treatment in the modeling but they can usually be approximated by utilizing some of the model features designed for thermal or hydro-electric generation is necessary. For the purposes of the ProbA this type of DSM is considered controllable DR.
- **Distributor/Micro-Grid controlled DSM** falls between customer controlled and grid controlled DSM. It is similar to grid controlled but is dispatched based on local needs and system signals such as price. This hybrid DSM is fairly rare so far and specific system characteristics will dictate whether it should be modeled similarly to grid controlled DSM or customer controlled DSM.

Controllable DR, like any other resource should have its intrinsic uncertainty modeled. It has an uncertain capacity impact similar to the uncertainty introduced by thermal generation forced outages. Controllable DR has a much more muted effect typically however as it acts like an aggregation of a large number of small units. Its expected available capacity would exhibit a low variability. This variability is usually much less than the uncertainty in estimating the overall impact. Modeling controllable DR as a deterministic resource may be quite acceptable.

Whether controllable DR is modeled as an EOP or a dispatchable resource doesn't directly impact a probabilistic resource adequacy assessment. However, controllable DR and its intrinsic uncertainty should be modeled explicitly in the ProbA.

PAITF recommends the following requirements Assessment Areas with respect to controllable DR modeling:

- Assessment Area's must provide a narrative on their modeling methodology.
- Assessment Area's must model the limitations associated with controllable DR through one of the following approaches.
  - Assessment areas must model the limitations based on program performance and/or contractual obligations as a load modifier or energy limited resource.
  - If the probabilistic approach is not available, use a net value of MW reduction impact into the model. Include a detailed narrative of how the net value is calculated.

Capacity Modeling

Accurate capacity modeling is important in order to correctly produce probabilistic analysis. Generation resources can be of many forms including, but not limited to, combustion turbine, steam turbine, and pumped storage,

utilizing numerous types of fuels such as nuclear, fossil, solar, wind, and hydro. Some entities also consider certain DSM programs as generation resources.

In probabilistic capacity modeling, if the primary energy supply (energy to be converted to electricity) is limited or cannot be controlled by the generator operator, the probability consideration for that capacity will be consistent with the Variable Energy Resources (VER) capacity modeling guidelines in this section. When the primary energy supply (energy to be converted to electricity) is controllable by the generator operator, the probability consideration for that capacity will be based on the equipment outage performance.

Thermal Generation

Combinations of capacity ratings, outage rates, and other thermal parameters such as duration curves and ramp rates can be used to model the variability of thermal generation resources. Below are minimum requirements and PAITF recommendations for thermal generation modeling.

Ratings

The PAITF recommends for Assessment Areas that:

- Thermal generation resources in each Assessment Area should be modeled capturing seasonal capacity ratings. Since the goal of monthly indices such as the LOLH is to identify whether risks are greater in different times of the year, appropriate modeling of seasonal ratings is essential to evaluate risk throughout the calendar year.
- Assessment Area's narratives shall include how seasonal ratings are derived.
- Thermal generation capacity ratings should be consistent with the LTRA data collection process as indicated in recent LTRA report instructions.

Outage Rates

Forced Outages: Forced-outage rates (FOR) vary between resource types and areas. Most Assessment Areas are using FOR based on annual or seasonal averages. Generator performance is evaluated over long time periods generally 3–5 years and across various seasons. This allows for creating generator performance averages that may include seasonal variations.

PAITF recommends the following for Assessment Areas:

- Incorporating seasonal forced outage factor by either changing forced-outage rates with load or temperature or by derating generation specifically to account for this effect could improve the realism of the ProbA simulations. Model modifications may be needed to accommodate this improvement.
- Unit deratings should be reflected in the FOR, the unit transition states, and/or energy profiles with respect to unit's historical performances and unit's data availability.
- Assessment Area's narratives should include but not be limited to:
  - How forced outage ratings and derates are derived for each unit or by resource fuel type.
  - Ambient and seasonal conditions impacts such as temperature and heat indices.
  - How maintenance and reserve shut down hours are incorporated.
  - What type of FOR is utilized based on units' loading characteristics (e.g., EFOR or EFORd).

Scheduled Outages:
Scheduled outages should be considered within the probabilistic model. These outages may be categorized into the following groups: 1) Planned Outages—scheduled well in advance, and 2) Maintenance Outages—delayed maintenance in response to unforeseen events. Two approaches may be employed to account for scheduled outages model—random events or fixed schedules.

PAITF recommends with respect to modeling scheduled outages that each Assessment Area document its approach, either as a random schedule or a fixed schedule approach.

Variable Energy Resources

Wind and Solar Energy Resources

Wind and solar resources which are serving the BPS demand are required to be modeled. For instance, the impact of distributed solar should be reflected in load shapes and load forecast uncertainty models. Currently there is no standard method for modeling Variable Energy Resources (VER) in probabilistic assessment of power systems within the industry; however, a range of approaches have been proposed and implemented in academia and industry, each with their own inherent limitations. Given the intermittent nature of VER, these pose challenges in modeling and reliability analyses. It is recommended that a time series model be used in the probabilistic assessment of VER as time series models provide accurate predictions of the behavior of stochastic processes such as the variations in wind speed or solar radiation. The industry has not, however, been ready for using such time series model in probabilistic assessment of power systems containing VER yet. VER should be modeled as a stochastic parameter in the probabilistic assessment in which a key determinant of reliability is the ability of other resources to support the reliability index during periods of low availability of intermittent resources. This means that there needs to be information regarding the uncertainty distribution of the parameter, expressed either as mean and standard deviation in the case of a normal distribution, a more sophisticated non-normal statistical distribution, or as distribution of discrete samplings such as a number of years of historical resource availability (e.g., wind production or hydro production and/or reservoir information). As an interim solution, the following approach may be used:

- VER may be modeled assuming a certain probability distribution. The probability distribution function can be developed with reference to actual historical data. The models should be able to capture the uncertainty distribution of the parameter, expressed either as mean and standard deviation in the case of a normal distribution, a more sophisticated non-normal statistical distribution, or as a distribution of discrete variables such as a number of years of historical resource availability.
- Alternatively, seasonal accredited Capacity Contribution or some time referred to as the Effective Load Carrying Capability (ELCC) for variable resources should be used in the model. At least two values, one for the defined summer period and one for the defined winter period, can be used in the probabilistic assessment.

Each Assessment Area should document how each of these resources are modeled and what data is used. PAITF recommends that each Assessment Area:

- Describe how the ELCC or Capacity Contribution calculation is modeled across the year. If available, monthly or seasonal ELCCs, Capacity Contribution Calculations, or per-unit wind and/or solar generation profiles, based on history, for each significantly different wind or solar patterned zone in each Region/Assessment Area should be modeled.
- Provide the justification and methodology for the determination of the probability distribution function and seasonal accredited values for VER.

- Categorize the existing and annual future installed capacity of all wind resources and solar resources by each significantly different wind or solar patterned zone in your Region/Assessment Area. If available, provide these annual quantities on a monthly or seasonal basis.

Energy limited Resources

Energy limited generation such as hydro generation is an important source for electricity in North America. In some of the jurisdictions (e.g., Manitoba Hydro) energy limited generation comprises up to 90 percent of their total resources.

Typically there are three types of hydro resources including pumped storage, storage capable, and run of river. Currently these resources are primarily modeled either as thermal units or as deterministic load modifiers in probabilistic assessment of power systems in the industry. Modeling energy limited hydro unit as a thermal unit using the average FOR may produce performance results that are too optimistic. Modeling hydro units as simple deterministic load modifiers may not accurately incorporate the uncertainties associated with the primary resource of water; therefore, energy limited resources to be modeled probabilistically to recognize and reflect the variability in the primary source of water.

The PAITF recommends the following for Assessment Areas with respect to energy limited resources' modeling:

- Each Assessment Area should document how each of the energy limited resources are modeled and what data is used:
  - The type of hydro modeling approach currently used.
  - The capacity amount that can be reliably maintained for at least one full hour—designate number of hours if stated capacity amount can be sustained longer than one hour.
  - The annual forced outage rates, based on history, incorporating units impound times.
  - Storage maximum capacity in MWh values incorporating impound and discharging times.
  - The operating procedures for units' charging.
- For probabilistic assessment, water flows developed using historical data. The water flow can be treated as a random variable with a certain distribution and can be treated either as a continuous random variable using probability distribution function (PDF) or as a discrete random variable using probability mass function (PMF). The PDF and the PMF can be developed with reference to the historical water flows.
- Each Assessment Area should document in detail the justifications and methodologies for the development of the PDF/PMF, determination of the probabilities of different water conditions, and the modeling of hydro unit as an equivalent thermal unit
- Once the primary source of energy is modeled, the available capacity and energy can be determined considering the forced unavailability of the generating units and the associated storage capability.
- Alternatively Assessment Areas can model hydro units using the following approximate methods:
  - Deterministic load modifiers considering different water conditions (dry, wet, seasonal) with certain probabilities and calculate the weighted average indices
  - Analytical thermal equivalent approach modifying by either the capacity or the forced outage rate

Behind the Meter Generation

Behind the Meter Generation is a generating unit or multiple generating units on the customer's side of the retail meter that serve all or part of the retail load with electric energy[5]. There is a wide array of methodologies on how the BTMGs are incorporated in each Assessment Area.

PAITF recommends the following for Assessment Areas with regards to the BTMG resources*:*

- Each Assessment Area includes in their narrative if BTMGs are modeled and if so how within their respective areas.
- The narrative needs to detail how each Assessment Area treats the BTMGs, either as a resource or a load modifier, etc. and how they insure that the BTMGs are not double counted.
- For the BTMGs modeled as a resource category, they should follow capacity modeling recommendations.

Capacity Transfers: Imports and Exports

Imports and exports across areas of the BPS are generally categorized as two types: "firm" or "non-firm" transactions. Firm transactions are set in advance with firm scheduled transmission from the seller (source) to the purchaser (sink). Non-firm transactions occur from area-to-area as needed to assist to meet load and reliability obligations and are dependent upon the availability of resources and the transmission system after taking scheduled transactions into account.

Modeling approach for both types of imports and exports to capture: a) the variability in availability of the resources and transmission paths associated with the transactions, and b) the priority of firm transactions over non-firm transactions. However, given the complexity of this modeling approach and software limitations, the following is a list of acceptable modeling approaches from the PAITF for Assessment Areas:

- Firm Imports[6]
  - Net capacity transfers based on historical schedules and/or actual flows
  - Net capacity transfers based on contract amount
  - Internal thermal generation with forced outage rates and a commensurate reduction in the interface limits
- Non-Firm Imports
  - No reliance on non-firm support
  - A function of remaining capacity and interface limits. The interface limits should be adjusted to reflect the firm purchases/sales. Resource allocation should attempt to represent established markets and/or reserve sharing groups as much as possible within the model. See Transmission Modeling section recommendations on establishing interfaces and limitations.
- Firm Exports: Similar to either "Firm Imports" net capacity approaches.
- Non-Firm Exports: Similar to "Non-Firm Imports"

Along with adhering to the recommended approaches to modeling imports and exports, PAITF recommends the following requirements with respect to modeling capacity transactions:

[5] 2015 LTRA Data Instructions

[6] All approaches should consider firm transmission service and deliverability limitations

- Assessment Areas should coordinate with neighboring areas to determine the appropriate amount of import/export contractual obligations for probabilistic modeling and shall provide documentation of this coordination effort (including impact of imports/exports on the neighboring area's reliability).
- Assessment Areas should coordinate with neighboring areas to determine reasonable assumptions regarding external resources and load modeling that impact non-firm support.
- Assessment Areas should document their modeling methodology and assumptions.
- Assessment Areas should understand and document modeling similarities and differences from the LTRA in terms of peak MW amounts and seasonal/weekly/or daily variations of modeled flows in the probabilistic model.

Emergency Operating Procedures (EOP)

Emergency operating procedures (EOP) provide a plan for system operators when responding to capacity and energy emergencies on their respective systems. These procedures generally include alerts, warnings, as well as event levels to mitigate capacity and energy deficiencies in real-time.

EOP resources are the last line of defense prior to loss of firm load. Each assessment area decides whether or not to include the use of EOP in the planning criteria that determines the minimum amount of planning reserves for its area. Including or excluding the use of EOP in the Core Probabilistic Assessment should be consistent with the planning criteria for the assessment area.

When modeling EOP, Assessment Areas should consider the variability in the amount of relief obtainable and how it is prioritized with respect to other resources in the model. The key modeling assumptions of any EOP action are the priority level assigned to the resource whether capacity or load modifying, the variability of the amount of load and capacity relief, and the relationship these actions have with respect to neighboring modeled systems, particularly with respect to emergency capacity imports and exports.

The PAITF recommends the following for Assessment Areas with respect to EOP modeling:

- Assessment Areas should provide a narrative describing their methodology in determining the amount of EOP benefits for each EOP step. Specifically addressing at a minimum the following:
  - The amount counted for voltage reduction, and how the amount obtainable is determined.
  - The amount counted for public notice, and how the amount obtainable is determined.
  - Summarize all other EOP types, the amount of relief, and how the amount obtainable is determined.
- EOP should be modeled adhering to the guidelines in previous sections (i.e., Thermal, Imports, DR, etc.)
- EOP should be last available action modeled to serve load, and each step of the EOP should be explicitly modeled.
- Seasonal variability of EOP should be included when appropriate (e.g., DR, Capacity Resources, etc.)

If it is not modeled, PAITF recommends that each Assessment Area supplies thorough documentation explaining why they have decided not to model EOP, and summarize the impact this decision has on the probabilistic assessment results.

Transmission Modeling

Internal and external Transmission modeling and deliverability assumptions are key components in producing probabilistic analysis. Often, transmission is modeled deterministically into the probabilistic model, but it can be

modeled probabilistically. Flexibility should be maintained to allow Assessment Areas to define their modeling and deliverability requirements.

Transmission systems are typically modeled on a nodal (power flow) or zonal (pipe and bubble) basis. The determination on which method used is dependent on model simulation software capabilities and system characteristics. The amount of transmission zones and interface limits are dependent on the Assessment Areas' topology.

With respect to transmission modeling, PAITF recommends for Assessment Areas the following:

- Internal and external modeling constraints need to be addressed.
- Flexibility should be maintained to allow Assessment Areas to define their modeling and deliverability requirements.
- Each Assessment Area i*nclude*s in their narrative how transmission is *modeled within their respective areas*
- Specify how the transmission limits are determined and the approach(s) being used.
- Document transmission additions and retirements for years two and four that are included in the modeling: explain any differences between the modeled transmission additions and retirements, and explain the differences between the transmission addition and retirement data provided for the LTRA.
- Describe the Assessment Areas' transmission modeling approach: how that approach takes into account transmission constraints and outages within and outside of the Assessment Area, and how it developed the data needed for modeling that is consistent with its planning processes. If transmission constraints (e.g., thermal, voltage, stability, or interface limits) are used in the Assessment Areas' process, the methodology should be described. The Assessment Areas should also describe how deliverability of internal and external resources as well as access to external supplemental resources are addressed.

Sensitivity and Scenario Modeling

Sensitivity Modeling: Sensitivity analyses are run to assess the impact of a change in an input (either load, transmission or resource-related) on resource adequacy metrics. The runs are performed by changing one input at-a-time in order to isolate the potential impact of each input. Ideally, the change in each input should be accompanied by an associated probability.

Scenario Modeling: In its most general form, a scenario analysis is performed to assess the impact of changes in multiples inputs (either load, transmission or resource-related) on resource adequacy metrics. The runs are performed by changing multiple inputs at the same time. Ideally, each scenario should have an associated probability calculated based on the changes in inputs included within the scenario. Scenarios are likely to be identified in the LTRA or by sensitivity analysis results. In some cases, scenario analysis may require additional inputs (not included in the Core Probabilistic Assessment) relevant to address a specific reliability concern.

PAITF recommends the following for Assessment Areas:

- The sensitivity modeling should be addressed within the Core Probabilistic Assessment framework. NERC RAS identifies the variable data elements relevant to each sensitivity modeling.
- The scenario modeling should address the reliability issues identified within the LTRA that impact resource adequacy, within the Special-Coordinated Probabilistic Assessment framework. NERC ERO-RAPA and the PC identify reliability risk issues for scenario analysis, and NERC RAS evaluates input parameters relevant to each candidate scenario.

Coordinated NERC Regional Special Assessments

This approach is a coordinated effort between NERC and the Regions to utilize a common assessment method to evaluate and report on various resource adequacy issues. The purpose of this approach is to address potential resource adequacy concerns. The approach will identify uncertainties and trends using a uniform NERC probabilistic analysis. NERC will work closely with the Regions and Assessment Areas to conduct complimentary analyses to assess potential risks to reliability.

Special Assessment Determination

Driving factors are key findings from NERC's LTRA and core probabilistic assessments. If there is no existing study effort or market rules to address the issues, NERC (with inputs from RAS, PC, and ERO-RAPA as well as the Assessment Areas) will develop the risk analysis framework to identify the need to perform this assessment. NERC, the Regions, and representatives from each Assessment Area will work closely together to sufficiently conduct the analysis.

Roles and Responsibilities

A Coordinated NERC-Regional Special Assessment encompasses the deployment of a coordinated effort between NERC and the Regions to evaluate, assess, and report developing reliability concerns on Assessment Area resource adequacy using a common assessment method as shown below:

- **Coordination**: NERC will work closely with the Region(s) and Assessment Areas to develop a complementary study scope. Study results developed throughout the study will be shared with NERC and the Regions.
- **Data Collection**: The Region(s) will be responsible for collecting the required data to run the probabilistic study.
- **Modeling**: NERC has in-house probabilistic modeling capabilities to run a special assessment and responsibilities of running the model will be determined through a scope of work document.
- **Reviewing**: Overall peer review process is determined in the scope of work through NERC RAS. Inputs and feedback from the PC and ERO-RAPA are key elements in the development. Endorsements and approval process are topic dependent.

Modeling Requirements and Scope of Work

The special assessment should follow the general methods and assumptions of this Technical Guideline Document; however, deviations from general methods and assumptions may be required to support the scope of the special assessment work. This special assessment occurs at the request of NERC's PC and ERO-RAPA focusing on specific systems and areas of concern. Detailed milestones are left for NERC and Region(s) to assign.

Appendix A: Definitions

Backup/standby generators: These are customer owned generators that may be used to supply emergency power or other short term power needs. If this generation is obligated to operate at the instruction of a system operator, and will supply BPS demand, it can be included as a capacity resource. If operation is at the discretion of the backup/standby generator owner, this generator must be excluded.

BPS demand: This is the aggregated customer demand that the BPS is responsible for supplying from the BPS facilities.

Capable of supplying: These are resources that are connected to the BPS or are resources that reduce the BPS demand when generating.

Directly or indirectly supplied BPS demand: Direct supply is generation controlled by a BPS operator. Indirect supply is BTM generation that reduces BPS demand.

Direct or indirect instruction: Dispatch instructions provided to the generator operator via phone call or EMS signal (direct) or instructions provided to a third party that contacts the operator (indirect).

Future generating resource: A generator facility, planned or under construction, but not expected to be in commercial service by the end of the current calendar year.

Non-BPS demand: This is demand that is not included in any aggregation of BPS demand. This is customer demand supplied solely by customer owned generation.

NSC—Net seasonal capability: The maximum MW output of the generator given the expected ambient conditions of the season.

Primary energy supply: The energy (coal, wind, sunlight, water in a reservoir, etc.) delivered to the generating resource that is converted to electricity.

Appendix B: Contacts

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John N. Moura	Director, Reliability Assessment and System Analysis
Thomas Coleman	Director, Reliability Assessment
Noha Abdel-Karim	Senior Engineer, Reliability Assessment
David Calderon	Engineer, Reliability Assessment
Elliott Nethercutt	Senior Technical Advisor, Reliability Assessment
Michelle Marx	Executive Assistant, Reliability Assessment and System Analysis

NERC Probabilistic Assessment Improvement Task Force Roster[7]

Name	Region/Organization
Josh Collins (Chairman)	SERC
Layne Brown	WECC
Matthew Elkins	WECC
Vince Ordax	FRCC
Richard Becker	FRCC
Philip A. Fedora	NPCC
Ryan Westphal	MISO
Jordan Cole	MISO
Chris Haley	SPP
Alex Crawford	SPP
Paul Kure	RF
Patricio Garrido	PJM
Lewis De La Rosa	TEXAS-RE
Brad Wood	TEXAS-RE
Kevan Jefferies	Ontario Power Generation
David Jacobson	Manitoba Hydro
Bagen Bagen	Manitoba Hydro
Dange Huang	Manitoba Hydro
Joel Dison	Southern Company
Dale Burmester	American Transmission Company
Russell Schussler	Georgia Transmission Corporation
Anish Gaikwad	Electric Power Research Institute
Mark Walling	GE Energy Management
Chi Hung Kelvin Chu	GE Energy Management
Salva Andiappan (Observer)	MRO
Alan Phung (Observer)	FERC
Richard Sobonya (Observer)	FERC

[7] Probabilistic Assessment Improvement Task Force (PAITF) is a task force from the PC members, members from the RAS and selected observers from the industry. PAITF was formed in May 2015, following the March 2015 release of the 2014 Probabilistic Assessment report with a main mission to identify improvement opportunities by developing an improvement plan and a Probabilistic Technical Guideline Document with recommendations to enhance NERC's future probabilistic assessments.

Appendix C: Full List of Recommendations

- NERC to develop and maintain documentation describing the establishment of Assessment Areas.
- Core ProbA to remain biennial work product.
- It is at the discretion of each Assessment Area to select their solution tool, provided that metrics are calculated through simulation (e.g., Monte Carlo or convolution), while also adhering to all load, generation, and transmission modeling requirements/criteria/guidelines.
- In general resources modeled in Core ProbA to align with the LTRA Data Form Instructions with some exclusions of future generating resources based on confidence factor of resource being built.

Load Modeling

- **Each Assessment Area should incorporate both annual peak uncertainty and seasonal variation** in their load modeling.
- Each Assessment Area should submit a narrative describing their load modeling assumptions.
- Narratives should also include assumptions made on Demand-Side Management (DSM) modeling within the load shapes and forecasts. The DSM section highlights requirements and DSM modeling improvements.
- Load Forecast Uncertainty (LFU) must be incorporated into the ProbA models at a minimum. The industry standard for LFU modeling is to calculate the probability of load exceeding or falling below the forecast. LFU application can be conducted as a multiplier to the load shape(s), captured in multiple weather years modeling, or a combination thereof.
    - This LFU should capture the uncertainty due to weather and economics.
- Weather, economic and forecast trend uncertainty include:
    - Conservation and energy efficiency
    - Historic and future embedded variable generation (wind and solar mainly)
    - Controllable or dispatchable demand response
    - Other load shapes within the Assessment Area (among internal transmission zones)
    - Load shapes of outside areas (external Assessment Areas)
- What is included or excluded from the 50/50 base forecast should be detailed in each Assessment Area's narrative. This narrative should also include the methodology to calculate the 50/50 forecasted load for the study years and how that applies to the load shapes within the model.

Permanent Energy Efficiency Modeling (DSM)

- Assessment Areas should provide a narrative on their methodology to determine the impact of permanent EE on the historical demand series used for the ProbA model.
- Assessment Area's should provide a narrative on their methodology to determine the impact of permanent EE on the load growth rate(s) used in the ProbA model.
- If an Assessment Area utilizes permanent EE within an organized market, the Assessment Area must ensure that its impact is removed from the historical demand series and also ensure that the future impact on load is explicitly modeled as either a load modifier or as a resource with some defined level of uncertainty applied to its load reduction capability.

Controllable Demand Response Modeling (DSM)

- Assessment Area's must provide a narrative on their modeling methodology.
- Assessment Area's must model the limitations associated with controllable DR through one of the following approaches.
- Assessment areas must model the limitations based on program performance and/or contractual obligations as a load modifier or energy limited resource.
- If the probabilistic approach is not available, use a net value of MW reduction impact into the model. Include a detailed narrative of how the net value is calculated

Capacity Ratings

- Thermal generation resources in each Assessment Area should be modeled capturing seasonal capacity ratings. Since the goal of monthly indices such as the LOLH is to identify whether risks are greater in different times of the year, appropriate modeling of seasonal ratings is essential to evaluate risk throughout the calendar year.
- Assessment Area's narratives shall include how seasonal ratings are derived.
- Thermal generation capacity ratings should be consistent with the LTRA data collection process as indicated in recent LTRA report instructions.

Forced Outages

- Incorporating seasonal forced outage factor by either changing forced-outage rates with load or temperature or by derating generation specifically to account for this effect could improve the realism of the ProbA simulations. Model modifications may be needed to accommodate this improvement.
- Unit deratings should be reflected in the FOR, the unit transition states, and/or energy profiles with respect to unit's historical performances and unit's data availability.
- Assessment Area's narratives should include but not be limited to:
    - How forced outage ratings and derates are derived for each unit or by resource fuel type.
    - Ambient and seasonal conditions impacts such as temperature and heat indices.
    - How maintenance and reserve shut down hours are incorporated.
    - What type of FOR is utilized based on units' loading characteristics (e.g., EFOR or EFORd).

Scheduled Outages

- PAITF recommends with respect to modeling scheduled outages that each Assessment Area document its approach, either as a random schedule or a fixed schedule approach.

Variable Energy Resource (VER) Modeling

- VER may be modeled assuming a certain probability distribution. The probability distribution function can be developed with reference to actual historical data. The models should be able to capture the uncertainty distribution of the parameter, expressed either as mean and standard deviation in the case of a normal distribution, a more sophisticated non-normal statistical distribution, or as a distribution of discrete variables such as a number of years of historical resource availability.
- Alternatively, seasonal accredited Capacity Contribution or some time referred to as the Effective Load Carrying Capability (ELCC) for variable resources should be used in the model. At least two values, one for the defined summer period and one for the defined winter period, can be used in the probabilistic assessment.
- Each Assessment Area should document how each of these resources are modeled and what data is used. PAITF recommends that each Assessment Area:
    - Describe how the ELCC or Capacity Contribution calculation is modeled across the year. If available, monthly or seasonal ELCCs, Capacity Contribution Calculations, or per-unit wind and/or solar generation profiles, based on history, for each significantly different wind or solar patterned zone in each Region/Assessment Area should be modeled.
    - Provide the justification and methodology for the determination of the probability distribution function and seasonal accredited values for VER.

Energy-Limited Resource Modeling

- Each Assessment Area should document how each of the energy limited resources are modeled and what data is used:
    - The type of hydro modeling approach currently used.
    - The capacity amount that can be reliably maintained for at least one full hour—designate number of hours if stated capacity amount can be sustained longer than one hour.
    - The annual forced outage rates, based on history, incorporating units impound times.
    - Storage maximum capacity in MWh values incorporating impound and discharging times.
    - The operating procedures for units' charging.

- For probabilistic assessment, water flows developed using historical data. The water flow can be treated as a random variable with a certain distribution and can be treated either as a continuous random variable using probability distribution function (PDF) or as a discrete random variable using probability mass function (PMF). The PDF and the PMF can be developed with reference to the historical water flows.
- Each Assessment Area should document in detail the justifications and methodologies for the development of the PDF/PMF, determination of the probabilities of different water conditions, and the modeling of hydro unit as an equivalent thermal unit
- Once the primary source of energy is modeled, the available capacity and energy can be determined considering the forced unavailability of the generating units and the associated storage capability.
- Alternatively Assessment Areas can model hydro units using the following approximate methods:
    - Deterministic load modifiers considering different water conditions (dry, wet, seasonal) with certain probabilities and calculate the weighted average indices
    - Analytical thermal equivalent approach modifying by either the capacity or the forced outage rate

Behind-the-meter Generation (BTMG)

- Each Assessment Area includes in their narrative if BTMGs are modeled and if so how within their respective areas.
- The narrative needs to detail how each Assessment Area treats the BTMGs, either as a resource or a load modifier, etc. and how they insure that the BTMGs are not double counted.
- For the BTMGs modeled as a resource category, they should follow capacity modeling recommendations.

Emergency Operating Procedures (EOP)

- Assessment Areas should provide a narrative describing their methodology in determining the amount of EOP benefits for each EOP step. Specifically addressing at a minimum the following:
    - The amount counted for voltage reduction, and how the amount obtainable is determined.
    - The amount counted for public notice, and how the amount obtainable is determined.
    - Summarize all other EOP types, the amount of relief, and how the amount obtainable is determined.
- EOP should be modeled adhering to the guidelines in previous sections (i.e., Thermal, Imports, DR, etc.)
- EOP should be last available action modeled to serve load, and each step of the EOP should be explicitly modeled.
- Seasonal variability of EOP should be included when appropriate (e.g., DR, Capacity Resources, etc.)
- If it is not modeled, PAITF recommends that each Assessment Area supplies thorough documentation explaining why they have decided not to model EOP, and summarize the impact this decision has on the probabilistic assessment results.

Transmission Modeling

- Internal and external modeling constraints need to be addressed.
- Flexibility should be maintained to allow Assessment Areas to define their modeling and deliverability requirements.
- Each Assessment Area includes in their narrative how transmission is modeled within their respective areas
- Specify how the transmission limits are determined and the approach(s) being used.
- Document transmission additions and retirements for years two and four that are included in the modeling: explain any differences between the modeled transmission additions and retirements, and explain the differences between the transmission addition and retirement data provided for the LTRA.
- Describe the Assessment Areas' transmission modeling approach: how that approach takes into account transmission constraints and outages within and outside of the Assessment Area, and how it developed the data needed for modeling that is consistent with its planning processes. If transmission constraints (e.g., thermal, voltage, stability, or interface limits) are used in the Assessment Areas' process, the methodology should be described. The Assessment Areas should also describe how deliverability of internal and external resources as well as access to external supplemental resources are addressed.

Sensitivity & Scenario Modeling

- The sensitivity modeling should be addressed within the Core Probabilistic Assessment framework. NERC RAS identifies the variable data elements relevant to each sensitivity modeling.
- The scenario modeling should address the reliability issues identified within the LTRA that impact resource adequacy, within the Special-Coordinated Probabilistic Assessment framework. NERC ERO-RAPA and the PC identify reliability risk issues for scenario analysis, and NERC RAS evaluates input parameters relevant to each candidate scenario.

Exhibit NN

(UPDATED Consumers 10-Q for June 30, 2026)

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UNITED STATES SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-Q

☒ QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the quarterly period ended June 30, 2026

OR

☐ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____to_____

Commission File No.		Registrant; State of Incorporation; Address; and Telephone Number	IRS Employer Identification No.
1-9513		**CMS ENERGY CORPORATION** (A Michigan Corporation) One Energy Plaza, Jackson, Michigan 49201 (517) 788-0550	38-2726431
1-5611		**CONSUMERS ENERGY COMPANY** (A Michigan Corporation) One Energy Plaza, Jackson, Michigan 49201 (517) 788-0550	38-0442310

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
CMS Energy Corporation Common Stock, $0.01 par value	CMS	New York Stock Exchange
CMS Energy Corporation 5.625% Junior Subordinated Notes due 2078	CMSA	New York Stock Exchange
CMS Energy Corporation 5.875% Junior Subordinated Notes due 2078	CMSC	New York Stock Exchange
CMS Energy Corporation 5.875% Junior Subordinated Notes due 2079	CMSD	New York Stock Exchange
CMS Energy Corporation Depositary Shares, each representing a 1/1,000th interest in a share of 4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C	CMS PRC	New York Stock Exchange
Consumers Energy Company Cumulative Preferred Stock, $100 par value: $4.50 Series	CMS-PB	New York Stock Exchange

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

CMS Energy Corporation: Yes ☒ No ☐ **Consumers Energy Company:** Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

CMS Energy Corporation: Yes ☒ No ☐ **Consumers Energy Company:** Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

CMS Energy Corporation:		**Consumers Energy Company:**	
Large accelerated filer	☒	Large accelerated filer	☐
Non-accelerated filer	☐	Non-accelerated filer	☒
Accelerated filer	☐	Accelerated filer	☐
Smaller reporting company	☐	Smaller reporting company	☐
Emerging growth company	☐	Emerging growth company	☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

CMS Energy Corporation: ☐ **Consumers Energy Company:** ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

CMS Energy Corporation: Yes ☐ No ☒ **Consumers Energy Company:** Yes ☐ No ☒

Indicate the number of shares outstanding of each of the issuer's classes of common stock at July 13, 2026:

CMS Energy Corporation:	
CMS Energy Corporation Common Stock, $0.01 par value	313,577,136
Consumers Energy Company:	
Consumers Common Stock, $10 par value, privately held by CMS Energy Corporation	84,108,789

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CMS Energy Corporation
Consumers Energy Company
Quarterly Reports on Form 10-Q to the Securities and Exchange Commission for the Period Ended June 30, 2026

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Glossary

Certain terms used in the text and financial statements are defined below.

2023 Energy Law
Michigan's Public Acts 229, 230, 231, 233, 234, and 235 of 2023

ABATE
Association of Businesses Advocating Tariff Equity

AFUDC
Allowance for borrowed and equity funds used during construction

ARO
Asset retirement obligation

ASP
Appliance Service Plan

Aviator Wind
Aviator Wind Holdings, LLC, a VIE in which Aviator Wind Equity Holdings holds a Class B membership interest

Aviator Wind Equity Holdings
Aviator Wind Equity Holdings, LLC, a VIE in which Grand River Wind, LLC, a wholly owned subsidiary of NorthStar Clean Energy, has a 51-percent interest

Bay Harbor
A residential/commercial real estate area located near Petoskey, Michigan, in which CMS Energy sold its interest in 2002

Bcf
Billion cubic feet

BG Solar Holdings
BG Solar Holdings, LLC, a VIE in which BG Solar Holdings I, LLC, a wholly owned subsidiary of Grand River Solar, LLC, a wholly owned subsidiary of NorthStar Clean Energy, holds a Class B membership interest

CCR
Coal combustion residual

CEO
Chief Executive Officer

CERCLA
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended

CFO
Chief Financial Officer

Clean Air Act
Federal Clean Air Act of 1963, as amended

Clean Water Act
Federal Water Pollution Control Act of 1972, as amended

CMS Energy
CMS Energy Corporation and its consolidated subsidiaries, unless otherwise noted; the parent of Consumers and NorthStar Clean Energy

CMS Land
CMS Land Company, a wholly owned subsidiary of CMS Capital, L.L.C., a wholly owned subsidiary of CMS Energy

Consumers
Consumers Energy Company and its consolidated subsidiaries, unless otherwise noted; a wholly owned subsidiary of CMS Energy

Covert Generating Station
A 1,200-MW natural gas-fueled generation station that was acquired by Consumers in 2023 from New Covert Generating Company, LLC, a non-affiliated company

Craven
Craven County Wood Energy Limited Partnership, a VIE in which HYDRA-CO Enterprises, Inc., a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

CSAPR
Cross-State Air Pollution Rule of 2011, as amended

DB Pension Plans
Defined benefit pension plans of CMS Energy and Consumers, including certain present and former affiliates and subsidiaries

DB SERP

Defined Benefit Supplemental Executive Retirement Plan

Delta Solar Equity Holdings

Delta Solar Equity Holdings, LLC, a VIE in which Grand River Solar, LLC, a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

Dodd-Frank Act

Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010

DOE

U.S. Department of Energy

DTE Electric

DTE Electric Company, a non-affiliated company

EGLE

Michigan Department of Environment, Great Lakes, and Energy

Electric Supply Plan

Consumers' long-term strategy for delivering safe, reliable, affordable, clean, and equitable energy to its customers; this plan is outlined in Consumers' IRP and incorporates the REP

Endangered Species Act

Federal Endangered Species Act of 1973, as amended

Energy waste reduction

The reduction of energy consumption through energy efficiency and demand-side energy conservation, as established under Michigan law

EPA

U.S. Environmental Protection Agency

EPS

Earnings per share

ERP

Enterprise Resource Planning software

Exchange Act

Securities Exchange Act of 1934

Federal Power Act

Federal Power Act of 1920

FERC

Federal Energy Regulatory Commission

FTR

Financial transmission right

GAAP

U.S. Generally Accepted Accounting Principles

GCR

Gas cost recovery

Genesee

Genesee Power Station Limited Partnership, a VIE in which HYDRA-CO Enterprises, Inc., a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

Grayling

Grayling Generating Station Limited Partnership, a VIE in which HYDRA-CO Enterprises, Inc., a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

GW

Gigawatt, a unit of energy equal to 1 billion watts

HL Solar Holdings

HL Solar Holdings, LLC, a VIE in which HL Solar Holdings I, LLC, a wholly owned subsidiary of Grand River Solar, LLC, a wholly owned subsidiary of NorthStar Clean Energy, holds a Class B membership interest

IRP

Integrated Resource Plan

IRS

Internal Revenue Service

IT

Information technology

J.H. Campbell

J.H. Campbell Generating Complex, a three-unit coal-fueled electric generating facility comprised of Units 1 and 2, which are wholly owned by Consumers, and Unit 3, which Consumers jointly owns with the Michigan Public Power Agency, holding a 4.80-percent interest, and Wolverine Power, holding a 1.89-percent interest, each a non-affiliated entity

kWh

Kilowatt-hour, a unit of energy equal to 1,000 watt-hours

Ludington

Ludington pumped-storage plant, jointly owned by Consumers and DTE Electric

MATS

Mercury and Air Toxics Standards, which limit mercury, acid gases, and other toxic pollution from coal-fueled and oil-fueled power plants

MCV Facility

A 1,647-MW natural gas-fueled, combined-cycle cogeneration facility operated by the MCV Partnership

MCV Partnership

Midland Cogeneration Venture Limited Partnership, a non-affiliated company

METC

Michigan Electric Transmission Company, LLC, a non-affiliated company

MGP

Manufactured gas plant

Migratory Bird Treaty Act

Migratory Bird Treaty Act of 1918, as amended

MISO

Midcontinent Independent System Operator, Inc.

MISO Tariff

MISO Open Access Transmission, Energy, and Operating Reserve Markets Tariff

Mothball

To place a generating unit into a state of extended reserve shutdown in which the unit is inactive and unavailable for service for a specified period, during which the unit can be brought back into service after receiving appropriate notification and completing any necessary maintenance or other work; generation owners in MISO must request approval to mothball a unit, and MISO then evaluates the request for reliability impacts

MPSC

Michigan Public Service Commission

MW

Megawatt, a unit of power equal to 1 million watts

NAAQS

National Ambient Air Quality Standards

Natural Gas Act

Natural Gas Act of 1938

Newport Solar Holdings

Newport Solar Holdings III, LLC, a VIE in which Newport Solar Equity Holdings LLC, a wholly owned subsidiary of Grand River Solar, LLC, a wholly owned subsidiary of NorthStar Clean Energy, holds a Class B membership interest

NorthStar Clean Energy

NorthStar Clean Energy Company and its consolidated subsidiaries, unless otherwise noted; a wholly owned subsidiary of CMS Energy

NOx

Nitrogen oxides

NPDES

National Pollutant Discharge Elimination System, a permit system for regulating point sources of pollution under the Clean Water Act

NREPA

Part 201 of Michigan's Natural Resources and Environmental Protection Act of 1994, as amended

NWO Holdco

NWO Holdco, L.L.C., a VIE in which NWO Holdco I, LLC, a wholly owned subsidiary of NWO Wind Equity Holdings, LLC, holds a Class B membership interest

NWO Wind Equity Holdings

NWO Wind Equity Holdings, LLC, a VIE in which Grand River Wind, LLC, a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

OPEB

Other post-employment benefits

OPEB Plan

Postretirement health care and life insurance plans of CMS Energy and Consumers, including certain present and former affiliates and subsidiaries

PCB

Polychlorinated biphenyl

PPA

Power purchase agreement

PSCR

Power supply cost recovery

RCRA

Federal Resource Conservation and Recovery Act of 1976

Reliability Roadmap

Consumers' five-year strategy to improve its electric distribution system and the reliability of the grid; this plan was filed with the MPSC in 2023, and is an update to Consumers' previous Electric Distribution Infrastructure Investment Plan filed in 2021

REP

Renewable Energy Plan

ROA

Retail Open Access, which allows electric generation customers to choose alternative electric suppliers pursuant to Michigan's Public Acts 141 and 142 of 2000, as amended

SEC

U.S. Securities and Exchange Commission

Securitization

A financing method authorized by statute and approved by the MPSC which allows a utility to sell its right to receive a portion of the rate payments received from its customers for the repayment of securitization bonds issued by a special-purpose entity affiliated with such utility

SOFR

Secured overnight financing rate calculated and published by the Federal Reserve Bank of New York

TAES

Toshiba America Energy Systems Corporation, a non-affiliated company

TBJH

TBJH Inc., a non-affiliated company

TCJA

Tax Cuts and Jobs Act of 2017

Term SOFR

The rate per annum that is a forward-looking term rate based on SOFR

T.E.S. Filer City

T.E.S. Filer City Station Limited Partnership, a VIE in which HYDRA-CO Enterprises, Inc., a wholly owned subsidiary of NorthStar Clean Energy, has a 50-percent interest

Toshiba

Toshiba Corporation, a non-affiliated company

Toshiba International

Toshiba International Corporation, a non-affiliated company

VIE

Variable interest entity

Filing Format

This combined Form 10-Q is separately filed by CMS Energy and Consumers. Information in this combined Form 10-Q relating to each individual registrant is filed by such registrant on its own behalf. Consumers makes no representation regarding information relating to any other companies affiliated with CMS Energy other than its own subsidiaries.

CMS Energy is the parent holding company of several subsidiaries, including Consumers and NorthStar Clean Energy. None of CMS Energy, NorthStar Clean Energy, nor any of CMS Energy's other subsidiaries (other than Consumers) has any obligation in respect of Consumers' debt securities or preferred stock and holders of such securities should not consider the financial resources or results of operations of CMS Energy, NorthStar Clean Energy, nor any of CMS Energy's other subsidiaries (other than Consumers and its own subsidiaries (in relevant circumstances)) in making a decision with respect to Consumers' debt securities or preferred stock. Similarly, neither Consumers nor any other subsidiary of CMS Energy has any obligation in respect of securities of CMS Energy.

This report should be read in its entirety. No one section of this report deals with all aspects of the subject matter of this report. This report should be read in conjunction with the consolidated financial statements and related notes and with the Management's Discussion and Analysis of Financial Condition and Results of Operations included in the 2025 Form 10-K.

Available Information

CMS Energy's internet address is www.cmsenergy.com. CMS Energy routinely posts important information on its website and considers the Investor Relations section, www.cmsenergy.com/investor-relations, a channel of distribution for material information. Information contained on CMS Energy's website is not incorporated herein.

Forward-looking Statements and Information

This Form 10-Q and other CMS Energy and Consumers disclosures may contain forward-looking statements as defined by the Private Securities Litigation Reform Act of 1995. The use of "anticipates," "assumes," "believes," "could," "estimates," "expects," "forecasts," "goals," "guidance," "intends," "may," "might," "objectives," "plans," "possible," "potential," "predicts," "projects," "seeks," "should," "targets," "will," and other similar words is intended to identify forward-looking statements that involve risk and uncertainty. This discussion of potential risks and uncertainties is designed to highlight important factors that may impact CMS Energy's and Consumers' businesses and financial outlook. CMS Energy and Consumers have no obligation to update or revise forward-looking statements regardless of whether new information, future events, or any other factors affect the information contained in the statements. These forward-looking statements are subject to various factors that could cause CMS Energy's and Consumers' actual results to differ materially from the results anticipated in these statements. These factors include, but are not limited to, the following, all of which are potentially significant:

- the impact and effect of recent events, such as worsening trade relations, geopolitical tensions, war, acts of terrorism, and the responses to these events, and related economic disruptions including, but not limited to, inflation, energy price volatility, tariffs, and supply chain disruptions
- the impact of new or modified regulation by the MPSC, FERC, and other applicable governmental proceedings and regulations, including any associated impact on electric or gas rates or rate structures

- potentially adverse regulatory treatment, effects of a failure to receive timely regulatory orders that are or could come before the MPSC, FERC, or other governmental authorities, or effects of a government shutdown
- changes in the performance of or regulations applicable to MISO, METC, pipelines, railroads, vessels, or other service providers that CMS Energy, Consumers, or any of their affiliates rely on to serve their customers
- federal or executive actions, the adoption of or challenges to federal or state laws or regulations or changes in applicable laws, rules, regulations, principles, or practices, or in their interpretation, such as those related to energy policy, ROA, the Public Utility Regulatory Policies Act of 1978, infrastructure integrity or security, cybersecurity, gas pipeline safety, gas pipeline capacity, energy waste reduction, the financial compensation mechanism, the environment, regulation or deregulation, reliability, health care reforms, taxes, tax credits, accounting matters, tariffs, climate change, air emissions, renewable energy, the Dodd-Frank Act, and other business issues that could have an impact on CMS Energy's, Consumers', or any of their affiliates' businesses or financial results
- factors affecting, disrupting, interrupting, or otherwise impacting CMS Energy's or Consumers' facilities, utility infrastructure, operations, or backup systems, such as costs and availability of personnel, equipment, and materials; weather and climate, including catastrophic weather-related damage and extreme temperatures; natural disasters; fires; smoke; scheduled or unscheduled equipment outages; maintenance or repairs; contractor performance; environmental incidents; failures of equipment or materials; electric transmission and distribution or gas pipeline system constraints; interconnection requirements; political and social unrest; general strikes; the government and/or paramilitary response to political or social events; changes in trade policies, regulations, or tariffs; accidents; explosions; physical disasters; global pandemics; cyber incidents; physical or cyber attacks; vandalism; war or terrorism; and the ability to obtain or maintain insurance coverage for these events
- the ability of CMS Energy and Consumers to execute cost-reduction strategies and/or convert economic development opportunities
- potentially adverse regulatory or legal interpretations or decisions regarding environmental matters, or delayed regulatory treatment or permitting decisions that are or could come before agencies such as EGLE, the EPA, FERC, and/or the U.S. Army Corps of Engineers, and potential environmental remediation costs associated with these interpretations or decisions, including those that may affect Consumers' coal ash management or routine maintenance, repair, and replacement classification under New Source Review, a construction-permitting program under the Clean Air Act
- changes in energy markets, including availability, price, and seasonality of electric capacity and energy and the timing and extent of changes in commodity prices and availability and deliverability of coal, natural gas, natural gas liquids, electricity, oil, gasoline, diesel fuel, and certain related products
- the price of CMS Energy common stock, the credit ratings of CMS Energy and Consumers, capital and financial market conditions, and the effect of these market conditions on CMS Energy's and Consumers' interest costs and access to the capital markets, including availability of financing to CMS Energy, Consumers, or any of their affiliates

- the ability of CMS Energy and Consumers to execute their financing strategies
- the investment performance of the assets of CMS Energy's and Consumers' pension and benefit plans, the discount rates, mortality assumptions, and future medical costs used in calculating the plans' obligations, and the resulting impact on future funding requirements
- the impact of the economy, particularly in Michigan, and potential future volatility in the financial and credit markets on CMS Energy's, Consumers', or any of their affiliates' revenues, ability to collect accounts receivable from customers, or cost and availability of capital
- changes in the economic and financial viability of CMS Energy's and Consumers' suppliers, customers, and other counterparties and the continued ability of these third parties, including those in bankruptcy, to meet their obligations to CMS Energy and Consumers
- population changes in the geographic areas where CMS Energy and Consumers conduct business
- national, regional, and local economic, political, competitive, and regulatory policies, conditions, and developments
- loss of customer demand for electric generation supply to alternative electric suppliers, the creation of municipal utilities, increased use of self-generation including distributed generation, energy waste reduction, or energy storage
- loss of customer demand for natural gas due to alternative technologies or fuels or electrification
- the ability of Consumers to meet increased renewable energy demand due to customers seeking to meet their own sustainability goals in a timely and cost-efficient manner
- the reputational or other impact on CMS Energy and Consumers of the failure to meet the renewable or clean energy standards required by the 2023 Energy Law or to achieve or make timely progress on their greenhouse gas reduction goals related to reducing their impact on climate change
- adverse consequences of employee, director, or third-party fraud or non-compliance with codes of conduct or with laws or regulations
- federal regulation of electric sales, including periodic re-examination by federal regulators of CMS Energy's and Consumers' market-based sales authorizations
- any event, change, development, occurrence, or circumstance that could impact the implementation of the Electric Supply Plan, including any action by a regulatory authority or other third party to prohibit, delay, or impair the implementation of the Electric Supply Plan
- the ability to meet increases in electric demand associated with data centers, or alternatively, the risk that anticipated demand growth from data center expansion may not materialize as expected
- changes associated with artificial intelligence technologies and related sectors, including the risk that a significant decline in investor confidence could lead to broader economic disruption, reductions in customer demand, tightening of capital markets, higher financing costs, or other downstream impacts
- the availability, cost, coverage, and terms of insurance, the stability of insurance providers, and the ability of Consumers to recover the costs of any insurance from customers

- the effectiveness of CMS Energy's and Consumers' risk management policies, procedures, and strategies, including strategies to hedge risk related to interest rates and future prices of electricity, natural gas, basis risk, and other energy-related commodities
- factors affecting development of electric generation projects, gas transmission, and gas and electric distribution infrastructure replacement, conversion, and expansion projects, including factors related to project site identification, construction material availability, quality, and pricing, tariffs, embargoes on equipment, supply chain disruptions, schedule delays, interconnection delays, availability of qualified construction personnel, zoning, siting, permitting, acquisition of property rights, community opposition, environmental regulations, performance of contractors and counterparties, and government actions
- changes or disruption in fuel supply, including but not limited to supplier bankruptcy and delivery disruptions
- potential costs, lost revenues, reputational harm, or other consequences resulting from misappropriation of assets or sensitive information, corruption of data, or operational disruption in connection with a cyberattack or other cyber incident
- potential disruption to, interruption or failure of, or other impacts on IT backup or disaster recovery systems
- technological developments in energy production, storage, delivery, usage, and metering
- the ability to implement and integrate technology successfully, including artificial intelligence
- the impact of CMS Energy's and Consumers' integrated business software system and its effects on their operations, including utility customer billing and collections
- adverse consequences resulting from any past, present, or future assertion of indemnity or warranty claims associated with assets and businesses previously owned by CMS Energy or Consumers, including claims resulting from attempts by foreign or domestic governments to assess taxes on or to impose environmental liability associated with past operations or transactions
- the outcome, cost, and other effects of any legal or administrative claims, proceedings, investigations, or settlements
- the reputational impact on CMS Energy and Consumers of operational incidents, violations of corporate policies, regulatory violations, inappropriate use of social media, and other events
- restrictions imposed by various financing arrangements and regulatory requirements on the ability of Consumers and other subsidiaries of CMS Energy to transfer funds to CMS Energy in the form of cash dividends, loans, or advances
- earnings volatility resulting from the application of fair value accounting to certain energy commodity contracts or interest rate contracts
- changes in financial or regulatory accounting principles or policies or interpretation of principles or policies
- other matters that may be disclosed from time to time in CMS Energy's and Consumers' SEC filings, or in other public documents

All forward-looking statements should be considered in the context of the risk and other factors described above and as detailed from time to time in CMS Energy's and Consumers' SEC filings. For additional details regarding these and other uncertainties, see Part I—Item 1. Financial Statements and Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters and Note 3, Contingencies and Commitments; and Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations.

Part I—Financial Information

Item 1. Financial Statements

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CMS Energy Corporation
Consumers Energy Company
Management's Discussion and Analysis of Financial Condition and Results of Operations

This Management's Discussion and Analysis of Financial Condition and Results of Operations constitutes Part I—Item 2 of this Form 10-Q and is not part of the financial statements included in Item 1, for both CMS Energy and Consumers.

Executive Overview

CMS Energy is an energy company operating primarily in Michigan. It is the parent holding company of several subsidiaries, including Consumers, an electric and gas utility, and NorthStar Clean Energy, primarily a domestic independent power producer and marketer. Consumers' electric utility operations include the generation, purchase, distribution, and sale of electricity, and Consumers' gas utility operations include the purchase, transmission, storage, distribution, and sale of natural gas. Consumers' customer base consists of a mix of primarily residential, commercial, and diversified industrial customers. NorthStar Clean Energy, through its subsidiaries and equity investments, is engaged in domestic independent power production and the marketing of independent power production.

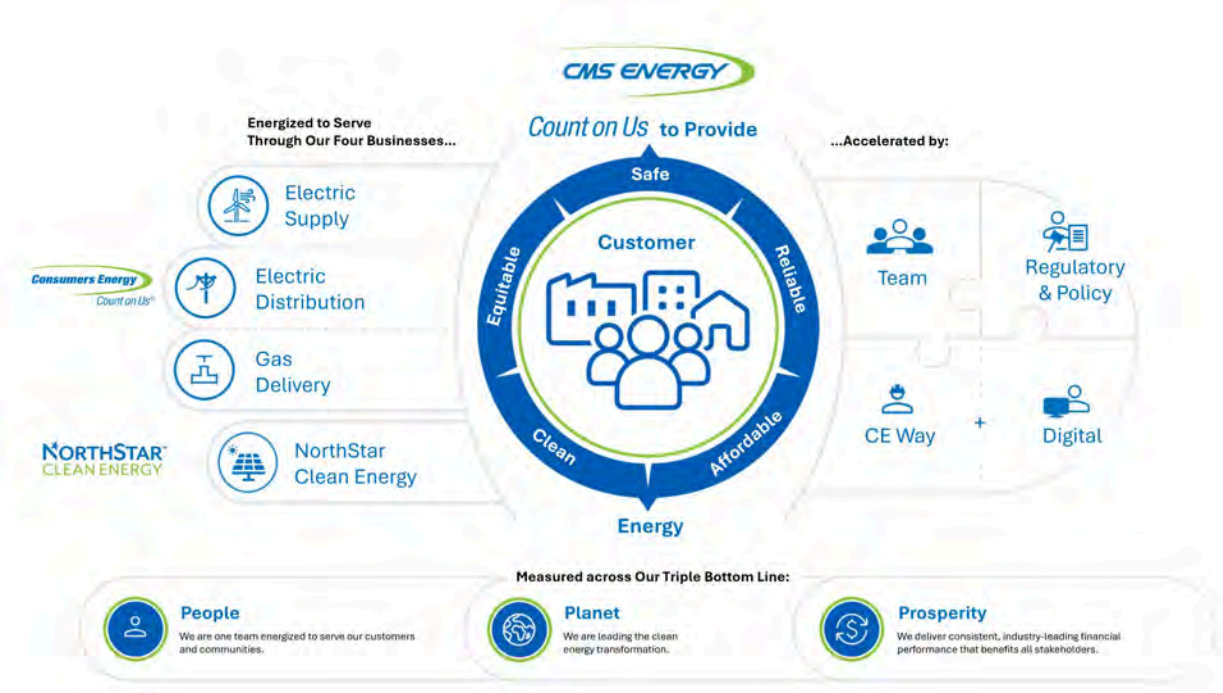
CMS Energy and Consumers manage their businesses by the nature of services each provides. CMS Energy operates principally in three business segments: electric utility; gas utility; and NorthStar Clean Energy, its non-utility operations and investments. Consumers operates principally in two business segments: electric utility and gas utility. CMS Energy's and Consumers' businesses are affected primarily by:

- regulation and regulatory matters
- state and federal legislation
- economic conditions
- load growth
- weather
- energy commodity prices
- interest rates
- their securities' credit ratings

The Triple Bottom Line

CMS Energy's and Consumers' purpose is to provide safe, reliable, affordable, clean, and equitable energy in service of their customers. In support of this purpose, CMS Energy and Consumers couple digital transformation with the "CE Way," a lean operating system designed to improve safety, quality, cost, delivery, and employee morale.

CMS Energy and Consumers measure their progress toward the purpose by considering their impact on the "triple bottom line" of people, planet, and prosperity; this consideration takes into account not only the economic value that CMS Energy and Consumers create for customers and investors, but also their responsibility to social and environmental goals. The triple bottom line balances the interests of employees, customers, suppliers, regulators, creditors, Michigan's residents, the investment community, and other stakeholders, and it reflects the broader societal impacts of CMS Energy's and Consumers' activities.



CMS Energy's Sustainability Report, which is available to the public, describes CMS Energy's and Consumers' progress toward world class performance measured in the areas of people, planet, and prosperity.

People: The people element of the triple bottom line represents CMS Energy's and Consumers' commitment to their employees, their customers, the residents of local communities in which they do business, and other stakeholders.

The safety of co-workers, customers, and the general public is a priority of CMS Energy and Consumers. Accordingly, CMS Energy and Consumers have worked to integrate a set of safety principles into their business operations and culture. These principles include complying with applicable safety, health, and security regulations and implementing programs and processes aimed at continually improving safety and security conditions.

CMS Energy and Consumers also place a high priority on customer value and on providing reliable, affordable, and equitable energy in service of their customers. Consumers' customer-driven investment program is aimed at improving safety and increasing electric and gas reliability.

In the electric rate case it filed with the MPSC in June 2025, Consumers updated its Reliability Roadmap, a five-year strategy to improve Consumers' electric distribution system and the reliability of the grid. The plan proposes spending through 2029 for projects designed to reduce the number and duration of power outages to customers through investment in infrastructure upgrades, vegetation management, and grid

modernization. Consumers has requested rate recovery of the investments needed to achieve the Reliability Roadmap's key objectives in its electric rate cases.

Central to Consumers' commitment to its customers are the initiatives it has undertaken to keep electricity and natural gas affordable, including:

- natural gas purchasing strategy
- replacement of coal-fueled generation and PPAs with a cost-efficient and reliable mix of renewable energy, less-costly dispatchable generation sources, and energy waste reduction and demand response programs
- targeted infrastructure investment to reduce maintenance costs and improve reliability and safety
- supply chain optimization
- economic development to increase sales and reduce overall rates
- information and control system efficiencies
- employee and retiree health care cost sharing
- tax planning
- cost-effective financing
- workforce productivity enhancements

While inflationary pressures and tariffs could impact supply chain availability and pricing, CMS Energy and Consumers are taking steps to help mitigate the impact on their ability to provide safe, reliable, affordable, clean, and equitable energy in service of their customers.

Planet: The planet element of the triple bottom line represents CMS Energy's and Consumers' commitment to protect the environment. This commitment extends beyond compliance with various state and federal environmental, health, and safety laws and regulations. Management considers extreme weather and other environmental risks in strategy development, business planning, and enterprise risk management processes.

CMS Energy and Consumers continue to focus on opportunities to protect the environment and reduce their carbon footprint from owned generation. CMS Energy, including Consumers, has decreased its combined percentage of electric supply (self-generated and purchased) from coal by 24 percentage points since 2015. Additionally, as a result of actions already taken through 2025, Consumers has:

- reduced carbon dioxide emissions from owned generation by nearly 30 percent since 2005
- reduced methane emissions by nearly 40 percent since 2012
- reduced the volume of water used to generate electricity by nearly 60 percent since 2012
- reduced landfill waste disposal by more than 2 million tons since 1992
- enhanced, restored, or protected more than 13,500 acres of land since 2017
- reduced sulfur dioxide and particulate matter emissions by more than 90 percent since 2005
- reduced NOx emissions by more than 85 percent since 2005
- reduced mercury emissions by more than 90 percent since 2007

In 2023, Michigan enacted the 2023 Energy Law, which among other things:

- increased the renewable energy standard from 15 percent to 50 percent by 2030 and 60 percent by 2035; renewable energy generated anywhere within MISO can be applied to meeting this standard, with certain limitations
- established a clean energy standard of 80 percent by 2035 and 100 percent by 2040; low- or zero-carbon emitting resources, such as nuclear generation and natural gas generation coupled with carbon capture, qualify as clean energy sources under this standard

- enhanced existing incentives for energy efficiency programs and returns earned on new clean or renewable PPAs
- created a new energy storage standard, requiring electric utilities to file plans by 2029 to help achieve a statewide target of 2,500 MW
- expanded the statutory cap on distributed generation resources to 10 percent of the electric utility's five-year average peak load

Consumers' Electric Supply Plan, its long-term strategy for delivering safe, reliable, affordable, clean, and equitable energy to its customers, is outlined in its IRP and incorporates Consumers' REP. The Electric Supply Plan is Consumers' blueprint for compliance with Michigan's 2023 Energy Law and for advancing sustainability objectives.

To meet these objectives, Consumers is executing a multi-faceted strategy. This strategy involves taking steps to end the use of coal, including the retirement of the D.E. Karn coal-fueled generating units, totaling 515 MW of nameplate capacity, in 2023 and obtaining MPSC approval to retire J.H. Campbell, totaling 1,407 MW of nameplate capacity. The retirement of J.H. Campbell is subject to temporary extensions under emergency orders issued by the U.S. Secretary of Energy. For a more detailed discussion of the emergency orders, see Consumers Electric Utility Outlook and Uncertainties—J.H. Campbell Emergency Orders and Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters.

To continue providing controllable sources of electricity to customers, Consumers purchased the Covert Generating Station, representing 1,200 MW of nameplate capacity, in 2023 and has solicited additional capacity from controllable sources of electricity to customers. In March 2026, Consumers announced the next IRP filing planned for September 2026 would include an all-of-the-above approach to electric supply, with over 13 GW in expanded renewables and clean energy resources including solar, battery storage, and wind, supported by two new natural gas-fueled electric generating plants totaling approximately 1,500 MW of capacity. These new units, which would be developed on existing sites in Bay and Genesee Counties, Michigan, would enhance reliability and maintain affordability.

Consumers' updates to its REP include up to 9,000 MW of both purchased and owned solar energy resources and up to 4,000 MW of wind energy resources. Coupled with updates to its IRP, these actions position Consumers to achieve 60-percent renewable energy by 2035 and 100-percent clean energy by 2040, and will also contribute to Consumers' achievement of the emissions reductions goals discussed below.

Under its Methane Reduction Plan, Consumers has set a goal of net-zero methane emissions from its natural gas delivery system by 2030. Consumers plans to reduce methane emissions from its system by about 80 percent from 2012 baseline levels by accelerating the replacement of aging pipe, rehabilitating or retiring outdated infrastructure, and adopting new technologies and practices. The remaining emissions will likely be offset through clean fuel alternatives or nature-based carbon removal pathways. To date, Consumers has reduced methane emissions by nearly 40 percent.

Additionally, to advance its environmental stewardship in Michigan and to minimize the impact of future regulations, Consumers set the following goals for the five-year period 2023 through 2027:

- to enhance, restore, or protect 6,500 acres of land through 2027; Consumers surpassed this goal during the three-year period 2023 through 2025 and enhanced, restored, or protected 6,700 acres of land
- to reduce water usage by 1.7 billion gallons through 2027; Consumers surpassed this goal during the three-year period 2023 through 2025 by reducing water usage by more than 1.9 billion gallons

- to annually divert a minimum of 90 percent of waste from landfills (through waste reduction, recycling, and reuse); during 2025, Consumers' rate of waste diverted from landfills was 93 percent

CMS Energy and Consumers are monitoring numerous legislative, policy, executive, and regulatory initiatives, including those related to regulation and reporting of greenhouse gases, and related litigation. While CMS Energy and Consumers cannot predict the outcome of these matters, which could affect them materially, they intend to continue to move forward with a triple-bottom-line approach that focuses on people, planet, and prosperity.

Prosperity: The prosperity element of the triple bottom line represents CMS Energy's and Consumers' commitment to meeting their financial objectives and providing economic development opportunities and benefits in the communities in which they do business. CMS Energy's and Consumers' financial strength allows them to maintain solid investment-grade credit ratings and thereby reduce funding costs for the benefit of customers and investors, to attract and retain talent, and to reinvest in the communities they serve.

For the six months ended June 30, 2026, CMS Energy's net income available to common stockholders was $455 million and diluted EPS were $1.47. This compares with net income available to common stockholders of $500 million and diluted EPS of $1.67 for the six months ended June 30, 2025. During the six months ended June 30, 2026, electric and gas rate increases and higher earnings at NorthStar Clean Energy were offset by the absence of gains on extinguishment of debt, higher service restoration costs, and increased depreciation and property taxes, reflecting higher capital spending. A more detailed discussion of the factors affecting CMS Energy's and Consumers' performance can be found in the Results of Operations section that follows this Executive Overview.

Over the next five years, Consumers expects weather-normalized electric deliveries to increase compared to 2025. This outlook reflects strong growth in electric demand, offset partially by the effects of energy waste reduction programs. Weather-normalized gas deliveries are expected to remain stable relative to 2025, reflecting modest growth in gas demand, offset by the effects of energy waste reduction programs.

Performance: Impacting the Triple Bottom Line

CMS Energy and Consumers remain committed to delivering safe, reliable, affordable, clean, and equitable energy in service of their customers and positively impacting the triple bottom line of people, planet, and prosperity. During 2025 and the first half of 2026, CMS Energy and Consumers:

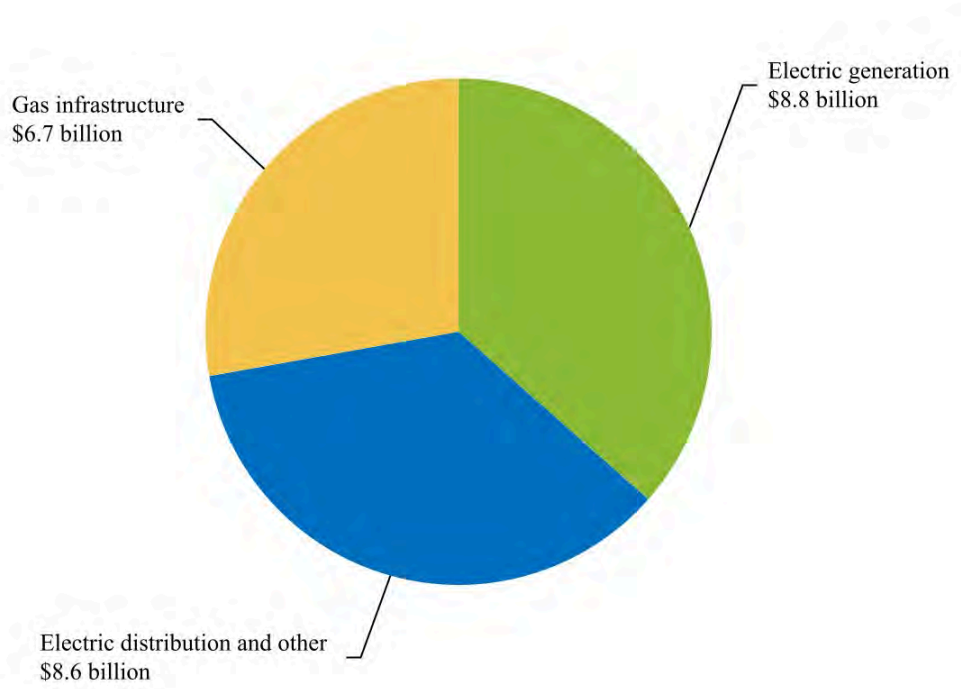
- advanced land stewardship efforts by exceeding a 6,500-acre restoration goal ahead of schedule, restoring 6,700 acres and expanding public access to more than 100 acres of utility-owned land across over 80 Michigan communities
- connected over 140,000 customers with $60 million in energy-bill assistance and helped make over $100 million in statewide aid available for 2026, reinforcing Consumers' commitment to affordability
- began operations at Muskegon Solar Energy Center, a 1,900-acre project generating 250 MW of clean energy to power 40,000 homes and businesses, supporting Michigan's energy needs and advancing the company's long-term clean energy strategy
- reached an agreement under Consumers' large-load tariff with a new data center expected to add more than 1 GW of incremental load growth in our service territory, supporting long-term sales growth and delivering economic benefits for Michigan
- expanded the use of drone technology enabling faster, safer inspections of 400 miles of hard-to-reach power lines and infrastructure resulting in reduced average outage time per customer and improved storm recovery capabilities

- announced the launch of "Green Giving," a program enabling the general public to contribute to renewable energy while offering financial benefits to low-income customers, along with a new Residential Renewable Energy Program, which allows customers of all income levels to subscribe and match their energy usage with renewable energy sources, supporting clean energy initiatives
- moved forward with an aggressive plan to enhance grid reliability for nearly 2 million homes and businesses by clearing trees along 8,000 miles of power lines and creating a modern, stronger, and more resilient power grid through infrastructure upgrades and technology investments
- deployed eight state-of-the-art vehicles that survey the company's nearly 30,000-mile gas distribution system to find methane emissions, enhancing safety and reliability for Consumers' natural gas customers
- experienced success with the underground power line pilot program in early 2025, with pilot areas seeing 100-percent reduction in storm-related outages and improved customer satisfaction

CMS Energy and Consumers will continue to utilize the CE Way to enable them to achieve world class performance and positively impact the triple bottom line. Consumers' investment plan and the regulatory environment in which it operates also drive its ability to impact the triple bottom line.

Investment Plan: Over the next five years, Consumers expects to make significant expenditures on infrastructure upgrades, replacements, and clean generation. While it has a large number of potential investment opportunities that would add customer value, Consumers has prioritized its spending based on the criteria of enhancing public safety, increasing reliability, maintaining affordability for its customers, and advancing its environmental stewardship. Consumers' investment program, which is subject to approval through general rate case and other MPSC proceedings, is expected to result in annual rate-base growth of more than 10 percent. This rate-base growth, together with cost-control measures, should allow Consumers to maintain affordable customer prices.

Presented in the following illustration are Consumers' planned capital expenditures through 2030 of $24.1 billion:



Of this amount, Consumers plans to spend $8.8 billion on electric generation, which includes solar, wind, and natural gas-fueled generation, as well as energy storage. Consumers also expects to spend $15.3 billion over the next five years primarily to maintain and upgrade its electric distribution systems and gas infrastructure in order to enhance safety and reliability, improve customer satisfaction, reduce energy waste on those systems, and facilitate its clean energy transformation. Electric distribution and other projects comprise $8.6 billion primarily to strengthen circuits and substations, replace poles, and interconnect clean energy resources. The gas infrastructure projects comprise $6.7 billion to sustain deliverability, enhance pipeline integrity and safety, and reduce methane emissions.

Regulation: Regulatory matters are a key aspect of Consumers' business, particularly rate cases and regulatory proceedings before the MPSC, which permit recovery of new investments while helping to ensure that customer rates are fair and affordable. Important regulatory events and developments not already discussed are summarized below.

2026 Electric Rate Case: In June 2026, Consumers filed an application with the MPSC seeking a rate increase of $481 million made up of two components. First, Consumers requested a $456 million annual rate increase, based on a 10.25-percent return on equity for the projected 12-month period ending April 30, 2028. The filing requested authority to recover costs related to new infrastructure investment primarily in distribution system reliability. Second, Consumers requested approval of a $25 million surcharge for the recovery of distribution investments made during the 12 months ended February 28, 2026 that exceeded the rate amounts authorized in accordance with previous electric rate orders. The MPSC must issue a final order in this case before or in April 2027.

2025 Electric Rate Case: In March 2026, the MPSC issued an order stating an annual rate increase of $277 million, based on a 9.90-percent authorized return on equity. The MPSC also approved deferred accounting treatment for $22 million of incremental costs associated with accelerated low-voltage

distribution vegetation management and $15 million of ERP implementation costs. Additionally, the MPSC approved a $24 million surcharge for the recovery of distribution investments made during the 12 months ended February 28, 2025 that exceeded the rate amounts authorized in accordance with previous electric rate orders. The new rates became effective in May 2026.

Subsequent to issuance of the final order, Consumers identified an error affecting the calculation of the rate increase requested and reflected in the case. On a corrected basis, Consumers' rate increase reflected in the MPSC's order was $217 million, with no change to the total revenue requirement, approved costs, or customer rates. In April 2026, the MPSC issued an Errata to its March 2026 order to reflect this correction in the public record.

2025 Gas Rate Case: In December 2025, Consumers filed an application with the MPSC seeking an annual rate increase of $240 million based on a 10.25-percent authorized return on equity for the projected 12-month period ending October 31, 2027. In June 2026, Consumers revised its requested increase to $232 million. The MPSC must issue a final order in this case before or in October 2026.

Looking Forward

CMS Energy and Consumers will continue to consider the impact on the triple bottom line of people, planet, and prosperity in their daily operations as well as in their long-term strategic decisions. Consumers will continue to seek fair and timely regulatory treatment that will support its customer-driven investment plan, while pursuing cost-control measures that will allow it to maintain sustainable customer base rates. The CE Way is an important means of realizing CMS Energy's and Consumers' purpose of providing safe, reliable, affordable, clean, and equitable energy in service of their customers.

Results of Operations

CMS Energy Consolidated Results of Operations

In Millions, Except Per Share Amounts

	Three Months Ended			Six Months Ended		
June 30	2026	2025	Change	2026	2025	Change
Net Income Available to Common Stockholders	$ 117	$ 198	$ (81)	$ 455	$ 500	$ (45)
Basic Earnings Per Average Common Share	$ 0.38	$ 0.67	$ (0.29)	$ 1.48	$ 1.68	$ (0.20)
Diluted Earnings Per Average Common Share	$ 0.37	$ 0.66	$ (0.29)	$ 1.47	$ 1.67	$ (0.20)

In Millions

	Three Months Ended			Six Months Ended		
June 30	2026	2025	Change	2026	2025	Change
Electric Utility	$ 137	$ 167	$ (30)	$ 247	$ 291	$ (44)
Gas Utility	27	25	2	247	238	9
NorthStar Clean Energy	18	22	(4)	59	4	55
Corporate interest and other	(65)	(16)	(49)	(98)	(33)	(65)
Net Income Available to Common Stockholders	$ 117	$ 198	$ (81)	$ 455	$ 500	$ (45)

Presented in the following table is a summary of changes to net income available to common stockholders for the three and six months ended June 30, 2026 versus 2025:

In Millions

	Three Months Ended	Six Months Ended
June 30, 2025	$ 198	$ 500
Reasons for the change		
Consumers electric utility and gas utility		
Electric sales	$ (31)	$ (33)
Gas sales	(7)	(5)
Electric rate increase	38	63
Gas rate increase, offset partially by the absence of ASP sale gain amortization	25	74
Higher service restoration costs	(40)	(70)
Higher depreciation and amortization	(17)	(42)
Higher IT expenses, including early-phase ERP implementation costs	(7)	(20)
Higher property taxes, reflecting higher capital spending	(8)	(19)
Higher other maintenance and operating expenses	(8)	(15)
Higher interest charges	(4)	(13)
Higher vegetation management costs	(7)	(7)
Higher other income, net of expenses	10	30
Absence of coal-fueled generation costs[1]	5	16
Lower income tax expenses	23	6
	$ (28)	$ (35)
NorthStar Clean Energy	(4)	55
Corporate interest and other	(49)	(65)
June 30, 2026	$ 117	$ 455

[1] See Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters—Consumers Electric Utility—J.H. Campbell Emergency Order.

Consumers Electric Utility Results of Operations

Presented in the following table are the detailed changes to the electric utility's net income available to common stockholders for the three and six months ended June 30, 2026 versus 2025:

In Millions

	Three Months Ended		Six Months Ended	
June 30, 2025		$ 167		$ 291
Reasons for the change				
Electric deliveries[1] and rate increases				
Rate increase, including return on higher renewable capital spending	$ 38		$ 63	
Lower revenue due primarily to weather and sales mix	(30)		(29)	
Lower energy waste reduction program revenues	(8)		(16)	
Lower other revenues	(1)		(4)	
		$ (1)		$ 14
Maintenance and other operating expenses				
Higher service restoration costs	(40)		(70)	
Higher IT expenses, including early-phase ERP implementation costs	(7)		(20)	
Higher vegetation management costs	(7)		(7)	
Absence of coal-fueled generation costs[2]	5		16	
Lower energy waste reduction program costs	8		16	
Lower (higher) other maintenance and operating expenses	(3)		1	
		(44)		(64)
Depreciation and amortization				
Increased plant in service, reflecting higher capital spending		(14)		(26)
General taxes				
Higher property taxes, reflecting higher capital spending		(5)		(11)
Other income, net of expenses				
Higher AFUDC due primarily to the REP[3]	15		28	
Lower other income, net of expenses	(5)		(2)	
		10		26
Interest charges				
Higher AFUDC interest due primarily to the REP[3]	7		12	
Higher debt expense	(5)		(11)	
Lower other interest charges	1		1	
		3		2
Income taxes				
Lower electric utility pre-tax earnings	13		16	
Absence of state deferred tax remeasurement	8		8	
Increase in tax reserves[4]	—		(12)	
Lower other income taxes	—		3	
		21		15
June 30, 2026		$ 137		$ 247

[1] For the three months ended June 30, deliveries to end-use customers were 8.9 billion kWh in 2026 and in 2025. For the six months ended June 30, deliveries to end-use customers were 18.0 billion kWh in 2026 and in 2025.

[2] See Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters—Consumers Electric Utility—J.H. Campbell Emergency Order.

[3] The MPSC authorized Consumers to record AFUDC on REP construction work in progress beginning in 2026. Previously, Consumers recognized a current return on construction work in progress.

[4] See Notes to the Unaudited Consolidated Financial Statements—Note 8, Income Taxes.

Consumers Gas Utility Results of Operations

Presented in the following table are the detailed changes to the gas utility's net income available to common stockholders for the three and six months ended June 30, 2026 versus 2025:

In Millions

	Three Months Ended		Six Months Ended	
June 30, 2025		$ 25		$ 238
Reasons for the change				
Gas deliveries[1] and rate increases				
Rate increase	$ 29		$ 90	
Lower other revenues	(7)		(5)	
		$ 22		$ 85
Maintenance and other operating expenses				
Absence of ASP sale gain amortization[2]	(4)		(16)	
Higher maintenance and other operating expenses	(5)		(16)	
		(9)		(32)
Depreciation and amortization				
Increased plant in service, reflecting higher capital spending		(3)		(16)
General taxes				
Higher property taxes, reflecting higher capital spending		(3)		(8)
Other income, net of expenses		—		4
Interest charges		(7)		(15)
Income taxes				
Increase in tax reserves[3]	—		(6)	
Higher gas utility pre-tax earnings	—		(5)	
Absence of state deferred tax remeasurement	4		4	
Higher other income taxes	(2)		(2)	
		2		(9)
June 30, 2026		$ 27		$ 247

[1] For the three months ended June 30, deliveries to end-use customers were 46 Bcf in 2026 and 49 Bcf in 2025. For the six months ended June 30, deliveries to end-use customers were 181 Bcf in 2026 and 184 Bcf in 2025.

[2] In 2024, Consumers sold its unregulated ASP business to a non-affiliated company, and the MPSC subsequently approved the application of a portion of the gain as an offset to the revenue deficiency in lieu

of additional rate relief during the 12-month period beginning October 1, 2024, which concluded in September 2025.

[3] See Notes to the Unaudited Consolidated Financial Statements—Note 8, Income Taxes.

NorthStar Clean Energy Results of Operations

Presented in the following table are the detailed changes to NorthStar Clean Energy's net income available to common stockholders for the three and six months ended June 30, 2026 versus 2025:

In Millions

	Three Months Ended	Six Months Ended
June 30, 2025	$ 22	$ 4
Reason for the change		
Higher earnings from renewable projects, reflecting timing of tax benefits	$ 15	$ 69
Lower other expenses	1	6
Higher tax expense	(23)	(19)
Higher (lower) operating earnings	3	(1)
June 30, 2026	$ 18	$ 59

Corporate Interest and Other Results of Operations

Presented in the following table are the detailed changes to corporate interest and other results for the three and six months ended June 30, 2026 versus 2025:

In Millions

	Three Months Ended	Six Months Ended
June 30, 2025	$ (16)	$ (33)
Reasons for the change		
Absence of gains on extinguishment of debt	$ (72)	$ (72)
Higher interest charges	(3)	(14)
Lower tax expense	29	14
Higher (lower) interest earnings and other	(3)	7
June 30, 2026	$ (65)	$ (98)

Cash Position, Investing, and Financing

At June 30, 2026, CMS Energy had $345 million of consolidated cash and cash equivalents, which included $104 million of restricted cash and cash equivalents. At June 30, 2026, Consumers had $215 million of consolidated cash and cash equivalents, which included $85 million of restricted cash and cash equivalents.

Operating Activities

Presented in the following table are specific components of net cash provided by operating activities for the six months ended June 30, 2026 versus 2025:

		In Millions
CMS Energy, including Consumers		
Six Months Ended June 30, 2025	$	1,414
Reasons for the change		
Lower net income	$	(115)
Non-cash transactions[1]		74
Unfavorable impact of changes in core working capital,[2] due primarily to higher GCR undercollections, increase in coal purchases, and timing of payments to vendors, offset partially by higher collections on receivables		(97)
Favorable impact of changes in other assets and liabilities, due primarily to higher tax-credit sale proceeds, offset partially by final recovery of previously deferred power supply costs		51
Six Months Ended June 30, 2026	$	1,327
Consumers		
Six Months Ended June 30, 2025	$	1,479
Reasons for the change		
Lower net income	$	(30)
Non-cash transactions[1]		41
Unfavorable impact of changes in core working capital,[2] due primarily to higher GCR undercollections, increase in coal purchases, and timing of payments to vendors, offset partially by higher collections on receivables		(126)
Unfavorable impact of changes in other assets and liabilities, due primarily to final recovery of previously deferred power supply costs and higher income tax payments to CMS Energy		(124)
Six Months Ended June 30, 2026	$	1,240

1 Non-cash transactions comprise depreciation and amortization, changes in deferred income taxes and investment tax credits, and other non-cash operating activities and reconciling adjustments.

2 Core working capital comprises accounts receivable, accrued revenue, inventories, accounts payable, and accrued rate refunds.

Investing Activities

Presented in the following table are specific components of net cash used in investing activities for the six months ended June 30, 2026 versus 2025:

		In Millions
CMS Energy, including Consumers		
Six Months Ended June 30, 2025	$	(1,880)
Reasons for the change		
Higher capital expenditures	$	(234)
Other investing activities, primarily lower cost to retire property		21
Six Months Ended June 30, 2026	$	(2,093)
Consumers		
Six Months Ended June 30, 2025	$	(1,632)
Reasons for the change		
Higher capital expenditures	$	(285)
Other investing activities, primarily lower cost to retire property		28
Six Months Ended June 30, 2026	$	(1,889)

Financing Activities

Presented in the following table are specific components of net cash provided by financing activities for the six months ended June 30, 2026 versus 2025:

		In Millions
CMS Energy, including Consumers		
Six Months Ended June 30, 2025	$	1,213
Reasons for the change		
Lower debt issuances	$	(1,282)
Higher debt retirements		(42)
Lower repayments of notes payable		65
Higher issuances of common stock		511
Higher payments of dividends on common stock		(27)
Higher proceeds from sale of membership interests in VIEs		16
Other financing activities, primarily higher customer advances for construction and lower debt issuance costs		42
Six Months Ended June 30, 2026	$	496
Consumers		
Six Months Ended June 30, 2025	$	714
Reasons for the change		
Lower debt issuances	$	(274)
Higher debt retirements		(118)
Lower repayments of notes payable		65
Repayment of notes payable to CMS Energy		(340)
Higher stockholder contribution from CMS Energy		705
Higher payments of dividends on common stock		(32)
Other financing activities, primarily higher customer advances for construction		33
Six Months Ended June 30, 2026	$	753

Capital Resources and Liquidity

CMS Energy and Consumers expect to have sufficient liquidity to fund their present and future commitments. CMS Energy uses dividends and tax-sharing payments from its subsidiaries and external financing and capital transactions to invest in its utility and non-utility businesses, retire debt, pay dividends, and fund its other obligations. The ability of CMS Energy's subsidiaries, including Consumers, to pay dividends to CMS Energy depends upon each subsidiary's revenues, earnings, cash needs, and other factors. In addition, Consumers' ability to pay dividends is restricted by certain terms included in its articles of incorporation and potentially by FERC requirements and provisions under the Federal Power Act and the Natural Gas Act. For additional details on Consumers' dividend restrictions, see Notes to the Unaudited Consolidated Financial Statements—Note 4, Financings and Capitalization—Dividend Restrictions. During the six months ended June 30, 2026, Consumers paid $448 million in dividends on its common stock to CMS Energy.

Consumers uses cash flows generated from operations, external financing transactions, and the monetization of tax credits, along with stockholder contributions from CMS Energy, to fund capital expenditures, retire debt, pay dividends, and fund its other obligations. Consumers also uses these sources of funding to contribute to its employee benefit plans.

Financing and Capital Resources: CMS Energy and Consumers rely on the capital markets to fund their robust capital plan. Barring any sustained market dislocations or disruptions, CMS Energy and Consumers expect to continue to have ready access to the financial and capital markets and will continue to explore possibilities to take advantage of market opportunities as they arise with respect to future funding needs. Consumers is required to maintain FERC authorization for financings. If access to these markets were to diminish or otherwise become restricted, CMS Energy and Consumers would implement contingency plans to address debt maturities, which could include reduced capital spending.

In 2023, CMS Energy entered into an equity offering program under which it could sell shares of its common stock having an aggregate sales price of up to $1 billion in privately negotiated transactions, in "at the market" offerings, or through forward sales transactions. During the six months ended June 30, 2026, CMS Energy entered into forward sale agreements for approximately 6.4 million shares at a weighted average initial forward price of $75.63 per share. During the same period, CMS Energy settled all of the remaining forward sale contracts under this program by issuing approximately 6.5 million shares at a weighted average price of $75.80 per share, resulting in net proceeds of $495 million. CMS Energy has fully utilized the program and does not have any remaining capacity available for future issuances under the 2023 equity offering program.

In May 2026, CMS Energy entered into an equity offering program under which it may sell shares of its common stock having an aggregate sales price of up to $3 billion in privately negotiated transactions, in "at the market" offerings, or through forward sales transactions. There have been no sales of securities under this program.

CMS Energy, NorthStar Clean Energy, and Consumers use revolving credit facilities for general working capital purposes and to issue letters of credit. At June 30, 2026, CMS Energy had $715 million of its revolving credit facility available, NorthStar Clean Energy had $163 million available under its revolving credit facility, and Consumers had $1.3 billion available under its revolving credit facilities.

An additional source of liquidity is Consumers' commercial paper program, which allows Consumers to issue, in one or more placements, up to $500 million in aggregate principal amount of commercial paper notes with maturities of up to 365 days at market interest rates. These issuances are supported by Consumers' revolving credit facilities. While the amount of outstanding commercial paper does not reduce the available capacity of the revolving credit facilities, Consumers does not intend to issue

commercial paper in an amount exceeding the available capacity of the facilities. At June 30, 2026, there were no commercial paper notes outstanding under this program.

For additional details about these programs and facilities, see Notes to the Unaudited Consolidated Financial Statements—Note 4, Financings and Capitalization.

Certain of CMS Energy's, NorthStar Clean Energy's, and Consumers' credit agreements contain covenants that require each entity to maintain certain financial ratios, as defined therein. At June 30, 2026, no default had occurred with respect to any of the financial covenants contained in these credit agreements. Each of the entities was in compliance with the covenants contained in their respective credit agreements as of June 30, 2026, as presented in the following table:

	Limit	Actual
CMS Energy, parent only		
Debt to capital[1]	≤ 0.70 to 1.0	0.55 to 1.0
NorthStar Clean Energy		
Debt to capital[2]	≤ 0.50 to 1.0	0.07 to 1.0
Debt service coverage[2]	≥ 2.00 to 1.0	5.54 to 1.0
Pledged equity interests to aggregate commitment[2,3]	≥ 2.00 to 1.0	2.07 to 1.0
Consumers		
Debt to capital[4]	≤ 0.65 to 1.0	0.50 to 1.0

1 Applies to CMS Energy's revolving credit agreement and letter of credit reimbursement agreement.

2 Applies to NorthStar Clean Energy's revolving credit agreement.

3 The aggregate book value of the pledged equity interests under the revolving credit agreement was at least two-times the aggregate commitment under the revolving credit agreement at June 30, 2026.

4 Applies to Consumers' revolving credit agreements and certain letter of credit reimbursement agreements.

Outlook

Several business trends and uncertainties may affect CMS Energy's and Consumers' financial condition and results of operations. These trends and uncertainties could have a material impact on CMS Energy's and Consumers' consolidated income, cash flows, or financial position.

Since 2025, the federal government has taken numerous executive actions related to tariffs and trade, alleviating regulatory burdens, and environmental regulations and enforcement, among other areas of potential impact. Many of these actions require further implementation by federal agencies and departments, and many of these actions are or likely will be subject to judicial review. CMS Energy and Consumers continue to monitor these executive actions and will continue taking steps to deliver consistently on the triple bottom line.

For additional details regarding these and other uncertainties, see Forward-looking Statements and Information; Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters, Note 3, Contingencies and Commitments, and Note 8, Income Taxes; and Item 1A. Risk Factors in the 2025 Form 10-K.

Consumers Electric Utility Outlook and Uncertainties

Energy Supply: Consumers' Electric Supply Plan, its long-term strategy for delivering safe, reliable, affordable, clean, and equitable energy to its customers, is outlined in its IRP and incorporates Consumers' REP. The Electric Supply Plan is Consumers' blueprint for compliance with Michigan's 2023 Energy Law and for advancing sustainability objectives.

Among other things, the 2023 Energy Law:

- increased the renewable energy standard from 15 percent to 50 percent by 2030 and 60 percent by 2035
- established a clean energy standard of 80 percent by 2035 and 100 percent by 2040; low- or zero-carbon emitting resources, such as nuclear generation and natural gas generation coupled with carbon capture, qualify as clean energy sources under this standard
- created a new energy storage standard, requiring electric utilities to file plans by 2029 to help achieve a statewide target of 2,500 MW; the MPSC Staff has indicated that Consumers' share of this target is 817 MW

Consumers' integrated resource planning process provides a clear path toward these goals. Consumers expects to file updates to its IRP in September 2026 to reinforce and expand that pathway, while recent updates to the REP—approved by the MPSC in September 2025—position Consumers to achieve 60-percent renewable energy by 2035 and 100-percent clean energy by 2040.

To meet these objectives, Consumers is executing a multi-faceted strategy:

- Ending the use of coal—In 2023, Consumers retired the D.E. Karn coal-fueled generating units, totaling 515 MW of nameplate capacity, and as authorized by the MPSC, issued securitization bonds to finance the recovery of and return on those units. Additionally, Consumers obtained MPSC approval to retire J.H. Campbell in May 2025, totaling 1,407 MW of nameplate capacity, and to recover its remaining book value plus a 9.0-percent return on equity through regulatory asset treatment upon its retirement. As discussed further below, the retirement of J.H. Campbell is subject to temporary extensions under emergency orders issued by the U.S. Secretary of Energy.

- Resource adequacy and reliability—To maintain reliability during the transition, Consumers purchased the Covert Generating Station, representing 1,200 MW of nameplate capacity, in 2023. Additionally, in September 2025, Consumers entered into a new ten-year PPA with the MCV Partnership for the purchase of up to 1,240 MW of capacity and associated energy from the MCV Facility, effective June 1, 2030. The agreement is subject to MPSC approval, which will be requested as part of the next IRP filing.

  In March 2026, Consumers announced the next IRP filing planned for September 2026 would include an all-of-the-above approach to electric supply, with over 13 GW in expanded renewables and clean energy resources including solar, battery storage, and wind, supported by two new natural gas-fueled electric generating plants totaling approximately 1,500 MW of capacity. These new units, which would be developed on existing sites in Bay and Genesee Counties, Michigan, would enhance reliability and maintain affordability.

- Energy storage investments—Consumers has contracted to purchase 850 MW of capacity from battery storage facilities to be located in Michigan's Lower Peninsula and with expected commercial operation dates through 2028.

- Renewable expansion—Recent REP updates include up to 4,000 MW of wind energy resources and up to 9,000 MW of both purchased and owned solar energy resources, of which 1,060 MW will support Consumers' voluntary green pricing program.

Presented in the following illustration is the aggregate renewable capacity that Consumers expects to add to its portfolio through PPAs and owned generation under its IRP, voluntary green pricing program, and REP updates:



The company earns a return equal to its pre-tax weighted-average cost of capital on permanent capital structure for payments under new clean, renewable, or energy storage PPAs with non-affiliated entities.

Consumers will continue to competitively bid new capacity and energy resources, ensuring a balanced portfolio of intermittent renewables and dispatchable clean resources. Any resulting contracts are subject to MPSC approval. Through these integrated plans, Consumers is advancing Michigan's clean energy transition while maintaining system reliability, affordability, and regulatory compliance.

J.H. Campbell Emergency Orders: In May 2025, before the planned closure of J.H. Campbell, the U.S. Secretary of Energy issued an emergency order under section 202(c) of the Federal Power Act requiring J.H. Campbell to continue operating for 90 days, through August 20, 2025. Subsequently, the U.S. Secretary of Energy has issued four additional emergency orders for 90 days each, currently requiring continued operation of J.H. Campbell through August 16, 2026. These orders stated that continued operation of J.H. Campbell was required to meet an energy emergency across MISO's North and Central regions. Consistent with the Federal Power Act and DOE regulations, the orders authorize Consumers to obtain cost recovery at FERC.

As directed, Consumers has continued to make J.H. Campbell available in the MISO market and, in June 2025, filed a complaint at FERC seeking a modification of the MISO Tariff that would enable Consumers to recover the costs of complying with the emergency orders. Consumers' complaint sought a mechanism in the MISO Tariff that would allow allocation of those compliance costs across the MISO

North and Central regions, consistent with the nature of the energy emergency declared in the U.S. Secretary of Energy orders. In August 2025, FERC granted Consumers' complaint and ordered MISO to revise its tariff accordingly. MISO submitted a compliance filing with FERC in September 2025 and FERC rejected that filing in March 2026. MISO submitted a revised compliance filing in April 2026 and FERC approval of that filing remains pending.

From the date the first emergency order became effective through June 30, 2026, the net financial impact of complying with the emergency orders was $259 million after applying MISO revenues of $239 million.

In January 2026, Consumers filed a request at FERC seeking recovery and allocation of the net financial impact of complying with the May 2025 emergency order, which was $42 million after applying MISO revenues of $78 million. FERC approval of this filing, which encompasses recovery sought by the joint owners of J.H. Campbell, remains pending.

For all subsequent emergency orders, Consumers intends to seek recovery and allocation through FERC consistent with the recovery sought for the May 2025 emergency order. The ultimate financial impact remains subject to the outcome of the FERC proceedings and any future guidance or interpretation.

Following the May 2025 emergency order, several third-party stakeholders, including the Michigan Attorney General, the Organization of MISO States, and a group of environmental and public interest groups, asked the U.S. Secretary of Energy to reconsider the May 2025 emergency order. In July 2025, after the U.S. Secretary of Energy took no action on those requests, several parties filed petitions for review of the May 2025 emergency order in federal court. The requests for rehearing were subsequently denied, and similar challenges to the subsequent orders are underway. Third parties have also challenged FERC's August 2025 order granting Consumers' complaint seeking revisions to the MISO Tariff. That legal challenge is on hold pending the separate legal challenges to the emergency orders. The U.S. Secretary of Energy will likely issue more orders to require the continued operation of J.H. Campbell. While the timing and content of future orders and the outcome of third-party legal challenges are not yet known, Consumers is committed to pursuing cost recovery as provided for under applicable laws, orders, and proceedings.

To ensure appropriate staffing levels at J.H. Campbell, Consumers has implemented retention measures and expects to incur up to $4 million during each 90-day emergency order period. Consumers will seek recovery of these retention costs from FERC, consistent with rate recovery sought for other costs of complying with the emergency orders. For additional details on this program, see Notes to the Unaudited Consolidated Financial Statements—Note 13, Exit Activities and Asset Sales.

Electric Customer Deliveries and Revenue: Consumers' electric customer deliveries are seasonal and largely dependent on Michigan's economy. The consumption of electric energy typically increases in the summer months, due primarily to the use of air conditioners and other cooling equipment. In addition, Consumers' electric rates, which follow a seasonal rate design, are higher in the summer months than in the remaining months of the year. Each year in June, electric residential customers transition to a summer peak time-of-use rate that allows them to take advantage of lower-cost energy during off-peak times during the summer months. Thus, customers can reduce their electric bills by shifting their consumption from on-peak to off-peak times.

Over the next five years, Consumers expects weather-normalized electric deliveries to increase compared to 2025. This outlook reflects strong growth in electric demand, offset partially by the effects of energy waste reduction programs. Actual delivery levels will depend on:

- energy conservation measures and results of energy waste reduction programs
- weather fluctuations
- Michigan's economic conditions, including data center expansion; utilization, expansion, or contraction of large commercial and industrial facilities; economic development; population trends; electric vehicle adoption; and housing activity

Electric ROA: Michigan law allows electric customers in Consumers' service territory to buy electric generation service from alternative electric suppliers in an aggregate amount capped at 10 percent of Consumers' sales, with certain exceptions. At June 30, 2026, electric deliveries under the ROA program were at the 10-percent limit. Fewer than 300 of Consumers' electric customers purchased electric generation service under the ROA program.

In 2016, Michigan law established a path to ensure that forward capacity is secured for all electric customers in Michigan, including customers served by alternative electric suppliers under ROA. The law also authorized the MPSC to ensure that alternative electric suppliers have procured enough capacity to cover their anticipated capacity requirements for the four-year forward period. In 2017, the MPSC issued an order establishing a state reliability mechanism for Consumers. Under this mechanism, if an alternative electric supplier does not demonstrate that it has procured its capacity requirements for the four-year forward period, its customers will pay a set charge to the utility for capacity that is not provided by the alternative electric supplier.

During 2017, the MPSC issued orders finding that it has statutory authority to determine and implement a local clearing requirement, which requires all electric suppliers to demonstrate that a portion of the capacity used to serve customers is located in the MISO footprint in Michigan's Lower Peninsula. In 2020, the Michigan Supreme Court affirmed the MPSC's statutory authority to implement a local clearing requirement on individual electric providers.

In 2020, ABATE and another intervenor filed a complaint against the MPSC in the U.S. District Court for the Eastern District of Michigan challenging the constitutionality of a local clearing requirement. The complaint requested the federal court to issue a permanent injunction prohibiting the MPSC from implementing a local clearing requirement on individual electric providers. In 2023, the U.S. District Court for the Eastern District of Michigan dismissed the complaint. ABATE and the other intervenor filed a claim of appeal of the Eastern District Court's decision with the U.S. Court of Appeals for the Sixth Circuit.

In January 2025, the Sixth Circuit Court of Appeals issued an opinion finding that the MPSC's imposition of a local clearing requirement on individual electric suppliers would discriminate against interstate commerce. The Court of Appeals remanded to the District Court for a determination of whether the local clearing requirement discriminated against interstate commerce and whether the MPSC's regulation survives a strict scrutiny standard, which depends on a determination of whether the local clearing requirement is the only means of achieving the state's goal of securing reliable energy supply. In January 2025, Consumers filed a petition for rehearing and en banc review with the Sixth Circuit Court of Appeals, requesting the Court to reconsider and reverse the panel's opinion. In February 2025, the Sixth Circuit Court of Appeals issued an order denying Consumers' petition for rehearing and en banc review. The case has therefore been remanded to the District Court for the Eastern District of Michigan for consideration of whether the MPSC's local clearing requirement meets the strict scrutiny standard pursuant to the Court of Appeals' decision. The remanded proceeding is pending at the Eastern District Court; there is no deadline for decision.

Sale of Hydroelectric Facilities: In September 2025, Consumers signed an agreement to sell its 13 river hydroelectric dams, which are located throughout Michigan, to a non-affiliated company. Additionally, Consumers signed an agreement to purchase power generated by the facilities for 30 years, at a price that reflects the counterparty's acceptance of the risks and rewards of ownership of the facilities, including FERC licensing obligations. The agreements are contingent upon MPSC and FERC approval, for which Consumers filed in October 2025.

In July 2026, Consumers filed exceptions to the proposal for decision issued in the related regulatory proceeding. The filing proposed a state-administered fund that would be established using all financial compensation mechanism revenues received under the PPA, estimated to total approximately $270 million over the term of the agreement. Under the proposal, the fund would be controlled by the State of Michigan and used to support dam safety improvements, emergency response and remediation efforts, and future decommissioning or license surrender obligations associated with the hydroelectric facilities. The proposal is subject to regulatory review and approval.

An order from the MPSC is expected in September 2026. In Consumers' most recent electric rate cases, the MPSC has approved deferred accounting treatment for costs of owning and operating the hydroelectric dams pending and until completion of the transaction. At June 30, 2026, the net book value of the hydroelectric facilities was immaterial.

To ensure necessary staffing at the hydroelectric facilities through the anticipated sale, Consumers has provided current employees at the facilities with a retention incentive program. Subsequently, to ensure continued safe operation of the facilities after the sale, the buyer will offer employment to the current hydroelectric employees for a period of at least a year. The retention incentive benefits are contingent upon MPSC and FERC approval of the sale transaction.

Electric Rate Matters: Rate matters are critical to Consumers' electric utility business. For additional details on rate matters, see Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters and Note 3, Contingencies and Commitments.

2026 Electric Rate Case: In June 2026, Consumers filed an application with the MPSC seeking a rate increase of $481 million made up of two components. First, Consumers requested a $456 million annual rate increase, based on a 10.25-percent return on equity for the projected 12-month period ending April 30, 2028. The filing requested authority to recover costs related to new infrastructure investment primarily in distribution system reliability. Second, Consumers requested approval of a $25 million surcharge for the recovery of distribution investments made during the 12 months ended February 28, 2026 that exceeded the rate amounts authorized in accordance with previous electric rate orders.

Presented in the following table are the components of the requested increase in revenue:

In Millions

Projected 12-Month Period Ending April 30		2028
Investment in rate base	$	248
Operating and maintenance costs		46
Sales and other revenue		59
Cost of capital		103
Subtotal	$	456
Surcharge		25
Total	$	481

The MPSC must issue a final order in this case before or in April 2027.

Depreciation Rate Case: In December 2025, Consumers filed a depreciation case related to its electric and common utility property. In this case, Consumers requested to increase depreciation expense, and its recovery of that expense, by $34 million annually based on December 31, 2024 balances.

Electric Environmental Outlook: Consumers' electric operations are subject to various federal, state, and local environmental laws and regulations. Consumers estimates that it will incur capital expenditures of $245 million from 2026 through 2030 to continue to comply with RCRA, the Clean Air Act, and numerous other environmental regulations. Consumers expects to recover these costs in customer rates, but cannot guarantee this result. Multiple environmental laws and regulations are subject to litigation. Consumers' primary environmental compliance focus includes, but is not limited to, the following matters.

Air Quality: Multiple air quality regulations apply, or may apply, to Consumers' electric utility.

MATS, emission standards for electric generating units published by the EPA based on Section 112 of the Clean Air Act, continue to apply to Consumers. In February 2026, the EPA issued a final rule repealing changes made to the MATS rule in 2024. The company has complied, and continues to comply, with the MATS regulation and this repeal will have minimal impacts on Consumers' electric generating units. Consumers does not expect MATS to impact its environmental strategy materially.

CSAPR requires Michigan and many other states to improve air quality by reducing power plant emissions that, according to EPA modeling, contribute to ground-level ozone in other downwind states. Consumers complies with this regulation and expects it to have minimal financial and operational impact in the near and/or long term.

In 2015, the EPA lowered the NAAQS for ozone and made it more difficult to construct or modify power plants and other emission sources in areas of the country that do not meet the ozone standard. Three counties in western Michigan have been designated as "serious" ozone nonattainment. Based on recent air-quality data, EGLE has submitted a Clean Data Determination for two of those counties, a step toward redesignating those two counties to ozone attainment. The EPA has proposed approving the Clean Data Determination. Separately, a December 2025 court decision vacated the EPA's 2023 redesignation of a seven-county area in southeast Michigan from moderate ozone nonattainment to attainment. In May 2026, EGLE submitted to the EPA an addendum to its request to redesignate the southeast Michigan counties to attainment status based on updated ozone data for the area. None of Consumers' fossil-fuel-fired generating units are located in the affected western or southeastern Michigan areas. Consumers will continue to monitor developments related to the court decision and any resulting regulatory actions but does not expect them to have any impact on its generating assets.

In 2024, the EPA published a lower fine particulate matter NAAQS, which could result in newly designated nonattainment areas in Michigan starting in 2026. In 2025, EGLE proposed nonattainment areas for Kalamazoo and Wayne counties, with a decision by the EPA expected in 2026. Consumers does not have any fossil-fuel-fired generating assets in these counties and therefore does not expect this rule to have significant impacts on its existing generating assets or its clean energy strategy. Consumers will continue to monitor NAAQS rulemakings and litigation to evaluate potential impacts to its generating assets.

In January 2026, the EPA published a final rule amending new source performance standards for new, modified, and reconstructed stationary combustion turbines to lower emission limits for NOx. This final rule requires new large simple-cycle turbine units with higher capacity factors to install control equipment for NOx emissions. This rule will apply to any future stationary combustion turbines.

Consumers continues to evaluate these rules in conjunction with other EPA and EGLE rulemakings, litigation, executive orders, treaties, and congressional actions. This evaluation could result in:

- a change in Consumers' fuel mix
- changes in the types of generating units Consumers may purchase or build in the future
- changes in how certain units are operated, including the installation of additional emission control equipment
- the retirement, mothballing, extended operation, or repowering with an alternative fuel of some of Consumers' generating units
- changes in Consumers' environmental compliance costs
- the purchase or sale of emission allowances

Greenhouse Gases: There have been numerous legislative, executive, and regulatory initiatives at the state, regional, national, and international levels that involve the potential regulation and reporting of greenhouse gases. Consumers continues to monitor and comment on these initiatives, as appropriate.

In 2025, the EPA proposed a rule to reconsider the Greenhouse Gas Reporting Program by eliminating the reporting obligations from numerous emission sources, including Consumers' electric generation sites and distribution equipment. In February 2026, the EPA finalized a portion of the proposed rule that delayed reporting deadlines for reporting year 2025 from March to October 2026 but did not substantively address whether the program would be retained or eliminated. Reporting of carbon dioxide to the EPA, however, will continue for sources subject to the Clean Air Act Acid Rain Program, which includes Consumers' fossil-fuel-fired electric generation. This change could result in inconsistent approaches in voluntary greenhouse gas accounting for industrial sources.

In 2024, the EPA finalized its rule under Section 111 of the Clean Air Act to address greenhouse gas emissions from new combustion turbine electric generating units and existing coal-, gas-, and oil-fueled steam electric generating units. These rules do not address existing combustion turbine electric generating units. In 2025, the EPA issued a proposed rule containing two different pathways to rescind these requirements. Consumers does not expect these proposed changes will have a significant impact on its existing gas- and oil-fueled steam electric generating assets. Consumers will continue to follow the EPA rules that address greenhouse gas emissions and will continue to evaluate potential impacts to its operations, both present and future.

Increased frequency or intensity of severe or extreme weather events, including those due to climate change, could materially impact Consumers' facilities, energy sales, and results of operations. Consumers is unable to predict these events; however, Consumers evaluates the potential physical impacts of climate change on its operations, including increased frequency or intensity of storm activity; increased precipitation; increased temperature; and changes in lake and river levels. Consumers released a report addressing the physical risks of climate change on its infrastructure in 2022. Consumers is taking steps to mitigate these risks as appropriate.

While Consumers cannot predict the outcome of changes in U.S. policy or of other legislative, executive, or regulatory initiatives involving the potential regulation or reporting of greenhouse gases, it intends to move forward with its compliance with Michigan's clean energy requirements, its own sustainability goals, and its emphasis on reliable and resilient electric supply. Litigation, international treaties, executive orders, federal laws and regulations (including regulations by the EPA), and state laws and regulations, if enacted or ratified, could ultimately impact Consumers. Consumers may be required to:

- replace equipment
- install additional emission control equipment

- purchase emission allowances or credits (including potential greenhouse gas offset credits)
- curtail operations or modify existing facility retirement schedules
- arrange for alternative sources of supply
- purchase or build facilities that generate fewer emissions
- mothball, sell, or retire facilities that generate certain emissions
- pursue energy efficiency or demand response measures more swiftly
- take other steps to manage, sequester, or lower the emission of greenhouse gases

Although associated capital or operating costs relating to greenhouse gas regulation or legislation could be material and cost recovery cannot be assured, Consumers expects to recover these costs in rates consistent with the recovery of other reasonable costs of complying with environmental laws and regulations.

CCRs: In 2015, the EPA published a rule regulating CCRs under RCRA. This rule adopts minimum standards for the disposal of non-hazardous CCRs in CCR landfills and surface impoundments and criteria for the beneficial use of CCRs. The rule also sets out conditions under which some CCR units would be forced to cease receiving CCRs and related process water and to initiate closure. Due to continued litigation, many aspects of the rule have been remanded to the EPA, resulting in more proposed and final rules.

In 2024, the EPA finalized a rule regulating legacy CCR surface impoundments and CCR management units in response to litigation that exempted inactive impoundments at inactive facilities from the 2015 CCR rule. The new rule adopts minimum standards for impoundments at electric generating facilities that became inactive before the 2015 CCR rule's effective date. During 2024, owners and operators were required to assess whether an inactive facility contains a legacy surface impoundment and then, for identified locations, proceed with the compliance schedule.

Additionally, the EPA established groundwater monitoring, corrective action, closure, and post-closure care requirements for CCR surface impoundments and landfills closed prior to the effective date of the 2015 CCR rule, but that do not meet the closure technical and performance standards of the 2024 rule. These include inactive CCR landfills that were previously exempted from regulation but that are now considered CCR management units. Owners are required to conduct an evaluation at active facilities or any inactive facilities with at least one legacy impoundment to identify CCR management units and determine an appropriate course of action (closure, groundwater treatment, etc.) for each identified unit according to established compliance milestone schedules. In February 2026, the EPA issued a final rule extending the compliance milestone schedule for CCR management units. This extension does not have a material impact on Consumers' compliance strategy.

Separately, Congress passed legislation in 2016 allowing participating states to develop permitting programs for CCRs under RCRA Subtitle D. The EPA was granted authority to review these permitting programs to determine if permits issued under the proposed program would be as protective as the federal rule. Once approved, permits issued from an authorized state would serve as the basis for compliance, replacing the requirement to self-certify each aspect of the 2015 CCR rule.

Consumers, with agreement from EGLE, completed the work necessary to initiate closure by excavating CCRs or placing a final cover over each of its relevant CCR units prior to the closure initiation deadline set forth in the 2015 CCR rule. Consumers has historically been authorized to recover in electric rates costs related to coal ash disposal sites that supported power generation. Consumers completed an assessment of inactive facilities as required by the 2024 CCR rule, and did not identify any legacy impoundments. A proposed rule was issued in April 2026 requesting that entities subject to the regulations provide supporting information for proposed changes to requirements related to CCRMUs and

other CCR closure obligations. Consumers is evaluating the proposed rule. Any changes to compliance strategy will depend on the content of any final rule issued.

Water: Multiple water-related regulations apply, or may apply, to Consumers.

The EPA regulates cooling water intake systems of existing electric generating plants under Section 316(b) of the Clean Water Act. The rules seek to reduce alleged harmful impacts on aquatic organisms, such as fish. In 2018, Consumers submitted to EGLE studies and recommended plans to comply with Section 316(b) for its coal-fueled units but has not yet received final approval.

The EPA also regulates the discharge of wastewater through its effluent limitation guidelines for steam electric generating plants. Consumers has submitted the appropriate notices of planned participation in compliance with this rule. Consumers has also submitted timely NPDES permit applications and will be working with EGLE to incorporate applicable provisions during the permit renewal process.

Many of Consumers' facilities maintain NPDES permits, which are vital to the facilities' operations. Consumers applies for renewal of these permits every five years. Failure of EGLE to renew any NPDES permit, a successful appeal against a permit, a change in the interpretation or scope of NPDES permitting, or onerous terms contained in a permit could have a significant detrimental effect on the operations of a facility.

Protected Wildlife: Multiple regulations apply, or may apply, to Consumers relating to protected species and habitats.

Statutes like the federal Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act of 1940 and changes to permitting may impact operations at Consumers' facilities. In 2024, the U.S. Fish and Wildlife Service published a final rule providing for bald eagle general permits for qualifying wind farms and electric distribution systems. Consumers has received, or is pursuing, bald eagle general permits for all its wind farms. While any resulting permitting and monitoring fees and/or restrictions on operations could impact Consumers' existing and future operations, Consumers does not expect any material changes to its environmental strategy or Electric Supply Plan as a result of this rule.

Additionally, Consumers regularly monitors proposed changes to the listing status of several species within its operational area. A change in species listed under the Endangered Species Act, or under Michigan's equivalent law, may impact Consumers' costs to mitigate its impact on protected species and habitats at certain existing facilities as well as siting choices for new facilities.

Other Matters: Other electric environmental matters could have a material impact on Consumers' outlook. For additional details on other electric environmental matters, see Notes to the Unaudited Consolidated Financial Statements—Note 3, Contingencies and Commitments—Consumers Electric Utility Contingencies—Electric Environmental Matters.

Consumers Gas Utility Outlook and Uncertainties

Gas Deliveries: Consumers' gas customer deliveries are seasonal. The peak demand for natural gas occurs in the winter due to colder temperatures and the resulting use of natural gas as heating fuel.

Over the next five years, Consumers expects weather-normalized gas deliveries to remain stable relative to 2025. This outlook reflects modest growth in gas demand, offset by the effects of energy waste reduction programs. Actual delivery levels will depend on:

- weather fluctuations
- use by power producers
- availability and development of renewable energy sources
- gas price changes
- Michigan's economic conditions, including population trends and housing activity
- the price or demand of competing energy sources or fuels
- energy efficiency and conservation impacts

Gas Rate Matters: Rate matters are critical to Consumers' gas utility business. For additional details on rate matters, see Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters and Note 3, Contingencies and Commitments.

2025 Gas Rate Case: In December 2025, Consumers filed an application with the MPSC seeking an annual rate increase of $240 million based on a 10.25-percent authorized return on equity for the projected 12-month period ending October 31, 2027. In June 2026, Consumers revised its requested increase to $232 million.

Presented in the following table are the components of the requested increase in revenue:

		In Millions
Projected 12-Month Period Ending October 31		2027
Investment in rate base	$	93
Operating and maintenance costs		61
Cost of capital		77
Sales/gross margin		1
Total	$	232

The MPSC must issue a final order in this case before or in October 2026.

Gas Pipeline and Storage Integrity and Safety: Consumers' gas operations are governed by federal and state pipeline safety rules, and there are robust processes and procedures in place to maintain compliance with these regulations. The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration has published rules that revise federal safety standards for gas transmission pipelines and underground storage facilities. Consumers has implemented measures to achieve compliance with the revised regulations. Proposed rules expanding federal gas safety requirements for distribution lines are in the final stages of regulatory review with publication anticipated near the end of 2026. Consumers will continue to monitor developments related to the proposed rules and assess impacts to its gas pipeline and storage assets. While Consumers expects to recover any costs of complying with new regulations in customer rates, it cannot guarantee that result.

Gas Environmental Outlook: Consumers expects to incur response activity costs at a number of sites, including 23 former MGP sites. For additional details, see Notes to the Unaudited Consolidated Financial Statements—Note 3, Contingencies and Commitments—Consumers Gas Utility Contingencies.

Consumers' gas operations are subject to various federal, state, and local environmental laws and regulations. Multiple environmental laws and regulations are subject to litigation. Consumers' primary environmental compliance focus includes, but is not limited to, the following matters.

Air Quality: Multiple air quality regulations apply, or may apply, to Consumers' gas utility.

In 2015, the EPA lowered the NAAQS for ozone and made it more difficult to construct or modify natural gas compressor stations and other emission sources in areas of the country that do not meet the ozone standard. Three counties in western Michigan have been designated as "serious" ozone nonattainment. Based on recent air-quality data, EGLE has submitted a Clean Data Determination for two of those counties, a step toward redesignating those two counties to ozone attainment. However, Consumers has one compressor station located in the remaining nonattainment area. Consequently, Consumers is retrofitting equipment at this compressor station to lower NOx emissions.

Additionally, a December 2025 court decision vacated the EPA's 2023 redesignation of the seven-county area in southeast Michigan from moderate ozone nonattainment to attainment. In May 2026, EGLE submitted to the EPA an addendum to its request for redesignation to attainment for the southeast Michigan counties, based on updated ozone data for the area. Four of Consumers' compressor stations are located in these counties, with one station having assets that may be impacted by the redesignation change. Consumers will continue to monitor the recent court decision's impact on the seven-county area in southeast Michigan, including resulting agency actions, and the potential impacts to compressor station assets.

Consumers will continue to monitor NAAQS rulemakings and litigation, and evaluate potential impacts to its compressor stations and other applicable natural gas storage and delivery assets.

In 2024, the EPA published a lower fine particulate matter NAAQS, which could result in newly designated nonattainment areas in Michigan starting in 2026. In 2025, EGLE proposed nonattainment areas for Kalamazoo and Wayne counties, with a decision by the EPA expected in 2026. Consumers has one compressor station located in Wayne County and will continue to monitor NAAQS rulemakings and litigation to evaluate potential impacts to the natural gas compressor station assets.

Greenhouse Gases: Some interest exists at the various levels of government in regulating greenhouse gases or their sources. Future regulations, if adopted, may involve requirements to reduce methane emissions from Consumers' gas utility operations and carbon dioxide emissions from customer use of natural gas. Consumers will continue to monitor such potential rules for impacts.

In September 2025, the EPA proposed a rule to reconsider the Greenhouse Gas Reporting Program by removing the natural gas distribution segment from the reporting obligations under the petroleum and natural gas source category, and proposed to delay the reporting obligations until 2034 for the remaining sources in this category. In February 2026, the EPA finalized a portion of the proposed rule that delayed reporting deadlines for reporting year 2025 from March to October 2026 but did not substantively address whether the program would be retained or eliminated. If this proposal is finalized as proposed, it could result in inconsistent approaches in voluntary greenhouse gas accounting for industrial sources.

Consumers is making voluntary efforts to reduce its gas utility's methane emissions. Under its Methane Reduction Plan, Consumers has set a goal of net-zero methane emissions from its natural gas delivery system by 2030. Consumers plans to reduce methane emissions from its system by about 80 percent from

2012 baseline levels by accelerating the replacement of aging pipe, rehabilitating or retiring outdated infrastructure, and adopting new technologies and practices. The remaining emissions will likely be offset through clean fuel alternatives or nature-based carbon removal pathways. To date, Consumers has reduced methane emissions by nearly 40 percent.

Consumers has already initiated work in these key areas by continuing to expand its energy waste reduction targets and by offering gas customers the ability to offset their carbon footprint associated with natural gas use by purchasing renewable natural gas and/or carbon credits associated with Michigan forest preservation. Consumers has renewable natural gas facilities under construction scheduled for commercial operation in 2026 and is monitoring regulatory developments and market conditions closely as part of its ongoing evaluation of the projects. As part of this evaluation, two early-phase renewable natural gas development projects have been paused indefinitely, and Consumers recognized an impairment charge of $15 million related to these projects in 2025. Consumers is evaluating and monitoring newer technologies to determine their role in achieving Consumers' interim and long-term net-zero goals, including biofuels, geothermal, synthetic methane, carbon capture sequestration systems, and other innovative technologies.

NorthStar Clean Energy Outlook and Uncertainties

CMS Energy's primary focus with respect to its NorthStar Clean Energy businesses is to maximize the value of generating assets representing 1,865 MW of capacity.

In July 2026, the CMS Energy Board of Directors approved a plan to divest certain renewable projects owned by NorthStar Clean Energy and to exit non-utility renewables development. The projects included in the planned divestiture are primarily non-Michigan-based renewable generation projects. CMS Energy has initiated a sales process for these renewable projects and is evaluating market information and potential indications of interest. CMS Energy expects to classify the related assets and liabilities as held for sale in the third quarter of 2026, as the held-for-sale criteria were not met as of June 30, 2026. CMS Energy could record a material impairment charge in the third quarter of 2026 if expected sale proceeds are insufficient to recover the carrying value of the assets. CMS Energy expects to complete the divestment within twelve months, subject to negotiating contractual terms with a third-party, which would then be subject to regulatory approvals and other customary closing conditions.

In June 2026, NorthStar Clean Energy sold to a tax equity investor a Class A membership interest in HL Solar Holdings, the holding company of a 96-MW solar generation project being constructed in St. Clair County, Michigan, and the future holding company of a 120-MW solar generation project being constructed in Hart Township, Michigan. The nameplate capacity of both projects has been committed under long-term renewable energy purchase agreements. The tax equity investor contributed $9 million in June 2026 and will contribute additional amounts upon further completion of the projects. The tax equity financing will also incorporate the sale of investment tax credits once the projects are placed into service for tax purposes, expected later in 2026.

NorthStar Clean Energy retained a Class B membership interest in HL Solar Holdings. Earnings, tax attributes, and cash flows generated by HL Solar Holdings will be allocated among and distributed to the membership classes in accordance with the ratios specified in the associated limited liability company operating agreement; these ratios will change over time and will not be representative of the ownership interest percentages of each membership class. For additional details, see Notes to the Unaudited Consolidated Financial Statements—Note 12, Variable Interest Entities.

Trends, uncertainties, and other matters related to NorthStar Clean Energy that could have a material impact on CMS Energy's consolidated income, cash flows, or financial position include:

- investment in and financial benefits received from renewable energy and energy storage projects, including changes to tax and trade policy
- delays or difficulties in financing, constructing, and developing projects, including those arising from the performance of contractors, suppliers, or other counterparties
- changes in energy, capacity, and other commodity prices
- changes in market rules, resource accreditation methodologies, and regulatory frameworks, including MISO capacity accreditation requirements
- severe weather events and climate change associated with increasing levels of greenhouse gases
- changes in various environmental laws, regulations, principles, or practices, or in their interpretation
- indemnity obligations assumed in connection with ownership interests in facilities that involve tax equity financing
- representations, warranties, and indemnities provided in connection with sales of assets
- delays or difficulties in obtaining environmental permits

For additional details regarding NorthStar Clean Energy's uncertainties, see Notes to the Unaudited Consolidated Financial Statements—Note 3, Contingencies and Commitments—Guarantees.

NorthStar Clean Energy Environmental Outlook: NorthStar Clean Energy's operations are subject to various federal, state, and local environmental laws and regulations. Multiple environmental laws and regulations are subject to litigation. NorthStar Clean Energy's primary environmental compliance focus includes, but is not limited to, the following matters.

MATS, emission standards for electric generating units published by the EPA based on Section 112 of the Clean Air Act, continue to apply to one of the NorthStar Clean Energy electric generating sites. In February 2026, the EPA issued a final rule repealing changes made to the MATS rule in 2024. The company has complied, and continues to comply, with the MATS regulation and this repeal will have minimal impacts on NorthStar Clean Energy's electric generating units. NorthStar Clean Energy does not expect MATS to impact its environmental strategy materially.

CSAPR requires Michigan and many other states to improve air quality by reducing power plant emissions that, according to EPA modeling, contribute to ground-level ozone in other downwind states. NorthStar Clean Energy complies with this regulation and expects it to have minimal financial and operational impact in the near and/or long term.

In 2024, the EPA published a lower fine particulate matter NAAQS, which could result in newly designated nonattainment areas in Michigan starting in 2026. In 2025, EGLE proposed nonattainment areas for Kalamazoo and Wayne counties, with a decision by the EPA expected in 2026. NorthStar Clean Energy has two fossil-fuel-fired generating units in these counties and will continue to monitor NAAQS rulemaking and litigation to evaluate potential impacts to its generating assets.

In January 2026, the EPA published a final rule amending new source performance standards for new, modified, and reconstructed stationary combustion turbines to lower emission limits for NOx. This final rule requires new large simple-cycle turbine units with higher capacity factors to install control equipment for NOx emissions. NorthStar Clean Energy's existing generation is not impacted by this rule, but the rule could apply to any future generation.

A December 2025 court decision vacated the EPA's 2023 redesignation of the seven-county area in southeast Michigan from moderate ozone nonattainment to attainment. In May 2026, EGLE submitted to

the EPA an addendum to its request for redesignation to attainment for the southeast Michigan counties, based on updated ozone data for the area. NorthStar Clean Energy has one electric generating station located within this area. NorthStar Clean Energy will continue to monitor the recent court decision's impact on the seven-county area in southeast Michigan, including resulting agency actions, and the potential impacts to compressor station assets.

For additional details regarding the ozone NAAQS, see Consumers Electric Utility Outlook and Uncertainties—Electric Environmental Outlook.

In 2025, the EPA proposed a rule to reconsider the Greenhouse Gas Reporting Program by eliminating the reporting obligations from numerous emission sources. Reporting of carbon dioxide to the EPA, however, will continue for sources subject to the Clean Air Act Acid Rain Program. In February 2026, the EPA finalized a portion of the proposed rule that delayed reporting deadlines for reporting year 2025 from March to October 2026 but did not substantively address whether the program would be retained or eliminated. This change could result in inconsistent approaches in voluntary greenhouse gas accounting for industrial sources.

In 2024, the EPA finalized its rule under Section 111 of the Clean Air Act to address greenhouse gas emissions from new combustion turbine electric generating units and existing coal-, gas-, and oil-fueled steam electric generating units. These rules do not address existing combustion turbine electric generating units. In 2025, the EPA issued a proposed rule containing two different pathways to rescind these requirements. Neither pathway impacts NorthStar Clean Energy's existing facilities. NorthStar Clean Energy will continue to follow the EPA rules that address greenhouse gas emissions and will continue to evaluate potential impacts to its operations, both present and future.

Many of NorthStar Clean Energy's facilities maintain NPDES permits, which are vital to the facilities' operations. NorthStar Clean Energy applies for renewal of these permits every five years. Failure of EGLE to renew any NPDES permit, a successful appeal against a permit, a change in the interpretation or scope of NPDES permitting, or onerous terms contained in a permit could have a significant detrimental effect on the operations of a facility.

Other Outlook and Uncertainties

Litigation: CMS Energy, Consumers, and certain of their subsidiaries are parties to various litigation matters, as well as to administrative proceedings before various courts and governmental agencies, arising in the ordinary course of business. For additional details regarding certain legal matters, see Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters, Note 3, Contingencies and Commitments, and Note 8, Income Taxes.

New Accounting Standards

For details regarding new accounting standards issued but not yet effective, see Notes to the Unaudited Consolidated Financial Statements—Note 1, New Accounting Standards.

CMS Energy Corporation
Consolidated Statements of Income (Unaudited)

In Millions, Except Per Share Amounts

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Operating Revenue	$ 1,829	$ 1,838	$ 4,559	$ 4,285
Operating Expenses				
Fuel for electric generation	104	134	324	351
Purchased and interchange power	455	439	906	819
Purchased power – related parties	14	30	34	48
Cost of gas sold	102	124	618	507
Maintenance and other operating expenses	464	397	912	802
Depreciation and amortization	308	288	720	676
General taxes	118	109	291	271
Total operating expenses	1,565	1,521	3,805	3,474
Operating Income	264	317	754	811
Other Income (Expense)				
Non-operating retirement benefits, net	50	47	101	89
Other income	29	95	57	109
Other expense	(4)	(5)	(8)	(11)
Total other income	75	137	150	187
Interest Charges				
Interest on long-term debt	211	199	420	386
Interest expense – related parties	3	3	6	6
Other interest expense	5	—	4	(1)
Allowance for borrowed funds used during construction	(9)	(3)	(17)	(6)
Total interest charges	210	199	413	385
Income Before Income Taxes	129	255	491	613
Income Tax Expense	33	62	118	125
Net Income	96	193	373	488
Loss Attributable to Noncontrolling Interests	(24)	(8)	(87)	(17)
Net Income Attributable to CMS Energy	120	201	460	505
Preferred Stock Dividends	3	3	5	5
Net Income Available to Common Stockholders	$ 117	$ 198	$ 455	$ 500
Basic Earnings Per Average Common Share	$ 0.38	$ 0.67	$ 1.48	$ 1.68
Diluted Earnings Per Average Common Share	$ 0.37	$ 0.66	$ 1.47	$ 1.67

The accompanying notes are an integral part of these statements.

CMS Energy Corporation

Consolidated Statements of Comprehensive Income (Unaudited)

In Millions

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Net Income	$ 96	$ 193	$ 373	$ 488
Retirement Benefits Liability				
Amortization of net actuarial loss, net of tax of $— for all periods	—	—	1	—
Other Comprehensive Income	—	—	1	—
Comprehensive Income	96	193	374	488
Comprehensive Loss Attributable to Noncontrolling Interests	(24)	(8)	(87)	(17)
Comprehensive Income Attributable to CMS Energy	$ 120	$ 201	$ 461	$ 505

The accompanying notes are an integral part of these statements.

CMS Energy Corporation
Consolidated Statements of Cash Flows (Unaudited)

In Millions

Six Months Ended June 30	2026	2025
Cash Flows from Operating Activities		
Net income	$ 373	$ 488
Adjustments to reconcile net income to net cash provided by operating activities		
Depreciation and amortization	720	676
Deferred income taxes and investment tax credits	114	124
Other non-cash operating activities and reconciling adjustments	(104)	(144)
Changes in assets and liabilities		
Accounts receivable and accrued revenue	211	80
Inventories	(34)	34
Accounts payable and accrued rate refunds	(136)	24
Other current assets and liabilities	(7)	117
Other non-current assets and liabilities	190	15
Net cash provided by operating activities	1,327	1,414
Cash Flows from Investing Activities		
Capital expenditures (excludes assets placed under finance lease)	(2,006)	(1,772)
Cost to retire property and other investing activities	(87)	(108)
Net cash used in investing activities	(2,093)	(1,880)
Cash Flows from Financing Activities		
Proceeds from issuance of debt	1,167	2,449
Retirement of debt	(883)	(841)
Decrease in notes payable	—	(65)
Issuance of common stock	528	17
Payment of dividends on common and preferred stock	(358)	(331)
Proceeds from the sale of membership interests in VIEs	—	44
Proceeds from the sale of membership interest in VIE to tax equity investor	60	—
Other financing costs	(18)	(60)
Net cash provided by financing activities	496	1,213
Net Increase (Decrease) in Cash and Cash Equivalents, Including Restricted Amounts	(270)	747
Cash and Cash Equivalents, Including Restricted Amounts, Beginning of Period	615	178
Cash and Cash Equivalents, Including Restricted Amounts, End of Period	$ 345	$ 925
Other Cash Flow Activities and Non-cash Investing and Financing Activities		
Non-cash transactions		
Capital expenditures not paid	590	537
Deemed contribution from sale of membership interest	$ 87	$ —

The accompanying notes are an integral part of these statements.

CMS Energy Corporation
Consolidated Balance Sheets (Unaudited)

ASSETS

In Millions

	June 30 2026	December 31 2025
Current Assets		
Cash and cash equivalents	$ 241	$ 509
Restricted cash and cash equivalents	104	106
Accounts receivable and accrued revenue, less allowance of $32 in 2026 and $27 in 2025	1,008	1,306
Accounts receivable – related parties	15	17
Inventories at average cost		
Gas in underground storage	414	427
Materials and supplies	345	329
Generating plant fuel stock	65	35
Deferred property taxes	350	479
Regulatory assets	81	104
Prepayments and other current assets	243	160
Total current assets	2,866	3,472
Plant, Property, and Equipment		
Plant, property, and equipment, gross	39,227	37,763
Less accumulated depreciation and amortization	10,496	10,135
Plant, property, and equipment, net	28,731	27,628
Construction work in progress	3,598	3,052
Total plant, property, and equipment	32,329	30,680
Other Non-current Assets		
Regulatory assets	3,274	3,355
Accounts receivable	18	18
Investments	63	61
Postretirement benefits	2,053	1,957
Other	302	398
Total other non-current assets	5,710	5,789
Total Assets	$ 40,905	$ 39,941

LIABILITIES AND EQUITY

In Millions

	June 30 2026	December 31 2025
Current Liabilities		
Current portion of long-term debt and finance leases	$ 870	$ 956
Accounts payable	1,223	1,395
Accounts payable – related parties	6	9
Accrued rate refunds	—	28
Accrued interest	183	182
Accrued taxes	498	708
Regulatory liabilities	96	85
Other current liabilities	187	185
Total current liabilities	3,063	3,548
Non-current Liabilities		
Long-term debt	18,172	17,807
Non-current portion of finance leases	259	135
Regulatory liabilities	4,152	4,091
Postretirement benefits	93	95
AROs	808	792
Deferred investment tax credit	116	118
Deferred income taxes	3,399	3,252
Other non-current liabilities	444	392
Total non-current liabilities	27,443	26,682
Commitments and Contingencies (Notes 2, 3, and 8)		
Equity		
Common stockholders' equity		
Common stock, authorized 700.0 shares in 2026 and 350.0 shares in 2025; outstanding 313.6 shares in 2026 and 306.4 shares in 2025	3	3
Other paid-in capital	7,036	6,510
Accumulated other comprehensive loss	(35)	(36)
Retained earnings	2,546	2,443
Total common stockholders' equity	9,550	8,920
Cumulative redeemable perpetual preferred stock, Series C, authorized 9.2 depositary shares; outstanding 9.2 depositary shares in both periods	224	224
Total stockholders' equity	9,774	9,144
Noncontrolling interests	625	567
Total equity	10,399	9,711
Total Liabilities and Equity	$ 40,905	$ 39,941

The accompanying notes are an integral part of these statements.

CMS Energy Corporation
Consolidated Statements of Changes in Equity (Unaudited)

In Millions, Except Per Share Amounts

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Total Equity at Beginning of Period	$ 10,051	$ 8,923	$ 9,711	$ 8,748
Common Stock				
At beginning and end of period	3	3	3	3
Other Paid-in Capital				
At beginning of period	6,669	5,975	6,510	6,009
Common stock issued	368	23	540	35
Common stock repurchased	(1)	—	(14)	(12)
Adjustment for sale of membership interests in VIEs	—	—	—	(34)
At end of period	7,036	5,998	7,036	5,998
Accumulated Other Comprehensive Loss				
Retirement benefits liability				
At beginning of period	(35)	(41)	(36)	(41)
Amortization of net actuarial loss	—	—	1	—
Amortization of prior service cost	—	—	—	—
At end of period	(35)	(41)	(35)	(41)
Retained Earnings				
At beginning of period	2,605	2,174	2,443	2,035
Net income attributable to CMS Energy	120	201	460	505
Dividends declared on common stock	(176)	(162)	(352)	(325)
Dividends declared on preferred stock	(3)	(3)	(5)	(5)
At end of period	2,546	2,210	2,546	2,210
Cumulative Redeemable Perpetual Preferred Stock, Series C				
At beginning and end of period	224	224	224	224
Noncontrolling Interests				
At beginning of period	585	588	567	518
Sale of membership interests in VIEs	—	—	—	78
Sale of membership interest in VIE to tax equity investor	70	—	152	—
Loss attributable to noncontrolling interests	(24)	(8)	(87)	(17)
Other changes in noncontrolling interests	(6)	(3)	(7)	(2)
At end of period	625	577	625	577
Total Equity at End of Period	$ 10,399	$ 8,971	$ 10,399	$ 8,971
Dividends declared per common share	$ 0.5700	$ 0.5425	$ 1.1400	$ 1.0850
Dividends declared per preferred stock Series C depositary share	$ 0.2625	$ 0.2625	$ 0.5250	$ 0.5250

The accompanying notes are an integral part of these statements.

Consumers Energy Company
Consolidated Statements of Income (Unaudited)

In Millions

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Operating Revenue	$ 1,726	$ 1,746	$ 4,338	$ 4,094
Operating Expenses				
Fuel for electric generation	69	113	230	306
Purchased and interchange power	434	394	853	729
Purchased power – related parties	14	30	34	48
Cost of gas sold	102	123	616	505
Maintenance and other operating expenses	429	376	845	749
Depreciation and amortization	293	276	693	651
General taxes	114	106	284	265
Total operating expenses	1,455	1,418	3,555	3,253
Operating Income	271	328	783	841
Other Income (Expense)				
Non-operating retirement benefits, net	47	45	95	84
Other income	29	19	50	29
Other expense	(7)	(4)	(10)	(7)
Total other income	69	60	135	106
Interest Charges				
Interest on long-term debt	139	131	272	253
Interest expense – related parties	12	10	26	20
Other interest expense	2	3	2	3
Allowance for borrowed funds used during construction	(9)	(3)	(17)	(5)
Total interest charges	144	141	283	271
Income Before Income Taxes	196	247	635	676
Income Tax Expense	38	59	131	142
Net Income	158	188	504	534
Preferred Stock Dividends	1	1	1	1
Net Income Available to Common Stockholder	$ 157	$ 187	$ 503	$ 533

The accompanying notes are an integral part of these statements.

Consumers Energy Company

Consolidated Statements of Comprehensive Income (Unaudited)

In Millions

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Net Income	$ 158	$ 188	$ 504	$ 534
Other Comprehensive Income	—	—	—	—
Comprehensive Income	$ 158	$ 188	$ 504	$ 534

The accompanying notes are an integral part of these statements.

Consumers Energy Company
Consolidated Statements of Cash Flows (Unaudited)

In Millions

Six Months Ended June 30	2026	2025
Cash Flows from Operating Activities		
Net income	$ 504	$ 534
Adjustments to reconcile net income to net cash provided by operating activities		
Depreciation and amortization	693	651
Deferred income taxes and investment tax credits	87	66
Other non-cash operating activities and reconciling adjustments	(102)	(80)
Changes in assets and liabilities		
Accounts and notes receivable and accrued revenue	221	95
Inventories	(37)	33
Accounts payable and accrued rate refunds	(123)	59
Other current assets and liabilities	(28)	125
Other non-current assets and liabilities	25	(4)
Net cash provided by operating activities	1,240	1,479
Cash Flows from Investing Activities		
Capital expenditures (excludes assets placed under finance lease)	(1,804)	(1,519)
Cost to retire property and other investing activities	(85)	(113)
Net cash used in investing activities	(1,889)	(1,632)
Cash Flows from Financing Activities		
Proceeds from issuance of debt	849	1,123
Retirement of debt	(175)	(57)
Decrease in notes payable	—	(65)
Decrease in notes payable – related parties	(340)	—
Stockholder contribution	855	150
Payment of dividends on common and preferred stock	(449)	(417)
Other financing costs	13	(20)
Net cash provided by financing activities	753	714
Net Increase in Cash and Cash Equivalents, Including Restricted Amounts	104	561
Cash and Cash Equivalents, Including Restricted Amounts, Beginning of Period	111	119
Cash and Cash Equivalents, Including Restricted Amounts, End of Period	$ 215	$ 680
Other Cash Flow Activities and Non-cash Investing and Financing Activities		
Non-cash transactions		
Capital expenditures not paid	$ 497	$ 425

The accompanying notes are an integral part of these statements.

Consumers Energy Company
Consolidated Balance Sheets (Unaudited)

ASSETS

In Millions

	June 30 2026	December 31 2025
Current Assets		
Cash and cash equivalents	$ 130	$ 25
Restricted cash and cash equivalents	85	86
Accounts receivable and accrued revenue, less allowance of $32 in 2026 and $27 in 2025	962	1,210
Accounts and notes receivable – related parties	8	15
Inventories at average cost		
Gas in underground storage	414	427
Materials and supplies	336	316
Generating plant fuel stock	60	31
Deferred property taxes	350	479
Regulatory assets	81	104
Prepayments and other current assets	198	132
Total current assets	2,624	2,825
Plant, Property, and Equipment		
Plant, property, and equipment, gross	37,175	36,120
Less accumulated depreciation and amortization	10,177	9,842
Plant, property, and equipment, net	26,998	26,278
Construction work in progress	3,102	2,354
Total plant, property, and equipment	30,100	28,632
Other Non-current Assets		
Regulatory assets	3,274	3,355
Accounts receivable	24	24
Accounts and notes receivable – related parties	87	88
Postretirement benefits	1,910	1,821
Other	247	346
Total other non-current assets	5,542	5,634
Total Assets	$ 38,266	$ 37,091

LIABILITIES AND EQUITY

In Millions

	June 30 2026	December 31 2025
Current Liabilities		
Current portion of long-term debt and finance leases	$ 466	$ 579
Notes payable – related parties	—	340
Accounts payable	1,100	1,229
Accounts payable – related parties	12	14
Accrued rate refunds	—	28
Accrued interest	150	149
Accrued taxes	509	747
Regulatory liabilities	96	85
Other current liabilities	146	163
Total current liabilities	2,479	3,334
Non-current Liabilities		
Long-term debt	12,308	11,524
Long-term debt – related parties	1,005	1,005
Non-current portion of finance leases	178	81
Regulatory liabilities	4,152	4,091
Postretirement benefits	68	70
AROs	763	753
Deferred investment tax credit	116	118
Deferred income taxes	3,321	3,201
Other non-current liabilities	388	336
Total non-current liabilities	22,299	21,179
Commitments and Contingencies (Notes 2, 3, and 8)		
Equity		
Common stockholder's equity		
Common stock, authorized 125.0 shares; outstanding 84.1 shares in both periods	841	841
Other paid-in capital	9,949	9,094
Accumulated other comprehensive loss	(13)	(13)
Retained earnings	2,674	2,619
Total common stockholder's equity	13,451	12,541
Cumulative preferred stock, $4.50 series, authorized 7.5 shares; outstanding 0.4 shares in both periods	37	37
Total equity	13,488	12,578
Total Liabilities and Equity	$ 38,266	$ 37,091

The accompanying notes are an integral part of these statements.

Consumers Energy Company
Consolidated Statements of Changes in Equity (Unaudited)

In Millions

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Total Equity at Beginning of Period	$ 13,016	$ 11,656	$ 12,578	$ 11,431
Common Stock				
At beginning and end of period	841	841	841	841
Other Paid-in Capital				
At beginning of period	9,494	8,324	9,094	8,174
Stockholder contribution	455	—	855	150
At end of period	9,949	8,324	9,949	8,324
Accumulated Other Comprehensive Loss				
Retirement benefits liability				
At beginning and end of period	(13)	(11)	(13)	(11)
Retained Earnings				
At beginning of period	2,657	2,465	2,619	2,390
Net income	158	188	504	534
Dividends declared on common stock	(140)	(145)	(448)	(416)
Dividends declared on preferred stock	(1)	(1)	(1)	(1)
At end of period	2,674	2,507	2,674	2,507
Cumulative Preferred Stock				
At beginning and end of period	37	37	37	37
Total Equity at End of Period	$ 13,488	$ 11,698	$ 13,488	$ 11,698

The accompanying notes are an integral part of these statements.

CMS Energy Corporation
Consumers Energy Company
Notes to the Unaudited Consolidated Financial Statements

These interim consolidated financial statements have been prepared by CMS Energy and Consumers in accordance with GAAP for interim financial information and with the instructions to Form 10-Q and Article 10 of Regulation S-X. As a result, CMS Energy and Consumers have condensed or omitted certain information and note disclosures normally included in consolidated financial statements prepared in accordance with GAAP. CMS Energy and Consumers have reclassified certain prior period amounts to conform to the presentation in the present period.

CMS Energy and Consumers are required to make estimates using assumptions that may affect reported amounts and disclosures; actual results could differ from these estimates. In management's opinion, the unaudited information contained in this report reflects all adjustments of a normal recurring nature necessary to ensure that CMS Energy's and Consumers' financial position, results of operations, and cash flows for the periods presented are fairly stated. The notes to the unaudited consolidated financial statements and the related unaudited consolidated financial statements should be read in conjunction with the consolidated financial statements and related notes contained in the 2025 Form 10-K. Due to the seasonal nature of CMS Energy's and Consumers' operations, the results presented for this interim period are not necessarily indicative of results to be achieved for the fiscal year.

1: New Accounting Standards

New Accounting Standards Not Yet Effective

ASU 2024-03, Income Statement—Reporting Comprehensive Income—Expense Disaggregation Disclosures (Subtopic 220-40): Disaggregation of Income Statement Expenses: This standard requires public companies to provide disaggregated information about certain expense categories presented on the income statement. The guidance calls for annual and interim disclosures that separate specified components, such as employee compensation, depreciation, and amortization, within relevant expense line items in the notes to the financial statements. The standard is effective for annual reporting periods beginning after December 15, 2026, and interim periods beginning after December 15, 2027, with early adoption permitted. CMS Energy and Consumers will adopt the guidance upon the effective date. The standard will not have an impact on CMS Energy's or Consumers' consolidated net income, cash flows, or financial position.

ASU 2025-06, Intangibles—Goodwill and Other—Internal-Use Software (Subtopic 350-40): Targeted Improvements to the Accounting for Internal-Use Software: This standard updates guidance for capitalizing costs related to internal-use software development. The amendments remove references to the previous "project stage" model and clarify the threshold for when capitalization should begin, focusing on whether completion of the project is probable. The amendments are effective for annual and interim reporting periods beginning after December 15, 2027. The guidance may be applied on a prospective, retrospective, or modified transition basis. Early adoption is permitted. CMS Energy and Consumers are currently evaluating the new standard.

ASU 2026-02, Environmental Credits and Environmental Credit Obligations (Topic 818): This standard establishes a comprehensive accounting model for environmental credits based on the intended use of those credits and requires recognition of certain environmental credit obligations arising from regulatory compliance programs. The guidance also expands disclosure related to environmental credit activities,

obligations, and significant estimates and judgments. The amendments are effective for annual and interim reporting periods beginning after December 15, 2027. The guidance is required to be applied on a retrospective basis through a cumulative-effect adjustment to retained earnings as of the beginning of the annual reporting period of adoption. Prior-period financial statement information will not be recast. Early adoption is permitted. CMS Energy and Consumers are currently evaluating the new standard.

2: Regulatory Matters

Regulatory matters are critical to Consumers. The Michigan Attorney General, ABATE, the MPSC Staff, residential customer advocacy groups, environmental organizations, and certain other parties typically participate in MPSC proceedings concerning Consumers, such as Consumers' rate cases and PSCR and GCR processes. Intervenors also participate in certain FERC matters, including FERC's regulation of certain wholesale rates that affect Consumers' power supply costs. These parties often challenge various aspects of those proceedings, including the prudence of Consumers' policies and practices, and seek cost disallowances and other relief. The parties also have appealed significant MPSC and FERC orders. Depending upon the specific issues, the outcomes of rate cases and proceedings, including judicial proceedings challenging MPSC and FERC orders or other actions, could negatively affect CMS Energy's and Consumers' liquidity, financial condition, and results of operations. Consumers cannot predict the outcome of these proceedings.

2025 Electric Rate Case: In June 2025, Consumers filed an application with the MPSC requesting authority to recover costs related to new infrastructure investment primarily in distribution system reliability. Consumers refined its request in October 2025, requesting an annual rate increase of $423 million, based on a 10.25-percent authorized return on equity for the projected 12-month period ending April 30, 2027. Of the annual rate increase requested, Consumers requested deferred accounting treatment for $21 million of operating and maintenance costs associated with accelerated low-voltage distribution vegetation management and $15 million associated with ERP implementation costs, resulting in a net requested annual rate increase of $387 million. Additionally, Consumers requested approval of a $24 million surcharge for the recovery of distribution investments made during the 12 months ended February 28, 2025 that exceeded the rate amounts authorized in accordance with previous electric rate orders.

In March 2026, the MPSC issued an order stating an annual rate increase of $277 million, based on a 9.90-percent authorized return on equity. The MPSC also approved deferred accounting treatment for $22 million of incremental costs associated with accelerated low-voltage distribution vegetation management and $15 million of ERP implementation costs. Additionally, the MPSC approved a $24 million surcharge for the recovery of distribution investments made during the 12 months ended February 28, 2025 that exceeded the rate amounts authorized in accordance with previous electric rate orders. The new rates became effective in May 2026.

Subsequent to issuance of the final order, Consumers identified an error affecting the calculation of the rate increase requested and reflected in the case. On a corrected basis, Consumers' requested rate increase was $328 million. Consumers' rate increase reflected in the MPSC's order was $217 million, with no change to the total revenue requirement, approved costs, or customer rates. In April 2026, the MPSC issued an Errata to its March 2026 order to reflect this correction in the public record.

Service Restoration Cost Deferral Application: As a result of catastrophic storms in Consumers' electric service territory, Consumers incurred significant service restoration costs during March 2026. In June 2026, Consumers filed with the MPSC an ex parte application requesting approval to defer, as a regulatory asset, operating and maintenance expenses associated with the storms, estimated to be

$57 million. Consumers would have the opportunity to seek appropriate recovery and ratemaking treatment for amounts recorded as a regulatory asset in a future rate case or other proceeding.

J.H. Campbell Emergency Orders: In May 2025, before the planned closure of J.H. Campbell, the U.S. Secretary of Energy issued an emergency order under section 202(c) of the Federal Power Act requiring J.H. Campbell to continue operating for 90 days, through August 20, 2025. Subsequently, the U.S. Secretary of Energy has issued four additional emergency orders for 90 days each, currently requiring continued operation of J.H. Campbell through August 16, 2026. These orders stated that continued operation of J.H. Campbell was required to meet an energy emergency across MISO's North and Central regions. Consistent with the Federal Power Act and DOE regulations, the orders authorize Consumers to obtain cost recovery at FERC.

As directed, Consumers has continued to make J.H. Campbell available in the MISO market and, in June 2025, filed a complaint at FERC seeking a modification of the MISO Tariff that would enable Consumers to recover the costs of complying with the emergency orders. Consumers' complaint sought a mechanism in the MISO Tariff that would allow allocation of those compliance costs across the MISO North and Central regions, consistent with the nature of the energy emergency declared in the U.S. Secretary of Energy orders. In August 2025, FERC granted Consumers' complaint and ordered MISO to revise its tariff accordingly. MISO submitted a compliance filing with FERC in September 2025 and FERC rejected that filing in March 2026. MISO submitted a revised compliance filing in April 2026 and FERC approval of that filing remains pending.

From the date the first emergency order became effective through June 30, 2026, the net financial impact of complying with the emergency orders was $259 million after applying MISO revenues of $239 million.

In January 2026, Consumers filed a request at FERC seeking recovery and allocation of the net financial impact of complying with the May 2025 emergency order, which was $42 million after applying MISO revenues of $78 million. FERC approval of this filing, which encompasses recovery sought by the joint owners of J.H. Campbell, remains pending.

For all subsequent emergency orders, Consumers intends to seek recovery and allocation through FERC consistent with the recovery sought for the May 2025 emergency order. The ultimate financial impact remains subject to the outcome of the FERC proceedings and any future guidance or interpretation.

Following the May 2025 emergency order, several third-party stakeholders, including the Michigan Attorney General, the Organization of MISO States, and a group of environmental and public interest groups, asked the U.S. Secretary of Energy to reconsider the May 2025 emergency order. In July 2025, after the U.S. Secretary of Energy took no action on those requests, several parties filed petitions for review of the May 2025 emergency order in federal court. The requests for rehearing were subsequently denied, and similar challenges to the subsequent orders are underway. Third parties have also challenged FERC's August 2025 order granting Consumers' complaint seeking revisions to the MISO Tariff. That legal challenge is on hold pending the separate legal challenges to the emergency orders. The U.S. Secretary of Energy will likely issue more orders to require the continued operation of J.H. Campbell. While the timing and content of future orders and the outcome of third-party legal challenges are not yet known, Consumers is committed to pursuing cost recovery as provided for under applicable laws, orders, and proceedings.

3: Contingencies and Commitments

CMS Energy and Consumers are involved in various matters that give rise to contingent liabilities. Depending on the specific issues, the resolution of these contingencies could negatively affect CMS Energy's and Consumers' liquidity, financial condition, and results of operations. In their disclosures of these matters, CMS Energy and Consumers provide an estimate of the possible loss or range of loss when such an estimate can be made. Disclosures stating that CMS Energy or Consumers cannot predict the outcome of a matter indicate that they are unable to estimate a possible loss or range of loss for the matter.

CMS Energy Contingencies

CMS Land retained environmental remediation obligations for the collection and treatment of leachate at Bay Harbor after selling its interests in the development in 2002. Leachate is produced when water enters into cement kiln dust piles left over from former cement plant operations at the site. In 2012, CMS Land and EGLE finalized an agreement establishing the final remedies and the future water quality criteria at the site. CMS Land completed all construction necessary to implement the remedies required by the agreement and will continue to maintain and operate a system to discharge treated leachate into Little Traverse Bay under an NPDES permit, which was valid through 2025. CMS Land submitted a renewal request in March 2025, and will continue to operate under the existing permit until a renewal is issued.

At June 30, 2026, CMS Energy had a recorded liability of $47 million for its remaining obligations for environmental remediation. CMS Energy calculated this liability based on discounted projected costs, using a discount rate of 4.34 percent and an inflation rate of 1 percent on annual operating and maintenance costs. The undiscounted amount of the remaining obligation is $60 million. CMS Energy expects to pay the following amounts for long-term leachate disposal and operating and maintenance costs during the remainder of 2026 and in each of the next five years:

In Millions

	2026	2027	2028	2029	2030	2031
Long-term leachate disposal and operating and maintenance costs	$ 2	$ 4	$ 4	$ 4	$ 4	$ 4

CMS Energy's estimate of response activity costs and the timing of expenditures could change if there are changes in circumstances or assumptions used in calculating the liability. Although a liability for its present estimate of remaining response activity costs has been recorded, CMS Energy cannot predict the ultimate financial impact or outcome of this matter.

Consumers Electric Utility Contingencies

Electric Environmental Matters: Consumers' operations are subject to environmental laws and regulations. Historically, Consumers has generally been able to recover, in customer rates, the costs to operate its facilities in compliance with these laws and regulations.

Cleanup and Solid Waste: Consumers expects to incur remediation and other response activity costs at a number of sites under NREPA. Consumers believes that these costs should be recoverable in rates, but cannot guarantee that outcome. Consumers estimates its liability for NREPA sites for which it can estimate a range of loss to be between $2 million and $3 million. At June 30, 2026, Consumers had a recorded liability of $2 million, the minimum amount in the range of its estimated probable NREPA liability, as no amount in the range was considered a better estimate than any other amount.

Consumers is a potentially responsible party at a number of contaminated sites subject to response actions under CERCLA. CERCLA liability may exist at Superfund sites as well as other current, former, or potential response sites. From time to time, Consumers receives notices, information requests, or other communications from governmental agencies or third parties regarding alleged or potential responsibility for contamination at certain current or former electric generating sites or other locations.

In 2010, Consumers received official notification from the EPA that identified Consumers as a potentially responsible party for cleanup of PCBs at the Kalamazoo River CERCLA site. The notification claimed that the EPA had reason to believe that Consumers disposed of PCBs and arranged for the disposal and treatment of PCB-containing materials at portions of the site. In 2011, Consumers received a follow-up letter from the EPA requesting that Consumers agree to participate in a removal action plan along with several other companies for an area of lower Portage Creek, which is connected to the Kalamazoo River. All parties asked to participate in the removal action plan, including Consumers, declined to accept liability. Until further information is received from the EPA, Consumers is unable to estimate a range of potential liability for cleanup of the river.

Based on its experience, Consumers estimates its share of the total liability for known CERCLA sites to be between $21 million and $57 million. Various factors, including the number and creditworthiness of potentially responsible parties involved with each site, affect Consumers' share of the total liability. At June 30, 2026, Consumers had a recorded liability of $21 million for its share of the total liability at these sites, the minimum amount in the range of its estimated probable CERCLA liability, as no amount in the range was considered a better estimate than any other amount.

The timing of payments related to Consumers' remediation and other response activities at its CERCLA and NREPA sites is uncertain. Consumers periodically reviews these cost estimates. A change in the underlying assumptions, such as an increase in the number of sites, different remediation techniques, the nature and extent of contamination, and legal and regulatory requirements, could affect its estimates of NREPA and CERCLA liability.

Ludington Overhaul Contract Dispute: Consumers and DTE Electric, co-owners of Ludington, entered into a 2010 engineering, procurement, and construction agreement with Toshiba International, under which Toshiba International contracted to perform a major overhaul and upgrade of Ludington. Toshiba International later assigned the contract and all of its obligations to TAES. TAES' work under the contract was incomplete, defective, and non-conforming. Consumers and DTE Electric repeatedly documented TAES' failure to perform under the contract and demanded that TAES provide a comprehensive plan to resolve those matters, including adherence to its warranty commitments and other contractual obligations. Consumers and DTE Electric engaged in extensive efforts to resolve these issues with TAES, including formal demands to TAES' parent, Toshiba, under a parent guaranty it provided. TAES did not provide a comprehensive plan or otherwise meet its performance obligations. As a result of TAES' defaults, Consumers and DTE Electric terminated the contract.

In order to enforce their rights under the contract and parent guaranty, and to pursue appropriate damages, Consumers and DTE Electric filed a complaint against TAES and Toshiba in the U.S. District Court for the Eastern District of Michigan in 2022. TAES and Toshiba filed a motion to dismiss the complaint, along with an answer and counterclaims seeking approximately $15 million in damages related to payments allegedly owed under the parties' contract. The court denied the motion to dismiss filed by TAES and Toshiba.

The case against TAES went to trial before a jury and, in December 2025, the jury rendered a verdict in Consumers' and DTE Electric's favor. The jury found that TAES breached the parties' contract and awarded damages of $383 million. The parties separately stipulated to $11 million in additional liquidated damages for late performance by TAES. These amounts are subject to pre- and post-judgment interest. In

addition, the jury rejected TAES' counterclaim, determining that Consumers and DTE Electric did not breach the contract. The parent guaranty provided by Toshiba allows Consumers and DTE Electric to recover legal costs in addition to damages. The parties are still engaged in post-verdict proceedings at the District Court and the jury verdict may be appealed; these processes could take two years or more to conclude with finality. Notwithstanding the favorable jury verdict for Consumers, the ultimate outcome remains subject to the related additional proceedings, which could have a material adverse effect on CMS Energy's and Consumers' financial condition, results of operations, or liquidity. Additionally, Consumers and DTE Electric must still resolve their claim against Toshiba under the parent guaranty, which is still pending but which was bifurcated by the Court from the claims against TAES.

Previously, Toshiba announced that TBJH became the majority shareholder and new parent company of Toshiba through a common stock purchase. TBJH is a subsidiary of a Japanese private equity firm. Consumers and DTE Electric do not believe that this affects their rights under the parent guaranty provided by Toshiba.

With MPSC approval, Consumers and DTE Electric were authorized to defer as a regulatory asset the costs associated with repairing or replacing the defective work performed by TAES while the litigation with TAES and Toshiba remains pending. Consumers currently estimates that its share of repair, replacement, and other damages resulting from TAES' defective work is approximately $350 million, which is expected to be offset in part or entirely by future litigation proceeds received from TAES or Toshiba. Consumers and DTE Electric will have the opportunity to seek appropriate recovery and ratemaking treatment for amounts recorded as a regulatory asset following final resolution of the litigation and appeals, including any amounts not recovered from TAES or Toshiba. Consumers cannot predict the financial impact or outcome of such proceedings.

Consumers Gas Utility Contingencies

Consumers expects to incur remediation and other response activity costs at a number of sites under NREPA. These sites include 23 former MGP facilities. Consumers operated the facilities on these sites for some part of their operating lives. For some of these sites, Consumers has no present ownership interest or may own only a portion of the original site.

At June 30, 2026, Consumers had a recorded liability of $58 million for its remaining obligations for these sites. Consumers expects to pay the following amounts for remediation and other response activity costs during the remainder of 2026 and in each of the next five years:

In Millions

	2026	2027	2028	2029	2030	2031
Remediation and other response activity costs	$ 2	$ 8	$ 25	$ 11	$ 3	$ 1

Consumers periodically reviews these cost estimates. Any significant change in the underlying assumptions, such as an increase in the number of sites, changes in remediation techniques, or legal and regulatory requirements, could affect Consumers' estimates of annual response activity costs and the MGP liability.

Pursuant to orders issued by the MPSC, Consumers defers its MGP-related remediation costs and recovers them from its customers over a ten-year period. At June 30, 2026, Consumers had a regulatory asset of $78 million related to the MGP sites.

Guarantees

Presented in the following table are CMS Energy's and Consumers' guarantees at June 30, 2026:

In Millions

Guarantee Description	Issue Date	Expiration Date	Maximum Obligation	Carrying Amount
CMS Energy, including Consumers				
Indemnity obligations from sale of membership interests in VIEs[1]	various	various	$ 229	$ —
Indemnity obligations from stock and asset sale agreements[2]	various	indefinite	152	—
Guarantee[3]	2011	indefinite	30	—
Consumers				
Guarantee[3]	2011	indefinite	$ 30	$ —

1 These obligations arose from the sale of membership interests in Aviator Wind, BG Solar Holdings, HL Solar Holdings, Newport Solar Holdings, and NWO Holdco to tax equity investors. NorthStar Clean Energy provided certain indemnity obligations that protect the tax equity investors against losses incurred as a result of breaches of representations and warranties under the associated limited liability company agreements. These obligations are generally capped at an amount equal to the tax equity investor's capital contributions plus a specified return, less any distributions and tax benefits it receives, in connection with its membership interest. For any indemnity obligations related to Aviator Wind, NorthStar Clean Energy would recover 49 percent of any amounts paid to the tax equity investor from the other owner of Aviator Wind Equity Holdings. Additionally, Aviator Wind holds insurance coverage that would partially protect against losses incurred as a result of certain failures to qualify for production tax credits. For further details on NorthStar Clean Energy's ownership interest in these entities, see Note 12, Variable Interest Entities.

2 These obligations arose from stock and asset sale agreements under which CMS Energy or a subsidiary of CMS Energy indemnified the purchaser for losses resulting from various matters, including claims related to taxes. The maximum obligation amount is mostly related to an Equatorial Guinea tax claim.

3 This obligation comprises a guarantee provided by Consumers to the DOE in connection with a settlement agreement regarding damages resulting from the department's failure to accept spent nuclear fuel from nuclear power plants formerly owned by Consumers.

Additionally, in the normal course of business, CMS Energy, Consumers, and certain other subsidiaries of CMS Energy have entered into various agreements containing tax and other indemnity provisions for which they are unable to estimate the maximum potential obligation. CMS Energy and Consumers consider the likelihood that they would be required to perform or incur substantial losses related to these indemnities and those disclosed in the table to be remote.

Other Contingencies

In addition to the matters disclosed in this Note and Note 2, Regulatory Matters, there are certain other lawsuits and administrative proceedings before various courts and governmental agencies, as well as unasserted claims that may result in such proceedings, arising in the ordinary course of business to which CMS Energy, Consumers, and certain other subsidiaries of CMS Energy are parties. These other lawsuits, proceedings, and unasserted claims may involve personal injury, property damage, contracts, environmental matters, federal and state taxes, rates, licensing, employment, and other matters. Certain of these matters, while potentially substantial, are covered by insurance and the insurer or insurers are involved in the relevant proceedings. Further, CMS Energy and Consumers occasionally self-report

certain regulatory non-compliance matters that may or may not eventually result in administrative proceedings. CMS Energy and Consumers believe that the outcome of any one of these proceedings and potential claims will not have a material negative effect on their consolidated results of operations, financial condition, or liquidity.

4: Financings and Capitalization

Financings: Presented in the following table is a summary of major long-term debt issuances during the six months ended June 30, 2026:

		Principal (In Millions)	Interest Rate (%)	Issuance Date	Maturity Date
NorthStar Clean Energy					
Term loan[1]	$	24	variable	April 2026	June 2031
Term loan[1]		90	variable	June 2026	June 2031
Construction financing agreement[2]		252	variable	March 2026	Five years after conversion date
Total NorthStar Clean Energy	$	366			
Consumers					
First mortgage bonds	$	850	5.125	May 2026	May 2036
Total Consumers	$	850			
Total CMS Energy	$	1,216			

1 At completion of project construction, NorthStar Clean Energy converted construction financing agreements into term loans.

2 At completion of project construction, scheduled for the second half of 2026, NorthStar Clean Energy expects to convert $133 million of these outstanding borrowings into term loans maturing five years after the conversion date and to repay the remaining $119 million.

Retirements: Presented in the following table is a summary of major long-term debt retirements during the six months ended June 30, 2026:

		Principal (In Millions)	Interest Rate (%)	Retirement Date	Maturity Date
CMS Energy, parent only					
Senior notes	$	300	3.000	May 2026	May 2026
Total CMS Energy, parent only	$	300			
NorthStar Clean Energy					
Construction financing agreement[1]	$	270	variable	June 2026	June 2026
Total NorthStar Clean Energy	$	270			
Consumers					
First mortgage bonds	$	115	5.240	May 2026	May 2026
Total Consumers	$	115			
Total CMS Energy	$	685			

1 At completion of project construction, NorthStar Clean Energy converted $114 million of the construction financing agreements into term loans and repaid the remaining $156 million.

Credit Facilities: The following credit facilities with banks were available at June 30, 2026:

In Millions

Expiration Date	Amount of Facility	Amount Borrowed	Letters of Credit Outstanding	Amount Available
CMS Energy, parent only				
Unsecured revolving credit facility, expiring November 2030[1]	$ 750	$ —	$ 35	$ 715
Unsecured letter of credit facility, expiring September 2026	50	—	49	1
NorthStar Clean Energy				
Secured revolving credit facility, expiring May 2028[2]	$ 300	$ —	$ 137	$ 163
Secured letter of credit facility, expiring September 2028[3]	37	—	37	—
Secured revolving credit facility, expiring May 2029[4]	75	—	—	75
Secured letter of credit facility[5]	19	—	19	—
Secured letter of credit facility[6]	22	—	7	15
Consumers				
Secured revolving credit facility, expiring November 2030[1,7]	$ 1,100	$ —	$ 53	$ 1,047
Secured revolving credit facility, expiring November 2028[1,7]	300	—	—	300
Secured letter of credit facility, expiring May 2027[1,7]	100	—	100	—
Unsecured letter of credit facility, expiring March 2028	50	—	41	9
Unsecured letter of credit facility[8]	97	—	97	—
Unsecured letter of credit facility[8]	125	—	125	—
Unsecured letter of credit facility[8]	106	—	106	—

1 There were no borrowings under this facility during the six months ended June 30, 2026.

2 Obligations under this facility are secured by certain pledged equity interests in subsidiaries of NorthStar Clean Energy; under the terms of this facility, the interests may not be sold by NorthStar Clean Energy unless there is an agreed-upon substitution for the pledged equity interests. At June 30, 2026, the net book value of the pledged equity interests was $622 million. Also under the terms of this facility, NorthStar Clean Energy may be restricted from remitting cash dividends to CMS Energy in the event of default.

3 This letter of credit facility is available to a subsidiary of Aviator Wind Equity Holdings and is secured by assets of Aviator Wind. For more information regarding Aviator Wind Equity Holdings and Aviator Wind, see Note 12, Variable Interest Entities.

4 This letter of credit facility is available to a subsidiary of NorthStar Clean Energy and is secured by development assets.

5 The letter of credit facility is available to certain subsidiaries of NorthStar Clean Energy and is secured under term loans maturing in June 2031.

[6] The letter of credit facility is available to certain subsidiaries of NorthStar Clean Energy and is secured under a construction-to-term financing agreement. It will expire five years after the term conversion date.

[7] Obligations under these facilities are secured by first mortgage bonds of Consumers.

[8] Letters of credit issued under this uncommitted letter of credit facility have expiration dates with automatic renewal provisions.

Regulatory Authorization for Financings: Consumers is required to maintain FERC authorization for financings. Any long-term issuances during the authorization period are exempt from FERC's competitive bidding and negotiated placement requirements. In April 2026, FERC approved Consumers' application for authority to issue long-term and short-term debt securities. The authorization is effective May 1, 2026 through April 30, 2028.

Short-term Borrowings: Under Consumers' commercial paper program, Consumers may issue, in one or more placements, investment-grade commercial paper notes with maturities of up to 365 days at market interest rates. These issuances are supported by Consumers' revolving credit facilities and may have an aggregate principal amount outstanding of up to $500 million. While the amount of outstanding commercial paper does not reduce the available capacity of the revolving credit facilities, Consumers does not intend to issue commercial paper in an amount exceeding the available capacity of the facilities. At June 30, 2026, there were no commercial paper notes outstanding under this program.

In December 2025, Consumers renewed a short-term credit agreement with CMS Energy, permitting Consumers to borrow up to $500 million at an interest rate of the prior month's average one-month Term SOFR minus 0.100 percent. In March 2026, Consumers increased the limit at which it could borrow under the agreement to $750 million. At June 30, 2026, there were no outstanding borrowings under the agreement.

NorthStar Clean Energy's Supplier Financing Program: Under a supplier financing program, NorthStar Clean Energy agrees to pay a bank that is acting as its payment agent the stated amount of confirmed invoices from participating suppliers on the original maturity dates of the invoices. The bank is required to pay the supplier invoices that have been confirmed as valid under the program in full within 135 days of the invoice date. NorthStar Clean Energy does not provide collateral or a guarantee to the bank in support of its payment obligations under the agreement, nor does it pay a fee for the service. NorthStar Clean Energy or the bank may terminate the supplier financing program agreement upon 30 days prior written notice to the other party. Obligations under this program, which are accounted for in accounts payable on CMS Energy's consolidated balance sheets, were $45 million at June 30, 2026 and $78 million at December 31, 2025.

Dividend Restrictions: At June 30, 2026, payment of dividends by CMS Energy on its common stock was limited to $9.6 billion under provisions of the Michigan Business Corporation Act of 1972.

Under the provisions of its articles of incorporation, at June 30, 2026, Consumers had $2.6 billion of unrestricted retained earnings available to pay dividends on its common stock to CMS Energy. Provisions of the Federal Power Act and the Natural Gas Act appear to restrict dividends payable by Consumers to the amount of Consumers' retained earnings. Several decisions from FERC suggest that, under a variety of circumstances, dividends from Consumers on its common stock would not be limited to amounts in Consumers' retained earnings. Any decision by Consumers to pay dividends on its common stock in excess of retained earnings would be based on specific facts and circumstances and would be subject to a formal regulatory filing process.

During the six months ended June 30, 2026, Consumers paid $448 million in dividends on its common stock to CMS Energy.

Issuance of Common Stock: In 2023, CMS Energy entered into an equity offering program under which it could sell shares of its common stock having an aggregate sales price of up to $1 billion in privately negotiated transactions, in “at the market” offerings, or through forward sales transactions.

During the six months ended June 30, 2026, CMS Energy entered into forward sale agreements for approximately 6.4 million shares at a weighted average initial forward price of $75.63 per share. During the same period, CMS Energy settled all of the remaining forward sale contracts under this program by issuing approximately 6.5 million shares at a weighted average price of $75.80 per share, resulting in net proceeds of $495 million. CMS Energy has fully utilized the program and does not have any remaining capacity available for future issuances under the 2023 equity offering program.

In May 2026, CMS Energy entered into an equity offering program under which it may sell shares of its common stock having an aggregate sales price of up to $3 billion in privately negotiated transactions, in “at the market” offerings, or through forward sales transactions. There have been no sales of securities under this program.

Under the forward sales transactions, CMS Energy may either settle physically by issuing shares of its common stock at the then-applicable forward sale price specified by the agreement or settle net by delivering or receiving cash or shares. CMS Energy may settle the contracts at any time through their maturity dates, and presently intends to physically settle the contracts by delivering shares of its common stock.

The initial forward price in the forward equity sale contracts includes a deduction for commissions and will be adjusted on a daily basis over the term based on an interest rate factor. The forward price will also be reduced on certain dates by certain predetermined amounts to reflect expected dividend payments. No amounts are recorded on CMS Energy’s consolidated balance sheets until settlements of the forward equity sale contracts occur.

5: Fair Value Measurements

Accounting standards define fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. When measuring fair value, CMS Energy and Consumers are required to incorporate all assumptions that market participants would use in pricing an asset or liability, including assumptions about risk. A fair value hierarchy prioritizes inputs used to measure fair value according to their observability in the market. The three levels of the fair value hierarchy are as follows:

- Level 1 inputs are unadjusted quoted prices in active markets for identical assets or liabilities.
- Level 2 inputs are observable, market-based inputs, other than Level 1 prices. Level 2 inputs may include quoted prices for similar assets or liabilities in active markets, quoted prices in inactive markets, and inputs derived from or corroborated by observable market data.
- Level 3 inputs are unobservable inputs that reflect CMS Energy’s or Consumers’ own assumptions about how market participants would value their assets and liabilities.

CMS Energy and Consumers classify fair value measurements within the fair value hierarchy based on the lowest level of input that is significant to the fair value measurement in its entirety.

Assets and Liabilities Measured at Fair Value on a Recurring Basis

Presented in the following table are CMS Energy's and Consumers' assets and liabilities recorded at fair value on a recurring basis:

In Millions

	CMS Energy, including Consumers		Consumers	
	June 30 2026	December 31 2025	June 30 2026	December 31 2025
Assets[1]				
Cash equivalents	$ 35	$ 154	$ —	$ —
Restricted cash equivalents	104	106	85	86
Nonqualified deferred compensation plan assets	38	36	29	27
Derivative instruments	3	2	3	2
Total assets	$ 180	$ 298	$ 117	$ 115
Liabilities[1]				
Nonqualified deferred compensation plan liabilities	$ 38	$ 36	$ 29	$ 27
Derivative instruments	2	3	—	—
Total liabilities	$ 40	$ 39	$ 29	$ 27

[1] All assets and liabilities were classified as Level 1 with the exception of derivative contracts, which were classified as Level 2 and 3.

Cash Equivalents: Cash equivalents and restricted cash equivalents consist of money market funds with daily liquidity.

Nonqualified Deferred Compensation Plan Assets and Liabilities: The nonqualified deferred compensation plan assets consist of mutual funds, which are bought and sold only at the discretion of plan participants. The assets are valued using the daily quoted net asset values. CMS Energy and Consumers value their nonqualified deferred compensation plan liabilities based on the fair values of the plan assets, as they reflect the amount owed to the plan participants in accordance with their investment elections. CMS Energy and Consumers report the assets in other non-current assets and the liabilities in other non-current liabilities on their consolidated balance sheets.

Derivative Instruments: CMS Energy and Consumers value their derivative instruments using either a market approach that incorporates information from market transactions, or an income approach that discounts future expected cash flows to a present value amount. CMS Energy's and Consumers' derivatives are classified as Level 2 and 3.

The derivatives classified as Level 2 are interest rate swaps at NorthStar Clean Energy, which are valued using market-based inputs.

Subsidiaries of NorthStar Clean Energy have entered into floating-to-fixed interest rate swaps to reduce the impact of interest rate fluctuations associated with interest payments on certain future long-term variable-rate debt. The interest rate swaps economically hedge the future variability of interest payments on debt with a notional amount of $209 million. Gains or losses on these swaps are reported in other expense on CMS Energy's consolidated statements of income. The amount recorded in other expense was $2 million for the three months ended June 30, 2026 and $1 million for the three months ended

June 30, 2025. The amount recorded in other expense was $2 million for the six months ended June 30, 2026 and $4 million for the six months ended June 30, 2025. The fair value of these swaps recorded in other liabilities on CMS Energy's consolidated balance sheets totaled less than $1 million at June 30, 2026 and totaled $3 million at December 31, 2025.

The majority of derivatives classified as Level 3 are FTRs held by Consumers. Due to the lack of quoted pricing information, Consumers determines the fair value of its FTRs based on Consumers' average historical settlements. Consumers reports derivatives associated with FTRs in other current assets on its consolidated balance sheets. There was no material activity within the Level 3 category of derivatives during the periods presented.

6: Financial Instruments

Presented in the following table are the carrying amounts and fair values, by level within the fair value hierarchy, of CMS Energy's and Consumers' financial instruments that are not recorded at fair value. The table excludes cash, cash equivalents, short-term financial instruments, and trade accounts receivable and payable whose carrying amounts approximate their fair values. For information about assets and liabilities recorded at fair value and for additional details regarding the fair value hierarchy, see Note 5, Fair Value Measurements.

In Millions

	June 30, 2026					December 31, 2025				
		Fair Value					Fair Value			
			Level					Level		
	Carrying Amount	Total	1	2	3	Carrying Amount	Total	1	2	3
CMS Energy, including Consumers										
Assets										
Long-term receivables[1]	$ 6	$ 5	$ —	$ —	$ 5	$ 7	$ 6	$ —	$ —	$ 6
Liabilities										
Long-term debt[2]	19,036	18,438	1,984	14,643	1,811	18,757	17,645	2,042	13,663	1,940
Long-term payables[3]	6	6	—	—	6	7	7	—	—	7
Consumers										
Assets										
Long-term receivables[1]	$ 6	$ 5	$ —	$ —	$ 5	$ 7	$ 6	$ —	$ —	$ 6
Notes receivable – related party[4]	89	89	—	—	89	90	90	—	—	90
Liabilities										
Long-term debt[5]	12,769	12,209	—	10,398	1,811	12,097	11,031	—	9,091	1,940
Long-term debt – related party[6]	1,005	649	—	649	—	1,005	657	—	657	—
Long-term payables	1	1	—	—	1	2	2	—	—	2

[1] Includes current portion of long-term accounts receivable and notes receivable of $2 million at June 30, 2026 and $3 million at December 31, 2025.

[2] Includes current portion of long-term debt of $864 million at June 30, 2026 and $950 million at December 31, 2025.

[3] Includes current portion of long-term payables of $1 million at June 30, 2026 and $2 million at December 31, 2025.

[4] Includes current portion of notes receivable – related party of $7 million at June 30, 2026 and December 31, 2025.

[5] Includes current portion of long-term debt of $461 million at June 30, 2026 and $573 million at December 31, 2025.

[6] For more information on CMS Energy's repurchases of Consumers' first mortgage bonds, see Note 4, Financings and Capitalization—CMS Energy's Purchase of Consumers' First Mortgage Bonds.

Notes receivable – related party represents Consumers' portion of the DB SERP demand note payable issued by CMS Energy to the DB SERP rabbi trust. The demand note bears interest at an annual rate of 4.10 percent and has a maturity date of 2028.

7: Retirement Benefits

CMS Energy and Consumers provide pension, OPEB, and other retirement benefits to eligible employees under a number of different plans.

Costs: Presented in the following table are the costs (credits) and other changes in plan assets and benefit obligations incurred in CMS Energy's and Consumers' retirement benefit plans:

In Millions

	DB Pension Plans				OPEB Plan			
	Three Months Ended		Six Months Ended		Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025	2026	2025	2026	2025
CMS Energy, including Consumers								
Net periodic credit								
Service cost	$ 6	$ 7	$ 12	$ 13	$ 2	$ 2	$ 4	$ 4
Interest cost	25	27	50	54	9	11	19	22
Expected return on plan assets	(59)	(57)	(119)	(114)	(31)	(28)	(62)	(56)
Amortization of:								
Net loss	3	2	7	5	—	1	—	2
Prior service cost (credit)	1	1	2	2	(8)	(8)	(16)	(17)
Settlement loss	2	2	5	5	—	—	—	—
Net periodic credit	$ (22)	$ (18)	$ (43)	$ (35)	$ (28)	$ (22)	$ (55)	$ (45)
Consumers								
Net periodic credit								
Service cost	$ 6	$ 6	$ 12	$ 12	$ 2	$ 2	$ 4	$ 4
Interest cost	24	25	47	51	9	11	19	21
Expected return on plan assets	(56)	(54)	(112)	(108)	(29)	(26)	(58)	(52)
Amortization of:								
Net loss	3	3	6	5	—	1	—	2
Prior service cost (credit)	1	1	2	2	(8)	(9)	(16)	(17)
Settlement loss	2	2	5	5	—	—	—	—
Net periodic credit	$ (20)	$ (17)	$ (40)	$ (33)	$ (26)	$ (21)	$ (51)	$ (42)

In Consumers' electric and gas rate cases, the MPSC approved a mechanism allowing Consumers to defer for future recovery or refund pension and OPEB expenses above or below the amounts used to set existing rates. Amounts deferred will be collected from or refunded to customers over ten years. At June 30, 2026, CMS Energy, including Consumers, had deferred $4 million of pension credits and $6 million of OPEB credits under this mechanism related to 2026 expense. At June 30, 2025, CMS Energy, including Consumers, had deferred less than $1 million of pension credits and $5 million of OPEB credits under this mechanism related to 2025 expense.

8: Income Taxes

Presented in the following table is a reconciliation of the statutory U.S. federal income tax rate to the effective income tax rate from continuing operations:

Six Months Ended June 30	2026	2025
CMS Energy, including Consumers		
Income tax expense at statutory rate	21.0 %	21.0 %
Increase (decrease) in income taxes from:		
State and local income taxes, net of federal income tax effect[1]	5.5	7.2
Tax credits		
Renewable energy tax credits	(5.5)	(5.7)
Other	(0.6)	(0.2)
Nontaxable or nondeductible items	0.2	0.2
Changes in unrecognized tax benefits[2]	3.9	0.5
Other adjustments		
Taxes attributable to noncontrolling interests	4.3	1.3
TCJA excess deferred taxes	(3.3)	(3.6)
Property differences	(1.4)	(0.5)
Other, net	(0.1)	0.2
Effective tax rate	24.0 %	20.4 %
Consumers		
Income tax expense at statutory rate	21.0 %	21.0 %
Increase (decrease) in income taxes from:		
State and local income taxes, net of federal income tax effect[1]	4.6	6.7
Tax credits		
Renewable energy tax credits	(4.3)	(3.3)
Other	(0.5)	(0.4)
Nontaxable or nondeductible items	0.2	0.2
Changes in unrecognized tax benefits[2]	3.0	0.4
Other adjustments		
TCJA excess deferred taxes	(2.5)	(3.0)
Property differences	(1.1)	(0.3)
Other, net	0.2	(0.3)
Effective tax rate	20.6 %	21.0 %

[1] In June 2025, state deferred tax balances were increased by $12 million to reflect a change in Illinois tax policy that establishes nexus for Consumers. The policy change is effective for tax years beginning January 1, 2026.

[2] The change in unrecognized tax benefits was primarily associated with Consumers' state income tax claim.

State Income Tax Claim: In February 2025, CMS Energy received an adverse ruling from the Michigan Tax Tribunal in regards to the methodology of state apportionment for Consumers' electricity sales to MISO. In March 2025, CMS Energy filed an appeal with the Michigan Court of Appeals. The Court issued an opinion in the appeal in February 2026, affirming the Michigan Tax Tribunal's ruling. In June 2026, CMS Energy filed a request for leave to appeal the Michigan Court of Appeals' decision to the

Michigan Supreme Court. CMS Energy is currently awaiting the Court's decision on whether to grant review.

CMS Energy and Consumers evaluated and increased their uncertain tax positions associated with this matter, recognizing a $19 million increase to income tax expense during 2026. While CMS Energy and Consumers are confident in the merits of their position, if the appeal to the Michigan Supreme Court was unsuccessful, the companies would be required to revise the estimated value of their state deferred tax liabilities, which could result in a material impact to their results of operations.

9: Earnings Per Share—CMS Energy

Presented in the following table are CMS Energy's basic and diluted EPS computations based on income from continuing operations:

In Millions, Except Per Share Amounts

	Three Months Ended		Six Months Ended	
June 30	2026	2025	2026	2025
Income available to common stockholders				
Income from continuing operations	$ 96	$ 193	$ 373	$ 488
Less loss attributable to noncontrolling interests	(24)	(8)	(87)	(17)
Less preferred stock dividends	3	3	5	5
Income from continuing operations available to common stockholders – basic and diluted	$ 117	$ 198	$ 455	$ 500
Average common shares outstanding				
Weighted-average shares – basic	310.2	298.5	308.3	298.4
Add dilutive nonvested stock awards	0.3	0.6	0.3	0.6
Add dilutive contingently convertible securities	0.3	—	0.3	—
Weighted-average shares – diluted	310.8	299.1	308.9	299.0
Income from continuing operations per average common share available to common stockholders				
Basic	$ 0.38	$ 0.67	$ 1.48	$ 1.68
Diluted	0.37	0.66	1.47	1.67

Nonvested Stock Awards

CMS Energy's nonvested stock awards are composed of participating and non-participating securities. The participating securities accrue cash dividends when common stockholders receive dividends. Since the recipient is not required to return the dividends to CMS Energy if the recipient forfeits the award, the nonvested stock awards are considered participating securities. As such, the participating nonvested stock awards were included in the computation of basic EPS. The non-participating securities accrue stock dividends that vest concurrently with the stock award. If the recipient forfeits the award, the stock dividends accrued on the non-participating securities are also forfeited. Accordingly, the non-participating awards and stock dividends were included in the computation of diluted EPS, but not in the computation of basic EPS.

Forward Equity Sale Contracts

CMS Energy has entered and settled forward equity sale contracts. These forward equity sale contracts are non-participating securities. While the forward sale price in the forward equity sale contract is decreased on certain dates by certain predetermined amounts to reflect expected dividend payments, these price adjustments were set upon inception of the agreement and the forward contract does not give the owner the right to participate in undistributed earnings. Accordingly, the forward equity sale contracts were included in the computation of diluted EPS, but not in the computation of basic EPS. The impact to diluted EPS was de minimis.

The potentially dilutive impact from these forward equity sale contracts is reflected in diluted EPS using the treasury stock method. There will be a dilutive effect on EPS when the average market price of common stock shares is above the applicable adjusted forward sale price. Additionally, any physical settlement or net share settlement of the agreements would dilute EPS. For further details on the forward equity sale contracts, see Note 4, Financings and Capitalization.

Convertible Securities

CMS Energy has issued convertible senior notes. Potentially dilutive common shares issuable upon conversion of the convertible senior notes are determined using the if-converted method for calculating diluted EPS. Upon conversion, the convertible senior notes are required to be paid in cash with only amounts exceeding the principal permitted to be settled in shares. Accordingly, the convertible senior notes were included in the computation of diluted EPS, but not in the computation of basic EPS.

10: Revenue

Presented in the following tables are the components of operating revenue:

In Millions

Three Months Ended June 30, 2026	Electric Utility	Gas Utility	NorthStar Clean Energy[1]	Consolidated
CMS Energy, including Consumers				
Consumers utility revenue	$ 1,333	$ 386	$ —	$ 1,719
Other	—	—	89	89
Revenue recognized from contracts with customers	$ 1,333	$ 386	$ 89	$ 1,808
Leasing income	—	—	14	14
Financing income	3	2	—	5
Consumers alternative-revenue programs	2	—	—	2
Total operating revenue – CMS Energy	$ 1,338	$ 388	$ 103	$ 1,829
Consumers				
Consumers utility revenue				
Residential	$ 629	$ 279		$ 908
Commercial	467	81		548
Industrial	188	7		195
Other	49	19		68
Revenue recognized from contracts with customers	$ 1,333	$ 386		$ 1,719
Financing income	3	2		5
Alternative-revenue programs	2	—		2
Total operating revenue – Consumers	$ 1,338	$ 388		$ 1,726

[1] Amounts represent NorthStar Clean Energy's operating revenue from independent power production and its sales of energy commodities. Certain of NorthStar Clean Energy's power sales agreements are accounted for as operating leases. In addition to fixed payments, these agreements have variable payments based on energy delivered. NorthStar Clean Energy's leasing income included variable lease payments of $9 million for the three months ended June 30, 2026.

In Millions

Three Months Ended June 30, 2025	Electric Utility	Gas Utility	NorthStar Clean Energy[1]	Consolidated
CMS Energy, including Consumers				
Consumers utility revenue	$ 1,355	$ 385	$ —	$ 1,740
Other	—	—	58	58
Revenue recognized from contracts with customers	$ 1,355	$ 385	$ 58	$ 1,798
Leasing income	—	—	34	34
Financing income	2	2	—	4
Consumers alternative-revenue programs	2	—	—	2
Total operating revenue – CMS Energy	$ 1,359	$ 387	$ 92	$ 1,838
Consumers				
Consumers utility revenue				
Residential	$ 619	$ 276		$ 895
Commercial	473	90		563
Industrial	199	10		209
Other	64	9		73
Revenue recognized from contracts with customers	$ 1,355	$ 385		$ 1,740
Financing income	2	2		4
Alternative-revenue programs	2	—		2
Total operating revenue – Consumers	$ 1,359	$ 387		$ 1,746

[1] Amounts represent NorthStar Clean Energy's operating revenue from independent power production and its sales of energy commodities. Certain of NorthStar Clean Energy's power sales agreements are accounted for as operating leases. In addition to fixed payments, these agreements have variable payments based on energy delivered. NorthStar Clean Energy's leasing income included variable lease payments of $23 million for the three months ended June 30, 2025.

In Millions

Six Months Ended June 30, 2026	Electric Utility	Gas Utility	NorthStar Clean Energy[1]	Consolidated
CMS Energy, including Consumers				
Consumers utility revenue	$ 2,698	$ 1,628	$ —	$ 4,326
Other	—	—	157	157
Revenue recognized from contracts with customers	$ 2,698	$ 1,628	$ 157	$ 4,483
Leasing income	—	—	64	64
Financing income	5	4	—	9
Consumers alternative-revenue programs	3	—	—	3
Total operating revenue – CMS Energy	$ 2,706	$ 1,632	$ 221	$ 4,559
Consumers				
Consumers utility revenue				
Residential	$ 1,292	$ 1,169		$ 2,461
Commercial	915	356		1,271
Industrial	390	40		430
Other	101	63		164
Revenue recognized from contracts with customers	$ 2,698	$ 1,628		$ 4,326
Financing income	5	4		9
Alternative-revenue programs	3	—		3
Total operating revenue – Consumers	$ 2,706	$ 1,632		$ 4,338

[1] Amounts represent NorthStar Clean Energy's operating revenue from independent power production and its sales of energy commodities. Certain of NorthStar Clean Energy's power sales agreements are accounted for as operating leases. In addition to fixed payments, these agreements have variable payments based on energy delivered. NorthStar Clean Energy's leasing income included variable lease payments of $46 million for the six months ended June 30, 2026.

In Millions

Six Months Ended June 30, 2025	Electric Utility	Gas Utility	NorthStar Clean Energy[1]	Consolidated
CMS Energy, including Consumers				
Consumers utility revenue	$ 2,649	$ 1,432	$ —	$ 4,081
Other	—	—	115	115
Revenue recognized from contracts with customers	$ 2,649	$ 1,432	$ 115	$ 4,196
Leasing income	—	—	76	76
Financing income	5	4	—	9
Consumers alternative-revenue programs	4	—	—	4
Total operating revenue – CMS Energy	$ 2,658	$ 1,436	$ 191	$ 4,285
Consumers				
Consumers utility revenue				
Residential	$ 1,213	$ 1,007		$ 2,220
Commercial	891	329		1,220
Industrial	372	40		412
Other	173	56		229
Revenue recognized from contracts with customers	$ 2,649	$ 1,432		$ 4,081
Financing income	5	4		9
Alternative-revenue programs	4	—		4
Total operating revenue – Consumers	$ 2,658	$ 1,436		$ 4,094

[1] Amounts represent NorthStar Clean Energy's operating revenue from independent power production and its sales of energy commodities. Certain of NorthStar Clean Energy's power sales agreements are accounted for as operating leases. In addition to fixed payments, these agreements have variable payments based on energy delivered. NorthStar Clean Energy's leasing income included variable lease payments of $54 million for the six months ended June 30, 2025.

Electric and Gas Utilities

Consumers Utility Revenue: Consumers recognizes revenue primarily from the sale of electric and gas utility services at tariff-based rates regulated by the MPSC. Consumers' customer base consists of a mix of residential, commercial, and diversified industrial customers. Consumers' tariff-based sales performance obligations are described below.

- Consumers has performance obligations for the service of standing ready to deliver electricity or natural gas to customers, and it satisfies these performance obligations over time. Consumers recognizes revenue at a fixed rate as it provides these services. These arrangements generally do not have fixed terms and remain in effect as long as the customer consumes the utility service. The rates are set by the MPSC through the rate-making process and represent the stand-alone selling price of Consumers' service to stand ready to deliver.

- Consumers has performance obligations for the service of delivering the commodity of electricity or natural gas to customers, and it satisfies these performance obligations upon delivery. Consumers recognizes revenue at a price per unit of electricity or natural gas delivered, based on the tariffs established by the MPSC. These arrangements generally do not have fixed terms and remain in effect as long as the customer consumes the utility service. The rates are set by the MPSC through the rate-making process and represent the stand-alone selling price of a bundled

product comprising the commodity, electricity or natural gas, and the service of delivering such commodity.

In some instances, Consumers has specific fixed-term contracts with large commercial and industrial customers to provide electricity or gas at certain tariff rates or to provide gas transportation services at contracted rates. The amount of electricity and gas to be delivered under these contracts and the associated future revenue to be received are generally dependent on the customers' needs. Accordingly, Consumers recognizes revenues at the tariff or contracted rate as electricity or gas is delivered to the customer. Consumers also has other miscellaneous contracts with customers related to pole and other property rentals and utility contract work. Generally, these contracts are short term or evergreen in nature.

Accounts Receivable and Unbilled Revenues: Accounts receivable comprise trade receivables and unbilled receivables. CMS Energy and Consumers record their accounts receivable at cost less an allowance for uncollectible accounts. The allowance is increased for uncollectible accounts expense and decreased for account write-offs net of recoveries. CMS Energy and Consumers establish the allowance based on historical losses, management's assessment of existing economic conditions, customer payment trends, and reasonable and supported forecast information. CMS Energy and Consumers assess late payment fees on trade receivables based on contractual past-due terms established with customers. Accounts are written off when deemed uncollectible, which is generally when they become six months past due.

CMS Energy and Consumers recorded uncollectible accounts expense of $7 million for the three months ended June 30, 2026 and $8 million for the three months ended June 30, 2025. CMS Energy and Consumers recorded uncollectible accounts expense of $20 million for the six months ended June 30, 2026 and 2025.

Consumers' customers are billed monthly in cycles having billing dates that do not generally coincide with the end of a calendar month. This results in customers having received electricity or natural gas that they have not been billed for as of the month-end. Consumers estimates its unbilled revenues by applying an average billed rate to total unbilled deliveries for each customer class. Unbilled revenues, which are recorded as accounts receivable and accrued revenue on CMS Energy's and Consumers' consolidated balance sheets, were $429 million at June 30, 2026 and $659 million at December 31, 2025.

Alternative-revenue Program: Consumers accounts for its financial compensation mechanism as an alternative-revenue program. Consumers recognizes revenue related to the financial compensation mechanism as payments are made on MPSC-approved PPAs.

Consumers does not reclassify revenue from its alternative-revenue program to revenue from contracts with customers at the time the amounts are collected from customers.

11: Reportable Segments

Reportable segments consist of business units defined by the products and services they offer. CMS Energy's and Consumers' chief operating decision-maker is the CEO. The chief operating decision-maker evaluates segment performance and profitability using net income available to CMS Energy's common stockholders. This metric provides a clear, consistent basis for analyzing the financial results of each segment and supports decision-making regarding the allocation of resources.

Resource allocation to CMS Energy's and Consumers' segments begins with the annual budgeting process, which establishes initial funding and resource levels for each segment. The budget incorporates key financial and operational inputs, including anticipated revenues, expenses, and capital requirements, aligning with CMS Energy's and Consumers' strategic objectives and regulatory obligations. The chief operating decision-maker reviews budget-to-actual variances on a monthly basis and makes interim decisions to reallocate resources among segments as needed, ensuring a timely and effective response to changing conditions. For the electric utility and gas utility segments, the chief operating decision-maker uses this assessment to determine whether the segments are achieving their regulatory authorized return on equity.

CMS Energy

The segments reported for CMS Energy are:

- electric utility, consisting of regulated activities associated with the generation, purchase, distribution, and sale of electricity in Michigan
- gas utility, consisting of regulated activities associated with the purchase, transmission, storage, distribution, and sale of natural gas in Michigan
- NorthStar Clean Energy, consisting of various subsidiaries engaging in domestic independent power production and the marketing of independent power production

CMS Energy presents corporate interest, other expenses, and Consumers' other consolidated entities within other reconciling items.

Consumers

The segments reported for Consumers are:

- electric utility, consisting of regulated activities associated with the generation, purchase, distribution, and sale of electricity in Michigan
- gas utility, consisting of regulated activities associated with the purchase, transmission, storage, distribution, and sale of natural gas in Michigan

Consumers' other consolidated entities are presented within other reconciling items.

In Millions

Three Months Ended June 30, 2026	Electric Utility	Gas Utility	NorthStar Clean Energy	Segments Total	Other Reconciling Items	Consolidated
CMS Energy, including Consumers						
Operating revenue	$ 1,338	$ 388	$ 103	$ 1,829	$ —	$ 1,829
Operating expenses						
Power supply cost[1]	517	—	56	573	—	573
Cost of gas sold	—	102	—	102	—	102
Maintenance and other operating expenses	308	121	30	459	5	464
Depreciation and amortization	236	57	15	308	—	308
General taxes	78	36	3	117	1	118
Total operating expenses	1,139	316	104	1,559	6	1,565
Operating Income (Loss)	199	72	(1)	270	(6)	264
Other income	46	23	3	72	3	75
Interest charges	86	58	4	148	62	210
Income (Loss) Before Income Taxes	159	37	(2)	194	(65)	129
Income tax expense (benefit)	21	10	5	36	(3)	33
Income (Loss) From Continuing Operations	138	27	(7)	158	(62)	96
Other segment items[2]	(1)	—	25	24	(3)	21
Net Income (Loss) Available to Common Stockholders	$ 137	$ 27	$ 18	$ 182	$ (65)	$ 117
Property, plant, and equipment, gross	$ 22,595 [3]	$ 14,548 [3]	$ 2,058	$ 39,201	$ 26	$ 39,227
Total assets	23,926 [3]	14,193 [3]	2,689	40,808	97	40,905

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect loss attributable to noncontrolling interests and preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Three Months Ended June 30, 2026	Electric Utility	Gas Utility	Segments Total	Other Reconciling Items	Consolidated
Consumers					
Operating revenue	$ 1,338	$ 388	$ 1,726	$ —	$ 1,726
Operating expenses					
Power supply cost[1]	517	—	517	—	517
Cost of gas sold	—	102	102	—	102
Maintenance and other operating expenses	308	121	429	—	429
Depreciation and amortization	236	57	293	—	293
General taxes	78	36	114	—	114
Total operating expenses	1,139	316	1,455	—	1,455
Operating Income	199	72	271	—	271
Other income	46	23	69	—	69
Interest charges	86	58	144	—	144
Income Before Income Taxes	159	37	196	—	196
Income tax expense	21	10	31	7	38
Net Income (Loss)	138	27	165	(7)	158
Other segment items[2]	(1)	—	(1)	—	(1)
Net Income (Loss) Available to Common Stockholder	$ 137	$ 27	$ 164	$ (7)	$ 157
Property, plant, and equipment, gross	$ 22,595 [3]	$ 14,548 [3]	$ 37,143	$ 32	$ 37,175
Total assets	23,979 [3]	14,234 [3]	38,213	53	38,266

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Three Months Ended June 30, 2025	Electric Utility	Gas Utility	NorthStar Clean Energy	Segments Total	Other Reconciling Items	Consolidated
CMS Energy, including Consumers						
Operating revenue	$ 1,359	$ 387	$ 92	$ 1,838	$ —	$ 1,838
Operating expenses						
Power supply cost[1]	537	—	66	603	—	603
Cost of gas sold	—	123	1	124	—	124
Maintenance and other operating expenses	264	112	18	394	3	397
Depreciation and amortization	222	54	12	288	—	288
General taxes	73	33	3	109	—	109
Total operating expenses	1,096	322	100	1,518	3	1,521
Operating Income (Loss)	263	65	(8)	320	(3)	317
Other income	36	23	2	61	76	137
Interest charges	89	51	(1)	139	60	199
Income (Loss) Before Income Taxes	210	37	(5)	242	13	255
Income tax expense (benefit)	42	12	(18)	36	26	62
Income (Loss) From Continuing Operations	168	25	13	206	(13)	193
Other segment items[2]	(1)	—	9	8	(3)	5
Net Income (Loss) Available to Common Stockholders	$ 167	$ 25	$ 22	$ 214	$ (16)	$ 198
Property, plant, and equipment, gross	$ 20,761 [3]	$ 13,609 [3]	$ 1,562	$ 35,932	$ 30	$ 35,962
Total assets	21,942 [3]	13,388 [3]	2,105	37,435	264	37,699

1 Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

2 Other segment items reflect loss attributable to noncontrolling interests and preferred stock dividends.

3 Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Three Months Ended June 30, 2025	Electric Utility	Gas Utility	Segments Total	Other Reconciling Items	Consolidated
Consumers					
Operating revenue	$ 1,359	$ 387	$ 1,746	$ —	$ 1,746
Operating expenses					
Power supply cost[1]	537	—	537	—	537
Cost of gas sold	—	123	123	—	123
Maintenance and other operating expenses	264	112	376	—	376
Depreciation and amortization	222	54	276	—	276
General taxes	73	33	106	—	106
Total operating expenses	1,096	322	1,418	—	1,418
Operating Income	263	65	328	—	328
Other income	36	23	59	1	60
Interest charges	89	51	140	1	141
Income Before Income Taxes	210	37	247	—	247
Income tax expense	42	12	54	5	59
Net Income (Loss)	168	25	193	(5)	188
Other segment items[2]	(1)	—	(1)	—	(1)
Net Income (Loss) Available to Common Stockholder	$ 167	$ 25	$ 192	$ (5)	$ 187
Property, plant, and equipment, gross	$ 20,761 [3]	$ 13,609 [3]	$ 34,370	$ 36	$ 34,406
Total assets	21,997 [3]	13,430 [3]	35,427	40	35,467

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

Presented in the following tables is financial information by segment:

In Millions

Six Months Ended June 30, 2026	Electric Utility	Gas Utility	NorthStar Clean Energy	Segments Total	Other Reconciling Items	Consolidated
CMS Energy, including Consumers						
Operating revenue	$ 2,706	$ 1,632	$ 221	$ 4,559	$ —	$ 4,559
Operating expenses						
Power supply cost[1]	1,117	—	147	1,264	—	1,264
Cost of gas sold	—	616	2	618	—	618
Maintenance and other operating expenses	585	260	60	905	7	912
Depreciation and amortization	469	224	27	720	—	720
General taxes	157	127	6	290	1	291
Total operating expenses	2,328	1,227	242	3,797	8	3,805
Operating Income (Loss)	378	405	(21)	762	(8)	754
Other income	89	46	10	145	5	150
Interest charges	169	114	6	289	124	413
Income (Loss) Before Income Taxes	298	337	(17)	618	(127)	491
Income tax expense (benefit)	50	90	12	152	(34)	118
Income (Loss) From Continuing Operations	248	247	(29)	466	(93)	373
Other segment items[2]	(1)	—	88	87	(5)	82
Net Income (Loss) Available to Common Stockholders	$ 247	$ 247	$ 59	$ 553	$ (98)	$ 455
Property, plant, and equipment, gross	$ 22,595 [3]	$ 14,548 [3]	$ 2,058	$ 39,201	$ 26	$ 39,227
Total assets	23,926 [3]	14,193 [3]	2,689	40,808	97	40,905

1 Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

2 Other segment items reflect loss attributable to noncontrolling interests and preferred stock dividends.

3 Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Six Months Ended June 30, 2026	Electric Utility	Gas Utility	Segments Total	Other Reconciling Items	Consolidated
Consumers					
Operating revenue	$ 2,706	$ 1,632	$ 4,338	$ —	$ 4,338
Operating expenses					
Power supply cost[1]	1,117	—	1,117	—	1,117
Cost of gas sold	—	616	616	—	616
Maintenance and other operating expenses	585	260	845	—	845
Depreciation and amortization	469	224	693	—	693
General taxes	157	127	284	—	284
Total operating expenses	2,328	1,227	3,555	—	3,555
Operating Income	378	405	783	—	783
Other income	89	46	135	—	135
Interest charges	169	114	283	—	283
Income Before Income Taxes	298	337	635	—	635
Income tax expense (benefit)	50	90	140	(9)	131
Net Income	248	247	495	9	504
Other segment items[2]	(1)	—	(1)	—	(1)
Net Income Available to Common Stockholder	$ 247	$ 247	$ 494	$ 9	$ 503
Property, plant, and equipment, gross	$ 22,595 [3]	$ 14,548 [3]	$ 37,143	$ 32	$ 37,175
Total assets	23,979 [3]	14,234 [3]	38,213	53	38,266

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Six Months Ended June 30, 2025	Electric Utility	Gas Utility	NorthStar Clean Energy	Segments Total	Other Reconciling Items	Consolidated
CMS Energy, including Consumers						
Operating revenue	$ 2,658	$ 1,436	$ 191	$ 4,285	$ —	$ 4,285
Operating expenses						
Power supply cost[1]	1,083	—	135	1,218	—	1,218
Cost of gas sold	—	505	2	507	—	507
Maintenance and other operating expenses	521	228	48	797	5	802
Depreciation and amortization	443	208	25	676	—	676
General taxes	146	119	6	271	—	271
Total operating expenses	2,193	1,060	216	3,469	5	3,474
Operating Income (Loss)	465	376	(25)	816	(5)	811
Other income	63	42	3	108	79	187
Interest charges	171	99	(1)	269	116	385
Income (Loss) Before Income Taxes	357	319	(21)	655	(42)	613
Income tax expense (benefit)	65	81	(7)	139	(14)	125
Income (Loss) From Continuing Operations	292	238	(14)	516	(28)	488
Other segment items[2]	(1)	—	18	17	(5)	12
Net Income (Loss) Available to Common Stockholders	$ 291	$ 238	$ 4	$ 533	$ (33)	$ 500
Property, plant, and equipment, gross	$ 20,761 [3]	$ 13,609 [3]	$ 1,562	$ 35,932	$ 30	$ 35,962
Total assets	21,942 [3]	13,388 [3]	2,105	37,435	264	37,699

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect loss attributable to noncontrolling interests and preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

In Millions

Six Months Ended June 30, 2025	Electric Utility	Gas Utility	Segments Total	Other Reconciling Items	Consolidated
Consumers					
Operating revenue	$ 2,658	$ 1,436	$ 4,094	$ —	$ 4,094
Operating expenses					
Power supply cost[1]	1,083	—	1,083	—	1,083
Cost of gas sold	—	505	505	—	505
Maintenance and other operating expenses	521	228	749	—	749
Depreciation and amortization	443	208	651	—	651
General taxes	146	119	265	—	265
Total operating expenses	2,193	1,060	3,253	—	3,253
Operating Income	465	376	841	—	841
Other income	63	42	105	1	106
Interest charges	171	99	270	1	271
Income Before Income Taxes	357	319	676	—	676
Income tax expense (benefit)	65	81	146	(4)	142
Net Income	292	238	530	4	534
Other segment items[2]	(1)	—	(1)	—	(1)
Net Income Available to Common Stockholder	$ 291	$ 238	$ 529	$ 4	$ 533
Property, plant, and equipment, gross	$ 20,761 [3]	$ 13,609 [3]	$ 34,370	$ 36	$ 34,406
Total assets	21,997 [3]	13,430 [3]	35,427	40	35,467

[1] Power supply costs reflect fuel for electric generation, purchased and interchange power, and purchased power – related parties.

[2] Other segment items reflect preferred stock dividends.

[3] Amounts include a portion of Consumers' other common assets attributable to both the electric and gas utility businesses.

12: Variable Interest Entities

Consolidated VIEs: In June 2026, NorthStar Clean Energy sold to a tax equity investor a Class A membership interest in HL Solar Holdings, the holding company of a 96-MW solar generation project being constructed in St. Clair County, Michigan, and the future holding company of a 120-MW solar generation project being constructed in Hart Township, Michigan. The nameplate capacity of both projects has been committed under long-term renewable energy purchase agreements. The tax equity investor contributed $9 million in June 2026 and will contribute additional amounts upon further completion of the projects. The tax equity financing will also incorporate the sale of investment tax credits once the projects are placed into service for tax purposes, expected later in 2026.

NorthStar Clean Energy consolidates this and other entities that it does not wholly own, but for which it manages and controls the entities' operating activities. NorthStar Clean Energy is the primary beneficiary of these entities because it has the power to direct the activities that most significantly impact the economic performance of the companies, as well as the obligation to absorb losses or the right to receive benefits from the companies.

Presented in the following table is information about the VIEs NorthStar Clean Energy consolidates:

Consolidated VIE	NorthStar Clean Energy's ownership interest	Description of VIE
Aviator Wind Equity Holdings	51-percent ownership interest[1]	Holds a Class B membership interest in Aviator Wind
Aviator Wind	Class B membership interest[2]	Holding company of a 525-MW wind generation project in Coke County, Texas
BG Solar Holdings[3]	Class B membership interest[2]	Holding company of a 200-MW solar generation project in Branch County, Michigan
Delta Solar Equity Holdings	50-percent ownership interest[1]	Holding company of a 24-MW solar generation project in Delta Township, Michigan
HL Solar Holdings	Class B membership interest[2]	Holding company of a 96-MW solar generation project in St. Clair County, Michigan and future holding company of a 120-MW solar generation project in Hart Township, Michigan
Newport Solar Holdings	Class B membership interest[2]	Holding company of a 180-MW solar generation project in Jackson County, Arkansas
NWO Wind Equity Holdings	50 percent ownership interest[1]	Holds a Class B membership interest in NWO Holdco
NWO Holdco	Class B membership interest[2]	Holding company of a 100-MW wind generation project in Paulding County, Ohio

1 The remaining ownership interest is presented as noncontrolling interest on CMS Energy's consolidated balance sheets.

2 The Class A membership interest in the entity is held by a tax equity investor and is presented as noncontrolling interest on CMS Energy's consolidated balance sheets. Under the associated limited liability company agreement, the tax equity investor is guaranteed preferred returns from the entity.

3 During 2025, the tax equity investor contributed $15 million and recognized a deemed contribution of $35 million associated with BG Solar Holdings' sale of investment tax credits related to a portion of the project placed into service for tax purposes in 2025. The remaining portion of the project was placed into service for tax purposes during 2026, and the tax equity investor recognized a deemed contribution of $87 million. In June 2026, the project achieved commercial operation and the tax equity investor contributed an additional $56 million.

Earnings, tax attributes, and cash flows generated by the entities in which NorthStar Clean Energy holds a Class B membership are allocated among and distributed to the membership classes in accordance with the ratios specified in the associated limited liability company agreements; these ratios change over time and are not representative of the ownership interest percentages of each membership class. Since these entities' income and cash flows are not distributed among their investors based on ownership interest percentages, NorthStar Clean Energy allocates the entities' income (loss) among the investors by applying the hypothetical liquidation at book value method. This method calculates each investor's earnings based on a hypothetical liquidation of the entities at the net book value of underlying assets as of the balance sheet date. The liquidation tax gain (loss) is allocated to each investor's capital account, resulting in income (loss) equal to the period change in the investor's capital account balance.

Presented in the following table are the carrying values of the VIEs' assets and liabilities included on CMS Energy's consolidated balance sheets:

In Millions

	June 30, 2026	December 31, 2025
Current		
Cash and cash equivalents	$ 29	$ 20
Restricted cash and cash equivalents	18	19
Accounts receivable	12	42
Prepayments and other current assets	17	5
Non-current		
Plant, property, and equipment, net	1,399	1,037
Construction work in progress	170	357
Other non-current assets	7	5
Total assets[1]	$ 1,652	$ 1,485
Current		
Current portion of long-term debt and finance leases	$ 38	$ 65
Accounts payable	33	29
Other current liabilities	1	—
Non-current		
Long-term debt	57	118
Non-current portion of finance leases	43	39
AROs	44	38
Other non-current liabilities	7	3
Total liabilities	$ 223	$ 292

[1] Assets may be used only to meet VIEs' obligations and commitments.

NorthStar Clean Energy is obligated under certain indemnities that protect the tax equity investors against losses incurred as a result of breaches of representations and warranties under the associated limited liability company agreements. For additional details on these indemnity obligations, see Note 3, Contingencies and Commitments—Guarantees.

Consumers' wholly-owned subsidiaries, Consumers 2014 Securitization Funding and Consumers 2023 Securitization Funding, are VIEs designed to collateralize Consumers' securitization bonds. These entities are considered VIEs primarily because their equity capitalization is insufficient to support their operations. Consumers is the primary beneficiary of and consolidates these VIEs, as it has the power to direct the activities that most significantly impact the economic performance of the companies, as well as the obligation to absorb losses or the right to receive benefits from the companies. The VIEs' primary assets and liabilities comprise non-current regulatory assets and long-term debt. The carrying value of the regulatory assets on Consumers' consolidated balance sheets was $489 million at June 30, 2026 and $549 million at December 31, 2025. The carrying value of securitization bonds on Consumers' consolidated balance sheets was $525 million at June 30, 2026 and $585 million at December 31, 2025.

Non-consolidated VIEs: NorthStar Clean Energy has variable interests in T.E.S. Filer City, Grayling, Genesee, and Craven. While NorthStar Clean Energy owns 50 percent of each partnership, it is not the primary beneficiary of any of these partnerships because decision making is shared among unrelated parties, and no one party has the ability to direct the activities that most significantly impact the entities'

economic performance, such as operations and maintenance, plant dispatch, and fuel strategy. The partners must agree on all major decisions for each of the partnerships.

Presented in the following table is information about these partnerships, which are accounted for using the equity method:

Name	Nature of the Entity	Nature of CMS Energy's Involvement
T.E.S. Filer City	Coal-fueled power generator	Long-term PPA between partnership and Consumers Employee assignment agreement
Grayling	Wood waste-fueled power generator	Long-term PPA between partnership and Consumers Reduced dispatch agreement with Consumers[1] Operating and management contract
Genesee	Wood waste-fueled power generator	Long-term PPA between partnership and Consumers Reduced dispatch agreement with Consumers[1] Operating and management contract
Craven	Wood waste-fueled power generator	Operating and management contract

[1] Reduced dispatch agreements allow the facilities to be dispatched based on the market price of power compared with the cost of production of the plants. This results in fuel cost savings that each partnership shares with Consumers' customers.

The creditors of these partnerships do not have recourse to the general credit of CMS Energy, NorthStar Clean Energy, or Consumers. NorthStar Clean Energy's maximum risk exposure to these partnerships is generally limited to its investment in the partnerships, which is included in investments on CMS Energy's consolidated balance sheets in the amount of $53 million at June 30, 2026 and $54 million at December 31, 2025.

13: Exit Activities and Asset Sales

J.H. Campbell Retirement: The retirement of J.H. Campbell is subject to temporary extensions under emergency orders issued by the U.S. Secretary of Energy. As a result, Consumers has implemented retention measures to ensure appropriate staffing levels and expects to incur up to $4 million during each 90-day emergency order period. Consumers will seek recovery of these retention costs from FERC, consistent with rate recovery sought for other costs of complying with the emergency orders. For additional information on the emergency orders associated with J.H. Campbell, see Note 2, Regulatory Matters.

Presented in the following table is a reconciliation of the retention benefit liability recorded in other current liabilities on Consumers' consolidated balance sheets:

In Millions

Six Months Ended June 30	2026	2025 [1]
Retention benefit liability at beginning of period	$ 2	$ 14
Costs deferred as a regulatory asset	7	3
Costs paid or settled	(7)	—
Retention benefit liability at the end of the period	$ 2	$ 17

[1] Includes amounts associated with a retention incentive program established under Consumers' IRP in connection with the planned retirement of J.H. Campbell in May 2025. Final payments under this program were made in November 2025.

Sale of Hydroelectric Facilities: In September 2025, Consumers signed an agreement to sell its 13 river hydroelectric dams, which are located throughout Michigan, to a non-affiliated company. Additionally, Consumers signed an agreement to purchase power generated by the facilities for 30 years, at a price that reflects the counterparty's acceptance of the risks and rewards of ownership of the facilities, including FERC licensing obligations. The agreements are contingent upon MPSC and FERC approval, for which Consumers filed in October 2025.

In July 2026, Consumers filed exceptions to the proposal for decision issued in the related regulatory proceeding. The filing proposed a state-administered fund that would be established using all financial compensation mechanism revenues received under the PPA, estimated to total approximately $270 million over the term of the agreement. Under the proposal, the fund would be controlled by the State of Michigan and used to support dam safety improvements, emergency response and remediation efforts, and future decommissioning or license surrender obligations associated with the hydroelectric facilities. The proposal is subject to regulatory review and approval.

An order from the MPSC is expected in September 2026. In Consumers' most recent electric rate cases, the MPSC has approved deferred accounting treatment for costs of owning and operating the hydroelectric dams pending and until completion of the transaction. At June 30, 2026, the net book value of the hydroelectric facilities was immaterial.

To ensure necessary staffing at the hydroelectric facilities through the anticipated sale, Consumers has provided current employees at the facilities with a retention incentive program. Subsequently, to ensure continued safe operation of the facilities after the sale, the buyer will offer employment to the current hydroelectric employees for a period of at least a year. The retention incentive benefits are contingent upon MPSC and FERC approval of the sale transaction.

NorthStar Clean Energy Strategic Divestments: In July 2026, the CMS Energy Board of Directors approved a plan to divest certain renewable projects owned by NorthStar Clean Energy and to exit non-utility renewables development. The projects included in the planned divestiture are primarily non-Michigan-based renewable generation projects. CMS Energy has initiated a sales process for these renewable projects and is evaluating market information and potential indications of interest. CMS Energy expects to classify the related assets and liabilities as held for sale in the third quarter of 2026, as the held-for-sale criteria were not met as of June 30, 2026. CMS Energy could record a material impairment charge in the third quarter of 2026 if expected sale proceeds are insufficient to recover the carrying value of the assets. CMS Energy expects to complete the divestment within twelve months, subject to negotiating contractual terms with a third-party, which would then be subject to regulatory approvals and other customary closing conditions.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

See Management's Discussion and Analysis of Financial Condition and Results of Operations included in this Form 10-Q beginning on page 16.

Item 3. Quantitative and Qualitative Disclosures About Market Risk

There have been no material changes to market risk as previously disclosed in Part II—Item 7A. Quantitative and Qualitative Disclosures About Market Risk, in the 2025 Form 10-K.

Item 4. Controls and Procedures

CMS Energy

Disclosure Controls and Procedures: CMS Energy's management, with the participation of its CEO and CFO, has evaluated the effectiveness of its disclosure controls and procedures (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. Based on such evaluation, CMS Energy's CEO and CFO have concluded that, as of the end of such period, its disclosure controls and procedures are effective.

Internal Control Over Financial Reporting: There have not been any changes in CMS Energy's internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the last fiscal quarter that have materially affected, or are reasonably likely to affect materially, its internal control over financial reporting.

Consumers

Disclosure Controls and Procedures: Consumers' management, with the participation of its CEO and CFO, has evaluated the effectiveness of its disclosure controls and procedures (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. Based on such evaluation, Consumers' CEO and CFO have concluded that, as of the end of such period, its disclosure controls and procedures are effective.

Internal Control Over Financial Reporting: There have not been any changes in Consumers' internal control over financial reporting (as such term is defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the last fiscal quarter that have materially affected, or are reasonably likely to affect materially, its internal control over financial reporting.

Part II—Other Information

Item 1. Legal Proceedings

CMS Energy, Consumers, and certain of their affiliates are parties to various lawsuits and regulatory matters in the ordinary course of business. For information regarding material legal proceedings, including updates to information reported under Part I—Item 3. Legal Proceedings of the 2025 Form 10-K, see Part I—Item 1. Financial Statements—Notes to the Unaudited Consolidated Financial Statements—Note 2, Regulatory Matters and Note 3, Contingencies and Commitments.

Item 1A. Risk Factors

There have been no material changes to the Risk Factors as previously disclosed in Part I—Item 1A. Risk Factors in the 2025 Form 10-K, which Risk Factors are incorporated herein by reference.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds

Unregistered Sales of Equity Securities

None.

Issuer Repurchases of Equity Securities

Presented in the following table are CMS Energy's repurchases of common stock for the three months ended June 30, 2026:

Period	Total Number of Shares Purchased[1]	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Maximum Number of Shares That May Yet Be Purchased Under Publicly Announced Plans or Programs
April 1, 2026 to April 30, 2026	—	$ —	—	—
May 1, 2026 to May 31, 2026	125	73.27	—	—
June 1, 2026 to June 30, 2026	—	—	—	—
Total	125	$ 73.27	—	—

[1] All of the common shares were repurchased to satisfy the minimum statutory income tax withholding obligation for common shares that have vested under the Performance Incentive Stock Plan. The value of shares repurchased is based on the market price on the vesting date.

Item 3. Defaults Upon Senior Securities

None.

Item 4. Mine Safety Disclosures

Not applicable.

Item 5. Other Information

On July 22, 2026, the CMS Energy Board of Directors approved a plan to divest certain renewable projects owned by NorthStar Clean Energy and to exit non-utility renewables development. The projects included in the planned divestiture are primarily non-Michigan-based renewable generation projects. CMS Energy has initiated a sales process for these renewable projects and is evaluating market information and potential indications of interest. CMS Energy expects to classify the related assets and liabilities as held for sale in the third quarter of 2026, as the held-for-sale criteria were not met as of June 30, 2026.

Upon classification of these assets as held-for-sale, the related disposal group would be required to be measured at the lower of carrying value or fair value less costs to sell. If the estimated fair value less costs to sell of the disposal group is less than its carrying value, impairment charges may be required and CMS Energy could record a material impairment charge in the third quarter of 2026. This impairment determination requires significant judgment and estimates, including assumptions regarding future cash flows, market conditions, power prices, discount rates, operating performance, transaction structure, expected proceeds from the sale process, and costs to sell. These estimates are inherently uncertain and may change.

CMS Energy expects to complete the divestment within 12 months, subject to negotiating contractual terms with a third party, which would then be subject to regulatory approvals and other customary closing conditions. If the divestiture is delayed, modified, or not completed on anticipated terms, or if market conditions for renewable energy assets deteriorate, additional impairment charges, valuation adjustments, or losses on disposition could be required.

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Item 6. Exhibits

CMS Energy's and Consumers' Exhibit Index

The agreements included as exhibits to this Form 10-Q filing are included solely to provide information regarding the terms of the agreements and are not intended to provide any other factual or disclosure information about CMS Energy, Consumers, or other parties to the agreements. The agreements may contain representations and warranties made by each of the parties to each of the agreements that were made exclusively for the benefit of the parties involved in each of the agreements and should not be treated as statements of fact. The representations and warranties were made as a way to allocate risk if one or more of those statements prove to be incorrect. The statements were qualified by disclosures of the parties to each of the agreements that may not be reflected in each of the agreements. The agreements may apply standards of materiality that are different than standards applied to other investors. Additionally, the statements were made as of the date of the agreements or as specified in the agreements and have not been updated. The representations and warranties may not describe the actual state of affairs of the parties to each agreement.

Additional information about CMS Energy and Consumers may be found in this filing, at www.cmsenergy.com, at www.consumersenergy.com, and through the SEC's website at www.sec.gov.

Exhibits		Description
3.1[1]	—	Restated Articles of Incorporation of CMS Energy, effective June 1, 2004, and as amended from time to time
4.1	—	156th Supplemental Indenture dated as of May 5, 2026, between Consumers and The Bank of New York Mellon, as Trustee (Exhibit 4.1 to Form 8-K filed May 5, 2026, and incorporated herein by reference)
31.1	—	CMS Energy's certification of the CEO pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	—	CMS Energy's certification of the CFO pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.3	—	Consumers' certification of the CEO pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.4	—	Consumers' certification of the CFO pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1	—	CMS Energy's certifications pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2	—	Consumers' certifications pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS	—	Inline XBRL Instance Document
101.SCH	—	Inline XBRL Taxonomy Extension Schema
101.CAL	—	Inline XBRL Taxonomy Extension Calculation Linkbase
101.DEF	—	Inline XBRL Taxonomy Extension Definition Linkbase
101.LAB	—	Inline XBRL Taxonomy Extension Labels Linkbase
101.PRE	—	Inline XBRL Taxonomy Extension Presentation Linkbase
104	—	Cover Page Interactive Data File (the cover page XBRL tags are embedded in the Inline XBRL document)

[1] Obligations of CMS Energy or its subsidiaries, but not of Consumers.

Signatures

Pursuant to the requirements of the Securities Exchange Act of 1934, each registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized. The signature for each undersigned company shall be deemed to relate only to matters having reference to such company or its subsidiary.

CMS ENERGY CORPORATION

Dated: July 28, 2026 By: /s/ Srikanth Maddipati

Srikanth Maddipati

Executive Vice President and Chief Financial Officer

CONSUMERS ENERGY COMPANY

Dated: July 28, 2026 By: /s/ Srikanth Maddipati

Srikanth Maddipati

Executive Vice President and Chief Financial Officer

FILED AND EFFECTIVE JUNE 1, 2004

STATE OF MICHIGAN
MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
BUREAU OF COMMERCIAL SERVICES — CORPORATION DIVISION
LANSING, MICHIGAN

RESTATED ARTICLES OF INCORPORATION
(Profit Corporation)
Corporation Identification Number 485-283

These Restated Articles of Incorporation of CMS Energy Corporation (the "Corporation") are executed pursuant to the provisions of Sections 641 through 651, Act 284, Public Acts of 1972, as amended, (the "Act"). These Restated Articles of Incorporation were authorized by the Board of Directors at its meeting held on May 28, 2004 without a vote of the shareholders pursuant to the provisions of Section 642 of the Act in order to restate and integrate the Articles and do not further amend the Articles as theretofore amended, and there is no material discrepancy between those provisions and the provisions of these Restated Articles.

The present name of the Corporation is CMS Energy Corporation. There are no former names.

The date of filing the original Articles of Incorporation in Michigan was February 26, 1987.

RESTATED ARTICLES OF INCORPORATION

The following Restated Articles of Incorporation supersede the original Articles as amended and shall be the Articles of Incorporation of CMS Energy Corporation.

ARTICLE I

The name of the corporation is CMS Energy Corporation (hereinafter called the "Corporation").

ARTICLE II

The purpose or purposes for which the Corporation is organized is to engage in any activity within the purposes for which corporations may be organized under the Business Corporation Act of Michigan.

ARTICLE III

The total number of shares of all classes of stock which the Corporation shall have authority to issue is 360,000,000, of which 10,000,000 shares, par value $.01 per share, are of a class designated Preferred Stock ("Preferred Stock"), and 350,000,000 shares, par value $.01 per share, are of a class designated Common Stock ("Common Stock").

The statement of the designations and the voting and other powers, preferences and rights, and the qualifications, limitations or restrictions thereof, of the Common Stock and of the Preferred Stock is as follows:

PREEMPTIVE RIGHTS

The holders of shares of Preferred Stock or of Common Stock shall have no preemptive rights to subscribe for or purchase any additional issues of shares of the capital stock of the Corporation of any class now or hereafter authorized or any Preferred Stock, bonds, debentures, or other obligations or rights or options convertible into or exchangeable for or entitling the holder or owner to subscribe for or purchase any shares of capital stock, or any rights to exchange shares issued for shares to be issued.

PREFERRED STOCK

The shares of Preferred Stock may be issued from time to time in one or more series with such relative rights and preferences of the shares of any such series as may be determined by the Board of Directors. The Board of Directors is authorized to fix by resolution or resolutions adopted prior to the issuance of any shares of each particular series of Preferred Stock, the designation, powers, preferences and relative, participating, optional and other rights, and the qualifications, limitations and restrictions thereof, if any, of such series, including, but without limiting the generality of the foregoing, the following:

(a) The rate of dividend, if any;

(b) The price at and the terms and conditions upon which shares may be redeemed;

(c) The rights, if any, of the holders of shares of the series upon voluntary or involuntary liquidation, merger, consolidation, distribution or sale of assets, dissolution or winding up of the Corporation;

(d) Sinking fund or redemption or purchase provisions, if any, to be provided for shares of the series;

(e) The terms and conditions upon which shares may be converted into shares of other series or other capital stock, if issued with the privilege of conversion; and

(f) The voting rights in the event of default in the payment of dividends or under such other circumstances and upon such conditions as the Board of Directors may determine.

No holder of any shares of any series of Preferred Stock shall be entitled to vote in the election of directors or in respect of any other matter except as may be required by the Michigan Business Corporation Act, as amended, or as is permitted by the resolution or resolutions adopted by the Board of Directors authorizing the issue of such series of Preferred Stock.

Series Established By Articles

There is hereby established one series of Preferred Stock designated as 4.50% Cumulative Convertible Preferred Stock. The number of shares that shall constitute such series shall be 5,000,000 shares.

4.50% Cumulative Convertible Preferred Stock

The Board of Directors hereby establishes a series of the preferred stock of the Corporation and hereby states that the series' voting powers, designations, preferences and relative, participating, optional or other special rights, and qualifications, limitations or restrictions thereof (in addition to the provisions set forth in the Articles of Incorporation which are applicable to the preferred stock of all series), shall be as follows:

1. Designation and Amount; Ranking.

(a) There shall be created from the 10,000,000 shares of preferred stock, par value $0.01 per share, of the Corporation authorized to be issued pursuant to the Articles of Incorporation, a series of preferred stock, designated as the "4.50% Cumulative Convertible Preferred Stock," par value $0.01 per share (the "4.50% Convertible Preferred Stock"), and the number of shares of such series shall be 5,000,000. Such number of shares may be decreased by resolution of the Board of Directors; provided that no decrease shall reduce the number of shares of 4.50% Convertible Preferred Stock to a number less than that of the shares of 4.50% Convertible Preferred Stock then outstanding plus the number of shares issuable upon exercise of options or rights then outstanding.

(b) The 4.50% Convertible Preferred Stock will, with respect to both dividend rights and rights upon the liquidation, winding-up or dissolution of the Corporation, rank (i) senior to all Junior Stock and (ii) on a parity with all other Parity Stock.

2. Definitions. As used herein, the following terms shall have the following meanings:

"Accumulated Dividends" shall mean, with respect to any share of 4.50% Convertible Preferred Stock, as of any date, the aggregate accumulated and unpaid dividends on such share from and including the most recent Dividend Payment Date to which dividends have been paid (or the Issue Date, if such date is prior to the first Dividend Payment Date) to but not including such date.

"Additional Dividends" shall have the meaning given to it in Section 3(b).

"Affiliate" shall have the meaning ascribed to it, on the date hereof, under Rule 405 of the Securities Act.

"Agent Members" shall have the meaning given to it in Section 11(a)(ii).

"Board of Directors" shall mean the Board of Directors of the Corporation or, with respect to any action to be taken by the Board of Directors, any committee (special or otherwise) of the Board of Directors duly authorized to take such action.

“Business Day” shall mean any day other than a Saturday, Sunday or other day on which commercial banks in The City of New York are authorized or required by law or executive order to close.

“Certificate of Designation” means the designation if the 4.50% Convertible Preferred Stock in this Article III.

“Certificated 4.50% Convertible Preferred Stock” shall have the meaning given to it in Section 4(f).

“Common Equity” of any Person means capital stock of such Person that is generally entitled to (i) vote in the election of directors of such Person or (ii) if such Person is not a corporation, vote or otherwise participate in the selection of the governing body, partners, managers or others that will control the management or policies of such Person.

“Common Stock” shall mean the common stock, par value $0.01 per share, of the Corporation, or any other class of stock resulting from successive changes or reclassifications of such common stock consisting solely of changes in par value, or from par value to no par value, or as a result of a subdivision, combination or merger, consolidation or similar transaction in which the Corporation is a constituent corporation.

“Continuing Director” means a director who either was a member of the Board of Directors on December 5, 2003 or who becomes a member of the Board of Directors subsequent to that date and whose appointment, election or nomination for election by the Corporation’s shareholders is duly approved by a majority of the Continuing Directors on the Board of Directors at the time of such approval, either by a specific vote or by approval of the proxy statement issued by the Corporation on behalf of the Board of Directors in which such individual is named as nominee for director.

“Conversion Agent” means the office or agency designated by the Corporation where 4.50% Convertible Preferred Stock may be presented for conversion. Initially, the Conversion Agent shall be the Corporation located at One Energy Plaza, Jackson, Michigan 49201.

“Conversion Date” shall have the meaning given to it in Section 7(b).

“Conversion Notice” shall have the meaning given to it in Section 7(a).

“Conversion Price” shall mean $9.893 per share of Common Stock.

“Conversion Rate” shall mean the number of shares of Common Stock issuable upon conversion of a share of 4.50% Convertible Preferred Stock per Liquidation Preference. The initial Conversion Rate is 5.0541 shares of Common Stock issuable upon conversion of a share of 4.50% Convertible Preferred Stock per Liquidation Preference.

“Corporation Notice” shall have the meaning given to it in Section 4(e).

“Corporation Notice Date” shall have the meaning given to it in Section 4(e).

“Distributed Assets or Securities” shall have the meaning given to it in Section 7(f)(iii).

“Dividend Payment Date” shall mean March 1, June 1, September 1 and December 1 of each year, commencing March 1, 2004.

“Dividend Rate” shall have the meaning given to it in Section 3(a).

“Dividend Record Date” shall mean February 15, May 15, August 15 and November 15 of each year.

“DTC” or “Depository” means The Depository Trust Company.

“Equity Interests” means any capital stock, partnership, joint venture, member or limited liability or unlimited liability company interest, beneficial interest in a trust or similar entity or other equity interest or investment of whatever nature.

“Exchange Act” shall mean the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

“Fair Market Value” means the amount which a willing buyer would pay a willing seller in an arm’s length transaction.

A “Fundamental Change” shall be deemed to have occurred at such time after the original issuance of the 4.50% Convertible Preferred Stock that any of the following occurs: (i) the Common Stock or other capital stock into which the 4.50% Convertible Preferred Stock is convertible is neither listed for trading on a United States national securities exchange nor approved for trading on the NASDAQ National Market or another established automated over-the-counter trading market in the United States; (ii) a “person” or “group” within the meaning of Section 13(d) of the Exchange Act, other than the Corporation, any subsidiary of the Corporation or any employee benefit plan of the Corporation or any such subsidiary, files a Schedule TO (or any other schedule, form or report under the Exchange Act) disclosing that such person or group has become the direct or indirect ultimate “beneficial owner” (as such term is used in Rules 13d-3 and 13d-5 under the Exchange Act, except that a person or group shall be deemed to have “beneficial ownership” of all shares that such Person or group has the right to acquire whether such right is exercisable immediately or only after the passage of time) of Common Equity of the Corporation representing more than 50% of the voting power of the Corporation’s Common Equity; (iii) consummation of any share exchange, consolidation or merger of the Corporation pursuant to which the Common Stock will be converted into cash, securities or other property or any sale, lease or other transfer (in one transaction or a series of transactions) of all or substantially all of the consolidated assets of the Corporation and its subsidiaries, taken as a whole, to any Person (other than the Corporation or one or more of the Corporation’s subsidiaries); *provided, however,* that a transaction where the holders of the Corporation’s Common Equity immediately prior to such transaction own, directly or indirectly, more than 50% of the aggregate voting power of all classes of Common Equity of the continuing or surviving corporation or transferee immediately after such event shall not be a Fundamental Change; or (iv) Continuing Directors cease to constitute at least a majority of the Board of Directors; *provided, however,* that a Fundamental Change shall not be deemed to have occurred in respect of any of the foregoing if either (A) the Last Reported Sale Price per share of Common Stock for any five

Trading Days within the period of 10 consecutive Trading Days ending immediately before the later of the Fundamental Change or the public announcement thereof shall equal or exceed 105% of the Conversion Price in effect immediately before the Fundamental Change or the public announcement thereof or (B) at least 90% of the consideration (excluding cash payments for fractional shares) in the transaction or transactions constituting the Fundamental Change consists of shares of capital stock traded on a national securities exchange or quoted on the NASDAQ National Market (or which shall be so traded or quoted when issued or exchanged in connection with such Fundamental Change) (such securities being referred to as "Publicly Traded Securities") and as a result of such transaction or transactions the 4.50% Convertible Preferred Stock becomes convertible into such Publicly Traded Securities (excluding cash payments for fractional shares).

"Fundamental Change Purchase Date" shall have the meaning given to it in Section 4(a).

"Fundamental Change Purchase Notice" shall have the meaning given to it in Section 4(c).

"Fundamental Change Purchase Price" shall have the meaning given to it in Section 4(a).

"Global 4.50% Convertible Preferred Stock" shall have the meaning given to it in Section 11(a)(i).

"Holder" or "holder" shall mean a holder of record of the 4.50% Convertible Preferred Stock.

"Issue Date" shall mean December 5, 2003, the original date of issuance of the 4.50% Convertible Preferred Stock.

"Junior Stock" shall mean all classes of common stock of the Corporation and each other class of capital stock or series of 4.50% Convertible Preferred Stock established after the Issue Date, by the Board of Directors, the terms of which do not expressly provide that such class or series ranks senior to or on parity with the 4.50% Convertible Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

"Last Reported Sale Price" of Common Stock on any date means the closing sale price per share (or, if no closing sale price is reported, the average of the bid and ask prices or, if more than one in either case, the average of the average bid and the average ask prices) on that date as reported in composite transactions for the principal U.S. securities exchange on which Common Stock is traded or, if the Common Stock is not listed on a U.S. national or regional securities exchange, as reported by the NASDAQ National Market. If the Common Stock is not listed for trading on a U.S. national or regional securities exchange and not reported by the NASDAQ National Market on the relevant date, the Last Reported Sale Price shall be the last quoted bid price for Common Stock in the over-the-counter market on the relevant date as reported by the National Quotation Bureau or similar organization. If the Common Stock is not so quoted, the Last Reported Sale Price will be the average of the mid-point of the last bid and ask prices for the Common Stock on the relevant date from each of at least three nationally recognized independent investment banking firms selected by the Corporation for this purpose.

"Liquidation Preference" shall mean, with respect to each share of 4.50% Convertible Preferred Stock, $50.

“Mandatory Conversion Date” shall have the meaning given to it in Section 8(b).

“Market Price” means the average of the Last Reported Sales Price per share of Common Stock for the 20 Trading Day period ending on the applicable date of determination (if the applicable date of determination is a Trading Day or, if not, then on the last Trading Day prior to such applicable date of determination), appropriately adjusted to take into account the occurrence, during the period commencing on the first of the Trading Days during such 20 Trading Day period and ending on the applicable date of determination, of any event that would result in an adjustment of the Conversion Rate under this Certificate of Designation.

“Market Value” shall mean the average closing price of the Common Stock for a five consecutive Trading Day period on the NYSE (or such other national securities exchange or automated quotation system on which the Common Stock is then listed or authorized for quotation or, if the Common Stock is not so listed or authorized for quotation, an amount determined in good faith by the Board of Directors to be the fair value of the Common Stock).

“Maximum Conversion Rate” shall have the meaning given to it in Section 7(f)(viii).

“NYSE” shall mean the New York Stock Exchange, Inc.

“Officer” means the Chairman of the Board of Directors, the President, any Vice President, the Treasurer, the Secretary or any Assistant Secretary of the Corporation.

“Officers’ Certificate” means a certificate signed by two Officers.

“Opinion of Counsel’ means a written opinion from legal counsel who is acceptable to the Transfer Agent. The counsel may be an employee of or counsel to the Corporation or the Transfer Agent.

“Parity Stock” shall mean any class of capital stock or series of preferred stock established as of or after the Issue Date by the Board of Directors, the terms of which expressly provide that such class or series will rank on parity with the 4.50% Convertible Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

“Paying Agent” means any Person authorized by the Corporation to pay the dividends or Fundamental Change Purchase Price on any of the shares of 4.50% Convertible Preferred Stock on behalf of the Corporation. Initially, the Paying Agent shall be the Corporation.

“Person” shall mean any individual, corporation, general partnership, limited partnership, limited liability partnership, joint venture, association, joint-stock company, trust, limited liability company, unincorporated organization or government or any agency or political subdivision thereof.

“Registration Default” shall have the meaning given to it in Section 3(b).

“Registration Rights Agreement” means the Registration Rights Agreement dated as of December 5, 2003, among the Corporation, Citigroup Global Markets Inc., Merrill Lynch, Pierce,

Fenner & Smith Incorporated and the certain other initial purchasers of the 4.50% Convertible Preferred Stock.

“SEC” or “Commission” shall mean the Securities and Exchange Commission.

“Securities Act” means the Securities Act of 1933, as amended.

“Security Register” means the security register recording the holders of 4.50% Convertible Preferred Stock kept at the offices of the Corporation.
“Security Registrar” shall be the Person holding the Security Register, and the Corporation will initially be designated as the Security Registrar.

“Senior Stock” shall mean each class of capital stock or series of preferred stock established after the Issue Date by the Board of Directors, the terms of which expressly provide that such class or series will rank senior to the 4.50% Convertible Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

“Shelf Registration Statement” shall mean a shelf registration statement filed with the SEC to cover resales of Transfer Restricted Securities by holders thereof, as required by the Registration Rights Agreement.

“Spin-Off Market Price” per share of Common Stock of the Corporation or the Equity Interests in a Subsidiary or other business unit of the Corporation on any day means the average of the daily Last Reported Sale Prices for the 10 consecutive Trading Days commencing on and including the fifth Trading Day after the ex date with respect to the issuance or distribution requiring such computations. As used herein, the term “ex date,” when used with respect to any issuance or distribution, shall mean the first date on which the security trades regular way on the NYSE or such other national regional exchange or market in which the security trades without the right to receive such issuance or distribution.

“Subsidiary” means a Person more than 50% of the outstanding voting stock of which is owned, directly or indirectly, by the Corporation or by one or more other Subsidiaries, or by the Corporation and one or more other Subsidiaries. For the purposes of this definition, “voting stock” means stock which ordinarily has voting power of the election of directors, whether at all times or only so long as no senior class of stock has such voting power by reason of any contingency.

“Trading Day” means (i) if the applicable security is listed, admitted for trading or quoted on the NYSE, the NASDAQ National Market or another national security exchange, a day on which the NYSE, the NASDAQ National Market or another national security exchange is open for business or (ii) if the applicable security is not so listed, admitted for trading or quoted, any day other than a Saturday or Sunday or a day on which banking institutions in the State of New York are authorized or obligated by law, regulation or executive order to close.

“Trading Exception” shall have the meaning given to it in Section 7(a)(ii).

“Trading Price” of the 4.50% Convertible Preferred Stock on any date of determination means the average of the secondary market bid quotations per share of 4.50% Convertible Preferred

Stock obtained by the Conversion Agent for $5,000,000 Liquidation Preference of the 4.50% Convertible Preferred Stock at approximately 3:30 p.m., New York City time, on such determination date from three independent nationally recognized securities dealers the Corporation selects, provided that if three such bids cannot reasonably be obtained by the Conversion Agent, but two such bids are obtained, then the average of the two bids shall be used, and if only one such bid can reasonably be obtained by the Conversion Agent, this one bid shall be used. If the Conversion Agent cannot reasonably obtain at least one bid for $5,000,000 Liquidation Preference of the 4.50% Convertible Preferred Stock from a nationally recognized securities dealer, then the Trading Price will be deemed to be less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate.

"Transfer Agent" shall mean the Corporation's duly appointed transfer agent for the 4.50% Convertible Preferred Stock. Initially, the Corporation will be the Transfer Agent.

"Transfer Restricted Securities" shall mean each share of 4.50% Convertible Preferred Stock (or the shares of Common Stock into which such share of 4.50% Convertible Preferred Stock is convertible) until (i) the date on which such security or its predecessor has been effectively registered under the Securities Act and disposed of in accordance with the Shelf Registration Statement, (ii) the date on which such security or predecessor is distributed to the public pursuant to Rule 144 under the Securities Act or is saleable pursuant to Rule 144(k) under the Securities Act or (iii) the date that such 4.50% Convertible Preferred Stock ceases to be outstanding.

"Voting Rights Class" shall have the meaning given to it in Section 5(a)(i).

"Voting Rights Triggering Event" shall mean the failure of the Corporation to pay dividends on the 4.50% Convertible Preferred Stock with respect to six or more quarterly periods (whether or not consecutive).

"Voting Stock" shall mean, with respect to any Person, securities of any class or classes of Capital Stock in such Person entitling the holders thereof (whether at all times or only so long as no senior class of stock has voting power by reason of contingency) generally to vote in the election of members of the Board of Directors or other governing body of such Person. For purposes of this definition, "Capital Stock" shall mean, with respect to any Person, any and all shares, interests, participations or other equivalents (however designated) of corporate stock or partnership interests and any and all warrants, options and rights with respect thereto (whether or not currently exercisable), including each class of common stock and preferred stock of such Person.

3. Dividends.

(a) The holders of shares of the outstanding 4.50% Convertible Preferred Stock shall be entitled, when, as and if declared by the Board of Directors out of funds of the Corporation legally available therefor, to receive cumulative cash dividends at the rate per annum of 4.50% per share on the Liquidation Preference (equivalent to $2.25 per annum per share), payable quarterly in arrears (the "Dividend Rate"). The Dividend Rate may be increased in the circumstances described in Section 3(b) below. Dividends payable for each full dividend period will be computed by dividing the Dividend Rate by four and shall be payable in arrears on each Dividend Payment Date (commencing March 1, 2004) for the quarterly period ending immediately prior to such Dividend Payment Date, to

the holders of record of 4.50% Convertible Preferred Stock at the close of business on the Dividend Record Date applicable to such Dividend Payment Date. Such dividends shall be cumulative from the most recent date as to which dividends shall have been paid or, if no dividends have been paid, from the Issue Date (whether or not in any dividend period or periods the Board of Directors shall have declared such dividends or there shall be funds of the Corporation legally available for the payment of such dividends) and shall accumulate on a day-to-day basis, whether or not earned or declared, from and after the Issue Date. Dividends payable for any partial dividend period shall be computed on the basis of days elapsed over a 360-day year consisting of twelve 30-day months. Accumulated unpaid dividends accrue and cumulate dividends at the annual rate of 4.50% and are payable in the manner provided in this Section 3.

(b) If (i) by November 5, 2004, the Shelf Registration Statement has not been filed with the Commission, (ii) by March 5, 2005, the Shelf Registration Statement has not been declared effective by the Commission, (iii) after the Shelf Registration Statement has been declared effective the Corporation fails to file a post-effective amendment, prospectus supplement, amendment or supplement to any document incorporated by reference into such prospectus or document if required by applicable law with the SEC within five business days after a Holder provides the Corporation with certain required information, if such filing is necessary to enable the Holder to deliver the prospectus to purchasers of such Holder's Transfer Restricted Securities, (iv) the Shelf Registration Statement ceases to be effective or fails to be usable without being succeeded within 30 days by a post-effective amendment or an additional registration statement filed and declared effective (other than as permitted in (iii) above) pursuant to the Exchange Act that cures the failure of the registration statement to be effective or usable, and (v) the aggregate duration of any suspension periods in any period exceeds certain limits described in the Registration Rights Agreement (each such event referred to in clauses (i), (ii), (iii), (iv) and (v) a "Registration Default"), additional dividends shall accumulate on the 4.50% Convertible Preferred Stock, from and including the date on which any such Registration Default shall occur to, but excluding, the date on which the Registration Default has been cured, at the rate of 0.25% per year for the first 90 days following such date and at a rate of 0.50% per year thereafter ("Additional Dividends"). With respect to shares of Common Stock issued upon conversion of the 4.50% Convertible Preferred Stock, Additional Dividends will accumulate on the then applicable conversion price from and including the date on which any such Registration Default shall occur to, but excluding, the date on which the Registration Default has been cured, at the rate of 0.25% per year for the first 90 days following such date and at a rate of 0.50% per year thereafter. Except as mentioned above, the Corporation will have no other liabilities for monetary damages with respect to its registration obligations. The receipt of Additional Dividends will be the sole monetary remedy available to a Holder if the Corporation fails to meet these obligations.

(c) No dividend will be declared or paid upon, or any sum set apart for the payment of dividends upon, any outstanding share of the 4.50% Convertible Preferred Stock with respect to any dividend period unless all dividends for all preceding dividend periods have been declared and paid or declared and a sufficient sum set apart for the payment of such dividend upon all outstanding shares of 4.50% Convertible Preferred Stock.

(d) No dividends or other distributions (other than a dividend or distribution payable solely in shares of Parity Stock or Junior Stock (in the case of Parity Stock) or Junior Stock (in the case of Junior Stock) and other than cash paid in lieu of fractional shares) may be declared, made or paid, or set apart for payment upon, any Parity Stock or Junior Stock, nor may any Parity Stock or Junior

Stock be redeemed, purchased or otherwise acquired for any consideration (or any money paid to or made available for a sinking fund for the redemption of any Parity Stock or Junior Stock) by or on behalf of the Corporation (except by conversion into or exchange for shares of Parity Stock or Junior Stock (in the case of Parity Stock) or Junior Stock (in the case of Junior Stock)), unless full Accumulated Dividends shall have been or contemporaneously are declared and paid, or are declared and a sum sufficient for the payment thereof is set apart for such payment, on the 4.50% Convertible Preferred Stock and any Parity Stock for all dividend payment periods terminating on or prior to the date of such declaration, payment, redemption, purchase or acquisition. Notwithstanding the foregoing, if full dividends have not been paid on the 4.50% Convertible Preferred Stock and any Parity Stock, dividends may be declared and paid on the 4.50% Convertible Preferred Stock and such Parity Stock so long as the dividends are declared and paid pro rata so that the amounts of dividends declared per share on the 4.50% Convertible Preferred Stock and such Parity Stock will in all cases bear to each other the same ratio that accumulated and unpaid dividends per share on the shares of 4.50% Convertible Preferred Stock and such other Parity Stock bear to each other.

(e) Holders of shares of 4.50% Convertible Preferred Stock shall not be entitled to any dividends on the 4.50% Convertible Preferred Stock, whether payable in cash, property or stock, in excess of full cumulative dividends and Additional Dividends (if any).

(f) The holders of shares of 4.50% Convertible Preferred Stock at the close of business on a Dividend Record Date will be entitled to receive the dividend payment on those shares on the corresponding Dividend Payment Date notwithstanding the subsequent conversion thereof or the Corporation's default in payment of the dividend due on that Dividend Payment Date. However, shares of 4.50% Convertible Preferred Stock surrendered for conversion during the period between the close of business on any Dividend Record Date and the close of business on the Business Day immediately preceding the applicable Dividend Payment Date must be accompanied by payment of an amount equal to the dividend payable on the shares on that Dividend Payment Date; provided, however, that no such payment need be made if (1) the Corporation has specified a Mandatory Conversion Date that is after a Dividend Record Date and on or prior to the immediately following Dividend Payment Date or (2) any accumulated and unpaid dividends exist at the time of conversion with respect to such shares of 4.50% Convertible Preferred Stock to the extent of such accumulated and unpaid dividends. A holder of shares of 4.50% Convertible Preferred Stock on a Dividend Record Date who (or whose transferee) tenders any shares for conversion on the corresponding Dividend Payment Date will receive the dividend payable by the Corporation on the 4.50% Convertible Preferred Stock on that date, and the converting holder need not include payment in the amount of such dividend upon surrender of shares of 4.50% Convertible Preferred Stock for conversion. Except as provided above with respect to a voluntary conversion pursuant to Section 7, the Corporation shall make no payment or allowance for unpaid dividends, whether or not in arrears, on converted shares or for dividends on the shares of Common Stock issued upon conversion.

(g) In any case where any Dividend Payment Date or Conversion Date (including upon the occurrence of a Fundamental Change) of any 4.50% Convertible Preferred Stock shall not be a Business Day, at any place of payment, then payment of dividends (and Additional Dividends, if any) need not be made on such date, but may be made on the next succeeding Business Day at such place of payment with the same force and effect as if made on the dividend payment date or Conversion Date (including upon the occurrence of a Fundamental Change); and no interest shall accumulate on

the amount so payable for the period from and after such Dividend Payment Date or Conversion Date, as the case may be, to such Business Day.

(h) The Paying Agent shall return to the Corporation upon written request any money or property held by it for the payment of any amount with respect to the 4.50% Convertible Preferred Stock that remains unclaimed for two years, provided, however, that the Paying Agent, before being required to make any such return, shall at the expense of the Corporation cause to be published once in a newspaper of general circulation in The City of New York or mail to each such Holder notice that such money or property remains unclaimed and that, after a date specified therein, which shall not be less than 30 days from the date of such publication or mailing, any unclaimed money or property then remaining shall be returned to the Corporation. After return to the Corporation, Holders entitled to the money or property must look to the Corporation for payment as general creditors unless an applicable abandoned property law designates another Person.

4. Fundamental Change.

(a) Purchase at the Option of the Holder Upon a Fundamental Change. Each Holder shall have the right, at such Holder's option, to require the Corporation to purchase any or all of such Holder's 4.50% Convertible Preferred Stock for cash or a check on the date that is no earlier than 60 days nor later than 90 days after the date of the Corporation Notice of the occurrence of such Fundamental Change (subject to extension to comply with applicable law, as provided in Section 4(h) (the "Fundamental Change Purchase Date"). The 4.50% Convertible Preferred Stock shall be repurchased in integral multiples of $50.00 (representing the Liquidation Preference). The Corporation shall purchase such 4.50% Convertible Preferred Stock at a price (the "Fundamental Change Purchase Price") equal to 100% of the Liquidation Price of the number of shares of 4.50% Convertible Preferred Stock to be purchased plus accumulated and unpaid dividends, including Additional Dividends, if any, to the Fundamental Change Purchase Date.

(b) Notice of Fundamental Change. The Corporation, or at its request (which must be received by the Paying Agent at least three Business Days (or such lesser period as agreed to by the Paying Agent) prior to the date the Paying Agent is requested to give such notice as described below), the Paying Agent, in the name of and at the expense of the Corporation, shall mail to all Holders a Corporation Notice of the occurrence of a Fundamental Change and of the purchase right arising as a result thereof, including the information required by Section 4(e) hereof, on or before the 30th day after the occurrence of such Fundamental Change.

(c) Exercise of Option. For 4.50% Convertible Preferred Stock to be so purchased at the option of the Holder, the Paying Agent must receive at its office in Jackson, Michigan, or any other offices of the Paying Agent maintained for such purposes, such shares of 4.50% Convertible Preferred Stock duly endorsed for transfer, together with a written notice of purchase in the form attached hereto as Exhibit A (a "Fundamental Change Purchase Notice") duly completed, on or before the 30th day prior to the Fundamental Change Purchase Date, subject to extension to comply with applicable law. The Fundamental Change Purchase Notice shall state:

(i) if certificated, the certificate numbers of the shares of 4.50% Convertible Preferred Stock which the Holder shall deliver to be purchased, or, if not certificated, the

Fundamental Change Purchase Notice must comply with appropriate Depository procedures;

(ii) the number of shares of 4.50% Convertible Preferred Stock which the Holder shall deliver to be purchased, which portion must be $50.00 or an integral multiple thereof; and

(iii) that such 4.50% Convertible Preferred Stock shall be purchased as of the Fundamental Change Purchase Date pursuant to the terms and conditions specified in the 4.50% Convertible Preferred Stock and in this Certificate of Designation.

(d) Procedures. The Corporation shall purchase from a Holder, pursuant to this Section 4, shares of 4.50% Convertible Preferred Stock or multiples of $50.00 if so requested by such Holder.

Any purchase by the Corporation contemplated pursuant to the provisions of this Section 4 shall be consummated by the delivery of the Fundamental Change Purchase Price to be received by the Holder promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of the 4.50% Convertible Preferred Stock.

Notwithstanding anything herein to the contrary, any Holder delivering to the Paying Agent the Fundamental Change Purchase Notice contemplated by Section 4(c) hereof shall have the right at any time prior to the close of business on the Business Day prior to the Fundamental Change Purchase Date to withdraw such Fundamental Change Purchase Notice (in whole or in part) by delivery of a written notice of withdrawal to the Paying Agent in accordance with Section 4(f) hereof.

The Paying Agent shall promptly notify the Corporation of the receipt by it of any Fundamental Change Purchase Notice or written notice of withdrawal thereof.

On or before 10:00 a.m. (New York City time) on the Fundamental Change Purchase Date, the Corporation shall deposit with the Paying Agent (or if the Corporation or an Affiliate of the Corporation is acting as the Paying Agent, shall segregate and hold in trust) money sufficient to pay the aggregate Fundamental Change Purchase Price of the 4.50% Convertible Preferred Stock to be purchased pursuant to this Section 4. Payment by the Paying Agent of the Fundamental Change Purchase Price for such 4.50% Convertible Preferred Stock shall be made promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of such 4.50% Convertible Preferred Stock. If the Paying Agent holds, in accordance with the terms of this Certificate of Designation, money sufficient to pay the Fundamental Change Purchase Price of such 4.50% Convertible Preferred Stock on the Business Day following the Fundamental Change Purchase Date, then, on and after such date, such 4.50% Convertible Preferred Stock shall cease to be outstanding and dividends (including Additional Dividends, if any) on such 4.50% Convertible Preferred Stock shall cease to accumulate, whether or not book-entry transfer of such 4.50% Convertible Preferred Stock is made or such 4.50% Convertible Preferred Stock is delivered to the Paying Agent, and all other rights of the Holder shall terminate (other than the right to receive the Fundamental Change Purchase Price upon delivery or transfer of the 4.50% Convertible Preferred Stock). Nothing herein shall preclude any withholding tax required by law.

The Corporation shall require each Paying Agent to agree in writing that the Paying Agent shall hold in trust for the benefit of Holders all money held by the Paying Agent for the payment of the

Fundamental Change Purchase Price. If the Corporation or an Affiliate of the Corporation acts as Paying Agent, it shall segregate the money held by it as Paying Agent and hold it as a separate trust fund.

All questions as to the validity, eligibility (including time of receipt) and acceptance of any 4.50% Convertible Preferred Stock pursuant to a Fundamental Change shall be determined by the Corporation, whose determination shall be final and binding.

(e) Notice of Fundamental Change. The Corporation shall send notices (each, a "Corporation Notice") to the Holders (and to beneficial owners as required by applicable law) at their addresses shown in the Security Register maintained by the Security Registrar, and delivered to the Paying Agent on or before the 30th day after the occurrence of the Fundamental Change ("Corporation Notice Date"). Each Corporation Notice shall include a form of Fundamental Change Purchase Notice to be completed by a Holder and shall state:

(i) the applicable Fundamental Change Purchase Price, excluding accumulated and unpaid dividends, Conversion Rate at the time of such notice (and any adjustments to the Conversion Rate) and, to the extent known at the time of such notice, the amount of dividends (including Additional Dividends, if any), if any, that will be payable with respect to the 4.50% Convertible Preferred Stock on the applicable Fundamental Change Purchase Date;

(ii) the events causing the Fundamental Change and the date of the Fundamental Change;

(iii) the Fundamental Change Purchase Date;

(iv) the last date on which a Holder may exercise its purchase right;

(v) the name and address of the Paying Agent and the Conversion Agent;

(vi) that the 4.50% Convertible Preferred Stock must be surrendered to the Paying Agent to collect payment of the Fundamental Change Purchase Price;

(vii) that the 4.50% Convertible Preferred Stock as to which a Fundamental Change Purchase Notice has been given may be converted only if the applicable Fundamental Change Purchase Notice has been withdrawn in accordance with the terms of this Certificate of Designation;

(viii) that the Fundamental Change Purchase Price for any of the 4.50% Convertible Preferred Stock as to which a Fundamental Change Purchase Notice has been given and not withdrawn shall be paid by the Paying Agent promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of such 4.50% Convertible Preferred Stock;

(ix) the procedures the Holder must follow under this Section 4;

(x) briefly, the conversion rights of the 4.50% Convertible Preferred Stock;

(xi) that, unless the Corporation defaults in making payment of such Fundamental Change Purchase Price on the 4.50% Convertible Preferred Stock covered by any Fundamental Change Purchase Notice, dividends (including Additional Dividends, if any) will cease to accumulate on and after the Fundamental Change Purchase Date;

(xii) the CUSIP or ISIN number of the 4.50% Convertible Preferred Stock; and

(xiii) the procedures for withdrawing a Fundamental Change Purchase Notice.

In connection with providing such Corporation Notice, the Corporation will issue a press release and publish a notice containing the information in such Corporation Notice in a newspaper of general circulation in The City of New York or publish such information on the Corporation's then existing Web site or through such other public medium as the Corporation may use at the time.

At the Corporation's request, made at least five Business Days prior to the date upon which such notice is to be mailed, and at the Corporation's expense, the Paying Agent shall give the Corporation Notice in the Corporation's name; *provided*, *however*, that, in all cases, the text of the Corporation Notice shall be prepared by the Corporation.

(f) Effect of Fundamental Change Purchase Notice. Upon receipt by the Corporation of the Fundamental Change Purchase Notice specified in this Section 4, the Holder of the 4.50% Convertible Preferred Stock in respect of which such Fundamental Change Purchase Notice was given shall (unless such Fundamental Change Purchase Notice is withdrawn as specified in this Section 4(f)) thereafter be entitled to receive solely the Fundamental Change Purchase Price with respect to such 4.50% Convertible Preferred Stock. Such Fundamental Change Purchase Price shall be paid by the Paying Agent to such Holder promptly following the later of (x) the Fundamental Change Purchase Date with respect to such 4.50% Convertible Preferred Stock (provided the conditions in this Section 4 have been satisfied) and (y) the time of delivery or book-entry transfer of such 4.50% Convertible Preferred Stock to the Paying Agent by the Holder thereof in the manner required by this Section 4. 4.50% Convertible Preferred Stock in respect of which a Fundamental Change Purchase Notice has been given by the Holder thereof may not be converted for shares of Common Stock on or after the date of the delivery of such Fundamental Change Purchase Notice unless such Fundamental Change Purchase Notice has first been validly withdrawn as specified in this Section 4(f). Payment of the Fundamental Change Purchase Price for shares of 4.50% Convertible Preferred Stock in registered, certificated form ("Certificated 4.50% Convertible Preferred Stock") for which a Fundamental Change Purchase Notice has been delivered and not withdrawn is conditioned upon delivery of such Certificated 4.50% Convertible Preferred Stock (together with necessary endorsements) to the Paying Agent at its office in Jackson, Michigan, or any other office of the Paying Agent maintained for such purpose, at any time (whether prior to, on or after the Fundamental Change Purchase Date) after the delivery of such Fundamental Change Purchase Notice. Payment of the Fundamental Change Purchase Price for such Certificated 4.50% Convertible Preferred Stock will be made promptly following the later of the Fundamental Change Purchase Date or the time of delivery of such Certificated 4.50% Convertible Preferred Stock.

If the Paying Agent holds, in accordance with the terms of this Certificate of Designation, money sufficient to pay the Fundamental Change Purchase Price of shares of 4.50% Convertible Preferred Stock on the Business Day following the Fundamental Change Purchase Date for such 4.50%

Convertible Preferred Stock, then, on and after such date, dividends on such 4.50% Convertible Preferred Stock will cease to accumulate, whether or not such 4.50% Convertible Preferred Stock is delivered to the Paying Agent, and all other rights of the Holder shall terminate (other than the right to receive the Fundamental Change Purchase Price upon delivery of the 4.50% Convertible Preferred Stock).

A Fundamental Change Purchase Notice may be withdrawn by means of a written notice of withdrawal delivered to the office of the Paying Agent at any time prior to 5:00 p.m. New York City time on the Business Day prior to the Fundamental Change Purchase Date to which it relates specifying:

(i) if certificated, the certificate number of 4.50% Convertible Preferred Stock in respect of which such notice of withdrawal is being submitted, or, if not certificated, the written notice of withdrawal must comply with appropriate Depository procedures;

(ii) the number of shares of 4.50% Convertible Preferred Stock with respect to which such notice of withdrawal is being submitted; and

(iii) the number of shares of 4.50% Convertible Preferred Stock, if any, which remains subject to the original Fundamental Change Purchase Notice and which have been or shall be delivered for purchase by the Corporation.

(g) 4.50% Convertible Preferred Stock Purchased in Part. Any shares of 4.50% Convertible Preferred Stock that are to be purchased only in part shall be surrendered (in physical or book-entry form) at the office of the Paying Agent (with, if the Corporation so requires, due endorsement by, or a written instrument of transfer in form satisfactory to the Corporation duly executed by, the Holder thereof or such Holder's attorney duly authorized in writing) and the Corporation shall execute and the Transfer Agent shall authenticate and deliver to the Holder of such 4.50% Convertible Preferred Stock, without service charge, new shares of 4.50% Convertible Preferred Stock, as requested by such Holder in an amount equal to, and in exchange for, the portion of the Liquidation Preference of the 4.50% Convertible Preferred Stock so surrendered which is not purchased.

(h) Covenant to Comply with Securities Laws Upon Purchase of the 4.50% Convertible Preferred Stock. In connection with any offer to purchase 4.50% Convertible Preferred Stock under this Section 4, the Corporation shall, to the extent applicable: (i) comply with Rules 13e-4 and 14e-1 (and any successor provisions thereto) under the Exchange Act, if applicable; (ii) file the related Schedule TO (or any successor schedule, form or report) under the Exchange Act, if applicable; and (iii) otherwise comply with all applicable federal and state securities laws so as to permit the rights and obligations under this Section 4 hereof to be exercised in the time and in the manner specified in this Section 4.

(i) Repayment to the Corporation. The Paying Agent shall return to the Corporation any cash or property that remains unclaimed as provided in the 4.50% Convertible Preferred Stock, together with interest that the Paying Agent has agreed to pay, if any, held by it for the payment of a Fundamental Change Purchase Price; provided, however, that to the extent that the aggregate amount of cash or property deposited by the Corporation pursuant to this Section 4 exceeds the aggregate Fundamental Change Purchase Price of the 4.50% Convertible Preferred Stock or portions thereof which the Corporation is obligated to purchase as of the Fundamental Change Purchase Date, then promptly on

and after the Business Day following the Fundamental Change Purchase Date, the Paying Agent shall return any such excess to the Corporation together with interest that the Paying Agent has agreed to pay, if any.

(j) Officers' Certificate. At least five Business Days before the Corporation Notice Date, the Corporation shall deliver an Officers' Certificate to the Paying Agent (provided, that, at the Corporation's option, the matters to be addressed in such Officers' Certificate may be divided among two such certificates) specifying:

(i) the manner of payment selected by the Corporation; and

(ii) whether the Corporation desires the Paying Agent to give the Corporation Notice required by Section 4(e) hereof.

5. Voting.

(a) The shares of 4.50% Convertible Preferred Stock shall have no voting rights except as set forth below or as otherwise required by Michigan law from time to time:

(i) If and whenever at any time or times a Voting Rights Triggering Event occurs, then the holders of shares of 4.50% Convertible Preferred Stock, voting as a single class with any other 4.50% Convertible Preferred Stock or preference securities having similar voting rights that are exercisable (the "Voting Rights Class"), will be entitled at the next regular or special meeting of shareholders of the Corporation to elect two additional directors of the Corporation, unless the Board of Directors is comprised of fewer than six directors at such time, in which case the Voting Rights Class shall be entitled to elect one additional director. Upon the election of any such additional directors, the number of directors that comprise the Board of Directors shall be increased by such number of additional directors.

(ii) Such voting rights may be exercised at a special meeting of the holders of the shares of the Voting Rights Class, called as hereinafter provided, or at any annual meeting of shareholders held for the purpose of electing directors, and thereafter at each such annual meeting until such time as all dividends in arrears on the shares of 4.50% Convertible Preferred Stock shall have been paid in full, at which time or times such voting rights and the term of the directors elected pursuant to Section 5(a)(i) shall terminate.

(iii) At any time when such voting rights shall have vested in holders of shares of the Voting Rights Class, an Officer of the Corporation may call, and, upon written request of the record holders of shares representing at least twenty-five percent (25%) of the voting power of the shares then outstanding of the Voting Rights Class, addressed to the Secretary of the Corporation, shall call a special meeting of the holders of shares of the Voting Rights Class. Such meeting shall be held at the earliest practicable date upon the notice required for annual meetings of shareholders at the place for holding annual meetings of shareholders of the Corporation, or, if none, at a place designated by the Board of Directors. Notwithstanding the provisions of this Section 5(a)(iii), no such special meeting shall be called during a period within

the 60 days immediately preceding the date fixed for the next annual meeting of shareholders, in which such case the election of directors pursuant to Section 5(a)(i) shall be held at such annual meeting of shareholders.

(iv) At any meeting held for the purpose of electing directors at which the holders of the Voting Rights Class shall have the right to elect directors as provided herein, the presence in person or by proxy of the holders of shares representing more than fifty percent (50%) in voting power of the then outstanding shares of the Voting Rights Class shall be required and shall be sufficient to constitute a quorum of such class for the election of directors by such class. The affirmative vote of the holders of shares of 4.50% Convertible Preferred Stock constituting a majority of the shares of 4.50% Convertible Preferred Stock present at such meeting, in person or by proxy shall be sufficient to elect any such director.

(v) Any director elected pursuant to the voting rights created under this Section 5(a) shall hold office until the next annual meeting of shareholders (unless such term has previously terminated pursuant to Section 5(a)(ii)) and any vacancy in respect of any such director shall be filled only by vote of the remaining director so elected by holders of the Voting Rights Class, or, if there be no such remaining director, by the holders of shares of the Voting Rights Class at a special meeting called in accordance with the procedures set forth in this Section 5, or, if no such special meeting is called, at the next annual meeting of shareholders. Upon any termination of such voting rights, the term of office of all directors elected pursuant to this Section 5 shall terminate.

(vi) So long as any shares of 4.50% Convertible Preferred Stock remain outstanding, unless a greater percentage shall then be required by law, the Corporation shall not, without the affirmative vote or consent of the holders of all of the outstanding 4.50% Convertible Preferred Stock voting or consenting, as the case may be, separately as one class, (i) create, authorize or issue any class or series of Senior Stock (or any security convertible into Senior Stock) or (ii) amend the Articles of Incorporation so as to affect adversely the specified rights, preferences, privileges or voting rights of holders of shares of 4.50% Convertible Preferred Stock.

(vii) In exercising the voting rights set forth in this Section 5(a), each share of 4.50% Convertible Preferred Stock shall be entitled to one vote.

(b) The Corporation may authorize, increase the authorized amount of, or issue any class or series of Parity Stock or Junior Stock, without the consent of the holders of 4.50% Convertible Preferred Stock, and in taking such actions the Corporation shall not be deemed to have affected adversely the rights, preferences, privileges or voting rights of holders of shares of 4.50% Convertible Preferred Stock.

6. Liquidation Rights.

(a) In the event of any liquidation, winding-up or dissolution of the Corporation, whether voluntary of involuntary, each holder of shares of 4.50% Convertible Preferred Stock shall be entitled to receive and to be paid out of the assets of the Corporation available for distribution to its

shareholders the Liquidation Preference plus Accumulated Dividends and Additional Dividends thereon in preference to the holders of, and before any payment or distribution is made on, any Junior Stock, including, without limitation, on any Common Stock.

(b) Neither the sale, conveyance, exchange or transfer (for cash, shares of stock, securities or other consideration) of all or substantially all the assets or business of the Corporation (other than in connection with the liquidation, winding-up or dissolution of its business) nor the merger or consolidation of the Corporation into or with any other Person shall be deemed to be a liquidation, winding-up or dissolution, voluntary or involuntary, for the purposes of this Section 6.

(c) After the payment to the holders of the shares of 4.50% Convertible Preferred Stock of full preferential amounts provided for in this Section 6, the holders of 4.50% Convertible Preferred Stock as such shall have no right or claim to any of the remaining assets of the Corporation.

(d) In the event the assets of the Corporation available for distribution to the holders of shares of 4.50% Convertible Preferred Stock upon any liquidation, winding-up or dissolution of the Corporation, whether voluntary or involuntary, shall be insufficient to pay in full all amounts to which such holders are entitled pursuant to Section 6(a), no such distribution shall be made on account of any shares of Parity Stock upon such liquidation, dissolution or winding-up unless proportionate distributable amounts shall be paid on account of the shares of 4.50% Convertible Preferred Stock, ratably, in proportion to the full distributable amounts for which holders of all 4.50% Convertible Preferred Stock and of any Parity Stock are entitled upon such liquidation, winding-up or dissolution.

7. Conversion.

(a) Conversion Rights. A Holder may convert 4.50% Convertible Preferred Stock into Common Stock during the periods and upon satisfaction of at least one of the conditions set forth below:

(i) in any calendar quarter (and only during such calendar quarter) if the Last Reported Sale Price for Common Stock for at least 20 Trading Days during the period of 30 consecutive Trading Days ending on the last Trading Day of the previous calendar quarter is greater than or equal to 120% of the Conversion Price per share of Common Stock on such last Trading Day;

(ii) during the five Business Days immediately following any ten consecutive Trading Day period in which the Trading Price per Liquidation Preference of 4.50% Convertible Preferred Stock (as determined following a request by a Holder of 4.50% Convertible Preferred Stock in accordance with the procedures described herein) for each day of that period was less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate (the “Trading Exception”); provided, however, that a Holder may not convert its 4.50% Convertible Preferred Stock if the average closing sale price of Common Stock for such ten consecutive Trading Day period is between the then current Conversion Price and 120% of the then applicable Conversion Price; in connection with any conversion upon satisfaction of such Trading Price condition, the Conversion Agent shall have no obligation to determine the Trading Price unless the Corporation has requested such determination; and the Corporation shall have no obligation to make such request unless the Holder provides

reasonable evidence that the Trading Price would be less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate; at which time, the Corporation shall instruct the Conversion Agent to determine the Trading Price beginning on the next Trading Day and on each successive Trading Day until the Trading Price is greater than or equal to 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate;

(iii) the Corporation becomes a party to a consolidation, merger or binding share exchange pursuant to which the Common Stock would be converted into cash or property (other than securities), in which case a Holder may surrender 4.50% Convertible Preferred Stock for conversion at any time from and after the date which is 15 days prior to the anticipated effective date for the transaction until 15 days after the actual effective date of such transaction; or

(iv) the Corporation elects to (i) distribute to all holders of Common Stock assets, debt securities or rights to purchase securities of the Corporation, which distribution has a per share value as determined by the Board of Directors exceeding 15% of the Last Reported Sale Price of a share of Common Stock on the Trading Day immediately preceding the declaration date for such distribution, or (ii) distribute to all holders of Common Stock rights entitling them to purchase, for a period expiring within 60 days after the date of such distribution, shares of Common Stock at less than the Last Reported Sale Price of Common Stock on the Trading Day immediately preceding the declaration date of the distribution. In the case of the foregoing clauses (i) and (ii), the Corporation must notify the Holders at least 20 Business Days immediately prior to the ex-dividend date for such distribution. Once the Corporation has given such notice, Holders may surrender their 4.50% Convertible Preferred Stock for conversion at any time thereafter until the earlier of the close of business on the Business Day immediately prior to the ex-dividend date or the Corporation's announcement that such distribution will not take place; provided, however, that a Holder may not exercise this right to convert if the Holder may participate in the distribution without conversion. As used herein, the term "ex dividend date," when used with respect to any issuance or distribution, shall mean the first date on which the Common Stock trades regular way on such exchange or in such market without the right to receive such issuance or distribution.

The initial Conversion Rate is 5.0541 shares of Common Stock per share of 4.50% Convertible Preferred Stock, subject to adjustment in certain events as described herein. The Corporation shall deliver cash or a check in lieu of any fractional share of Common Stock. A Holder may convert fewer than all of its 4.50% Convertible Preferred Stock so long as the 4.50% Convertible Preferred Stock converted is an integral multiple of the Liquidation Preference.

Holders of 4.50% Convertible Preferred Stock at the close of business on a Dividend Record Date will receive payment of dividends, payable on the corresponding Dividend Payment Date notwithstanding the conversion of such 4.50% Convertible Preferred Stock at any time after the close of business on such Dividend Record Date. 4.50% Convertible Preferred Stock surrendered for conversion by a Holder during the period from the close of business on any Dividend Record Date to the opening of business on the immediately following Dividend Payment Date must be accompanied

by payment of an amount equal to the dividend that the Holder is to receive on such 4.50% Convertible Preferred Stock; provided, however, that no such payment need be made if (1) the Corporation has specified a Mandatory Conversion Date that is after a Dividend Record Date and on or prior to the immediately following Dividend Payment Date or (2) any accumulated and unpaid dividends exist at the time of conversion with respect to such shares of 4.50% Convertible Preferred Stock to the extent of such accumulated and unpaid dividends.

To convert 4.50% Convertible Preferred Stock a Holder must (i) complete and manually sign the irrevocable conversion notice in the form attached hereto as Exhibit B (a "Conversion Notice") (or complete and manually sign a facsimile of such notice) and deliver such notice to the Conversion Agent at its office in Jackson, Michigan or any other offices of the Conversion Agent maintained by the Conversion Agent for such purpose, (ii) surrender the shares of 4.50% Convertible Preferred Stock to the Conversion Agent, (iii) furnish appropriate endorsements and transfer documents if required by the Conversion Agent or the Corporation and (iv) pay any transfer or similar tax, if required.

(b) Conversion Procedures. To convert 4.50% Convertible Preferred Stock, a Holder must satisfy the requirements in this Section 7 and in the 4.50% Convertible Preferred Stock. The date on which the Holder satisfies all those requirements is the conversion date (the "Conversion Date"). As soon as practicable, but in no event later than the fifth Business Day following the Conversion Date, the Corporation shall update the global security representing the shares of Common Stock to record the Holder's interest in the Common Stock, or deliver to the Holder, through the Conversion Agent, a certificate for the number of full shares of Common Stock issuable upon the conversion and cash or a check in lieu of any fractional share determined pursuant to Section 7(c) hereof. The Person in whose name the certificate is registered shall be treated as a shareholder of record on and after the Conversion Date; provided, however, that no surrender of 4.50% Convertible Preferred Stock on any date when the stock transfer books of the Corporation shall be closed shall be effective to constitute the Person or Persons entitled to receive the shares of Common Stock upon such conversion as the record holder or holders of such shares of Common Stock on such date, but such surrender shall be effective to constitute the Person or Persons entitled to receive such shares of Common Stock as the record holder or holders thereof for all purposes at the close of business on the next succeeding day on which such stock transfer books are open; such conversion shall be at the Conversion Rate in effect on the date that such shares of 4.50% Convertible Preferred Stock shall have been surrendered for conversion, as if the stock transfer books of the Corporation had not been closed. Upon conversion of 4.50% Convertible Preferred Stock, such Person shall no longer be a Holder of such 4.50% Convertible Preferred Stock.

No payment or adjustment shall be made for dividends on or other distributions with respect to any Common Stock except as provided in Section 7(f) hereof or as otherwise provided in this Certificate of Designation.

On conversion of 4.50% Convertible Preferred Stock, that portion of Accumulated Dividends with respect to the converted 4.50% Convertible Preferred Stock will be deemed canceled, extinguished or forfeited, rather than paid in full to the Holder thereof through delivery of the Common Stock (together with the cash or check payment, if any, in lieu of fractional shares) in exchange for the shares of 4.50% Convertible Preferred Stock being converted pursuant to the provisions hereof, and the Fair Market Value of such shares of Common Stock (together with any such cash or check

payment in lieu of fractional shares) shall be treated as issued, to the extent thereof, first in exchange for Accumulated Dividends through the Conversion Date, and the balance, if any, of such Fair Market Value of such Common Stock (and any such cash or check payment) shall be treated as issued in exchange for the Liquidation Preference of the 4.50% Convertible Preferred Stock being converted pursuant to the provisions hereof.

Upon surrender of 4.50% Convertible Preferred Stock that is converted in part, the Corporation shall execute, and the Transfer Agent shall authenticate and deliver to the Holder, new shares of 4.50% Convertible Preferred Stock in a number equal to the unconverted portion of the shares of 4.50% Convertible Preferred Stock surrendered.

If the last day on which 4.50% Convertible Preferred Stock may be converted is a legal holiday in a place where a Conversion Agent is located, the 4.50% Convertible Preferred Stock may be surrendered to that Conversion Agent on the next succeeding day that it is not a legal holiday.

(c) Cash or Check Payments in Lieu of Fractional Shares. The Corporation shall not issue a fractional share of Common Stock upon conversion of 4.50% Convertible Preferred Stock. Instead the Corporation shall deliver cash (or Corporation's check) for the current market value of the fractional share. The current market value of a fractional share shall be determined to the nearest 1/10,000th of a share by multiplying the Last Reported Sale Price of a full share of Common Stock on the Trading Day immediately preceding the Conversion Date by the fractional amount and rounding the product to the nearest whole cent.

(d) Taxes on Conversion. If a Holder converts 4.50% Convertible Preferred Stock, the Corporation shall pay any documentary, stamp or similar issue or transfer tax due on the issue of shares of Common Stock upon the conversion. However, the Holder shall pay any such tax which is due because the Holder requests the shares to be issued in a name other than the Holder's name. The Conversion Agent may refuse to deliver the certificates representing the Common Stock being issued in a name other than the Holder's name until the Conversion Agent receives a sum sufficient to pay any tax which shall be due because the shares are to be issued in a name other than the Holder's name. Nothing herein shall preclude any withholding tax required by law.

(e) Covenants of the Corporation. The Corporation shall, prior to issuance of any 4.50% Convertible Preferred Stock hereunder, and from time to time as may be necessary, reserve out of its authorized but unissued Common Stock a sufficient number of shares of Common Stock to permit the conversion of the 4.50% Convertible Preferred Stock.

All shares of Common Stock delivered upon conversion of the 4.50% Convertible Preferred Stock shall be newly issued shares or treasury shares, shall be duly and validly issued and fully paid and nonassessable and shall be free from preemptive rights and free of any lien or adverse claim.

The Corporation shall endeavor promptly to comply with all federal and state securities laws regulating the order and delivery of shares of Common Stock upon the conversion of 4.50% Convertible Preferred Stock, if any, and shall cause to have listed or quoted all such shares of Common Stock on each United States national securities exchange or over-the-counter or other domestic market on which the Common Stock is then listed or quoted.

(f) Adjustments to Conversion Rate. The Conversion Rate shall be adjusted from time to time, without duplication, as follows:

(i) In case the Corporation shall: (a) pay a dividend, or make a distribution, exclusively in shares of its capital stock, on the Common Stock; (b) subdivide its outstanding Common Stock into a greater number of shares; (c) combine its outstanding Common Stock into a smaller number of shares; or (d) reclassify its Common Stock, the Conversion Rate in effect immediately prior to the record date or effective date, as the case may be, for the adjustment pursuant to this Section 7(f) as described below, shall be adjusted so that the Holder of any 4.50% Convertible Preferred Stock thereafter surrendered for conversion shall be entitled to receive the number of shares of Common Stock of the Corporation which such Holder would have owned or have been entitled to receive after the happening of any of the events described above had such 4.50% Convertible Preferred Stock been converted immediately prior to such record date or effective date, as the case may be. An adjustment made pursuant to this Section 7(f) shall become effective immediately after the applicable record date in the case of a dividend or distribution and shall become effective immediately after the applicable effective date in the case of subdivision, combination or reclassification of the Corporation's Common Stock. If any dividend or distribution of the type described in clause (a) above is not so paid or made, the Conversion Rate shall again be adjusted to the Conversion Rate which would then be in effect if such dividend or distribution had not been declared.

(ii) In case the Corporation shall issue rights or warrants to all holders of the Common Stock entitling them (for a period expiring within 60 days after the date of issuance of such rights or warrants) to subscribe for or purchase Common Stock at a price per share less than the Market Price per share of Common Stock on the record date fixed for determination of shareholders entitled to receive such rights or warrants, the Conversion Rate in effect immediately after such record date shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately after such record date by a fraction of which (a) the numerator shall be the number of shares of Common Stock outstanding on such record date plus the number of additional shares of Common Stock offered for subscription or purchase, and (b) the denominator shall be the number of shares of Common Stock outstanding on such record date plus the number of shares which the aggregate offering price of the total number of shares so offered would purchase at the Market Price per share of Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such issuance of rights or warrants. Such adjustment shall be made successively whenever any such rights or warrants are issued, and shall become effective immediately after the opening of business on the day following the record date for the determination of shareholders entitled to receive such rights or warrants. To the extent that shares of Common Stock are not delivered after the expiration of such rights or warrants, the Conversion Rate shall be readjusted to the Conversion Rate which would then be in effect had the adjustments made upon the issuance of such rights or warrants been made on the basis of delivery of only the number of shares of Common Stock actually delivered. If such rights or warrants are not so issued, the Conversion Rate shall again be

adjusted to be the Conversion Rate which would then be in effect if such record date for the determination of shareholders entitled to receive such rights or warrants had not been fixed. In determining whether any rights or warrants entitle the holders to subscribe for or purchase shares of Common Stock at less than such Market Price, and in determining the aggregate offering price of such shares of Common Stock, there shall be taken into account any consideration received by the Corporation for such rights or warrants, the value of such consideration, if other than cash, to be determined by the Board of Directors.

(iii) In case the Corporation shall, by dividend or otherwise, distribute to all holders of Common Stock any assets, debt securities or rights or warrants to purchase any of its securities (excluding (a) any dividend, distribution or issuance covered by those referred to in Section 7(f)(i) or Section 7(f)(ii) hereof and (b) any dividend or distribution paid exclusively in cash) (any of the foregoing hereinafter in this Section 7(f)(iii) called the "Distributed Assets or Securities") in an aggregate amount per share of Common Stock that, combined together with the aggregate amount of any other such distributions to all holders of its Common Stock made within the 12 months preceding the date of payment of such distribution, and in respect of which no adjustment pursuant to this Section 7(f)(iii) has been made, exceeds 15% of the Market Price on the Trading Day immediately preceding the declaration of such distribution, then the Conversion Rate shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately prior to the close of business on the record date mentioned below by a fraction of which (A) the numerator shall be the Market Price per share of the Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution, and (B) the denominator shall be (1) the Market Price per share of the Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution less (2) the Fair Market Value on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution (as determined by the Board of Directors, whose determination shall be conclusive, and described in a certificate filed with the Paying Agent) of the Distributed Assets or Securities so distributed applicable to one share of Common Stock. Such adjustment shall become effective immediately after the record date for the determination of shareholders entitled to receive such distribution; provided, however, that, if (a) the Fair Market Value of the portion of the Distributed Assets or Securities so distributed applicable to one share of Common Stock is equal to or greater than the Market Price of the Common Stock on the record date for the determination of shareholders entitled to receive such distribution or (b) the Market Price of the Common Stock on the record date for the determination of shareholders entitled to receive such distribution is greater than the Fair Market Value per share of such Distributed Assets or Securities by less than $1.00, then, in lieu of the foregoing adjustment, adequate provision shall be made so that each Holder shall have the right to receive upon conversion, in addition to the shares of Common Stock, the kind and amount of assets, debt securities, or rights or warrants comprising the Distributed Assets or Securities the Holder would have received had such Holder converted such 4.50% Convertible Preferred Stock immediately prior to the record date for the

determination of shareholders entitled to receive such distribution. In the event that such distribution is not so paid or made, the Conversion Rate shall again be adjusted to the Conversion Rate which would then be in effect if such distribution had not been declared.

(iv) In case the Corporation shall make (a) any distributions, by dividend or otherwise, during any quarterly fiscal periods consisting exclusively of cash to all holders of outstanding shares of Common Stock in an aggregate amount that, together with (b) other all-cash or all-check distributions made to all holders of outstanding shares of Common Stock during such quarterly fiscal period, and (c) any cash and the Fair Market Value, as of the expiration of any tender or exchange offer (other than consideration payable in respect of any odd-lot tender offer) of consideration payable in respect of any tender or exchange offer by the Corporation or any of the Corporation's Subsidiaries for all or any portion of shares of Common Stock concluded during such quarterly fiscal period, exceed the product of $0 multiplied by the number of shares of Common Stock outstanding on the record date for such distribution, then, and in each such case, the Conversion Rate shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately prior to the close of business on the record date fixed for the determination of holders of Common Stock entitled to receive such distribution by a fraction of which (A) the numerator shall be the Market Price per share of the Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution and (B) the denominator shall be (1) the Market Price per share of Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution plus (2) $0 less (3) an amount equal to the quotient of (x) the combined amount distributed or payable in the transactions described in clauses (a), (b) and (c) above during such quarterly fiscal period and (y) the number of shares of Common Stock outstanding on such record date, such adjustment to become effective immediately after the record date for the determination of shareholders entitled to receive such distribution.

(v) With respect to Section 7(f)(iii) hereof, in the event that the Corporation makes any distribution to all holders of Common Stock consisting of Equity Interests in a Subsidiary or other business unit of the Corporation, the Conversion Rate shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately prior to the close of business on the record date fixed for the determination of holders of Common Stock entitled to receive such distribution by a fraction of which (i) the numerator shall be (x) the Spin-off Market Price per share of the Common Stock on such record date plus (y) the Spin-off Market Price per Equity Interest of the Subsidiary or other business unit of the Corporation on such record date and (ii) the denominator shall be the Spin-off Market Price per share of the Common Stock on such record date, such adjustment to become effective 10 Trading Days after the effective date of such distribution of Equity Interests in a Subsidiary or other business unit of the Corporation.

(vi) Upon conversion of the 4.50% Convertible Preferred Stock, the Holders shall receive, in addition to the Common Stock issuable upon such conversion, the rights issued under any future shareholder rights plan the Corporation implements (notwithstanding the occurrence of an event causing such rights to separate from the Common Stock at or prior to the time of conversion) unless, prior to conversion, the rights have expired, terminated or been redeemed or exchanged in accordance with such rights plan. If, and only if, the Holders of 4.50% Convertible Preferred Stock receive rights under such shareholder rights plans as described in the preceding sentence upon conversion of their 4.50% Convertible Preferred Stock, then no other adjustment pursuant to this Section 7(f) shall be made in connection with such shareholder rights plans.

(vii) For purposes of this Section 7(f), the number of shares of Common Stock at any time outstanding shall not include shares held in the treasury of the Corporation but shall include shares issuable in respect of scrip certificates issued in lieu of fractions of shares of Common Stock. The Corporation shall not pay any dividend or make any distribution on shares of Common Stock held in the treasury of the Corporation.

(viii) Notwithstanding the foregoing, in no event shall the Conversion Rate exceed the maximum conversion rate specified under this Section 7(f)(viii) (the "Maximum Conversion Rate") as a result of an adjustment pursuant to Section 7(f)(iii) or Section 7(f)(iv) hereof. The Maximum Conversion Rate shall initially be 6.5703 and shall be appropriately adjusted from time to time for any stock dividends on or subdivisions or combinations of the Common Stock. The Maximum Conversion Rate shall not apply to any adjustments made pursuant to any of the events in Section 7(f)(i) or Section 7(f)(ii) hereof.

(g) Calculation Methodology. No adjustment in the Conversion Price need be made unless the adjustment would require an increase or decrease of at least 1% in the Conversion Price then in effect, provided that any adjustment that would otherwise be required to be made shall be carried forward and taken into account in any subsequent adjustment. Except as stated in this Section 7, the Conversion Rate will not be adjusted for the issuance of Common Stock or any securities convertible into or exchangeable for Common Stock or carrying the right to purchase any of the foregoing. Any adjustments that are made shall be carried forward and taken into account in any subsequent adjustment. All calculations under Section 4 and Section 7(f) hereof and this Section 7(g) shall be made to the nearest cent or to the nearest 1/10,000th of a share, as the case may be.

(h) When No Adjustment Required. No adjustment to the Conversion Rate need be made:

(i) upon the issuance of any shares of Common Stock pursuant to any present or future plan providing for the reinvestment of dividends or interest payable on securities of the Corporation and the investment of additional optional amounts in shares of Common Stock under any plan;

(ii) upon the issuance of any shares of Common Stock or options or rights to purchase those shares pursuant to any present or future employee, director or consultant benefit plan or program of or assumed by the Corporation or any of its Subsidiaries;

(iii) upon the issuance of any shares of Common Stock pursuant to any option, warrant, right, or exercisable, exchangeable or convertible security not described in clause (ii) above and outstanding as of the date of this Certificate of Designation;

(iv) for a change in the par value or no par value of the Common Stock;

(v) for accumulated and unpaid dividends (including Additional Dividends, if any); or

(vi) if Holders are to participate in a merger or consolidation on a basis and with notice that the Board of Directors determines to be fair and appropriate in light of the basis and notice on which holders of Common Stock participate in the transaction; provided that the basis on which the Holders are to participate in the transaction shall not be deemed to be fair if it would require the conversion of securities at any time prior to the expiration of the conversion period specified for such securities.

To the extent the 4.50% Convertible Preferred Stock becomes convertible into cash, assets or property (other than capital stock of the Corporation or securities to which Section 7(l) hereof applies), no adjustment shall be made thereafter as to the cash, assets or property. Interest shall not accumulate on such cash.

(i) Notice of Adjustment. Whenever the Conversion Rate is adjusted, the Corporation shall promptly mail to Holders a notice of the adjustment. The Corporation shall file with the Conversion Agent such notice. The certificate shall, absent manifest error, be conclusive evidence that the adjustment is correct. No Conversion Agent shall be under any duty or responsibility with respect to any such certificate except to exhibit the same to any Holder desiring inspection thereof.

(j) Voluntary Increase. The Corporation may make such increases in the Conversion Rate, in addition to those required by Section 7(f) hereof, as the Board of Directors considers to be advisable to avoid or diminish any income tax to holders of Common Stock or rights to purchase Common Stock resulting from any dividend or distribution of stock (or rights to acquire stock) or from any event treated as such for income tax purposes. To the extent permitted by applicable law, the Corporation may from time to time increase the Conversion Rate by any amount, temporarily or otherwise, for any period of at least 20 days if the increase is irrevocable during the period and the Board of Directors shall have made a determination that such increase would be in the best interests of the Corporation, which determination shall be conclusive. Whenever the Conversion Rate is so increased, the Corporation shall mail to Holders and file with the Conversion Agent a notice of such increase. The Conversion Agent shall not be under any duty or responsibility with respect to any such notice except to exhibit the same to any holder desiring inspection thereof. The Corporation shall mail the notice at least 15 days before the date the increased Conversion Rate takes effect. The notice shall state the increased Conversion Rate and the period it shall be in effect.

(k) Notice to Holders Prior to Certain Actions. In case:

(i) the Corporation shall declare a dividend (or any other distribution) on its Common Stock that would require an adjustment in the Conversion Rate pursuant to Section 7(f) hereof;

(ii) the Corporation shall authorize the granting to all or substantially all the holders of its Common Stock of rights or warrants to subscribe for or purchase any share of any class or any other rights or warrants;

(iii) of any reclassification or reorganization of the Common Stock of the Corporation (other than a subdivision or combination of its outstanding Common Stock, or a change in par value, or from par value to no par value, or from no par value to par value), or of any consolidation or merger to which the Corporation is a party and for which approval of any shareholders of the Corporation is required, or of the sale or transfer of all or substantially all of the assets of the Corporation; or

(iv) of the voluntary or involuntary dissolution, liquidation or winding-up of the Corporation,

the Corporation shall cause to be filed with the Conversion Agent and to be mailed to each Holder at its address appearing on the Security Register, as promptly as possible but in any event at least 15 days prior to the applicable date hereinafter specified, a notice stating (x) the date on which a record is to be taken for the purpose of such dividend, distribution or rights or warrants, or, if a record is not to be taken, the date as of which the holders of Common Stock of record to be entitled to such dividend, distribution, or rights or warrants are to be determined or (y) the date on which such reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up is expected to become effective or occur, and the date as of which it is expected that holders of Common Stock of record shall be entitled to exchange their Common Stock for securities or other property deliverable upon such reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up. Failure to give such notice, or any defect therein, shall not affect the legality or validity of such dividend, distribution, reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up.

(l) Effect of Reclassification, Consolidation, Merger, Binding Share Exchange or Sale. If any of the following events occur, namely: (i) any reclassification or change of outstanding shares of Common Stock (other than a change in par value, or from par value to no par value, or from no par value to par value, or as a result of a subdivision or combination); (ii) any consolidation, merger, combination or binding share exchange of the Corporation with another Person as a result of which holders of Common Stock shall be entitled to receive stock, securities or other property or assets (including cash) with respect to or in exchange for such Common Stock; or (iii) any sale or conveyance of the properties and assets of the Corporation as, or substantially as, an entirety to any other Person as a result of which holders of Common Stock shall be entitled to receive stock, securities or other property or assets (including cash) with respect to or in exchange for such Common Stock, then the Corporation or the successor or purchasing Person, as the case may be, shall cause an amendment to this Certificate of Designation to be executed and filed in accordance with Michigan law, providing that each share of 4.50% Convertible Preferred Stock shall be convertible into the kind and amount of shares of stock and other securities or property or assets (including cash) receivable upon such reclassification, change, consolidation, merger, combination, binding share exchange, sale or conveyance by a holder of a number of shares of Common Stock issuable upon conversion of such 4.50% Convertible Preferred Stock immediately prior to such reclassification,

change, consolidation, merger, combination, binding share exchange, sale or conveyance. Such amended Certificate of Designation shall provide for adjustments which shall be as nearly equivalent as may be practicable to the adjustments provided for in this Section 7(l).

The Corporation shall cause notice of the execution of such amended Certificate of Designation to be mailed to each Holder, at its address appearing on the Security Register, within 20 days after filing thereof. Failure to deliver such notice shall not affect the legality or validity of such supplemental indenture.

The above provisions of this Section 7(l) shall similarly apply to successive reclassifications, changes, consolidations, mergers, combinations, binding share exchanges, sales and conveyances.

If this Section 7(l) applies to any event or occurrence, Section 7(f) hereof shall not apply.

(m) Responsibility of Conversion Agent. The Conversion Agent shall not at any time be under any duty or responsibility to any Holder to either calculate the Conversion Rate or determine whether any facts exist which may require any adjustment of the Conversion Rate, or with respect to the nature or extent or calculation of any such adjustment when made, or with respect to the method employed, or herein or in any amended Certificate of Designation provided to be employed, in making the same and shall be protected in relying upon an Officers' Certificate with respect to the same. The Conversion Agent shall not be accountable with respect to the validity or value (or the kind or amount) of any shares of Common Stock, or of any securities or property, which may at any time be issued or delivered upon the conversion of any 4.50% Convertible Preferred Stock and the Conversion Agent makes no representations with respect thereto. The Conversion Agent shall not be responsible for any failure of the Corporation to issue, transfer or deliver any shares of Common Stock or stock certificates or other securities or property or cash upon the surrender of any 4.50% Convertible Preferred Stock for the purpose of conversion or to comply with any of the duties, responsibilities or covenants of the Corporation contained in this Section 7(m). Without limiting the generality of the foregoing, the Conversion Agent shall not be under any responsibility to determine the correctness of any provisions contained in any amended Certificate of Designation entered into pursuant to this Section 7 relating either to the kind or amount of shares of stock or securities or property (including cash) receivable by Holders upon the conversion of their 4.50% Convertible Preferred Stock after any event referred to in this Section 7 or to any adjustment to be made with respect thereto, but may accept as conclusive evidence of the correctness of any such provisions, and shall be protected in relying upon, the Officers' Certificate (which the Corporation shall be obligated to file with the Conversion Agent prior to the execution of any such amended Certificate of Designation) with respect thereto.

(n) Simultaneous Adjustments. In the event that Section 7(f) hereof requires adjustments to the Conversion Rate under more than one of Section 7(f)(i), Section 7(f)(ii), Section 7(f)(iii) or Section 7(f)(iv) hereof, and the Dividend Record Dates for the distributions giving rise to such adjustments shall occur on the same date, then such adjustments shall be made by applying, first, the provisions of Section 7(f)(iii) hereof, second, the provisions of Section 7(f)(i) hereof and third, the provisions of Section 7(f)(ii) hereof; provided, however, that nothing in this Section 7(n) shall be done to evade the principle set forth in Section 7(f)(viii) hereof that the Maximum Conversion Rate shall not apply to any adjustments made with respect to any of the events in Section 7(f)(i) or Section 7(f)(ii) hereof.

(o) Successive Adjustments. After an adjustment to the Conversion Rate under Section 7(f) hereof, any subsequent event requiring an adjustment under Section 7(f) shall cause an adjustment to the Conversion Rate as so adjusted.

(p) General Considerations. Whenever successive adjustments to the Conversion Rate are called for pursuant to this Section 7, such adjustments shall be made to the Market Price as may be necessary or appropriate to effectuate the intent of this Section 7 and to avoid unjust or inequitable results as determined in good faith by the Board of Directors.

(q) Corporation Determination Final. Any determination which the Board of Directors must make pursuant to this Section 7 shall be conclusive and binding on the Holders.

8. Mandatory Conversion.

(a) At any time on or after December 5, 2008, the Corporation shall have the right, at its option, to cause the 4.50% Convertible Preferred Stock, in whole but not in part, to be automatically converted into that number of whole shares of Common Stock for each share of 4.50% Convertible Preferred Stock equal to the quotient of (i) the Liquidation Preference divided by (ii) the Conversion Price then in effect, with any resulting fractional shares of Common Stock to be settled in accordance with Section 7(c). The Corporation may exercise its right to cause a mandatory conversion pursuant to this Section 8(a) only if the Last Reported Sale Price of the Common Stock equals or exceeds 130% of the Conversion Price then in effect for at least 20 Trading Days in any consecutive 30-day trading period on the NYSE (or such other national securities exchange or automated quotation system on which the Common Stock is then listed or authorized for quotation), including the last Trading Day of such 30-day period, ending on the Trading Day prior to the Corporation's issuance of a press release announcing the mandatory conversion as described in Section 8(b).

(b) To exercise the mandatory conversion right described in Section 8(a), the Corporation must issue a press release for publication on the Dow Jones News Service prior to the opening of business on the first trading day following any date on which the conditions described in Section 8(a) are met, announcing such a mandatory conversion. The Corporation shall also give notice by mail or by publication (with subsequent prompt notice by mail) to the holders of 4.50% Convertible Preferred Stock (not more than four Business Days after the date of the press release) of the mandatory conversion announcing the Corporation's intention to convert the 4.50% Convertible Preferred Stock. The conversion date will be a date selected by the Corporation (the "Mandatory Conversion Date") and will be no more than five days after the date on which the Corporation issues the press release described in this Section 8(b).

(c) In addition to any information required by applicable law or regulation, the press release and notice of a mandatory conversion described in Section 8(b) shall state, as appropriate: (i) the Mandatory Conversion Date; (ii) the number of shares of Common Stock to be issued upon conversion of each share of 4.50% Convertible Preferred Stock; (iii) the number of shares of 4.50% Convertible Preferred Stock to be converted; and (iv) that dividends on the 4.50% Convertible Preferred Stock to be converted will cease to accumulate on the Mandatory Conversion Date.

(d) On and after the Mandatory Conversion Date, dividends will cease to accumulate on the 4.50% Convertible Preferred Stock called for a mandatory conversion pursuant to Section 8(a) and all rights of holders of such 4.50% Convertible Preferred Stock will terminate except for the right to

receive the whole shares of Common Stock issuable upon conversion thereof and cash, in lieu of any fractional shares of Common Stock in accordance with Section 7(c). The dividend payment with respect to the 4.50% Convertible Preferred Stock called for a mandatory conversion pursuant to Section 8(a) on a date during the period between the close of business on any Dividend Record Date to the close of business on the corresponding Dividend Payment Date will be payable on such Dividend Payment Date to the record holder of such share on such Dividend Record Date if such share has been converted after such Dividend Record Date and prior to such Dividend Payment Date. Except as provided in the immediately preceding sentence with respect to a mandatory conversion pursuant to Section 8(a), no payment or adjustment will be made upon conversion of 4.50% Convertible Preferred Stock for Accumulated Dividends or for dividends with respect to the Common Stock issued upon such conversion.

(e) The Corporation may not authorize, issue a press release or give notice of any mandatory conversion pursuant to Section 8(a) unless, prior to giving the mandatory conversion notice, all Accumulated Dividends on the 4.50% Convertible Preferred Stock for periods ended prior to the date of such mandatory conversion notice shall have been paid in cash.

(f) In addition to the mandatory conversion right described in Section 8(a), if there are less than 250,000 shares of 4.50% Convertible Preferred Stock outstanding, the Corporation shall have the right, at any time on or after December 5, 2008, at its option, to cause the 4.50% Convertible Preferred Stock to be automatically converted into that number of whole shares of Common Stock equal to the quotient of (i) the Liquidation Preference divided by (ii) the lesser of (A) the Conversion Price then in effect and (B) the Market Value for the period ending on the second Trading Day immediately prior to the Mandatory Conversion Date, with any resulting fractional shares of Common Stock to be settled in cash in accordance with Section 7(c). The provisions of clauses (b), (c), (d) and (e) of this Section 8 shall apply to any mandatory conversion pursuant to this clause (f); provided, that (i) the Mandatory Conversion Date described in Section 8(b) shall not be less than 15 days nor more than 30 days after the date on which the Corporation issues a press release pursuant to Section 8(b) announcing such mandatory conversion and (ii) the press release and notice of mandatory conversion described in Section 8(c) will not state the number of shares of Common Stock to be issued upon conversion of each share of 4.50% Convertible Preferred Stock.

9. Consolidation, Merger and Sale of Assets.

(a) The Corporation, without the consent of the Holders of any of the outstanding 4.50% Convertible Preferred Stock, may consolidate with or merge into any other Person or convey, transfer or lease all or substantially all its assets to any Person or may permit any Person to consolidate with or merge into, or transfer or lease all or substantially all its properties to, the Corporation; provided, however, that: (a) the successor, transferee or lessee is organized under the laws of the United States or any political subdivision thereof; (b) the shares of 4.50% Convertible Preferred Stock will become shares of such successor, transferee or lessee, having in respect of such successor, transferee or lessee the same powers, designations, preferences and relative, participating, optional or other rights on which, and the qualification, limitations or restrictions thereon, the 4.50% Convertible Preferred Stock had immediately prior to such transaction; and (c) the Corporation delivers to the Transfer Agent an Officers' Certificate and an Opinion of Counsel stating that such transaction complies with this Certificate of Designation (including without limitation the requirements of Section 7(l).

(b) Upon any consolidation by the Corporation with, or merger by the Corporation into, any other Person or any conveyance, transfer or lease of all or substantially all the assets of the Corporation as described in Section 9(a), the successor resulting from such consolidation or into which the Corporation is merged or the transferee or lessee to which such conveyance, transfer or lease is made will succeed to, and be substituted for, and may exercise every right and power of, the Corporation under the shares of 4.50% Convertible Preferred Stock, and, thereafter, except in the case of a lease, the predecessor (if still in existence) will be released from its obligations and covenants with respect to the 4.50% Convertible Preferred Stock.

10. SEC Reports.

Whether or not the Corporation is required to file reports with the Commission, if any shares of 4.50% Convertible Preferred Stock are outstanding, the Corporation shall file with the Commission all such reports and other information as it would be required to file with the Commission by Section 13(a) or 15(d) under the Exchange Act. The Corporation shall supply each holder of 4.50% Convertible Preferred Stock, upon request, without cost to such holder, copies of such reports or other information.

11. Certificates.

(a) Form and Dating. The 4.50% Convertible Preferred Stock and the Transfer Agent's certificate of authentication shall be substantially in the form of Exhibit C, which is hereby incorporated in and expressly made a part of this Certificate of Designation. The 4.50% Convertible Preferred Stock certificate may have notations, legends or endorsements required by law, stock exchange rule, agreements to which the Corporation is subject, if any, or usage (provided that any such notation, legend or endorsement is in a form acceptable to the Corporation). Each 4.50% Convertible Preferred Stock certificate shall be dated the date of its authentication. The terms of the 4.50% Convertible Preferred Stock certificate set forth in Exhibit C are part of the terms of this Certificate of Designation.

(i) Global 4.50% Convertible Preferred Stock. The 4.50% Convertible Preferred Stock shall be issued initially in the form of one or more fully registered global certificates with the global securities legend and restricted securities legend set forth in Exhibit C hereto (the "Global 4.50% Convertible Preferred Stock"), which shall be deposited on behalf of the purchasers represented thereby with DTC (or with such custodian as DTC may direct), and registered in the name of DTC or a nominee of DTC, duly executed by the Corporation and authenticated by the Transfer Agent as hereinafter provided. The number of shares of 4.50% Convertible Preferred Stock represented by Global 4.50% Convertible Preferred Stock may from time to time be increased or decreased by adjustments made on the records of the Transfer Agent and DTC or its nominee as hereinafter provided. With respect to shares of 4.50% Convertible Preferred Stock that are not "restricted securities" as defined in Rule 144 under the Securities Act on a Conversion Date, all shares of Common Stock distributed on such Conversion Date will be freely transferable without restriction under the Securities Act (other than by affiliates), and such shares will be eligible for receipt in global form through the facilities of DTC.

(ii) Book-Entry Provisions. In the event Global 4.50% Convertible Preferred Stock is deposited with or on behalf of DTC, the Corporation shall execute and the Transfer Agent shall authenticate and deliver initially one or more Global 4.50% Convertible Preferred Stock certificates that (a) shall be registered in the name of DTC as depository for such Global 4.50% Convertible Preferred Stock or the nominee of DTC and (b) shall be delivered by the Transfer Agent to DTC or pursuant to DTC's instructions or held by the Transfer Agent as custodian for DTC.

Members of, or participants in, DTC ("Agent Members") shall have no rights under this Certificate of Designation with respect to any Global 4.50% Convertible Preferred Stock held on their behalf by DTC or by the Transfer Agent as the custodian of DTC or under such Global 4.50% Convertible Preferred Stock, and DTC may be treated by the Corporation, the Transfer Agent and any agent of the Corporation or the Transfer Agent as the absolute owner of such Global 4.50% Convertible Preferred Stock for all purposes whatsoever. Notwithstanding the foregoing, nothing herein shall prevent the Corporation, the Transfer Agent or any agent of the Corporation or the Transfer Agent from giving effect to any written certification, proxy or other authorization furnished by DTC or impair, as between DTC and its Agent Members, the operation of customary practices of DTC governing the exercise of the rights of a holder of a beneficial interest in any Global 4.50% Convertible Preferred Stock.

(iii) Certificated 4.50% Convertible Preferred Stock. Except as provided in Section 11(c), owners of beneficial interests in Global 4.50% Convertible Preferred Stock will not be entitled to receive Certificated 4.50% Convertible Preferred Stock.

(b) Execution and Authentication. Two Officers shall sign the 4.50% Convertible Preferred Stock certificate for the Corporation by manual or facsimile signature.

If an Officer whose signature is on a 4.50% Convertible Preferred Stock certificate no longer holds that office at the time the Transfer Agent authenticates the 4.50% Convertible Preferred Stock certificate, the 4.50% Convertible Preferred Stock certificate shall be valid nevertheless.

A 4.50% Convertible Preferred Stock certificate shall not be valid until an authorized signatory of the Transfer Agent and the Security Registrar manually signs the certificate of authentication on the 4.50% Convertible Preferred Stock certificate. The signature shall be conclusive evidence that the 4.50% Convertible Preferred Stock certificate has been authenticated under this Certificate of Designation.

The Transfer Agent shall authenticate and deliver certificates for up to 5,000,000 shares of 4.50% Convertible Preferred Stock for original issue upon a written order of the Corporation signed by two Officers or by an Officer and an Assistant Treasurer of the Corporation. Such order shall specify the number of shares of 4.50% Convertible Preferred Stock to be authenticated and the date on which the original issue of 4.50% Convertible Preferred Stock is to be authenticated.

The Transfer Agent may appoint an authenticating agent reasonably acceptable to the Corporation to authenticate the certificates for 4.50% Convertible Preferred Stock. Unless limited by the terms of such appointment, an authenticating agent may authenticate certificates for 4.50% Convertible

Preferred Stock whenever the Transfer Agent may do so. Each reference in this Certificate of Designation to authentication by the Transfer Agent includes authentication by such agent. An authenticating agent has the same rights as the Transfer Agent or agent for service of notices and demands.

(c) Transfer and Exchange of Global 4.50% Convertible Preferred Stock. The transfer and exchange of Global 4.50% Convertible Preferred Stock or beneficial interests therein shall be effected through DTC, in accordance with this Certificate of Designation (including applicable restrictions on transfer set forth herein, if any) and the procedures of DTC therefor.

(i) Restrictions on Transfer and Exchange of Global 4.50% Convertible Preferred Stock.

(1) Notwithstanding any other provisions of this Certificate of Designation (other than the provisions set forth in Section 11(c)(ii)), Global 4.50% Convertible Preferred Stock may not be transferred as a whole except by DTC to a nominee of DTC or by a nominee of DTC to DTC or another nominee of DTC or by DTC or any such nominee to a successor depository or a nominee of such successor depository.

(2) In the event that the Global 4.50% Convertible Preferred Stock is exchanged for 4.50% Convertible Preferred Stock in definitive registered form pursuant to Section 11(c)(ii) prior to the effectiveness of a Shelf Registration Statement with respect to such securities, such 4.50% Convertible Preferred Stock may be exchanged only in accordance with such procedures as are substantially consistent with the provisions of this Section 11(c) (including the certification requirements set forth in the Exhibits to this Certificate of Designation intended to ensure that such transfers comply with Rule 144A or such other applicable exemption from registration under the Securities Act, as the case may be) and such other procedures as may from time to time be adopted by the Corporation.

(3) The 4.50% Convertible Preferred Stock, and any shares of Common Stock distributed pursuant to the conversion of the 4.50% Convertible Preferred Stock, may not be sold or otherwise transferred until the expiration of two years following the date of payment for and delivery of the 4.50% Convertible Preferred Stock, except (a) pursuant to registration under the Securities Act, (b) in accordance with Rule 144 (if available) or Rule 144A under the Securities Act (if available) or (c) in offshore transactions in reliance on Regulation S, and will bear a legend to this effect.

(ii) Authentication of Certificated 4.50% Convertible Preferred Stock. If at any time:

(1) DTC notifies the Corporation that DTC is unwilling or unable to continue as depository for the Global 4.50% Convertible Preferred Stock and a successor depository for the Global 4.50% Convertible Preferred Stock is not appointed by the Corporation within 90 days after delivery of such notice;

(2) DTC ceases to be a clearing agency registered under the Exchange Act and a successor depository for the Global 4.50% Convertible Preferred Stock is not appointed by the Corporation within 90 days; or

(3) the Corporation, in its sole discretion, notifies the Transfer Agent in writing that it elects to cause the issuance of Certificated 4.50% Convertible Preferred Stock under this Certificate of Designation,

then the Corporation will execute, and the Transfer Agent, upon receipt of a written order of the Corporation signed by two Officers or by an Officer and an Assistant Treasurer of the Corporation requesting the authentication and delivery of Certificated 4.50% Convertible Preferred Stock to the Persons designated by the Corporation, will authenticate and deliver Certificated 4.50% Convertible Preferred Stock equal to the number of shares of 4.50% Convertible Preferred Stock represented by the Global 4.50% Convertible Preferred Stock, in exchange for such Global 4.50% Convertible Preferred Stock.

(iii) Cancellation or Adjustment of Global 4.50% Convertible Preferred Stock. At such time as all beneficial interests in Global 4.50% Convertible Preferred Stock have either been exchanged for Certificated 4.50% Convertible Preferred Stock, converted or canceled, such Global 4.50% Convertible Preferred Stock shall be returned to DTC for cancellation or retained and canceled by the Transfer Agent. At any time prior to such cancellation, if any beneficial interest in Global 4.50% Convertible Preferred Stock is exchanged for Certificated 4.50% Convertible Preferred Stock, converted or canceled, the number of shares of 4.50% Convertible Preferred Stock represented by such Global 4.50% Convertible Preferred Stock shall be reduced and an adjustment shall be made on the books and records of the Transfer Agent with respect to such Global 4.50% Convertible Preferred Stock, by the Transfer Agent or DTC, to reflect such reduction.

(iv) Obligations with Respect to Transfers and Exchanges of 4.50% Convertible Preferred Stock.

(1) To permit registrations of transfers and exchanges, the Corporation shall execute and the Transfer Agent shall authenticate Certificated 4.50% Convertible Preferred Stock and Global 4.50% Convertible Preferred Stock as required pursuant to the provisions of this Section 11(c).

(2) All Certificated 4.50% Convertible Preferred Stock and Global 4.50% Convertible Preferred Stock issued upon any registration of transfer or exchange of Certificated 4.50% Convertible Preferred Stock or Global 4.50% Convertible Preferred Stock shall be the valid obligations of the Corporation, entitled to the same benefits under this Certificate of Designation as the Certificated 4.50% Convertible Preferred Stock or Global 4.50% Convertible Preferred Stock surrendered upon such registration of transfer or exchange.

(3) Prior to due presentment for registration of transfer of any shares of 4.50% Convertible Preferred Stock, the Transfer Agent and the Corporation may deem and treat the Person in whose name such shares of 4.50% Convertible Preferred Stock are registered as the absolute owner of such 4.50% Convertible Preferred Stock and neither the Transfer Agent nor the Corporation shall be affected by notice to the contrary.

(4) No service charge shall be made to a Holder for any registration of transfer or exchange upon surrender of any 4.50% Convertible Preferred Stock certificate or Common Stock certificate at the office of the Transfer Agent maintained for that purpose. However, the Corporation may require payment of a sum sufficient to cover any tax or other governmental charge that may be imposed in connection with any registration of transfer or exchange of 4.50% Convertible Preferred Stock certificates or Common Stock certificates.

(5) Upon any sale or transfer of shares of 4.50% Convertible Preferred Stock (including any 4.50% Convertible Preferred Stock represented by a Global 4.50% Convertible Preferred Stock certificate) or of certificated Common Stock pursuant to an effective registration statement under the Securities Act or pursuant to Rule 144 or another exemption from registration under the Securities Act (and based upon an Opinion of Counsel reasonably satisfactory to the Corporation if it so requests):

(A) in the case of any Certificated 4.50% Convertible Preferred Stock or certificated Common Stock, the Corporation and the Transfer Agent shall permit the holder thereof to exchange such 4.50% Convertible Preferred Stock or certificated Common Stock for Certificated 4.50% Convertible Preferred Stock or certificated Common Stock, as the case may be, that does not bear the restrictive legend set forth on Exhibit C and rescind any restriction on the transfer of such 4.50% Convertible Preferred Stock or Common Stock issuable in respect of the conversion of the 4.50% Convertible Preferred Stock; and

(B) in the case of any Global 4.50% Convertible Preferred Stock, such 4.50% Convertible Preferred Stock shall not be required to bear the restrictive legend set forth on Exhibit C; provided, however, that with respect to any request for an exchange of 4.50% Convertible Preferred Stock that is represented by Global 4.50% Convertible Preferred Stock for Certificated 4.50% Convertible Preferred Stock that does not bear a restrictive as set forth on Exhibit C in connection with a sale or transfer thereof pursuant to Rule 144 or another exemption from registration under the Securities Act (and based upon an Opinion of Counsel if the Corporation so requests), the Holder thereof shall certify in writing to the Transfer Agent that such request is being made pursuant to such exemption (such certification to be substantially in the form of Exhibit D hereto).

(v) No Obligation of the Transfer Agent.

(1) The Transfer Agent shall have no responsibility or obligation to any beneficial owner of Global 4.50% Convertible Preferred Stock, a member of, or a participant in, DTC or any other Person with respect to the accuracy of the records of DTC or its nominee or of any participant or member thereof, with respect to any ownership interest in the 4.50% Convertible Preferred Stock or with respect to the delivery to any participant, member, beneficial owner or other Person (other than DTC) of any notice or the payment of any amount, under or with respect to such Global 4.50% Convertible Preferred Stock. All notices and communications to be given to the Holders and all payments to be made to Holders under the 4.50% Convertible Preferred Stock shall be given or made only to the Holders (which shall be DTC or its nominee in the case of the Global 4.50% Convertible Preferred Stock). The rights of beneficial owners in any Global 4.50% Convertible Preferred Stock shall be exercised only through DTC subject to the applicable rules and procedures of DTC. The Transfer Agent may rely and shall be fully protected in relying upon information furnished by DTC with respect to its members, participants and any beneficial owners.

(2) The Transfer Agent shall have no obligation or duty to monitor, determine or inquire as to compliance with any restrictions on transfer imposed under this Certificate of Designation or under applicable law with respect to any transfer of any interest in any 4.50% Convertible Preferred Stock (including any transfers between or among DTC participants, members or beneficial owners in any Global 4.50% Convertible Preferred Stock) other than to require delivery of such certificates and other documentation or evidence as are expressly required by, and to do so if and when expressly required by, the terms of this Certificate of Designation, and to examine the same to determine substantial compliance as to form with the express requirements hereof.

(d) Replacement Certificates. If a mutilated 4.50% Convertible Preferred Stock certificate is surrendered to the Transfer Agent or if the Holder of a 4.50% Convertible Preferred Stock certificate claims that the 4.50% Convertible Preferred Stock certificate has been lost, destroyed or wrongfully taken, the Corporation shall issue and the Transfer Agent shall countersign a replacement 4.50% Convertible Preferred Stock certificate if the reasonable requirements of the Transfer Agent are met. If required by the Transfer Agent or the Corporation, such Holder shall furnish an indemnity bond sufficient in the judgment of the Corporation and the Transfer Agent to protect the Corporation and the Transfer Agent from any loss which either of them may suffer if a 4.50% Convertible Preferred Stock certificate is replaced. The Corporation and the Transfer Agent may charge the Holder for their expenses in replacing a 4.50% Convertible Preferred Stock certificate.

12. Additional Rights of Holders. In addition to the rights provided to Holders under this Certificate of Designation, Holders shall have the rights set forth in the Registration Rights Agreement.

13. Other Provisions.

(a) With respect to any notice to a Holder of shares of 4.50% Convertible Preferred Stock required to be provided hereunder, neither failure to mail such notice, nor any defect therein or in the mailing thereof, to any particular Holder shall affect the sufficiency of the notice or the validity of the proceedings referred to in such notice with respect to the other Holders or affect the legality or validity of any distribution, rights, warrant, reclassification, consolidation, merger, conveyance, transfer, dissolution, liquidation or winding-up, or the vote upon any such action. Any notice which was mailed in the manner herein provided shall be conclusively presumed to have been duly given whether or not the Holder receives the notice.

(b) Shares of 4.50% Convertible Preferred Stock issued and reacquired will be retired and canceled promptly after reacquisition thereof and, upon compliance with the applicable requirements of Michigan law, have the status of authorized but unissued shares of preferred stock of the Corporation undesignated as to series and may with any and all other authorized but unissued shares of preferred stock of the Corporation be designated or redesignated and issued or reissued, as the case may be, as part of any series of preferred stock of the Corporation, except that any issuance or reissuance of shares of 4.50% Convertible Preferred Stock must be in compliance with this Certificate of Designation.

(c) The shares of 4.50% Convertible Preferred Stock shall be issuable only in whole shares.

(d) All notice periods referred to herein shall commence on the date of the mailing of the applicable notice.

EXHIBIT A

FORM OF FUNDAMENTAL CHANGE PURCHASE NOTICE

To: CMS Energy Corporation

The undersigned registered holder of shares of 4.50% Convertible Preferred Stock hereby acknowledges receipt of a notice from CMS Energy Corporation (the "Corporation") as to the occurrence of a Fundamental Change with respect to the Corporation and requests and instructs the Corporation to repurchase the shares of 4.50% Convertible Preferred Stock ($50.00 liquidation preference or an integral multiple thereof) designated below, in accordance with the terms of the Certificate of Designation referred to in such 4.50% Convertible Preferred Stock and directs that the check of the Corporation, in payment for these shares of 4.50% Convertible Preferred Stock, be issued and delivered to the registered holder hereof unless a different name has been indicated below. If any portion of these shares of 4.50% Convertible Preferred Stock are not repurchased and are to be issued in the name of a Person other than the undersigned, the undersigned shall pay all transfer taxes payable with respect thereto.

Dated:

_____
Signature(s)

Signature(s) must be guaranteed by a commercial bank or trust company or a member firm of a major stock exchange if shares of 4.50% Convertible Preferred Stock are to be delivered other than to or in the name of the registered holder.

_____
Signature Guarantee

Fill in for registration of 4.50% Convertible Preferred Stock if to be issued other than to and in the name of registered holder:

_____
(Name)

_____
(Street Address)

_____
(City, state and zip code)
Please print name and address

Number of shares of 4.50% Convertible Preferred Stock to be purchased (if less than all are to be purchased):

_____

Certificate Number (if shares of 4.50% Convertible Preferred Stock are Certificated):

_____

Social Security or other taxpayer number:

_____

EXHIBIT B

FORM OF CONVERSION NOTICE

To: CMS Energy Corporation

The undersigned registered holder of these shares of 4.50% Convertible Preferred Stock hereby exercises the option to convert these shares of 4.50% Convertible Preferred Stock, or portion hereof (which is $50.00 liquidation preference or an integral multiple thereof) designated below, for shares of Common Stock of CMS Energy Corporation in accordance with the terms of the Certificate of Designation referred to in the 4.50% Convertible Preferred Stock, and directs that the shares, if any, issuable and deliverable upon such conversion, together with any check for cash deliverable upon such conversion, and any shares of 4.50% Convertible Preferred Stock representing any unconverted shares hereof, be issued and delivered to the registered holder hereof unless a different name has been indicated below. If shares or any portion of the 4.50% Convertible Preferred Stock not converted are to be issued in the name of a Person other than the undersigned, the undersigned shall pay all transfer taxes payable with respect thereto.

This notice shall be deemed to be an irrevocable exercise of the option to convert these shares of 4.50% Convertible Preferred Stock.

Dated:

_____
Signature(s)

Signature(s) must be guaranteed by a commercial bank or trust company or a member firm of a major stock exchange if shares of Common Stock are to be issued, or shares of 4.50% Convertible Preferred Stock to be delivered, other than to or in the name of the registered holder.

_____
Signature Guarantee

Fill in for registration of shares if to be delivered, and shares of 4.50% Convertible Preferred Stock if to be issued other than to and in the name of registered holder:

Number of shares of 4.50% Convertible Preferred Stock to be converted (if less than all):

_____
(Name)

_____
(Street Address)

Certificate Number (if shares of 4.50% Convertible Preferred Stock are Certificated):

_____
(City, state and zip code)
Please print name and address

Social Security or other taxpayer number:

EXHIBIT C

FORM OF PREFERRED STOCK
FACE OF SECURITY

THIS SECURITY (OR ITS PREDECESSOR) WAS ORIGINALLY ISSUED IN A TRANSACTION EXEMPT FROM REGISTRATION UNDER THE UNITED STATES SECURITIES ACT OF 1933 (THE "SECURITIES ACT"), AND THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF MAY NOT BE OFFERED, SOLD OR OTHERWISE TRANSFERRED IN THE ABSENCE OF SUCH REGISTRATION OR AN APPLICABLE EXEMPTION THEREFROM. EACH PURCHASER OF THIS SECURITY IS HEREBY NOTIFIED THAT THE SELLER OF THIS SECURITY MAY BE RELYING ON THE EXEMPTION FROM THE PROVISIONS OF SECTION 5 OF THE SECURITIES ACT PROVIDED BY RULE 144A THEREUNDER. THE HOLDER OF THIS SECURITY AGREES FOR THE BENEFIT OF THE COMPANY THAT (A) THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF MAY BE OFFERED, RESOLD, PLEDGED OR OTHERWISE TRANSFERRED ONLY (I) IN THE UNITED STATES TO A PERSON WHOM THE SELLER REASONABLY BELIEVES IS A QUALIFIED INSTITUTIONAL BUYER (AS DEFINED IN RULE 144A UNDER THE SECURITIES ACT ("RULE 144A")) IN A TRANSACTION MEETING THE REQUIREMENTS OF RULE 144A PURCHASING FOR ITS OWN ACCOUNT OR FOR THE ACCOUNT OF A QUALIFIED INSTITUTIONAL BUYER IN A TRANSACTION MEETING THE REQUIREMENTS OF RULE 144A, (II) OUTSIDE THE UNITED STATES IN AN OFFSHORE TRANSACTION IN ACCORDANCE WITH RULE 903 OR RULE 904 UNDER THE SECURITIES ACT, (III) PURSUANT TO AN EXEMPTION FROM REGISTRATION UNDER THE SECURITIES ACT PROVIDED BY RULE 144 THEREUNDER (IF AVAILABLE), (IV) IN ACCORDANCE WITH ANOTHER EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT, (V) TO CMS ENERGY CORPORATION OR (VI) PURSUANT TO AN EFFECTIVE REGISTRATION STATEMENT UNDER THE SECURITIES ACT, IN EACH OF CASES (I) THROUGH (VI) IN ACCORDANCE WITH ANY APPLICABLE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES, AND (B) THE HOLDER WILL, AND EACH SUBSEQUENT HOLDER IS REQUIRED TO, NOTIFY ANY PURCHASER OF THE SECURITY FROM IT OF THE RESALE RESTRICTIONS REFERRED TO IN CLAUSE (A) ABOVE.

THE HOLDER OF THIS SECURITY AGREES THAT SUCH HOLDER WILL NOT ENGAGE IN HEDGING TRANSACTIONS INVOLVING THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF UNLESS IN COMPLIANCE WITH THE SECURITIES ACT.

THIS SECURITY AND ANY RELATED DOCUMENTATION MAY BE AMENDED OR SUPPLEMENTED FROM TIME TO TIME TO MODIFY THE RESTRICTIONS ON AND PROCEDURES FOR RESALES AND OTHER TRANSFERS OF THIS SECURITY TO REFLECT ANY CHANGE IN APPLICABLE LAW OR REGULATION (OR THE INTERPRETATION THEREOF) OR IN PRACTICES RELATING TO THE RESALE OR TRANSFER OF RESTRICTED SECURITIES GENERALLY. THE HOLDER OF THIS SECURITY SHALL BE DEEMED BY THE ACCEPTANCE OF THIS SECURITY TO HAVE AGREED TO ANY SUCH AMENDMENT OR SUPPLEMENT.

THE HOLDER OF THIS SECURITY IS SUBJECT TO, AND ENTITLED TO THE BENEFITS OF, A REGISTRATION RIGHTS AGREEMENT, DATED AS OF DECEMBER 5, 2003 ENTERED INTO BY THE COMPANY FOR THE BENEFIT OF CERTAIN HOLDERS OF SECURITIES FROM TIME TO TIME.

Certificate Number
[ ]

Number of Shares
[ ]

CUSIP NO.:_____

4.50% Cumulative Convertible Preferred Stock (par value $0.01) (liquidation preference $50 per share)

of

CMS Energy Corporation

CMS Energy Corporation, a Michigan corporation (the 'Corporation"), hereby certifies that [ ] (the "Holder") is the registered owner of [ ] fully paid and non-assessable preferred securities of the Corporation designated the 4.50% Cumulative Convertible Preferred Stock (par value $0.01) (liquidation preference $50 per share) (the "4.50% Convertible Preferred Stock"). The shares of 4.50% Convertible Preferred Stock are transferable on the books and records of the Transfer Agent, in person or by a duly authorized attorney, upon surrender of this certificate duly endorsed and in proper form for transfer. The designations, rights, privileges, restrictions, preferences and other terms and provisions of the 4.50% Convertible Preferred Stock represented hereby are issued and shall in all respects be subject to the provisions of the Certificate of Designation dated December 4, 2003, as the same may be amended from time to time (the "Certificate of Designation"). Capitalized terms used herein but not defined shall have the meaning given them in the Certificate of Designation. The Corporation will provide a copy of the Certificate of Designation to a Holder without charge upon written request to the Corporation at its principal place of business.

Reference is hereby made to select provisions of the 4.50% Convertible Preferred Stock set forth on the reverse hereof, and to the Certificate of Designation, which select provisions and the Certificate of Designation shall for all purposes have the same effect as if set forth at this place.

Upon receipt of this certificate, the Holder is bound by the Certificate of Designation and is entitled to the benefits thereunder.

Unless the Transfer Agent's Certificate of Authentication hereon has been properly executed, these shares of 4.50% Convertible Preferred Stock shall not be entitled to any benefit under the Certificate of Designation or be valid or obligatory for any purpose.

IN WITNESS WHEREOF, the Corporation has executed this certificate this day of , 2003.

CMS ENERGY CORPORATION

By: _____

Name:

Title:

By: _____

Name:

Title:

TRANSFER AGENT'S AND SECURITY REGISTRAR'S CERTIFICATE OF AUTHENTICATION

These are shares of the 4.50% Convertible Preferred Stock referred to in the within-mentioned Certificate of Designation.

Dated: , 2003

CMS Energy Corporation, as Transfer Agent and Security Registrar

By: _____

Authorized Signatory

REVERSE OF SECURITY

Cash dividends on each share of 4.50% Convertible Preferred Stock shall be payable at a rate per annum set forth on the face hereof or as provided in the Certificate of Designation.

The shares of 4.50% Convertible Preferred Stock shall be convertible into the Corporation's Common Stock in the manner and according to the terms set forth in the Certificate of Designation.

The Corporation will furnish without charge to each holder who so requests the powers, designations, preferences and relative, participating, optional or other rights of each class of stock and the qualifications, limitations or restrictions of such preferences and/or rights.

ASSIGNMENT

FOR VALUE RECEIVED, the undersigned assigns and transfers the shares of 4.50% Convertible Preferred Stock evidenced hereby to:

(Insert assignee's social security or tax identification number)

(Insert address and zip code of assignee)

and irrevocably appoints agent to transfer the shares of 4.50% Convertible Preferred Stock evidenced hereby on the books of the Transfer Agent. The agent may substitute another to act for him or her.

Date: _____

Signature: _____

(Sign exactly as your name appears on the other side of this 4.50% Convertible Preferred Stock certificate)

Signature Guarantee:
(1) _____

1 (Signature must be guaranteed by an "eligible guarantor institution" that is a bank, stockbroker, savings and loan association or credit union meeting the requirements of the Transfer Agent, which requirements include membership or participation in the Securities Transfer Agents Medallion Program ("STAMP") or such other "signature guarantee program" as may be determined by the Transfer Agent in addition to, or in substitution for, STAMP, all in accordance with the Securities Exchange Act of 1934, as amended.)

EXHIBIT D

CERTIFICATE TO BE DELIVERED UPON EXCHANGE OR REGISTRATION OF TRANSFER OF PREFERRED STOCK

Re: 4.50% Cumulative Convertible Preferred Stock (the "4.50% Convertible Preferred Stock") of CMS Energy Corporation (the "Corporation")

This Certificate relates to shares of 4.50% Convertible Preferred Stock held in ☐ */ book- entry or ☐ */ definitive form by (the "Transferor").

The Transferor*:

☐ has requested the Transfer Agent by written order to deliver in exchange for its beneficial interest in the 4.50% Convertible Preferred Stock held by the Depository shares of 4.50% Convertible Preferred Stock in definitive, registered form equal to its beneficial interest in such 4.50% Convertible Preferred Stock (or the portion thereof indicated above); or

☐ has requested the Transfer Agent by written order to exchange or register the transfer of 4.50% Convertible Preferred Stock.

In connection with such request and in respect of such 4.50% Convertible Preferred Stock, the Transferor does hereby certify that the Transferor is familiar with the Certificate of Designation relating to the above-captioned 4.50% Convertible Preferred Stock and that the transfer of this 4.50% Convertible Preferred Stock does not require registration under the Securities Act of 1933, as amended (the "Securities Act") because */:

☐ Such 4.50% Convertible Preferred Stock is being acquired for the Transferor's own account without transfer.

☐ Such 4.50% Convertible Preferred Stock is being transferred to the Corporation.

☐ Such 4.50% Convertible Preferred Stock is being transferred to a qualified institutional buyer (as defined in Rule 144A under the Securities Act), in reliance on Rule 144A.

☐ Such 4.50% Convertible Preferred Stock is being transferred in reliance on and in compliance with another exemption from the registration requirements of the Securities Act (and based on an Opinion of Counsel if the Corporation so requests).

*/ Please check applicable box.

[NAME OF TRANFEROR]

By: _____

Its: _____

Date: _____

COMMON STOCK

The shares of Common Stock may be issued from time to time as the Board of Directors shall determine for such consideration as shall be fixed by the Board of Directors. Each share of Common Stock of the Corporation shall be equal to every other share of said stock in every respect. The voting, distribution, dividend, liquidation and other rights and limitations of the Common Stock are as follows:

(1) *Dividend Rights.* Subject to the express terms of any outstanding series of Preferred Stock, dividends or distributions may be declared and paid in cash or otherwise upon the Common Stock out of the assets of the Corporation legally available therefore.

(2) *Voting Rights.*

(a) Except as provided in Section 2(b) and except as otherwise provided by law, the holders of Common Stock are entitled to one vote on all matters as to which holders of Common Stock are entitled to vote. Subject to Article XI, a majority of the votes cast by the holders of Common Stock entitled to vote thereon is sufficient for the adoption of any question presented except as otherwise required by law or these Articles of Incorporation.

(b) Unless the vote or consent of the holders of a greater number of shares shall then be required by law, the vote or consent of the holders of a majority of all of the shares of Common Stock then outstanding, shall be necessary for authorizing, effecting or validating the merger or consolidation of the Corporation into or with any other entity if such merger or consolidation would adversely affect the powers or special rights of Common Stock either directly by amendment of these Articles of Incorporation or indirectly by requiring the holders of Common Stock to accept or retain, in such merger or consolidation, anything other than (i) shares of Common Stock or (ii) shares of the surviving or resulting corporation having, in either case, powers and special rights identical to those of Common Stock prior to such merger or consolidation.

(3) *Liquidation Rights.* Subject to Section 4, in the event of the dissolution, liquidation or winding up of the Corporation, whether voluntary or involuntary, after payment or provision for payment of the debts and other liabilities of the Corporation and after there shall have been paid or set apart for the holders of Preferred Stock the full preferential amounts (including any accumulated and unpaid dividends) to which they are entitled, the holders of Common Stock shall be entitled to receive, on a per share basis, the assets of the Corporation remaining for distribution to the holders of Common Stock. Neither the merger or consolidation of the Corporation into or with any other corporation, nor the merger or consolidation of any other corporation into or with the Corporation nor any sale, transfer or lease of all or any part of the assets of the Corporation, shall be deemed to be a dissolution, liquidation or winding up for purposes of this Section 3.

(4) *Subdivision or Combination.* If the Corporation shall in any manner subdivide (by stock split, stock dividend or otherwise) or combine (by reverse stock split or otherwise) the outstanding shares of Common Stock, the voting and liquidation rights of Common Stock shall be appropriately adjusted so as to avoid any dilution in the aggregate voting or liquidation rights of Common Stock.

ARTICLE IV

The address of the registered office is One Energy Plaza, Jackson, Michigan, 49201. The name of the resident agent at the registered office is Michael D. VanHemert. The mailing address of the registered office is One Energy Plaza Jackson, Michigan 49201.

ARTICLE V

Special meetings of the shareholders may be called only by the Board of Directors or by the Chairman of the Board.

ARTICLE VI

The number of directors of the Corporation shall be as specified in, or determined in the manner provided in, the bylaws of the Corporation.

Any vacancies occurring on the Corporation's Board of Directors (whether by reason of the death, resignation or removal of a director) may be filled by a majority vote of the directors then in office although less than a quorum. An increase in the number of members of the Board of Directors shall be construed as creating a vacancy.

ARTICLE VII

A director may be removed by the affirmative vote of a majority of the members of the Board of Directors then in office. A director also may be removed by shareholders, but only for cause, at an annual meeting of shareholders and by the affirmative vote of a majority of the shares then entitled to vote for the election of directors. For purposes of this section, cause for removal shall be construed to exist only if a director whose removal is proposed has been convicted of a felony by a court of competent jurisdiction and such conviction is no longer subject to appeal or has been adjudged by a court of competent jurisdiction to be liable for willful misconduct in the performance of his or her duty to the Corporation in a matter of substantial importance to the Corporation and such adjudication is no longer subject to appeal.

ARTICLE VIII

A director shall not be personally liable to the Corporation or its shareholders for monetary damages for breach of duty as a director except (i) for a breach of the director's duty of loyalty to the Corporation or its shareholders, (ii) for acts or omissions not in good faith or that involve intentional misconduct or a knowing violation of law, (iii) for a violation of Section 551(1) of the Michigan Business Corporation Act, and (iv) for any transaction from which the director derived an improper personal benefit. No amendment to or repeal of this Article VIII, and no modification to its provisions by law, shall apply to, or have any effect upon, the liability or alleged liability of any director of the Corporation for or with respect to any acts or omissions of such director occurring prior to such amendment, repeal or modification.

ARTICLE IX

Each director and each officer of the Corporation shall be indemnified by the Corporation to the fullest extent permitted by law against expenses (including attorneys' fees), judgments, penalties, fines and amounts paid in settlement actually and reasonably incurred by him or her in connection with the defense of any proceeding in which he or she was or is a party or is threatened to be made a party by reason of being or having been a director or an officer of the Corporation. Such right of indemnification is not exclusive of any other rights to which such director or officer may be entitled under any now or hereafter existing statute, any other provision of these Articles, bylaw, agreement, vote of shareholders or otherwise. If the Business Corporation Act of the State of Michigan is amended after approval by the shareholders of this Article IX to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director of the Corporation shall be eliminated or limited to the fullest extent permitted by the Business Corporation Act of the State of Michigan, as so amended. Any repeal or modification of this Article IX by the shareholders of the Corporation shall not adversely affect any right or protection of a director of the Corporation existing at the time of such repeal or modification.

ARTICLE X

Each director shall be a shareholder of the Corporation and any director ceasing to be a shareholder shall thereupon immediately cease to be a director.

ARTICLE XI

The Corporation reserves the right to amend, alter, change or repeal any provision in these Articles of Incorporation as permitted by law, and all rights conferred on shareholders herein are granted subject to this reservation. Notwithstanding the foregoing, the provisions of Articles V, VI, VII, VIII, IX and this Article XI may not be amended, altered, changed or repealed unless such amendment, alteration, change or repeal is approved by the affirmative vote of the holders of not less than 75% of the outstanding shares entitled to vote thereon.

Signed on May 28, 2004

CMS ENERGY CORPORATION

By: /s/ Michael D. VanHemert

Michael D. VanHemert
Vice President and Corporate Secretary

STATE OF MICHIGAN)
) ss.
COUNTY OF JACKSON)

On this 28th day of May 2004, before me appeared Michael D. VanHemert, to me personally known, who, being by me duly sworn, did say that he is Vice President and Corporate Secretary of CMS Energy Corporation, which executed the foregoing instrument, and that the seal affixed to said instrument is the corporate seal of said corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors and shareholders, and said officer acknowledged said instrument to be the free act and deed of said corporation.

/s/ Joyce H. Norkey

Joyce N. Norkey
Notary Public for Jackson County
State of Michigan
My Commission Expires September 2006

FILED AND EFFECTIVE December 20, 2004

CERTIFICATE OF DESIGNATION
OF
4.50% CUMULATIVE CONVERTIBLE PREFERRED STOCK, SERIES B
OF
CMS ENERGY CORPORATION

Pursuant to Section 302(4) of the Michigan Business Corporation Act, MCLA §450.1302(4):

CMS ENERGY CORPORATION, a Michigan corporation (the "Corporation"), does hereby certify that the following resolution was duly adopted pursuant to the authority of the Board of Directors of the Corporation, with the provisions thereof fixing the number of shares of the series and the dividend rate being set through a Special Financing Committee of the Board of Directors:

RESOLVED: That, pursuant to the authority expressly granted to and vested in the Board of Directors of the Corporation by the provisions of Article III of the Restated Articles of Incorporation of the Corporation, as amended from time to time (the "Articles of Incorporation"), and pursuant to Section 302(4) of the Michigan Business Corporation Act, the Board of Directors hereby establishes a series of the preferred stock of the Corporation and hereby states that the series' voting powers, designations, preferences and relative, participating, optional or other special rights, and qualifications, limitations or restrictions thereof (in addition to the provisions set forth in the Articles of Incorporation which are applicable to the preferred stock of all series), shall be as follows:

1. Designation and Amount; Ranking.

(a) There shall be created from the 10,000,000 shares of preferred stock, par value $0.01 per share, of the Corporation authorized to be issued pursuant to the Articles of Incorporation, a series of preferred stock, designated as the "4.50% Cumulative Convertible Preferred Stock, Series B," par value $0.01 per share (the "Preferred Stock"), and the number of shares of such series shall be 4,910,000. Such number of shares may be decreased by resolution of the Board of Directors; provided that no decrease shall reduce the number of shares of Preferred Stock to a number less than that of the shares of Preferred Stock then outstanding plus the number of shares issuable upon exercise of options or rights then outstanding. The Preferred Stock was exchanged for 4,910,000 of then outstanding shares of 4.50% Cumulative Convertible Preferred Stock, par value $0.01 per share (the "Original Preferred Stock"), established pursuant to the Certificate of Designation of 4.50% Cumulative Convertible Preferred Stock of CMS Energy Corporation dated December 4, 2003 pursuant to an exchange offer.

(b) The Preferred Stock will, with respect to both dividend rights and rights upon the liquidation, winding-up or dissolution of the Corporation, rank (i) senior to all Junior Stock and (ii) on a parity with all other Parity Stock.

2. Definitions. As used herein, the following terms shall have the following meanings:

"Accumulated Dividends" shall mean, with respect to any share of Preferred Stock, as of any date, the aggregate accumulated and unpaid dividends on such share from and including the most recent Dividend Payment Date to which dividends have been paid (or the Issue Date, if such date is prior to the first Dividend Payment Date) to but not including such date.

"Additional Dividends" shall have the meaning given to it in Section 3(b).

"Additional Shares" shall have the meaning given to it in Section 7(f)(vi).

"Affiliate" shall have the meaning ascribed to it, on the date hereof, under Rule 405 of the Securities Act.

"Agent Members" shall have the meaning given to it in Section 11(a)(ii).

“Board of Directors” shall mean the Board of Directors of the Corporation or, with respect to any action to be taken by the Board of Directors, any committee (special or otherwise) of the Board of Directors duly authorized to take such action.

“Business Day” shall mean any day other than a Saturday, Sunday or other day on which commercial banks in The City of New York are authorized or required by law or executive order to close.

“Certificate of Designation” means this certificate of designation designating the Preferred Stock.

“Certificated Preferred Stock” shall have the meaning given to it in Section 4(f).

“Common Equity” of any Person means capital stock of such Person that is generally entitled to (i) vote in the election of directors of such Person or (ii) if such Person is not a corporation, vote or otherwise participate in the selection of the governing body, partners, managers or others that will control the management or policies of such Person.

“Common Stock” shall mean the common stock, par value $0.01 per share, of the Corporation, or any other class of stock resulting from successive changes or reclassifications of such common stock consisting solely of changes in par value, or from par value to no par value, or as a result of a subdivision, combination or merger, consolidation or similar transaction in which the Corporation is a constituent corporation.

“Continuing Director” means a director who either was a member of the Board of Directors on November 9, 2004 or who becomes a member of the Board of Directors subsequent to that date and whose appointment, election or nomination for election by the Corporation’s shareholders is duly approved by a majority of the Continuing Directors on the Board of Directors at the time of such approval, either by a specific vote or by approval of the proxy statement issued by the Corporation on behalf of the Board of Directors in which such individual is named as nominee for director.

“Conversion Agent” means the office or agency designated by the Corporation where Preferred Stock may be presented for conversion. Initially, the Conversion Agent shall be the Corporation located at One Energy Plaza, Jackson, Michigan 49201.

“Conversion Date” shall have the meaning given to it in Section 7(b).

“Conversion Notice” shall have the meaning given to it in Section 7(a).

“Conversion Price” shall mean $9.893 per share of Common Stock.

“Conversion Rate” shall mean the number of shares of Common Stock issuable upon conversion of a share of Preferred Stock per Liquidation Preference, subject to adjustment as herein set forth. The initial Conversion Rate is 5.0541 shares of Common Stock issuable upon conversion of a share of Preferred Stock per Liquidation Preference.

“Conversion Value” shall have the meaning given to it in Section 7(m)(i).

“Corporation Notice” shall have the meaning given to it in Section 4(e).

“Corporation Notice Date” shall have the meaning given to it in Section 4(e).

“Determination Date” shall have the meaning given to it in Section 7(m).

“Distributed Assets or Securities” shall have the meaning given to it in Section 7(f)(iii).

“Dividend Adjustment Amount” shall have the meaning given to it in Section 7(f)(iv)(B).

“Dividend Payment Date” shall mean March 1, June 1, September 1 and December 1 of each year, commencing March 1, 2005.

“Dividend Rate” shall have the meaning given to it in Section 3(a).

“Dividend Record Date” shall mean February 15, May 15, August 15 and November 15 of each year.

“DTC” or “Depository” means The Depository Trust Company.

“Effective Date” shall have the meaning given to it in Section 7(a)(iii).

“Equity Interests” means any capital stock, partnership, joint venture, member or limited liability or unlimited liability company interest, beneficial interest in a trust or similar entity or other equity interest or investment of whatever nature.

“Exchange Act” shall mean the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

“Fair Market Value” means the amount which a willing buyer would pay a willing seller in an arm’s length transaction.

A “Fundamental Change” shall be deemed to have occurred at such time after the original issuance of the Preferred Stock that any of the following occurs: (i) the Common Stock or other capital stock into which the Preferred Stock is convertible is neither listed for trading on a United States national securities exchange nor approved for trading on the NASDAQ National Market or another established automated over-the-counter trading market in the United States; (ii) a “person” or “group” within the meaning of Section 13(d) of the Exchange Act, other than the Corporation, any subsidiary of the Corporation or any employee benefit plan of the Corporation or any such subsidiary, files a Schedule TO (or any other schedule, form or report under the Exchange Act) disclosing that such person or group has become the direct or indirect ultimate “beneficial owner” (as such term is used in Rules 13d-3 and 13d-5 under the Exchange Act, except that a person or group shall be deemed to have “beneficial ownership” of all shares that such Person or group has the right to acquire whether such right is exercisable immediately or only after the passage of time) of Common Equity of the Corporation representing more than 50% of the voting power of the Corporation’s Common Equity; (iii) consummation of any share exchange, consolidation or merger of the Corporation pursuant to which the Common Stock will be converted into cash, securities or other property or any sale, lease or other transfer (in one transaction or a series of transactions) of all or substantially all of the consolidated assets of the Corporation and its subsidiaries, taken as a whole, to any Person (other than the Corporation or one or more of the Corporation’s subsidiaries); *provided, however,* that a transaction where the holders of the Corporation’s Common Equity immediately prior to such transaction own, directly or indirectly, more than 50% of the aggregate voting power of all classes of Common Equity of the continuing or surviving corporation or transferee immediately after such event shall not be a Fundamental Change; or (iv) Continuing Directors cease to constitute at least a majority of the Board of Directors; *provided, however,* that a Fundamental Change shall not be deemed to have occurred in respect of any of the foregoing if either (1) the Last Reported Sale Price of Common Stock for any five Trading Days within the ten consecutive Trading Days ending immediately before the later of the Fundamental Change or the public announcement thereof equals or exceeds 105% of the applicable Conversion Price of the Preferred Stock in effect immediately before the Fundamental Change or the public announcement thereof or (2) at least 90% of the consideration (excluding cash payments for fractional shares) in the transaction or transactions constituting the Fundamental Change consists of shares of capital stock traded on a national securities exchange or quoted on the NASDAQ National Market (or which shall be so traded or quoted when issued or exchanged in connection with such Fundamental Change) (such securities being referred to as “Publicly Traded Securities”) and as a result of such transaction or transactions the Preferred Stock becomes convertible into such Publicly Traded Securities (excluding cash payments for fractional shares).

“Fundamental Change Purchase Date” shall have the meaning given to it in Section 4(a).

“Fundamental Change Purchase Notice” shall have the meaning given to it in Section 4(c).

“Fundamental Change Purchase Price” shall have the meaning given to it in Section 4(a).

“Global Preferred Stock” shall have the meaning given to it in Section 11(a)(i).

“Holder” or “holder” shall mean a holder of record of the Preferred Stock.

“Issue Date” shall mean December 15, 2004, the original date of issuance of the Preferred Stock.

“Junior Stock” shall mean all classes of common stock of the Corporation and each other class of capital stock or series of preferred stock established after the Issue Date, by the Board of Directors, the terms of which do not expressly provide that such class or series ranks senior to or on parity with the Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

“Last Reported Sale Price” of the applicable security on any date means the closing sale price per share (or, if no closing sale price is reported, the average of the bid and ask prices or, if more than one in either case, the average of the average bid and the average ask prices) on that date as reported in composite transactions for the principal U.S. securities exchange on which the applicable security is traded or, if the applicable security is not listed on a U.S. national or regional securities exchange, as reported by the NASDAQ National Market. If the applicable security is not listed for trading on a U.S. national or regional securities exchange and not reported by the NASDAQ National Market on the relevant date, the Last Reported Sale Price shall be the last quoted bid price for the applicable security in the over-the-counter market on the relevant date as reported by the National Quotation Bureau or similar organization. If the applicable security is not so quoted, the Last Reported Sale Price will be the average of the mid-point of the last bid and ask prices for the applicable security on the relevant date from each of at least three nationally recognized independent investment banking firms selected by the Corporation for this purpose.

“Liquidation Preference” shall mean, with respect to each share of Preferred Stock, $50.00.

“Mandatory Conversion Date” shall have the meaning given to it in Section 8(b).

“Market Price” means the average of the Last Reported Sales Price per share of Common Stock for the 20 Trading Day period ending on the applicable date of determination (if the applicable date of determination is a Trading Day or, if not, then on the last Trading Day prior to such applicable date of determination), appropriately adjusted to take into account the occurrence, during the period commencing on the first of the Trading Days during such 20 Trading Day period and ending on the applicable date of determination, of any event that would result in an adjustment of the Conversion Rate under this Certificate of Designation.

“Market Value” shall mean the average closing price of the Common Stock for a five consecutive Trading Day period on the NYSE (or such other national securities exchange or automated quotation system on which the Common Stock is then listed or authorized for quotation or, if the Common Stock is not so listed or authorized for quotation, an amount determined in good faith by the Board of Directors to be the fair value of the Common Stock).

“Maximum Conversion Rate” shall have the meaning given to it in Section 7(f)(xi).

“Net Shares” shall have the meaning given to it in Section 7(m)(ii)(B).

“Net Share Amount” shall have the meaning given to it in Section 7(m)(ii)(B).

“NYSE” shall mean the New York Stock Exchange, Inc.

“Officer” means the Chairman of the Board of Directors, the President, any Vice President, the Treasurer, the Secretary or any Assistant Secretary of the Corporation.

“Officers’ Certificate” means a certificate signed by two Officers.

“Opinion of Counsel’ means a written opinion from legal counsel who is acceptable to the Transfer Agent. The counsel may be an employee of or counsel to the Corporation or the Transfer Agent.

“Original Preferred Stock” shall have the meaning given to it in Section 3(a).

“Parity Stock” shall mean any class of capital stock or series of preferred stock established as of or after the Issue Date by the Board of Directors, the terms of which expressly provide that such class or series will rank on parity with the Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

“Paying Agent” means any Person authorized by the Corporation to pay the dividends or Fundamental Change Purchase Price on any of the shares of Preferred Stock on behalf of the Corporation. Initially, the Paying Agent shall be the Corporation.

“Person” shall mean any individual, corporation, general partnership, limited partnership, limited liability partnership, joint venture, association, joint-stock company, trust, limited liability company, unincorporated organization or government or any agency or political subdivision thereof.

“Pre-Dividend Sale Price” shall have the meaning given to it in Section 7(f)(iv)(A).

“Principal Return” shall have the meaning given to it in Section 7(m)(ii)(A).

“Public Acquirer Change of Control” shall have the meaning given to it in Section 7(f)(vii).

“Public Acquirer Common Stock” shall have the meaning given to it in Section 7(f)(vii).

“Registration Default” shall have the meaning given to it in Section 3(b).

“Registration Rights Agreement” means the Registration Rights Agreement dated as of December 5, 2003, among the Corporation, Citigroup Global Markets Inc., Merrill Lynch, Pierce, Fenner & Smith Incorporated and the certain other initial purchasers of the Original Preferred Stock.

“SEC” or “Commission” shall mean the Securities and Exchange Commission.

“Securities Act” means the Securities Act of 1933, as amended.

“Security Register” means the security register recording the holders of Preferred Stock kept at the offices of the Corporation.

“Security Registrar” shall be the Person holding the Security Register, and the Corporation will initially be designated as the Security Registrar.

“Senior Stock” shall mean each class of capital stock or series of preferred stock established after the Issue Date by the Board of Directors, the terms of which expressly provide that such class or series will rank senior to the Preferred Stock as to dividend rights or rights upon the liquidation, winding-up or dissolution of the Corporation.

“Share Price” means the price per share of Common Stock paid in connection with a corporate transaction described in Section 7(m)(v) hereof, which shall be equal to (i) if holders of Common Stock receive only cash in such corporate transaction, the cash amount paid per share of Common Stock and (ii) in all other cases, the average of the Last Reported Sale Prices of Common Stock on the five Trading Days up to but not including the Effective Date.

“Shelf Registration Statement” shall mean the shelf registration statement on Form S-3 filed with the SEC on September 24, 2004 to cover resales of Transfer Restricted Securities by holders thereof, as required by the Registration Rights Agreement.

“Spin-Off Market Price” per share of Common Stock or the Equity Interests in a Subsidiary or other business unit of the Corporation on any day means the average of the daily Last Reported Sale Prices for the 10 consecutive Trading Days commencing on and including the fifth Trading Day after the ex date with respect to the issuance or distribution requiring such computations. As used herein, the term “ex date,” when used with respect to any issuance or distribution, shall mean the first date on which the security trades regular way on the NYSE or such other national regional exchange or market in which the security trades without the right to receive such issuance or distribution.

“Subsidiary” means a Person more than 50% of the outstanding voting stock of which is owned, directly or indirectly, by the Corporation or by one or more other Subsidiaries, or by the Corporation and one or more other Subsidiaries. For the purposes of this definition, “voting stock” means stock which ordinarily has voting power of the election of directors, whether at all times or only so long as no senior class of stock has such voting power by reason of any contingency.

“Ten Day Average Closing Stock Price” shall have the meaning given to it in Section 7(m)(i)(B).

“Trading Day” means (i) if the applicable security is listed, admitted for trading or quoted on the NYSE, the NASDAQ National Market or another national security exchange, a day on which the NYSE, the NASDAQ National Market or another national security exchange is open for business or (ii) if the applicable security is not so listed, admitted for trading or quoted, any day other than a Saturday or Sunday or a day on which banking institutions in the State of New York are authorized or obligated by law, regulation or executive order to close.

“Trading Exception” shall have the meaning given to it in Section 7(a)(ii).

“Trading Price” of the Preferred Stock on any date of determination means the average of the secondary market bid quotations per share of Preferred Stock obtained by the Conversion Agent for $5,000,000 Liquidation Preference of the Preferred Stock at approximately 3:30 p.m., New York City time, on such determination date from three independent nationally recognized securities dealers the Corporation selects, provided that if three such bids cannot reasonably be obtained by the Conversion Agent, but two such bids are obtained, then the average of the two bids shall be used, and if only one such bid can reasonably be obtained by the Conversion Agent, this one bid shall be used. If the Conversion Agent cannot reasonably obtain at least one bid for $5,000,000 Liquidation Preference of the Preferred Stock from a nationally recognized securities dealer, then the Trading Price will be deemed to be less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate.

“Transfer Agent” shall mean the Corporation’s duly appointed transfer agent for the Preferred Stock. Initially, the Corporation will be the Transfer Agent.

“Transfer Restricted Securities” shall mean each share of Preferred Stock (or the shares of Common Stock into which such share of Preferred Stock is convertible) until (i) the date on which such security or its predecessor has been effectively registered under the Securities Act and disposed of in accordance with the Shelf Registration Statement, (ii) the date on which such security or predecessor is distributed to the public pursuant to Rule 144 under the Securities Act or is saleable pursuant to Rule 144(k) under the Securities Act or (iii) the date that such Preferred Stock ceases to be outstanding.

“Voting Rights Class” shall have the meaning given to it in Section 5(a)(i).

“Voting Rights Triggering Event” shall mean the failure of the Corporation to pay dividends on the Preferred Stock with respect to six or more quarterly periods (whether or not consecutive).

“Voting Stock” shall mean, with respect to any Person, securities of any class or classes of Capital Stock in such Person entitling the holders thereof (whether at all times or only so long as no senior class of stock has voting power by reason of contingency) generally to vote in the election of members of the Board of Directors or other governing body of such Person. For purposes of this definition, “Capital Stock” shall mean, with

respect to any Person, any and all shares, interests, participations or other equivalents (however designated) of corporate stock or partnership interests and any and all warrants, options and rights with respect thereto (whether or not currently exercisable), including each class of common stock and preferred stock of such Person.

3. Dividends.

(a) The holders of shares of the outstanding Preferred Stock shall be entitled, when, as and if declared by the Board of Directors out of funds of the Corporation legally available therefor, to receive cumulative cash dividends at the rate per annum of 4.50% per share on the Liquidation Preference (equivalent to $2.25 per annum per share), payable quarterly in arrears (the "Dividend Rate"). The Dividend Rate may be increased in the circumstances described in Section 3(b) below. Dividends payable for each full dividend period will be computed by dividing the Dividend Rate by four and shall be payable in arrears on each Dividend Payment Date (commencing March 1, 2005) for the quarterly period ending immediately prior to such Dividend Payment Date, to the holders of record of Preferred Stock at the close of business on the Dividend Record Date applicable to such Dividend Payment Date. Such dividends shall be cumulative from the most recent date as to which dividends shall have been paid on the Original Preferred Stock or, if no dividends have been paid, from the Issue Date (whether or not in any dividend period or periods the Board of Directors shall have declared such dividends or there shall be funds of the Corporation legally available for the payment of such dividends) and shall accumulate on a day-to-day basis, whether or not earned or declared, from and after the Issue Date. Dividends payable for any partial dividend period shall be computed on the basis of days elapsed over a 360-day year consisting of twelve 30-day months. Accumulated unpaid dividends accrue and cumulate dividends at the annual rate of 4.50% and are payable in the manner provided in this Section 3.

(b) If (i) by March 5, 2005, the Shelf Registration Statement has not been amended to cover resales of the Preferred Stock and declared effective by the Commission, (ii) after the Shelf Registration Statement has been declared effective the Corporation fails to file a post-effective amendment, prospectus supplement, amendment or supplement to any document incorporated by reference into such prospectus or document if required by applicable law with the SEC within five business days after a Holder provides the Corporation with certain required information, if such filing is necessary to enable the Holder to deliver the prospectus to purchasers of such Holder's Transfer Restricted Securities, (iii) the Shelf Registration Statement ceases to be effective or fails to be usable without being succeeded within 30 days by a post-effective amendment or an additional registration statement filed and declared effective (other than as permitted in (ii) above) pursuant to the Exchange Act that cures the failure of the registration statement to be effective or usable, and (iv) the aggregate duration of any suspension periods in any period exceeds certain limits described in the Registration Rights Agreement (each such event referred to in clauses (i), (ii), (iii) and (iv) a "Registration Default"), additional dividends shall accumulate on the Preferred Stock, from and including the date on which any such Registration Default shall occur to, but excluding, the date on which the Registration Default has been cured, at the rate of 0.25% per year for the first 90 days following such date and at a rate of 0.50% per year thereafter ("Additional Dividends"). With respect to shares of Common Stock issued upon conversion of the Preferred Stock, Additional Dividends will accumulate on the then applicable conversion price from and including the date on which any such Registration Default shall occur to, but excluding, the date on which the Registration Default has been cured, at the rate of 0.25% per year for the first 90 days following such date and at a rate of 0.50% per year thereafter. Except as mentioned above, the Corporation will have no other liabilities for monetary damages with respect to its registration obligations. The receipt of Additional Dividends will be the sole monetary remedy available to a Holder if the Corporation fails to meet these obligations.

(c) No dividend will be declared or paid upon, or any sum set apart for the payment of dividends upon, any outstanding share of the Preferred Stock with respect to any dividend period unless all dividends for all preceding dividend periods have been declared and paid or declared and a sufficient sum set apart for the payment of such dividend upon all outstanding shares of Preferred Stock.

(d) No dividends or other distributions (other than a dividend or distribution payable solely in shares of Parity Stock or Junior Stock (in the case of Parity Stock) or Junior Stock (in the case of Junior Stock) and other than cash paid in lieu of fractional shares) may be declared, made or paid, or set apart for payment upon, any Parity Stock or Junior Stock, nor may any Parity Stock or Junior Stock be redeemed, purchased or otherwise acquired for any consideration (or any money paid to or made available for a sinking fund for the redemption of any Parity Stock or Junior Stock) by or on behalf of the Corporation (except by conversion into or exchange for shares of Parity Stock or Junior Stock (in the case of Parity Stock) or Junior Stock (in the case of Junior Stock)), unless full Accumulated Dividends shall have been or contemporaneously are declared and paid, or are declared and a sum sufficient for the payment thereof is set apart for such payment, on the Preferred Stock and any Parity Stock for all dividend payment periods terminating on or prior to the date of such declaration, payment, redemption, purchase or acquisition. Notwithstanding the foregoing, if full dividends have not been paid on the Preferred Stock and any Parity Stock, dividends may be declared and paid on the Preferred Stock and such Parity Stock so long as the dividends are declared and paid pro rata so that the amounts of dividends declared per share on the Preferred Stock and such Parity Stock will in all cases bear to each other the same ratio that accumulated and unpaid dividends per share on the shares of Preferred Stock and such other Parity Stock bear to each other.

(e) Holders of shares of Preferred Stock shall not be entitled to any dividends on the Preferred Stock, whether payable in cash, property or stock, in excess of full cumulative dividends and Additional Dividends (if any).

(f) The holders of shares of Preferred Stock at the close of business on a Dividend Record Date will be entitled to receive the dividend payment on those shares on the corresponding Dividend Payment Date notwithstanding the subsequent conversion thereof or the Corporation's default in payment of the dividend due on that Dividend Payment Date. However, shares of Preferred Stock surrendered for conversion during the period between the close of business on any Dividend Record Date and the close of business on the Business Day immediately preceding the applicable Dividend Payment Date must be accompanied by payment of an amount equal to the dividend payable on the shares on that Dividend Payment Date; provided, however, that no such payment need be made if (1) the Corporation has specified a Mandatory Conversion Date that is after a Dividend Record Date and on or prior to the immediately following Dividend Payment Date or (2) any accumulated and unpaid dividends exist at the time of conversion with respect to such shares of Preferred Stock to the extent of such accumulated and unpaid dividends. A holder of shares of Preferred Stock on a Dividend Record Date who (or whose transferee) tenders any shares for conversion on the corresponding Dividend Payment Date will receive the dividend payable by the Corporation on the Preferred Stock on that date, and the converting holder need not include payment in the amount of such dividend upon surrender of shares of Preferred Stock for conversion. Except as provided above with respect to a voluntary conversion pursuant to Section 7, the Corporation shall make no payment or allowance for unpaid dividends, whether or not in arrears, on converted shares or for dividends on the shares of Common Stock issued upon conversion.

(g) In any case where any Dividend Payment Date or Conversion Date (including upon the occurrence of a Fundamental Change) of any Preferred Stock shall not be a Business Day, at any place of payment, then payment of dividends (and Additional Dividends, if any) need not be made on such date, but may be made on the next succeeding Business Day at such place of payment with the same force and effect as if made on the dividend payment date or Conversion Date (including upon the occurrence of a Fundamental Change); and no dividends shall accumulate on the amount so payable for the period from and after such Dividend Payment Date or Conversion Date, as the case may be, to such Business Day.

(h) The Paying Agent shall return to the Corporation upon written request any money or property held by it for the payment of any amount with respect to the Preferred Stock that remains unclaimed for two years, provided, however, that the Paying Agent, before being required to make any such return, shall at the expense of the Corporation cause to be published once in a newspaper of general circulation in The City of New York or mail to each such Holder notice that such money or property remains unclaimed and that, after a date specified therein, which shall not be less than 30 days from the date of such publication or mailing, any unclaimed money or property then remaining shall be returned to the Corporation. After return to the Corporation, Holders entitled to

the money or property must look to the Corporation for payment as general creditors unless an applicable abandoned property law designates another Person.

4. Fundamental Change.

(a) Purchase at the Option of the Holder Upon a Fundamental Change. Each Holder shall have the right, at such Holder's option, to require the Corporation to purchase any or all of such Holder's Preferred Stock for cash or a check on the date that is no earlier than 60 days nor later than 90 days after the date of the Corporation Notice of the occurrence of such Fundamental Change (subject to extension to comply with applicable law, as provided in Section 4(h) (the "Fundamental Change Purchase Date"). The Preferred Stock shall be repurchased in integral multiples of $50.00 (representing the Liquidation Preference). The Corporation shall purchase such Preferred Stock at a price (the "Fundamental Change Purchase Price") equal to 100% of the Liquidation Price of the number of shares of Preferred Stock to be purchased plus accumulated and unpaid dividends, including Additional Dividends, if any, to the Fundamental Change Purchase Date.

(b) Notice of Fundamental Change. The Corporation, or at its request (which must be received by the Paying Agent at least three Business Days (or such lesser period as agreed to by the Paying Agent) prior to the date the Paying Agent is requested to give such notice as described below), the Paying Agent, in the name of and at the expense of the Corporation, shall mail to all Holders a Corporation Notice of the occurrence of a Fundamental Change and of the purchase right arising as a result thereof, including the information required by Section 4(e) hereof, on or before the 30th day after the occurrence of such Fundamental Change.

(c) Exercise of Option. For Preferred Stock to be so purchased at the option of the Holder, the Paying Agent must receive at its office in Jackson, Michigan, or any other offices of the Paying Agent maintained for such purposes, such shares of Preferred Stock duly endorsed for transfer, together with a written notice of purchase in the form attached hereto as Exhibit A (a "Fundamental Change Purchase Notice") duly completed, on or before the 30th day prior to the Fundamental Change Purchase Date, subject to extension to comply with applicable law. The Fundamental Change Purchase Notice shall state:

(i) if certificated, the certificate numbers of the shares of Preferred Stock which the Holder shall deliver to be purchased, or, if not certificated, the Fundamental Change Purchase Notice must comply with appropriate Depository procedures;

(ii) the number of shares of Preferred Stock which the Holder shall deliver to be purchased, which portion must be $50.00 or an integral multiple thereof; and

(iii) that such Preferred Stock shall be purchased as of the Fundamental Change Purchase Date pursuant to the terms and conditions specified in the Preferred Stock and in this Certificate of Designation.

(d) Procedures. The Corporation shall purchase from a Holder, pursuant to this Section 4, shares of Preferred Stock or multiples of $50.00 if so requested by such Holder.

Any purchase by the Corporation contemplated pursuant to the provisions of this Section 4 shall be consummated by the delivery of the Fundamental Change Purchase Price to be received by the Holder promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of the Preferred Stock.

Notwithstanding anything herein to the contrary, any Holder delivering to the Paying Agent the Fundamental Change Purchase Notice contemplated by Section 4(c) hereof shall have the right at any time prior to the close of business on the Business Day prior to the Fundamental Change Purchase Date to withdraw such Fundamental Change Purchase Notice (in whole or in part) by delivery of a written notice of withdrawal to the Paying Agent in accordance with Section 4(f) hereof.

The Paying Agent shall promptly notify the Corporation of the receipt by it of any Fundamental Change Purchase Notice or written notice of withdrawal thereof.

On or before 10:00 a.m. (New York City time) on the Fundamental Change Purchase Date, the Corporation shall deposit with the Paying Agent (or if the Corporation or an Affiliate of the Corporation is acting as the Paying Agent, shall segregate and hold in trust) money sufficient to pay the aggregate Fundamental Change Purchase Price of the Preferred Stock to be purchased pursuant to this Section 4. Payment by the Paying Agent of the Fundamental Change Purchase Price for such Preferred Stock shall be made promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of such Preferred Stock. If the Paying Agent holds, in accordance with the terms of this Certificate of Designation, money sufficient to pay the Fundamental Change Purchase Price of such Preferred Stock on the Business Day following the Fundamental Change Purchase Date, then, on and after such date, such Preferred Stock shall cease to be outstanding and dividends (including Additional Dividends, if any) on such Preferred Stock shall cease to accumulate, whether or not book-entry transfer of such Preferred Stock is made or such Preferred Stock is delivered to the Paying Agent, and all other rights of the Holder shall terminate (other than the right to receive the Fundamental Change Purchase Price upon delivery or transfer of the Preferred Stock). Nothing herein shall preclude any withholding tax required by law.

The Corporation shall require each Paying Agent to agree in writing that the Paying Agent shall hold in trust for the benefit of Holders all money held by the Paying Agent for the payment of the Fundamental Change Purchase Price. If the Corporation or an Affiliate of the Corporation acts as Paying Agent, it shall segregate the money held by it as Paying Agent and hold it as a separate trust fund.

All questions as to the validity, eligibility (including time of receipt) and acceptance of any Preferred Stock pursuant to a Fundamental Change shall be determined by the Corporation, whose determination shall be final and binding.

(e) Notice of Fundamental Change. The Corporation shall send notices (each, a "Corporation Notice") to the Holders (and to beneficial owners as required by applicable law) at their addresses shown in the Security Register maintained by the Security Registrar, and delivered to the Paying Agent on or before the 30th day after the occurrence of the Fundamental Change ("Corporation Notice Date"). Each Corporation Notice shall include a form of Fundamental Change Purchase Notice to be completed by a Holder and shall state:

(i) the applicable Fundamental Change Purchase Price, excluding accumulated and unpaid dividends, Conversion Rate at the time of such notice (and any adjustments to the Conversion Rate) and, to the extent known at the time of such notice, the amount of dividends (including Additional Dividends, if any), if any, that will be payable with respect to the Preferred Stock on the applicable Fundamental Change Purchase Date;

(ii) the events causing the Fundamental Change and the date of the Fundamental Change;

(iii) the Fundamental Change Purchase Date;

(iv) the last date on which a Holder may exercise its purchase right;

(v) the name and address of the Paying Agent and the Conversion Agent;

(vi) that the Preferred Stock must be surrendered to the Paying Agent to collect payment of the Fundamental Change Purchase Price;

(vii) that the Preferred Stock as to which a Fundamental Change Purchase Notice has been given may be converted only if the applicable Fundamental Change Purchase Notice has been withdrawn in accordance with the terms of this Certificate of Designation;

(viii) that the Fundamental Change Purchase Price for any of the Preferred Stock as to which a Fundamental Change Purchase Notice has been given and not withdrawn shall be paid by the Paying Agent promptly following the later of the Fundamental Change Purchase Date or the time of book-entry transfer or delivery of such Preferred Stock;

(ix) the procedures the Holder must follow under this Section 4;

(x) briefly, the conversion rights of the Preferred Stock;

(xi) that, unless the Corporation defaults in making payment of such Fundamental Change Purchase Price on the Preferred Stock covered by any Fundamental Change Purchase Notice, dividends (including Additional Dividends, if any) will cease to accumulate on and after the Fundamental Change Purchase Date;

(xii) the CUSIP or ISIN number of the Preferred Stock; and

(xiii) the procedures for withdrawing a Fundamental Change Purchase Notice.

In connection with providing such Corporation Notice, the Corporation will issue a press release and publish a notice containing the information in such Corporation Notice in a newspaper of general circulation in The City of New York or publish such information on the Corporation's then existing Web site or through such other public medium as the Corporation may use at the time.

At the Corporation's request, made at least five Business Days prior to the date upon which such notice is to be mailed, and at the Corporation's expense, the Paying Agent shall give the Corporation Notice in the Corporation's name; *provided, however,* that, in all cases, the text of the Corporation Notice shall be prepared by the Corporation.

(f) Effect of Fundamental Change Purchase Notice. Upon receipt by the Corporation of the Fundamental Change Purchase Notice specified in this Section 4, the Holder of the Preferred Stock in respect of which such Fundamental Change Purchase Notice was given shall (unless such Fundamental Change Purchase Notice is withdrawn as specified in this Section 4(f)) thereafter be entitled to receive solely the Fundamental Change Purchase Price with respect to such Preferred Stock. Such Fundamental Change Purchase Price shall be paid by the Paying Agent to such Holder promptly following the later of (x) the Fundamental Change Purchase Date with respect to such Preferred Stock (provided the conditions in this Section 4 have been satisfied) and (y) the time of delivery or book-entry transfer of such Preferred Stock to the Paying Agent by the Holder thereof in the manner required by this Section 4. Preferred Stock in respect of which a Fundamental Change Purchase Notice has been given by the Holder thereof may not be converted for shares of Common Stock on or after the date of the delivery of such Fundamental Change Purchase Notice unless such Fundamental Change Purchase Notice has first been validly withdrawn as specified in this Section 4(f). Payment of the Fundamental Change Purchase Price for shares of Preferred Stock in registered, certificated form ("Certificated Preferred Stock") for which a Fundamental Change Purchase Notice has been delivered and not withdrawn is conditioned upon delivery of such Certificated Preferred Stock (together with necessary endorsements) to the Paying Agent at its office in Jackson, Michigan, or any other office of the Paying Agent maintained for such purpose, at any time (whether prior to, on or after the Fundamental Change Purchase Date) after the delivery of such Fundamental Change Purchase Notice. Payment of the Fundamental Change Purchase Price for such Certificated Preferred Stock will be made promptly following the later of the Fundamental Change Purchase Date or the time of delivery of such Certificated Preferred Stock.

If the Paying Agent holds, in accordance with the terms of this Certificate of Designation, money sufficient to pay the Fundamental Change Purchase Price of shares of Preferred Stock on the Business Day following the Fundamental Change Purchase Date for such Preferred Stock, then, on and after such date, dividends on such Preferred Stock will cease to accumulate, whether or not such Preferred Stock is delivered to the Paying Agent, and all other rights of the Holder shall terminate (other than the right to receive the Fundamental Change Purchase Price upon delivery of the Preferred Stock).

A Fundamental Change Purchase Notice may be withdrawn by means of a written notice of withdrawal delivered to the office of the Paying Agent at any time prior to 5:00 p.m. New York City time on the Business Day prior to the Fundamental Change Purchase Date to which it relates specifying:

(i) if certificated, the certificate number of Preferred Stock in respect of which such notice of withdrawal is being submitted, or, if not certificated, the written notice of withdrawal must comply with appropriate Depository procedures;

(ii) the number of shares of Preferred Stock with respect to which such notice of withdrawal is being submitted; and

(iii) the number of shares of Preferred Stock, if any, which remains subject to the original Fundamental Change Purchase Notice and which have been or shall be delivered for purchase by the Corporation.

(g) Preferred Stock Purchased in Part. Any shares of Preferred Stock that are to be purchased only in part shall be surrendered (in physical or book-entry form) at the office of the Paying Agent (with, if the Corporation so requires, due endorsement by, or a written instrument of transfer in form satisfactory to the Corporation duly executed by, the Holder thereof or such Holder's attorney duly authorized in writing) and the Corporation shall execute and the Transfer Agent shall authenticate and deliver to the Holder of such Preferred Stock, without service charge, new shares of Preferred Stock, as requested by such Holder in an amount equal to, and in exchange for, the portion of the Liquidation Preference of the Preferred Stock so surrendered which is not purchased.

(h) Covenant to Comply with Securities Laws Upon Purchase of the Preferred Stock. In connection with any offer to purchase Preferred Stock under this Section 4, the Corporation shall, to the extent applicable: (i) comply with Rules 13e-4 and 14e-1 (and any successor provisions thereto) under the Exchange Act, if applicable; (ii) file the related Schedule TO (or any successor schedule, form or report) under the Exchange Act, if applicable; and (iii) otherwise comply with all applicable federal and state securities laws so as to permit the rights and obligations under this Section 4 hereof to be exercised in the time and in the manner specified in this Section 4.

(i) Repayment to the Corporation. The Paying Agent shall return to the Corporation any cash or property that remains unclaimed as provided in the Preferred Stock, together with interest that the Paying Agent has agreed to pay, if any, held by it for the payment of a Fundamental Change Purchase Price; provided, however, that to the extent that the aggregate amount of cash or property deposited by the Corporation pursuant to this Section 4 exceeds the aggregate Fundamental Change Purchase Price of the Preferred Stock or portions thereof which the Corporation is obligated to purchase as of the Fundamental Change Purchase Date, then promptly on and after the Business Day following the Fundamental Change Purchase Date, the Paying Agent shall return any such excess to the Corporation together with interest that the Paying Agent has agreed to pay, if any.

(j) Officers' Certificate. At least five Business Days before the Corporation Notice Date, the Corporation shall deliver an Officers' Certificate to the Paying Agent (provided, that, at the Corporation's option, the matters to be addressed in such Officers' Certificate may be divided among two such certificates) specifying:

(i) the manner of payment selected by the Corporation; and

(ii) whether the Corporation desires the Paying Agent to give the Corporation Notice required by Section 4(e) hereof.

5. Voting.

(a) The shares of Preferred Stock shall have no voting rights except as set forth below or as otherwise required by Michigan law from time to time:

(i) If and whenever at any time or times a Voting Rights Triggering Event occurs, then the holders of shares of Preferred Stock, voting as a single class with any other preferred stock or preference securities having similar voting rights that are exercisable (the "Voting Rights Class"), will be entitled at the next regular or special meeting of shareholders of the Corporation to elect two additional directors of the Corporation, unless the Board of Directors is comprised of fewer than six directors at such time, in which case the Voting Rights Class shall be entitled to elect one additional director. Upon the election of any such additional directors, the number of directors that comprise the Board of Directors shall be increased by such number of additional directors.

(ii) Such voting rights may be exercised at a special meeting of the holders of the shares of the Voting Rights Class, called as hereinafter provided, or at any annual meeting of shareholders held for the purpose of electing directors, and thereafter at each such annual meeting until such time as all dividends in arrears on the shares of Preferred Stock shall have been paid in full, at which time or times such voting rights and the term of the directors elected pursuant to Section 5(a)(i) shall terminate.

(iii) At any time when such voting rights shall have vested in holders of shares of the Voting Rights Class, an Officer of the Corporation may call, and, upon written request of the record holders of shares representing at least twenty-five percent (25%) of the voting power of the shares then outstanding of the Voting Rights Class, addressed to the Secretary of the Corporation, shall call a special meeting of the holders of shares of the Voting Rights Class. Such meeting shall be held at the earliest practicable date upon the notice required for annual meetings of shareholders at the place for holding annual meetings of shareholders of the Corporation, or, if none, at a place designated by the Board of Directors. Notwithstanding the provisions of this Section 5(a)(iii), no such special meeting shall be called during a period within the 60 days immediately preceding the date fixed for the next annual meeting of shareholders, in which such case the election of directors pursuant to Section 5(a)(i) shall be held at such annual meeting of shareholders.

(iv) At any meeting held for the purpose of electing directors at which the holders of the Voting Rights Class shall have the right to elect directors as provided herein, the presence in person or by proxy of the holders of shares representing more than fifty percent (50%) in voting power of the then outstanding shares of the Voting Rights Class shall be required and shall be sufficient to constitute a quorum of such class for the election of directors by such class. The affirmative vote of the holders of shares of Preferred Stock constituting a majority of the shares of Preferred Stock present at such meeting, in person or by proxy shall be sufficient to elect any such director.

(v) Any director elected pursuant to the voting rights created under this Section 5(a) shall hold office until the next annual meeting of shareholders (unless such term has previously terminated pursuant to Section 5(a)(ii)) and any vacancy in respect of any such director shall be filled only by vote of the remaining director so elected by holders of the Voting Rights Class, or, if there be no such remaining director, by the holders of shares of the Voting Rights Class at a special meeting called in accordance with the procedures set forth in this Section 5, or, if no such special meeting is called, at the next annual meeting of shareholders. Upon any termination of such voting rights, the term of office of all directors elected pursuant to this Section 5 shall terminate.

(vi) So long as any shares of Preferred Stock remain outstanding, unless a greater percentage shall then be required by law, the Corporation shall not, without the affirmative vote or consent of the holders of all of the outstanding Preferred Stock voting or consenting, as the case may be, separately as one class, (i) create, authorize or issue any class or series of Senior Stock (or any security convertible into Senior Stock) or (ii) amend the Articles of Incorporation so as to affect adversely the specified rights, preferences, privileges or voting rights of holders of shares of Preferred Stock.

(vii) In exercising the voting rights set forth in this Section 5(a), each share of Preferred Stock shall be entitled to one vote.

(b) The Corporation may authorize, increase the authorized amount of, or issue any class or series of Parity Stock or Junior Stock, without the consent of the holders of Preferred Stock, and in taking such actions the Corporation shall not be deemed to have affected adversely the rights, preferences, privileges or voting rights of holders of shares of Preferred Stock.

6. Liquidation Rights.

(a) In the event of any liquidation, winding-up or dissolution of the Corporation, whether voluntary of involuntary, each holder of shares of Preferred Stock shall be entitled to receive and to be paid out of the assets of the Corporation available for distribution to its shareholders the Liquidation Preference plus Accumulated Dividends and Additional Dividends thereon in preference to the holders of, and before any payment or distribution is made on, any Junior Stock, including, without limitation, on any Common Stock.

(b) Neither the sale, conveyance, exchange or transfer (for cash, shares of stock, securities or other consideration) of all or substantially all the assets or business of the Corporation (other than in connection with the liquidation, winding-up or dissolution of its business) nor the merger or consolidation of the Corporation into or with any other Person shall be deemed to be a liquidation, winding-up or dissolution, voluntary or involuntary, for the purposes of this Section 6.

(c) After the payment to the holders of the shares of Preferred Stock of full preferential amounts provided for in this Section 6, the holders of Preferred Stock as such shall have no right or claim to any of the remaining assets of the Corporation.

(d) In the event the assets of the Corporation available for distribution to the holders of shares of Preferred Stock upon any liquidation, winding-up or dissolution of the Corporation, whether voluntary or involuntary, shall be insufficient to pay in full all amounts to which such holders are entitled pursuant to Section 6(a), no such distribution shall be made on account of any shares of Parity Stock upon such liquidation, dissolution or winding- up unless proportionate distributable amounts shall be paid on account of the shares of Preferred Stock, ratably, in proportion to the full distributable amounts for which holders of all Preferred Stock and of any Parity Stock are entitled upon such liquidation, winding-up or dissolution.

7. Conversion.

(a) Conversion Rights. A Holder may convert Preferred Stock into cash and shares of Common Stock during the periods and upon satisfaction of at least one of the conditions set forth below:

(i) in any calendar quarter (and only during such calendar quarter) if the Last Reported Sale Price for Common Stock for at least 20 Trading Days during the period of 30 consecutive Trading Days ending on the last Trading Day of the previous calendar quarter is greater than or equal to 120% of the Conversion Price per share of Common Stock on such last Trading Day;

(ii) during the five Business Days immediately following any ten consecutive Trading Day period in which the Trading Price per Liquidation Preference of Preferred Stock (as determined following a request by a Holder of Preferred Stock in accordance with the procedures described herein) for each day of that period was less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate (the “Trading Exception”); provided, however, that a Holder may not convert its Preferred Stock if the average closing sale price of Common Stock for such ten consecutive Trading Day period is between the then current Conversion Price and 120% of the then applicable Conversion Price; in connection with any conversion upon satisfaction of such Trading Price condition, the Conversion Agent shall have no obligation to determine the Trading Price unless the Corporation has requested such determination; and the Corporation shall have no obligation to make such request unless the Holder provides reasonable evidence that the Trading

Price would be less than 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate; at which time, the Corporation shall instruct the Conversion Agent to determine the Trading Price beginning on the next Trading Day and on each successive Trading Day until the Trading Price is greater than or equal to 95% of the product of the sale price of Common Stock and the then applicable Conversion Rate;

(iii) the Corporation becomes a party to a consolidation, merger or binding share exchange pursuant to which the Common Stock would be converted into cash or property (other than securities), in which case a Holder may surrender Preferred Stock for conversion at any time from and after the date which is 15 days prior to the anticipated effective date for the transaction until 15 days after the actual effective date (the "Effective Date") of such transaction; or

(iv) the Corporation elects to (i) distribute to all holders of Common Stock assets, debt securities or rights to purchase securities of the Corporation, which distribution has a per share value as determined by the Board of Directors exceeding 15% of the Last Reported Sale Price of a share of Common Stock on the Trading Day immediately preceding the declaration date for such distribution, or (ii) distribute to all holders of Common Stock rights entitling them to purchase, for a period expiring within 60 days after the date of such distribution, shares of Common Stock at less than the Last Reported Sale Price of Common Stock on the Trading Day immediately preceding the declaration date of the distribution. In the case of the foregoing clauses (i) and (ii), the Corporation must notify the Holders at least 20 Business Days immediately prior to the ex-dividend date for such distribution. Once the Corporation has given such notice, Holders may surrender their Preferred Stock for conversion at any time thereafter until the earlier of the close of business on the Business Day immediately prior to the ex-dividend date or the Corporation's announcement that such distribution will not take place; provided, however, that a Holder may not exercise this right to convert if the Holder may participate in the distribution without conversion. As used herein, the term "ex dividend date," when used with respect to any issuance or distribution, shall mean the first date on which the Common Stock trades regular way on such exchange or in such market without the right to receive such issuance or distribution.

The initial Conversion Rate is 5.0541 shares of Common Stock per share of Preferred Stock, subject to adjustment in certain events as described herein. The Corporation shall deliver cash or a check in lieu of any fractional share of Common Stock. A Holder may convert fewer than all of its Preferred Stock so long as the Preferred Stock converted is an integral multiple of the Liquidation Preference.

Holders of Preferred Stock at the close of business on a Dividend Record Date will receive payment of dividends, payable on the corresponding Dividend Payment Date notwithstanding the conversion of such Preferred Stock at any time after the close of business on such Dividend Record Date. Preferred Stock surrendered for conversion by a Holder during the period from the close of business on any Dividend Record Date to the opening of business on the immediately following Dividend Payment Date must be accompanied by payment of an amount equal to the dividend that the Holder is to receive on such Preferred Stock; provided, however, that no such payment need be made if (1) the Corporation has specified a Mandatory Conversion Date that is after a Dividend Record Date and on or prior to the immediately following Dividend Payment Date or (2) any accumulated and unpaid dividends exist at the time of conversion with respect to such shares of Preferred Stock to the extent of such accumulated and unpaid dividends.

To convert Preferred Stock a Holder must (i) complete and manually sign the irrevocable conversion notice in the form attached hereto as Exhibit B (a "Conversion Notice") (or complete and manually sign a facsimile of such notice) and deliver such notice to the Conversion Agent at its office in Jackson, Michigan or any other offices of the Conversion Agent maintained by the Conversion Agent for such purpose, (ii) surrender the shares of Preferred Stock to the Conversion Agent, (iii) furnish appropriate endorsements and transfer documents if required by the Conversion Agent or the Corporation and (iv) pay any transfer or similar tax, if required.

(b) Conversion Procedures. To convert Preferred Stock, a Holder must satisfy the requirements in this Section 7 and in the Preferred Stock. The date on which the Holder satisfies all those requirements is the conversion date (the "Conversion Date"). Subject to the procedures set forth in Section 7(f) hereof, as soon as practicable, but in no event later than the fifth Business Day following the Conversion Date, the Corporation shall deliver the Conversion Value in cash and deliver the Common Stock by either of the following methods: (i) update the global security representing the shares of Common Stock to record the Holder's interest in the Common Stock, or (ii) deliver to the Holder, through the Conversion Agent, a certificate for the number of full shares representing Net Shares, if any, together with, in either case, cash or a check in lieu of any fractional share determined pursuant to Section 7(c) hereof. The Person in whose name the certificate is registered shall be treated as a shareholder of record on and after the Conversion Date; provided, however, that no surrender of Preferred Stock on any date when the stock transfer books of the Corporation shall be closed shall be effective to constitute the Person or Persons entitled to receive the shares of Common Stock upon such conversion as the record holder or holders of such shares of Common Stock on such date, but such surrender shall be effective to constitute the Person or Persons entitled to receive such shares of Common Stock as the record holder or holders thereof for all purposes at the close of business on the next succeeding day on which such stock transfer books are open; such conversion shall be at the Conversion Rate in effect on the date that such shares of Preferred Stock shall have been surrendered for conversion, as if the stock transfer books of the Corporation had not been closed. Upon conversion of Preferred Stock, such Person shall no longer be a Holder of such Preferred Stock.

No payment or adjustment shall be made for dividends on or other distributions with respect to any Common Stock except as provided in Section 7(f) hereof or as otherwise provided in this Certificate of Designation.

On conversion of Preferred Stock, delivery of the Principal Return, the Net Shares and the cash or check payment, if any, in lieu of fractional shares will be deemed to satisfy the Corporation's obligation to pay the Liquidation Preference of the converted Preferred Stock, including Accumulated Dividends, if any. Accumulated Dividends with respect to the converted Preferred Stock will be deemed canceled, extinguished or forfeited, rather than paid in full to the Holder thereof.

Upon surrender of Preferred Stock that is converted in part, the Corporation shall execute, and the Transfer Agent shall authenticate and deliver to the Holder, new shares of Preferred Stock in a number equal to the unconverted portion of the shares of Preferred Stock surrendered.

If the last day on which Preferred Stock may be converted is a legal holiday in a place where a Conversion Agent is located, the Preferred Stock may be surrendered to that Conversion Agent on the next succeeding day that it is not a legal holiday.

(c) Cash or Check Payments in Lieu of Fractional Shares. The Corporation shall not issue a fractional share of Common Stock upon conversion of Preferred Stock. Instead the Corporation shall deliver cash (or Corporation's check) for the current market value of the fractional share. The current market value of a fractional share shall be determined to the nearest 1/10,000th of a share by multiplying the Last Reported Sale Price of a full share of Common Stock on the Trading Day immediately preceding the Conversion Date by the fractional amount and rounding the product to the nearest whole cent.

(d) Taxes on Conversion. If a Holder converts Preferred Stock, the Corporation shall pay any documentary, stamp or similar issue or transfer tax due on the issue of shares of Common Stock upon the conversion. However, the Holder shall pay any such tax which is due because the Holder requests the shares to be issued in a name other than the Holder's name. The Conversion Agent may refuse to deliver the certificates representing the Common Stock being issued in a name other than the Holder's name until the Conversion Agent receives a sum sufficient to pay any tax which shall be due because the shares are to be issued in a name other than the Holder's name. Nothing herein shall preclude any withholding tax required by law.

(e) Covenants of the Corporation. The Corporation shall, prior to issuance of any Preferred Stock hereunder, and from time to time as may be necessary, reserve out of its authorized but unissued Common Stock a sufficient number of shares of Common Stock to permit the conversion of the Preferred Stock.

All shares of Common Stock delivered upon conversion of the Preferred Stock shall be newly issued shares or treasury shares, shall be duly and validly issued and fully paid and nonassessable and shall be free from preemptive rights and free of any lien or adverse claim.

The Corporation shall endeavor promptly to comply with all federal and state securities laws regulating the order and delivery of shares of Common Stock upon the conversion of Preferred Stock, if any, and shall cause to have listed or quoted all such shares of Common Stock on each United States national securities exchange or over-the-counter or other domestic market on which the Common Stock is then listed or quoted.

(f) Adjustments to Conversion Rate. The Conversion Rate shall be adjusted from time to time, without duplication, as follows:

(i) In case the Corporation shall: (A) pay a dividend, or make a distribution, exclusively in shares of its capital stock, on the Common Stock; (B) subdivide its outstanding Common Stock into a greater number of shares; (C) combine its outstanding Common Stock into a smaller number of shares; or (D) reclassify its Common Stock, the Conversion Rate in effect immediately prior to the record date or effective date, as the case may be, for the adjustment pursuant to this Section 7(f) as described below, shall be adjusted so that the Holder of any Preferred Stock thereafter surrendered for conversion shall be entitled to receive the cash and number of shares of Common Stock of the Corporation which such Holder would have owned or have been entitled to receive after the happening of any of the events described above had such Preferred Stock been converted immediately prior to such record date or effective date, as the case may be. An adjustment made pursuant to this Section 7(f) shall become effective immediately after the applicable record date in the case of a dividend or distribution and shall become effective immediately after the applicable effective date in the case of subdivision, combination or reclassification of the Corporation's Common Stock. If any dividend or distribution of the type described in clause (A) above is not so paid or made, the Conversion Rate shall again be adjusted to the Conversion Rate which would then be in effect if such dividend or distribution had not been declared.

(ii) In case the Corporation shall issue rights or warrants to all holders of the Common Stock entitling them (for a period expiring within 60 days after the date of issuance of such rights or warrants) to subscribe for or purchase Common Stock at a price per share less than the Market Price per share of Common Stock on the record date fixed for determination of shareholders entitled to receive such rights or warrants, the Conversion Rate in effect immediately after such record date shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately after such record date by a fraction of which (A) the numerator shall be the number of shares of Common Stock outstanding on such record date plus the number of additional shares of Common Stock offered for subscription or purchase, and (B) the denominator shall be the number of shares of Common Stock outstanding on such record date plus the number of shares which the aggregate offering price of the total number of shares so offered would purchase at the Market Price per share of Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such issuance of rights or warrants. Such adjustment shall be made successively whenever any such rights or warrants are issued, and shall become effective immediately after the opening of business on the day following the record date for the determination of shareholders entitled to receive such rights or warrants. To the extent that shares of Common Stock are not delivered after the expiration of such rights or warrants, the Conversion Rate shall be readjusted to the Conversion Rate which would then be in effect had the adjustments made upon the issuance of such rights or warrants been made on the basis of delivery of only the number of shares of Common Stock actually delivered. If such rights or warrants are not so issued, the Conversion Rate shall again be adjusted to be the Conversion Rate which would then be in effect if such record date for the determination of shareholders entitled to receive such rights or warrants had not been fixed. In determining whether any rights or warrants entitle the holders to subscribe for or purchase shares of Common Stock at less than such Market Price, and in determining the aggregate offering price of such shares of Common Stock, there shall be taken into account any consideration received by the

Corporation for such rights or warrants, the value of such consideration, if other than cash, to be determined by the Board of Directors.

(iii) In case the Corporation shall, by dividend or otherwise, distribute to all holders of Common Stock any assets, debt securities or rights or warrants to purchase any of its securities (excluding (a) any dividend, distribution or issuance covered by those referred to in Section 7(f)(i) or Section 7(f)(ii) hereof and (b) any dividend or distribution paid exclusively in cash) (any of the foregoing hereinafter in this Section 7(f)(iii) called the "Distributed Assets or Securities") in an aggregate amount per share of Common Stock that, combined together with the aggregate amount of any other such distributions to all holders of its Common Stock made within the 12 months preceding the date of payment of such distribution, and in respect of which no adjustment pursuant to this Section 7(f)(iii) has been made, exceeds 15% of the Market Price on the Trading Day immediately preceding the declaration of such distribution, then the Conversion Rate shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately prior to the close of business on the record date mentioned below by a fraction of which (A) the numerator shall be the Market Price per share of the Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution, and (B) the denominator shall be (1) the Market Price per share of the Common Stock on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution less (2) the Fair Market Value on the earlier of such record date or the Trading Day immediately preceding the ex-dividend date for such dividend or distribution (as determined by the Board of Directors, whose determination shall be conclusive, and described in a certificate filed with the Paying Agent) of the Distributed Assets or Securities so distributed applicable to one share of Common Stock. Such adjustment shall become effective immediately after the record date for the determination of shareholders entitled to receive such distribution; provided, however, that, if (a) the Fair Market Value of the portion of the Distributed Assets or Securities so distributed applicable to one share of Common Stock is equal to or greater than the Market Price of the Common Stock on the record date for the determination of shareholders entitled to receive such distribution or (b) the Market Price of the Common Stock on the record date for the determination of shareholders entitled to receive such distribution is greater than the Fair Market Value per share of such Distributed Assets or Securities by less than $1.00, then, in lieu of the foregoing adjustment, adequate provision shall be made so that each Holder shall have the right to receive upon conversion, in addition to the cash and shares of Common Stock, the kind and amount of assets, debt securities, or rights or warrants comprising the Distributed Assets or Securities the Holder would have received had such Holder converted such Preferred Stock immediately prior to the record date for the determination of shareholders entitled to receive such distribution. In the event that such distribution is not so paid or made, the applicable Conversion Rate shall again be adjusted to the Conversion Rate which would then be in effect if such distribution had not been declared.

(iv) In case the Corporation shall declare a cash dividend or cash distribution to all or substantially all of the holders of Common Stock, the Conversion Rate shall be increased so that the applicable Conversion Rate shall equal the price determined by multiplying the Conversion Rate in effect immediately prior to the record date for such dividend or distribution by a fraction,

(A) the numerator of which shall be the average of the Last Reported Sale Price of Common Stock for the five consecutive Trading Days ending on the Trading Day immediately preceding the record date for such dividend or distribution (the "Pre-Dividend Sale Price"), and

(B) the denominator of which shall be the Pre-Dividend Sale Price, minus the full amount of such cash dividend or cash distribution applicable to one share of Common Stock (the "Dividend Adjustment Amount"), with

such adjustment to become effective immediately after the record date for such dividend or distribution; *provided* that if the denominator of the foregoing fraction is less than $1.00 (including a negative

amount), then in lieu of the foregoing adjustment, adequate provision shall be made so that each Holder shall have the right to receive upon conversion, in addition to the cash and Common Stock issuable upon such conversion, the amount of cash such Holder would have received had such Holder converted its Preferred Stock solely into Common Stock at the then applicable Conversion Rate immediately prior to the record date for such cash dividend or cash distribution. If such cash dividend or cash distribution is not so paid or made, the applicable Conversion Rate shall again be adjusted to be the Conversion Rate that would then be in effect if such dividend or distribution had not been declared.

(v) In the case the Corporation shall make (a) any distributions, by dividend or otherwise, during any quarterly fiscal periods consisting exclusively of cash to all holders of outstanding shares of Common Stock in an aggregate amount that, together with (b) other all-cash or all-check distributions made to all holders of outstanding shares of Common Stock during such quarterly fiscal period, and (c) any cash and the Fair Market Value, as of the expiration of any tender or exchange offer (other than consideration payable in respect of any odd-lot tender offer) of consideration payable in respect of any tender or exchange offer by the Corporation or any of the Corporation's Subsidiaries for all or any portion of shares of Common Stock concluded during such quarterly fiscal period, exceed the product of $0 multiplied by the number of shares of Common Stock outstanding on the record date for such distribution, then, and in each such case, the Conversion Rate shall be increased in accordance with the provisions of clause (iv) above.

(vi) If a Holder elects to convert Preferred Stock in connection with a corporate transaction that occurs on or prior to December 5, 2008 that constitutes a Fundamental Change (other than as described in clause (iv) of the definition of Fundamental Change) and 10% or more of the Fair Market Value of the consideration for the Common Stock (as determined by the Board of Directors, whose determination shall be conclusive evidence of such Fair Market Value) in the corporate transaction consists of (A) cash, (B) other property or (C) securities that are not traded or scheduled to be traded immediately following such transaction on a U.S. national securities exchange or the Nasdaq National Market, then the Conversion Rate for the Preferred Stock surrendered for conversion by such Holder shall be adjusted so that such Holder will be entitled to receive cash and shares of Common Stock equal to the sum of (1) the Conversion Value and (2) the number of additional shares of Common Stock (the "Additional Shares") determined in the manner set forth below, subject in each case to the Corporation's payment elections as described in Section 7 hereof. For the avoidance of doubt, the adjustment provided for in this Section 7(f)(vi) shall only be made with respect to the Preferred Stock being converted in connection with such Fundamental Change and shall not be effective as to any Preferred Stock not so converted.

The number of Additional Shares will be determined by reference to the table below, based on the date on which such corporate transaction becomes effective (the "Effective Date") and the Share Price; *provided* that if the Share Price is between two Share Price amounts in the table below or the Effective Date is between two Effective Dates in the table, the number of Additional Shares will be determined by a straight-line interpolation between the number of Additional Shares set forth for the higher and lower Share Price amounts and the two dates, as applicable, based on a 365-day year.

The Share Prices set forth in the first row of the table below (i.e., column headers) will be adjusted as of any date on which the applicable Conversion Rate of the Preferred Stock is adjusted pursuant to this Section 7(f). The adjusted Share Prices will equal the Share Prices applicable immediately prior to such adjustment, multiplied by a fraction, the numerator of which is the Conversion Rate immediately prior to the adjustment giving rise to the Share Price adjustment and the denominator of which is the Conversion Rate as so adjusted.

The following table sets forth the hypothetical Share Price and number of Additional Shares to be received per Liquidation Preference of the Preferred Stock:

	Share Price														
Effective Date	$7.81	$8.00	$9.00	$10.00	$11.00	$12.00	$13.00	$14.00	$15.00	$20.00	$25.00	$30.00	$35.00	$40.00	$50.00
November 9, 2004	1.52	1.52	1.42	1.20	1.02	0.88	0.79	0.70	0.63	0.39	0.27	0.20	0.15	0.12	0.00
December 5, 2005	1.52	1.52	1.33	1.11	0.93	0.79	0.71	0.61	0.55	0.33	0.23	0.17	0.13	0.10	0.00
December 5, 2006	1.52	1.52	1.23	1.00	0.82	0.89	0.62	0.52	0.47	0.27	0.18	0.13	0.10	0.08	0.00
December 5, 2007	1.52	1.43	1.12	0.89	0.70	0.57	0.50	0.41	0.34	0.19	0.12	0.09	0.07	0.05	0.00
December 5, 2008	1.52	1.36	1.03	0.77	0.57	0.43	0.37	0.27	0.20	0.10	0.06	0.05	0.04	0.03	0.00

The Share Prices and Additional Share amounts set forth above are based upon an initial Conversion Rate per share of 5.0541 per Liquidation Preference of the Preferred Stock.

If the Share Price is equal to or in excess of $50.00 per share (subject to adjustment), no Additional Shares will be issued upon conversion.

If the Share Price is less than $7.61 per share (subject to adjustment), no Additional Shares will be issued upon conversion.

Notwithstanding the foregoing, any adjustment to the applicable Conversion Rate relating to the issuance of Additional Shares as described in this Section 7(f)(vi) will not exceed the Maximum Conversion Rate.

(vii) Notwithstanding the foregoing, in the case of a Public Acquirer Change of Control, the Corporation may, in lieu of increasing the applicable Conversion Rate by Additional Shares as described in Section 7(f)(vii) hereof, elect to adjust the applicable Conversion Rate and the related conversion obligation such that upon conversion the Issuer will deliver cash and a number of shares of Public Acquirer Common Stock such that by multiplying the Conversion Rate in effect immediately before the Public Acquirer Change of Control shall be adjusted by a fraction:

(A) the numerator of which will be the average of the Last Reported Sale Price of the Common Stock for the five consecutive trading days prior to but excluding the effective date of such Public Acquirer Change of Control; and

(B) the denominator of which will be the average of the Last Reported Sale Price of the Public Acquirer Common Stock for the five consecutive trading days commencing on the Trading Day next succeeding the effective date of such Public Acquirer Change of Control.

A "Public Acquirer Change of Control" means any event described in Section 7(f)(vi) hereof that would otherwise obligate the Corporation to increase the Conversion Rate as described in Section 7(f)(vi) hereof and the acquirer (or any entity of which the acquirer is a directly or indirectly wholly-owned Subsidiary and such entity provides a guarantee to the Preferred Stock) has a class of common stock traded on a U.S. national securities exchange or quoted on the Nasdaq National Market or which will be so traded or quoted when issued or exchanged in connection with such event (the "Public Acquirer Common Stock").

After the adjustment of the applicable Conversion Rate in connection with a Public Acquirer Change of Control, the applicable Conversion Rate will be subject to further similar adjustments in the event that any of the events described in this Section 7(f) occur thereafter.

The Corporation is required to notify Holders of its election in writing of such transaction, which notice shall be made five Business Days prior to the effective date of such Public Acquirer Change of Control. In addition, the Holder can also, subject to certain conditions, require the Corporation to repurchase all or a portion of its Preferred Stock as described under Section 4.

(viii) With respect to Section 7(f)(iii) hereof, in the event that the Corporation makes any distribution to all holders of Common Stock consisting of Equity Interests in a Subsidiary or other business unit of the Corporation, the Conversion Rate shall be adjusted so that the same shall equal the Conversion Rate determined by multiplying the Conversion Rate in effect immediately prior to the close of business on the record date fixed for the determination of holders of Common Stock entitled to receive such distribution by a fraction of which (A) the numerator shall be (x) the Spin-off Market Price per share of the Common Stock on such record date plus (y) the Spin-off Market Price per Equity Interest of the Subsidiary or other business unit of the Corporation on such record date and (B) the denominator shall be the Spin-off Market Price per share of the Common Stock on such record date, such adjustment to become effective 10 Trading Days after the effective date of such distribution of Equity Interests in a Subsidiary or other business unit of the Corporation.

(ix) Upon conversion of the Preferred Stock, the Holders shall receive, in addition to the cash and Common Stock issuable upon such conversion, the rights issued under any future shareholder rights plan the Corporation implements (notwithstanding the occurrence of an event causing such rights to separate from the Common Stock at or prior to the time of conversion) unless, prior to conversion, the rights have expired, terminated or been redeemed or exchanged in accordance with such rights plan. If, and only if, the Holders of Preferred Stock receive rights under such shareholder rights plans as described in the preceding sentence upon conversion of their Preferred Stock, then no other adjustment pursuant to this Section 7(f) shall be made in connection with such shareholder rights plans.

(x) For purposes of this Section 7(f), the number of shares of Common Stock at any time outstanding shall not include shares held in the treasury of the Corporation but shall include shares issuable in respect of scrip certificates issued in lieu of fractions of shares of Common Stock. The Corporation shall not pay any dividend or make any distribution on shares of Common Stock held in the treasury of the Corporation.

(xi) Notwithstanding the foregoing, in no event shall the Conversion Rate exceed the maximum conversion rate specified under this Section 7(f)(xi) (the "Maximum Conversion Rate") as a result of an adjustment pursuant to Sections 7(f)(iii), 7(f)(iv) or 7(f)(vi) hereof. The Maximum Conversion Rate shall initially be 6.5703 and shall be appropriately adjusted from time to time for any stock dividends on or subdivisions or combinations of the Common Stock. The Maximum Conversion Rate shall not apply to any adjustments made pursuant to any of the events in Section 7(f)(i) or Section 7(f)(ii) hereof.

(g) Calculation Methodology. No adjustment in the Conversion Price need be made unless the adjustment would require an increase or decrease of at least 1% in the Conversion Price then in effect, provided that any adjustment that would otherwise be required to be made shall be carried forward and taken into account in any subsequent adjustment. Except as stated in this Section 7, the Conversion Rate will not be adjusted for the issuance of Common Stock or any securities convertible into or exchangeable for Common Stock or carrying the right to purchase any of the foregoing. Any adjustments that are made shall be carried forward and taken into account in any subsequent adjustment. All calculations under Section 4 and Section 7(f) hereof and this Section 7(g) shall be made to the nearest cent or to the nearest 1/10,000th of a share, as the case may be.

(h) When No Adjustment Required. No adjustment to the Conversion Rate need be made:

(i) upon the issuance of any shares of Common Stock pursuant to any present or future plan providing for the reinvestment of dividends or interest payable on securities of the Corporation and the investment of additional optional amounts in shares of Common Stock under any plan;

(ii) upon the issuance of any shares of Common Stock or options or rights to purchase those shares pursuant to any present or future employee, director or consultant benefit plan or program of or assumed by the Corporation or any of its Subsidiaries;

(iii) upon the issuance of any shares of Common Stock pursuant to any option, warrant, right, or exercisable, exchangeable or convertible security not described in clause (ii) above and outstanding as of the date of this Certificate of Designation;

(iv) for a change in the par value or no par value of the Common Stock;

(v) for accumulated and unpaid dividends (including Additional Dividends, if any); or

(vi) if Holders are to participate in a merger or consolidation on a basis and with notice that the Board of Directors determines to be fair and appropriate in light of the basis and notice on which holders of Common Stock participate in the transaction; provided that the basis on which the Holders are to participate in the transaction shall not be deemed to be fair if it would require the conversion of securities at any time prior to the expiration of the conversion period specified for such securities.

To the extent the Preferred Stock becomes convertible into cash, assets or property (other than capital stock of the Corporation or securities to which Section 7(l) hereof applies), no adjustment shall be made thereafter as to the cash, assets or property. Interest shall not accumulate on such cash.

(i) Notice of Adjustment. Whenever the Conversion Rate is adjusted, the Corporation shall promptly mail to Holders a notice of the adjustment. The Corporation shall file with the Conversion Agent such notice. The certificate shall, absent manifest error, be conclusive evidence that the adjustment is correct. No Conversion Agent shall be under any duty or responsibility with respect to any such certificate except to exhibit the same to any Holder desiring inspection thereof.

(j) Voluntary Increase. The Corporation may make such increases in the Conversion Rate, in addition to those required by Section 7(f) hereof, as the Board of Directors considers to be advisable to avoid or diminish any income tax to holders of Common Stock or rights to purchase Common Stock resulting from any dividend or distribution of stock (or rights to acquire stock) or from any event treated as such for income tax purposes. To the extent permitted by applicable law, the Corporation may from time to time increase the Conversion Rate by any amount, temporarily or otherwise, for any period of at least 20 days if the increase is irrevocable during the period and the Board of Directors shall have made a determination that such increase would be in the best interests of the Corporation, which determination shall be conclusive. Whenever the Conversion Rate is so increased, the Corporation shall mail to Holders and file with the Conversion Agent a notice of such increase. The Conversion Agent shall not be under any duty or responsibility with respect to any such notice except to exhibit the same to any holder desiring inspection thereof. The Corporation shall mail the notice at least 15 days before the date the increased Conversion Rate takes effect. The notice shall state the increased Conversion Rate and the period it shall be in effect.

(k) Notice to Holders Prior to Certain Actions. In case:

(i) the Corporation shall declare a dividend (or any other distribution) on its Common Stock that would require an adjustment in the Conversion Rate pursuant to Section 7(f) hereof;

(ii) the Corporation shall authorize the granting to all or substantially all the holders of its Common Stock of rights or warrants to subscribe for or purchase any share of any class or any other rights or warrants;

(iii) of any reclassification or reorganization of the Common Stock of the Corporation (other than a subdivision or combination of its outstanding Common Stock, or a change in par value, or from par value to no par value, or from no par value to par value), or of any consolidation or merger to which the Corporation is a party and for which approval of any shareholders of the Corporation is required, or of the sale or transfer of all or substantially all of the assets of the Corporation; or

(iv) of the voluntary or involuntary dissolution, liquidation or winding-up of the Corporation, the Corporation shall cause to be filed with the Conversion Agent and to be mailed to each Holder at its address appearing on the Security Register, as promptly as possible but in any event at least 15 days

prior to the applicable date hereinafter specified, a notice stating (x) the date on which a record is to be taken for the purpose of such dividend, distribution or rights or warrants, or, if a record is not to be taken, the date as of which the holders of Common Stock of record to be entitled to such dividend, distribution, or rights or warrants are to be determined or (y) the date on which such reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up is expected to become effective or occur, and the date as of which it is expected that holders of Common Stock of record shall be entitled to exchange their Common Stock for securities or other property deliverable upon such reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up. Failure to give such notice, or any defect therein, shall not affect the legality or validity of such dividend, distribution, reclassification, reorganization, consolidation, merger, sale, transfer, dissolution, liquidation or winding-up.

(l) Effect of Reclassification, Consolidation, Merger, Binding Share Exchange or Sale. If any of the following events occur, namely; (i) any reclassification or change of outstanding shares of Common Stock (other than a change in par value, or from par value to no par value, or from no par value to par value, or as a result of a subdivision or combination); (ii) any consolidation, merger, combination or binding share exchange of the Corporation with another Person as a result of which holders of Common Stock shall be entitled to receive stock, securities or other property or assets (including cash) with respect to or in exchange for such Common Stock; or (iii) any sale or conveyance of the properties and assets of the Corporation as, or substantially as, an entirety to any other Person as a result of which holders of Common Stock shall be entitled to receive stock, securities or other property or assets (including cash) with respect to or in exchange for such Common Stock, then the Corporation or the successor or purchasing Person, as the case may be, shall cause an amendment to this Certificate of Designation to be executed and filed in accordance with Michigan law, providing that each share of Preferred Stock shall be convertible into the kind and amount of shares of stock and other securities or property or assets (including cash) receivable upon such reclassification, change, consolidation, merger, combination, binding share exchange, sale or conveyance by a holder of a number of shares of Common Stock issuable upon conversion of such Preferred Stock immediately prior to such reclassification, change, consolidation, merger, combination, binding share exchange, sale or conveyance. Such amended Certificate of Designation shall provide for adjustments which shall be as nearly equivalent as may be practicable to the adjustments provided for in this Section 7(l).

The Corporation shall cause notice of the execution of such amended Certificate of Designation to be mailed to each Holder, at its address appearing on the Security Register, within 20 days after filing thereof. Failure to deliver such notice shall not affect the legality or validity of such supplemental indenture.

The above provisions of this Section 7(l) shall similarly apply to successive reclassifications, changes, consolidations, mergers, combinations, binding share exchanges, sales and conveyances.

If this Section 7(l) applies to any event or occurrence, Section 7(f) hereof shall not apply.

(m) Conversion Value of Preferred Stock Tendered.

(i) Subject to certain exceptions described in Sections 7(a)(ii), 7(a)(iii) and 7(a)(iv), Holders tendering the Preferred Stock for conversion shall be entitled to receive, upon conversion of such Preferred Stock, per the Liquidation Preference, cash and shares of Common Stock, the value of which (the “Conversion Value”) shall be equal to the product of:

(A) the then applicable Conversion Rate; and

(B) the average of the Common Stock prices for the ten consecutive Trading Days (appropriately adjusted to take into account the occurrence during such period of stock splits, stock dividends and similar events) beginning on the second Trading Day immediately following the day the Preferred Stock is tendered for conversion (the ‘Ten Day Average Closing Stock Price”).

(ii) Subject to certain exceptions described below and under Sections 7(a)(ii), 7(a)(iii) and 7(a)(iv), the Corporation shall deliver the Conversion Value to converting Holders as follows;

(A) an amount in cash (the "Principal Return") equal to the lesser of (1) the Conversion Value of the Preferred Stock to be converted and (2) the aggregate Liquidation Preference per share of Preferred Stock to be converted;

(B) if the aggregate Conversion Value of the Preferred Stock to be converted is greater than the Principal Return, an amount in whole shares (the "Net Shares"), determined as set forth below, equal to such aggregate Conversion Value less the Principal Return (the "Net Share Amount"); and

(C) an amount paid in cash, determined as set forth below, in lieu of any fractional shares of Common Stock.

The number of Net Shares to be paid shall be determined by dividing the Net Share Amount by the Ten Day Average Closing Stock Price. Holders of Preferred Stock will not receive fractional shares upon conversion of Preferred Stock. In lieu of fractional shares. Holders will receive cash for the value of the fractional shares, which cash payment shall be based on the Ten Day Average Closing Stock Price.

The Conversion Value, Principal Return, number of Net Shares and Net Share Amount shall be determined by the Corporation at the end of the ten consecutive Trading Day period beginning on the second Trading Day immediately following the day the Preferred Stock are tendered for conversion (the "Determination Date").

The Corporation shall pay the Principal Return and cash for fractional shares and deliver the Net Shares, if any, as promptly as practicable after the Determination Date, but in no event later than five Business Days thereafter. Except as provided in Section 7, delivery of the Principal Return, Net Shares and cash in lieu of fractional shares shall be deemed to satisfy the Corporation's obligation to pay the Liquidation Preference, including Additional Dividends, if any. Any accumulated and unpaid dividends, including Additional Dividends, shall be deemed canceled, extinguished or forfeited rather than paid in full.

(n) Responsibility of Conversion Agent. The Conversion Agent shall not at any time be under any duty or responsibility to any Holder to either calculate the Conversion Rate or determine whether any facts exist which may require any adjustment of the Conversion Rate, or with respect to the nature or extent or calculation of any such adjustment when made, or with respect to the method employed, or herein or in any amended Certificate of Designation provided to be employed, in making the same and shall be protected in relying upon an Officers' Certificate with respect to the same. The Conversion Agent shall not be accountable with respect to the validity or value (or the kind or amount) of any shares of Common Stock, or of any securities or property, which may at any time be issued or delivered upon the conversion of any Preferred Stock and the Conversion Agent makes no representations with respect thereto. The Conversion Agent shall not be responsible for any failure of the Corporation to issue, transfer or deliver any shares of Common Stock or stock certificates or other securities or property or cash upon the surrender of any Preferred Stock for the purpose of conversion or to comply with any of the duties, responsibilities or covenants of the Corporation contained in this Section 7(n). Without limiting the generality of the foregoing, the Conversion Agent shall not be under any responsibility to determine the correctness of any provisions contained in any amended Certificate of Designation entered into pursuant to this Section 7 relating either to the kind or amount of shares of stock or securities or property (including cash) receivable by Holders upon the conversion of their Preferred Stock after any event referred to in this Section 7 or to any adjustment to be made with respect thereto, but may accept as conclusive evidence of the correctness of any such provisions, and shall be protected in relying upon, the Officers' Certificate (which the Corporation shall be obligated to file with the Conversion Agent prior to the execution of any such amended Certificate of Designation) with respect thereto.

(o) Simultaneous Adjustments. In the event that Section 7(f) hereof requires adjustments to the Conversion Rate under more than one of Section 7(f)(i), Section 7(f)(ii), Section 7(f)(iii) or Section 7(f)(iv) hereof, and the Dividend Record Dates for the distributions giving rise to such adjustments shall occur on the same date, then

such adjustments shall be made by applying, first, the provisions of Section 7(f)(iii) hereof, second, the provisions of Section 7(f)(i) hereof and third, the provisions of Section 7(f)(ii) hereof; provided, however, that nothing in this Section 7(o) shall be done to evade the principle set forth in Section 7(f)(x) hereof that the Maximum Conversion Rate shall not apply to any adjustments made with respect to any of the events in Section 7(f)(i) or Section 7(f)(ii) hereof.

(p) Successive Adjustments. After an adjustment to the Conversion Rate under Section 7(f) hereof, any subsequent event requiring an adjustment under Section 7(f) shall cause an adjustment to the Conversion Rate as so adjusted.

(q) General Considerations. Whenever successive adjustments to the Conversion Rate are called for pursuant to this Section 7, such adjustments shall be made to the Market Price as may be necessary or appropriate to effectuate the intent of this Section 7 and to avoid unjust or inequitable results as determined in good faith by the Board of Directors.

(r) Corporation Determination Final. Any determination which the Board of Directors must make pursuant to this Section 7 shall be conclusive and binding on the Holders.

8. Mandatory Conversion.

(a) At any time on or after December 5, 2008, the Corporation shall have the right, at its option, to cause the Preferred Stock, in whole but not in part, to be automatically converted into cash and shares of Common Stock equal to the Conversion Value and in accordance with the provisions of Section 7 hereof. The Corporation may exercise its right to cause a mandatory conversion pursuant to this Section 8(a) only if the Last Reported Sale Price of the Common Stock equals or exceeds 130% of the Conversion Price then in effect for at least 20 Trading Days in any consecutive 30-day trading period on the NYSE (or such other national securities exchange or automated quotation system on which the Common Stock is then listed or authorized for quotation), including the last Trading Day of such 30-day period, ending on the Trading Day prior to the Corporation's issuance of a press release announcing the mandatory conversion as described in Section 8(b).

(b) To exercise the mandatory conversion right described in Section 8(a), the Corporation must issue a press release for publication on the Dow Jones News Service prior to the opening of business on the first trading day following any date on which the conditions described in Section 8(a) are met, announcing such a mandatory conversion. The Corporation shall also give notice by mail or by publication (with subsequent prompt notice by mail) to the holders of Preferred Stock (not more than four Business Days after the date of the press release) of the mandatory conversion announcing the Corporation's intention to convert the Preferred Stock. The conversion date will be a date selected by the Corporation (the "Mandatory Conversion Date") and will be no more than five days after the date on which the Corporation issues the press release described in this Section 8(b).

(c) In addition to any information required by applicable law or regulation, the press release and notice of a mandatory conversion described in Section 8(b) shall state, as appropriate: (i) the Mandatory Conversion Date; (ii) the Conversion Value, including the Principal Return, the Net Shares and the cash in lieu of fractional shares to be delivered upon conversion of the Preferred Stock; (iii) the number of shares of Preferred Stock to be converted; and (iv) that dividends on the Preferred Stock to be converted will cease to accumulate on the Mandatory Conversion Date.

(d) On and after the Mandatory Conversion Date, dividends will cease to accumulate on the Preferred Stock called for a mandatory conversion pursuant to Section 8(a) and all rights of holders of such Preferred Stock will terminate except for the right to receive the cash and whole shares of Common Stock issuable upon conversion thereof and cash, in lieu of any fractional shares of Common Stock in accordance with Section 7(c). The dividend payment with respect to the Preferred Stock called for a mandatory conversion pursuant to Section 8(a) on a date during the period between the close of business on any Dividend Record Date to the close of business on the corresponding Dividend Payment Date will be payable on such Dividend Payment Date to the record holder of such share on such Dividend Record Date if such share has been converted after such Dividend Record Date and

prior to such Dividend Payment Date. Except as provided in the immediately preceding sentence with respect to a mandatory conversion pursuant to Section 8(a), no payment or adjustment will be made upon conversion of Preferred Stock for Accumulated Dividends or for dividends with respect to the Common Stock issued upon such conversion.

(e) The Corporation may not authorize, issue a press release or give notice of any mandatory conversion pursuant to Section 8(a) unless, prior to giving the mandatory conversion notice, all Accumulated Dividends on the Preferred Stock for periods ended prior to the date of such mandatory conversion notice shall have been paid in cash.

(f) In addition to the mandatory conversion right described in Section 8(a), if there are less than 250,000 shares of Preferred Stock outstanding, the Corporation shall have the right, at any time on or after December 5, 2008, at its option, to cause the Preferred Stock to be automatically converted into cash and shares of Common Stock equal to the Conversion Value and in accordance with the provisions of Section 7 hereof.

9. Consolidation, Merger and Sale of Assets.

(a) The Corporation, without the consent of the Holders of any of the outstanding Preferred Stock, may consolidate with or merge into any other Person or convey, transfer or lease all or substantially all its assets to any Person or may permit any Person to consolidate with or merge into, or transfer or lease all or substantially all its properties to, the Corporation; provided, however, that: (i) the successor, transferee or lessee is organized under the laws of the United States or any political subdivision thereof; (ii) the shares of Preferred Stock will become shares of such successor, transferee or lessee, having in respect of such successor, transferee or lessee the same powers, designations, preferences and relative, participating, optional or other rights on which, and the qualification, limitations or restrictions thereon, the Preferred Stock had immediately prior to such transaction; and (iii) the Corporation delivers to the Transfer Agent an Officers' Certificate and an Opinion of Counsel stating that such transaction complies with this Certificate of Designation (including without limitation the requirements of Section 7(l).

(b) Upon any consolidation by the Corporation with, or merger by the Corporation into, any other Person or any conveyance, transfer or lease of all or substantially all the assets of the Corporation as described in Section 9(a), the successor resulting from such consolidation or into which the Corporation is merged or the transferee or lessee to which such conveyance, transfer or lease is made will succeed to, and be substituted for, and may exercise every right and power of, the Corporation under the shares of Preferred Stock, and, thereafter, except in the case of a lease, the predecessor (if still in existence) will be released from its obligations and covenants with respect to the Preferred Stock.

10. SEC Reports.

Whether or not the Corporation is required to file reports with the Commission, if any shares of Preferred Stock are outstanding, the Corporation shall file with the Commission all such reports and other information as it would be required to file with the Commission by Section 13(a) or 15(d) under the Exchange Act. The Corporation shall supply each holder of Preferred Stock, upon request, without cost to such holder, copies of such reports or other information.

11. Certificates.

(a) Form and Dating. The Preferred Stock and the Transfer Agent's certificate of authentication shall be substantially in the form of Exhibit C, which is hereby incorporated in and expressly made a part of this Certificate of Designation. The Preferred Stock certificate may have notations, legends or endorsements required by law, stock exchange rule, agreements to which the Corporation is subject, if any, or usage (provided that any such notation, legend or endorsement is in a form acceptable to the Corporation). Each Preferred Stock certificate shall be dated the date of its authentication. The terms of the Preferred Stock certificate set forth in Exhibit C are part of the terms of this Certificate of Designation.

(i) Global Preferred Stock. The Preferred Stock shall be issued initially in the form of one or more fully registered global certificates with the global securities legend and restricted securities legend set forth in Exhibit C hereto (the "Global Preferred Stock"), which shall be deposited on behalf of the purchasers represented thereby with DTC (or with such custodian as DTC may direct), and registered in the name of DTC or a nominee of DTC, duly executed by the Corporation and authenticated by the Transfer Agent as hereinafter provided. The number of shares of Preferred Stock represented by Global Preferred Stock may from time to time be increased or decreased by adjustments made on the records of the Transfer Agent and DTC or its nominee as hereinafter provided. With respect to shares of Preferred Stock that are not "restricted securities" as defined in Rule 144 under the Securities Act on a Conversion Date, all shares of Common Stock distributed on such Conversion Date will be freely transferable without restriction under the Securities Act (other than by affiliates), and such shares will be eligible for receipt in global form through the facilities of DTC.

(ii) Book-Entry Provisions. In the event Global Preferred Stock is deposited with or on behalf of DTC, the Corporation shall execute and the Transfer Agent shall authenticate and deliver initially one or more Global Preferred Stock certificates that (a) shall be registered in the name of DTC as depository for such Global Preferred Stock or the nominee of DTC and (b) shall be delivered by the Transfer Agent to DTC or pursuant to DTC's instructions or held by the Transfer Agent as custodian for DTC.

Members of, or participants in, DTC ("Agent Members") shall have no rights under this Certificate of Designation with respect to any Global Preferred Stock held on their behalf by DTC or by the Transfer Agent as the custodian of DTC or under such Global Preferred Stock, and DTC may be treated by the Corporation, the Transfer Agent and any agent of the Corporation or the Transfer Agent as the absolute owner of such Global Preferred Stock for all purposes whatsoever. Notwithstanding the foregoing, nothing herein shall prevent the Corporation, the Transfer Agent or any agent of the Corporation or the Transfer Agent from giving effect to any written certification, proxy or other authorization furnished by DTC or impair, as between DTC and its Agent Members, the operation of customary practices of DTC governing the exercise of the rights of a holder of a beneficial interest in any Global Preferred Stock.

(iii) Certificated Preferred Stock. Except as provided in Section 11(c), owners of beneficial interests in Global Preferred Stock will not be entitled to receive Certificated Preferred Stock.

(b) Execution and Authentication. Two Officers shall sign the Preferred Stock certificate for the Corporation by manual or facsimile signature.

If an Officer whose signature is on a Preferred Stock certificate no longer holds that office at the time the Transfer Agent authenticates the Preferred Stock certificate, the Preferred Stock certificate shall be valid nevertheless.

A Preferred Stock certificate shall not be valid until an authorized signatory of the Transfer Agent and the Security Registrar manually signs the certificate of authentication on the Preferred Stock certificate. The signature shall be conclusive evidence that the Preferred Stock certificate has been authenticated under this Certificate of Designation.

The Transfer Agent shall authenticate and deliver certificates for 4,910,000 shares of Preferred Stock for original issue upon a written order of the Corporation signed by two Officers or by an Officer and an Assistant Treasurer of the Corporation. Such order shall specify the number of shares of Preferred Stock to be authenticated and the date on which the original issue of Preferred Stock is to be authenticated.

The Transfer Agent may appoint an authenticating agent reasonably acceptable to the Corporation to authenticate the certificates for Preferred Stock. Unless limited by the terms of such appointment, an authenticating agent may authenticate certificates for Preferred Stock whenever the Transfer Agent may do so. Each reference in this Certificate of Designation to authentication by the Transfer Agent includes authentication

by such agent. An authenticating agent has the same rights as the Transfer Agent or agent for service of notices and demands.

(c) Transfer and Exchange of Global Preferred Stock. The transfer and exchange of Global Preferred Stock or beneficial interests therein shall be effected through DTC, in accordance with this Certificate of Designation (including applicable restrictions on transfer set forth herein, if any) and the procedures of DTC therefor.

(i) Restrictions on Transfer and Exchange of Global Preferred Stock.

(A) Notwithstanding any other provisions of this Certificate of Designation (other than the provisions set forth in Section 11(c)(ii)), Global Preferred Stock may not be transferred as a whole except by DTC to a nominee of DTC or by a nominee of DTC to DTC or another nominee of DTC or by DTC or any such nominee to a successor depository or a nominee of such successor depository.

(B) In the event that the Global Preferred Stock is exchanged for Preferred Stock in definitive registered form pursuant to Section 11(c)(ii) prior to the effectiveness of a Shelf Registration Statement with respect to such securities, such Preferred Stock may be exchanged only in accordance with such procedures as are substantially consistent with the provisions of this Section 11(c) (including the certification requirements set forth in the Exhibits to this Certificate of Designation intended to ensure that such transfers comply with Rule 144A or such other applicable exemption from registration under the Securities Act, as the case may be) and such other procedures as may from time to time be adopted by the Corporation.

(C) The Preferred Stock, and any shares of Common Stock distributed pursuant to the conversion of the Preferred Stock, may not be sold until December 5, 2005, except (a) pursuant to registration under the Securities Act, (b) in accordance with Rule 144 (if available) or Rule 144A under the Securities Act (if available) or (c) in offshore transactions in reliance on Regulation S, and will bear a legend to this effect.

(ii) Authentication of Certificated Preferred Stock. If at any time:

(A) DTC notifies the Corporation that DTC is unwilling or unable to continue as depository for the Global Preferred Stock and a successor depository for the Global Preferred Stock is not appointed by the Corporation within 90 days after delivery of such notice;

(B) DTC ceases to be a clearing agency registered under the Exchange Act and a successor depository for the Global Preferred Stock is not appointed by the Corporation within 90 days; or

(C) the Corporation, in its sole discretion, notifies the Transfer Agent in writing that it elects to cause the issuance of Certificated Preferred Stock under this Certificate of Designation,

then the Corporation will execute, and the Transfer Agent, upon receipt of a written order of the Corporation signed by two Officers or by an Officer and an Assistant Treasurer of the Corporation requesting the authentication and delivery of Certificated Preferred Stock to the Persons designated by the Corporation, will authenticate and deliver Certificated Preferred Stock equal to the number of shares of Preferred Stock represented by the Global Preferred Stock, in exchange for such Global Preferred Stock.

(iii) Cancellation or Adjustment of Global Preferred Stock. At such time as all beneficial interests in Global Preferred Stock have either been exchanged for Certificated Preferred Stock, converted or canceled, such Global Preferred Stock shall be returned to DTC for cancellation or retained and canceled by the Transfer Agent. At any time prior to such cancellation, if any beneficial interest in Global Preferred Stock is exchanged for Certificated Preferred Stock, converted or canceled, the number of shares of Preferred Stock represented by such Global Preferred Stock shall be reduced and an adjustment shall be

made on the books and records of the Transfer Agent with respect to such Global Preferred Stock, by the Transfer Agent or DTC, to reflect such reduction.

(iv) Obligations with Respect to Transfers and Exchanges of Preferred Stock.

(A) To permit registrations of transfers and exchanges, the Corporation shall execute and the Transfer Agent shall authenticate Certificated Preferred Stock and Global Preferred Stock as required pursuant to the provisions of this Section 11(c).

(B) All Certificated Preferred Stock and Global Preferred Stock issued upon any registration of transfer or exchange of Certificated Preferred Stock or Global Preferred Stock shall be the valid obligations of the Corporation, entitled to the same benefits under this Certificate of Designation as the Certificated Preferred Stock or Global Preferred Stock surrendered upon such registration of transfer or exchange.

(C) Prior to due presentment for registration of transfer of any shares of Preferred Stock, the Transfer Agent and the Corporation may deem and treat the Person in whose name such shares of Preferred Stock are registered as the absolute owner of such Preferred Stock and neither the Transfer Agent nor the Corporation shall be affected by notice to the contrary.

(D) No service charge shall be made to a Holder for any registration of transfer or exchange upon surrender of any Preferred Stock certificate or Common Stock certificate at the office of the Transfer Agent maintained for that purpose. However, the Corporation may require payment of a sum sufficient to cover any tax or other governmental charge that may be imposed in connection with any registration of transfer or exchange of Preferred Stock certificates or Common Stock certificates.

(E) Upon any sale or transfer of shares of Preferred Stock (including any Preferred Stock represented by a Global Preferred Stock certificate) or of certificated Common Stock pursuant to an effective registration statement under the Securities Act or pursuant to Rule 144 or another exemption from registration under the Securities Act (and based upon an Opinion of Counsel reasonably satisfactory to the Corporation if it so requests):

(1) in the case of any Certificated Preferred Stock or certificated Common Stock, the Corporation and the Transfer Agent shall permit the holder thereof to exchange such Preferred Stock or certificated Common Stock for Certificated Preferred Stock or certificated Common Stock, as the case may be, that does not bear the restrictive legend set forth on Exhibit C and rescind any restriction on the transfer of such Preferred Stock or Common Stock issuable in respect of the conversion of the Preferred Stock; and

(2) in the case of any Global Preferred Stock, such Preferred Stock shall not be required to bear the restrictive legend set forth on Exhibit C; provided, however, that with respect to any request for an exchange of Preferred Stock that is represented by Global Preferred Stock for Certificated Preferred Stock that does not bear a restrictive as set forth on Exhibit C in connection with a sale or transfer thereof pursuant to Rule 144 or another exemption from registration under the Securities Act (and based upon an Opinion of Counsel if the Corporation so requests), the Holder thereof shall certify in writing to the Transfer Agent that such request is being made pursuant to such exemption (such certification to be substantially in the form of Exhibit D hereto).

(v) No Obligation of the Transfer Agent.

(A) The Transfer Agent shall have no responsibility or obligation to any beneficial owner of Global Preferred Stock, a member of, or a participant in, DTC or any other Person with respect to the accuracy of the records of DTC or its nominee or of any participant or member thereof, with respect to any ownership interest in the Preferred Stock or with respect to the delivery to any participant, member, beneficial owner or other Person (other than DTC) of any notice or the payment of any amount, under or with respect to such Global Preferred Stock. All notices and communications to be given to the Holders and all payments to be made to Holders under the Preferred Stock shall be given or made only

to the Holders (which shall be DTC or its nominee in the case of the Global Preferred Stock). The rights of beneficial owners in any Global Preferred Stock shall be exercised only through DTC subject to the applicable rules and procedures of DTC. The Transfer Agent may rely and shall be fully protected in relying upon information furnished by DTC with respect to its members, participants and any beneficial owners.

(B) The Transfer Agent shall have no obligation or duty to monitor, determine or inquire as to compliance with any restrictions on transfer imposed under this Certificate of Designation or under applicable law with respect to any transfer of any interest in any Preferred Stock (including any transfers between or among DTC participants, members or beneficial owners in any Global Preferred Stock) other than to require delivery of such certificates and other documentation or evidence as are expressly required by, and to do so if and when expressly required by, the terms of this Certificate of Designation, and to examine the same to determine substantial compliance as to form with the express requirements hereof.

(d) Replacement Certificates. If a mutilated Preferred Stock certificate is surrendered to the Transfer Agent or if the Holder of a Preferred Stock certificate claims that the Preferred Stock certificate has been lost, destroyed or wrongfully taken, the Corporation shall issue and the Transfer Agent shall countersign a replacement Preferred Stock certificate if the reasonable requirements of the Transfer Agent are met. If required by the Transfer Agent or the Corporation, such Holder shall furnish an indemnity bond sufficient in the judgment of the Corporation and the Transfer Agent to protect the Corporation and the Transfer Agent from any loss which either of them may suffer if a Preferred Stock certificate is replaced. The Corporation and the Transfer Agent may charge the Holder for their expenses in replacing a Preferred Stock certificate.

12. Additional Rights of Holders. In addition to the rights provided to Holders under this Certificate of Designation, Holders shall have the rights set forth in the Registration Rights Agreement.

13. Other Provisions.

(a) With respect to any notice to a Holder of shares of Preferred Stock required to be provided hereunder, neither failure to mail such notice, nor any defect therein or in the mailing thereof, to any particular Holder shall affect the sufficiency of the notice or the validity of the proceedings referred to in such notice with respect to the other Holders or affect the legality or validity of any distribution, rights, warrant, reclassification, consolidation, merger, conveyance, transfer, dissolution, liquidation or winding-up, or the vote upon any such action. Any notice which was mailed in the manner herein provided shall be conclusively presumed to have been duly given whether or not the Holder receives the notice.

(b) Shares of Preferred Stock issued and reacquired will be retired and canceled promptly after reacquisition thereof and, upon compliance with the applicable requirements of Michigan law, have the status of authorized but unissued shares of preferred stock of the Corporation undesignated as to series and may with any and all other authorized but unissued shares of preferred stock of the Corporation be designated or redesignated and issued or reissued, as the case may be, as part of any series of preferred stock of the Corporation, except that any issuance or reissuance of shares of Preferred Stock must be in compliance with this Certificate of Designation.

(c) The shares of Preferred Stock shall be issuable only in whole shares.

(d) All notice periods referred to herein shall commence on the date of the mailing of the applicable notice.

IN WITNESS WHEREOF, the Corporation has caused this certificate to be signed and attested this 15th day of December, 2004.

CMS ENERGY CORPORATION

By: /s/ Michael D. VanHemert

Name: Michael D. VanHemert

Title: Vice President and Secretary

Attest: /s/ Joyce H. Norkey

Joyce H. Norkey

EXHIBIT A

FORM OF FUNDAMENTAL CHANGE PURCHASE NOTICE

To: CMS Energy Corporation

The undersigned registered holder of shares of Preferred Stock hereby acknowledges receipt of a notice from CMS Energy Corporation (the "Corporation") as to the occurrence of a Fundamental Change with respect to the Corporation and requests and instructs the Corporation to repurchase the shares of Preferred Stock ($50.00 liquidation preference or an integral multiple thereof) designated below, in accordance with the terms of the Certificate of Designation referred to in such Preferred Stock and directs that the check of the Corporation, in payment for these shares of Preferred Stock, be issued and delivered to the registered holder hereof unless a different name has been indicated below. If any portion of these shares of Preferred Stock are not repurchased and are to be issued in the name of a Person other than the undersigned, the undersigned shall pay all transfer taxes payable with respect thereto.

Dated:

_____
Signature(s)

Signature(s) must be guaranteed by a commercial bank or trust company or a member firm of a major stock exchange if cash and shares of Preferred Stock are to be delivered other than to or in the name of the registered holder.

_____
Signature Guarantee

Fill in for registration of Preferred Stock if to be issued other than to and in the name of registered holder:

_____
(Name)

_____
(Street Address)

_____
(City, state and zip code)
Please print name and address

Number of shares of Preferred Stock to be purchased (if less than all are to be purchased):

_____

Certificate Number (if shares of Preferred Stock are Certificated):

_____

Social Security or other taxpayer number:

_____

EXHIBIT B

FORM OF CONVERSION NOTICE

To: CMS Energy Corporation

The undersigned registered holder of these shares of Preferred Stock hereby exercises the option to convert these shares of Preferred Stock, or portion hereof (which is $50.00 liquidation preference or an integral multiple thereof) designated below, for cash and shares of Common Stock of CMS Energy Corporation in accordance with the terms of the Certificate of Designation referred to in the Preferred Stock, and directs that the shares, if any, issuable and deliverable upon such conversion, together with any check for cash deliverable upon such conversion, and any shares of Preferred Stock representing any unconverted shares hereof, be issued and delivered to the registered holder hereof unless a different name has been indicated below. If shares or any portion of the Preferred Stock not converted are to be issued in the name of a Person other than the undersigned, the undersigned shall pay all transfer taxes payable with respect thereto.

This notice shall be deemed to be an irrevocable exercise of the option to convert these shares of Preferred Stock.

Dated:

_____
Signature(s)

Signature(s) must be guaranteed by a commercial bank or trust company or a member firm of a major stock exchange if cash and shares of Common Stock are to be issued, or shares of Preferred Stock to be delivered, other than to or in the name of the registered holder.

_____
Signature Guarantee

Fill in for registration of shares if to be delivered, and shares of Preferred Stock if to be issued other than to and in the name of registered holder:

_____
(Name)

_____
(Street Address)

_____
(City, state and zip code)
Please print name and address

Number of shares of Preferred Stock to be converted (if less than all):

_____

Certificate Number (if shares of Preferred Stock are Certificated):

_____

Social Security or other taxpayer number:

_____

EXHIBIT C

FORM OF PREFERRED
STOCK FACE OF SECURITY

THIS SECURITY (OR ITS PREDECESSOR) WAS ORIGINALLY ISSUED IN A TRANSACTION EXEMPT FROM REGISTRATION UNDER THE UNTIED STATES SECURITIES ACT OF 1933, AS AMENDED (THE "SECURITIES ACT"), AND THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF MAY NOT BE OFFERED, SOLD OR OTHERWISE TRANSFERRED IN THE ABSENCE OF SUCH REGISTRATION OR AN APPLICABLE EXEMPTION THEREFROM. EACH PURCHASER OF THIS SECURITY IS HEREBY NOTIFIED THAT THE SELLER OF THIS SECURITY MAY BE RELYING ON THE EXEMPTION FROM THE PROVISIONS OF SECTION 5 OF THE SECURITIES ACT PROVIDED BY RULE 144A THEREUNDER. THE HOLDER OF THIS SECURITY AGREES FOR THE BENEFIT OF THE COMPANY THAT (A) THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF MAY BE OFFERED, RESOLD, PLEDGED OR OTHERWISE TRANSFERRED ONLY (I) IN THE UNITED STATES TO A PERSON WHOM THE SELLER REASONABLY BELIEVES IS A QUALIFIED INSTITUTIONAL BUYER (AS DEFINED IN RULE 144A UNDER THE SECURITIES ACT ("RULE 144A")) IN A TRANSACTION MEETING THE REQUIREMENTS OF RULE 144A PURCHASING FOR ITS OWN ACCOUNT OR FOR THE ACCOUNT OF A QUALIFIED INSTITUTIONAL BUYER IN A TRANSACTION MEETING THE REQUIREMENTS OF RULE 144A, (II) OUTSIDE THE UNITED STATES IN AN OFFSHORE TRANSACTION IN ACCORDANCE WITH RULE 903 OR RULE 904 UNDER THE SECURITIES ACT, (III) PURSUANT TO AN EXEMPTION FROM REGISTRATION UNDER THE SECURITIES ACT PROVIDED BY RULE 144 THEREUNDER (IF AVAILABLE), (IV) IN ACCORDANCE WITH ANOTHER EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT, (V) TO CMS ENERGY CORPORATION OR (VI) PURSUANT TO AN EFFECTIVE REGISTRATION STATEMENT UNDER THE SECURITIES ACT, IN EACH OF CASES (I) THROUGH (VI) IN ACCORDANCE WITH ANY APPLICABLE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES, AND (B) THE HOLDER WILL, AND EACH SUBSEQUENT HOLDER IS REQUIRED TO, NOTIFY ANY PURCHASER OF THE SECURITY FROM IT OF THE RESALE RESTRICTIONS REFERRED TO IN CLAUSE (A) ABOVE.

THE HOLDER OF THIS SECURITY AGREES THAT SUCH HOLDER WILL NOT ENGAGE IN HEDGING TRANSACTIONS INVOLVING THIS SECURITY AND THE COMMON STOCK ISSUABLE UPON CONVERSION HEREOF UNLESS IN COMPLIANCE WITH THE SECURITIES ACT.

THIS SECURITY AND ANY RELATED DOCUMENTATION MAY BE AMENDED OR SUPPLEMENTED FROM TIME TO TIME TO MODIFY THE RESTRICTIONS ON AND PROCEDURES FOR RESALES AND OTHER TRANSFERS OF THIS SECURITY TO REFLECT ANY CHANGE IN APPLICABLE LAW OR REGULATION (OR THE INTERPRETATION THEREOF) OR IN PRACTICES RELATING TO THE RESALE OR TRANSFER OF RESTRICTED SECURITIES GENERALLY. THE HOLDER OF THIS SECURITY SHALL BE DEEMED BY THE ACCEPTANCE OF THIS SECURITY TO HAVE AGREED TO ANY SUCH AMENDMENT OR SUPPLEMENT.

THE HOLDER OF THIS SECURITY IS SUBJECT TO, AND ENTITLED TO THE BENEFITS OF, A REGISTRATION RIGHTS AGREEMENT, DATED AS OF DECEMBER 5, 2003 ENTERED INTO BY THE COMPANY FOR THE BENEFIT OF CERTAIN HOLDERS OF SECURITIES FROM TIME TO TIME.

Certificate Number
[ ]

Number of Shares
[ ]

CUSIP NO.:_____

4.50% Cumulative Convertible Preferred Stock, Series B (par value $0.01) (liquidation preference $50 per share)
of
CMS Energy Corporation

CMS Energy Corporation, a Michigan corporation (the "Corporation"), hereby certifies that [___] (the "Holder") is the registered owner of [___] fully paid and non-assessable preferred securities of the Corporation designated the 4.50% Cumulative Convertible Preferred Stock, Series B (par value $0.01) (liquidation preference $50 per share) (the "Preferred Stock"). The shares of Preferred Stock are transferable on the books and records of the Transfer Agent, in person or by a duly authorized attorney, upon surrender of this certificate duly endorsed and in proper form for transfer. The designations, rights, privileges, restrictions, preferences and other terms and provisions of the Preferred Stock represented hereby are issued and shall in all respects be subject to the provisions of the Certificate of Designation dated December 15, 2004, as the same may be amended from time to time (the "Certificate of Designation"). Capitalized terms used herein but not defined shall have the meaning given them in the Certificate of Designation. The Corporation will provide a copy of the Certificate of Designation to a Holder without charge upon written request to the Corporation at its principal place of business.

Reference is hereby made to select provisions of the Preferred Stock set forth on the reverse hereof, and to the Certificate of Designation, which select provisions and the Certificate of Designation shall for all purposes have the same effect as if set forth at this place.

Upon receipt of this certificate, the Holder is bound by the Certificate of Designation and is entitled to the benefits thereunder.

Unless the Transfer Agent's Certificate of Authentication hereon has been properly executed, these shares of Preferred Stock shall not be entitled to any benefit under the Certificate of Designation or be valid or obligatory for any purpose.

IN WITNESS WHEREOF, the Corporation has executed this certificate this___ day of , 2004.

CMS ENERGY CORPORATION

By: _____
Name:
Title:

By: _____
Name:
Title:

TRANSFER AGENT'S AND SECURITY REGISTRAR'S CERTIFICATE OF AUTHENTICATION

These are shares of the Preferred Stock referred to in the within-mentioned Certificate of Designation.

Dated: , 2004

CMS Energy Corporation, as Transfer Agent and Security Registrar

By: _____

Authorized Signatory

REVERSE OF SECURITY

Cash dividends on each share of Preferred Stock shall be payable at a rate per annum set forth on the face hereof or as provided in the Certificate of Designation.

The shares of Preferred Stock shall be convertible into cash and the shares of the Corporation's Common Stock in the manner and according to the terms set forth in the Certificate of Designation.

The Corporation will furnish without charge to each holder who so requests the powers, designations, preferences and relative, participating, optional or other rights of each class of stock and the qualifications, limitations or restrictions of such preferences and/or rights.

ASSIGNMENT

FOR VALUE RECEIVED, the undersigned assigns and transfers the shares of Preferred Stock evidenced hereby to:

(Insert assignee's social security or tax identification number)

(Insert address and zip code of assignee)

and irrevocably appoints agent to transfer the shares of Preferred Stock evidenced hereby on the books of the Transfer Agent. The agent may substitute another to act for him or her.

Date: _____

Signature: _____

(Sign exactly as your name appears on the other side of this Preferred Stock certificate)

Signature Guarantee: (1) _____

1 (Signature must be guaranteed by an "eligible guarantor institution" that is a bank, stockbroker, savings and loan association or credit union meeting the requirements of the Transfer Agent, which requirements include membership or participation in the Securities Transfer Agents Medallion Program ("STAMP") or such other "signature guarantee program" as may be determined by the Transfer Agent in addition to, or in substitution for. STAMP, all in accordance with the Securities Exchange Act of 1934, as amended.)

EXHIBIT D

CERTIFICATE TO BE DELIVERED UPON EXCHANGE OR REGISTRATION OF TRANSFER OF PREFERRED STOCK

Re: 4.50% Cumulative Convertible Preferred Stock, Series B (the "Preferred Stock") of CMS Energy Corporation (the "Corporation")

This Certificate relates to___ shares of Preferred Stock held in ☐ */ book-entry or ☐ */ definitive form by (the "Transferor").

The Transferor*:

☐ has requested the Transfer Agent by written order to deliver in exchange for its beneficial interest in the Preferred Stock held by the Depository cash and shares of Preferred Stock in definitive, registered form equal to its beneficial interest in such Preferred Stock (or the portion thereof indicated above); or

☐ has requested the Transfer Agent by written order to exchange or register the transfer of Preferred Stock.

In connection with such request and in respect of such Preferred Stock, the Transferor does hereby certify that the Transferor is familiar with the Certificate of Designation relating to the above-captioned Preferred Stock and that the transfer of this Preferred Stock does not require registration under the Securities Act of 1933, as amended (the "Securities Act") because */:

☐ Such Preferred Stock is being acquired for the Transferor's own account without transfer.

☐ Such Preferred Stock is being transferred to the Corporation.

☐ Such Preferred Stock is being transferred to a qualified institutional buyer (as defined in Rule 144A under the Securities Act), in reliance on Rule 144A.

☐ Such Preferred Stock is being transferred in reliance on and in compliance with another exemption from the registration requirements of the Securities Act (and based on an Opinion of Counsel if the Corporation so requests).

*/ Please check applicable box.

[NAME OF TRANSFEROR]

By: _____

Its:

Date: _____

Michigan Department of Labor & Economic Growth

Filing Endorsement

This is to Certify that the CERTIFICATE OF CORRECTION

for

CMS ENERGY CORPORATION

ID NUMBER: 485283

received by facsimile transmission on February 27, 2006 is hereby endorsed

Filed on February 27, 2006 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Effective Date: December 20, 2004

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 27TH day of February, 2006.



, Director

Bureau of Commercial Services

Sent by Facsimile Transmission 06058

BCS / CD - 518 (Rev. 12/05)

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
BUREAU OF COMMERCIAL SERVICES

Date Received **(FOR BUREAU USE ONLY)**

This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Name

Joyce H Norkey, Assistant Secretary, CMS Energy Corporation

Address

One Energy Plaza, EP1-420

City	**State**	**Zip Code**
Jackson, MI		**49201-2276**

EFFECTIVE DATE:

Document will be returned to the name and address you enter above.
If left blank document will be mailed to the registered office.

CERTIFICATE OF CORRECTION

For use by Corporations and Limited Liability Companies
(Please read information and instruction on last page)

Pursuant to the provisions of Act 284, Public Acts of 1972 (profit corporations), Act 162, Public Acts of 1982 (nonprofit corporations), or Act 23, Public Acts of 1993 (limited liability companies), the undersigned corporation or limited liability company executes the following Certificate:

1. **The name of the corporation or limited liability company is:**

   CMS Energy Corporation

2. **The identification number assigned by the Bureau is: 485–283**
3. **The corporation or limited liability company is formed under the laws of the State of Michigan**
4. **That a Certificate of Designation of 4.50% Cumulative Convertible Preferred Stock, Series B**
   (Title of Document Being Corrected)

   was filed by the Bureau on December 20, 2004 and that said document requires correction.
5. **Describe the inaccuracy or defect contained in the above named document:**

   The amount of shares issued of the 4.50% Cumulative Convertible Preferred Stock, Series B, should have been 5,000,000 shares instead of 4,910,000 shares in exchange for 5,000,000 shares, instead of 4,910,000 shares, of 4.50% Cumulative Convertible Preferred Stock. In addition, a correction needs to be made to the definition of "Fundamental Change".
6. **The document is corrected as follows:**

   See Attachment.
7. **This document is hereby executed in the same manner as the Act requires the document being corrected to be executed.**

Signed this 27th day of February, 2006

By	/s/ Michael D. VanHemert	By	/s/ Joyce H. Norkey	By	
	(Signature)		(Signature)		(Signature)
	Michael D. VanHemert		**JOYCE H. NORKEY NOTARY PUBLIC JACKSON CO, MI MY COMMISSION EXPIRES Sep 7, 2006**		
	(Type or Print Name and Title)		(Type or Print Name and Title)		(Type or Print Name and Title)
	Vice President, Corporate Secretary and Chief Governance Officer				

ATTACHMENT TO CERTIFICATE OF CORRECTION
OF CMS ENERGY CORPORATION
(CORPORATION IDENTIFICATION NUMBER 485-283)

6. The Certificate of Designation of 4.50% Cumulative Convertible Preferred Stock, Series B, of CMS Energy Corporation filed on December 20, 2004 is corrected as follows (corrections are in **bold**):

Page 1

1. Designation and Amount; Ranking.

(a) There shall be created from the 10,000,000 shares of preferred stock, par value $0.01 per share, of the Corporation authorized to be issued pursuant to the Articles of Incorporation, a series of preferred stock, designated as the "4.50% Cumulative Convertible Preferred Stock, Series B," par value $0.01 per share (the "Preferred Stock"), and the number of shares of such series shall be 5,000,000. Such number of shares may be decreased by resolution of the Board of Directors; provided that no decrease shall reduce the number of shares of Preferred Stock to a number less than that of the shares of Preferred Stock then outstanding plus the number of shares issuable upon exercise of options or rights then outstanding. The Preferred Stock was exchanged for **5,000,000** of then outstanding shares of 4.50% Cumulative Convertible Preferred Stock, par value $0.01 per share (the "Original Preferred Stock"), established pursuant to the Certificate of Designation of 4.50% Cumulative Convertible Preferred Stock of CMS Energy Corporation dated December 4, 2003 pursuant to an exchange offer.

* * *

Page 3

A "Fundamental Change" shall be deemed to have occurred at such time after the original issuance of the Preferred Stock...; *provided, however*, that a Fundamental Change shall not be deemed to have occurred in respect of any of the foregoing if either (1) the Last Reported Sale Price of Common Stock for any five Trading Days within the ten consecutive Trading Days ending immediately before the later of the Fundamental Change or the public announcement thereof equals or exceeds 105% of the applicable Conversion Price of the Preferred Stock in effect immediately before the Fundamental Change or the public announcement thereof **(except that this clause (1) shall not apply to the events described in Section 7(f)(vi) hereof)** or (2) at least 90% of the consideration (excluding cash payments for fractional shares) in the transaction or transactions constituting the Fundamental Change consists of shares of capital stock traded on a national securities exchange or quoted on the NASDAQ National Market (or which shall be so traded or quoted when issued or exchanged in connection with such Fundamental Change) (such securities being referred to as "Publicly Traded Securities") and as a result of such transaction or transactions the Preferred Stock becomes convertible into such Publicly Traded Securities (excluding cash payments for fractional shares).

* * *

Page 27

The Transfer Agent shall authenticate and deliver certificates for **5,000,000** shares of Preferred Stock for original issue upon a written order of the Corporation signed by two Officers or by an Officer and an Assistant Treasurer of the Corporation. Such order shall specify the number of shares of Preferred Stock to be authenticated and the date on which the original issue of Preferred Stock is to be authenticated.

* * *

Michigan Department of Labor & Economic Growth

Filing Endorsement

This is to Certify that the CERT. OF CHANGE OF REG. OFF./RES. AGENT

for

CMS ENERGY CORPORATION

ID NUMBER: 485283

received by facsimile transmission on October 27, 2006 is hereby endorsed

Filed on October 27, 2006 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 27TH day of October, 2006.



, Director

Bureau of Commercial Services

Sent by Facsimile Transmission 06300

BCS / CD-520 (Rev. 12/05)

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
BUREAU OF COMMERCIAL SERVICES

Date Received (FOR BUREAU USE ONLY)

This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Name
Jane M. Kramer

Address
One Energy Plaza

City	State	Zip Code	
Jackson,	MI	49201	EFFECTIVE DATE:

Document will be returned to the name and address you enter above.

If left blank document will be mailed to the registered office.

CERTIFICATE OF CHANGE OF REGISTERED OFFICE AND/OR CHANGE OF RESIDENT AGENT
For use by Domestic and Foreign Corporations and Limited Liability Companies
(Please read information and Instructions on reverse side)

Pursuant to the provisions of Act 284, Public Acts of 1972 (profit corporations), Act 162, Public Acts of 1982 (nonprofit corporations), or Act 23, Public Acts of 1993 (limited liability companies), the undersigned corporation or limited liability company executes the following Certificate:

1. The name of the corporation or limited liability company is:
   CMS Energy Corporation
2. The identification number assigned by the Bureau is: 485–283
3. a. The name of the resident agent on file with the Bureau is: Michael D. VanHemert
   b. The location of the registered office on file with the Bureau is:

One Energy Plaza, EP1-420	Jackson, Michigan	49201—2276
(Street Address)	(City)	(Zip Code)

   c. The mailing address of the above registered office on file with the Bureau is:

One Energy Plaza, EP1-420	Jackson, Michigan	49201—2276
(Street Address or P.O. Box)	(City)	(Zip Code)

ENTER IN ITEM 4 THE INFORMATION AS IT SHOULD NOW APPEAR ON THE PUBLIC RECORD

4. a. The name of the resident agent is: Catherine M. Reynolds
   b. The address of the registered office is:

One Energy Plaza, EP1-420	Jackson, Michigan	49201—2276
(Street Address)	(City)	(Zip Code)

   c. The mailing address of the registered office IF DIFFERENT THAN 4B is:

(Street Address or P.O. Box)	(City)	(Zip Code)

5. The above changes were authorized by resolution duly adopted by: 1. ALL CORPORATIONS: its Board of Directors; 2. PROFIT CORPORATIONS ONLY: the resident agent if only the address of the registered office is changed, in which case a copy of this statement has been mailed to the corporation: 3. LIMITED LIABILITY COMPANIES: an operating agreement, affirmative vote of a majority of the members pursuant to section 502(1), managers pursuant to section 405, or the resident agent if only the address of the registered office is changed.

6. The corporation or limited liability company further states that the address of its registered office and the address of its resident agent, as changed, are identical.

Signature	Type or Print Name and Title or Capacity	Date Signed
/s/ Jane M. Kramer	Jane M. Kramer, Assistant Secretary	10-27-06

Michigan Department Of Energy, Labor & Economic Growth

Filing Endorsement

This is to Certify that the CERTIFICATE OF AMENDMENT - CORPORATION

for

CMS ENERGY CORPORATION

ID NUMBER: 485283

received by facsimile transmission on May 22, 2009 is hereby endorsed

Filed on May 22, 2009 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 22ND day of May, 2009.



, Director

BCS / CD-515 (Rev. 03/07)

MICHIGAN DEPARTMENT OF LABOR & ECONOMIC GROWTH
BUREAU OF COMMERCIAL SERVICES

Date Received (FOR BUREAU USE ONLY)

This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Name
CMS Energy Corporation c/o Catherine M. Reynolds
Address
One Energy Plaza, EP12-246

City	State	ZIP Code
Jackson	MI	49201

Document will be returned to the name and address you enter above.
If left blank document will be mailed to the registered office.

EFFECTIVE DATE:

CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION
For use by Domestic Profit and Nonprofit Corporations
(Please read information and instructions on the last page)

Pursuant to the provisions of Act 284, Public Acts of 1972, (profit corporations), or Act 162, Public Acts of 1982 (nonprofit corporations), the undersigned corporation executes the following Certificate:

1. The present name of the corporation is: CMS Energy Corporation
2. The identification number assigned by the Bureau is: 485-283
3. Article XII of the Articles of Incorporation is hereby amended to read as follows:

In an uncontested election of directors, each director of the Corporation shall be elected by a majority of the votes cast by the shares present in person or represented by proxy at the meeting and entitled to vote on the election of directors (a "majority vote"); however, in a contested election, the directors shall be elected by a plurality of the votes of the shares present in person or represented by proxy at the meeting and entitled to vote on the election of directors. For purposes of this provision, a majority of the votes cast means that the number of shares voted "for" a director must exceed 50% of the votes cast with respect to that director. For purposes of this Article XII, (i) an "uncontested election" is an election in which the number of nominees for director is not greater than the number to be elected, and (ii) a "contested election" is an election in which the number of nominees for director is greater than the number to be elected.

Following any uncontested election, any incumbent director who failed to receive a majority vote, shall tender his or her resignation to the Board of Directors. A recommendation on whether or not to accept such resignation offer shall be made by (i) a designated standing committee of the Board of Directors (the "Committee"), or (ii) if each member of the Committee did not receive a majority vote, then the independent directors who did receive a majority vote may appoint a committee from amongst themselves to consider the resignation offer and make a recommendation to the Board of Directors, or (iii) if three or fewer independent directors received a majority vote, then all such directors may participate in the actions regarding the resignation offers and make a recommendation to the Board of Directors. The Board of Directors will act on the recommendation and publicly disclose its decision within 90 days from the date of the certification of the election results. The director who tenders his or her resignation will not participate in the Board of Directors' decision.

COMPLETE ONLY ONE OF THE FOLLOWING:

4. Profit or Nonprofit Corporation: For amendments adopted by unanimous consent of Incorporators before the first meeting of the board of directors or trustees.

The foregoing amendment to the Articles of Incorporation was duly adopted on the day of , , in accordance with the provisions of the Act by the unanimous consent of the incorporator(s) before the first meeting of the Board of Directors or Trustees.

Signed this _____ day of _____, _____

_____ (Signature)	_____ (Signature)
_____ (Type or Print Name)	_____ (Type or Print Name)
_____ (Signature)	_____ (Signature)
_____ (Type or Print Name)	_____ (Type or Print Name)

5. Profit Corporation Only: Shareholder or Board Approval

The foregoing amendment to the Articles of Incorporation proposed by the board was duly adopted on the 22nd day of May, 2009, by the: (check one of the following)

- ☑ shareholders at a meeting in accordance with Section 611(3) of the Act.
- ☐ written consent of the shareholders having not less than the minimum number of votes required by statute in accordance with Section 407(1) of the Act. Written notice to shareholders who have not consented in writing has been given. (Note: Written consent by less than all of the shareholders is permitted only if such provision appears in the Articles of Incorporation.)
- ☐ written consent of all the shareholders entitled to vote in accordance with Section 407(2) of the Act.
- ☐ board of a profit corporation pursuant to section 611(2) of the Act.

Profit Corporations and Professional Service Corporations

Signed this 22 day of May, 2009

By /s/ Catherine M. Reynolds
(Signature of an authorized officer or agent)

Catherine M. Reynolds, Vice President and Corporate Secretary
(Type or Print Name)

Michigan Department of Licensing and Regulatory Affairs

Filing Endorsement

This is to Certify that the CERT. OF CHANGE OF REG. OFF./RES. AGENT

for

CMS ENERGY CORPORATION

ID NUMBER: 485283

received by facsimile transmission on November 20, 2013 is hereby endorsed

Filed on November 20, 2013 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 20TH day of November, 2013.

Alan J. Schefke, Director
Corporations, Securities & Commercial Licensing Bureau

Sent by Facsimile Transmission 13324

CSCL/CD-520 (Rev. 02/13)

MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
CORPORATIONS, SECURITIES & COMMERCIAL LICENSING BUREAU

Date Received (FOR BUREAU USE ONLY)

This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Name
Georgine R. Hyden

Address
One Energy Plaza, EP1-416

City	State	Zip Code	
Jackson,	Michigan	49201	EFFECTIVE DATE:

Document will be returned to the name and address you enter above.
If left blank document will be returned to the registered office.

CERTIFICATE OF CHANGE OF REGISTERED OFFICE AND/OR CHANGE OF RESIDENT AGENT

For use by Domestic and Foreign Corporations and Limited Liability Companies
(Please read information and instructions on the last page)

Pursuant to the provisions of Act 284, Public Acts of 1972 (profit corporations), or Act 162, Public Acts of 1982 (nonprofit corporations), or Act 23, Public Acts 1993 (limited liability companies), the undersigned execute the following Certificate:

1. The present name of the corporation is:
   CMS Energy Corporation
2. The identification number assigned by the Bureau is: 485283
3. a. The name of the resident agent on file with the Bureau is: Catherine M. Reynolds
   b. The location of the registered office on file with the Bureau is:

One Energy Plaza, EP1-420,	Jackson, Michigan	49201
(Street Address)	(City)	(Zip Code)

   c. The mailing address of the above registered office on file with the Bureau is:

One Energy Plaza, EP1-420,	Jackson, Michigan	49201
(Street Address or P.O. Box)	(City)	(Zip Code)

ENTER IN ITEM F4 THE INFORMATION AS IT SHOULD NOW APPEAR ON THE PUBLIC RECORD

4. a. The name of the resident agent is: Melissa M. Gleespen
   b. The address of its registered office is:

One Energy Plaza,	Jackson, Michigan	49201
(Street Address)	(City)	(Zip Code)

   c. The mailing address of the registered office IF DIFFERENT THAN 4B is:

(Street Address or P.O. Box)	(City)	(Zip Code)

5. The above changes were authorized by resolution duly adopted by: 1. ALL CORPORATIONS: its Board of Directors; 2. PROFIT CORPORATIONS ONLY: the resident agent if only the address of the registered office is changed, in which case a copy of this statement has been mailed to the corporation.

6. The corporation or limited liability company further states that the address of its registered office and the address of its resident agent as changed, are identical.

Signature	Type or Print Name and Title or Capacity	Date Signed
/s/ Georgine R. Hyden	Georgine R. Hyden, Assistant Secretary	11-19-13

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CERTIFICATE OF DESIGNATION OF

4.200% CUMULATIVE REDEEMABLE PERPETUAL
PREFERRED STOCK, SERIES C
OF
CMS ENERGY CORPORATION

FILED

JUN 29 2021

**ADMINISTRATOR
CORPORATIONS DIVISION**

CMS Energy Corporation, a corporation organized and existing under the Business Corporation Act of the State of Michigan (the "**Corporation**"), in accordance with the provisions of Section 302(3) thereof, does hereby certify:

The board of directors of the Corporation (the "**Board of Directors**"), in accordance with Article III of the Restated Articles of Incorporation, as amended, of the Corporation, the Amended and Restated Bylaws of the Corporation and applicable law, authorized the issuance and sale by the Corporation of shares of its Preferred Stock pursuant to resolutions adopted by the Board of Directors effective May 1, 2020 (collectively, the "**Resolutions**") and granted the Special Financing Committee of the Board of Directors (the "**Committee**") the full authority to act on behalf of the Board of Directors for the purposes stated in the Resolutions with respect to the proposed issuance and sale by the Corporation of shares of its Preferred Stock, and pursuant to the authority conferred upon the Committee in accordance with Section 528(1)(a) of the Business Corporation Act of the State of Michigan and the Resolutions, the Committee adopted the following resolution creating and setting forth the terms of a series of Preferred Stock of the Corporation designated as the "4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C."

RESOLVED, that pursuant to the authority vested in the Committee and in accordance with the Resolutions, the provisions of the Restated Articles of Incorporation, as amended, of the Corporation, the Amended and Restated Bylaws of the Corporation and applicable law, a series of Preferred Stock, par value $0.01 per share, of the Corporation be and hereby is created, and that the designation and number of shares of such series, and the voting and other powers, preferences and relative, participating, optional or other special rights, and the qualifications, limitations or restrictions, of the shares of such series (in addition to the provisions of the Restated Articles of Incorporation, as amended, of the Corporation, which are applicable to Preferred Stock regardless of series), are as follows:

SECTION 1. *Designation*. The distinctive serial designation of such series of Preferred Stock is "4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C" (the "**Series C Preferred Stock**"). Each share of Series C Preferred Stock shall be identical in all respects to every other share of Series C Preferred Stock, except as to the respective dates from which dividends thereon shall accumulate, to the extent such dates may differ as permitted pursuant to Section 4(a) below.

SECTION 2. *Number of Shares and Ranking*.

(a) The authorized number of shares of Series C Preferred Stock shall be 9,200. Such number of shares may be decreased by resolution of the Board of Directors; provided that no decrease shall reduce the number of shares of Series C Preferred Stock to a number that is less than that of the shares of Series C Preferred Stock then outstanding. Any such decrease in the number of shares of Series C Preferred Stock shall have the status of authorized but unissued shares of Preferred Stock undesignated as to series and may with any and all other authorized but unissued shares of Preferred Stock be designated or redesignated and issued or reissued, as the case may be, as part of any series of Preferred Stock.

(b) The Series C Preferred Stock shall rank, with respect to dividend rights and distribution rights upon the liquidation, winding-up or dissolution of the Corporation: (i) senior to the Common Stock and each other class or series of Junior Stock; (ii) on parity with each class or series of Parity Stock; and (iii) junior to each class or series of Senior Stock.

SECTION 3. *Definitions.* As used herein with respect to the Series C Preferred Stock:

"**Articles**" means the Restated Articles of Incorporation of the Corporation, as amended and as the same may be amended, restated or amended and restated from time to time.

"**Board of Directors**" means the Board of Directors of the Corporation.

"**Business Day**" means any day other than a Saturday or Sunday or any other day on which commercial banks in New York City are authorized or required by law or executive order to close.

"**Bylaws**" means the Amended and Restated Bylaws of the Corporation, as they may be amended, restated or amended and restated from time to time.

"**Certificate of Designation**" means this Certificate of Designation establishing the terms of the Series C Preferred Stock.

The term "**close of business**" means 5:00 p.m., New York City time.

"**Common Stock**" means the common stock of the Corporation.

"**Corporation**" means CMS Energy Corporation, a Michigan corporation.

"**Dividend Disbursing Agent**" means Equiniti Trust Company d/b/a EQ Shareowner Services, the Corporation's duly appointed dividend disbursing agent for the Series C Preferred Stock, or any successor appointed under Section 9.

"**Dividend Payment Date**" has the meaning set forth in Section 4(a).

"**Dividend Period**" means the period from, and including, a Dividend Payment Date to, but excluding, the next Dividend Payment Date, except that the initial Dividend Period shall commence on, and include, the Initial Issue Date.

"**DTC**" has the meaning set forth in Section 6.

"**Holder**" means each Person in whose name any share of the Series C Preferred Stock is registered on the stock register of the Corporation, who shall be treated by the Corporation and the Registrar as the absolute owner of such share of the Series C Preferred Stock.

"**Initial Issue Date**" means July 1, 2021, the original issue date of shares of the Series C Preferred Stock.

"**Junior Stock**" means: (a) the Common Stock; and (b) each other class or series of capital stock of the Corporation established after the Initial Issue Date the terms of which do not expressly provide that such class or series shall rank senior to or on parity with the Series C Preferred Stock as to dividend rights and distribution rights upon the Corporation's liquidation, winding-up or dissolution.

"**Liquidation Dividend Amount**" shall have the meaning set forth in Section 7(a).

"**Liquidation Preference**" means, as to the Series C Preferred Stock, $25,000 per share thereof, subject to adjustment as provided in Section 16(b).

"Nonpayment Event" shall have the meaning set forth in Section 8(b)(i).

"**Officer**" shall have the meaning set forth in Section 14(b).

"**Parity Stock**" means each class or series of capital stock of the Corporation established after the Initial Issue Date the terms of which expressly provide that such class or series shall rank on parity with the Series C Preferred Stock as to dividend rights and distribution rights upon the Corporation's liquidation, winding-up or dissolution.

"**Person**" means any individual, partnership, corporation, limited liability company, business trust, joint stock company, trust, unincorporated association, joint venture, governmental authority or other entity of whatever nature.

"**Preferred Directors**" shall have the meaning set forth in Section 8(b)(i).

"**Preferred Stock**" means the preferred stock of the Corporation.

"**Prospectus Supplement**" means the prospectus supplement dated June 24, 2021 relating to the initial offering and sale of the depositary shares each representing a 1/1,000th interest in a share of the Series C Preferred Stock.

"**Ratings Event**" means that, and shall be deemed to have occurred when, any nationally recognized statistical rating organization as defined in Section 3(a)(62) of the Securities Exchange Act of 1934, as amended, or in any successor provision thereto, that then publishes a rating for the Corporation (a "**Rating Agency**"), amends, clarifies or changes the criteria it uses to assign equity credit to securities such as the Series C Preferred Stock, which amendment, clarification or change results in:

(a) the shortening of the length of time the Series C Preferred Stock is assigned a particular level of equity credit by that Rating Agency as compared to the length of time the Series C

Preferred Stock would have been assigned that level of equity credit by that Rating Agency or its predecessor on the Initial Issue Date; or

(b) the lowering of the equity credit (including up to a lesser amount) assigned to the Series C Preferred Stock by that Rating Agency as compared to the equity credit assigned by that Rating Agency or its predecessor on the Initial Issue Date.

"**Record Date**" has the meaning set forth in Section 4(a).

"**Redemption Date**" means any date fixed for redemption of any shares of Series C Preferred Stock pursuant to the provisions of Section 5.

"**Registrar**" means Equiniti Trust Company d/b/a EQ Shareowner Services, the Corporation's duly appointed registrar for the Series C Preferred Stock, or any successor appointed under Section 9.

"**Senior Stock**" means each class or series of capital stock of the Corporation established after the Initial Issue Date the terms of which expressly provide that such class or series shall rank senior to the Series C Preferred Stock as to dividend rights or distribution rights upon the Corporation's liquidation, winding-up or dissolution.

"**Series C Preferred Stock**" has the meaning set forth in Section 1.

"**Share Dilution Amount**" means the increase in the number of diluted shares outstanding (determined in accordance with accounting principles generally accepted in the United States, and as measured from the date of the Corporation's consolidated financial statements most recently filed with the Securities and Exchange Commission prior to the Initial Issue Date) resulting from the grant, vesting or exercise of equity-based compensation to directors, employees, contractors and agents and equitably adjusted for any stock split, stock dividend, reverse stock split, reclassification or similar event.

"**Transfer Agent**" means Equiniti Trust Company d/b/a EQ Shareowner Services, the Corporation's duly appointed transfer agent for the Series C Preferred Stock, or any successor appointed under Section 9.

"**Voting Preferred Stock**" means any series of Preferred Stock, other than the Series C Preferred Stock, ranking equally with the Series C Preferred Stock either as to dividends or to the distribution of assets upon liquidation, dissolution or winding-up of the Corporation and upon which voting rights similar to the voting rights of the Series C Preferred Stock in all material respects have been established for such series of Preferred Stock and which are exercisable at the time of any vote of the Preferred Stock.

SECTION 4. *Dividends.*

(a) *Rate*. Subject to the rights of holders of any class or series of capital stock of the Corporation ranking senior to the Series C Preferred Stock with respect to dividends, Holders shall be entitled to receive, when, as and if declared by the Board of Directors (or an authorized committee thereof) out of funds of the Corporation legally available for payment, cash dividends at the rate per annum of 4.200% on the Liquidation Preference per share of the Series C Preferred Stock. Declared dividends on the Series C Preferred Stock will be payable in arrears on January 15, April 15, July 15 and October 15 of each year, commencing on October 15, 2021 (each, a "**Dividend Payment Date**"). Dividends on the Series C Preferred Stock shall accumulate daily from and including the most recent date as to which dividends shall have been paid or, if no dividends have been paid, from the Initial Issue Date (or such other date as may be set forth in the certificate evidencing the relevant shares of Series C Preferred Stock) without regard to whether funds are legally available for the declaration or payment of such dividends. Declared dividends shall be payable on the relevant Dividend Payment Date to Holders as they appear on the Corporation's stock register at the close of business on the immediately preceding January 1, April 1, July 1 or October 1, as applicable (each, a "**Record Date**"). These Record Dates shall apply regardless of whether a particular Record Date is a Business Day. If a Dividend Payment Date is not a Business Day, payment of declared dividends shall be made on the next succeeding Business Day, without any interest, additional dividends, or other payment in lieu of interest or additional dividends accumulating with respect to this delay.

Dividends accumulating or payable on the Series C Preferred Stock for any Dividend Period (or portion thereof) shall be calculated on the basis of a 360-day year consisting of twelve 30-day months. Accumulations of dividends on shares of the Series C Preferred Stock shall not bear interest or dividends on such accumulated amount.

No dividend shall be declared or paid on, or any sum of cash set aside for the payment of dividends on, any outstanding shares of Series C Preferred Stock with respect to any Dividend Period unless all dividends for all preceding Dividend Periods have been declared and paid on, or a sufficient sum of cash has been set aside for the payment of such dividends on, all outstanding shares of Series C Preferred Stock.

(b) *Priority of Dividends*. So long as any share of the Series C Preferred Stock remains outstanding, no dividend or distribution shall be declared or paid on Common Stock or any other Junior Stock, and no Common Stock or any other Junior Stock shall be repurchased, redeemed or otherwise acquired for consideration by the Corporation or any of its subsidiaries unless, in each case, all accumulated and unpaid dividends for all preceding Dividend Periods have been declared and paid, or a sufficient sum of cash has been set aside for the payment of such dividends, on all outstanding shares of the Series C Preferred Stock. The foregoing limitation shall not apply to: (i) any dividend or distribution payable in shares of Common Stock or other Junior Stock, together with cash in lieu of any fractional share; (ii) repurchases, redemptions or other acquisitions of Common Stock or other Junior Stock in connection with the administration of any benefit or other incentive plan, including any employment contract, including, without limitation, (x) purchases to offset the Share Dilution Amount pursuant to a publicly announced repurchase plan; *provided* that any purchases to offset the Share Dilution Amount shall in no event exceed the Share Dilution Amount, (y) the forfeiture of unvested shares of restricted stock or share withholdings or other surrender of shares to which the holder may otherwise be entitled upon exercise, delivery or vesting of equity

awards (whether in payment of applicable taxes, the exercise price or otherwise), and (z) the payment of cash in lieu of fractional shares; (iii) purchases of fractional interests in shares of Common Stock or other Junior Stock pursuant to the conversion or exchange provisions of such shares of other Junior Stock or any securities exchangeable for or convertible into shares of Common Stock or other Junior Stock; (iv) any dividends or distributions of rights or Common Stock or other Junior Stock in connection with a shareholders' rights plan or any redemption or repurchase of rights pursuant to any shareholders' rights plan; (v) repurchases of Common Stock or other Junior Stock pursuant to a contractually binding requirement to buy Common Stock or other Junior Stock existing prior to the preceding Dividend Period, including under a contractually binding stock repurchase plan; (vi) the deemed purchase or acquisition of fractional interests in shares of Common Stock or other Junior Stock pursuant to the conversion or exchange provisions of such shares or the security being converted or exchanged; (vii) the acquisition by the Corporation or any of its subsidiaries of record ownership in Common Stock or other Junior Stock for the beneficial ownership of any other Persons (other than the Corporation or any of its subsidiaries), including as trustees or custodians, and the payment of cash in lieu of fractional shares; and (viii) the exchange or conversion of Junior Stock for or into other Junior Stock and the payment of cash in lieu of fractional shares.

When dividends on shares of the Series C Preferred Stock with respect to any previously completed Dividend Period (A) have not been declared and paid in full or (B) have been declared but a sum of cash sufficient for payment thereof has not been set aside for the benefit of the Holders thereof on the applicable Record Date, no dividends may be declared or paid on any Parity Stock unless dividends are declared on the shares of Series C Preferred Stock such that the respective amounts of such dividends declared on the shares of Series C Preferred Stock and such Parity Stock shall bear the same ratio to each other as all accumulated dividends and all declared and unpaid dividends per share on the shares of Series C Preferred Stock and such Parity Stock bear to each other; *provided, however,* that any unpaid dividends will continue to accumulate. The foregoing limitation shall not apply to (i) purchases of fractional interests in shares of Parity Stock pursuant to the conversion or exchange provisions of such shares of Parity Stock or any securities exchangeable for or convertible into shares of Parity Stock, (ii) the deemed purchase or acquisition of fractional interests in shares of Parity Stock pursuant to the conversion or exchange provisions of such shares or the security being converted or exchanged, (iii) the acquisition by the Corporation or any of its subsidiaries of record ownership in Parity Stock for the beneficial ownership of any other Persons (other than for the Corporation or any of its subsidiaries), including as trustees or custodians, and the payment of cash in lieu of fractional shares and (iv) the exchange or conversion of Parity Stock for or into other Parity Stock (with the same or lesser aggregate liquidation amount) or Junior Stock and the payment of cash in lieu of fractional shares.

Subject only to the foregoing, and not otherwise, such dividends (payable in cash, securities or other property) as may be determined by the Board of Directors (or an authorized committee thereof) may be declared and paid on any securities, including Common Stock, from time to time out of any funds legally available for such payment, and Holders shall not be entitled to participate in any such dividends declared on securities other than the Series C Preferred Stock.

SECTION 5. *Optional Redemption.*

The Corporation may, at its option, redeem the Series C Preferred Stock:

(a) in whole or in part, from time to time, on or after July 15, 2026 at a redemption price in cash equal to $25,000 per share of Series C Preferred Stock, subject to equitable adjustment as provided below; or

(b) in whole but not in part, at any time within 120 days after the conclusion of any review or appeal process instituted by the Corporation following the occurrence of a Ratings Event, or, if no review or appeal process is available or sought with respect to such Ratings Event, at any time within 120 days after the occurrence of such Ratings Event, at a redemption price in cash equal to $25,500 per share of Series C Preferred Stock, subject to equitable adjustment as provided below,

plus, in each case, all accumulated and unpaid dividends (whether or not declared) to, but excluding, such Redemption Date; *provided* that, notwithstanding the foregoing, if a Redemption Date for any shares of Series C Preferred Stock occurs subsequent to a Record Date and on or prior to the next succeeding Dividend Payment Date, then the full amount of accumulated and unpaid dividends (whether or not declared) on such shares of Series C Preferred Stock to, but excluding, such Dividend Payment Date shall be paid on such Dividend Payment Date to the Persons who were the Holders of such shares at the close of business on such Record Date and such accumulated and unpaid dividends shall not be paid or required to be paid on the Redemption Date and shall not constitute a part of the redemption price of such shares.

The redemption price shall be subject to equitable adjustment whenever there shall occur a stock split, combination, reclassification or other similar event involving the Series C Preferred Stock. Any such adjustments shall be determined in good faith by the Board of Directors (or an authorized committee thereof) and submitted by the Board of Directors (or such authorized committee thereof) to the Transfer Agent.

SECTION 6. *Redemption Procedures.*

If the Series C Preferred Stock is to be redeemed, the notice of redemption shall be given by first class mail, postage prepaid, or by overnight air courier guaranteeing next day delivery, to the Holders of the Series C Preferred Stock to be redeemed, mailed not less than 30 days, nor more than 60 days, prior to the Redemption Date (*provided* that, if the Series C Preferred Stock is held in book-entry form evidenced by a global certificate held by The Depository Trust Company ("**DTC**," which term includes any successor thereto) or its nominee, the Corporation may give such notice in any manner permitted or required by DTC. Each notice of redemption shall include a statement setting forth:

(a) the Redemption Date;

(b) the number of shares of Series C Preferred Stock to be redeemed and, if less than all the shares of Series C Preferred Stock held by such Holder are to be redeemed, the number of such shares of Series C Preferred Stock to be redeemed from such Holder;

(c) the redemption price;

(d) the place or places where Holders may surrender certificates evidencing the Series C Preferred Stock for payment of the redemption price; and

(e) that dividends on the shares of Series C Preferred Stock to be redeemed shall cease to accumulate from and after such Redemption Date.

If notice of redemption of any shares of Series C Preferred Stock has been given, and if the funds necessary for such redemption have been set aside by the Corporation for the benefit of the Holders of the shares of Series C Preferred Stock so called for redemption, then, from and after the Redemption Date, dividends shall cease to accumulate on such shares of Series C Preferred Stock, and such shares of Series C Preferred Stock shall no longer be deemed outstanding and all rights of the Holders of such shares of Series C Preferred Stock shall terminate, except for (i) the right of the Holders thereof to receive the amount payable with respect to such redemption, without interest and (ii) if the Redemption Date occurs subsequent to a Record Date and on or prior to the next succeeding Dividend Payment Date, the right of the Persons who were the Holders of such shares at the close of business on such Record Date to receive, on such Dividend Payment Date, the full amount of accumulated and unpaid dividends (whether or not declared) on such shares to, but excluding, such Dividend Payment Date. Any funds unclaimed at the end of one year from the Redemption Date shall, to the extent permitted by law, be released by the Corporation, after which time the Holders of such Series C Preferred Stock so called for redemption shall look only to the Corporation for payment of the redemption price of such Series C Preferred Stock. If a Redemption Date is not a Business Day, payment shall be made on the next succeeding Business Day, without any interest, additional dividends, or other payment in lieu of interest or additional dividends accumulating with respect to this delay.

In case of any redemption of only part of the Series C Preferred Stock at the time outstanding, the Series C Preferred Stock to be redeemed shall be selected either pro rata or by lot. If fewer than all the shares represented by any certificate are redeemed, a new certificate shall be issued representing the unredeemed shares without charge to the Holder thereof.

SECTION 7. *Liquidation, Winding-up or Dissolution.*

(a) In the event of any liquidation, winding-up or dissolution of the Corporation, whether voluntary or involuntary, each Holder shall be entitled to receive the Liquidation Preference per share of the Series C Preferred Stock, plus an amount (the "**Liquidation Dividend Amount**") equal to accumulated and unpaid dividends (whether or not declared) on such shares to (but excluding) the date fixed for liquidation, winding-up or dissolution, to be paid out of the assets of the Corporation legally available for distribution to its shareholders, after payment or provision for the Corporation's debts, obligations and liabilities, including debt and other liabilities owed to the Corporation's creditors, as required by applicable law, and to holders of shares of any class or series of capital stock of the Corporation ranking senior to the Series C Preferred Stock with respect to distribution rights upon the Corporation's liquidation, winding-up or dissolution and before any payment or distribution is made to holders of any Junior Stock (including, without limitation, Common Stock).

(b) If, upon the voluntary or involuntary liquidation, winding-up or dissolution of the Corporation, the amounts payable with respect to (i) the Liquidation Preference plus the Liquidation Dividend Amount on the shares of Series C Preferred Stock and (ii) the liquidation preference of, and the amount of accumulated and unpaid dividends (to, but excluding, the date fixed for such liquidation, winding-up or dissolution) on, all other Parity Stock are not paid in full, the Holders and all holders of any such other Parity Stock shall share equally and ratably in any distribution of the

Corporation's assets in proportion to their respective liquidation preferences and amounts equal to the accumulated and unpaid dividends to which they are entitled.

(c) After the payment to any Holder of the full amount of the Liquidation Preference and the Liquidation Dividend Amount for each of such Holder's shares of Series C Preferred Stock, such Holder as such shall have no right or claim to any of the remaining assets of the Corporation.

(d) Neither the sale, lease or exchange of all or substantially all of the Corporation's assets, nor the Corporation's merger or consolidation into or with any other Person, shall be deemed to be the voluntary or involuntary liquidation, winding-up or dissolution of the Corporation.

SECTION 8. *Voting Rights*.

(a) *General*. Holders shall not have any voting rights except as set forth in this Section 8 and except as otherwise from time to time specifically required by Michigan law. Without limitation to the foregoing, but subject to any limits and restrictions stated in the Articles, no vote or consent of the Holders shall be required for the issuance of any additional shares of Series C Preferred Stock not exceeding the aggregate number of shares authorized in this Certificate of Designation.

(b) *Voting Rights*.

(i) Whenever dividends on any shares of the Series C Preferred Stock or any other class or series of Preferred Stock that ranks on parity with the Series C Preferred Stock as to payment of dividends, and upon which similar voting rights have been conferred and are exercisable, shall have not been declared and paid for the equivalent of six quarterly dividend payments, whether or not for consecutive Dividend Periods (a "**Nonpayment Event**"), the Holders of the Series C Preferred Stock (voting as a single class together with holders of any and all other classes of authorized Preferred Stock having equivalent voting rights, whether or not the holders of such Preferred Stock would be entitled to vote for the election of directors if such default in dividends did not exist) shall be entitled to vote as a single class for the election of a total of two additional members of the Board of Directors (the "**Preferred Directors**"), provided that the Board of Directors shall at no time include more than two Preferred Directors. In that event, the number of directors on the Board of Directors shall automatically increase by two and, at the request of any Holder of Series C Preferred Stock or other Preferred Stock with equivalent voting rights, a special meeting of the Holders of Series C Preferred Stock and the holders of any other class or series of Preferred Stock that ranks on parity with Series C Preferred Stock as to payment of dividends and for which dividends have not been paid shall be called for the election of the two directors (unless such request is received less than 90 days before the date fixed for the next annual or special meeting of the shareholders, in which event such election shall be held at such next annual or special meeting of shareholders), followed by such election at each subsequent annual meeting. These voting rights will continue until full dividends have been paid regularly on the shares of the Series C Preferred Stock and any other class or series of Preferred Stock that ranks on parity with the Series C Preferred Stock as to payment of dividends for at least four consecutive quarterly Dividend Periods or their equivalent following the Nonpayment Event.

If and when full dividends have been paid regularly on the Series C Preferred Stock and any other class or series of Preferred Stock that ranks on parity with the Series C Preferred Stock

as to payment of dividends for at least four consecutive quarterly Dividend Periods or their equivalent following a Nonpayment Event, the Holders of the Series C Preferred Stock shall be divested of the foregoing voting rights (subject to revesting in the event of each subsequent Nonpayment Event) and the term of office of each Preferred Director so elected shall terminate and the number of directors on the Board of Directors shall automatically decrease by two. Any Preferred Director may be removed at any time without cause by the Holders of a majority of the outstanding shares of the Series C Preferred Stock (together with holders of any and all other classes of authorized Preferred Stock having equivalent voting rights, whether or not the holders of such Preferred Stock would be entitled to vote for the election of directors if such default in dividends did not exist) when they have the voting rights described above. So long as a Nonpayment Event continues, any vacancy in the office of a Preferred Director (other than prior to the initial election of the Preferred Directors) may be filled by the written consent of the Preferred Director remaining in office or, if none remains in office, by a vote of the Holders of the outstanding shares of Series C Preferred Stock (together with holders of any and all other class of authorized Preferred Stock having equivalent voting rights, whether or not the holders of such Preferred Stock would be entitled to vote for the election of directors if such default in dividends did not exist) to serve until the next annual meeting of shareholders. The Preferred Directors shall each be entitled to one vote per director on any matter.

(ii) So long as any shares of the Series C Preferred Stock are outstanding, in addition to any other vote or consent of shareholders required by law or by the Articles, the affirmative vote or consent of the holders of not less than two-thirds of the total stated liquidation preference (excluding accumulated and unpaid dividends thereon, and premiums or other similar amounts, if any) of all outstanding shares of Series C Preferred Stock and all outstanding shares of any other series of Voting Preferred Stock (subject to Section 8(b)(iii)) at the time outstanding and entitled to vote thereon, voting together as a single class, given in person or by proxy, either in writing without a meeting or by vote at an annual or special meeting of such shareholders, shall be necessary for the Corporation to effect:

(A) any amendment of the Articles, including this Certificate of Designation, so as to authorize, or increase the authorized amount of, any class or series of Senior Stock;

(B) any amendment of any provision of the Articles, other than this Certificate of Designation, so as to adversely affect the special rights, preferences, privileges, restrictions, or voting powers of the Series C Preferred Stock; or

(C) any consummation of a binding share exchange or reclassification involving the shares of the Series C Preferred Stock, or of a merger or consolidation of the Corporation with or into another entity, unless in each case (x) the shares of the Series C Preferred Stock remain outstanding or, in the case of any such merger or consolidation with respect to which the Corporation is not the surviving or resulting entity (or the Series C Preferred Stock is otherwise exchanged or reclassified), are converted or reclassified into or exchanged for preferred stock of the surviving or resulting entity or its ultimate parent, and (y) the shares of the Series C Preferred Stock that remain outstanding or such shares of preferred stock, as the case may be, have rights, preferences, privileges and voting powers that, taken as a whole, are not materially less favorable to the holders thereof than the

rights, preferences, privileges and voting powers, taken as a whole, of the Series C Preferred Stock immediately prior to the consummation of such transaction;

provided, *however*, that, for the avoidance of doubt, (1) any increase in the amount of the Corporation's authorized but unissued shares of Preferred Stock, (2) any increase in the amount of the Corporation's authorized Series C Preferred Stock or the issuance of any additional shares of the Series C Preferred Stock or (3) the authorization or creation of any class or series of Parity Stock or Junior Stock, any increase in the amount of authorized but unissued shares of such class or series of Parity Stock or Junior Stock or the issuance of any shares of such class or series of Parity Stock or Junior Stock shall be deemed not to adversely affect (or to otherwise cause to be materially less favorable) the rights, preferences, privileges, restrictions or voting powers of the Series C Preferred Stock, and shall not require the affirmative vote or consent of the Holders, except as required pursuant to Michigan law.

(iii) If any amendment, share exchange, reclassification, merger or consolidation specified in this Section 8(b) would adversely affect (or cause to be materially less favorable, as applicable) the rights, preferences, privileges, restrictions or voting powers of one or more but not all series of Voting Preferred Stock, then only the series of Voting Preferred Stock adversely affected (or the terms of which would be materially less favorable, as applicable) and entitled to vote shall vote as a class in lieu of all other series of Voting Preferred Stock.

(iv) Without the consent of the Holders, to the fullest extent permitted by applicable law and so long as such action does not adversely affect the special rights, preferences, privileges, restrictions or voting powers of the Series C Preferred Stock, the Corporation may amend, alter, supplement, or repeal any terms of the Series C Preferred Stock, including by way of amendment to this Certificate of Designation, for the following purposes:

(A) to cure any ambiguity or mistake, or to correct or supplement any provision contained in this Certificate of Designation that may be defective or inconsistent with any other provision contained in this Certificate of Designation;

(B) to make any provision with respect to matters or questions relating to the Series C Preferred Stock that is not inconsistent with the provisions of the Articles, including this Certificate of Designation; or

(C) to waive any of the Corporation's rights with respect thereto.

(v) Without the consent of the Holders, to the fullest extent permitted by applicable law, the Corporation may amend, alter, supplement or repeal any terms of the Series C Preferred Stock, including by way of amendment to this Certificate of Designation, in order to conform the terms thereof to the description of the terms of the Series C Preferred Stock set forth under "Certain Terms of the Series C Preferred Stock" in the Prospectus Supplement.

(c) *Procedures for Voting and Consents*. The rules and procedures for calling and conducting any meeting of the Holders (including, without limitation, the fixing of a Record Date in connection therewith), the solicitation and use of proxies at such a meeting, the obtaining of written consents and any other procedural aspect or matter with regard to such a meeting or such consents shall be governed by any rules the Board of Directors, in its discretion, may adopt from time to time, which

rules and procedures shall conform to the requirements of the Articles, the Bylaws, applicable law and the rules of any national securities exchange or other trading facility on which the Series C Preferred Stock is listed or traded at the time.

SECTION 9. *Transfer Agent, Registrar, and Dividend Disbursing Agent.* The duly appointed Transfer Agent, Registrar and Dividend Disbursing Agent for the Series C Preferred Stock shall be Equiniti Trust Company d/b/a EQ Shareowner Services. The Corporation may, in its sole discretion, remove any Person serving as the Transfer Agent, Registrar or Dividend Disbursing Agent; *provided*, *however*, that prior to the effectiveness of any such removal the Corporation shall appoint a successor Transfer Agent, Registrar or Dividend Disbursing Agent, as the case may be, who shall accept such appointment prior to the effectiveness of such removal. Upon any such removal or appointment, the Corporation shall send notice thereof to the Holders.

SECTION 10. *Record Holders.* To the fullest extent permitted by applicable law, the Corporation and the Transfer Agent may deem and treat the Holder of any shares of the Series C Preferred Stock as the true and lawful owner thereof for all purposes.

SECTION 11. *Notices.* The Corporation shall send all notices or communications to Holders of the Series C Preferred Stock pursuant to this Certificate of Designation in writing by first class mail, postage prepaid, or by overnight air courier guaranteeing next day delivery, to the Holders' respective addresses shown on the register for the Series C Preferred Stock (*provided* that, if the Series C Preferred Stock is held in book-entry form evidenced by a global certificate held by DTC or its nominee, the Corporation shall be permitted to send notices or communications to Holders pursuant to the procedures of DTC, and notices and communications that the Corporation sends in this manner will be deemed to have been properly sent to such Holders in writing).

SECTION 12. *No Preemptive Rights.* The Holders shall have no preemptive or preferential rights to purchase or subscribe for any stock, obligations, warrants or other securities of the Corporation of any class or series.

SECTION 13. *Other Rights.* The shares of the Series C Preferred Stock shall not have any rights, preferences, privileges or voting powers or relative, participating, optional or other special rights, or qualifications, limitations or restrictions thereof, other than as set forth herein or in the Articles or as provided by applicable law.

SECTION 14. *Stock Certificates*.

(a) Shares of the Series C Preferred Stock shall initially be represented by stock certificates substantially in the form set forth as Exhibit A hereto.

(b) Stock certificates representing shares of the Series C Preferred Stock shall be signed by the President or a Vice President, and by the Treasurer, an Assistant Treasurer, the Secretary or an Assistant Secretary (each, an "**Officer**"), in accordance with the Bylaws and applicable Michigan law, by manual or facsimile signature.

(c) A stock certificate representing shares of the Series C Preferred Stock shall not be valid until manually countersigned by an authorized signatory of the Transfer Agent and Registrar. Each

stock certificate representing shares of the Series C Preferred Stock shall be dated the date of its countersignature.

(d) If any Officer of the Corporation who has signed a stock certificate no longer holds that office at the time the Transfer Agent and Registrar countersigns the stock certificate, the stock certificate shall be valid nonetheless.

SECTION 15. *Replacement Certificates*. If physical certificates are issued, and any of the Series C Preferred Stock certificates shall be mutilated, lost, stolen or destroyed, the Corporation shall, at the expense of the Holder, issue, in exchange and in substitution for and upon cancellation of the mutilated Series C Preferred Stock certificate, or in lieu of and substitution for the Series C Preferred Stock certificate lost, stolen or destroyed, a new Series C Preferred Stock certificate of like tenor and representing an equivalent Liquidation Preference of shares of the Series C Preferred Stock, but only upon receipt of evidence of such loss, theft or destruction of such Series C Preferred Stock certificate and indemnity, if requested, reasonably satisfactory to the Corporation and the Transfer Agent.

SECTION 16. *Miscellaneous.*

(a) The Corporation shall pay any and all stock transfer and documentary stamp taxes that may be payable in respect of any initial issuance or delivery of shares of the Series C Preferred Stock or certificates representing such shares.

(b) The Liquidation Preference shall be subject to equitable adjustment whenever there shall occur a stock split, combination, reclassification or other similar event involving the Series C Preferred Stock. Such adjustments shall be determined in good faith by the Board of Directors (or an authorized committee thereof) and submitted by the Board of Directors (or such authorized committee thereof) to the Transfer Agent.

(c) Shares of Series C Preferred Stock that are redeemed, purchased or otherwise acquired by the Corporation shall be cancelled and shall revert to authorized but unissued shares of Series C Preferred Stock which may be reissued from time to time by the Corporation, unless the Board of Directors determines by resolution that the shares shall have the status of authorized but unissued shares of Preferred Stock undesignated as to series and may with any and all other authorized but unissued shares of Preferred Stock be designated or redesignated and issued or reissued, as the case may be, as part of any series of Preferred Stock.

SECTION 17. *Withholding Taxes*. Notwithstanding anything to the contrary, if the Corporation or other applicable withholding agent pays withholding taxes or backup withholding on behalf of the Holder or beneficial owner, the Corporation or other applicable withholding agent may, at its option, set off such payments against payments of cash on the Series C Preferred Stock.

Exhibit A

[FORM OF FACE OF
4.200% CUMULATIVE REDEEMABLE PERPETUAL PREFERRED
STOCK, SERIES C CERTIFICATE]

THE SHARES OF 4.200% CUMULATIVE REDEEMABLE PERPETUAL PREFERRED STOCK, SERIES C ARE SUBJECT TO REDEMPTION AT THE OPTION OF THE CORPORATION (AS DEFINED BELOW) AT THE TIMES AND REDEMPTION PRICES, AND ON TERMS AND CONDITIONS, SET FORTH IN THE CERTIFICATE OF DESIGNATION (AS DEFINED BELOW).

Certificate Number [ ]
Cumulative

[Number] Shares of 4.200%
Redeemable Perpetual Preferred Stock, Series C
CUSIP: 125896 829
ISIN: US1258968296

CMS ENERGY CORPORATION
(Formed under the laws of the State of Michigan)

4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C
(Liquidation Preference as specified below)

CMS Energy Corporation, a Michigan corporation (the "**Corporation**"), hereby certifies that [_____] (the "**Holder**") is the registered owner of [_____] shares of fully paid and non-assessable shares of the Corporation's designated 4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C, with a Liquidation Preference of $25,000.00 per share (the "**Series C Preferred Stock**"). The shares of the Series C Preferred Stock are transferable on the books and records of the Registrar, in person or by a duly authorized attorney, upon surrender of this certificate duly endorsed and in proper form for transfer. The rights, privileges, restrictions and other terms and provisions of the Series C Preferred Stock represented hereby are and shall in all respects be subject to the provisions of the Certificate of Designation of 4.200% Cumulative Redeemable Perpetual Preferred Stock, Series C of CMS Energy Corporation dated June 28, 2021, as the same may be amended from time to time (the "**Certificate of Designation**"). Capitalized terms used herein but not defined shall have the meanings given them in the Certificate of Designation. The Corporation will provide a copy of the Certificate of Designation to the Holder without charge upon written request to the Corporation at its principal place of business.

Reference is hereby made to the provisions of the Series C Preferred Stock set forth on the reverse hereof and in the Certificate of Designation, which provisions shall for all purposes have the same effect as if set forth at this place. If the terms of this certificate conflict with the terms of the Certificate of Designation, then the terms of the Certificate of Designation will control to the extent of such conflict.

Upon receipt of this executed certificate, the Holder is bound by the Certificate of Designation and is entitled to the benefits thereunder.

Unless the Transfer Agent and Registrar have properly countersigned this certificate, these shares of the Series C Preferred Stock shall not be entitled to any benefit under the Certificate of Designation or be valid or obligatory for any purpose.

[Remainder of Page Intentionally Left Blank]

Witness the facsimile seal of the Corporation and the facsimile signatures of its duly authorized officers.

Dated:

CMS ENERGY CORPORATION

By:_____
Name:
Title: [President or Vice President]

[Impression or Facsimile of Corporation Seal]

CMS ENERGY CORPORATION

By:_____
Name
Title: [Treasurer, Assistant Treasurer, Secretary or Assistant Secretary]

COUNTERSIGNATURE

These are shares of the Series C Preferred Stock referred to in the within-mentioned Certificate of Designation.

Dated: [__], [__]

Equiniti Trust Company d/b/a EQ Shareowner Services,

as Transfer Agent and Registrar

By:_____

Name:

Title:

[FORM OF REVERSE OF

CERTIFICATE FOR SERIES C PREFERRED STOCK]

Cumulative cash dividends on each share of the Series C Preferred Stock shall be payable at the rate provided in the Certificate of Designation.

The Corporation shall furnish without charge to each Holder who so requests a full statement of the designation, relative rights, preferences and limitations of each class and series of stock of the Corporation authorized to be issued, including the Series C Preferred Stock, in so far as the same shall have been prescribed and the authority of the Board of Directors of the Corporation to designate and prescribe the relative rights, preferences and limitations of other series. Such statement may be obtained from the Corporation at the Corporation's principal executive offices, which, on the Initial Issue Date of shares of the Series C Preferred Stock, were located at One Energy Plaza, Jackson, Michigan 49201.

ASSIGNMENT

FOR VALUE RECEIVED, the undersigned assigns and transfers the shares of the Series C Preferred Stock evidenced hereby to:

_____

(Insert assignee's social security or taxpayer identification number, if any)

_____

_____

_____

(Insert address and zip code of assignee)

and irrevocably appoints: _____ as agent to transfer the shares of the Series C Preferred Stock evidenced hereby on the books of the Transfer Agent and Registrar. The agent may substitute another to act for him or her.

Date:

Signature: _____

(Sign exactly as your name appears on the other side of this Certificate)

Signature Guarantee: _____

(Signature must be guaranteed by an "eligible guarantor institution" that is a bank, stockbroker, savings and loan association or credit union meeting the requirements of the Transfer Agent, which requirements include membership or participation in the Securities Transfer Agents Medallion Program ("STAMP") or such other "signature guarantee program" as may be determined by the Transfer Agent in addition to, or in substitution for, STAMP, all in accordance with the Securities Exchange Act of 1934, as amended.)

IN WITNESS WHEREOF, CMS ENERGY CORPORATION has caused this Certificate of Designation to be signed by its Assistant Secretary on this 28th day of June, 2021.

CMS ENERGY CORPORATION

By:/s/ TERRY L. CHRISTIAN
Name: Terry L. Christian
Title: Assistant Secretary and authorized agent

[Signature Page to Series C Certificate of Designation]

Filed by Corporations Division Administrator Filing Number: 224820666040 Date: 05/08/2024

LARA Corporations Online Filing System
Department of Licensing and Regulatory Affairs

Form Revision Date 07/2016

CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION

For use by DOMESTIC PROFIT CORPORATION

Pursuant to the provisions of Act 284, Public Acts of 1972,the undersigned corporation executes the following Certificate:

The identification number assigned by the Bureau is: 800497353

The name of the corporation is: CMS ENERGY CORPORATION

The Articles of Incorporation is hereby amended to read as follows:

Article IV

The street address of the registered office of the corporation and the name of the resident agent at the registered office (P.O. Boxes are not acceptable):

1. Agent Name: MELISSA M GLEESPEN
2. Street Address: ONE ENERGY PLAZA
   Apt/Suite/Other:
   City: JACKSON
   State: MI Zip Code: 49201

3. Registered Office Mailing Address:
   P.O. Box or Street Address: ONE ENERGY PLAZA, EP1-416
   Apt/Suite/Other:
   City: JACKSON
   State: MI Zip Code: 49201

Use the space below for additional Articles or for continuation of previous Articles. Please identify any Article being continued or added.

ARTICLE XI OF THE ARTICLES OF INCORPORATION IS HEREBY AMENDED TO READ AS FOLLOWS:

ARTICLE XI

THE CORPORATION RESERVES THE RIGHT TO AMEND, ALTER, CHANGE OR REPEAL ANY PROVISION IN THESE ARTICLES OF INCORPORATION AS PERMITTED BY LAW, AND ALL RIGHTS CONFERRED ON SHAREHOLDERS HEREIN ARE GRANTED SUBJECT TO THIS RESERVATION. NOTWITHSTANDING THE FOREGOING, THE PROVISIONS OF ARTICLES V, VI, VII, VIII, IX AND THIS ARTICLE XI MAY NOT BE AMENDED, ALTERED, CHANGED OR REPEALED UNLESS SUCH AMENDMENT, ALTERATION, CHANGE OR REPEAL IS APPROVED BY THE AFFIRMATIVE VOTE OF A MAJORITY OF THE OUTSTANDING SHARES ENTITLED TO VOTE THEREON.

2. The foregoing amendment to the Articles of Incorporation proposed by the board was duly adopted on: 05/03/2024 by the shareholders at a meeting in accordance with Section 611(3) of the Act.

This document must be signed by an authorized officer or agent:

Signed this 7th Day of May, 2024 by:

Signature	Title	Title if "Other" was selected
Terry L. Christian	Authorized Agent	

By selecting ACCEPT, I hereby acknowledge that this electronic document is being signed in accordance with the Act. I further certify that to the best of my knowledge the information provided is true, accurate, and in compliance with the Act.

○ Decline ◉ Accept

Filed by Corporations Division Administrator Filing Number: 224820666040 Date: 05/08/2024

MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

FILING ENDORSEMENT

This is to Certify that the CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION

for

CMS ENERGY CORPORATION

ID Number: 800497353

received by electronic transmission on May 07, 2024 ***, is hereby endorsed.***

Filed on May 08, 2024 ***, by the Administrator.***

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

LICENSING AND REGULATORY AFFAIRS
TUEBOR
CIRCUMSPICE
Corporations, Securities & Commercial Licensing Bureau

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, *in the City of Lansing, this 8th day of May, 2024.*

Linda Clegg, Director
Corporations, Securities & Commercial Licensing Bureau

CSCL/CD 515 (Rev. 07/25)

MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
CORPORATIONS, SECURITIES & COMMERCIAL LICENSING BUREAU

Date Received	AC1 (FOR BUREAU USE ONLY)
	$34610 MC 26050884557928
	This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

Corporations Division Administrator
FILED
Doc #: 28534994
Filed Date: 5/8/2026

Name
Rhonda Morris
Address
One Energy Plaza
City | State | ZIP Code
Jackson MI 49201

Document will be returned to the name and address you enter above.
If left blank, document will be returned to the registered office.

CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION

For use by Domestic Profit and Nonprofit Corporations

(Please read information and instructions on the last page)

Pursuant to the provisions of Act 284, Public Acts of 1972, (profit corporations), or Act 162, Public Acts of 1982 (nonprofit corporations), the undersigned corporation executes the following Certificate:

1. The present name of the corporation is:
   CMS Energy Corporation

2. The identification number assigned by the Bureau is: 800487353

3. Article III of the Articles of Incorporation is hereby amended to read as follows:

The total number of shares of all classes of stock which the Corporation shall have authority to issue is 710,000,000, of which 10,000,000 shares, par value $.01 per share, are of a class designated Preferred Stock ("Preferred Stock"), and 700,000,000 shares, par value $.01 per share, are of a class designated Common Stock ("Common Stock").

C0772-4496 05/08/2026 Received by Michigan Corporations Division

C0772-4497 05/08/2026 Received by Michigan Corporations Division

COMPLETE ONLY ONE OF THE FOLLOWING:

4. Profit or Nonprofit Corporations: For amendments adopted by unanimous consent of incorporators before the first meeting of the board of directors or trustees.

The foregoing amendment to the Articles of Incorporation was duly adopted on the _____ day of _____, _____, in accordance with the provisions of the Act by the unanimous consent of the incorporator(s) before the first meeting of the Board of Directors or Trustees.

Signed this _____ day of _____, _____

_____ (Signature)	_____ (Signature)
_____ (Type or Print Name)	_____ (Type or Print Name)
_____ (Signature)	_____ (Signature)
_____ (Type or Print Name)	_____ (Type or Print Name)

5. Profit Corporation Only: Shareholder or Board Approval

The foregoing amendment to the Articles of Incorporation proposed by the board was duly adopted on the 8th day of May, 2026, by the: (check one of the following)

- [x] shareholders at a meeting in accordance with Section 611(3) of the Act.
- [ ] written consent of the shareholders that have at least the minimum number of votes required by statute in accordance with Section 407(1) of the Act. Written notice to shareholders that have not consented in writing has been given. (Note: Written consent by less than all of the shareholders is permitted only if such provision appears in the Articles of Incorporation.)
- [ ] written consent of all the shareholders entitled to vote in accordance with Section 407(2) of the Act.
- [ ] board of a profit corporation pursuant to Section 611(2) of the Act.

Profit Corporations and Professional Service Corporations

Signed this 8th day of May, 2026

By _____ (Signature of an authorized officer or agent)

Georgine R. Hyden (Type or Print Name)

28534725

LARA LICENSING AND REGULATORY AFFAIRS

STATE OF MICHIGAN
CSCL/CD- 515 - CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION

Corporations Division Administrator

FILED

Doc #: 28534725
Filed Date: 5/8/2026

C0772-4020 05/08/2026 Received by Michigan Corporations Division

Certificate of Amendment to the Articles of Incorporation for use by Domestic Profit and Nonprofit Corporations

Pursuant to the provisions of Act 284, Public Acts of 1972, (profit corporations), or Act 162, Public Acts of 1982 (nonprofit corporations), the undersigned executes the following Certificate:

Corporation Information

The present name of the corporation is:	CMS ENERGY CORPORATION
The identification number assigned by the Bureau is:	800497353
Corporation Type:	Domestic Profit Corporation

Optional Article(s)

ARTICLE V - Special meetings of the shareholders may be called by the Board of Directors, the Chairman of the Board, or shareholders entitled to cast at least 10% of the outstanding shares entitled to vote thereon. The procedure to be followed by shareholders in calling a special meeting and the methodology for determining the percentage of votes entitled to be cast by the shareholders seeking to call a special meeting (including without limitation any minimum holding periods or other limitations or conditions) shall be as set forth in the bylaws of the Corporation.

Filing Effective Date

The filing will be effective:	when filed by the Corporations Division Administrator.

Shareholder or Board Approval

The foregoing amendment to the Articles of Incorporation proposed by the board was duly adopted on:	05/08/2026
The amendment was adopted by:	shareholders at a meeting in accordance with Section 611(3) of the Act

Attestations

☒ I understand that the information I enter into the online system is public information and will appear online and on copy requests exactly as I enter it into the system.

☒ I have been authorized by the business entity to file this document online.

☒ I, HEREBY SWEAR AND/OR AFFIRM, under penalty of law, including criminal prosecution, that the facts contained in this document are true. I certify that I am signing this document as the person(s) whose signature is required, or as an agent of the person(s) whose signature is required, who has authorized me to place his/her signature on this document.

Signature(s)

Authorized Agent	*Georgine R Hyden*	*Lindsey White*	*05/08/2026*
Signer's Capacity	On behalf of	Sign Here	Date

28538021

LARA LICENSING AND REGULATORY AFFAIRS

STATE OF MICHIGAN
CSCL/CD- 515 - CERTIFICATE OF AMENDMENT TO THE ARTICLES OF INCORPORATION

Corporations Division Administrator
FILED
Doc #: 28538021
Filed Date: 5/11/2026

C0774-1705 05/11/2026 Received by Michigan Corporations Division

Certificate of Amendment to the Articles of Incorporation for use by Domestic Profit and Nonprofit Corporations

Pursuant to the provisions of Act 284, Public Acts of 1972, (profit corporations), or Act 162, Public Acts of 1982 (nonprofit corporations), the undersigned executes the following Certificate:

Corporation Information

The present name of the corporation is:	CMS ENERGY CORPORATION
The identification number assigned by the Bureau is:	800497353
Corporation Type:	Domestic Profit Corporation

Article III

Common Shares	700000000
Preferred Shares	10000000
Total Shares	710000000
If there is more than one class or series of shares, state the relative rights, preferences and limitations of the shares of each class in the box below.	The total number of shares of all classes of stock which the Corporation shall have authority to issue is 710,000,000, of which 10,000,000 shares, par value $.01 per share, are of a class designated Preferred Stock (Preferred Stock), and 700,000,000 shares, par value $.01 per share, are of a class designated Common Stock (Common Stock). The statement of the designations and the voting and other powers, preferences and rights, and the qualifications, limitations or restrictions thereof, of the Common Stock and of the Preferred Stock is as follows: Series Established By Articles - There is hereby established one series of Preferred Stock designated as 4.200% Cumulative Redeemable Perpetual Preferred Stock. The number of shares that shall constitute such series shall be 9,200 shares. COMMON STOCK - The shares of Common Stock may be issued from time to time as the Board of Directors shall determine for such consideration as shall be fixed by the Board of Directors.

Optional Article(s)

This space is intentionally left blank.

Filing Effective Date

The filing will be effective:	when filed by the Corporations Division Administrator.

Shareholder or Board Approval

The foregoing amendment to the Articles of Incorporation proposed by the board was duly adopted on:	05/08/2026
The amendment was adopted by:	board of a profit corporation pursuant to Section 611(2) of the Act

Attestations

☒ I understand that the information I enter into the online system is public information and will appear online and on copy requests exactly as I enter it into the system.

☒ I have been authorized by the business entity to file this document online.

☒ I, HEREBY SWEAR AND/OR AFFIRM, under penalty of law, including criminal prosecution, that the facts contained in this document are true. I certify that I am signing this document as the person(s) whose signature is required, or as an agent of the person(s) whose signature is required, who has authorized me to place his/her signature on this document.

Signature(s)

Authorized Agent	*Georgine R Hyden*	*Lindsey White*	*05/11/2026*
Signer's Capacity	On behalf of	Sign Here	Date

C0774-1706 05/11/2026 Received by Michigan Corporations Division

Certification of Garrick J. Rochow

I, Garrick J. Rochow, certify that:

1. I have reviewed this quarterly report on Form 10-Q of CMS Energy Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: July 28, 2026

By: /s/ Garrick J. Rochow

Garrick J. Rochow

President and Chief Executive Officer

Certification of Srikanth Maddipati

I, Srikanth Maddipati, certify that:

1. I have reviewed this quarterly report on Form 10-Q of CMS Energy Corporation;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: July 28, 2026

By: /s/ Srikanth Maddipati

Srikanth Maddipati

Executive Vice President and Chief Financial Officer

Certification of Garrick J. Rochow

I, Garrick J. Rochow, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Consumers Energy Company;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: July 28, 2026

By: /s/ Garrick J. Rochow

Garrick J. Rochow

President and Chief Executive Officer

Certification of Srikanth Maddipati

I, Srikanth Maddipati, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Consumers Energy Company;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: July 28, 2026

By: /s/ Srikanth Maddipati

Srikanth Maddipati

Executive Vice President and Chief Financial Officer

Certification of CEO and CFO Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

In connection with the Quarterly Report on Form 10-Q of CMS Energy Corporation (the "Company") for the quarterly period ended June 30, 2026 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), Garrick J. Rochow, as President and Chief Executive Officer of the Company, and Srikanth Maddipati, as Executive Vice President and Chief Financial Officer of the Company, each hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of his knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ Garrick J. Rochow

Name: Garrick J. Rochow
Title: President and Chief Executive Officer
Date: July 28, 2026

/s/ Srikanth Maddipati

Name: Srikanth Maddipati
Title: Executive Vice President and Chief Financial Officer
Date: July 28, 2026

Certification of CEO and CFO Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

In connection with the Quarterly Report on Form 10-Q of Consumers Energy Company (the "Company") for the quarterly period ended June 30, 2026 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), Garrick J. Rochow, as President and Chief Executive Officer of the Company, and Srikanth Maddipati, as Executive Vice President and Chief Financial Officer of the Company, each hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of his knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ Garrick J. Rochow

Name: Garrick J. Rochow
Title: President and Chief Executive Officer
Date: July 28, 2026

/s/ Srikanth Maddipati

Name: Srikanth Maddipati
Title: Executive Vice President and Chief Financial Officer
Date: July 28, 2026

Attachment O

FERC Docket No. EL25-90, submission of MPSC, June 20, 2025, p. 2.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Consumers Energy Company	)	**Docket No. EL25-90-000**
v.	)	
Midcontinent Independent System Operator, Inc.	)	

COMMENTS OF MICHIGAN PUBLIC POWER AGENCY IN SUPPORT OF COMPLAINT

Pursuant to Rule 213 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or the "Commission"),[1] Michigan Public Power Agency ("MPPA") respectfully submits these comments in support of the June 6, 2025, complaint of Consumers Energy Company ("Consumers Energy" or "Consumers") against Midcontinent Independent System Operator, Inc. ("MISO") (the "Complaint").[2] For the reasons set forth below, the Commission should grant the Complaint and the relief requested therein.

I. COMMENTS

MPPA owns a 4.80% interest in Unit No. 3 of the Campbell Plant and supports the Complaint.[3] MPPA purchased its ownership interest through the 1979 Campbell Unit No. 3 Ownership and Operating Agreement ("O&O Agreement"). Article 7 of the O&O Agreement provides that MPPA and Consumers Energy shall share all operating costs of Unit No. 3 in proportion to their ownership interests in the unit.[4] Operating costs include operation and

[1] 18 C.F.R. § 385.213.
[2] *Consumers Energy Company v. Midcontinent Independent System Operator, Inc.*, Complaint, Docket No. EL25-90-000 (filed June 6, 2025) ("Complaint"). MPPA filed a (doc-less) motion to intervene in this proceeding on June 13, 2025.
[3] *Id.* at n.12.
[4] 1979 Campbell Unit No. 3 Ownership and Operating Agreement, § 7.2.

maintenance expenses and the portion of administrative and general expenses of Consumers Energy's system-wide electric operations which is attributable to Unit No. 3.[5]

Consumers Energy planned to retire the Campbell Plant on or about May 31, 2025. However, on May 23, 2025, the Department of Energy ("DOE") ordered Consumers Energy to continue to operate the plant at least until August 21, 2025.[6] Consumers Energy's Complaint explains that, as a result of the DOE Order, the owners may incur costs (net of any market revenues) related to the extended operation of the Campbell Plant past its planned retirement date of May 31, 2025.[7] Currently, no mechanism in the MISO Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff") enables the owners of the Campbell Plant to recover their costs (net of any market revenues) associated with the plant's continued operations. The DOE Order directed Consumers to file tariff revisions or waivers necessary to effectuate the DOE Order, stating that rate recovery is available pursuant to 16 U.S.C. § 824a(c).[8] The Complaint requests that the Commission direct MISO to revise its Tariff pursuant to sections 202(c)[9] and 309 of the Federal Power Act ("FPA"), or in the alternative grant relief pursuant to section 206, to add a new rate schedule pursuant to which a later filing may be made to recover costs incurred to comply with the DOE Order to the extent not recovered through market revenues.[10]

Consumers Energy's proposed cost recovery mechanism is just and reasonable. The only costs that the Complaint seeks to recover through the proposed cost recovery mechanism are those net of market revenues, which appropriately limits the recovery of the costs of the Campbell Plant from MISO customers in the central and north regions to those costs the owners were unable to

[5] *Id.* § 7.1.
[6] U.S. Department of Energy, Order No. 202-25-3 (May 23, 2025) ("DOE Order").
[7] Complaint at 3-4.
[8] DOE Order at F.
[9] Section 202(c) provides that the Commission may prescribe just and reasonable terms, "including the compensation or reimbursement which should be paid to or by any such party." *See* 16 U.S.C. § 824a(c)(1).
[10] 16 U.S.C. §§ 824a(c), 825h, 824e.

recover in the market and avoids over recovery of such costs. Likewise, the proposal to recover such costs only from MISO Zones 1 through 7 represents a just and reasonable approach.[11] The Commission's beneficiary pays/cost causation principles provide that costs should be allocated to those who caused the costs and benefit from the costs. The central and north regions of MISO will benefit from the Campbell Plant's continued operation, as reflected by the discussion in the DOE Order.[12]

Because the Campbell Plant is in MISO and will be participating in MISO's markets, Consumers Energy's proposal for MISO to revise its Tariff to provide for the recovery of those costs is reasonable. It would not be feasible for Consumers Energy or the Commission to try to create a framework outside of MISO that would allocate the costs to those who benefited from the plant's operation.[13]

As a co-owner of the Campbell Plant, Unit No. 3, MPPA will be required to pay its share of costs related to its continued operations. MPPA has a right to recover its costs for the same reasons Consumers Energy has a right to recover its costs.[14] MPPA appreciates that Consumers Energy has recognized that right and has committed to coordinating with MPPA on its cost recovery.[15] Thus, MPPA agrees that for Consumers Energy and MPPA "to have a means of recovering the costs that [they] [have] a right to recover, the MISO Tariff must be amended to include an appropriate [cost] recovery mechanism."[16]

[11] Complaint at 17-18.
[12] DOE Order at 2.
[13] *See* Complaint at 4, 18.
[14] *Id.* at 11-13.
[15] *Id.* at n.12; *see also id.* at Attachment A ("Consumers Energy (on its own behalf and, as necessary, on behalf of the minority interest owners in Campbell Unit 3, Wolverine Power Supply Cooperative, Inc. and the Michigan Public Power Agency) shall petition FERC to approve recovery of Order Costs, net of market revenues, that FERC determines are recoverable pursuant to section 202(c)….").
[16] *Id.* at 18.

II. CONCLUSION

WHEREFORE, for the foregoing reasons, MPPA respectfully requests that the Commission grant the Complaint so that the owners of the Campbell Plant may recover the costs they incur, net of market revenues, to comply with the DOE Order.

Respectfully submitted,

//s// Alan I. Robbins

Alan I. Robbins
Debra D. Roby
Thomas B. Steiger III
Washington Energy Law LLP
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Tel: (202) 326-9313
Email: arobbins@washingtonenergylaw.com
droby@washingtonenergylaw.com
tsteiger@washingtonenergylaw.com

Counsel to Michigan Public Power Agency

Dated: June 20, 2025.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary of the Federal Energy Regulatory Commission in this proceeding.

Dated at Washington, D.C. this 20th day of June, 2025.

//s// Jessika Dziechciowska

Jessika Dziechciowska
Energy Practice Analyst
Washington Energy Law LLP
900 17th Street, N.W., Suite 500-A
Washington, D.C. 20006
Tel: (202) 326-9308
Email: jdziechciowska@washingtonenergylaw.com

Attachment P

Michigan AG Request for Rehearing of Order No. 202-25-3

UNITED STATES OF AMERICA
BEFORE THE
UNITED STATES DEPARTMENT OF ENERGY

Order No. 202-25-3

REQUEST FOR REHEARING BY MICHIGAN ATTORNEY GENERAL DANA NESSEL

Dana Nessel
Michigan Attorney General

Michael E. Moody (P51985)
Lucas Wollenzien (P86928)
Assistant Attorneys General
Special Litigation Division
P.O. Box 30755
Lansing, MI 48909
517-335-7627
MoodyM2@michigan.gov
WollenzienL@michigan.gov

Christopher M. Bzdok (P53094)
Special Assistant Attorney General
chris@tropospherelegal.com

Dated: June 18, 2025

Pursuant to section 313*l* of the Federal Power Act ("the Act"), 16 U.S.C. § 825*l*, Michigan Attorney General Dana Nessel, on behalf of the people of the State of Michigan, requests that the Department of Energy (Department or DOE) grant rehearing of Order No. 202-25-3 (May 23, 2025) ("Order"). The Order invoked the Department's emergency authority under section 202(c) of the Act to prevent the scheduled retirement of the J.H. Campbell power plant (J.H. Campbell) in West Olive, Michigan.

The Order is an unlawful abuse of the Department's emergency authority. Until now, the Department has reserved section 202(c) for real emergencies like natural disasters and extreme weather and has typically acted at the behest of grid operators or governmental bodies. In the Order, acting on its own motion and without notice, the Department declares that the retirement of J.H. Campbell presents an emergency. But the Order's emergency determination cannot bear even the mildest scrutiny.

The scheduled retirement of J.H. Campbell was the culmination of a carefully planned process that unfolded over four years. Under the oversight of the Michigan Public Service Commission (MPSC), Consumers Energy (Consumers) executed a plan to retire an old and inefficient facility, J.H. Campbell, and replace it largely with newer resources that would both increase Consumers' available generation capacity and save its ratepayers money. J.H. Campbell's proposed retirement was also studied carefully by the Midcontinent Independent System Operator (MISO), the regional

grid operator, which determined that the facility could retire without causing reliability issues.

In the Order, the Department uses its authority under section 202(c) in a manner untethered from the need to identify a real emergency and unhindered by the statutory requirement that the actions it orders go no further than necessary to address the emergency. The result of this overreach will be unnecessary costs imposed on already-overburdened ratepayers, needless pollution emitted into Michigan and its neighboring states, and an unprecedented intrusion into the authority of states and the Federal Energy Regulatory Commission to regulate the resource adequacy of our electric grid.

I. MOTION TO INTERVENE

The Michigan Attorney General,[1] on behalf of the people of the State of Michigan, moves to intervene in this proceeding and thereby to become a party for purposes of Section 313*l* of the Act, 16 U.S.C. § 825*l*. The People of the State of Michigan have an interest in and are aggrieved by the Order in several ways. First, households and businesses in Michigan will pay higher electricity bills as a result of the Order. The retirement of J.H. Campbell and its replacement with more cost-effective resources were elements of a careful plan expected to save Michigan

[1] *See* MCL 14.28 ("The attorney general . . . may, when in [her] own judgment the interests of the state require it, intervene in and appear for the people of this state in any other court or tribunal, in any cause or matter, civil or criminal, in which the people of this state may be a party or interested."). *See also In re Certified Question*, 465 Mich 537, 543-545; 638 NW2d 409 (2002), *Gremore v Peoples Community Hospital Authority*, 8 Mich App 56; 153 NW2d 377 (1967), and *People v O'Hara*, 278 Mich 281; 270 NW2d 298 (1936).

ratepayers nearly $600 million.[2] By ordering the continued operation of J.H. Campbell, the Order ensures that Michigan ratepayers will pay higher costs. Although the precise amounts of costs are not yet known, it is certain that Michigan ratepayers will be stuck with substantial new costs in excess of what they would have paid absent the Order.

Second, the People of the State of Michigan will suffer environmental harms as a result of the Order. J.H. Campbell is a significant source of particulate matter, nitrogen oxides, sulfur oxides, and carbon dioxide,[3] among other pollutants. By prolonging the operations of J.H. Campbell beyond its planned retirement date, the Order will increase the amount of pollution emitted in the state of Michigan, causing harms to the public health and welfare.

Third, the retirement of J.H. Campbell on May 31, 2025, was a provision agreed to as part of a settlement agreement in Michigan Public Service Commission Case (MPSC) No. U-21090, to which the Michigan Attorney General was a party. Because the Order deprives the Michigan Attorney General of the benefit of her bargain under the settlement agreement, the Michigan Attorney General will suffer a discrete and separate harm as a result of the Order.

II. BACKGROUND

A. DOE's Historical Use of Section 202(c).

[2] *See* Michigan Public Service Commission Case No. U-21090-0867, Reply Brief of Consumers at 1 – 2, available at https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y0000032ZSXAA2.
[3] *See In the Matter of the Application of Consumers Energy Co. for Approval of Its Integrated Res. Plan Pursuant to Mcl 460.6t & for Other Relief.*, No. U-21090, 2022 WL 2915368, at *73 (June 23, 2022).

In the past, the Department has used section 202(c) sparingly. The Department has used this authority only in response to concrete, particularized emergencies, and subject to limitations to ensure that the Department's reach extends no further than necessary to address the emergency at hand.

Between enactment of the Department of Energy Organization Act in 1977, Pub. L. No. 95-91, and the end of last year, the Department appears to have used section 202(c) nineteen times, not counting amendments and extension orders. DOE's first usage of section 202(c) came in response to the California Energy Crisis in 2000.[4] That order was followed by two others directing the operation of the Cross-Sound Cable, a submarine transmission line connecting New York and Connecticut that was complete but that had been delayed from entering service due to environmental permitting issues.[5] But by far the most common usage – comprising 13 of 19 instances – has been in response to extreme weather events such as hurricanes,[6] extreme cold,[7] and extreme heat.[8] In each of these weather-driven cases, the exercise of emergency power was requested by the relevant system operator or responsible utility, or both.

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[4] DOE, *Order Pursuant to Section 202(c) of the Federal Power Act* (Dec. 14, 2000). Section 202(c) was used by the Federal Power Commission prior to the Department of Energy Organization Act's creation of DOE. Those uses were generally limited to orders directing interconnection as a result of discrete and sudden emergencies or war. *See* Benjamin Rolsma, *The New Reliability Override*, 57 U. Conn. L. Rev. 789, 822 (2025).

[5] *See* DOE Order No. 202-02-1 (Aug. 16, 2002); DOE Order No. 202-03-01 (Aug. 14, 2003).

[6] *See* DOE Order Nos. 202-05-1 & -2 (Sept. 28, 2005) (response to Hurricane Rita); DOE Order No. 202-08-1 (Sept. 14, 2008) (Hurricane Ike); DOE Order No. 202-20-1 (Aug. 27, 2020) (Hurricane Laura); DOE Order No. 202-24-1 (Oct. 9, 2024) (Hurricane Milton).

[7] *See* DOE Order No. 202-21-1 (Feb. 14, 2021); DOE Order No. 202-22-3 (Dec. 23, 2022); DOE Order No. 202-22-4 (Dec. 24, 2022).

[8] *See* DOE Order No. 202-20-2 (Sept. 6, 2020) (responding to extreme heat in California); DOE Order No. 202-21-2 (responding to extreme heat, wildfires and drought in California); DOE Order Nos. 202-22-1 & 2 and amendments (same).

And in each, DOE carefully limited its remedy to ensure that generation facilities were only ordered to run in circumstances necessary to address the emergency and in a manner so as to minimize any conflict with environmental requirements.[9] DOE also limited the duration of those orders to the minimum period necessary to address the emergency, often shorter than 10 days.[10]

Prior to the Order, DOE had used section 202(c) on three occasions to delay the retirement of generation facilities.[11] These cases had key features in common. In each: (i) the order was requested by a system operator or governmental body; (ii) the generation facility had ceased or would soon cease operation due to an inability to comply with environmental laws; (iii) the request aimed to address a concrete and particularized emergency threatening an imminent loss of load; and, (iv) DOE tailored its order to go no further than necessary to address the emergency.

The first such instance came in 2004, when the District of Columbia's Public Service Commission requested an order directing the continued operation of a power plant located in Alexandria, Virginia, owned by the Mirant Corporation (Mirant). After its state regulator found the plant to be out of compliance with its air permit, Mirant abruptly announced that the plant would close.[12] The D.C. Public Service Commission, supported by the local utility, PEPCO, explained that the Mirant facility

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[9] *See supra* notes 3 – 5.
[10] *Id*.
[11] Nor did the DOE's predecessor agency, the Federal Power Commission, use section 202(c) to delay retirement of any generation units between the section's enactment in 1935 and the formation of DOE in 1977. *See* Rolsma, 57 U. Conn. L. Rev. at 843-46.
[12] DOE Order No. 202-05-3 (Dec. 20, 2005) at 1 (explaining that Mirant provided emissions information to its state regulator on August 19, 2005, the regulator demanded immediate action that same day, and Mirant decided to cease operations on August 24).

directly powered downtown D.C. and that, without it, critical federal infrastructure faced an unacceptable risk of blackout.[13] Before acting on the request, the Department commissioned an analysis from the Oak Ridge National Laboratory that confirmed the threat that the plant's closure would pose to reliability in D.C.[14] Based on that study, and based on the severity of the harm that could result from a prolonged power outage to downtown D.C., the Department issued an order directing the continued operation of the Mirant facility.[15] The Department took pains, however, to limit its order to go no further than necessary to address the emergency. The Department directed Mirant to maintain the facility's capacity to respond when needed, but only ordered it to run when one or both of the 230 kV transmission lines serving downtown D.C. were out of service.[16]

Twelve years later, in 2017, the Department received a request from the Grand River Dam Authority (GRDA), an Oklahoma state agency, to direct the continued operation of Unit No. 1 at the Grand River Energy Center. GRDA explained that the Grand River Energy Center was needed to provide dynamic reactive power support to the local grid, a fact confirmed by the region's Reliability Coordinator, the Southwest Power Pool (SPP). GRDA explained, however, that it would be unable to provide reactive power without action from DOE. Unit No.1, the subject of the request, had been ordered to close by an Administrative Order of the Environmental Protection Agency. Unit No. 2 had been struck by lightning and was under repair.

[13] *Id*. at 2.
[14] *Id*. at 3 – 4.
[15] *Id*. at 5 – 8.
[16] *Id*. at 10 – 11.

And, construction of the new Unit No. 3 had been delayed because flooding in Louisiana interfered with the fabrication of essential project materials.[17] The Department granted GRDA's request, ordering Unit No. 1 to remain in operation for 90 days or until Unit No. 2 or Unit No. 3 were brought online, whichever came first.[18] The Department strictly limited its remedy, directing GRDA only to provide "dynamic reactive power support and not real power generation, and only when called upon by SPP for reliability purposes."[19]

Later that year, the Department received a pair of requests from PJM and Dominion Virginia (Dominion) to direct the continued operation of Units 1 and 2 of the Yorktown Power Station. PJM and Dominion explained that, based on PJM load flow studies, these units were necessary to prevent uncontrolled power disruptions and shedding of critical loads in the North Hampton Roads area east of Richmond.[20] DOE issued an order directing Dominion to maintain operation at the two units, but to dispatch those units "only when called upon by PJM for reliability purposes."[21] DOE later extended the order several times due to the delayed completion of the transmission line needed to resolve the reliability issue. In doing so, DOE cited the "imminent" risk of load-shedding in the North Hampton Roads area absent extension of the order.[22] In its extension order, the Department continued to limit dispatch of

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[17] Letter Request of Grand River Dam Authority, April 11, 2017. Available at https://www.energy.gov/sites/default/files/2017/05/f34/GRDA%20public%20202%28c%29%20letter.pdf.
[18] DOE Order No. 202-17-1 at 2.
[19] *Id*.
[20] DOE Order No. 202-17-2, at 1.
[21] *Id*. at 2.
[22] DOE Order No. 202-17-4, Summary of Findings, Sept. 14, 2017.

the units only when called upon by PJM for reliability purposes and, further, directed PJM and Dominion to exhaust available resources, including demand response and behind-the-meter generation resources, prior to operating the units.[23]

B. Executive Order 14262 and the White House Strategy to Prop Up the Coal Industry.

Over the past several months, the White House and the Department have sought to radically transform how section 202(c) of the Federal Power Act is applied, departing in almost every material respect from the longstanding approach described above. As shown below, the Order cannot be understood intelligibly as a response to a discrete event or emergency akin to past orders under section 202(c). Rather, it can only be understood as part of a long-term and multi-part strategy to preserve coal and other fossil fuel generation under the guise of grid reliability concerns.

On April 8, 2025, President Trump issued Executive Order 14262, *Strengthening the Reliability and Security of the United States Electric Grid*.[24] The Executive Order was issued concurrently with three other executive actions aimed at supporting the coal industry that were announced at a White House political event explicitly focused on that objective.[25] This event, and the related Executive Order, are one of several in a series of public actions by the Administration aimed at reversing coal plant retirements and promoting fossil fuel generation.

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[23] DOE Order No. 202-17-4 at 2.
[24] Executive Order 14262, 90 Fed. Reg. 15521 (April 14, 2025).
[25] New York Times, *Trump Signs Orders Aimed at Reviving a Struggling Coal Industry* (April 8, 2025); Executive Order 14261, *Reinvigorating Americans Beautiful Clean Coal Industry and Amending Executive Order 14241*, 90 Fed. Reg. 15517 (April 14, 2025); Executive Order 14260, *Protecting American Energy from State Overreach*, 90 Fed. Reg. 15513 (April 14, 2025); *Regulatory Relief for Certain Stationary Sources To Promote American Energy*, 90 Fed. Reg. 16777 (April 21, 2025).

Executive Order 14262 directs DOE to, among other things, streamline and expedite the issuance of emergency orders under section 202(c), specifically in order to "safeguard the reliability and security of the United States' electric grid during periods when the relevant grid operator forecasts a temporary interruption of electricity supply [that] is necessary to prevent a complete grid failure."[26] It also directs DOE to take a subsequent series of actions related to national resource adequacy, including mandating:

- the development of a uniform methodology for assessing reserve margins and identifying "at-risk" regions;
- establishment of a process by which the developed methodology and any analysis results are regularly assessed; and,
- establishment of a protocol to identify generation resources within a region that are critical to system reliability, a mechanism under section 202(c) to ensure such generation resources are appropriately retained and, for resources over 50MW, are prevented from leaving the bulk-power system or converting their source of fuel.[27]

DOE has not yet published the analysis or protocols—the deadline provided in Executive Order 14262 is July 7.

Executive Order 14262 states that it is intended to help address the national energy emergency declared in the earlier-issued Executive Order 14,156, *Declaring a National Energy Emergency*.[28] In fact, this order is part of a broader pattern in which the Administration has expansively invoked emergency powers to achieve long-standing political objectives, rather than respond to genuine, unforeseen crises. The

[26] Executive Order 14262 section 3(a).
[27] Executive Order 14262 section 3(b), (c).
[28] Executive Order 14262, section 2.

President has declared eight national emergencies in 2025 alone—more than any other President in the first 100 days of an administration.[29]

C. The Planned Retirement of JH Campbell.

i. Description of J.H. Campbell

J.H. Campbell is a three-unit coal-fired power plant with a total rated net generating capability of approximately 1,450 megawatts (MW).[30] (The Order incorrectly states that J.H. Campbell has a capacity of 1,560 MW). In its current degraded condition, however, J.H. Campbell has a maximum capacity of 920 MW.[31] Part of that difference comes from the fact that Unit 2 is not operational, nor was it operational when the Order was issued. When Unit 2 comes back on-line later this month, the maximum capacity of the facility will be 1,180 MW. J.H. Campbell Unit 1 is 63-years-old and has a rated net generating capability of 261 MW, but now has an effective maximum output of 220 MW.[32] Unit 2 is 58-years-old and has a rated net generating capability of 356 MW. Currently out of service, when Unit 2 comes back online it will have a maximum capacity of 260 MW.[33] Unit 3 is 45 years old and has a rated net generating capability of 843 MW. The current maximum capacity of Unit 3 is 700 MW.[34] Consumers operates the entire J.H. Campbell plant and is the sole

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[29] *See* https://www.brennancenter.org/our-work/research-reports/declared-national-emergencies-under-national-emergencies-act.

[30] Michigan Public Service Commission (MPSC) Case No. U-21585, Direct Testimony of Richard Blumenstock, p. 7, Table 1 (5 Tr 1394-95); see also, https://www.consumersenergy.com/about-us/electric-generation/campbell-complex-retirement, last checked June 11, 2025 (reporting 1,450 MW of capacity).

[31] Conversation between representatives of Consumers and the undersigned counsel, June 12, 2025.

[32] *Id.*

[33] *Id.*

[34] *Id.*

owner of Units 1 and 2. Consumers owns about 93% of Unit 3, the Michigan Public Power Agency owns 4.8% of Unit 3, and Wolverine Power Supply Cooperative owns less than 2% of Unit 3.[35]

J.H. Campbell and Consumers' service territory are located within MISO Local Resource Zone 7. Most of the lower peninsula of Michigan is in MISO Zone 7, except for a small area in the southwest portion of the State, which is in PJM.

ii. State proceeding approving the retirement of J.H. Campbell

In 2021, Consumers proposed to retire J.H. Campbell in 2025 for economic reasons. The MPSC thoroughly reviewed the proposed retirement for a year in an integrated resource plan (IRP) proceeding governed by Michigan statute.[36] No party in the case opposed the retirement of Units 1 and 2; and only a few opposed the retirement of Unit 3.[37] The MPSC ultimately approved Consumers' proposed retirement of J.H. Campbell in a settlement joined by most of the parties to the case. A single party appealed the MPSC's decision to approve the retirement of Unit 3, but the Michigan Court of Appeals affirmed that decision in 2023.[38] Both the MPSC and the appeals court found that Michigan would still have more than enough generating capacity to serve demand after J.H. Campbell retired.[39]

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[35] MPSC Case No. U-21090 (Kapala Direct, 7 Tr 1739); Ex. WPSC-1, p. 19 (Agreement, p. 11), section 2.1, available at https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000001QqldAAC.

[36] MCL 460.6t.

[37] MPSC Case No. U-21090, Order approving contested settlement, June 23, 2022, p. 8.

[38] *Wolverine Power Supply Coop., Inc. v Michigan Public Service Commission (In re Consumers Energy)*, 2023 Mich. App. LEXIS 2045; 2023 WL 2620437 (March 23, 2023).

[39] *Id.*

Michigan's IRP statute requires electric utilities whose rates are regulated by the MPSC to periodically file an integrated resource plan. The IRP is a projection of the utility's load obligations and a plan to meet those obligations.[40] The IRP statute directs the MPSC to approve a plan if the MPSC determines that it "represents the most reasonable and prudent means of meeting the electric utility's energy and capacity needs."[41] To make that decision, the statute instructs the MPSC to consider whether the IRP appropriately balances seven statutory factors: (i) resource adequacy and capacity to serve anticipated peak electric load, applicable planning reserve margin, and local clearing requirement; (ii) compliance with applicable state and federal environmental regulations; (iii) competitive pricing; (iv) reliability; (v) commodity price risks; (vi) diversity of generation supply; and (vii) whether proposed levels of peak load reduction and energy waste reduction are reasonable and cost effective.[42]

The IRP statute also directs the MPSC to establish – among other things – computer modeling scenarios that must be used to analyze the costs of possible plans in an IRP, including costs associated with plant retirement dates.[43] In the modeling used to prepare its 2021 IRP, Consumers determined that it would be most cost-effective to retire the entire J.H. Campbell plant in 2025.[44] Later in the proceeding, Consumers conducted more modeling that compared other possible retirement dates

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[40] MCL 460.6t(3).

[41] MCL 460.6t(8)(a).

[42] *Id.*

[43] MCL 460.6t(1).

[44] MPSC Case No. U-21090 (Blumenstock Direct, 3 Tr 99 and 147-49), available at https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000001OEXnAAO.

to a 2025 retirement and again concluded that the most cost-effective retirement date was 2025.[45] Among other things, parties to the IRP case noted that the 2025 retirement of J.H. Campbell would save ratepayers $150 million in avoidable capital expenditures.[46]

After months of litigation, most of the parties reached a settlement agreement, which Consumers filed with the MPSC on April 20, 2022.[47] The settlement agreement approved the retirement of J.H. Campbell – but it also approved the construction, procurement, and extension of other major generating resources. The net effect of these changes was to substantially increase the total generating resources available to MISO Zone 7.

iii. Effect of Consumers' overall plan on resource adequacy

MISO measures capacity for resource adequacy purposes in zonal resource credits (ZRCs). One ZRC is equal to one MW of deliverable seasonal accredited capacity, which is the net amount of capacity MISO calculates it can reasonably expect from a resource.[48]

Consumers' IRP projected that the entire J.H. Campbell plant would provide 1,346 ZRCs in 2024, its last full year of planned operation.[49] In recognition of the

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[45] *Id*. (Walz Rebuttal, 3 Tr 364-73 & Ex A-123; Blumenstock Rebuttal, 3 Tr 178-79).

[46] MPSC Case No. U-21090, Order approving contested settlement, June 23, 2022, pp. 48, 55.

[47] MPSC Case No. U-21090-0777 (Settlement Agreement), available at https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000002gLkGAAU.

[48] MISO Knowledge Base, KA-01402, available at https://help.misoenergy.org/knowledgebase/article/KA-01402/en-us#:~:text=Zonal%20Resource%20Credits%20(ZRC)%20are,Seasonal%20Accredited%20Capacity%20(SAC); MISO, Resource Adequacy, available at https://www.misoenergy.org/planning/resource-adequacy2/resource-adequacy/#t=10&p=0&s=FileName&sd=desc.

[49] MPSC Case No. U-21090, Order approving contested settlement, June 23, 2022, p. 33.

reduced capacity that would result from the retirement of J.H. Campbell, the settlement authorized Consumers to acquire the Covert gas plant, which Consumers has done.[50] At the time, the Covert plant was in the PJM regional transmission organization – but after acquiring it, Consumers redesignated the Covert plant as part of MISO Zone 7.[51] This action added 1,114 ZRCs to Zone 7 – almost enough by itself to offset the ZRCs removed by the Campbell retirement.[52]

The settlement also authorized Consumers to continue operating Units 3 and 4 of the Karn plant – peaking units that burn natural gas and oil – until 2031, rather than retire them in 2023 as originally planned.[53] This action maintained another 784 ZRCs in Zone 7 beyond what was in Consumers' original plan.[54] The settlement agreement also authorized Consumers to develop or acquire 250 ZRCs of new solar generation by mid-2025, increasing to 852 ZRCs by mid-2028; added 94 ZRCs of demand response and energy waste reduction by mid-2025; and added 71 ZRCs of new battery storage in 2024-2027.[55] The settlement also provided that Consumers would issue a solicitation for power purchase agreements (PPAs) that would provide capacity beginning in 2025/2026, right after J.H. Campbell's retirement.[56] The PPA solicitation would seek up to 500 MW of dispatchable generation, and up to 200 MW of clean energy resources.[57]

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[50] *Id*. at 5.
[51] *Id*. at 91.
[52] *Id*. at 50.
[53] *Id*. at 11.
[54] *Id*.
[55] *Id*. at 23.
[56] *Id*. at 6 – 7. In MISO, the planning year runs from June 1 through May 31.
[57] *Id*.

Overall, the plan approved in the settlement was projected to increase Zone 7's capacity by at least 127 ZRCs by June 2025 – an increase that will grow to at least 923 ZRCs by 2028, not including the 700 MW of additional capacity sought in the PPA solicitations.[58]

iv. MPSC approval of the settlement and affirmance on appeal

Consumers' IRP settlement agreement was supported by most parties in the case, including Consumers, Staff, the Attorney General, consumer advocates, a transmission company, commercial and industrial customers, businesses in the advanced energy sector, environmental groups, and third-party energy developers.[59] The MPSC approved the Settlement Agreement on June 23, 2022.[60] The state commission found that the plan embodied in the settlement "is the most reasonable and prudent means of meeting Consumers' energy and capacity needs."[61]

In reaching these conclusions, the MPSC specifically addressed resource adequacy.[62] After discussing the record evidence regarding the Covert plant, Karn units 3 and 4, new battery storage, and ongoing investments in solar, energy waste reduction, and demand response,[63] the MPSC concluded that "the approval of the settlement agreement will enhance resource adequacy in Zone 7 in both the near-term and long-term."[64] One party, Wolverine Power Supply Cooperative, appealed

[58] *Id.* at 24.
[59] *Id.* at 30 – 31.
[60] *Id.* at 87-93.
[61] *Id.* at 95.
[62] *Id.* at 90-93.
[63] *Id.*
[64] *Id.* at 92.

the MPSC's decision to approve the Campbell plant retirement. The Michigan Court of Appeals affirmed the MPSC. The court specifically addressed resource adequacy, quoted the MPSC's findings about the generating resource additions, and found that the state commission's decision was based on substantial evidence.[65]

v. Subsequent proceedings before the MPSC show that both Consumers' service territory and Michigan as a whole will have sufficient capacity this summer and for years to come

Filings in MPSC proceedings regarding capacity supply and resource adequacy demonstrate that there is no capacity shortfall. To the contrary, the most current available information is that both Consumers and MISO Zone 7 will have sufficient capacity this summer and for years to come. On June 10, 2025, Consumers reported that it now has a surplus of 273 ZRCs for this summer.[66] Consumers further reported that it expects J.H. Campbell will not contribute any ZRCs to the Company's summer position.[67]

Consumers' ZRC projections compare Consumers' available resources not just to projected actual demand but to the planning reserve margin requirement (PRMR). MISO establishes the PRMR as the amount of reserve margin target necessary to meet NERC's Loss of Load Expectation (LOLE) standard of 1 day in 10 years.[68] NERC

[65] *Wolverine Power Supply Coop., Inc. v Michigan Public Service Commission (In re Consumers Energy)*, 2023 Mich. App. LEXIS 2045; 2023 WL 2620437 (March 23, 2023).

[66] *See* Attachment D, Consumers' Responses from June 10, 2025.

[67] *Id*.

[68] MISO Resource Adequacy Business Practices Manual, BPM-011-r31, p. 27, Section 3.4.2 LOLE Analysis; MPSC Case No. U-21775, Capacity Demonstration Results Report, May 12, 2025, p. 9.

defines the LOLE as "the expected number of days per year for which the available generation capacity is insufficient to serve the daily peak demand."[69]

For Michigan as a whole, the MPSC Staff finds in its annual capacity demonstration report that – except for one small municipal utility – all Michigan load serving entities "were able to procure the necessary capacity to demonstrate compliance for the current planning year in all four seasons" in Planning Year 2025-26.[70] The Staff Report also finds that there are more than enough resources in Zone 7 to meet the MISO Local Clearing Requirement (LCR) – which is the minimum amount of resources that must be located within a MISO local resource zone to meet the reliability standard.[71] While Zone 7 did not have enough internal resources to meet its entire PRMR, it is not required to do so under MISO rules, and the zone is able to import 785.5 ZRCs of external resources to meet its PRMR for the current planning year.[72]

Looking ahead, the Staff Report projects that Zone 7 will have more than enough resources to meet both its LCR and the PRMR in each of planning years 2026, 2027, and 2028.[73] Zone 7's LCR surplus will increase each year to reach 4,975 ZRCs by Planning Year 2028, and its PRMR surplus will increase each year to reach 3,428 ZRCs by Planning Year 2028.[74]

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[69] NERC Probabilistic Assessment Technical Guideline, August 2016, p. 2.
[70] MPSC Case No. U-21775, Capacity Demonstration Results Report, May 12, 2025, p. 6.
[71] *Id*. at 16.
[72] *Id*.
[73] *Id*. at p. 26, Appendix C.
[74] *Id*.

vi. MISO approved the retirement of J.H. Campbell after a detailed study process governed by MISO's FERC-approved tariff

More than three years before the Secretary issued Order 202-25-3, MISO determined via a detailed technical study that retirement of J.H. Campbell would not materially impact reliability in MISO. That determination remains in effect.

Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff requires that the owner of a Generation Resource that is planning to suspend operations of all or a portion of that resource must notify MISO at least 26 weeks in advance by submitting a completed Attachment Y Notice.[75] The Tariff states that MISO will perform an Attachment Y Reliability Study to determine whether the Generation Resource is necessary for the reliability of the Transmission System based on analyses described in the Tariff and criteria in the MISO Business Practices Manuals.[76]

On December 14, 2021, Consumers submitted to MISO an Attachment Y notice of intent to suspend J.H. Campbell Units 1, 2, and 3 effective June 1, 2025.[77] After more than a year of study, MISO approved the suspension on March 11, 2022.[78] MISO stated that after reviewing the J.H. Campbell suspension for power system reliability impacts, MISO had determined that "the suspension of Campbell Units 1, 2 & 3 would not result in violations of applicable reliability criteria. Therefore, Campbell Units 1,

[75] MISO Tariff, Section 38.2.7(a)(i).
[76] MISO Tariff, Section 38.2.7(c).
[77] Attachment C (Letter dated December 14, 2021, from Timothy J. Sparks, Consumers Energy, to Andrew Witmeier, MISO, and Attachment Y Notification of Generating Resources Change of Status).
[78] Attachment C (Letter dated March 11, 2022, from Andrew Witmeier, MISO, to Timothy J. Sparks, Consumers Energy, re: Approval of Campbell Units 1, 2 & 3 Attachment Y Suspension Notice).

2 & 3 may suspend without the need for the generators to be designated as a System Support Resource ('SSR') units as defined in the Tariff."[79]

On May 27, 2025, MISO requested that Consumers submit a modified Attachment Y request with a new suspension start date of August 21, 2025, consistent with the date in Order 202-25-3.[80] Consumers submitted the modified Attachment Y notice with the new date on May 28, 2025.[81] On May 30, 2025, MISO notified Consumers that with the modification, "the Attachment Y remains as is, still approved, except with a new/different start date."[82]

D. The Order

On May 23, 2025, the Secretary of Energy issued the Order pursuant to section 202(c) of the Federal Power Act, determining that an emergency exists in the region of the country served by MISO "due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes" and ordering Consumers and MISO to ensure the continued operation of J.H. Campbell for at least 90 days notwithstanding the longstanding plan to retire the facility on May 31, 2025. In issuing the Order, the Department issued a press release that, like Executive

[79] *Id*.
[80] Attachment C (Email dated May 27, 2025, from Huaitao Zhang, MISO, to Kathy Wetzel, Consumers Energy).
[81] Attachment C (Email dated May 28, 2025, from Rachael Moore, Consumers Energy to Huaitao Zhang, MISO).
[82] Attachment C (Email dated May 30, 2025, from Marc Keyser, MISO, to Rachael Moore, Consumers Energy).

Order 14262, states the Order "is in accordance with President Trump's Executive Order: Declaring a National Energy Emergency."[83]

Over four short paragraphs, the Order outlines the "emergency situation" allegedly necessitating invocation of section 202(c) authority. It points primarily to "*potential* tight reserve margins during the summer 2025 period," citing to the North American Electric Reliability Corporation (NERC) 2025 Summer Reliability Assessment, including the statement that MISO is "at elevated risk of operational reserve shortfalls during periods of high demand or low resource output."[84] The Order then describes the retirement of thermal generation capacity including the retirement of approximately 2,700 MW of coal-fired capacity in Michigan since 2020 and the scheduled May 31, 2025, retirement of J.H. Campbell.[85] The Order acknowledges Consumers' acquisition of 1,200 MW of replacement natural gas capacity and MISO's April 2025 conclusion that its auction resulted in "demonstrated sufficient capacity,"[86] but does not reference, let alone consider, the extensive processes that MISO and the MPSC undertook to evaluate and mitigate any reliability or resource adequacy risk that would be caused by the retirement of J.H. Campbell.[87] Nor does the Order describe any actions that MISO or Consumers have taken or could take to mitigate any alleged emergency conditions short of ordering the continued operation of the plant. Rather, it relies almost exclusively on:

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[83] DOE Press Release (May 23, 2025) available at https://www.energy.gov/articles/energy-secretary-issues-emergency-order-secure-grid-reliability-ahead-summer-months.
[84] DOE Order 202-25-3 at 1 (emphasis added).
[85] *Id.* at 1.
[86] *Id.* at 2.
[87] *See* Section II.C *supra*.

- The general statement in NERC's 2025 Summer Reliability Assessment that there is anticipated to be "elevated risk of operating reserve shortfalls"
- Language in MISO's Planning Resource Auction Results for Planning Year 2025-26 that, "for the northern and central zones, which includes Michigan, 'new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources,'" and that the results "reinforce the need to increase capacity" and,
- Language from the MISO Auction Results that the summer months have, relative to other times, the "highest risk and tighter supply-demand balance."[88]

The Order concludes that "additional dispatch of the Campbell Plant," for the 90-day duration of the order and on conditions contained in the order, "is necessary to best meet the emergency and serve the public interest."[89] As a result, the Order mandates that:

- MISO and Consumers Energy take all necessary steps to ensure the Campbell Plant is available for dispatch;[90]
- MISO employ economic dispatch of the plant, and that Consumers comply with all such dispatch orders;[91]
- All operation of J.H. Campbell "must comply with applicable environmental requirements . . . to the maximum extent feasible while operating consistent with the emergency conditions."[92]
- MISO submit reports to DOE on plant operations, environmental impacts, and actions taken to comply with the Order.[93]
- "Relevant governmental authorities" take such action as necessary to enable MISO to effectuate the dispatch and operation of the units.[94]
- Consumers request any necessary revisions or waivers to effectuate the order with FERC.[95]

III. STATEMENT OF ISSUES AND SPECIFICATIONS OF ERROR

[88] DOE Order 202-25-3 at 2.
[89] DOE Order 202-25-3 at 2.
[90] *Id.* at 2 (Ordering Paragraph A).
[91] *Id.* (Ordering Paragraph A).
[92] *Id.* at 3 (Ordering Paragraph C).
[93] *Id.* at 3 (Ordering Paragraph B, D).
[94] *Id.* at 3 (Ordering Paragraph E).
[95] *Id.* at 3 (Ordering Paragraph F).

As explained in Section IV below, the Michigan Department of Attorney General submits the following statement of issues and specifications of error:

1. The Order is contrary to law because it fails to establish the existence of an emergency under section 202(c) or the Department's regulations implementing section 202(c). The statutory text, legislative history, judicial construction and DOE's regulations all confirm that an "emergency" is an occurrence that is sudden, unexpected and requiring immediate action. The Order introduces no facts that would satisfy that definition. 16 U.S.C. § 824a(c); 10 C.F.R. § 205.371; *Richmond Power and Light v. FERC*, 574 F.2d 610, 615 (D.C. Cir. 1978); *Otter Tail Power Co. v. Fed. Power Comm*., 429 F.2d 232, 233-34 (1970).

2. The Order is contrary to law because it exceeds the Department's statutory authority. Abusing a statute meant only for emergencies, the Order intrudes on authority reserved to States and to other federal regulators to regulate resource adequacy. Section 202(c) does not vest DOE with general regulatory authority over resource adequacy, or the authority to decide which power plants may retire except for so long as a true emergency exists. The Department may not "discover in a long-extant statute an unheralded power representing a transformative expansion in its regulatory authority." *W. Virginia v. Env't Prot. Agency*, 597 U.S. 697, 724–25, (2022) (quoting *Util. Air Regul. Grp. v. E.P.A.*, 573 U.S. 302, 324 (2014))(internal quotations omitted).

3. The Order fails to present substantial evidence for its emergency determination and fails to exercise reasoned decision-making by ignoring critical facts and shortcomings in its analysis. Specifically, the Order: (i) presents a discussion of the NERC 2025 Summer Reliability Assessment that is unreasoned, incomplete, and that fails to substantiate the existence of an emergency; (ii) the Order's apparent reliance on generator retirements in Michigan as evidence of an emergency is unreasonable; (iii) the Order acknowledges that the most recent MISO auction "demonstrated sufficient capacity" but fails to explain why an emergency exists nonetheless, (iv) the Order fails even to acknowledge that MISO approved the retirement of J.H. Campbell through the study process governed by its FERC-approved tariff; (v) the Order makes no effort to review the proceedings before the MPSC, or to note any consultation with Michigan officials as required by 42 U.S.C. § 7113; (vi) the Order fails to provide any specific evidence or reasoning why J.H. Campbell must remain in operation and why alternative measures are inadequate. *E.g. Emera Maine v. FERC*, 854 F.3d 9, 22 (D.C. Cir. 2017) (order under the Federal Power Act must reflect "a principled and reasoned decision supported by the evidentiary record" (quotation marks omitted)); *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (agency must examine the relevant data and articulate a satisfactory

explanation for its action including a rational connection between the facts found and the choice made); *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962) (an "agency must make findings that support its decision, and those findings must be supported by substantial evidence").

4. The Order is arbitrary and capricious and contrary to law because section 202(c) provides no authority for the Department to command a generator to engage in "economic dispatch." 16 U.S.C. § 824a(c); *Michigan v. EPA*, 268 F.3d 1075, 1081 (D.C. Cir. 2001) (absent statutory authorization, an agency's "action is plainly contrary to law and cannot stand").

5. The Order is arbitrary and capricious and contrary to law because the Department failed to limit its remedy as required by section 202(c)(2). The Order adheres to neither the temporal constraint nor the environmental constraints imposed by section 202(c)(2). 16 U.S.C. § 824a(c)(2).

6. The Order violates the National Environmental Policy Act because it fails to assess the environmental consequences of a major federal action significantly affecting the human environment. 42 U.S.C. § 4321; *et seq*.

IV. REQUEST FOR REHEARING

A. The Department Has Failed to Establish the Existence of an Emergency under Section 202(c) or the Department's Regulations Implementing Section 202(c).

i. Congress limited DOE's authority under section 202(c) to the unique circumstances of war or emergency

Section 202(c) confers an extraordinary power. Enacted in 1935, section 202(c) empowered the Federal Power Commission to command action from market participants and – crucially – to do so freed from most of the core procedural safeguards, jurisdictional boundaries, and substantive limitations that undergird the rest of the Federal Power Act. While the rest of the Act authorizes Commission action

only after opportunity for hearing,[96] section 202(c) allows the Commission (now the Department) to act on its own motion and without prior notice. And in profound contrast to the rest the Federal Power Act and general utility law principles,[97] section 202(c) empowers the Department to require utilities to incur costs – through a command to provide generation or transmission service – without first considering the impact to ratepayers or whether the resulting rates will be just and reasonable.

It comes as no surprise, therefore, that when Congress granted the Commission this extraordinary power, Congress restricted its use to extraordinary circumstances. Section 202(c) authorizes action only "[d]uring the continuance of any war in which the United States is engaged, or whenever the Commission determines that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy, or of fuel or water for generating facilities, or other causes." The Act permits some measure of flexibility with respect to what type of events may cause the emergency, allowing for "other causes" beyond those enumerated. But the Act is clear that any such event, including a "shortage of electric energy," must be one that constitutes an "emergency."

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[96] *See e.g.*, 16 U.S.C. §§ 824a(b), 824a(e), 824a-1(a), 824a-3(f), 824a-4, 824b(a)(4), 824c(b), 824d, 824e, 824f, 824i(b), 824j, 824j-1, 824k, 824m, 824o & 824p.

[97] Two cornerstones of the law of regulated utilities are the filed rate doctrine and the rule against retroactive ratemaking. As FERC has explained, "a central purpose of the filed rate doctrine and the rule against retroactive ratemaking is to protect ratepayers from being subjected to an additional surcharge above the rate on file for service already performed." *Old Dominion Elec. Coop.*, 154 FERC ¶ 61,155 (2016). In its June 6, 2025, complaint filed in FERC Docket No. EL25-90, Consumers asserts that the filed rate doctrine and the rule against retroactive ratemaking are inapplicable in the context of an order under section 202(c).

Because the Act does not define "emergency," the Department must look first to the public meaning of that word at the time of enactment. Webster's New International Dictionary of the English Language (1930) defined "emergency" as a "sudden or unexpected appearance or occurrence . . . . An unforeseen occurrence or combination of circumstances which calls for immediate action or remedy; pressing necessity; exigency." Contemporary dictionaries likewise define "emergency" to refer to a circumstance that is "unexpectedly arising, and urgently demanding immediate attention."[98]

These definitions accord with the legislative history of the Federal Power Act, which characterized section 202(c) as an authority to be used in response to "crises":

> This is a temporary power designed to avoid a repetition of the conditions during the last war, when a serious power shortage arose. Drought and other natural emergencies have created similar crises in certain sections of the country; such conditions should find a federal agency ready to do all that can be done in order to prevent a break-down in electric supply.[99]

The few courts that have had occasion to opine on the meaning of "emergency" in section 202(c) have likewise emphasized that the provision applies in very limited circumstances, and not as a tool to address longer-term, structural concerns. In *Richmond Power and Light v. FERC*, the D.C. Circuit upheld the Commission's judgment that the dependence on foreign oil occasioned by the 1973 oil embargo was

[98] *See Acuity Ins. Co. v. McDonald's Towing & Rescue, Inc.,* 747 F. App'x 377, 380–81 (6th Cir. 2018) (addressing a statute that leaves "emergency" undefined and quoting 7 Oxford English Dictionary 231 (2012) among others to supply a definition).
[99] S. Rep. No. 74-621 at 49 (1935).

not an "emergency" under the Act, noting that section 202(c) "speaks of 'temporary' emergencies, epitomized by wartime disturbances."[100]

In *Otter Tail Power Co. v. Fed. Power Comm'n,* the U.S. Court of Appeals for the Eighth Circuit described section 202(c) as enabling the Commission to "react to a war or natural disaster." The court also distinguished section 202(c) from section 202(b), under which the Commission may also order interconnections, but only after a hearing. The court explained that, in contrast to section 202(c), which "enables the Commission to proceed without notice or hearing" to address immediate crises, section 202(b) "applies to a crisis which is likely to develop in the foreseeable future but which does not necessitate immediate action on the part of the Commission."[101]

Through its regulations, the Department has also interpreted "emergency" for purposes of section 202(c) to mean circumstances that arise suddenly and unexpectedly:

> "Emergency," as used herein, is defined as an unexpected inadequate supply of electric energy which may result from the unexpected outage or breakdown of facilities for the generation, transmission or distribution of electric power. Such events may be the result of weather conditions, acts of God, or unforeseen occurrences not reasonably within the power of the affected "entity" to prevent. An emergency also can result from a sudden increase in customer demand, an inability to obtain adequate amounts of the necessary fuels to generate electricity, or a regulatory action which prohibits the use of certain electric power supply facilities.[102]

In summary, the plain meaning of the statutory text, its legislative history, judicial construction, and the Department's own regulations all establish that an

[100] 574 F.2d 610, 615 (D.C. Cir. 1978).
[101] 429 F.2d 232, 234 (8th Cir. 1970).
[102] 10 C.F.R. § 205.371.

"emergency," including one occasioned by a "shortage of electric energy," must be sudden, unexpected, and demanding of "immediate action."

ii. The Order fails to present facts establishing an emergency under section 202(c) or the Department's regulations

Even taken as complete and accurate claims (which they are not), the factual assertions made in the Order fail to describe an "emergency." The Order does not claim that the retirement of J.H. Campbell was sudden or unexpected. Nor could it. The retirement of J.H. Campbell was carefully planned over a period of years and was approved by the MPSC through a public proceeding. Further, Consumers' plan to retire J.H. Campbell included a commitment to procure replacement resources that improved its capacity position. And Consumers' proposal to retire J.H. Campbell was approved in advance by MISO after a thorough review of its impact on reliability.

Nor did the publication of NERC's 2025 Summer Reliability Assessment in May 2025 transform a long-planned retirement into an event with sudden or unexpected implications requiring immediate action. The Order notes that the 2025 NERC Summer Reliability Assessment characterizes MISO as being at an "elevated risk of operating reserve shortfalls." But NERC's "elevated risk" designation in no way signifies an emergency condition. "Elevated risk," it should be emphasized, falls *below* NERC's highest risk designation: that of "high" risk.[103] NERC's decision not to place MISO in the highest risk category in its Summer Reliability Assessment is

[103] The "High" risk designation refers to a risk of shortfall during normal peak conditions, whereas the "Elevated" risk designation refers to a risk of shortfall during above-normal peak conditions. See Attachment A, NERC, 2025 Summer Reliability Assessment at 6.

in itself powerful evidence that there is no "emergency" stemming from a lack of operating reserves.

The "elevated risk" designation is also far from unusual. In the same report, NERC also designated the systems overseen by SPP, the Electric Reliability Council of Texas (ERCOT), and the New England Independent System Operator (ISO-NE) as at "elevated risk."[104] Except for 2022, when it was designated as "high" risk, MISO has been designated as "elevated" risk in every NERC Summer Reliability Assessment since NERC initiated the practice of designating regions as "high," elevated," or "normal" risk in 2021.[105] NERC has also designated MISO as "elevated" risk in every Winter Reliability Assessment since 2021.[106] In effect, what the Order implies through its reliance on the NERC report's "elevated" risk designation, is that the fifteen states of MISO – along with large swaths in the rest of the United States – have been in an uninterrupted state of emergency for many years on end. This interpretation, if credited, would effectively read the word "emergency" out of section 202(c).

The Order's hand-waving reference to "potential tight reserve margins" identified in the 2025 NERC Summer Reliability Assessment likewise fails to describe an emergency. The very fact that the Order attempts to rely on "potential" future conditions itself contradicts the notion that MISO is presently facing an

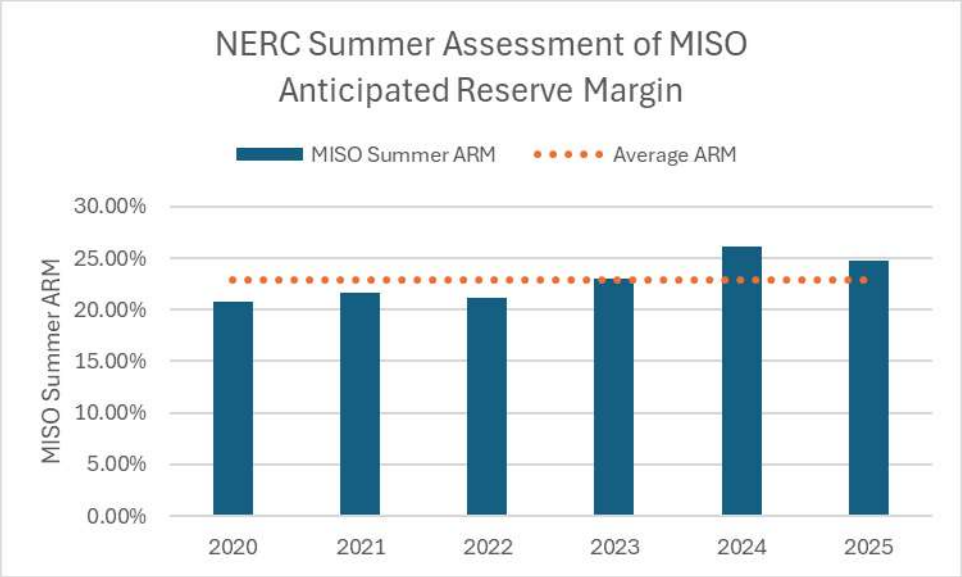
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[104] *Id*.

[105] *See* NERC Summer Reliability Assessments years 2021 – 2025, available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.

[106] *See* NERC Winter Reliability Assessments years 2021 – 2025, available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.

emergency as conceived under section 202(c). Moreover, the actual reserve margins in MISO this summer do not support an emergency determination. The NERC report calculated MISO's anticipated reserve margin for Summer 2025 as 24.7%.[107] This figure substantially exceeds NERC's "Reference Margin Level" for MISO of 15.7%,[108] which is the level that NERC has "established for the areas to meet resource adequacy criteria."[109] MISO's anticipated reserve margin of 24.7% is also *higher* than its average of recent years. The chart below shows the anticipated reserve margin for MISO as calculated in the NERC Summer Reliability Assessment for each year.[110] The chart shows that the 2025 anticipated reserve margin of 24.7% exceeds the 2020-2025 average of 22.9%. Again, the Order has failed to describe a circumstance that is "unexpected," "sudden" or "demanding of immediate attention."



[107] Attachment A, NERC, 2025 Summer Reliability Assessment at 10.
[108] *Id*. at 44.
[109] *Id*. at 15.
[110] *See* NERC Summer Reliability Assessments years 2020 – 2025, available at https://www.nerc.com/pa/RAPA/ra/Pages/default.aspx.

The other factual assertions in the Order likewise fail to describe an emergency. The Order devotes one of its few substantive paragraphs to explaining that various generation units have retired in Michigan, reaching back as far as 1997.[111] But generation units retire everywhere as part of the normal, continuous cycle through which old units are replaced with new ones. The unsurprising fact that generation units have retired in Michigan over the last 28 years says nothing about whether there is presently adequate generation in the State, and even less about whether an emergency exists in the region as a whole.

The Order then points to the results of the April 2025 MISO Planning Resource Auction. But these results explicitly contradict the claim that an emergency exists in MISO. The Order acknowledges MISO's conclusion that the auction "demonstrated sufficient capacity." In fact, the Order truncates this quote, which stated in full that: "The 2025 PRA demonstrated sufficient capacity at the regional, subregional and zonal levels, with the summer price reflecting the highest risk and a tighter supply-demand balance."[112] Remarkably, the Order attempts to brush aside the obvious import of this conclusion, preferring instead to focus on the second half of the sentence. But the second half of that sentence merely refers to the fact that the summer price for capacity in MISO, which separates the auction results by season, is high*er* and has a tight*er* supply/demand balance than those of the fall, winter and spring seasons (a fact illustrated by the chart below the header text).

[111] Order at 1.
[112] Attachment B, MISO, Planning Resource Auction, Results for Planning Year 2025 – 2026 (April 2025) at 12.

This sentence does not indicate any kind of shortfall in the summer season, much less an emergency shortfall.

The Order also quotes from a slide that states "for North/Central, new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources."[113] But this slide is simply noting that the total capacity of resources *offered* into the 2025 auction in the North/Central region was lower than what was offered into the 2024 auction. This slide does not say that the total amount of capacity *procured* in the North/Central region through the auction was inadequate. In other words, this slide is in no way inconsistent with the conclusion in the same report that the "2025 PRA demonstrated sufficient capacity at the regional, subregional and zonal levels."[114] Further, even as a characterization of the total capacity offered into the auction, the Order ignored a crucial fact in this slide. The slide shows that the reason for the decrease in capacity offered was not because of a decrease in physical generating capacity, but because of a change in the capacity accreditation of various resources—most notably, the very "dispatchable generation" that the order prioritizes. This change in MISO's capacity accreditation methodology occurred over the previous year.[115] The bar chart in Attachment B shows a reduction in accredited capacity for gas and coal of 3.4 GW, which is greater than the overall reduction in offered

[113] *Id*. at 13.
[114] *Id*. at 12.
[115] *Midcontinent Independent System Operator, Inc*., 189 FERC ¶ 61,065 (Oct. 25, 2024).

capacity.[116] In other words, MISO concluded that coal (and gas) resources, such as J.H. Campbell, should be deemed to contribute less to capacity requirements than it had previously assumed.

B. Abusing an Authority Meant for True Emergencies, the Order Intrudes on Authority Reserved to States and to Other Federal Regulators.

i. Resource adequacy is regulated by the states, and by FERC under other provisions of the Federal Power Act

Resource adequacy refers to the capacity of an electric power system to meet demand reliably at all times, including during system peaks and through potential outages. Resource adequacy is "measured at the system level to capture the overall impact of outages of individual components including generators and transmission."[117] Resource adequacy planning is the process by which utilities and system operators, under regulatory supervision, ensure resource adequacy. Resource adequacy planning involves technical and economic considerations that go into determining what resources are added to the grid and which resources should retire and when.

With respect to regulatory oversight for resource adequacy, section 201 of the FPA, 16 U.S.C. § 824(b)(1), reserves authority over generation facilities to the states. It states in pertinent part: "The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, *but shall not have jurisdiction*, except as specifically provided in this subchapter and subchapter III of this chapter, *over*

[116] Attachment B, MISO, Planning Resource Auction, Results for Planning Year 2025 – 2026 (April 2025) at 13.
[117] NREL, Resource Adequacy Basics, available at https://www.nrel.gov/research/resource-adequacy.

facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter."[118]

Some states have retained this authority over resource adequacy in its entirety.[119] Others have directed their utilities to join RTO/ISOs that, through their tariffs, impose resource adequacy requirements. Those RTO/ISOs also generally establish markets that allow market participants to buy and sell capacity and thereby to facilitate market entry and exit decisions based on price signals. Resource adequacy requirements in RTO/ISO tariffs have been held to be practices affecting wholesale rates subject to the jurisdiction of FERC under sections 205 and 206 of the Federal Power Act, 16 U.S.C. §§ 824d & 824e.[120]

In Michigan, the regulation of resource adequacy planning has both a state and federal aspect. As a member of MISO, Consumers has a capacity obligation under the MISO tariff. MISO's resource adequacy requirements, however, are designed to be complementary to the primary role of the states in ensuring resource adequacy.[121]

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[118] *Id*. (emphasis added).

[119] *See Devon Power LLC et al.,* 109 FERC ¶ 61,154, P 47 (2004) ("Resource adequacy is a matter that has traditionally rested with the states, and it should continue to rest there. States have traditionally designated the entities that are responsible for procuring adequate capacity to serve loads within their respective jurisdictions.").

[120] *See Conn. Dep't of Pub. Util. Control v. FERC*, 569 F.3d 477, 483 (D.C. Cir. 2009).

[121] *Midcontinent Indep. Sys. Operator, Inc.*, 170 FERC ¶ 61,215, 62,606 at P 13 (2020) ("approximately 90% of the load in MISO is served by vertically integrated LSEs, the vast majority of which are subject to state integrated resource planning processes. To accommodate the make-up of the MISO's footprint, MISO's proposed Tariff provisions accepted in the February 2018 Order provide that its resource adequacy requirements "are complementary to the reliability mechanisms of the states and the Regional Entities ... within the [MISO] region."); *see also id*. ("MISO's proposed Tariff language

Consumers' investment decisions are regulated by the MPSC. Through the state IRP process (described in Section II.C above), the MPSC exercises regulatory authority over Consumers in order to ensure that the utility obtains the amount of capacity it needs to meet its obligations under the MISO tariff, and that it does so at the best value to ratepayers, and with a composition of resources that otherwise complies with state law, including state environmental requirements.

ii. Section 202(c) does not vest DOE with general regulatory authority over resource adequacy

The Order indicates that the Department believes it has the authority to decide which power plants may retire and when, not based on the kind of real emergency that has justified past action, but rather based on its own policy preferences. The Department appears to want to place its own judgment about operating reserve margins ahead of MISO's, and its own preference for which resources are employed to maintain resource adequacy ahead of Michigan's. In effect, the Department appears to read section 202(c) so as to give itself authority to regulate resource adequacy. Any ambiguity on this point was put to rest by the Department's June 13 letter referring cost recovery issues for J.H. Campbell to FERC. In that letter, the Department, through counsel, acknowledged that resource adequacy concerns

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explains that the resource adequacy requirements 'are not intended to and shall not in any way affect state actions over entities under the states' jurisdiction.' In other words, unlike the centralized capacity constructs used in the Eastern RTOs/ISOs, MISO's Auction is not—*and has never been*—the primary mechanism for its [Load Serving Entities] to procure capacity."); *Midwest Indep. Transmission Sys. Operator, Inc.*, 119 FERC ¶ 61,311, 62,722 at P 75 (2007) ("From the beginning . . . the Commission has recognized the role that state resource planning plays in managing the resource adequacy of [MISO]").

motivated the Order and went so far as to purport to dictate whether J.H. Campbell would be counted as a capacity resource pursuant to the MISO tariff.[122]

Section 202(c) does not provide the Department with the authority it claims. Had Congress intended to vest regulatory authority over resource adequacy in section 202(c), – displacing both state law and sections 205 and 206 of the Federal Power Act, – it would have stated so clearly. But of course it did not. The authorizing language says no more than that DOE may "require by order . . . such generation . . . of electric energy as in its judgment will best meet the emergency and serve the public interest." Indeed, it defies logic that, had Congress intended to empower DOE to be the general decider of which power plants may retire across every utility and independent power producer across the entire country – a function with profound implications for rates, state sovereignty, and a broad array of other stakeholder interests – that Congress would have done so through what may be the only provision in the Federal Power Act that empowers the regulator to act without first assessing the effect on ratepayers or seeking public input, and one of the only provisions that extends to otherwise non-jurisdictional utilities such as public power entities and those in ERCOT.

But even if the text of section 202(c) could, theoretically, be stretched to such an expansive reading (which it cannot), the United States Supreme Court has emphatically rejected statutory interpretations whereby an agency "claim[s] to discover in a long-extant statute an unheralded power representing a transformative

[122] FERC Docket No. EL25-90, submission of Dep't of Energy, June 13, 2025 ("Because the May 23, 2025 Order is predicated on the shortage of facilities for the generation of electric energy and other causes, such as resource adequacy concerns, the Campbell plant shall not be counted as a capacity resource.").

expansion in its regulatory authority."[123] That is exactly what the Department seeks to do here. It seeks to discover in a 90-year-old statute a basis to exercise much broader regulatory authority than it ever has in the past. While it is true, as we explain above in section II.A, that the Department has used section 202(c) to delay power plant retirements on three occasions over the 90-year history, it has always done so at the request of a system operator or governmental body and in a manner narrowly tailored to prevent a concrete and particularized emergency. It has never done so simply to impose its policy preferences ahead of the judgment of those bodies responsible for resource adequacy.

C. The Order Fails to Present Substantial Evidence for its Emergency Determination and Fails to Exercise Reasoned Decision-making by Ignoring Critical Facts.

The Order relies on three sources of evidence for its emergency determination: the NERC 2025 Summer Reliability Assessment, generator retirements in Michigan, and the results of MISO's 2025 Planning Resource Auction. None of these three sources provide evidence that an emergency exists. By relying on these sources, and by misconstruing each of them, the Order fails to exercise reasoned decision-making.

The Order also entirely ignores several other critical facts and considerations. The Order ignores the fact that MISO approved the deactivation of J.H. Campbell. The Order ignores the conclusions of the MPSC proceeding that approved the retirement of J.H. Campbell. And even if it were correct that a capacity shortfall

[123] *W. Virginia v. Env't Prot. Agency*, 597 U.S. 697, 724–25, (2022) (quoting *Util. Air Regul. Grp. v. E.P.A.*, 573 U.S. 302, 324 (2014))(internal quotations omitted).

exists in MISO, the Order fails to explain why preventing the retirement of J.H. Campbell through an emergency measure is necessary to address the shortfall.

i. The Order's discussion of the NERC 2025 Summer Reliability Assessment is unreasoned and incomplete

As explained above in Section IV.A, the Order's discussion of the NERC 2025 Summer Reliability Assessment is both incomplete and unreasoned. Specifically, the Order fails to explain (i) why the NERC report supports an emergency finding for MISO given that NERC did not put MISO in the "high" risk category, (ii) why NERC's designation of MISO as at "elevated" risk provides evidence of a "sudden" or "unexpected" circumstance given that MISO has been at this risk level or higher for years running, and (iii) why the "potential tight reserve margins" identified in the NERC report constitute an emergency given that MISO well exceeds the NERC reference margin level and even exceeds its own average Summer anticipated reserve margin over the 2020 – 2025 period.

ii. The Order's apparent reliance on generator retirements in Michigan is unreasonable

The Order attempts to support its emergency finding by recounting the fact that various power plants have retired in the state of Michigan.[124] As explained above, because power plant retirements are a regular occurrence in the electric power sector, the Order's discussion of this topic fails to present even *prima facie* evidence of an emergency. It also fails to exhibit reasoned decision-making in two key respects. First, it is unreasonable to point to capacity retirements in isolation

[124] Order at 1.

without also considering all the other factors that contribute to resource adequacy. Such factors include capacity additions, changes in load, load shape and load flexibility, demand response, transmission access to external resources, etc. Of course, MISO *did* consider all those factors in the modeling that went into the Attachment Y process through which it approved the deactivation of J.H. Campbell.[125]

Second, the Order fails to explain how power plant retirements in Michigan are related to the emergency the Department purports to identify. In past orders where the Department has used section 202(c) to delay a power plant's retirement, the Department has acted on application of a utility or system operator to address a discrete, localized emergency that would be caused by the impending retirement.[126] The Department makes no such claim to geographic specificity here. Rather, the remainder of the "Emergency Situation" section of the Order appears to describe a purported emergency throughout MISO, insofar as it relies on NERC's general statements about MISO reserve margins and the results of the MISO Planning Resource Auction. Thus, the Order fails to explain why it is relying on power plant retirements in a single state—Michigan—to support its claim that an emergency exists in the region as a whole.

iii. The Order acknowledges that the most recent MISO auction "demonstrated sufficient capacity" but fails to explain why an emergency exists nonetheless

[125] *See* MISO Transmission Planning Business Practices Manual, BPM-020-r32 Section 6.2 (Generator Retirement and Suspension Studies and System Support Resources), Section 6.2.3 (Study Scope Development).
[126] *See* Section II.A *supra*.

As explained in Section IV.A above, the Order cites to the MISO planning reserve auction report while ignoring the statement in that report that: "The 2025 PRA demonstrated sufficient capacity at the regional, subregional and zonal levels." It is entirely unreasonable for the Department to cite this report as evidence of an emergency when the report has concluded exactly the opposite. The Order's effort to focus on other aspects of the report are equally unreasonable. The unremarkable statement that summer prices are higher than prices in other seasons and therefore reflect a tighter supply/demand balance falls far short of providing evidence for an emergency. Likewise, the Order's reliance on the fact that less capacity was *offered* in the 2025 auction than was offered into the 2024 auction hardly describes an emergency. Further, the Order fails to note the information conveyed in the slide it quotes from, which shows that the only material change between 2024 and 2025 was a result in a change in capacity accreditation values rather than a change in physical resources available.

iv. The Order fails to acknowledge that MISO approved the retirement of J.H. Campbell

As explained in Section II.C above, after a robust, technical, and considered process, MISO approved the retirement of the three J.H. Campbell units pursuant to the study process governed by its tariff. MISO concluded that "the suspension of Campbell Units 1, 2 & 3 would not result in violations of applicable reliability criteria." As the system operator, MISO has more in-depth knowledge of its system than the Department does. The Department should have explained why it reached a

different conclusion than MISO. Instead, the Order failed even to mention that MISO conducted this study and approved the retirement.

v. The Order makes no effort to review the findings of the MPSC or to demonstrate consultation with Michigan as required by 42 U.S.C. § 7113

The Order acknowledges that Consumers acquired the Covert gas plant, but in all other respects fails to acknowledge the MPSC proceeding that approved Consumers' IRP settlement entailing retirement of J.H. Campbell. As explained above in Section II.C, acquiring the Covert gas plant was not the only action Consumers took as part of that IRP. The IRP also delayed the retirement of the peaking units at the Karn facility and included the acquisition of other new resources, with the result that Consumers' capacity position was set to improve materially even after the retirement of J.H. Campbell. The Order also ignores the Michigan capacity demonstration proceedings that found both Consumers and MISO Zone 7 have sufficient capacity resources in 2025 and in the years to come.

Section 103 of the Department of Energy Organization Act, 42 U.S.C. § 7113, provides:

> Whenever any proposed action by the Department conflicts with the energy plan of any State, the Department shall give due consideration to the needs of such State, and where practicable, shall attempt to resolve such conflict through consultations with appropriate State officials.

The Order plainly conflicts with Michigan's energy plan, as reflected in the MPSC's approval of Consumers' IRP. Equally clearly, the Order does not give "due consideration" to the needs of Michigan. Nor does it appear that the Department

made any attempt to resolve the conflict it created through consultation with the appropriate State officials. The Department, therefore, has failed to comply with Section 103 of the Department of Energy Organization Act. A practical consequence of the Department's apparent failure to consult with the State is that the Order lacks basic information related to its action, including the Order's inexplicable failure to accurately state the capacity of J.H. Campbell, the lack of awareness as to the operational status of Unit 2, the understatement of resources Consumers acquired to replace J.H. Campbell, and the omission of any reference to the reliability analysis undertaken by the State.

vi. The Order fails to provide any specific evidence or reasoning why J.H. Campbell must remain in operation and why alternative measures are inadequate

Even accepting the Order's contention that there exists a capacity shortfall in MISO, it does not follow that commanding the continued operation of J.H. Campbell is the best or even an appropriate means of alleviating the shortfall. The Order does not assert that there is a local problem on the grid that only J.H. Campbell can solve. In this respect, the Order departs markedly from past uses of section 202(c) and from the Department's regulations implementing section 202(c), which state that: "Actions under this authority are envisioned as meeting a specific inadequate power supply situation."[127]

Rather, the emergency that the Order purports to identify – "potential tight reserve margins" – is one that spans the entire fifteen-state MISO region and one

[127] 10 C.F.R. § 205.371.

that could presumably be addressed by any number of actions across MISO. And, given that J.H. Campbell amounts to well less than 1% of generation capacity in MISO, there likely were options available that would have had a much greater impact on the overall balance of supply and demand. Further, because J.H. Campbell is an over 60-year-old facility in a largely degraded operational state, there presumably were alternative actions available that could have met the purported need with higher levels of reliability.

Yet the Order does not acknowledge any alternatives or explain whether less burdensome measures were exhausted before taking this action. The question of whether alternative measures could have been used to address the "emergency" is made more challenging by the fact that the Order never quantifies the extent of the emergency it purports to identify within MISO. But that omission merely highlights rather than excuses the deficiencies of the Order.

One possible alternative may have been demand-side measures. The Department's regulations require applicants seeking an order under section 202(c) to provide a "description of any conservation or load reduction actions that have been implemented . . . [and a] discussion of the achieved or expected results."[128] In the Yorktown case, the Department required Dominion to exhaust all demand response measures before dispatching the facility.[129] And yet here the Department failed to make any inquiry or even to consider whether demand-side measures could have

[128] 10 C.F.R. § 205.373.
[129] *See* DOE Order No. 202-17-4 (Sept. 14, 2017) ("PJM and Dominion shall exhaust all reasonably and practically available resources, including demand response and behind-the-meter generation resources, prior to operating Yorktown Unit 1 or Yorktown Unit 2.")

addressed the purported emergency. Similarly, the Department's regulations require applicants to describe their efforts made to obtain additional power through third parties.[130] But again, the Department failed to consider whether MISO could alleviate the purported emergency through access to external resources.

D. The Department's Direction that MISO Operate J.H. Campbell Using "Economic" Dispatch Is Inconsistent with its Authority under Section 202(c).

The Department's Order directs MISO to "take every step to employ economic dispatch of the Campbell Plant."[131] The Order indicates that the use of economic dispatch is intended to "minimize cost to ratepayers."[132] However, this mandate to MISO exceeds the authority provided by section 202(c). Nor is the use of economic dispatch likely to serve the public interest.

The Order does not define "economic dispatch" or specify how it intends MISO to dispatch the units. In the Energy Policy Act of 2005, Congress adopted a definition of "economic dispatch" that generally conforms to accepted use: "the operation of generation facilities to produce energy at the lowest cost to reliably serve consumers, recognizing any operational limits of generation and transmission facilities."[133] Drawing on this statutory definition, FERC issued a 2006 report, *Security Constrained Economic Dispatch: Definitions, Practices, Issues, and Recommendations,* that provides a useful explanation of the 2-step process that

[130] 10 C.F.R. § 205.373(h).
[131] Order at 2 (Ordering Paragraph A)
[132] *Id.*
[133] *See* section 1234(b) of the Energy Policy Act of 2005, 42 U.S.C. § 16432(b);

regions have, in practice, adopted to implement economic dispatch.[134] This process includes (1) *day ahead unit commitment*, in which grid operators commit generators to be online in the subsequent 24-hour period, determined based on which generators will be most economic, taking into account each unit's physical operating characteristics, and (2) *unit dispatch*, in which grid operators dispatch committed resources at specified levels, in real-time, determined based on what set of units will minimize total system costs, given actual load, generation, and transmission conditions and constraints.[135]

Section 202(c) authorizes DOE to direct certain actions during emergency conditions. As relevant here, section 202(c)(1) provides DOE with "authority . . . to require by order . . . such generation . . . of electric energy as in its judgment will *best meet the emergency* and serve the public interest." In other words, DOE's power extends only to ordering actions that meet the emergency that the Department has identified.

But economic dispatch is not a rational response to the types of emergencies that section 202(c) authorizes DOE to address. Nor would economic dispatch be a rational approach to addressing the circumstance that DOE is purporting to address with its order—a potential capacity shortfall—if that were within its authority under section 202(c). In fact, DOE has made no effort to explain why economic dispatch is a rational remedy here, — let alone the best means of meeting the "emergency" that it

[134] FERC, *Security Constrained Economic Dispatch: Definitions, Practices, Issues, and Recommendations* (July 31, 2006), https://www.ferc.gov/sites/default/files/2020-05/final-cong-rpt.pdf.
[135] *Id.* at 5-6.

has identified. And, unlike prior Orders, here DOE acted on its own motion without a request or input of MISO and so cannot rely on the expertise of the cognizant grid operator or operating utility requesting a specific remedy to justify the appropriateness of economic dispatch.[136]

i. Economic dispatch is not a rational response to a shortage of electric energy

Economic dispatch is the standard procedure by which operators (such as MISO) operate the grid. However, outside of normal operations, including during emergency conditions, generation units may be selected "out of merit order" as necessary to ensure that generation and load are balanced. Operating a unit pursuant to economic dispatch is, necessarily, inconsistent with operating the unit in a manner designed to address an emergency, such as a shortage of electric energy. If a unit would be dispatched under purely economic conditions, but electric demand can alternatively be met with other existing supply (or demand response) resources, that unit is *not* necessary to meet the emergency. However, if the unit would, in fact, be needed to address a shortage, it should be dispatched regardless of whether its offer price is above or below the market-clearing price. In other words, economic dispatch is not a dispatch rule that is reasonably tailored to ensure that the unit addresses a shortage of electric energy.

[136] *See* DOE Order No. 202-18-1 at 4 (The statute requires only that the Secretary use his or her best judgment to meet the emergency and serve the public interest. In this situation, the expertise of the applicant was an important factor. The Department received an application from PJM, which . . . holds the highest-level, federally-regulated reliability responsibilities for the system it manages.), https://www.energy.gov/sites/prod/files/2017/11/f46/Summary%20of%20Findings%20Order%20No.%202-18-1.pdf.

Prior DOE orders have contained significant operating constraints to satisfy this statutory requirement. Orders have specified that units subject to a section 202(c) order should only run in specific emergency alert conditions — specific conditions in which grid operators have exhausted the capacity of other available generators, imports, and voluntary demand response, and failure to call on additional generation will risk involuntary load shed.[137] Similarly, in its order to delay retirement of the Yorktown plant, DOE recognized that dispatch of the units must be constrained, that continued operation of the units under the standard methodologies used by the local utility (Dominion Energy Virginia) and grid operator (PJM) would not be appropriate, and that Dominion and PJM must exhaust available resources, including demand response and behind-the-meter generation resources, prior to operating Yorktown Units 1 or 2.[138] Similarly, in the case of its 2005 District of Columbia Department of Public Service order, the Department directed Mirant to maintain its facility's capacity to respond when needed, but only ordered it to run when one or both of the 230 kV transmission lines serving downtown D.C. were out of service.[139] And in its 2017 order regarding GRDA's Grand River Energy Center

[137] DOE Order No. 202-21-1 (authorizing operation only during Energy Emergency Alert Level 2 or Level 3); DOE Order No. 202-21-2 (authorizing operation only during Energy Emergency Alert Level 2 or higher); DOE Order 202-22-1 (same); DOE Order No. 202-22-3 (same); DOE Order No. 202-22-4 (same).

[138] DOE Order No. 202-17-2 (providing that Yorktown units 1 and 2 may be dispatched "only when called upon to address reliability needs" and directing PJM and Dominion Energy Virginia "to provide the dispatch methodology to the Department upon implementation, and to report all dates on which Yorktown Units 1 and 2 are operated"); DOE Order No. 202-18-1 at 3 (relying on the fact that DOE "require[d] PJM and Dominion to exhaust available resources, including demand response and behind-the-meter generation resources, prior to operating Yorktown Units 1 or 2").

[139] DOE Order No. 202-05-3 (Dec. 20, 2005), District of Columbia Public Service Commission at 10 – 11.

Unit 1, the Department strictly limited its remedy, directing GRDA only to provide "dynamic reactive power support and not real power generation, and only when called upon by SPP for reliability purposes."[140] DOE's Order contains no such constraints, and it fails to explain or justify such deviation from consistent past practice.

ii. Economic dispatch is an arbitrary response to any alleged capacity shortage

Indeed, even on DOE's own terms, the justification for the Order does not support ordering J.H. Campbell to operate whenever MISO's economic dispatch rules would select it to operate. The Order points specifically to questions about the sufficiency of electric *capacity* and the ability of MISO to meet load during periods of high demand and low resource output over the next 90 days as the basis for its emergency determination.[141] For example, the Order points to NERC's 2025 Summer Reliability Assessment, and specifically to the finding that "MISO is at elevated risk of operating reserve shortfalls *during periods of high demand and low resource output*."[142] The order repeatedly raises concern about the risk of "*capacity* shortfall for MISO," the extent to which *capacity* of certain generating resources have retired or may retire, and that MISOs' *capacity* market auction (the Planning Resource Auction Results for Planning Year 2025-26) "reinforce the need to increase *capacity*."[143] Dispatch of J.H. Campbell at any time other than a specifically identified operating reserve shortfall (e.g., a concrete expected supply/demand imbalance)—let

[140] DOE Order No. 202-17-1 at 2.
[141] Order at 1-2
[142] Order at 1 (emphasis added).
[143] Order at 1-2.

alone dispatch whenever the plant would be called upon by MISO's economic dispatch algorithm—is *not* necessary to address the type of emergency that the DOE order identifies. Even if the order sufficiently justified retention of J.H. Campbell as a capacity resource (which it does not for the reasons outlined above), it would not follow that J.H. Campbell's electric *energy* is needed to address the identified emergency. Given the nature of the alleged emergency identified in the Order, no dispatch from J.H. Campbell should be necessary unless and until called upon by MISO expressly to address an emergency purpose.

iii. "Economic dispatch" is not in the public interest in this case

Section 202(c) also requires that DOE determine that a given remedy is in the public interest.[144] The public interest determination is not an independent or sufficient criteria to order any particular action. Rather, Congress's use of the conjunctive "and" in section 202(c)(1) clearly prohibits DOE from ordering actions that the Department believes will advance the public interest if those actions exceed what is needed to address the identified emergency. In fact, DOE acknowledged this limit on its authority in its order denying rehearing of its order directing the retention of the Yorktown power plant.[145] Therefore, for the reasons explained above, economic dispatch is not appropriate even *if* DOE determines that it would advance the public interest.

However, DOE's vague direction to MISO to operate Campbell using "economic dispatch" will not further the public interest. DOE's order does not explain why it

[144] 16 USC § 824a (c)(1).
[145] DOE Order 202-18-1 at 4.

believes economic dispatch would be in the public interest, other than a general reference to "minimize[ing] cost to ratepayers." However, this justification fails for two reasons. First, the Order's reference to economic dispatch is ambiguous and leaves open the likelihood that Consumers will operate the facility even at times when its operation will have the effect of *increasing* costs to consumers. For example, Consumers is likely to commit J.H. Campbell into MISO's day ahead electricity market as a "must run" unit, rather than using Emergency commitment.[146] In other words, Consumers will operate the units at least at minimum load every day rather than when there is a forecasted shortfall (e.g., due to unexpected load, unit outage, or a natural disaster). In such circumstances, J.H. Campbell will run at its minimum operational level regardless of whether doing so is truly economic. As a result, DOE has not justified, and cannot be reasonably certain, that economic dispatch will "minimize cost to ratepayers" — its sole explanation for the operational profile it has directed MISO to adopt. In other words, DOE's ordering of economic dispatch in this case is arbitrary.

Moreover, by directing economic dispatch, rather than reserving J.H. Campbell for discrete supply shortages by committing it as Emergency status, DOE's order will result in the facility operating significantly more than necessary. Because J.H. Campbell is old, and because Consumers has been deferring maintenance in anticipation of its retirement, a significant step-up in operation caused by must-run commitment and economic dispatch will increase the likelihood that one or more

[146] *See* MISO Tariff, Section 39.2.5.b.xxvi (discussing Emergency Commitment Status).

units break, requiring costly maintenance to continue operating. Such repairs would likely further increase costs to ratepayers—costs that would be less likely to occur under an operational order better tailored to the emergency that DOE has identified. For example, DOE could have minimized the risk of ratepayer costs had it directed Consumers and MISO to commit (and ultimately dispatch) the facility only after analysis showing a likely near-term supply/demand imbalance or short-term emergency conditions (such as a heatwave, or the forced outage of a large generator or transmission line). The Order is arbitrary and capricious by ordering operation that risks increasing costs to ratepayers, the very outcome DOE has said it is looking to avoid.

Second, the Order fails to consider, let alone explain away, the fact that the State of Michigan has made an independent judgment that it would be in the best interest of ratepayers, the state, and the environment, to accept Consumers' proposal to retire J.H. Campbell. As explained above, the State of Michigan and MISO each went through robust processes to assess the need for J.H. Campbell (or lack thereof), as well as the economic and environmental impacts of its continued operation. The State of Michigan appears not to have been consulted on DOE's Order, notwithstanding the extensive process that it underwent to evaluate whether retirement would be in the public interest. Here, the public interest is best effectuated by respecting the Michigan's considered decision to approve the closure of J.H. Campbell plant, rather than to allow its near continuous operation at ratepayer expense.

Finally, for the reasons explained more fully below, the Order fails to consider the increased air and water pollution that will be caused by J.H. Campbell operating pursuant to economic dispatch instructions. DOE fails to even consider these harms, let alone weigh them against the (alleged) benefits of increased operation, in its determination that economic dispatch of the J.H. Campbell plant will further the public interest.

E. The Department failed to limit its remedy as required by 202(c)(2).

Section 202(c) imposes strict substantive limits on the Department's authority to issue emergency orders that may result in conflicts with any Federal, State, or local environmental law or regulation. Congress deliberately included these limitations to prevent section 202(c) from becoming a de facto exemption from environmental regulation. Here, DOE failed to comply with either of the statute's two express constraints and therefore acted unlawfully.

i. Section 202(c)(2) contains two distinct and binding legal constraints

Congress imposed two critical limitations on the scope of a DOE emergency order under section 202(c):

Temporal Constraint. First, DOE must "ensure that such order requires generation . . . of electric energy only during hours necessary to meet the emergency and serve the public interest."[147] Again, this is a conjunctive requirement such that both conditions—operation in a given hour must be necessary to meet the emergency

[147] 16 U.S.C. § 824a(c)(2).

and operation in a given hour must serve the public interest—must be satisfied.[148] Moreover, by referring to the "hours" necessary to meet the emergency, Congress placed a high burden on DOE to demonstrate that the remedy provided was narrowly tailored to the specifics of the emergency that the order is designed to address.

Environmental Constraint. Second, the Department must "ensure that such order . . ., to the maximum extent practicable, is consistent with any applicable Federal, State, or local environmental law or regulation and minimizes any adverse environmental impacts."[149]

The Department acknowledges that, "additional generation may result in a conflict with environmental standards and requirements" and so it is required to limit additional generation from J.H. Campbell. However, the Order then wholly fails to meet the acknowledged temporal and environmental constraints in the particular ordering conditions that it establishes.

ii. The Order violates Section 202(c)(2)'s temporal constraint

The Order states that its direction to Campbell is "limited in duration to align with the emergency circumstances."[150] But, in fact, DOE has directed the unit to operate for the entire statutory maximum of 90 days. And, as described in more detail *supra,* within that 90-day window, DOE has directed the use of "economic dispatch"—an operational direction that will likely result in Campbell operating at least at its

[148] DOE Order No. 202-18-1, 4(Nov. 6, 2017).
[149] 16 U.S.C. § 824a(c)(2).
[150] Order at 2.

minimum output level, and more likely at the maximum output Consumers Energy can manage, taking into account the state of the facility, continuously for the 90-day period—without providing any other temporal limitation on operations. In other words, the Order appears to assume, without explanation, that an emergency will exist in every hour over the entire 90-day period of the Order that Consumers happens to submit a bid into MISO's energy auction that is lower than the market-clearing price.[151] There is no reason to expect that this will actually be the case.

For these and all the reasons explained in section IV.C, the Order's direction that MISO dispatch J.H. Campbell economically is flatly inconsistent with section 202(c)'s requirement that emergency orders be limited to "only" those "hours" in which operation is necessary to meet the emergency. DOE cannot transform an hour-by-hour limitation into a blanket summer-season waiver through hand-waving at "elevated risk" of tight operating reserves and "*potential* electricity shortfalls."

DOE's failure to limit dispatch to discrete periods when the generation is needed to address the purported emergency renders the Order unlawful under the plain terms of § 202(c).

iii. The Order violates section 202(c)(2)'s environmental constraint

Section 202(c)(2) also requires DOE to ensure, "to the maximum extent practicable," that its orders (1) are consistent with applicable environmental laws and

[151] In fact, it is not clear that DOE will limit operation to 90 days. DOE is authorized to extend the Order beyond 90 days under section 202(c), 16 U.S.C. § 824a(c)(4)(A), and has made no representation that the "emergency" is likely to be resolved by the end of the 90-day period.

regulations and (2) "minimize any adverse environmental impacts." The Department makes no serious effort to comply with this mandate.

First, the Order contains no analysis of J.H. Campbell's environmental obligations. J.H. Campbell is subject to air pollution requirements limiting its emissions of SO_2, NO_x, particulate matter, and mercury, and mandates the use of pollution control equipment such as baghouses, dry sorbent injection, and activated carbon injection systems.[152] DOE does not reference these requirements, direct Consumers to optimize the use of pollution controls or avoid operation during air quality episodes (even if those episodes occur at a time when the marginal energy from J.H. Campbell is not needed to meet electric demand), or provide any guidance for how Consumers is to operate the facility in the event that these requirements would come in conflict with its ability to provide power at any given time. It does not clarify what steps Consumers Energy would have to take to ensure continued operation of pollution control equipment in the event such equipment malfunctioned during the 90-day period. Nor does it appear the Department consulted with the State of Michigan, including its environmental regulator, to identify mechanisms to allow J.H. Campbell to remain available in a way that would minimize conflicts with state environmental laws, which the State was uniquely positioned to advise on and which

[152] *See* Michigan Department of Environment, Great Lakes, and Energy, Renewable Operating Permit Issued to Consumers Energy, J.H. Campbell Generating Complex [J.H. Campbell ROP] (July 2, 2021), accessible through the Michigan Department of Environment, Great Lakes, and Energy's "MiEnviro Portal," https://www.michigan.gov/egle/maps-data/mienviroportal, and also accessible at https://www.egle.state.mi.us/aps/downloads/rop/pub_ntce/B2835/B2835%20FINAL%2007-01-21.pdf.

is required by section 103 of the Department of Energy Organization Act.[153] Instead, the Order offers only generic language about "compliance with applicable requirements… to the maximum extent feasible."

Second, the Order does not establish any operational criteria to "minimize any adverse environmental impacts" as required by section 202(c)(2). This requirement is in addition to the direction to minimize conflicts between operations and environmental requirements. It makes clear that Congress intended DOE to go beyond just avoiding regulatory conflicts but to proactively consider the environmental impact of its emergency orders. But DOE did not design its order to minimize environmental impacts of continued operation of J.H. Campbell. In fact, DOE's order runs directly contrary to the objective of minimizing environmental impacts by expressly directing MISO to operate J.H. Campbell on an "economic dispatch" basis. That instruction prioritizes low-cost dispatch irrespective of environmental impact.

F. The Order Violates NEPA.

Orders issued under section 202(c) are major federal actions subject to NEPA.[154] Such orders direct federal interventions that may affect environmental conditions. The direction to continue operation of J.H. Campbell is unquestionably a major action that significantly affects the environment. Continued operation of J.H. Campbell will result in significant increases of air and water pollution compared to a

[153] *See* 42 U.S.C. § 7113.
[154] 42 U.S.C. § 4336e(10) (defining a "major federal action" as one in which the agency carrying out such action determines subject to substantial Federal control and responsibility.").

scenario in which Campbell retired as planned.[155] In fact, the Order directly concedes this point, stating "the additional generation may result in a conflict with environmental standards and requirements."[156]

For any DOE action affecting the quality of the environment, DOE must comply with NEPA—including through issuance of an environmental impact statement, environmental assessment, categorical exclusion, or special environmental analysis.[157] DOE has not taken, or even initiated, any such action. As such, it is acting contrary to its own NEPA regulations and to its obligations under NEPA.

DOE has previously sought to comply with NEPA for section 202(c) orders through categorical exclusions or special environmental assessments. Neither have been undertaken in this instance. Moreover, neither would be applicable here.

DOE has previously pointed to categorical exclusion B4.4 for "power management activities." However, that categorical exclusion is applicable only "provided that the operations of generating projects would remain within normal operating limits." Here, the Order explicitly authorizes the J.H. Campbell plant to operate beyond its normal permitted limits. Consequently, neither categorical exclusion B4.4, nor any other available exclusion, applies.

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[155] *See* J.H. Campbell ROP, *supra* n. 152; State of Michigan Department of Environmental Quality, Authorization to Discharge Under the National Pollutant Discharge Elimination System, Permit No. MI0001422 (May 29, 2018), accessible through the Michigan Department of Environment, Great Lakes, and Energy's "MiEnviro Portal," https://www.michigan.gov/egle/maps-data/mienviroportal.
[156] Order at 2.
[157] *See* 10 C.F.R. § 1021.102(b).

More recently, DOE has, on certain occasions, relied on emergency provisions that can excuse agencies from preparing environmental documents before taking such actions,[158] and instead prepared after-the-fact Special Environmental Analyses in the event that an order results in a significant effect on the environment.[159] However, these instances involved sudden emergencies that provided DOE substantially less notice compared to the months or years of advance warning DOE received regarding J.H Campbell's scheduled retirement. In this case, DOE acted in response to circumstances known well in advance: the long-scheduled retirement of J.H. Campbell on May 31, 2025. Given considerable lead time, DOE had ample opportunity to prepare, at a minimum, an EA prior to issuing its Order. DOE's failure to initiate any environmental review thus lacks justification.

Moreover, there will be even less justification for a failure to initiate appropriate environmental review for any extension of the Order beyond the initial 90 days. Under section 202(c)(3), orders conflicting with environmental laws are strictly limited to 90 days but may be extended. However, such extension requires consultation with other federal agencies responsible for regulating or with expertise in such environmental impacts.[160] Any justification that NEPA can be sidestepped to

[158] *See* 10 C.F.R. § 1021.343(a); 40 C.F.R. § 1506.12.
[159] *See* DOE, Air Quality and Environmental Justice Memorandum (2021), https://www.energy.gov/sites/default/files/2022-01/sea-05-ercot-air-quality-and-ej-analysis-2021-07-21.pdf; DOE, Special Environmental Analysis for Actions Taken Under U.S Department of Energy Emergency Orders Regarding Operation of the Potomac River Generating Station in Alexandria Virginia (2006), https://www.energy.gov/sites/default/files/nepapub/nepa_documents/RedDont/SEA-04-2006.pdf
[160] 16 U.S.C. § 824a(c)(4)(B).

address an emergency need fades as DOE's orders extend beyond the initial 90-day period.

V. CONCLUSION

For the foregoing reasons, the Michigan Attorney General's request for rehearing should be granted.

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Dated: June 18, 2025

Attachment A

2025 NERC Summer Reliability Assessment

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION



2025 Summer Reliability Assessment

May 2025

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Preface

Electricity is a key component of the fabric of modern society and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable, resilient, and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security

Because nearly 400 million citizens in North America are counting on us

The North American BPS is spans six Regional Entities as shown on the map and in the corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	WECC

About this Assessment

NERC's *2025 Summer Reliability Assessment* (*SRA*) identifies, assesses, and reports on areas of concern regarding the reliability of the North American BPS for the upcoming summer season. In addition, the *SRA* presents peak electricity demand and supply changes and highlights any unique regional challenges or expected conditions that might affect the reliability of the BPS. The reliability assessment process is a coordinated evaluation between the NERC Reliability Assessment Subcommittee, the Regional Entities, and NERC staff with demand and resource projections obtained from the assessment areas. This report reflects an independent assessment by NERC and the ERO Enterprise and is intended to inform industry leaders, planners, operators, and regulatory bodies so that they are better prepared to take necessary actions to ensure BPS reliability. This report also provides an opportunity for industry to discuss plans and preparations to ensure reliability for the upcoming summer period.

Key Findings

NERC's annual *SRA* covers the upcoming four-month (June–September) summer period. This assessment evaluates generation resource and transmission system adequacy as well as energy sufficiency to meet projected summer peak demands and operating reserves. This includes a deterministic evaluation of data submitted for peak demand hour and peak risk hour as well as results from recently updated probabilistic analyses. Additionally, this assessment identifies potential reliability issues of interest and regional topics of concern. While the scope of this seasonal assessment is focused on the upcoming summer, the key findings are consistent with risks and issues that NERC highlighted in the *2024 Long-Term Reliability Assessment (LTRA*), which covers a 10-year horizon, and other earlier reliability assessments and reports.[1]

Rising electricity demand forecasts, generation growth, and the increasing pace of change in the resource mix feature prominently in the summer risk profile. Since last summer, the aggregate of peak electricity demand for NERC's 23 assessment areas has risen by over 10 GW—more than double the year-to-year increase that occurred between the summers of 2023 and 2024. Over 7.4 GW of generator capacity (nameplate) has retired or become inactive for the upcoming summer, including 2.5 GW of natural-gas-fired and 2.1 GW of coal-fired generators.[2] Meanwhile, growth in solar photovoltaic (PV) and battery storage resources has accelerated with the addition of 30 GW of nameplate solar PV resources and 13 GW of new battery storage. The new solar and battery resource additions are expected to provide over 35 GW in summer on-peak capacity. New wind resources are expected to provide 5 GW on peak. Operators in many parts of the BPS face challenges in meeting higher demand this summer with a resource mix that, in general, has less flexibility and more variability.

The following findings are derived from NERC and the ERO Enterprise's independent evaluation of electricity generation and transmission capacity as well as potential operational concerns that may need to be addressed for Summer 2025.

Resource Adequacy Assessment and Energy Risk Analysis

All areas are assessed as having adequate anticipated resources for normal summer peak load conditions (see **Figure 1**). However, the following areas face risks of electricity supply shortfalls during periods of more extreme summer conditions. This determination of elevated risk is based on analysis of plausible scenarios, including 90/10 demand forecasts and historical high outage rates as well as low wind or solar PV energy conditions:

- **Midcontinent Independent System Operator (MISO):** MISO is expecting to have an existing certain capacity of 142,793 MW in the *2025 SRA*, which is a slight reduction from the 143,866 MW submitted for the *2024 SRA*. The retirement of 1,575 MW of natural gas and coal-fired generation since last summer, combined with a reduction in net firm capacity transfers due to some capacity outside the MISO market opting out of the MISO planning resource auction, is contributing to less dispatchable generation in MISO. With higher demand and less firm resources, MISO is at elevated risk of operating reserve shortfalls during periods of high demand or low resource output. MISO's most recent energy assessment reveals that the period of highest energy shortfall risk has shifted from July to August. This shift is driven by the decline in dispatchable generation and the increasing share that solar and wind resources have in meeting demand. The risk of supply shortfalls increases in late summer as solar output diminishes earlier in the day, leaving variable wind and a more limited amount of dispatchable resources to meet demand.
- **NPCC-New England:** The New England area expects to have sufficient resources to meet the 2025 summer peak demand forecast. As of April 1, the 50/50 peak summer demand is forecast to be 24,803 MW for the weeks beginning June 1, 2025, through September 14, 2025, with a lowest projected net margin of -1,473 MW (6.0%). The lowest projected net margin assumes a net interchange of 1,245 MW, which is capacity-backed; however, ISO New England (ISO-NE) has typically imported around 3,000 MW during summer peak load conditions. ISO-NE anticipates an increase of approximately 500 MW in forced outages from its generating fleet compared to Summer 2024. Based on NPCC's most recent energy assessment, some use of New England's operating procedures for mitigating resource shortages is anticipated during Summer 2025. Cumulative loss of load expectation (LOLE) of <0.031 days/period, loss of load hours (LOLH) of <0.120 hours/period, and expected unserved energy (EUE) of <94 MWh/period were estimated for the expected load with expected summer resources while the reduced resources and highest peak load scenario resulted in an estimated cumulative LOLE risk of 4.369 days/period, with associated LOLH of 19.554 hours/period and EUE of 19,847 MWh/period.
- **MRO-SaskPower:** For the upcoming summer months, no capacity constraints or reliability issues are expected under normal conditions. However, in the event of generator forced outages of more than 350 MW, combined with above-normal peak demand, SaskPower may need to rely on short-term imports from neighboring utilities. Other remedial actions could include quickly activating demand-response programs, adjusting maintenance schedules, and, if necessary, implementing temporary load interruptions. SaskPower's modeling projects

[1] NERC's long-term, seasonal, and special reliability assessments are published on the Reliability Assessments webpage.

[2] Other retirements include 1.2 GW nuclear capacity following the retirement of some units at the Pickering Nuclear Generator Station in Ontario, and 1.6 GW of petroleum, hydro, and other generation. Source: NERC and EIA data.

the probability of experiencing a generation forced outage exceeding 350 MW to be 21.5%. Assuming maximum available imports, the same modeling projects the number of hours with an operating reserve shortfall this summer to be about 0.65 hours with the highest likelihood occurring in June, estimated at 0.43 hours.

- **MRO-SPP:** SPP's Anticipated Reserve Margin (28.5%) is similar to last summer, and resource shortfalls are not expected for the upcoming Summer 2025 season under normal conditions. However, SPP remains at risk for energy shortfalls if above-normal peak demand periods coincide with low wind output and high generator forced outages. Other known operational challenges for the upcoming season include managing wind energy fluctuations; SPP often experiences sharp ramps of its wind generation that can cause transmission system congestion as well as scarcity conditions.
- **Texas RE-ERCOT:** An additional 7 GW of installed solar PV resource capacity and nearly 7.5 GW in new battery storage is helping ERCOT meet rising summer peak demand. ERCOT is projected to have sufficient operating reserves for the August peak load hour given normal summer system conditions. Nevertheless, continued growth in both loads and intermittent renewable resources drives a risk of emergency conditions in the evening hours when solar generation ramps down and loads remain elevated. ERCOT's probabilistic risk assessment of energy emergency alert (EEA) likelihood for the highest risk periods associated with evening hours in the peak month of August is projected to fall to 3%, down from over 15% in 2024. Lower risk is attributed to a nearly doubling of battery energy storage capacity and improved energy availability from new battery storage and operational rules. The South Texas Interconnection reliability operating limit (IROL) continues to present a system constraint, which, under specific unlikely conditions, could ultimately require ERCOT system operators to direct firm load shedding to remain within IROL limits and prevent cascading load loss. For Summer 2025, this risk is being mitigated by updating transmission line dynamic ratings and switching actions to divert power away from the most limiting transmission circuits.
- **WECC-Mexico:** The WECC-Mexico assessment area in Baja California has a peak summer demand of 3,770 MW and is served by a resource mix that is mainly natural-gas-fired generation, with some geothermal, solar, wind, and oil-fired resources (5,636 MW total installed capacity, of which 4,125 MW are gas-fired generators). WECC-Mexico's 14% Anticipated Reserve Margin exceeds the Reference Margin Level for reliability (10%) calculated by WECC. For the upcoming summer, NERC assesses that historically average generator outage rates for peak demand periods can cause a supply shortfall within the WECC-Mexico assessment area and trigger the need for non-firm resources from neighboring areas. Note, in prior SRA reports, the Baja California portion of the BPS was included as part of the WECC-CA/MX assessment area. The *2025 SRA* includes a new assessment area map for the Western Interconnection. The new assessment area boundaries provide reliability risk information in more geographic detail for the United States and Mexico.

Resource additions since last summer have helped lower the risk of energy shortfalls in several areas. Across the U.S. portion of the Western Interconnection, over 6.5 GW of installed solar capacity has been added, along with nearly 7 GW in battery storage. The resources are expected to provide close to 14 GW in on-peak capacity. In British Columbia, new hydroelectric generators were commissioned, contributing to an additional 500 MW in capacity for the summer. The resource additions have alleviated capacity and energy shortfall risks identified in these assessment areas prior to Summer 2024 and provide supplies across the Western Interconnection.



Figure 1: Summer Reliability Risk Area Summary

Seasonal Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in above-normal conditions
Normal	Sufficient operating reserves expected

Other Reliability Issues

- **Weather services are expecting above-average summer temperatures across much of North America and continued below-average precipitation in the Northwest and Midwest.** In summer-peaking areas, temperature is one of the main drivers of demand and can also contribute to forced outages for generation and other BPS equipment. Average temperatures last summer across the United States and Canada were not as hot as Summer 2023, but Summer 2024 still managed to rank in the top four hottest recorded summers with certain areas breaking records yet again. Few high-level EEAs were issued between June and September 2024, and there were no supply disruptions that resulted from inadequate resources as Balancing Authorities (BA), Transmission Operators (TOP), and Reliability Coordinators (RC) employed a variety of operational mitigations and demand-side management measures. Natural-gas-fired electricity generation broke records last year—highlighting the criticality of natural gas in meeting electric demand. This continuing trend will be key in operator preparations that help to ensure fuel availability for the coming summer. The **Review of 2024 Capacity and Energy Performance** section describes actual demand and resource levels in comparison with NERC's *2024 SRA* and summarizes 2024 resource adequacy events.

- **Load growth is driving higher peak demand forecasts and contributing to resource and transmission adequacy challenges in many areas.** Fifteen of the 23 assessment areas are expecting an increase in peak summer demand from Summer 2024. Aggregated peak demand across all assessment areas has increased by over 10 GW since 2024. This is more than double the increase in peak demand from 2023 to 2024. One of the largest increases is seen in the U.S. West (+5%), where a new peak demand record was set last summer. Extreme heat is reported as a main reliability concern this year among BAs in WECC. With precipitation expected to be lower than average in the Northwest, natural-gas-fired generation and demand-side management could be important in offsetting any lower-than-normal levels of hydroelectric generation availability. SERC Southeast is also projecting a sizable increase in peak demand of more than 2% from NERC's *2024 SRA*. Entities in the assessment area cite economic growth and increased industrial and data mining loads as the main drivers.

- **Aging generation facilities present increased challenges to maintaining generator readiness and resource adequacy.** Forced outage rates for conventional generators and wind resources have trended toward historically high levels in recent years.[3] System operators face increasing risk of resource shortfalls and operating challenges caused by forced generator outages, especially during periods of high demand or when relatively few conventional resources are dispatched to serve load. The threat to BPS reliability can be compounded in areas where aging resources are further depended upon to provide essential reliability services. In the Southwest, for example, a portion of capacity has been in operation for roughly 60 years. Electric utilities in SERC-Central have also described aging generation as a reliability challenge. Historical performance has demonstrated the need for planning assumptions that account for elevated forced outage rates for these generators. Older generators can also require extensive overhauls, such as generator rewinds, that take resources out of service for extended periods of time as discovery work can lead to additional unplanned maintenance.

- **Battery resource additions are helping reduce energy shortfall risks that can arise from resource variability and peaks in demand.** In Texas, California, and across the U.S. West, the influx of battery energy storage systems (BESS) in recent years has markedly improved the ability to manage energy risks during challenging summer periods. These areas can be exposed to energy shortfalls during hours of peak demand and into evening as solar PV output diminishes, but BESS resources that maintain their charge during the day can help meet peak demand and also overcome energy shortfalls on the system that might otherwise occur with solar down-ramps or variability. Natural-gas-fired generation also continues to play an important role in meeting peak demand and flexibly responding to fluctuations output from variable energy resources (VER).

- **Grid operators need to remain vigilant for the potential of inverter-based resources (IBR) to unexpectedly trip during grid disturbances.** While this near-term challenge persists, NERC continues to work diligently with industry to develop long-term solutions to this issue. In April, NERC published the *Aggregated Report on NERC Level 2 Recommendation to Industry: Findings from Inverter-Based Resource Model Quality Deficiencies Alert*.[4] In the report, NERC summarized the deficiencies identified in the Level 2 alert issued in June 2024. The report's findings were as follows:
  - Many grid operators indicated that they did not have the requested data readily available, supporting the previous finding that data acquisition and management was insufficient.
  - Interconnection process requirements are insufficient.
  - Two-thirds of the protection settings used by grid operators are not set to provide the maximum capability. This creates a significant artificial limitation of overall ride-through capability of BPS-connected solar photovoltaic (PV) facilities.
  - 20% of the surveyed facilities use a facility capability with a 0.95 power factor limit, which means that a significant amount of underused reactive capability exists on the BPS.
  - Dynamic model data is inconsistent.

[3] See Key Findings in NERC's 2024 *State of Reliability* report

[4] *Findings from Inverter-Based Resource Model Quality Deficiencies Alert*

As solar, wind, and battery resources remain the predominant types of resources being added to the BPS, it is imperative for industry, vendors, and manufacturers to take the recommended steps for system modeling and study practices and IBR performance.

- **Operators of natural-gas-fired generators should maintain lines of communication with natural gas system operators to support electric grid reliability.** The 2024 summer season was the fourth hottest on record,[5] and natural-gas-fired generation broke records with a peak monthly average in July of 208 TWh, up 4% from July 2023, per the latest data from the Energy Information Administration (EIA). The EIA projects that rising demand for natural gas exports this year in the wake of ramped up liquefied natural gas (LNG) production combined with lower field production levels could tighten natural gas supplies relative to last summer. Amid year-over-year increases in load projections in most assessment areas, this summer could see another record year for natural-gas-fired generation, thereby stretching supplies even further. Given that late spring and early summer are seasons when natural gas system owners and operators typically perform maintenance requiring system outages, vigilance is needed to ensure the reliability of fuel delivery to natural-gas-fired-generators.[6]
- **Supply chain issues continue to affect lead times for Bulk Electric System (BES) equipment maintenance, replacement, and construction.** While no specific reliability issues for the upcoming summer have been identified, Transmission Owners (TO) and Generator Owners (GO) face delays in parts, materials, and skilled technicians. When summer maintenance preparations or installations are delayed, effects on equipment availability can challenge system operators. Over the long term, supply chain issues and uncertainty continue to affect development. Lead times for transformers remain virtually unchanged, averaging 120 weeks in 2024. Large transformer lead times averaged 80–210 weeks.[7]
- **Wildfire risks in the areas that comprise the Western Interconnection remain ever present.** Wildfire conditions can affect transmission operations by prompting preemptive circuit outages to reduce the risk of fire ignition as well as through fire impacts to transmission infrastructure. Transmission system congestion and reduced import capacity can accompany wildfire conditions. Moreover, fires near wind generation result in curtailment for safety reasons, and solar facilities can be susceptible to range fires. Fire damage to transmission lines interconnected to remote hydro sites in the Pacific Northwest can be particularly problematic with restoration typically taking weeks to months to accomplish.

Recommendations

To reduce the risk of electricity shortfalls on the BPS this summer, NERC recommends the following:

- RCs, BAs, and TOPs in the elevated risk areas identified in the key findings should take the following actions:
  - Review seasonal operating plans and protocols for communicating and resolving potential supply shortfalls in anticipation of potentially extreme demand levels.
  - Consider the potential for higher-than-anticipated forced generator outage rates in operating plans due to plant age, operating patterns, or limited pre-seasonal maintenance availability.
  - Employ conservative generation and transmission outage coordination procedures and operate conservatively commensurate with long-range weather forecasts to ensure adequate resource availability. The review of system performance during the January 2025 cold weather event noted that early declaration of conservative operations in advance of extreme conditions helped reduce grid congestion and enhance transfer capability.[8]
  - Engage state or provincial regulators and policymakers to prepare for efficient implementation of demand-side management mechanisms called for in operating plans.
- GOs with solar PV resources should implement recommendations in the IBR performance issues alert that NERC issued in March 2023.[9]
- State regulators and industry should have protocols in place at the start of summer for managing emergent requests from generators for air-quality restriction waivers. If warranted, U.S. Department Energy (DOE) action to exercise emergency authority under the Federal Power Act (FPA) section 202(c) may be needed to ensure that sufficient generation is available during extreme weather conditions.

[5] US sweltered through its 4th-hottest summer on record – National Oceanic and Atmospheric Administration
[6] Short-Term Energy Outlook - U.S. Energy Information Administration (EIA)
[7] Supply shortages and an inflexible market give rise to high power transformer lead times | Wood Mackenzie
[8] See notable operations practices in Appendix 2 of the *January 2025 Arctic Events System Performance Review | FERC, NERC, and its Regional Entities: A Joint Staff Report*, April 2025.
[9] See NERC Level 2 Alert: Inverter-Based Resource Performance Issues, March, 2023. Owners and operators of BPS-connected IBRs that are currently not registered with NERC should consult NERC's IBR Registration Initiative for information on the registration process.

Summer Temperature and Drought Forecasts

During the summer season, heat drives peak electricity demand as consumers use more electricity to cool their homes and businesses. Summer 2024 was the fourth hottest summer on record for the United States and Canada, and Summer 2025 is expected to bring similar intensity. Assessment area load forecasts account for many years of historical demand data, often up to 30 years, to predict summer peak demand and prepare for more extreme conditions. According to their probabilistic assessments of the coming summer season, late July and early August are the periods most frequently identified among the assessment areas as the expected period of peak demand. Peak demand hours may not coincide with the highest risk hours in the summer as the resource mix shifts during a 24-hour cycle, particularly when there are prolonged periods of above-normal temperatures. Coordinating pre-season preparations and maintenance remains critical to avoiding forced outages where possible and mitigating risks to BPS reliability.

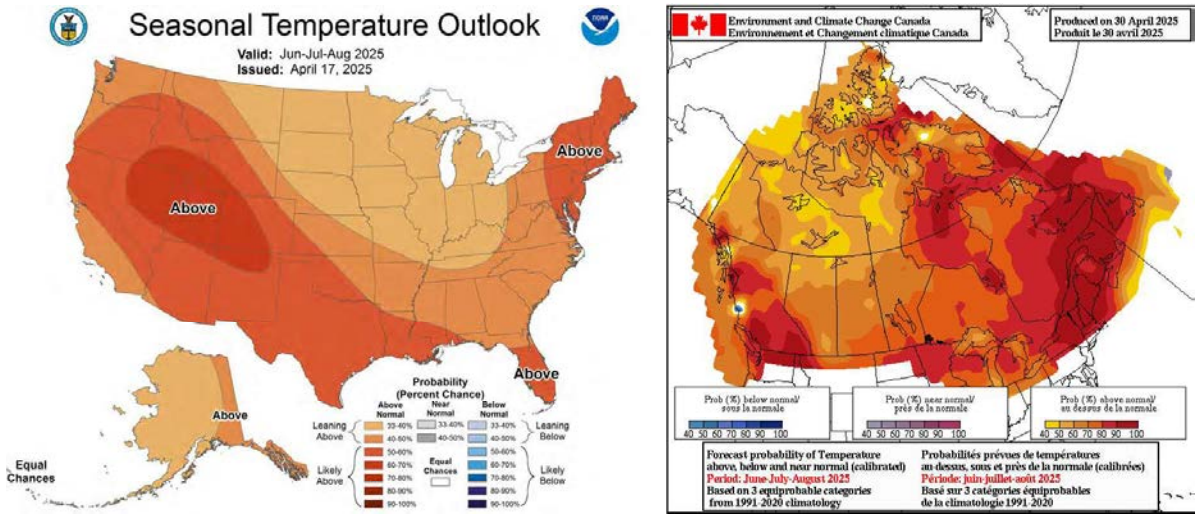


Figure 2: United States and Canada Summer Temperature Outlook[10]

[10] Seasonal forecasts obtained from U.S. National Weather Service and Natural Resources Canada: https://www.cpc.ncep.noaa.gov/products/predictions/long_range/ and https://weather.gc.ca/saisons/prob_e.html

Risk Assessment Discussion

NERC assesses the risk of electricity supply shortfall in each assessment area for the upcoming season by considering Planning Reserve Margins, seasonal risk scenarios, probability-based risk assessments, and other available risk information. NERC provides an independent assessment of the potential for each assessment area to have sufficient operating reserves under normal conditions as well as above-normal demand and low-resource output conditions selected for the assessment. A summary of the assessment approach is provided in Table 1.

Table 1: Seasonal Risk Assessment Summary

Category	Criteria[1]
High Potential for insufficient operating reserves in normal peak conditions	• Planning Reserve Margins do not meet Reference Margin Levels • Probabilistic indices exceed benchmarks (e.g., LOLH of 2.4 hours over the season) • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand and outage scenarios**[2]
Elevated Potential for insufficient operating reserves in above-normal conditions	• Probabilistic indices are low but not negligible (e.g., LOLH above 0.1 hours over the season) • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **extreme peak-day demand with normal resource scenarios** (i.e., typical or expected outage and derate scenarios for conditions)[2] • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand with reduced resources** (i.e., extreme outage and derate scenarios)[3]
Normal Sufficient operating reserves expected	• Probabilistic indices are negligible • Analysis of the risk hour(s) indicates resources will be sufficient to meet operating reserves under normal and extreme peak-day demand and outage scenarios[4]

Table Notes:
[1]The table provides general criteria. Other factors may influence a higher or lower risk assessment.
[2]**Normal resource scenarios** include planned and typical forced outages as well as outages and derates that are closely correlated to the extreme peak demand.
[3]**Reduced resource scenarios** include planned and typical forced outages and low-likelihood resource scenarios, such as extreme low-wind scenarios, low-hydro scenarios during drought years, or high thermal outages when such a scenario is warranted.
[4]Even in normal risk assessment areas, extreme demand and extreme outage scenarios that are not closely linked may indicate risk of operating reserve shortfall.

Assessment of Planning Reserve Margins and Operational Risk Analysis

Anticipated Reserve Margins, which provide the Planning Reserve Margins for normal peak conditions, as well as reserve margins for seasonal risk scenarios of more extreme conditions are provided in Table 2.

Table 2: Seasonal Risk Scenario On-Peak Reserve Margins

Assessment Area	Anticipated Reserve Margin	Anticipated Reserve Margin with Typical Outages	Anticipated Reserve Margin with Higher Demand, Outages, Derates in Extreme Conditions
MISO	24.7%	9.3%	-1.9%
MRO-Manitoba	14.6%	11.2%	3.8%
MRO-SaskPower	33.5%	28.3%	22.4%
MRO-SPP	28.5%	18.2%	3.4%
NPCC-Maritimes	42.2%	31.7%	18.6%
NPCC-New England	14.1%	3.9%	4.0%
NPCC-New York	31.6%	12.5%	5.2%
NPCC-Ontario	23.4%	23.4%	3.7%
NPCC-Québec	32.7%	28.2%	19.1%
PJM	24.7%	15.0%	5.3%
SERC-C	19.6%	12.7%	3.2%
SERC-E	29.1%	21.8%	13.0%
SERC-FP	20.2%	14.0%	11.8%
SERC-SE	41.3%	37.7%	12.5%
TRE-ERCOT	43.2%	33.0%	-5.1%
WECC-AB	42.6%	40.3%	20.5%
WECC-Basin	24.3%	15.9%	-27.2%
WECC-BC	24.3%	24.2%	-6.6%
WECC-CA	56.9%	51.0%	4.7%
WECC-Mex	14.1%	1.6%	-16.8%
WECC-NW	32.1%	29.4%	-13.0%
WECC-RM	25.7%	18.2%	-18.9%
WECC-SW	22.3%	14.0%	-13.0%

Seasonal risk scenarios for each assessment area are presented in the **Regional Assessments Dashboards** section. The on-peak reserve margin and seasonal risk scenario charts in each dashboard provide potential summer peak demand and resource condition information. The reserve margins on the right side of the dashboard pages provide a comparison to the previous year's assessment. The seasonal risk scenario charts present deterministic scenarios for further analysis of different demand and resource levels with adjustments for normal and extreme conditions. The assessment areas determined the adjustments to capacity and peak demand based on methods or assumptions that are summarized in the seasonal risk scenario charts; more information about these dashboard charts is provided in the **Data Concepts and Assumptions** section.

The seasonal risk scenario charts can be expressed in terms of reserve margins: In **Table 2**, each assessment area's Anticipated Reserve Margins are shown alongside the reserve margins for a typical generation outage scenario (where applicable) and the extreme demand and resource conditions in their seasonal risk scenario.

Highlighted in **orange** are the areas identified as having resource adequacy or energy risks for the summer in the **Key Findings** section. The typical outage reserve margin includes anticipated resources minus the capacity that is likely to be in maintenance or forced outage at peak demand. If the typical maintenance or forced outage margin is the same as the Anticipated Reserve Margin, it is because an assessment area has already factored typical outages into the anticipated resources. The extreme conditions margin includes all components of the scenario and represents the most severe operating conditions of an area's scenario. Note that any reserve margin below zero indicates that the resources fall below demand in the scenario.

In addition to the peak demand and seasonal risk hour scenario charts, the assessment areas provided a resource adequacy risk assessment that was probability-based for the summer season. Results are summarized in **Table 3**. The risk assessments account for the hour(s) of greatest risk of resource shortfall. For most areas, the hour(s) of risk coincides with the time of forecasted peak demand; however, some areas incur the greatest risk at other times based on the varying demand and resource profiles. Various risk metrics are provided and include LOLE, LOLH, EUE, and the probabilities of an EEA occurrence.

Energy Emergency Alerts

Extreme generation outages, low resource output, and peak loads similar to those experienced in wide-area heat events and the heat domes experienced in western parts of North America during the last three summers are ongoing reliability risks in certain areas for Summer 2025. When forecasted resources in an area fall below expected demand and operating reserve requirements, BAs may need to employ operating mitigations or EEAs to obtain the capacity and energy necessary for reliability. A description of each EEA level is provided below.

Energy Emergency Alert Levels

EEA Level	Description	Circumstances
EEA1	All available generation resources in use	• The BA is experiencing conditions in which all available generation resources are committed to meet firm load, firm transactions, and reserve commitments and is concerned about sustaining its required contingency reserves. • Non-firm wholesale energy sales (other than those that are recallable to meet reserve requirements) have been curtailed.
EEA2	Load management procedures in effect	• The BA is no longer able to provide its expected energy requirements and is an energy-deficient BA. • An energy-deficient BA has implemented its operating plan(s) to mitigate emergencies. • An energy-deficient BA is still able to maintain minimum contingency reserve requirements.
EEA3	Firm load interruption is imminent or in progress	• The energy-deficient BA is unable to meet minimum contingency reserve requirements.

Table 3: Probability-Based Risk Assessment		
Assessment Area	**Type of Assessment**	**Results and Insight from Assessment**
MISO	The Planning Year 2025–2026 LOLE Study Report, an annual LOLE probabilistic study[11]	The values for LOLH and EUE are taken from the assessment report noted, where the annual LOLE is set at 1 day in 10 years, or 0.1 LOLE for the summer season. For Summer 2025, LOLH is 0.252 hrs/year and EUE is 626.2 MWH/year for the Reference Margin Level. Expectations for load-loss and unserved energy are less than these amounts because MISO's resources are above the Reference Margin Level.
MRO-Manitoba	The 2024 LOLE Study	Manitoba Hydro's probability-based resource adequacy risk assessment for the summer (June–September) season is that there is a low risk of resource adequacy issues. The study indicated Annual Probabilistic Indices for the Manitoba Hydro system for 2026 of 5 MWh per year of EUE, considering a range of flow conditions, and that all of this risk would be in the higher load winter season. The increases in Manitoba load since the 2022 LOLE Study were more than offset by a reduction in long-term exports contract with the expiration of a major export sale in April 2025.
MRO-SaskPower	Probability-based capacity adequacy assessment Summer 2025	According to the study, SaskPower's expected number of hours with an operating reserve shortfall between June and September is about 0.65 hours, assuming maximum available imports. June has the highest likelihood of an EEA, estimated at 0.43 hours. For Summer 2025, the projected probability of experiencing a generation forced outage exceeding 350 MW stands at 21.5%. This number represents an approximation of the likelihood, during any given hour of the summer period, of encountering a generation forced outage surpassing the 350 MW threshold.
MRO-SPP	2024 NERC *LTRA* with Probabilistic Assessment (ProbA)	With the current SPP fleet, the ProbA base case Year 2 produced no LOLE.
NPCC	NPCC conducted an all-hour probabilistic assessment that consisted of a base case and several more severe scenarios examining low resources, reduced imports, and higher loads. The highest peak load scenario has a 7% probability of occurring.	NPCC Regional Entity assesses that there will be an adequate supply of electricity across the Regional Entity this summer. Necessary strategies and procedures are in place to deal with operational challenges and emergencies as they may develop. Preliminary results of the probabilistic analysis by assessment area are below. NPCC anticipates releasing the assessment in May.
NPCC-Maritimes		NPCC's assessment results indicate that Maritimes expects minimal LOLE, LOLH, and EUE over the May–September period, with the highest risk occurring in July and August. The assessment projected LOLE at less than 0.089 days per period, LOLH at less than 0.4 hours per period, and EUE at less than 16.5 MWh per period under the reduced resources and highest peak demand scenario.
NPCC-New England		Based on NPCC's assessment, cumulative LOLE (<0.031 days/period), LOLH (<0.120 hours/period), and EUE (<94 MWh/period) risks were estimated over the summer May to September period for the expected load with expected resources scenario. The highest peak load level conditions with reduced resources scenario resulted in an estimated cumulative LOLE risk (4.369 days/period), with associated LOLH (19.554 hours/period) and EUE (19,847 MWh/period) with the highest risk occurring in June, with some in July and August.
NPCC-New York		Negligible cumulative LOLE (<0.018 days/period), LOLH (<0.054 hours/period), and EUE (33 MWh/period) risks were estimated over the summer May–September period for the expected load with expected resources for the summer. For highest peak load level with low likelihood, reduced resource conditions resulted in an estimated cumulative LOLE risk (1.7 days/period), with associated LOLH (6.5 hours/period) and EUE (4,860 MWh/period) with the highest risk occurring in July and August.

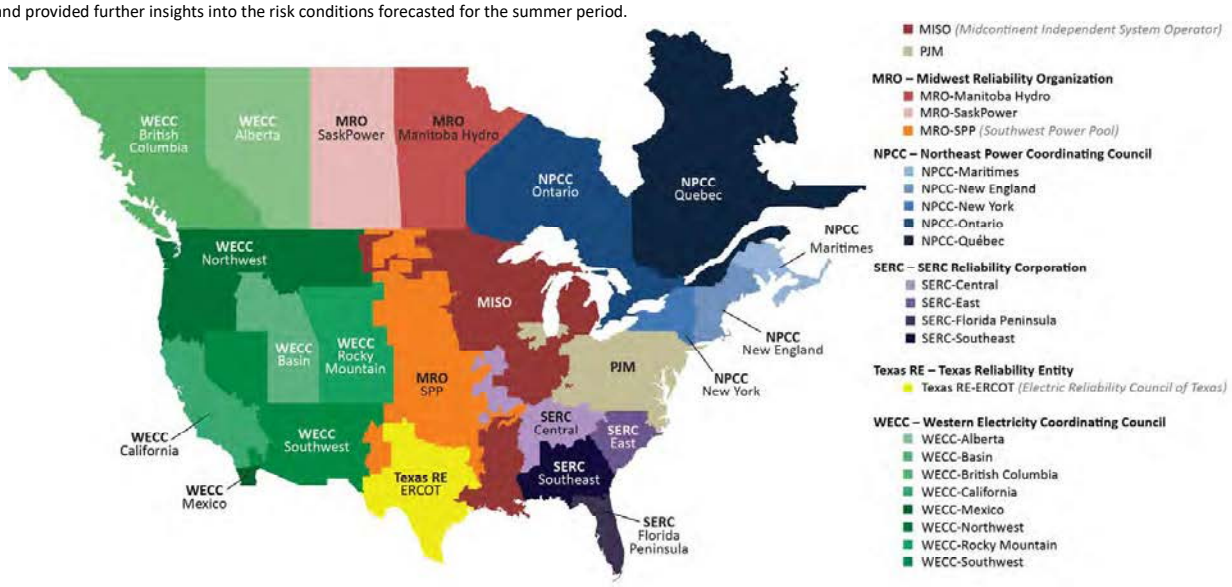
[11] PY 2025–2026 LOLE Study Report

Table 3: Probability-Based Risk Assessment		
Assessment Area	**Type of Assessment**	**Results and Insight from Assessment**
NPCC-Ontario		NPCC's preliminary result of this assessment indicates that the low-likelihood resource case, highest peak load level conditions resulted in a negligible cumulative LOLE (0.081 days/period), with associated cumulative LOLH (0.212 hours/period) and EUE (145.4 MWh/period) with the highest risks occurring predominantly in July, with some in August. Negligible cumulative LOLE, LOLH, and EUE risks were estimated over the May–September summer period for the other scenarios modeled.
NPCC-Québec		The Québec assessment area is not expected to require use of their operating procedures designed to mitigate resource shortages during Summer 2025. Québec did not demonstrate any measurable amounts of cumulative LOLE, LOLH, or EUE risks over the May–September summer period for all the scenarios modeled since the system is winter peaking.
PJM	2023 PJM Reserve Requirement Study (RRS)	PJM is expecting a low risk of resources falling below required operating reserves during Summer 2025. PJM is forecasting around 27% installed reserves (including expected committed demand resources), which is above the target installed reserve margin of 17.7% necessary to meet the 1-day-in-10-years LOLE criterion. The Reserve Requirement Study analyzed a wide range of load scenarios (low, regular, and extreme) as well as multiple scenarios for system-wide unavailable capacity due to forced outages, maintenance outages, and ambient derations. Due to the rather low penetration of limited and variable resources in PJM relative to PJM's peak load, the hour with the most loss-of-load risk remains the hour with the highest forecasted demand.
SERC-Central SERC-East SERC-Florida Peninsula SERC-Southeast	2024 NERC *LTRA* with ProbA. For the ProbA, SERC evaluates 8,760 hourly load and 1,900 sequential Monte Carlo simulations. The results are a probability weighted average of cases, including 38 historic weather-years that are applied to load forecasts for years 2026 and 2028. The model applies a range of economic load forecast errors from -4% to 4% and other noted assumptions.	The 2024 ProbA indicates some resource adequacy risk to SERC with the results for the year 2028 showing slightly higher risk than the year 2026. For the entire SERC footprint, Summer 2026 shows a low risk in summer afternoons into evenings, and for Summer 2028, that risk is still low but extends from summer evenings later into summer nights.
Texas RE-ERCOT	ERCOT probabilistic assessment using the Probabilistic Reserve Risk Model	The simulation indicates some risk of having to declare an EEA for hours ending 20 and 21 for the peak load day in August. These two hours have the highest EEA risk (reflecting corresponding high net load conditions) with probabilities of declaring an EEA 3.05% and 1.54%, respectively. This is categorized by ERCOT as "Low risk" per its criteria of hourly EEA probability that is equal to or less than 10%. For the *2024 SRA*, ERCOT reported EEA declaration probabilities for hours ending 20 and 21 of 18.4% and 9.2%, respectively. The large decrease in EEA probabilities is due to the addition of 7,414 MW of BESS capacity.
WECC	2024 Western Assessment on Resource Adequacy employs a probabilistic energy, area-wide assessment, using Multi Area Variable Resource Integration Convolution (MAVRIC) model	

Table 3: Probability-Based Risk Assessment		
Assessment Area	**Type of Assessment**	**Results and Insight from Assessment**
WECC-AB		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. All resource margins have increased since last summer with the addition of new capacity, including almost 2,700 MW of new natural gas capacity, 1,200 MW of new wind (+27%), 200 MW of new solar (+13%), and 54 MW of new energy storage systems (+27.5%) on-line. The peak hour has moved earlier, to 3:00 p.m. from 4:00 p.m., still in late July.
WECC-Basin		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The reserve margins are not anticipated to fall below the reference margin (14%) for the upcoming summer—existing-certain is forecast at 19% with anticipated and prospective at 24%. The area is expected to peak in early July around 3:00 p.m.
WECC-BC		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The reserve margins are not anticipated to fall below the reference margin for the upcoming summer. All reserve margins have increased since 2024 due to increased capacity and energy availability. The peak hour for summer is forecast for early August around 4 p.m.
WECC-CA		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The reserve margins are not anticipated to fall below the reference margin for the upcoming summer. Reserve margins have increased since last summer with the increased existing-certain and Tier 1 planned capacity more than offsetting the decrease in available demand response.
WECC-Mex		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The peak hour is expected to occur in early August around 4:00 p.m. The reserve margins (14%) are not anticipated to fall below the reference margin (10%) for the upcoming summer. An extreme summer peak load is anticipated to be 4,067 MW. Under extreme conditions, typical forced outages are expected to be 472 MW and derates for thermal generation resources are expected to be 330 MW, requiring imports from neighboring areas. The expected operating reserve requirement on peak is 226 MW.
WECC-RM		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The peak hour is expected to occur in late July around 4:00 p.m. Summer 2025 reserve margins (existing-certain 25%, and anticipated and prospective 26%) are not anticipated to fall below the reference margin (17%). An extreme summer peak load may be around 15 GW, and the area has 17.3 GW of existing-certain capacity plus 104 MW of planned new resources. Typical forced outages could be 1,044 MW and derates under extreme conditions of 1,561 MW for thermal and 990 MW for wind. The expected operating reserve requirement on peak is 846 MW.
WECC-NW		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. Summer 2025 peak hour is expected to occur in early July around 5:00 p.m. Reserve margins (existing-certain 29% and anticipated and prospective 32%) are not anticipated to fall below the reference margin (23%). An extreme summer peak load may be around 32,740 MW. Typical forced outages are forecast to be 777 MW with derates for thermal under extreme conditions to be 1,584 MW and 2,649 MW for wind. The expected operating reserve requirement on peak is 1,750 MW.
WECC-SW		Probabilistic analysis performed by WECC found no LOLH or EUE for this summer. The peak hour is expected to occur in early July around 5:00 p.m. The existing-certain 17% reserve margin does not fall below the reference margin (13%) for the upcoming summer. The anticipated and prospective reserve margin rises to 22%. An extreme summer peak load could approach 40 GW during the riskiest hour, while the region is anticipated to have 40.3 GW of existing-certain energy available and an additional 2 GW of Tier 1 planned resources. Typical forced outages are estimated near 3 GW, and derates for thermal under extreme conditions can shave another 3 GW from available energy. The expected operating reserve requirement is 2,119 MW.

Regional Assessments Dashboards

The following assessment area dashboards and summaries were developed based on data and narrative information collected by NERC from the six Regional Entities on an assessment area basis. Guidelines and definitions are in the **Data Concepts and Assumptions** table. On-peak reserve margin bar charts show the Anticipated Reserve Margin compared to a Reference Margin Level that is established for the areas to meet resource adequacy criteria. Prospective Reserve Margins can give an indication of additional on-peak capacity but are not used for assessing adequacy. The operational risk analysis shown in the following regional assessments dashboard pages provides a deterministic scenario for understanding how various factors that affect resources and demand can combine to impact overall resource adequacy. For each assessment area, there is a risk-period scenario graphic; the left **blue** column shows anticipated resources (from the **Demand and Resource Tables**), and the **orange** column at the right shows the two demand scenarios of the normal peak net internal demand (from the **Demand and Resource Tables**) and the extreme summer peak demand determined by the assessment area. The middle **red** or **green** bars show adjustments that are applied cumulatively to the anticipated resources. Adjustments may include reductions for typical generation outages (maintenance and forced not already accounted for in anticipated resources) and additions that represent the quantified capacity from operational tools (if any) that are available during scarcity conditions but have not been accounted for in the *SRA* reserve margins. Resources throughout the scenario are compared against expected operating reserve requirements that are based on peak load and normal weather. The cumulative effects from extreme events are also factored in through additional resource derates or low-output scenarios. In addition, results from a probability-based resource adequacy assessment are shown in the Highlights section of each dashboard. Methods varied by assessment area and provided further insights into the risk conditions forecasted for the summer period.





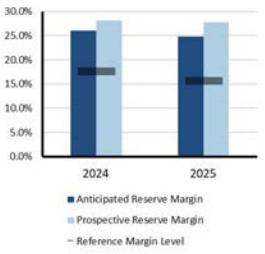
MISO

MISO is a not-for profit, member-based organization that administers wholesale electricity markets that provide customers with valued service; reliable, cost-effective systems and operations; dependable and transparent prices; open access to markets; and planning for long-term efficiency. MISO manages energy, reliability, and operating reserve markets that consist of 36 local BA and 394 market participants, serving approximately 42 million customers. Although parts of MISO fall in three Regional Entities, MRO is responsible for coordinating data and information submitted for NERC's reliability assessments.

Highlights

- Demand forecasts and resource data indicate that MISO is at elevated risk of operating reserve shortfalls during periods of high demand or low resource output.
- The performance of wind and solar generators during periods of high electricity demand is a key factor in determining whether system operators need to employ operating mitigations, such as maximum generation declarations and energy emergencies; MISO has over 31,000 MW of installed wind capacity and 18,245 MW of installed solar capacity; however, the historically based on-peak capacity contribution is 5,616 MW and 9,123 MW, respectively.
- Since last summer, over 1,400 MW of thermal generating capacity has been retired in MISO, and the new generation that has been added is predominantly solar (8,080 MW nameplate/4,140 MW on-peak).
- MISO's most recent energy assessment reveals that the period of highest energy shortfall risk has shifted from July to August.

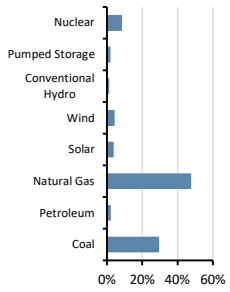
On-Peak Reserve Margin



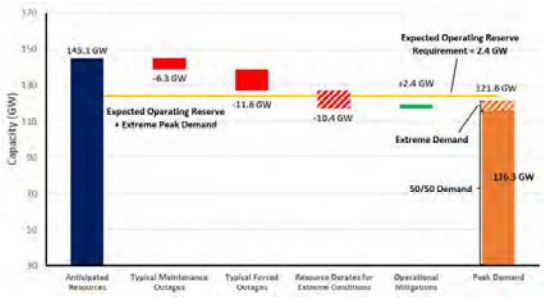
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak-demand scenarios. Above-normal summer peak load and extreme generator outage conditions could result in the need to employ operating mitigations (e.g., load-modifying resources and energy transfers from neighboring systems) and EEAs. Emergency declarations that can only be called upon when available generation is at maximum capability are necessary to access load-modifying resources (demand response) when operating reserve shortfalls are projected.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Maintenance Outages: Rolling five-year summer average of maintenance and planned outages

Forced Outages: Five-year average of all outages that were not planned

Extreme Derates: Maximum historical generation outages

Operational Mitigations: A total of 2.4 GW capacity resources available during extreme operating conditions



MRO-Manitoba Hydro

Manitoba Hydro is a provincial Crown corporation and one of the largest integrated electricity and natural gas distribution utilities in Canada. Manitoba Hydro is a leader in providing renewable energy and clean-burning natural gas. Manitoba Hydro provides electricity to approximately 608,500 electric customers in Manitoba and natural gas to approximately 293,000 customers in southern Manitoba. Its service area is the province of Manitoba, which is 251,000 square miles. Manitoba Hydro is winter peaking. Manitoba Hydro is its own Planning Coordinator (PC) and BA. Manitoba Hydro is a coordinating member of MISO, which is the RC for Manitoba Hydro.

Highlights

- Manitoba Hydro is not anticipating any operational challenges and/or emerging reliability issues in its assessment area for Summer 2025; the Anticipated Reserve Margin for Summer 2025 exceeds the 12% Reference Margin Level.
- While Manitoba Hydro experienced demand growth in the past year, the growth is less than the recent reduction in firm export contracts.
- Manitoba Hydro water supply conditions are below average but improved from this time last year, and above-average winter snowfall will favorably impact spring runoff.
- Manitoba Hydro expects to reliably supply its internal demand and export obligations even if extreme drought develops throughout the year.

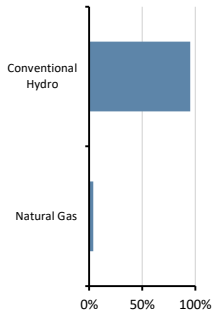
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

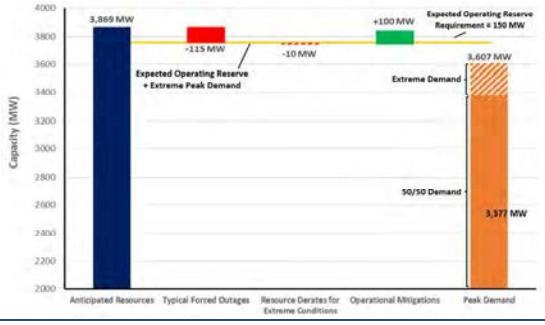
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: (50/50) Demand with allowance for extreme demand based on extreme summer weather scenario of 35.4 C (96 F)

Forced Outages: Typical forced outages

Extreme Derates: Summer wind capacity accreditation of 18.1% of nameplate rating based on MISO seasonal analysis

Normal hydro generation expected for this summer.

Operational Mitigations: Utilize Curtailable Rate Program to manage peak demand; utilize operating reserve if additional measures required



MRO-SaskPower

MRO-SaskPower is an assessment area in the Saskatchewan province of Canada. The province has a geographic area of 651,900 square kilometers (251,700 square miles) and a population of approximately 1.1 million. Peak demand is experienced in the winter. The Saskatchewan Power Corporation (SaskPower) is the PC and RC for the province of Saskatchewan and is the principal supplier of electricity in the province. SaskPower is a provincial Crown corporation and, under provincial legislation, is responsible for the reliability oversight of the Saskatchewan BES and its Interconnections.

Highlights

- Although Saskatchewan is mainly a winter-peaking region, summer can also bring high electricity demand due to extreme heat.
- Each year, SaskPower works with Manitoba Hydro on a joint summer operating study with input from the Western Area Power Administration and Basin Electric to develop operational guidelines to address any potential challenges.
- The expected number of hours with an operating reserve shortfall between June and September is about 0.65 hours, assuming maximum available imports. The risk of shortfall increases if major unplanned generator outages coincide with scheduled maintenance during peak demand months (June to September). For Summer 2025, the projected probability of experiencing a generation forced outage exceeding 350 MW stands at 21.5%. This number represents an approximation of the likelihood of encountering a generation forced outage surpassing the 350 MW threshold during any given hour of the summer period.
- If extreme heat coincides with significant generation outages, SaskPower will act by activating demand-response programs, arranging short-term power imports from neighboring utilities, and, if necessary, implementing temporary load interruptions to maintain grid stability.

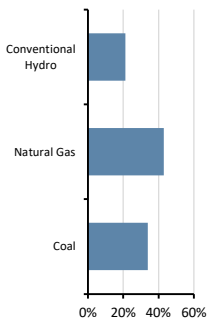
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand and outage conditions. Above-normal summer peak load and outage conditions are likely to result in the need to employ operating mitigations (e.g., demand response and transfers) and EEAs.

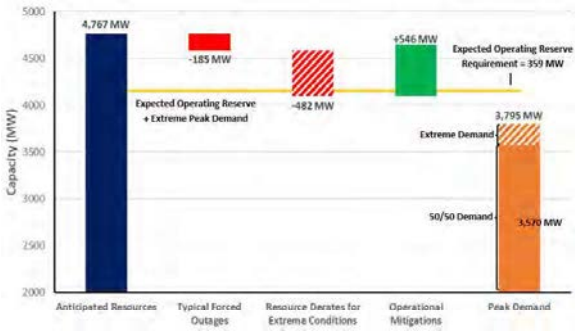
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and above-normal scenario based on peak demand with lighting and all consumer loads

Forced Outages: Estimated by using SaskPower forced outage model

Extreme Derates: Estimated resources unavailable in extreme conditions

Operational Mitigations: Estimated non-firm imports and standby generators on 2–7-day notice



MRO-SPP

SPP PC's footprint covers 546,000 square miles and encompasses all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. The SPP long-term assessment is reported based on the PC footprint, which touches parts of the MRO Regional Entity and the WECC Regional Entity. The SPP assessment area footprint has approximately 61,000 miles of transmission lines, 756 generating plants, and 4,811 transmission-class substations, and it serves a population of more than 18 million.

Highlights

- SPP projects a low likelihood of any emerging reliability issues impacting the area for the 2025 Summer season.
- Generation availability is not expected to be impacted by fuel shortages or river conditions this summer.
- BA generation capacity deficiency risks remain depending on wind generation output levels and unanticipated generation outages in combination with high load periods.
- Using the current operational processes and procedures, SPP will continue to assess the resource needs for the 2025 Summer season and will adjust generation and energy supply portfolios as needed to ensure that real-time energy sufficiency is maintained throughout the summer.

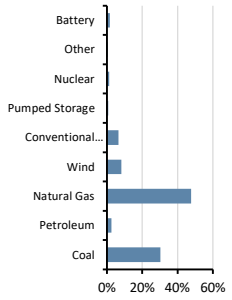
Risk Scenario Summary

Expected resources are sufficient to meet operating reserve requirements under normal peak-demand and outage scenarios. Above-normal summer peak load, low wind conditions, and higher-than-normal forced outages could result in the need for operating mitigations (e.g., demand response and transfers from neighboring systems) and EEAs.

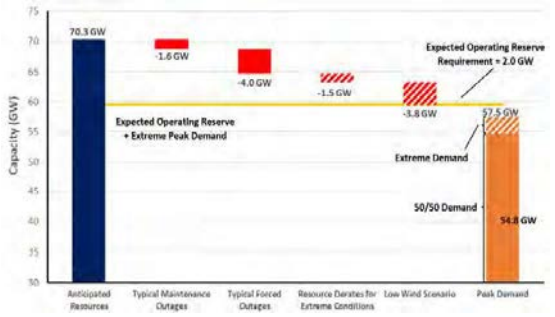
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand is a 5% increase from net internal demand

Maintenance and Forced Outages: Represent five-year historical averages; calculated from SPP's generation assessment process

Extreme Derates: Additional unavailable capacity from operational data at high-demand periods

Low Wind Scenario: Derates reflecting a low-wind day in the summer



NPCC-Maritimes

The Maritimes assessment area is a winter-peaking NPCC area that contains two BAs. It is comprised of the Canadian provinces of New Brunswick, Nova Scotia, and Prince Edward Island and the northern portion of Maine, which is radially connected to the New Brunswick power system. The area covers 58,000 square miles with a total population of 1.9 million.

Highlights

- As Maritimes is a winter-peaking system, no issues are expected for the upcoming summer assessment period with sufficient firm capacity to meet forecast peak demand. If an event were to occur, emergency operations and planning procedures are in place.
- Probabilistic analysis performed by NPCC for the NPCC *Summer Reliability Assessment* found negligible LOLH and EUE for the expected load and resource levels this summer. A scenario with an extreme high load shape produced minimal amounts of cumulative LOLE (<0.089 days/period), LOLH (<0.4 hours/period), or EUE (< 16.5 MWh/period) over the May–September summer period with the highest risk occurring in July and August.
- Dual-fueled units will have sufficient supplies of heavy fuel oil (HFO) on site to sustain operations in the event of natural gas supply interruptions.

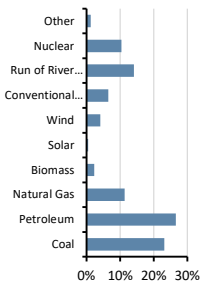
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak-demand scenarios. Above-normal summer peak load or extreme outage conditions could necessitate operating mitigations (e.g., demand response and non-firm transfers) and EEAs.

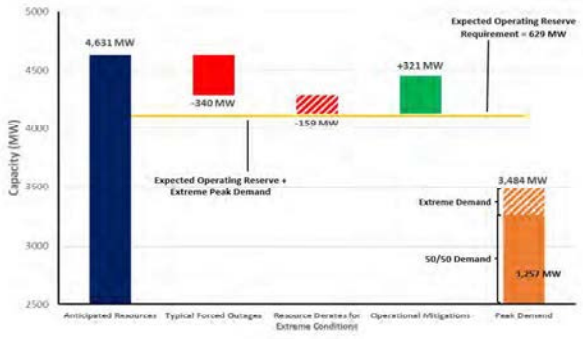
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (above 90/10) extreme demand forecast

Forced Outages: Based on historical operating experience

Extreme Derates: A low-likelihood scenario resulting in an additional 50% derate in the remaining capacity of both natural gas and wind resources under extreme conditions

Operational Mitigations: Imports anticipated from neighbors during emergencies, (e.g. New Brunswick Power System Operator can increase import capability from 200 MW to 550 MW under emergency operations for up to 30 minutes)



NPCC-New England

NPCC-New England is an assessment area consisting of the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont that is served by ISO New England (ISO-NE) Inc. ISO-NE is a regional transmission organization that is responsible for the reliable day-to-day operation of New England's bulk power generation and transmission system, administration of the area's wholesale electricity markets, and management of the comprehensive planning of the regional BPS.

The New England BPS serves approximately 14.5 million customers over 68,000 square miles.

Highlights

- ISO-NE forecasts adequate transmission capability and manageable capacity margins to meet the expected peak demand.
- Probabilistic analysis performed by NPCC for the NPCC *Summer Reliability Assessment* identified small amounts of cumulative LOLE, LOLH, and EUE for the expected load with anticipated resources for the summer. A reduced resources and highest peak load level scenario resulted in an estimated cumulative LOLE risk of 4.369 days/period, with associated LOLH (19.554 hours/period) and EUE (19,847 MWh/period). The highest risk occurs in June, with some risk in July and August.
- The NPCC 2025 *Summer Reliability Assessment* will be approved on or about May 12, 2025, and posted on NPCC's website.

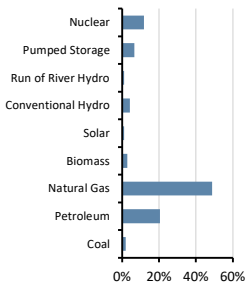
On-Peak Reserve Margin



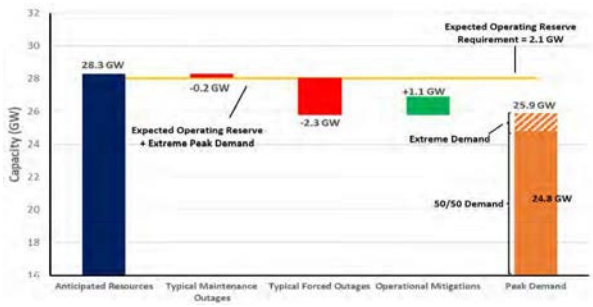
Risk Scenario Summary

Expected resources do not meet operating reserve requirements under normal peak-demand and outage scenarios. Additional non-firm transfers are likely to be needed and available from neighbors. More severe conditions (e.g., above-normal summer peak load and outage conditions) could result in an EEA.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

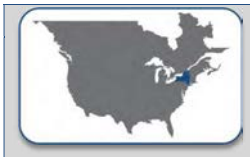
Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Peak net internal demand (50/50) and (90/10) extreme demand forecast

Maintenance Outages: Based on historical weekly averages

Typical Forced Outages: Based on seasonal capacity of each resource as determined by ISO-NE

Operational Mitigations: Based on load and capacity relief assumed available from invocation of ISO-NE operating procedures



NPCC-New York

NPCC-New York is an assessment area consisting of the New York ISO (NYISO) service territory. NYISO is responsible for operating New York's BPS, administering wholesale electricity markets, and conducting system planning. NYISO is the only BA within the state of New York. The BPS in New York encompasses over 11,000 miles of transmission lines and 760 power generation units and serves 20.2 million customers. For this *SRA*, the established Reference Margin Level is 15%. Wind, grid-connected solar PV, and run-of-river totals were derated for this calculation. However, New York requires load-serving entities to procure capacity for their loads equal to their peak demand plus an Installed Reserve Margin (IRM). The IRM requirement represents a percentage of capacity above peak load forecast and is approved annually by the New York State Reliability Council. The council approved the 2025–2026 IRM at 24.4%.

Highlights

- NYISO is not anticipating any operational issues for the upcoming summer operating period. Adequate reserve margins are anticipated.
- Probabilistic analysis performed by NPCC for the NPCC *Summer Reliability Assessment* found that use of New York's established operating procedures are sufficient to maintain a balance between electricity supply and expected 50/50 demand if needed to mitigate resource shortages during Summer 2025. Negligible cumulative LOLE (<0.018 days/period), LOLH (<0.054 hours/period), and EUE (33 MWh/period) risks were estimated over the summer May to September period for the expected load with expected resources for the summer. The highest peak load level with low likelihood reduced resource conditions resulted in an estimated cumulative LOLE risk (1.7 days/period), with associated LOLH (6.5 hours/period) and EUE (4860 MWh/period) with the highest risk occurring in July and August.
- The NPCC 2025 *Summer Reliability Assessment* will be approved on or about May 12, 2025, and posted on NPCC's website.

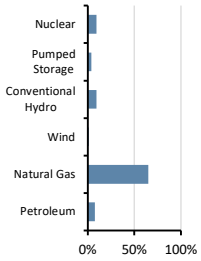
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios. Operating mitigations (e.g., demand response and transfers) may be needed to meet above-normal summer peak load and outage conditions.

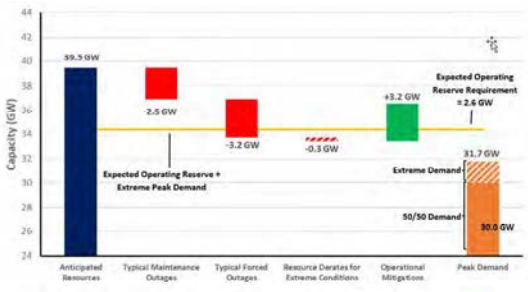
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) extreme demand forecast

Maintenance Outages: Based on historical performance and the new NYISO capacity accreditation process

Forced Outages: Based on historical five-year averages

Extreme Derates: Estimated resources unavailable in extreme conditions

Operational Mitigations: A total of 3.2 GW based on operational/emergency procedures in area emergency operations manual



NPCC-Ontario

NPCC-Ontario is an assessment area in the Ontario province of Canada. The Independent Electricity System Operator (IESO) is the BA for the province of Ontario. The province of Ontario covers more than 1 million square kilometers (415,000 square miles) and has a population of m16 million. Ontario is interconnected electrically with Québec, MRO-Manitoba, states in MISO (Minnesota and Michigan), and NPCC-New York.

Highlights

- Overall, Ontario is operating within a period where generation and transmission outages are more challenging to accommodate. The IESO is prepared and expects to have adequate supply for Summer 2025.
- The IESO has been actively coordinating and planning with market participants to maintain reliability.
- This season, the grid will benefit from increased capacity secured through the capacity auction and more planned projects, including new storage, coming into service.
- The IESO is working throughout 2025 to better integrate storage solutions into the electricity markets.
- Starting with this seasonal assessment, demand is forecasted by using probabilistic weather modeling, comparable to the methodology used in the IESO 18-month *Reliability Outlook* as opposed to the previous approach of using weather scenarios."

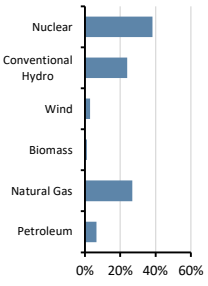
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

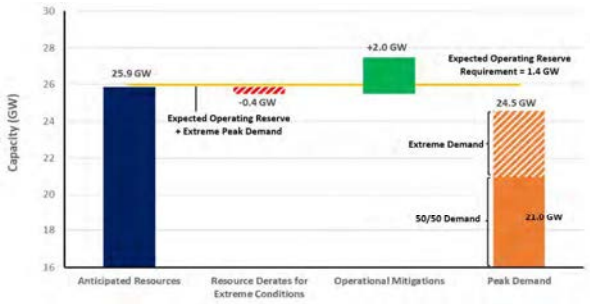
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50 forecast) and highest weather-adjusted daily demand based on 31 years of demand history, and extreme weather represents a 97/3 distribution of probabilistically modelled data

Extreme Derates: Derived from weather-adjusted temperature rating of thermal units and adjustments to expected hydro production for low water conditions

Operational Mitigations: The operational procedures used to mitigate extreme conditions total approximately 2,010 MW for the On-Peak Risk Scenario, consisting of imports, public appeals, and voltage reductions. Public appeals and voltage reductions were not included in the 2024 On-Peak Risk Scenario.



NPCC-Québec

The Québec assessment area (province of Québec) is a winter-peaking NPCC area that covers 595,391 square miles with a population of 8 million. Québec is one of the four Interconnections in North America; it has ties to Ontario, New York, New England, and the Maritimes consisting of either high-voltage direct current ties, radial generation, or load to and from neighboring systems.

Highlights

- The Québec area forecasted summer peak demand is 23,283 MW during the week beginning August 3, 2025, with a forecasted net margin of 5,698 MW (24.5%).
- Resource adequacy issues are not expected this summer.
- The Québec area expects to be able to assist other areas.
- Modeling was made more precise this year with the inclusion of summer demand-response programs, dispatchable demand-side management (DSM), and weekly modeling of the reserve requirements and bottled generation.

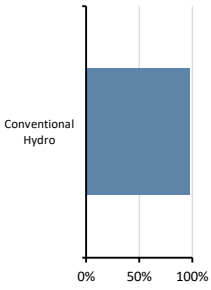
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

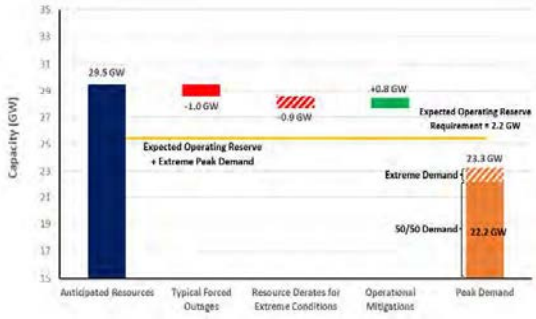
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenario: Net internal demand (50/50) and (90/10) demand forecast

Operational mitigations: An operational procedure used to mitigate extreme conditions and not already included in margins is the depletion of some operating reserves by 750 MW.



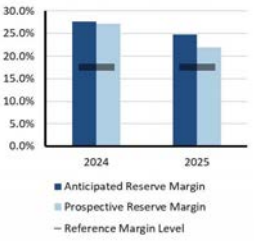
PJM

PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. PJM serves 65 million customers and covers 369,089 square miles. PJM is a BA, PC, Transmission Planner, Resource Planner, Interchange Authority, TOP, Transmission Service Provider, and RC.

Highlights

- PJM is forecasting 27% installed reserves (including expected committed demand response), which is above the target installed reserve margin of 17.7% necessary to meet the 1-day-in-10-years LOLE criterion.
- During extreme high temperatures that can cause record demand, PJM anticipates the need for demand-response resources to help reduce load at times this summer.

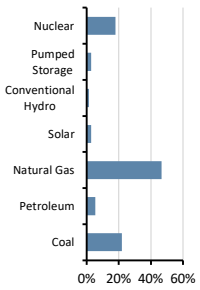
On-Peak Reserve Margin



Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Forced Outages: Based on historical data and trending

Extreme Derates: Accounts for reduced thermal capacity contributions due to performance in extreme conditions

Operational Mitigations: A total of 3 GW based on operational/emergency procedures



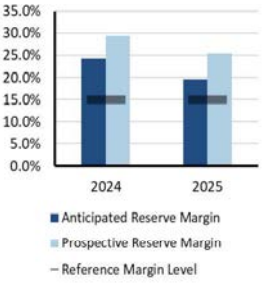
SERC-Central

SERC-Central is an assessment area within the SERC Regional Entity. SERC-Central includes all of Tennessee and portions of Georgia, Alabama, Mississippi, Missouri, and Kentucky. Historically a summer-peaking area, SERC-Central is beginning to have higher peak demand forecasts in winter. SERC is one of the six companies across North America that are responsible for the work under Federal Energy Regulatory Commission (FERC)-approved delegation agreements with NERC. SERC-Central is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

Highlights

- SERC-Central saw a sizable increase in its reserves last summer, but coal retirements this summer will result in SERC-Central having lower reserves.
- SERC-Central's anticipated resources meet operating reserve requirements under the expected conditions and under the summer risk period scenario.
- The probabilistic analysis metrics indicate adequate energy resources for the area.
- Entities perform resource studies to ensure resource adequacy to meet the summer peak demand and maintain the reliability of the system.
- Members of SERC-Central actively participate in the SERC working groups to perform coordinated studies and develop mitigating actions for any potential or emerging reliability impacts on transmission and resource adequacy.

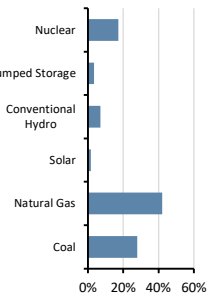
On-Peak Reserve Margin



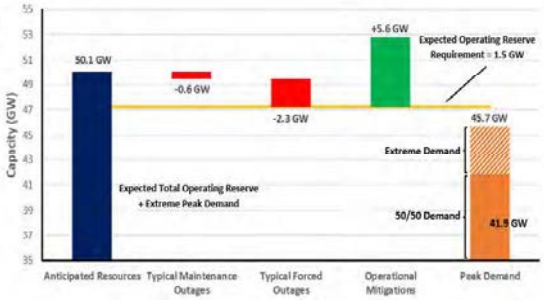
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios. More severe conditions (e.g., above-normal summer peak load and outage conditions) result in the need for additional non-firm transfers available from neighbors.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast based on extreme summer weather (equals or exceeds the (90/10) demand forecast)

Maintenance Outages: Adjusted for higher outages resulting from extreme summer temperatures and aggregated on a SERC subregional level

Forced Outages: Accounts for reduced thermal capacity contributions due to performance in extreme conditions

Operational Mitigations: 5.6 GW based on operational/emergency procedures



SERC-East

SERC-East is an assessment area within the SERC Regional Entity. SERC-East includes North Carolina and South Carolina. Historically a summer-peaking area, SERC-East is beginning to have higher peak demand forecasts in winter. SERC is one of the six companies across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

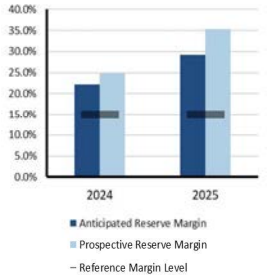
Highlights

- SERC-East's reserves are largely unchanged compared to the reference margin as compared to last summer's assessment.
- SERC-East's anticipated resources meet operating reserve requirements under the expected conditions and under the summer risk period scenario.
- While the last probabilistic analysis indicated that SERC-East could face potential unserved energy in summer, the 2026 and 2028 probabilistic analysis found the SERC-East unserved energy risk has shifted to winter mornings.
- Members of SERC-East actively participate in the SERC working groups to perform coordinated studies and develop mitigating actions for any potential or emerging reliability impacts on transmission and resource adequacy.

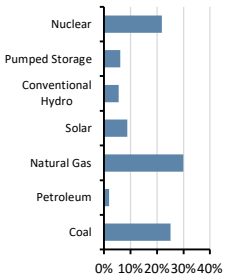
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast based on extreme summer weather (equals or exceeds the (90/10) demand forecast)

Maintenance Outages: Adjusted for higher outages resulting from extreme summer temperatures and aggregated on a SERC subregional level

Forced Outages: Accounts for reduced thermal capacity contributions due to performance in extreme conditions

Operational Mitigations: A total of 45 MW based on operational/emergency procedures



SERC-Florida Peninsula

SERC-Florida Peninsula is a summer-peaking assessment area within SERC. SERC is one of the six companies across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

Highlights

- SERC Florida-Peninsula's anticipated resources meet operating reserve requirements under the expected conditions and under the summer risk period scenario.
- The probabilistic analysis metrics indicate adequate energy resources for the subregion during the summer.
- Members of SERC-Florida Peninsula actively participate in the SERC working groups to perform coordinated studies and develop mitigating actions for any potential or emerging reliability impacts on transmission and resource adequacy.
- Entities have not identified any emerging reliability issues or operational concerns for the upcoming summer season.

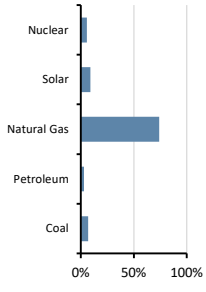
On-Peak Reserve Margin



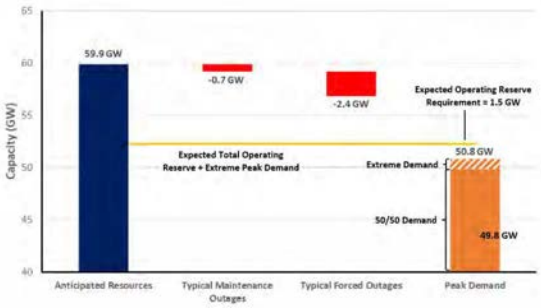
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast based on extreme summer weather (equals or exceeds the (90/10) demand forecast)

Maintenance Outages: Adjusted for higher outages resulting from extreme summer temperatures and aggregated on a SERC subregional level

Forced Outages: Accounts for reduced thermal capacity contributions due to performance in extreme conditions



SERC-Southeast

SERC-Southeast is a summer-peaking assessment area within the SERC Regional Entity. SERC-Southeast includes all or portions of Georgia, Alabama, and Mississippi. SERC is one of the six companies across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

Highlights

- An area within SERC-Southeast notes that natural gas pipeline constraints could impact reliability in summer, but this is not expected to pose a significant summer operational challenge.
- SERC-Southeast's anticipated resources meet operating reserve requirements under the expected conditions and under the summer risk period scenario.
- The probabilistic analysis metrics indicate adequate energy resources for the subregion.
- Members of SERC-Southeast actively participate in the SERC working groups to perform coordinated studies and develop mitigating actions for any potential or emerging reliability impacts on transmission and resource adequacy.

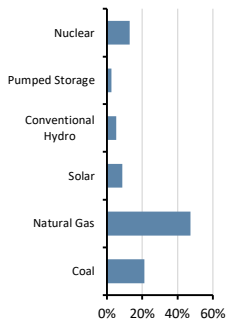
On-Peak Reserve Margin



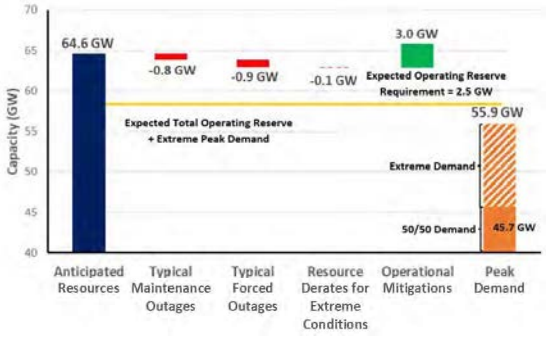
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast based on extreme summer weather (equals or exceeds the (90/10) demand forecast)

Maintenance Outages: Adjusted for higher outages resulting from extreme summer temperatures and aggregated on a SERC subregional level

Forced Outages: Accounts for reduced thermal capacity contributions due to performance in extreme conditions

Extreme Derates: Estimated resources unavailable in extreme conditions

Operational Mitigations: A total of 3 GW based on operational/emergency procedures



Texas RE-ERCOT

The Electric Reliability Council of Texas (ERCOT) is the independent system operator (ISO) for the ERCOT Interconnection and is located entirely in the state of Texas; it operates as a single BA. It also performs financial settlement for the competitive wholesale bulk-power market and administers retail switching for nearly 8 million premises in competitive choice areas. ERCOT is governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas Legislature. ERCOT is summer-peaking, and the forecasted summer peak load month is August. It covers approximately 200,000 square miles, connects over 52,700 miles of transmission lines, has over 1,100 generation units, and serves more than 26 million customers. Texas RE is responsible for the Regional Entity functions described in the Energy Policy Act of 2005 for ERCOT. On November 3, 2022, the Public Utility Commission of Texas issued an order directing ERCOT to assume the duties and responsibilities of the reliability monitor for the Texas grid.

Highlights

- ERCOT expects to have sufficient operating reserves for the August peak load hour given normal summer system conditions.
- ERCOT's probabilistic risk assessment indicates a low risk of having to declare EEAs during the expected August (and summer) peak load day; the EEA probability for the highest-risk hour—hour ending 9:00 p.m.—is 3.6%. The likelihood of an EEA is down significantly from the 2024 SRA due to almost a doubling of battery energy storage capacity and improved energy availability reflecting new battery storage and operational rules.
- Continued robust growth in both loads and intermittent renewable resources drives a higher risk of emergency conditions in the evening hours when solar generation ramps down and loads remain elevated.
- The South Texas IROL continues to present a risk of ERCOT directing system-wide firm load shedding to remain within IROL limits. This risk has been mitigated by updating transmission line dynamic ratings and switching actions to divert power away from the most limiting transmission circuits. The South Texas transmission limits are expected to be needed at least until the San Antonio South Reliability Project is placed in service, which is anticipated to be in Summer 2027.
- ERCOT will release its own August 2025 Monthly Outlook for Resource Adequacy on June 6.

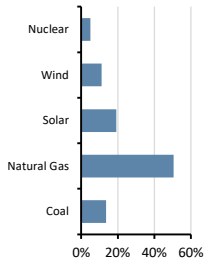
Risk Scenario Summary

Expected resources meet operating reserve requirements for the peak demand hour scenario. However, there is a risk of supply shortages during evening hours (when solar generation ramps down and demand remains high) if there are conventional generation forced outages or extreme low-wind conditions.

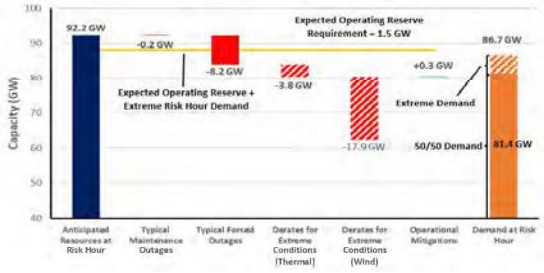
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario (9:00 p.m. local time)



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at hour ending 9 p.m. local time as solar PV output is diminished and demand remains high

Demand Scenarios: Net internal demand (50/50) and extreme demand (95/5) based on August peak load

Forced Outages: Based on the 95th percentile of historical averages of forced outages for June through September weekdays, hours ending 3:00–8:00 p.m. local time for the last three summer seasons

Extreme Derates: Based on the 90th percentile of thermal forced outages for peak August load day

Low Wind Scenario: Based on the 10th percentile of historical averages of hourly wind for June through September, hours ending 1:00–9:00 p.m. local time

Operational Mitigations: Additional capacity from switchable generation and additional imports



WECC-Alberta

WECC-Alberta is a winter-peaking assessment area in the WECC Regional Entity that consists of the province of Alberta. It has 16,369 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity.

Highlights

- Anticipated and prospective reserve margins are projected to remain above the Reference Margin Level.
- All resource margins have increased by about 50% since last summer with the addition of 23.2% new capacity, including almost 2,700 MW of new natural gas capacity, 1,200 MW of new wind (+27%), 200 MW of new solar (+13%), and 54 MW of new energy storage systems (+27.5%).
- The peak hour has moved earlier, to 3:00 p.m. from 4:00 p.m., still in late July.
- High temperatures, import limitations, and low or declining renewable output during summer evenings can result in grid alerts.
- Wildfires can threaten generating assets and transmission infrastructure requiring invocation of Alberta Electric System Operator (AESO) protocols that include instructing available assets and long lead-time assets to deliver energy up to their maximum capability, calling upon demand response, and maximizing import capability.

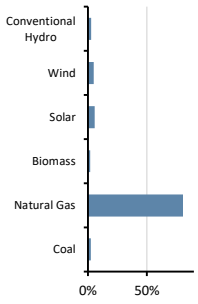
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

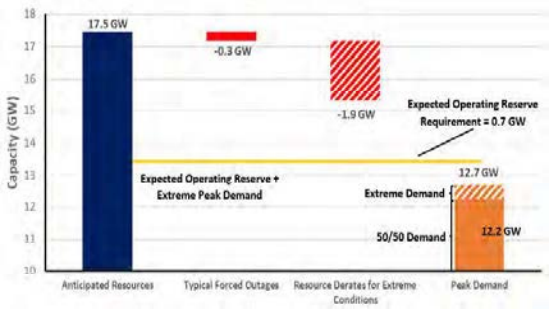
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) point of resource performance distribution



WECC-Basin

WECC-Basin is a summer-peaking assessment area in the WECC Regional Entity that includes Utah, southern Idaho, and a portion of western Wyoming, covering Idaho Power and PacifiCorp's eastern Balancing Authority Area. The population of this area is approximately 5.4 million. It has 15,910 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024 SRA.*

Highlights

- Total internal expected demand has increased 8% and demand response has increased almost 28% for a net internal demand increase of 7.2%.
- Reserve margins are not anticipated to fall below the reference margin (14%) for the upcoming summer; an early July peak is expected at around 3:00 p.m.
- During periods of contingency reserve shortage, EEAs may be declared in the region to obtain reserves from the Northwest Power Pool.
- Seasonal fluctuations in hydro supply require monitoring and forecasting to have high certainty that these resources will meet anticipated capacity; the Summer 2025 drought outlook for the United States indicates minimal drought conditions in Idaho and some drought areas in Utah this summer.
- Wildfires near wind generation can result in safety curtailments, and fire damage to transmission lines interconnected to hydro sites can present restoration challenges.

Risk Scenario Summary

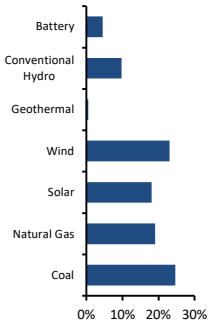
Expected resources meet operating reserve requirements under the assessed scenarios with imports.

On-Peak Reserve Margin

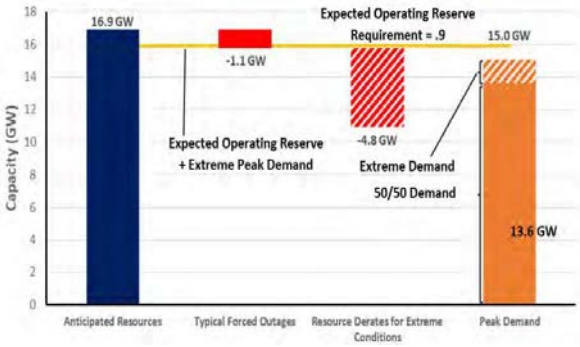
(Note: year comparison not available)



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) resource performance distribution at peak hour



WECC-British Columbia

WECC-British Columbia (BC) is a winter-peaking assessment area in the WECC Regional Entity that consists of the province of British Columbia. It has 11,184 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity.

Highlights

- Existing capacity reserve margin has increased from 19% to 22%, and anticipated and prospective reserve margin from 19% to 24%.
- Reserve margins are not anticipated to fall below the reference margin for the upcoming summer.
- The peak hour is forecast for early August at 4:00 p.m., two hours earlier than last summer's outlook of 6:00 p.m.
- About 60% of hydro owned or contracted energy comes from the Columbia and Peace basins. Heavy precipitation in Fall 2024 mitigated the impact of below-average snowpack the previous winter, resulting in hydro storage tracking close to historical averages as of Spring 2025.
- Wildfires can affect the transmission network and generator availability and have caused energy emergencies on the electric system in the past.

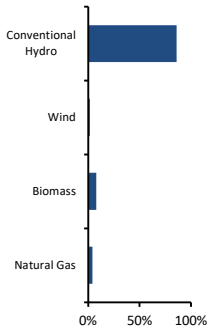
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

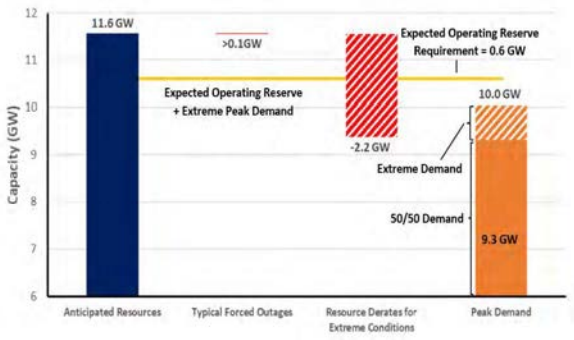
On-Peak Reserve Margin



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) resource performance distribution at peak hour



WECC-California

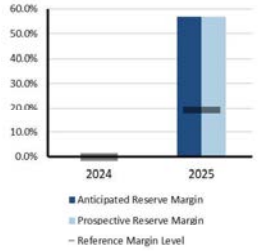
WECC-California is a summer-peaking assessment area in the Western Interconnection that includes most of California and a small section of Nevada. The assessment area has a population of over 42.5 million people. The area includes the California ISO, Los Angeles Department of Water and Power, Turlock Irrigation District, and the Balancing Area of Northern California. It has 32,712 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-California is a new assessment area in 2025 that was part of WECC-CA/MX in the 2024 SRA.*

Highlights

- Demand response is down 8.6% since last summer, existing-certain capacity is up 5.8%, and Tier 1 planned capacity is up 41.2% for a net increase in anticipated resources of 9%; anticipated and prospective reserve margins are up by 11.4%. The peak hour is still forecasted for early September around 4:00 p.m.
- Reserve margins are not anticipated to fall below the reference margin for the upcoming summer, and probabilistic assessment of normal and extreme resource/demand scenarios reveal no EUE or LOLH.
- Wildfires can and have threatened both the California Oregon Intertie line, resulting in import capability limitations.
- Prolonged elevated demand during heat waves in combination with thermal resource derates and forced outage rates present significant risk.
- An influx of IBRs and corresponding reduction in system inertia can potentially trigger system reliability issues and require additional regulation, flexible ramp, and future imbalance reserve requirements.
- Increased solar penetrations in this region along with changing load patterns from elevated temperatures and residential demand are shifting the hours with the most challenging resource adequacy needs later into the evening rather than traditional afternoon gross peak load periods.

On-Peak Reserve Margin

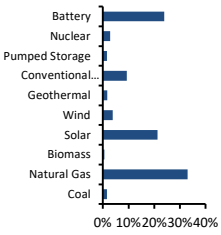
(Note: year comparison not available)



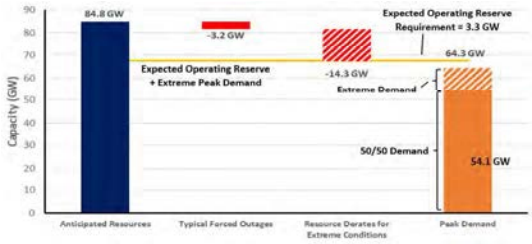
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios, and a probabilistic assessment of normal and extreme resource/demand scenarios reveals neither EUE nor LOLH.

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) at risk hour and (90/10) demand forecast at risk hour

Forced Outages: Estimated using market forced outage model

Extreme Derates: On natural gas units based on historical data and manufacturer data for temperature performance and outages



WECC-Mexico

WECC-Mexico is a summer-peaking assessment area in the Western Interconnection that includes the northern portion of the Mexican state of Baja California, which has a population of 3.8 million people and includes CENACE. It has 1,568 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Mexico is a new assessment area in 2025 that was part of WECC-CA/MX in the 2024 SRA.*

Highlights

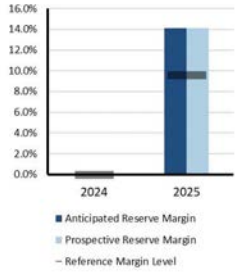
- Total and net internal expected (50/50) demand are up 6.8%, existing-certain capacity is up 29.8% or 989 MW, and Tier 1 planned capacity has fallen 100% to zero, leading to a decrease in the anticipated reserve margin from 22.9% down to 14.1%
- The peak hour is expected to occur in early August around 4:00 p.m.
- Operating reserves are a concern in this region during periods of extreme heat and elevated demand. High loading on Path 45 (See: WECC Path Rating Catalog) coupled with outages or derates to large thermal assets in this region can result in the declaration of an EAA and a request for assistance from RC West.

Risk Scenario Summary

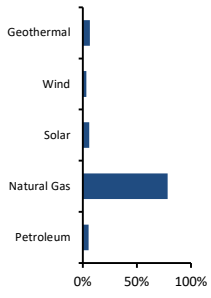
Expected resources at normal peak demand and outage conditions require some imports to maintain operating reserves. Thus, above-normal demand, high forced outage conditions, or transmission derates in the neighboring area could place WECC-Mexico in an energy emergency.

On-Peak Reserve Margin

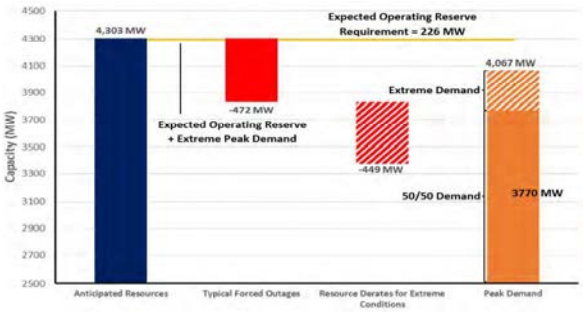
(Note: year comparison not available)



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) resource performance distribution at peak hour



WECC-Rocky Mountain

WECC-Rocky Mountain is a summer-peaking assessment area in the Western Interconnection that includes Colorado, most of Wyoming, and parts of Nebraska and South Dakota. The population of the area is approximately 6.7 million. It covers the balancing areas of the Public Service Company of Colorado and the Western Area Power Administration's Rocky Mountain Region. It has 18,797 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Rocky Mountain is a new assessment area in 2025 that was part of WECC-NW in the 2024 SRA.*

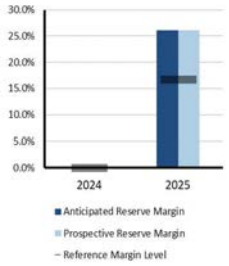
Highlights

- The reserve margins (existing-certain 25% and anticipated and prospective 26%) are not anticipated to fall below the reference margin (17%) for Summer 2025.
- Total and net internal demand (50/50) is up 25% or almost 2,800 MW, leading to a decline in the Anticipated Reserve Margin by almost a third.
- During the summer, there is increased load and decreased market purchase availability. Low wind availability and ramping scarcity events are a concern.
- Environmental and ecological factors have contributed to a rise in wildfire frequency and shortening of the fire return interval in the Rocky Mountain region, which, in addition to having caused generation outages, threatens rural co-ops disproportionately due to the extensive line buildout over remote regions.

Risk Scenario Summary

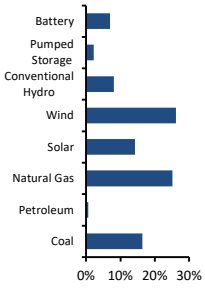
Expected resources meet operating reserve requirements under assessed scenarios with imports.

On-Peak Reserve Margin

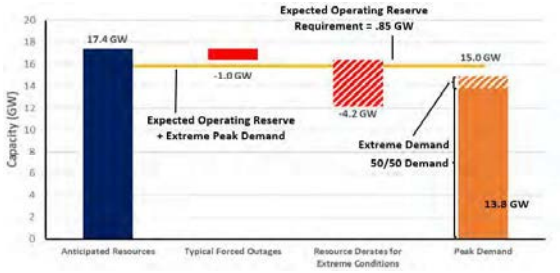


(Note: year comparison not available)

On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy occurs at the hour of peak demand

Demand Scenarios: Net internal demand (50/50) at risk hour and (90/10) demand forecast at risk hour

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) scenario



WECC-Northwest

WECC-Northwest is a winter-peaking assessment area in the WECC Regional Entity. The area includes Montana, Oregon, and Washington and parts of northern California and northern Idaho. The population of the area is approximately 13.6 million. It has 32,751 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Northwest is a new assessment area in 2025 that was part of a larger WECC-NW footprint in the 2024 SRA*.

Highlights

- The reserve margins (existing-certain 29% and anticipated and prospective 32%) are not anticipated to fall below the reference margin (23%) for the upcoming summer. An extreme summer peak load may be around 32,740 MW.
- Typical forced outages are forecast to be 771 MW, with derates for thermal under extreme conditions to be 1,584 MW and 2,649 MW for wind. The expected operating reserve requirement on peak is 1,750 MW.
- Extreme heat corresponds with elevated loads, reduced transmission ratings, and temperature derates of thermal resources, which can strain resource adequacy and grid reliability.
- Seasonal hydro variability is a risk.

Risk Scenario Summary

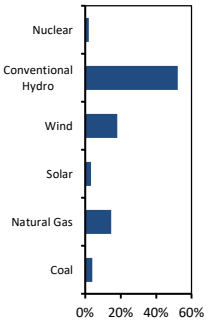
Expected resources meet operating reserve requirements under assessed scenarios with imports.

On-Peak Reserve Margin

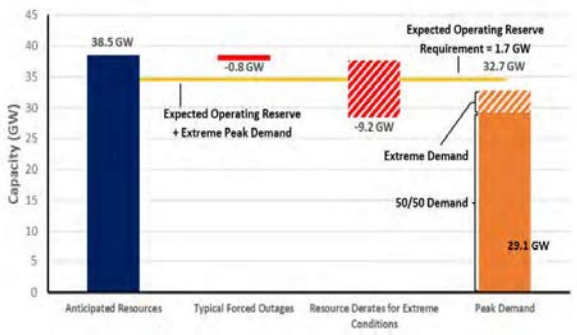
(Note: year comparison not available)



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy occurs at the hour of peak demand

Demand Scenarios: Net internal demand (50/50) at risk hour and (90/10) demand forecast at risk hour

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) scenario



WECC-Southwest

WECC-Southwest is a summer-peaking assessment area in the Western Interconnection that includes all of Arizona and New Mexico, most of Nevada, and small parts of California and Texas. The area has a population of approximately 13.6 million. It has 23,084 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025 SRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Southwest is a new, larger assessment area in 2025 that now includes a portion of WECC-NW in the 2024 SRA.*

Highlights

- Anticipated Reserve Margins for the summer are 22%, exceeding the Reference Margin Level for reliability calculated by WECC.
- WECC's probabilistic analysis indicates that the area is not expected to encounter LOLH or EUE under a range of demand and resource conditions.
- The peak hour is expected to occur in early July around 5:00 p.m., when solar generation output begins to diminish.
- Wide-area heat events or wildfires that affect resource and transmission availability across the western interconnection area a reliability concern for the Southwest. Firm imports may be limited at this time if neighboring areas are also experiencing peak loads, limiting energy availability to export to the Southwest.

Risk Scenario Summary

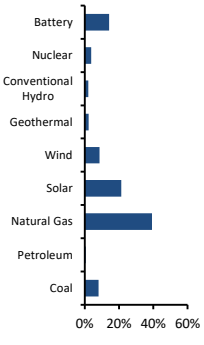
Expected resources meet operating reserve requirements under assessed scenarios with imports.

On-Peak Reserve Margin

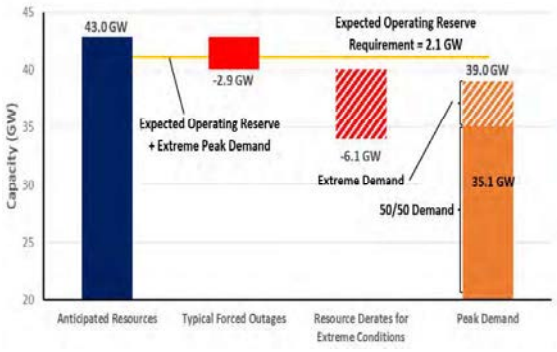
(Note: year comparison not available)



On-Peak Fuel Mix



2025 Summer Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy occurs at the hour of peak demand (5:00 p.m. local)

Demand Scenarios: Net internal demand (50/50) at risk hour and (90/10) demand forecast

Forced Outages: Average seasonal outages

Extreme Derates: Using (90/10) scenario

Data Concepts and Assumptions

The table below explains data concepts and important assumptions used throughout this assessment.

General Assumptions
• Reliability of the interconnected BPS is comprised of both adequacy and operating reliability:
▪ Adequacy is the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times while taking into account scheduled and reasonably expected unscheduled outages of system components.
▪ Operating reliability is the ability of the electric system to withstand sudden disturbances, such as electric short-circuits or unanticipated loss of system components.
• The reserve margin calculation is an important industry planning metric used to examine future resource adequacy.
• All data in this assessment is based on existing federal, state, and provincial laws and regulations.
• Differences in data collection periods for each assessment area should be considered when comparing demand and capacity data between year-to-year seasonal assessments.
• A positive net transfer capability would indicate a net importing assessment area; a negative value would indicate a net exporter.
Demand Assumptions
• Electricity demand projections, or load forecasts, are provided by each assessment area.
• Load forecasts include peak hourly load[12] or total internal demand for the summer and winter of each year.[13]
• Total internal demand projections are based on normal weather (50/50 distribution)[14] and are provided on a coincident[15] basis for most assessment areas.
• Net internal demand is used in all reserve margin calculations, and it is equal to total internal demand then reduced by the amount of controllable and dispatchable demand response projected to be available during the peak hour.
Resource Assumptions
Resource planning methods vary throughout the North American BPS. NERC uses the categories below to provide a consistent approach for collecting and presenting resource adequacy. Because the electrical output of VERs (e.g., wind, solar PV) depends on weather conditions, their contribution to reserve margins and other on-peak resource adequacy analysis is less than their nameplate capacity.
Anticipated Resources: • **Existing-Certain Capacity**: Included in this category are commercially operable generating units or portions of generating units that meet at least one of the following requirements when examining the period of peak demand for the summer season: unit must have a firm capability and have a power purchase agreement with firm transmission that must be in effect for the unit; unit must be classified as a designated network resource; and/or, where energy-only markets exist, unit must be a designated market resource eligible to bid into the market. • **Tier 1 Capacity Additions**: This category includes capacity that either is under construction or has received approved planning requirements. • **Net Firm Capacity Transfers (Imports minus Exports)**: This category includes transfers with firm contracts.
Prospective Resources: Includes all anticipated resources plus the following: **Existing-Other Capacity**: Included in this category are commercially operable generating units or portions of generating units that could be available to serve load for the period of peak demand for the season but do not meet the requirements of existing-certain.

[12] https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf used in NERC Reliability Standards

[13] The summer season represents June–September and the winter season represents December–February.

[14] Essentially, this means that there is a 50% probability that actual demand will be higher and a 50% probability that actual demand will be lower than the value provided for a given season/year.

[15] Coincident: This is the sum of two or more peak loads that occur in the same hour. Noncoincident: This is the sum of two or more peak loads on individual systems that do not occur in the same time interval; this is meaningful only when considering loads within a limited period of time, such as a day, a week, a month, a heating or cooling season, and usually for not more than one year. SERC calculates total internal demand on a noncoincidental basis.

Reserve Margin Descriptions

Planning Reserve Margin: This is the primary metric used to measure resource adequacy; it is defined as the difference in resources (anticipated or prospective) and net internal demand then divided by net internal demand and shown as a percentage.

Reference Margin Level: The assumptions and naming convention of this metric vary by assessment area. The RML can be determined using both deterministic and probabilistic (based on a 0.1/year loss-of-load study) approaches. In both cases, this metric is used by system planners to quantify the amount of reserve capacity in the system above the forecasted peak demand that is needed to ensure sufficient supply to meet peak loads. Establishing an RML is necessary to account for long-term factors of uncertainty involved in system planning, such as unexpected generator outages and extreme weather impacts that could lead to increase demand beyond what was projected in the 50/50 load forecasted. In many assessment areas, an RML is established by a state, provincial authority, ISO/Regional Transmission Organization (RTO), or other regulatory body. In some cases, the RML is a requirement. RMLs may be different for the summer and winter seasons. If an RML is not provided by an assessment area, NERC applies 15% for predominantly thermal systems and 10% for predominantly hydro systems.

Seasonal Risk Scenario Chart Description

Each assessment area performed an operational risk analysis that was used to produce the seasonal risk scenario charts in the **Regional Assessments Dashboards**. The chart presents deterministic scenarios for further analysis of different resource and demand levels: The left **blue** column shows anticipated resources, and the two **orange** columns at the right show the two demand scenarios of the normal peak net internal demand and the extreme summer peak demand—both determined by the assessment area. The middle **red** or **green** bars show adjustments that are applied cumulatively to the anticipated resources, such as the following:

- Reductions for typical generation outages (i.e., maintenance and forced outages that are not already accounted for in anticipated resources)
- Reductions that represent additional outage or performance derating by resource type for extreme, low-probability conditions (e.g., drought condition impacts on hydroelectric generation, low-wind scenario affecting wind generation, fuel supply limitations, or extreme temperature conditions that result in reduced thermal generation output)
- Additional capacity resources that represent quantified capacity from operational procedures, if any, that are made available during scarcity conditions

Not all assessment areas have the same categories of adjustments to anticipated resources. Furthermore, each assessment area determined the adjustments to capacity based on methods or assumptions that are summarized below the chart. Methods and assumptions differ by assessment area and may not be comparable.

The chart enables evaluation of resource levels against levels of expected operating reserve requirement and the forecasted demand. Furthermore, the effects from extreme events can also be examined by comparing resource levels after applying extreme scenario derates and/or extreme summer peak demand.

Resource Adequacy

The Anticipated Reserve Margin (ARM), which is based on available resource capacity, is a metric used to evaluate resource adequacy by comparing the projected capability of anticipated resources to serve forecast peak demand.[16] Large year-to-year changes in anticipated resources or forecast peak demand (net internal demand) can greatly impact Planning Reserve Margin calculations. All assessment areas have sufficient ARMs to meet or exceed their RML for the summer 2025 as shown in **Figure 4**.

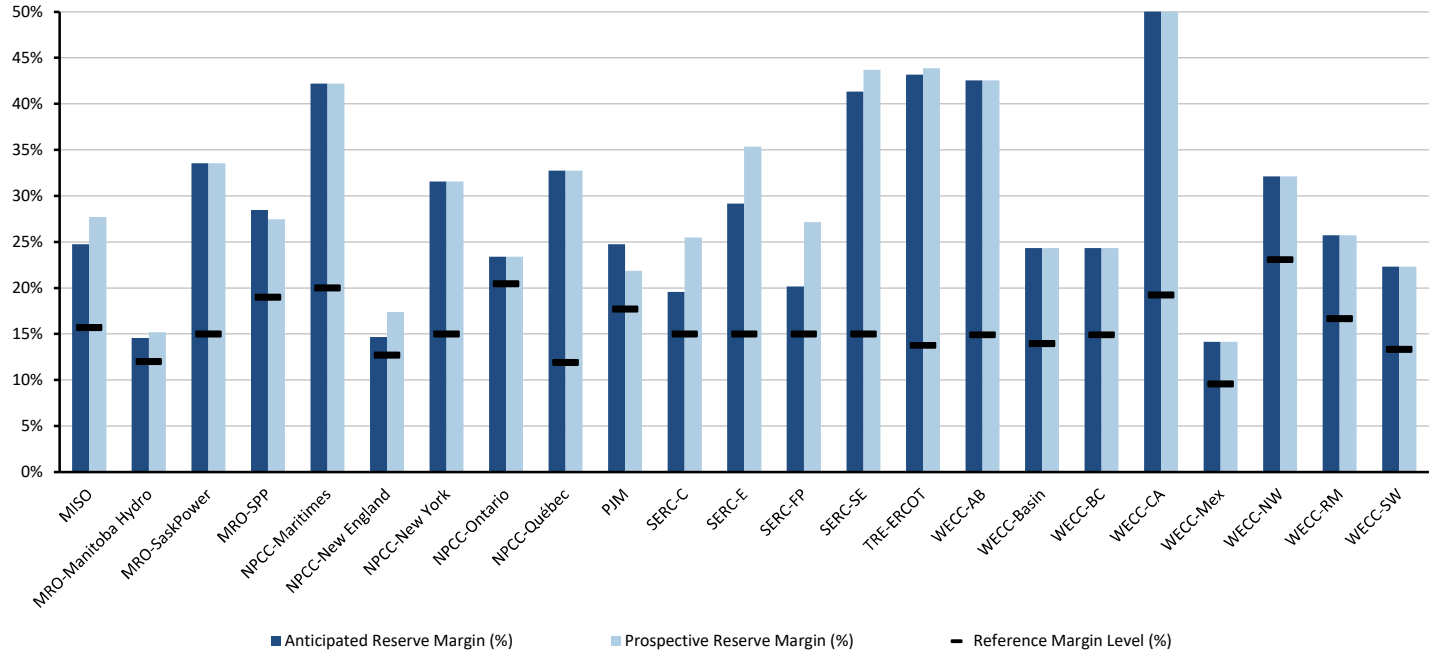


Figure 4: Summer 2025 Anticipated/Prospective Reserve Margins Compared to Reference Margin Level

[16] Generally, anticipated resources include generators and firm capacity transfers that are expected to be available to serve load during electrical peak loads for the season. Prospective resources are those that could be available but do not meet criteria to be counted as anticipated resources. Refer to the **Data Concepts and Assumptions** section for additional information on Anticipated/Prospective Reserve Margins, anticipated/prospective resources, and RMLs.

Changes from Year to Year

Figure 5 provides the relative change in the forecast ARMs from the 2024 Summer to the 2025 Summer. A significant decline can signal potential operational issues for the upcoming season. Additional details for each assessment area are provided in the Data Concepts and Assumptions and Regional Assessments Dashboards sections.

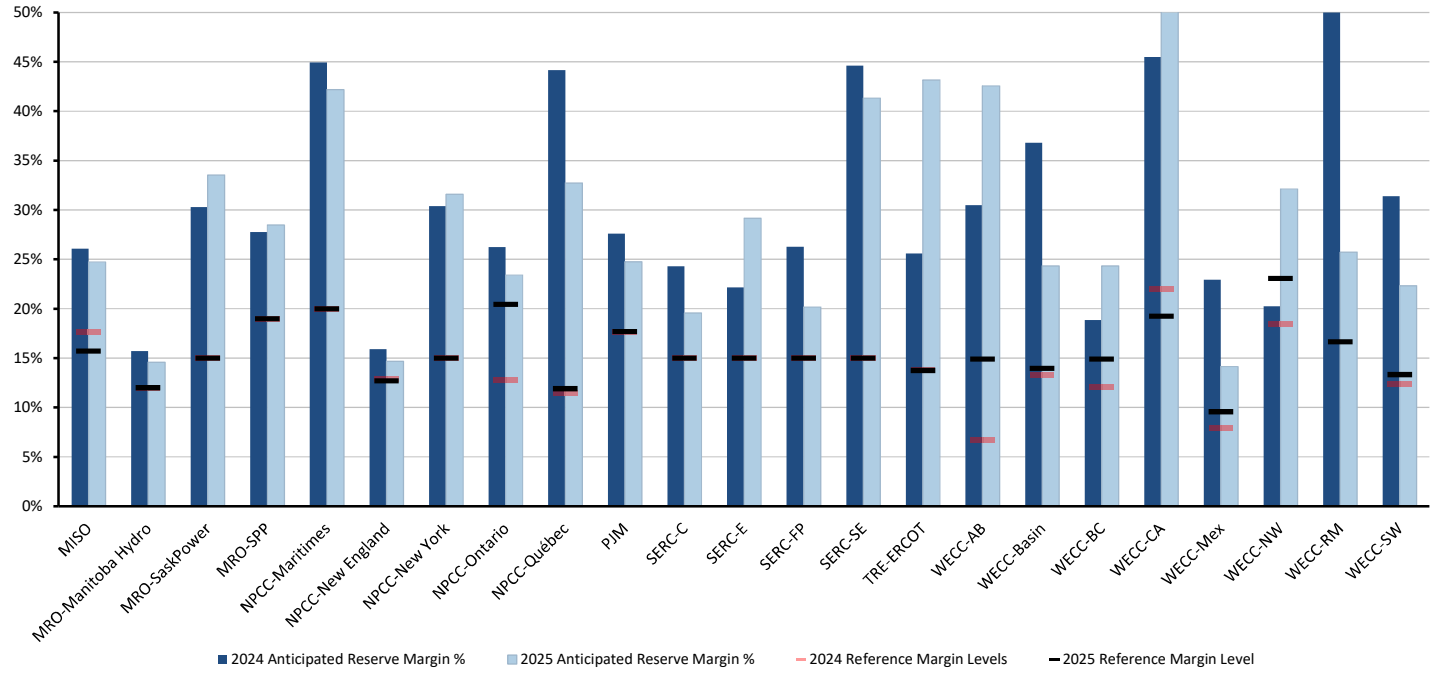


Figure 5: Summer 2024 and Summer 2025 Anticipated Reserve Margins Year-to-Year Change

Note: Yearly trends are not available for new WECC assessment areas in the United States and Baja California, Mexico.

Net Internal Demand

The changes in forecasted net internal demand for each assessment area are shown in Figure 6.[17] Assessment areas develop these forecasts based on historic load and weather information as well as other long-term projections.

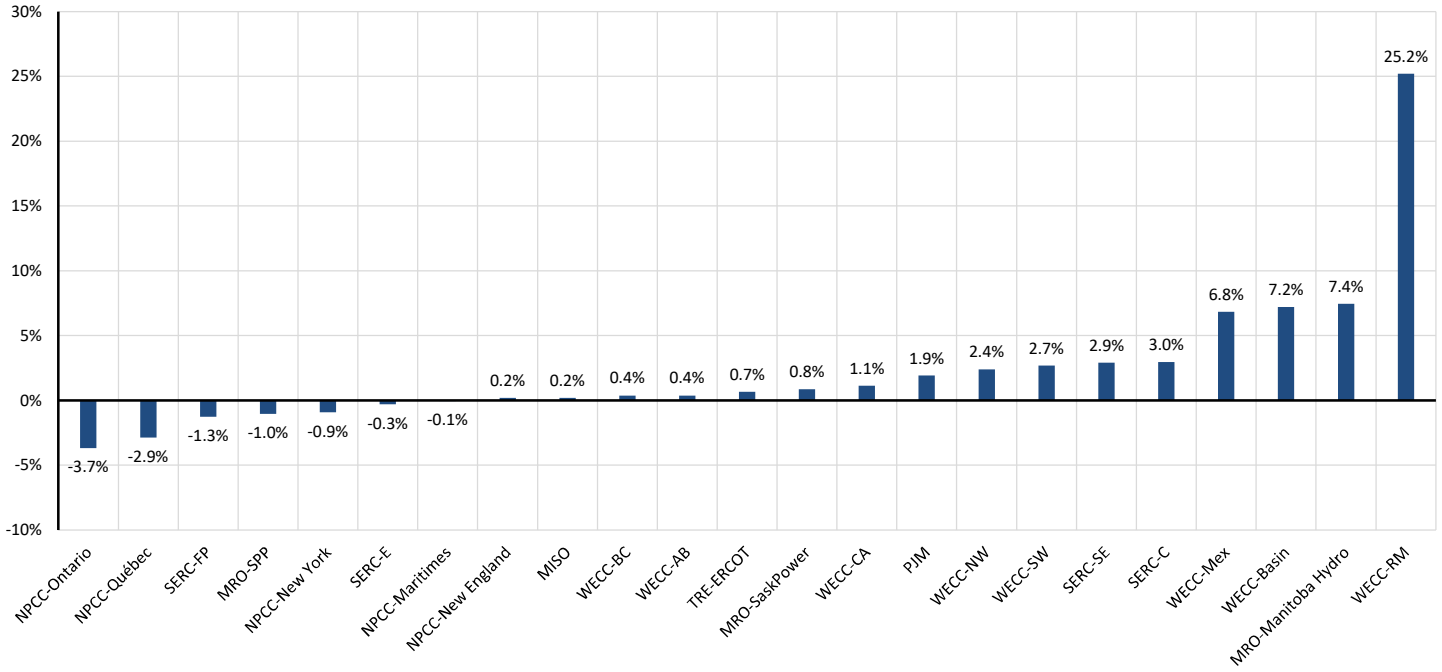


Figure 6: Changes in Net Internal Demand—Summer 2024 Forecast Compared to Summer 2025 Forecast

[17] Changes in modeling and methods are contributing to year-to-year changes in forecasted net internal demand projections in NPCC Maritimes and NPCC Ontario. See assessment area dashboards.

Demand and Resource Tables

Peak demand and supply capacity data—resource adequacy data—for each assessment area are as follows in each table (in alphabetical order).

MISO			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	124,830	125,313	0.4%
Demand Response: Available	8,750	9,004	2.9%
Net Internal Demand	116,079	116,309	0.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	143,866	142,793	-0.7%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	2,471	2,280	-7.7%
Anticipated Resources	146,337	145,073	-0.9%
Existing-Other Capacity	1,833	1,190	-35.1%
Prospective Resources	148,740	148,543	-0.1%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	26.1%	24.7%	-1.3
Prospective Reserve Margin	28.1%	27.7%	-0.4
Reference Margin Level	17.7%	15.7%	-2.0

MRO-Manitoba Hydro			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,143	3,377	7.4%
Demand Response: Available	0	0	-
Net Internal Demand	3,143	3,377	7.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	5,615	5,583	-0.6%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	-1,978	-1,714	-13.3%
Anticipated Resources	3,637	3,869	6.4%
Existing-Other Capacity	37	21	-42.9%
Prospective Resources	3,674	3,890	5.9%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	15.7%	14.6%	-1.1
Prospective Reserve Margin	16.9%	15.2%	-1.7
Reference Margin Level	12.0%	12.0%	0.0

MRO-SaskPower			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,590	3,620	0.8%
Demand Response: Available	50	50	0.0%
Net Internal Demand	3,540	3,570	0.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	4,323	4,477	3.6%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	290	290	0.0%
Anticipated Resources	4,613	4,767	3.3%
Existing-Other Capacity	0	0	-
Prospective Resources	4,613	4,767	3.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	30.3%	33.5%	3.2
Prospective Reserve Margin	30.3%	33.5%	3.2
Reference Margin Level	15.0%	15.0%	0.0

MRO-SPP			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	56,316	56,168	-0.3%
Demand Response: Available	979	1,408	43.8%
Net Internal Demand	55,337	54,760	-1.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	70,855	70,549	-0.4%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	-157	-201	27.5%
Anticipated Resources	70,698	70,348	-0.5%
Existing-Other Capacity	0	0	-
Prospective Resources	70,151	69,801	-0.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	27.8%	28.5%	0.7
Prospective Reserve Margin	26.8%	27.5%	0.7
Reference Margin Level	19.0%	19.0%	0.0

NPCC-Maritimes			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,586	3,584	-0.1%
Demand Response: Available	327	327	0.0%
Net Internal Demand	3,259	3,257	-0.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	4,660	4,348	-6.7%
Tier 1 Planned Capacity	0	220	-
Net Firm Capacity Transfers	63	63	0.0%
Anticipated Resources	4,723	4,631	-1.9%
Existing-Other Capacity	0	0	-
Prospective Resources	4,723	4,631	-1.9%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	44.9%	42.2%	-2.7
Prospective Reserve Margin	44.9%	42.2%	-2.7
Reference Margin Level	20.0%	20.0%	0.0

NPCC-New York			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	31,541	31,471	-0.2%
Demand Response: Available	1,281	1,487	16.1%
Net Internal Demand	30,260	29,984	-0.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	37,867	37,682	-0.5%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	1,585	1,769	11.6%
Anticipated Resources	39,452	39,451	0.0%
Existing-Other Capacity	0	0	-
Prospective Resources	39,452	39,451	0.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	30.4%	31.6%	1.2
Prospective Reserve Margin	30.4%	31.6%	1.2
Reference Margin Level	15.0%	15.0%	0.0

NPCC-New England			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	25,294	25,202	-0.4%
Demand Response: Available	661	399	-39.6%
Net Internal Demand	24,633	24,803	0.7%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	27,255	27,054	-0.7%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	1,297	1,245	-4.0%
Anticipated Resources	28,552	28,299	-0.9%
Existing-Other Capacity	138	668	384.1%
Prospective Resources	28,690	28,967	1.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	15.9%	14.1%	-1.8
Prospective Reserve Margin	16.5%	16.8%	0.3
Reference Margin Level	12.9%	12.7%	-0.2

NPCC-Ontario			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	22,753	21,955	-3.5%
Demand Response: Available	996	998	0.2%
Net Internal Demand	21,757	20,957	-3.7%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	26,856	24,760	-7.8%
Tier 1 Planned Capacity	9	413	4568.6%
Net Firm Capacity Transfers	600	689	14.8%
Anticipated Resources	27,465	25,862	-5.8%
Existing-Other Capacity	0	0	-
Prospective Resources	27,465	25,862	-5.8%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	26.2%	23.4%	-2.8
Prospective Reserve Margin	26.2%	23.4%	-2.8
Reference Margin Level	12.8%	20.5%	7.7

NPCC-Québec			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	22,922	23,283	1.6%
Demand Response: Available	0	1,020	-
Net Internal Demand	22,922	22,263	-2.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	35,731	32,132	-10.1%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	-2,689	-2,582	-4.0%
Anticipated Resources	33,042	29,550	-10.6%
Existing-Other Capacity	0	0	-
Prospective Resources	33,042	29,550	-10.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	44.1%	32.7%	-11.4
Prospective Reserve Margin	44.1%	32.7%	-11.4
Reference Margin Level	11.5%	11.9%	0.4

SERC-Central			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	42,636	42,765	0.3%
Demand Response: Available	1,941	864	-55.5%
Net Internal Demand	40,695	41,900	3.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	47,674	46,949	-1.5%
Tier 1 Planned Capacity	332	592	78.1%
Net Firm Capacity Transfers	2,578	2,554	-0.9%
Anticipated Resources	50,584	50,095	-1.0%
Existing-Other Capacity	2,075	2,475	19.2%
Prospective Resources	52,659	52,570	-0.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	24.3%	19.6%	-4.7
Prospective Reserve Margin	29.4%	25.5%	-3.9
Reference Margin Level	15.0%	15.0%	0.0

PJM			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	151,247	154,144	1.9%
Demand Response: Available	7,756	7,898	1.8%
Net Internal Demand	143,491	146,246	1.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	183,690	186,638	1.6%
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	-607	-4,200	591.9%
Anticipated Resources	183,083	182,438	-0.4%
Existing-Other Capacity	0	0	-
Prospective Resources	182,476	178,238	-2.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	27.6%	24.7%	-2.8
Prospective Reserve Margin	27.2%	21.9%	-5.3
Reference Margin Level	17.7%	17.7%	0.0

SERC-East			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	43,567	44,015	1.0%
Demand Response: Available	985	1,558	58.2%
Net Internal Demand	42,582	42,457	-0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	51,304	54,665	6.5%
Tier 1 Planned Capacity	122	17	-86.0%
Net Firm Capacity Transfers	593	150	-74.7%
Anticipated Resources	52,019	54,832	5.4%
Existing-Other Capacity	1,131	2,628	132.3%
Prospective Resources	53,150	57,459	8.1%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	22.2%	29.1%	7.0
Prospective Reserve Margin	24.8%	35.3%	10.5
Reference Margin Level	15.0%	15.0%	0.0

SERC-Florida Peninsula			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	53,293	52,987	-0.6%
Demand Response: Available	2,824	3,158	11.8%
Net Internal Demand	50,469	49,829	-1.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	63,199	59,395	-6.0%
Tier 1 Planned Capacity	34	102	197.8%
Net Firm Capacity Transfers	491	381	-22.4%
Anticipated Resources	63,724	59,878	-6.0%
Existing-Other Capacity	972	3,482	258.2%
Prospective Resources	64,696	63,360	-2.1%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	26.3%	20.2%	-6.1
Prospective Reserve Margin	28.2%	27.2%	-1.0
Reference Margin Level	15.0%	15.0%	0.0

Texas RE-ERCOT			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	84,818	85,151	0.4%
Demand Response: Available	3,496	3,292	-5.8%
Net Internal Demand	81,323	81,859	0.7%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	99,541	112,321	12.8%
Tier 1 Planned Capacity	2,578	4,854	88.3%
Net Firm Capacity Transfers	20	20	0.0%
Anticipated Resources	102,139	117,195	14.7%
Existing-Other Capacity	0	0	-
Prospective Resources	102,167	117,770	15.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	25.6%	43.2%	17.6
Prospective Reserve Margin	25.6%	43.9%	18.2
Reference Margin Level	13.75%	13.75%	0.0

SERC-Southeast			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	46,021	47,049	2.2%
Demand Response: Available	1,599	1,338	-16.3%
Net Internal Demand	44,422	45,711	2.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	63,693	64,111	0.7%
Tier 1 Planned Capacity	1,738	0	-100.0%
Net Firm Capacity Transfers	-1,192	489	-141.0%
Anticipated Resources	64,238	64,600	0.6%
Existing-Other Capacity	785	1,077	37.1%
Prospective Resources	65,024	65,676	1.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	44.6%	41.3%	-3.3
Prospective Reserve Margin	46.4%	43.7%	-2.7
Reference Margin Level	15.0%	15.0%	0.0

WECC-AB			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	12,201	12,246	0.4%
Demand Response: Available	0	0	-
Net Internal Demand	12,201	12,246	0.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,941	17,176	23.2%
Tier 1 Planned Capacity	1,981	281	-85.8%
Net Firm Capacity Transfers	0	0	-
Anticipated Resources	15,922	17,457	9.6%
Existing-Other Capacity	0	0	-
Prospective Resources	15,922	17,457	9.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	30.5%	42.6%	12.1
Prospective Reserve Margin	30.5%	42.6%	12.1
Reference Margin Level	6.7%	9.0%	2.7

WECC-BC			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	9,275	9,309	0.4%
Demand Response: Available	0	0	-
Net Internal Demand	9,275	9,309	0.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	11,022	11,313	2.6%
Tier 1 Planned Capacity	0	260	-
Net Firm Capacity Transfers	0	0	-
Anticipated Resources	11,022	11,573	5.0%
Existing-Other Capacity	0	0	-
Prospective Resources	11,022	11,573	5.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	18.8%	24.3%	5.5
Prospective Reserve Margin	18.8%	24.3%	5.5
Reference Margin Level	12.0%	14.9%	2.9

WECC-California			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	54,267	54,797	1.0%
Demand Response: Available	816	746	-8.6%
Net Internal Demand	53,451	54,051	1.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	71,564	75,726	5.8%
Tier 1 Planned Capacity	5,998	8,470	41.2%
Net Firm Capacity Transfers	197	598	203.6%
Anticipated Resources	77,759	84,794	9.0%
Existing-Other Capacity	0	0	-
Prospective Resources	77,759	84,794	9.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	45.5%	56.9%	11.4
Prospective Reserve Margin	45.5%	56.9%	11.4
Reference Margin Level	22.0%	19.2%	-2.8

WECC-Southwest			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	34,629	35,321	2.0%
Demand Response: Available	422	199	-52.9%
Net Internal Demand	34,207	35,122	2.7%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	37,716	40,300	6.9%
Tier 1 Planned Capacity	4,272	1,966	-54.0%
Net Firm Capacity Transfers	2,957	695	-76.5%
Anticipated Resources	44,945	42,961	-4.4%
Existing-Other Capacity	0	0	-
Prospective Resources	44,945	42,961	-4.4%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	31.4%	22.3%	-9.1
Prospective Reserve Margin	31.4%	22.3%	-9.1
Reference Margin Level	12.4%	13.3%	1.0

WECC-Northwest			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	28,475	29,157	2.4%
Demand Response: Available	30	30	0.0%
Net Internal Demand	28,445	29,127	2.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	33,164	36,388	9.7%
Tier 1 Planned Capacity	201	844	319.9%
Net Firm Capacity Transfers	838	1,249	49.0%
Anticipated Resources	34,203	38,481	12.5%
Existing-Other Capacity	0	0	-
Prospective Resources	34,203	38,481	12.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	20.2%	32.1%	11.9
Prospective Reserve Margin	20.2%	32.1%	11.9
Reference Margin Level	18.5%	23.1%	4.6

WECC-Basin			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	13,165	14,214	8.0%
Demand Response: Available	485	620	27.8%
Net Internal Demand	12,680	13,594	7.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,534	14,923	10.3%
Tier 1 Planned Capacity	2,436	704	-71.1%
Net Firm Capacity Transfers	1,376	1,274	-7.4%
Anticipated Resources	17,346	16,901	-2.6%
Existing-Other Capacity	0	0	-
Prospective Resources	17,346	16,901	-2.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	36.8%	24.3%	-12.5
Prospective Reserve Margin	36.8%	24.3%	-12.5
Reference Margin Level	13.3%	14.0%	0.7

WECC-Rocky Mountain			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	11,313	14,098	24.6%
Demand Response: Available	281	284	1.1%
Net Internal Demand	11,032	13,814	25.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	17,345	17,262	-0.5%
Tier 1 Planned Capacity	55	104	89.1%
Net Firm Capacity Transfers	0	0	-
Anticipated Resources	17,400	17,366	-0.2%
Existing-Other Capacity	0	0	-
Prospective Resources	17,400	17,366	-0.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	57.7%	25.7%	-32.0
Prospective Reserve Margin	57.7%	25.7%	-32.0
Reference Margin Level	18.0%	16.7%	-1.3

WECC-Mexico			
Demand, Resource, and Reserve Margins	**2024 SRA**	**2025 SRA**	**2024 vs. 2025 SRA**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,529	3,770	6.8%
Demand Response: Available	0	0	-
Net Internal Demand	3,529	3,770	6.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	3,314	4,303	29.8%
Tier 1 Planned Capacity	874	0	-100.0%
Net Firm Capacity Transfers	150	0	-100.0%
Anticipated Resources	4,338	4,303	-0.8%
Existing-Other Capacity	0	0	-
Prospective Resources	4,338	4,303	-0.8%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	22.9%	14.1%	-8.8
Prospective Reserve Margin	22.9%	14.1%	-8.8
Reference Margin Level	7.9%	9.6%	1.6

Variable Energy Resource Contributions

Because the electrical output of VERs (e.g., wind, solar PV) depends on weather conditions, on-peak capacity contributions are less than nameplate capacity. The following table shows the capacity contribution of existing wind and solar PV resources at the peak demand hour for each assessment area. Resource contributions are also aggregated by Interconnection and across the entire BPS. For NERC's analysis of risk periods after peak demand (e.g., U.S. assessment areas in WECC), lower contributions of solar PV resources are used because output is diminished during evening periods.

BPS Variable Energy Resources by Assessment Area

	Wind			Solar PV			Hydro			Energy Storage Systems (ESS)		
Assessment Area / Interconnection	Nameplate Wind	Expected Wind	Expected Share of Nameplate (%)	Nameplate Solar PV	Expected Solar PV	Expected Share of Nameplate (%)	Nameplate Hydro	Expected Hydro	Expected Share of Nameplate (%)	Nameplate ESS	Expected ESS	Expected Share of Nameplate (%)
MISO	30,992	6,039	19%	18,246	9,123	50%	1,572	1,467	93%	3,159	3,107	98%
MRO-Manitoba Hydro	259	48	19%	-	-	0%	202	60	30%	-	-	0%
MRO-SaskPower	816	310	38%	30	9	29%	848	686	81%	-	-	0%
NPCC-Maritimes	1,230	314	26%	147	-	0%	1,313	1,313	100%	12	6	50%
NPCC-New England	1,546	142	9%	3,266	1,412	43%	575	175	31%	192	110	57%
NPCC-New York	2,586	446	17%	609	243	40%	976	478	49%	32	17	53%
NPCC-Ontario	4,943	742	15%	478	66	14%	8,862	5,320	60%	-	-	0%
NPCC-Québec	4,024	885	22%	10	-	0%	444	444	100%	-	-	0%
PJM	12,465	1,855	15%	13,731	6,244	45%	2,505	2,505	100%	310	288	93%
SERC-Central	1,324	370	28%	1,810	1,053	58%	4,991	3,418	68%	100	100	100%
SERC-East	-	-	0%	7,097	5,022	71%	3,078	3,008	98%	19	8	41%
SERC-Florida Peninsula	-	-	0%	8,295	5,749	54%	-	-	0%	631	631	100%
SERC-Southeast	-	-	0%	8,507	7,728	91%	3,258	3,308	102%	115	105	92%
SPP	35,613	5,556	16%	1,159	492	42%	114	56	49%	182	41	23%
Texas RE-ERCOT	40,102	9,396	23%	31,473	22,962	73%	572	439	77%	15,291	12,190	80%
WECC-AB	5,712	796	14%	2,174	1,480	68%	894	456	51%	250	235	94%
WECC-BC	747	149	20%	2	-	0%	16,918	10,181	60%	-	-	0%
WECC-Basin	4,859	911	19%	2,648	2,231	84%	2,637	2,022	77%	120	118	98%
WECC-CA	7,836	1,207	15%	25,059	14,756	59%	14,565	6,518	45%	11,459	11,115	97%
WECC-Mexico	300	50	17%	350	227	65%	-	-	0%	-	-	0%
WECC-NW	9,199	3,107	34%	1,349	666	49%	33,068	20,145	61%	11	10	91%
WECC-RM	5,681	1,359	24%	2,523	1,669	66%	3,251	2,446	75%	242	235	97%
WECC-SW	4,848	1,091	23%	9,288	4,293	46%	1,316	845	64%	4,187	3,982	95%
EASTERN INTERCONNECTION	91,773	15,822	17%	67,138	37,886	56%	28,294	21,794	77%	4,752	4,413	93%
QUÉBEC INTERCONNECTION	4,024	885	22%	10	-	0%	444	444	100%	-	-	0%
TEXAS INTERCONNECTION	40,102	9,396	23%	31,473	22,962	73%	572	439	77%	15,291	12,190	80%
WECC INTERCONNECTION	39,182	8,670	22%	43,393	25,322	58%	72,649	42,613	59%	16,269	15,695	96%
All INTERCONNECTIONS	175,081	34,774	20%	142,014	86,170	61%	101,959	65,290	64%	36,311	32,298	89%

Review of 2024 Capacity and Energy Performance

The summer of 2024 was the fourth hottest on record for both the contiguous United States[18] and Canada,[19] with some areas experiencing their hottest summer ever. The result was record electricity demand in the United States as well as in Canada, which was particularly pronounced in the Western Interconnection. While peak demand exceeded normal summer forecasts in most areas, only one area experienced demand that met or exceeded a 90/10 demand scenario as defined in the prior year's *SRA*. In addition, Hurricane Helene, the deadliest Atlantic hurricane to strike the US mainland since 2005, made landfall in Florida in September and led to widespread flooding and power outages from Florida to North Carolina. Helene was one of five hurricanes to impact the US last summer, joining other extreme weather incidents such as drought across the West and wildfires in the Southwest. To manage the challenging grid conditions brought about by heat domes and these other extreme weather events, grid operators across North America used various operating mitigations up to, and including, the issuance of EEAs. No disruptions to the BPS occurred due to inadequate resources. The following section describes actual demand and resource levels in comparison with NERC's *2024 SRA* and summarizes 2024 resource adequacy events.

Eastern Interconnection–Canada and Québec Interconnection

During the June heat wave that extended across the eastern half of the United States and Canada, system operators in Ontario and the Maritimes provinces followed conservative operating protocols and issued energy emergencies. A late-summer heat wave resulted in an energy emergency in Maritimes.

Eastern Interconnection–United States

MISO experienced peak electricity demand during late August. Demand was between the normal and 90/10 summer peak forecast levels. Wind and solar resource output at the time of peak demand were near expectations for summer on-peak contributions. Forced outages of thermal units, however, were lower than expected. On the day prior to MISO's peak demand, operators issued advisories to maximize generation. Similar advisories were issued earlier in the summer, coinciding with above-normal temperatures and periods of high generator forced outages.

In SPP, summer electricity demand peaked in mid-July at a level below normal 50/50 forecasts. Above-normal wind performance and sufficient generator availability contributed to sufficient electricity supplies during peak conditions. In late August, however, SPP operators issued an EEA1 due to high load forecasts, generator outages, and forecasts for low wind output. The period coincided with MISO's peak demand period, making excess supplies for import uncertain. Also in August during a period of high demand and low resource availability, operators issued public appeals for conservation when a 345 kV line outage caused a transmission emergency. During other summer periods, SPP operators responded to forecasts for high demand and low resource conditions with resource advisories intended to maximize available generators.

Like SPP, PJM also experienced peak electricity demand in mid-July and issued an EEA in August. Peak demand in July was near 90/10 forecast levels. Generator outages were below normal at the time of peak demand. In late August, PJM operators issued an EEA1 in expectation of extreme demand.

A period of unseasonably high demand in early summer brought on by high temperatures in the Northeast contributed to an EEA1 in NPCC-New England when a large thermal generator encountered a forced outage. Peak demand in New England occurred in mid-July at a near-normal summer peak demand level. At the time of peak demand, generator outages were below historical averages.

Peak demand in the NPCC-New York area occurred in early July at a level below the normal summer peak demand forecast. Generator outages were below historical levels for peak summer conditions.

[18] US sweltered through its 4th-hottest summer on record – National Oceanic and Atmospheric Administration
[19] Climate Trends and Variations Bulletin – Summer 2024 – Government of Canada

Systems in the U.S. Southeast saw successive heat waves beginning prior to the official start to summer and extending to early fall. Operators in the SERC region used conservative operations and resource advisories to maximize generation and transmission network availability and issued EEAs when warranted by conditions. In some instances, EEAs were issued when generator outages threatened supplies needed for high demand. Peak demand in all assessment areas within the SERC region exceeded normal summer peak demand levels and approached 90/10 demand forecasts.

Texas Interconnection–ERCOT

Peak demand in ERCOT was at or near record levels last summer, as load growth and extreme temperatures contributed to escalating summer electricity needs. Demand peaked in August well above the 90/10 demand forecast. At the time of peak demand, wind generation was below expected levels for peak demand periods, while output from solar generation was near forecasted levels. Forced generator outages were well below historical average levels for peak demand, helping to meet the extreme electricity demand. Unlike the prior summer, ERCOT did not issue any conservation appeals to customers to reduce demand during high-demand periods. New solar generation, battery resources, and some thermal generation additions since Summer 2023 boosted electricity supplies, enabling operators to meet demand records without demand-side management.

Western Interconnection

In July, the Western Interconnection set a new peak demand record of 167,988 MW. Operators in United States and Canada employed procedures throughout summer to manage challenging grid conditions from extended extreme heat and wildfires.

Western Interconnection–Canada

In the province of Alberta, the electric system operator issued an EEA3 in early July as high temperatures contributed to elevated demand that coincided with a forced generator outage. A new summer peak demand record was set in Alberta later in July at 12.2 MW (up from 11.5 GW in summer 2023). Alberta's demand peak was slightly higher than the normal demand peak scenario projected in the spring of last year.

In British Columbia, peak demand reached 9.4 GW (up from 9.2 GW the previous year), also slightly above the normal peak demand that was projected last year.

In both Alberta and British Columbia, peak demand was still below the extreme peak demand scenarios previously projected, which lowered the risk profile of those provinces over Summer 2024.

Western Interconnection–United States

Demand peaked in July in the U.S. Northwest at a level below the normal summer peak demand. During a period of high demand in July, operators at a BA in the U.S. Northwest issued an EEA1 to address forecasted conditions.

The California-Mexico assessment area, which consists of the CAISO, Northern California, and CENACE BAs, experienced system peak electricity demand in early September at a level nearing the 90/10 peak demand forecast. The extreme demand contributed to localized supply concerns and led CAISO to declare a transmission emergency and use conservative operations protocols to posture the system. Despite the extreme demand, operators were able to maintain sufficient supply without resorting to public appeals, as was required in prior summers. New battery resources were instrumental in providing energy to meet high demand during late afternoon and early evenings. Natural-gas-fired generators also performed well and were important to meeting high demand during these same periods. Dry conditions from early summer prompted operators in CA/MX to frequently employ public safety power shutoff (PSPS) procedures beginning in June. Active wildfires led transmission operators to de-energize transmission lines in Northern California and declare transmission emergencies that affected operations across CAISO.

The U.S. Southwest experienced extended heat conditions and demand levels that exceeded 90/10 peak summer forecasts, with peak occurring in early August. Higher-than-expected wind and solar output and low generator outages helped maintain sufficient supplies.

2024 Summer Demand and Generation Summary at Peak Demand							
Assessment Area	Actual Peak Demand[1] (GW)	SRA Peak Demand Scenarios[2] (GW)	Wind – Actual[1] (MW)	Wind – Expected[3] (MW)	Solar – Actual[1] (MW)	Solar – Expected[3] (MW)	Forced Outages Summary[4] (MW)
MISO	118.6	116.1 125.8	4,565	5,599	5,858	4,981	4,412
MRO-Manitoba Hydro	3.6	3.1 3.3	50	48	0	0	290
MRO-SaskPower	3.7	3.5 3.7	170	208	22	6	0
MRO-SPP	54.3	55.3 57.5	10,869	5,876	442	486	6,046
NPCC-Maritimes	3.5	3.3 3.6	428	262	21	-	777
NPCC-New England	24.3	24.6 26.5	174	122	167	1,111	1,496
NPCC-New York	29	30.3 32	130	340	0	53	1,451
NPCC-Ontario	23.9	21.8 23.7	915	720	260	66	1,174
NPCC-Québec	23	22.9 24	2,270	-	0	-	10,500*
PJM	153.1	143.5 156.9	3,366	1,703	2,709	5,694	6,402
SERC-C	42.3	40.7 43.9	312	172	813	996	959
SERC-E	44	42.6 44.7	0	-	3,009	2,405	1,878
SERC-FP	52.4	50.5 53.6	0	-	5,376	5,643	
SERC-SE	44.9	44.4 45.3	0	-	3,507	7,217	1,007
TRE-ERCOT	85.5	81.3 82.3	6,286	9,070	17,566	17,797	3,622
WECC-AB	12.2	12.2 12.7	1,091	666	1,114	786	-**
WECC-BC	9.4	9.3 9.8	257	140	0.94	0	-**

2024 Summer Demand and Generation Summary at Peak Demand							
Assessment Area	**Actual Peak Demand[1] (GW)**	**SRA Peak Demand Scenarios[2] (GW)**	**Wind – Actual[1] (MW)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MW)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
WECC-CA/MX	58.9	53.2 61.6	1,633	1,124	10,112	13,147	921
WECC-NW	59.7	63 69.7	4,694	2,964	6,339	2,595	3,655
WECC-SW	30.8	26.4 28.8	1,179	542	3,357	1,294	2,042
Highlighting Notes	Actual peak demand in the highlighted areas met or exceeded extreme scenario levels.		Actual wind output in highlighted areas was significantly below seasonal forecast.		Actual solar output in highlighted areas was significantly below seasonal forecast.		Actual forced outages above or below forecast by factor of two

Table Notes:
[1] Actual demand, wind, and solar values for the hour of peak demand in U.S. areas were obtained from EIA From 930 data. For areas in Canada, this data was provided to NERC by system operators and utilities.
[2] See NERC *2024 SRA* demand scenarios for each assessment area (pp. 14–33). Values represent the normal summer peak demand forecast and an extreme peak demand forecast that represents a 90/10, or once-per-decade, peak demand. Some areas use other basis for extreme peak demand.
[3] Expected values of wind and solar resources from the *2024 SRA*.
[4] Values from NERC Generator Availability Data System for the 2024 summer hour of peak demand in each assessment area. Highlighted areas had actual forced outages that were more than twice the value for typical forced outage rates used in the 2024 summer risk period scenarios in the *2024 SRA*.
*Values include both maintenance and forced outages.
**Canadian assessment areas report to the NERC Generator Availability Data System on a voluntary basis, which can contribute to the absence of some values in certain assessment areas.

Attachment B

MISO 2025 PRA Report

Planning Resource Auction

Results for Planning Year 2025-26

April 2025

CORRECTIONS

Reposted 05/29/25

Slides Updated: 7, 11, 18-20, 23, 32-34

MISO met the planning year 2025/26 resource adequacy requirements, but pressure persists with reduced capacity surplus across the region and is reflected through improved price signals in this year's auction

Summer
$666.50
—
Fall
$91.60 (North/Central)
$74.09 (South)
—
Winter
$33.20
—
Spring
$69.88
—
Annualized
$217 (North/Central)
$212 (South)

- MISO's Reliability-Based Demand Curve (RBDC) improves price signals, reflecting the increased value of accredited capacity beyond the seasonal Planning Reserve Margin (PRM) target
  - For example, the auction cleared 1.9% above the 7.9% summer PRM target
- Summer price reflects the lowest available surplus capacity
  - Fall price varied slightly due to transfer limitations between the North and South
- Consistent with past years, most Load Service Entities (LSEs) self-supplied or secured capacity in advance and are hedged with respect to auction prices
- Surplus above the target PRM dropped 43% compared to last summer, despite the slightly lower PRM target (7.9% vs. 9.0% last year)
  - New capacity additions did not keep pace with reduced accreditation, suspensions/retirements and slightly reduced imports
- The results reinforce the need to increase capacity, as demand is expected to grow with new large load additions

Auction outcomes are consistent with the design intent of the Reliability-Based Demand Curve (RBDC), and MISO and its members can expect more stable and predictable capacity pricing, especially in surplus situations

In the 2025 PRA, the RBDC…

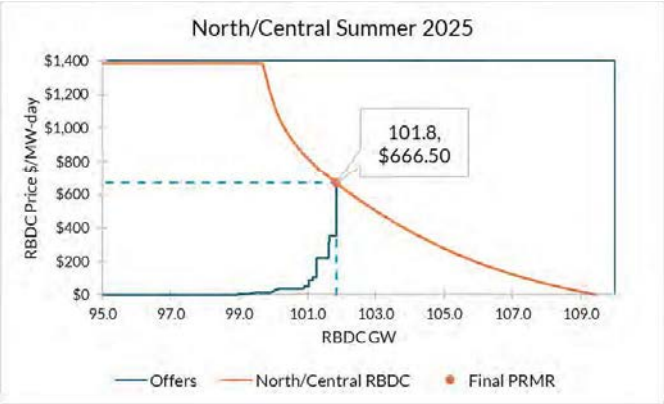
- Delivers competitive prices aligned with seasonal risks and tightening surplus
  - Prioritizes summer availability, the system's highest-risk season (based on 1-in-10 LOLE)
- Values incremental capacity above and below the LOLE target based on its reliability
  - Clears capacity above target Planning Reserve Margin based on its reliability value in each season
- Stabilizes prices in non-summer seasons, avoiding extreme volatility

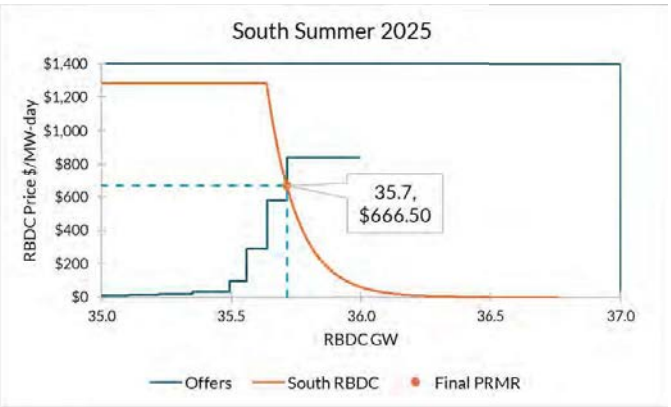
Why it Matters

- Sends clear and stable investment signals across the system, including to external resources
- Provides transparent value for capacity that exceeds the Planning Reserve Margin target
- Reflects subregional capacity needs and clears accordingly across all seasons

LOLE: Loss of Load Expectation

Auction pricing outcomes with the Reliability-Based Demand Curve (RBDC) better reflect value of capacity and resource adequacy risk across seasons





- Summer clearing of $666.50 reflects highest reliability risk and reducing surplus capacity year-over-year
  - Surplus capacity in the summer has reduced from approximately 6.5 GW in 2023, to 4.6 GW in 2024, to 2.6 GW in 2025
- Incremental capacity cleared beyond the target Planning Reserve Margin based on the value it adds to reliability (e.g., North/Central "effective" summer margin at 10.1% and South at 8.7% vs. target 7.9%)
  - A small quantity of capacity, that was offered at a price higher than the reliability value indicated through the demand curve, did not clear

MISO's Reliability-Based Demand Curve (RBDC) improves price signals, reflecting the increased value of accredited capacity beyond seasonal reliability targets

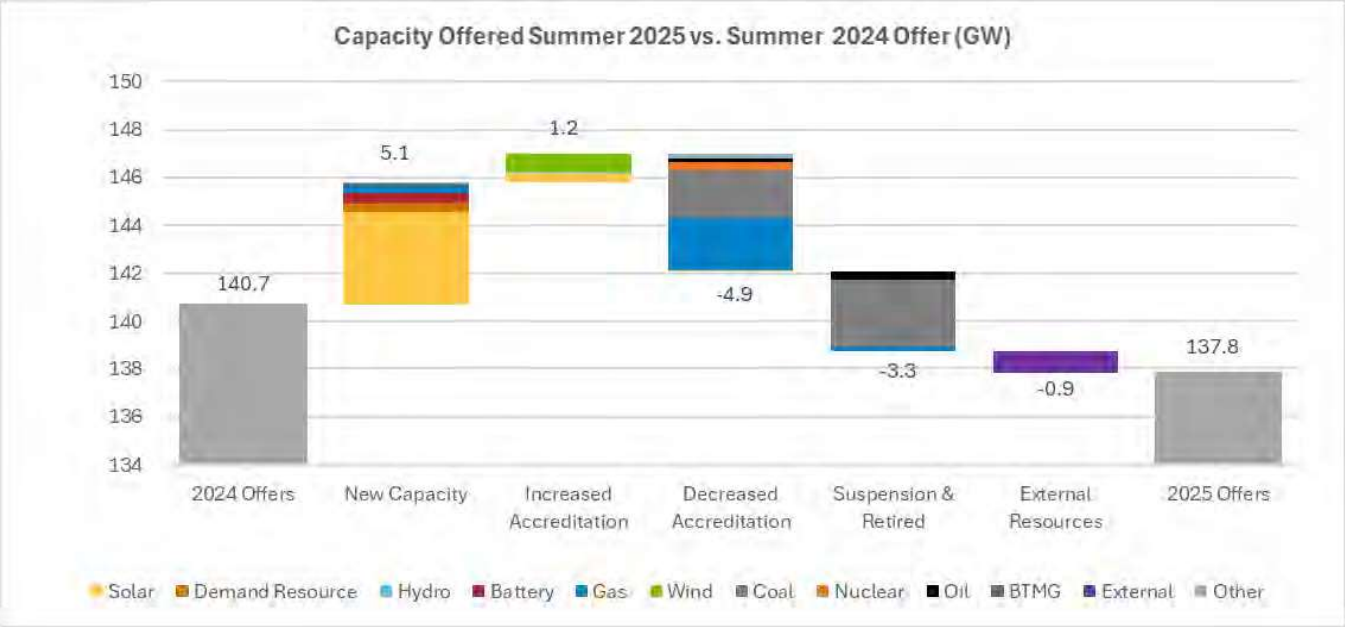
- Under RBDC, each season has an initial reliability target (PRM%)
- Auction cleared above seasonal final reliability target, representing additional reliability value at cost-competitive prices

	2025 Planning Resource Auction Initial Target vs. Final Cleared	Additional Reliability	Auction Clearing Price
Summer	Initial, 7.90% Cleared, 9.80%	+1.9%	$666.50
Fall	Initial, 14.90% Cleared, 17.50%	+2.6%	$91.60 N/C $74.09 S
Winter	Initial, 18.40% Cleared, 24.50%	+6.1%	$33.20
Spring	Initial, 25.30% Cleared, 26.80%	+1.5%	$69.88 ***Annualized*** **$217** (North/Central) **$212** (South)

PRM: Planning Reserve Margin

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

New capacity additions did not keep pace with decreased accreditation, suspensions/ retirements and external resources



BTMG: Behind the Meter Generation | Capacity indicated is offered accredited value

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

MISO has taken action on many Reliability Imperative initiatives to address resource adequacy challenges, but there's more to be done

Ongoing Challenges

- Accelerating demand for electricity
- Rapid pace of generation retirements continue
- Loss of accredited capacity and reliability attributes
- Majority of new resources with variable, intermittent output and high weather correlation
- Delays of new resource additions
- More frequent extreme weather

Completed Initiatives

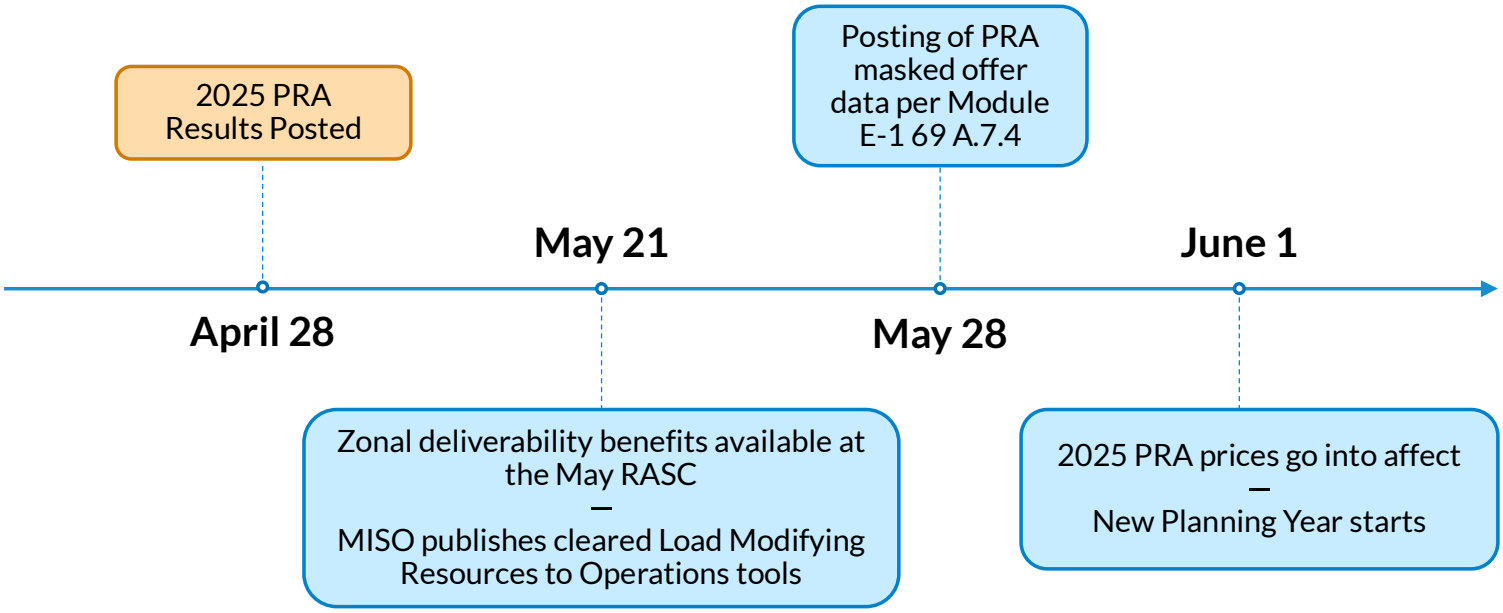
- ✓ Implemented Reliability-Based Demand Curve in 2025 PRA
- ✓ Non-emergency resource accreditation *(effective PY 2028/29)*
- ✓ Generation interconnection queue cap
- ✓ Improved generator interconnection queue process (*New application portal coming June 2025)*
- ✓ Approved over $30 billion in new transmission lines

Initiatives In Progress

- ❑ Implement Direct Loss of Load (DLOL)-based accreditation
- ❑ Enhance resource adequacy risk modeling
- ❑ Reduce queue cycle times through automation
- ❑ Implement interim Expedited Resource Addition Study (ERAS) process *(June 2025)*
- ❑ Demand Response and Emergency Resource reforms
- ❑ Enhance allocation of resource adequacy requirements

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Next Steps


2025 PRA Results Posted
Posting of PRA masked offer data per Module E-1 69 A.7.4
April 28
May 21
May 28
June 1
Zonal deliverability benefits available at the May RASC
—
MISO publishes cleared Load Modifying Resources to Operations tools
2025 PRA prices go into affect
—
New Planning Year starts

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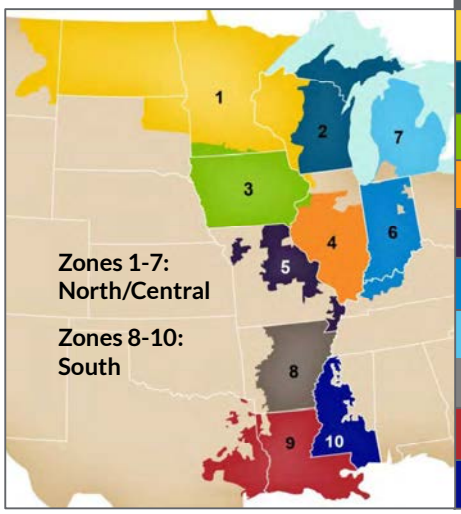
Acronyms

ACP: Auction Clearing Price
ARC: Aggregator of Retail Customers
BTMG: Behind the Meter Generator
CIL: Capacity Import Limit
CEL: Capacity Export Limit
CONE: Cost of New Entry
CPF: Coincident Peak Forecast
DLOL: Direct Loss-of-Load
DR: Demand Resource
ELCC: Effective Load Carrying Capability
EE: Energy Efficiency
ER: External Resource
ERAS: Expedited Resource Addition Study
ERZ: External Resource Zones
FRAP: Fixed Resource Adequacy Plan
ICAP: Installed Capacity
IMM: Independent Market Monitor
LBA: Load Balancing Authority
LCR: Local Clearing Requirement
LOLE: Loss of Load Expectation
LMR: Load Modifying Resource
LRR: Local Reliability Requirement
LRZ: Local Resource Zone
LSE: Load Serving Entity
OMS: Organization of MISO States
PO: Planned Outage
PRA: Planning Resource Auction
PRM: Planning Reserve Margin
PRMR: Planning Reserve Margin Requirement
RASC: Resource Adequacy Sub-Committee
RBDC: Reliability-Based Demand Curve
SAC: Seasonal Accredited Capacity
SREC: Sub-Regional Export Constraint
SRIC: Sub-Regional Import Constraint
SRPBC: Sub-Regional Power Balance Constraint
SS: Self Schedule
UCAP: Unforced Capacity
ZIA: Zonal Import Ability
ZRC: Zonal Resource Credit

The 2025 PRA demonstrated sufficient capacity at the regional, subregional and zonal levels, with the summer price reflecting the highest risk and a tighter supply-demand balance

2025 PRA Results

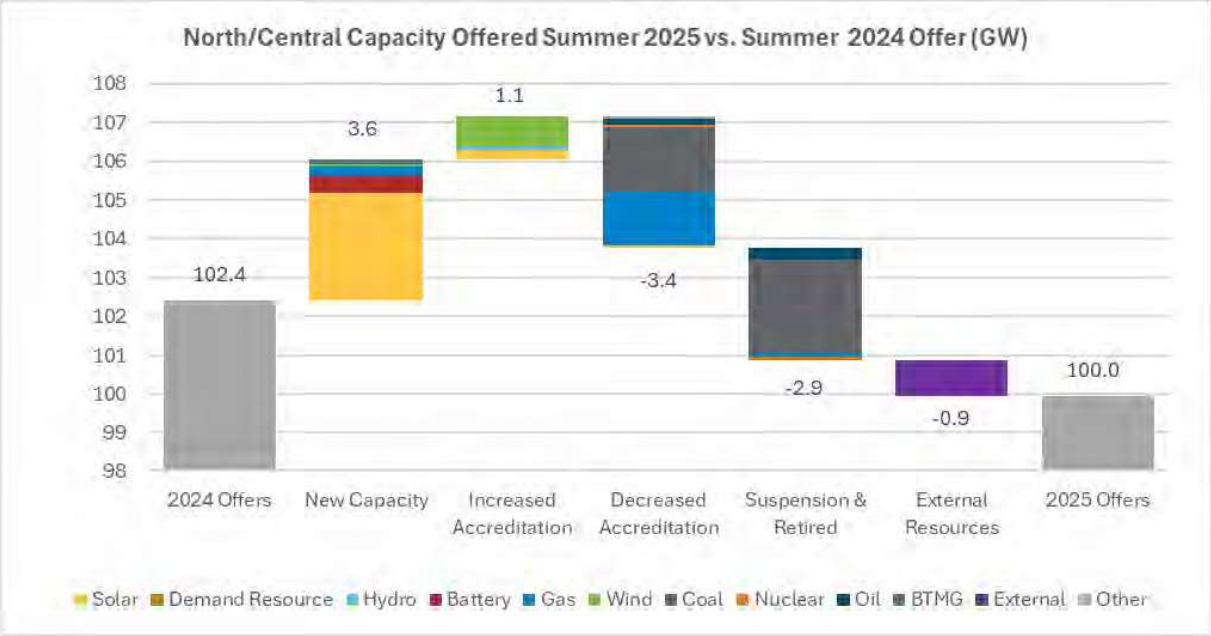
MISO Resource Adequacy Zones



	Price/MW-Day			
	Summer	Fall	Winter	Spring
1	$666.50	$91.60	$33.20	$69.88
2				
3				
4				
5				
6				
7				
8		$74.09		
9				
10				

Annualized
$217 (North/Central)
$212 (South)

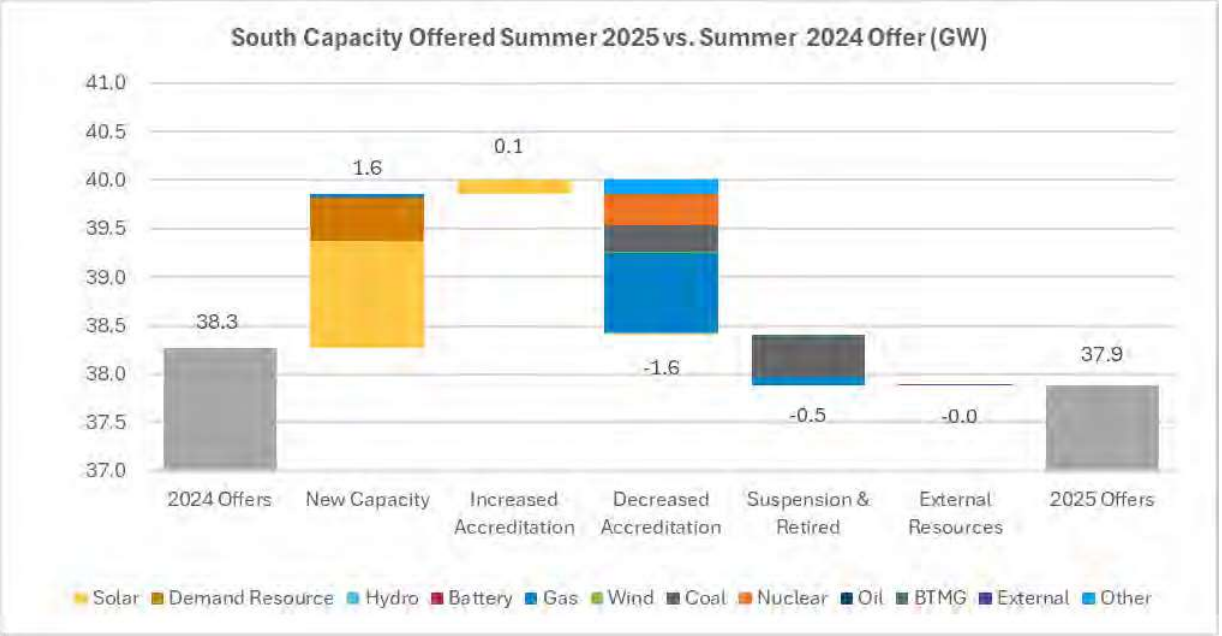
For North/Central, new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources



BTMG: Behind the Meter Generation | Capacity indicated is offered accredited value

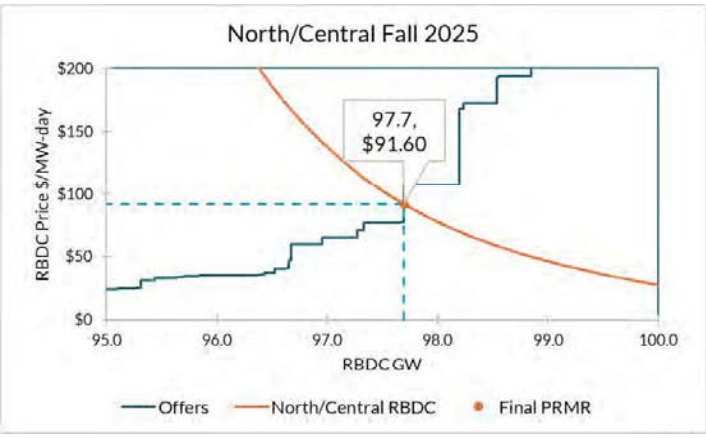
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

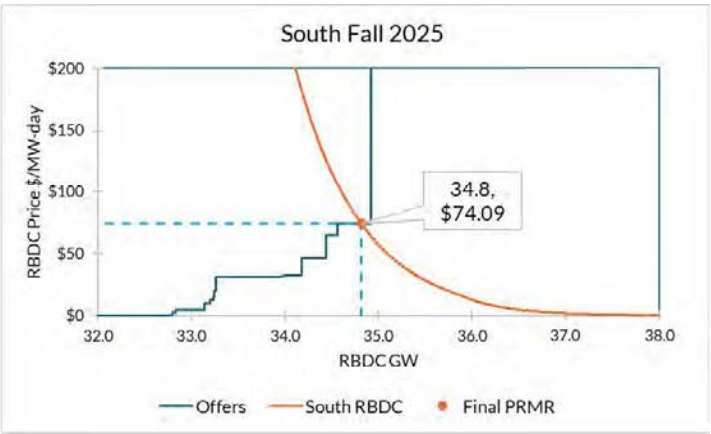
For the South, new capacity additions nearly offset the negative impacts of decreased accreditation, suspensions/retirements



BTMG: Behind the Meter Generation | Capacity indicated is offered accredited value

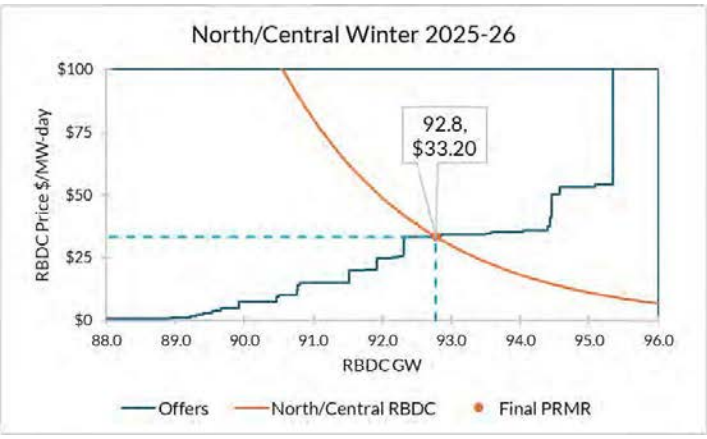
Fall 2025 Reliability-Based Demand Curve, Offer Curves and Auction Clearing Prices

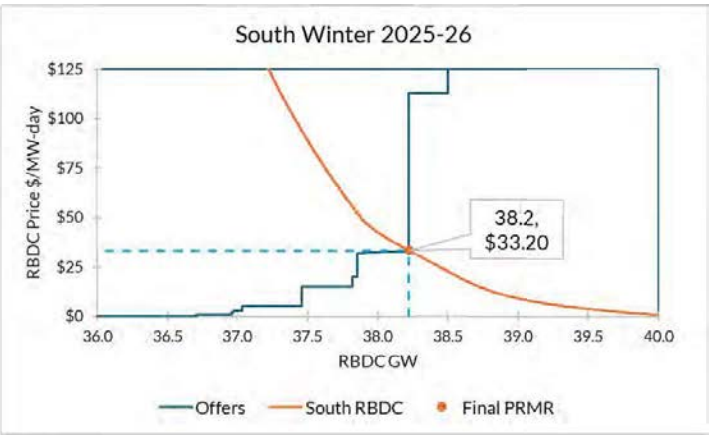




- Subregional RBDCs are determining clearing for both subregions
- Subregional Power Balance Constraint (SRPBC), South to North, is binding resulting in price separation between North/Central and South subregions in Fall season
  - ACP for North subregion is $91.60, and $74.09 South subregion
  - A marginal resource in the South sets the price in that subregion
- In fall season, "effective" margin for North/Central subregion is at 18.4% and 15.2 % for South subregion vs. target of 14.9%

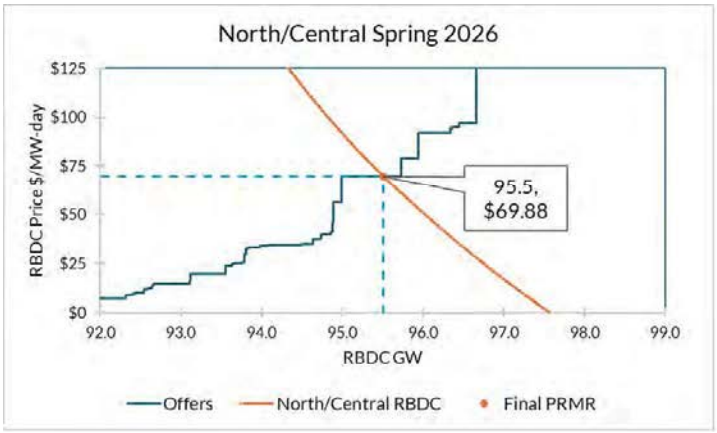
Winter 2025/26 Reliability-Based Demand Curve, Offer Curves and Auction Clearing Prices





- Subregional RBDCs are determining clearing for both subregions
- No price separation between North/Central and South subregions in winter
  - ACP for both subregions is $33.20
  - Multiple marginal resources, cleared *pro rata*, sets the price
- In winter, "effective" margin for North/Central subregion is at 23.3% and $27.3% for South subregion vs. target of 18.4%

Spring 2026 Reliability-Based Demand Curve, Offer Curves and Auction Clearing





- Subregional RBDCs are determining clearing for both subregions
- No price separation between North/Central and South subregions in spring
  - ACP for both subregions is $69.88
  - A marginal resource sets the price
- In spring, "effective" margin for North/Central subregion is at 27.5% and 25% for South subregion vs. target of 25.3%

Summer 2025 PRA Results by Zone

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	ERZ	North	South	System
Initial PRMR	18,459.4	13,190.2	10,889.2	9,237.6	8,281.3	18,484.8	21,228.0	8,487.8	21,812.2	5,142.9	N/A	99,770.5	35,442.9	135,213.4
Final PRMR	18,843.5	13,464.4	11,116.0	9,430.10	8,453.5	18,868.9	21,669.2	8,552.6	21,978.8	5,182.3	N/A	101,845.6	35,713.7	137,559.3
Offer Submitted (Including FRAP)	19,732.4	14,569.7	11,321.4	9,328.1	6,737.9	16,123.6	20,883.9	11,517.3	20,498.6	5,543.3	1580.1	99,952.6	37,883.7	137,836.3
FRAP	4,619.2	10,252.6	456.9	789.4	0.0	1,080.7	541.3	494.9	157.5	1,507.7	46.8	17,779.2	2,167.8	19,947.0
RBDC Opt-Out	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
Self Scheduled (SS)	4,985.3	3,344.1	10,450.2	7,677.2	6,647.8	11,080.3	20,305.5	10,260.6	17,870.6	3,831.3	1,358.8	65,567.6	32,244,1	97,811.7
Non-SS Offer Cleared	10,127.9	973.0	414.3	861.5	90.1	3,962.6	37.1	761.8	2,193.5	204.3	174.5	16,605.8	3,194.8	19,800.6
Committed (Offer Cleared + FRAP)	19,732.4	14,569.7	11,321.4	9,328.1	6,737.9	16,123.6	20,883.9	11,517.3	20,221.6	5,543.3	1,580.1	99,952.6	37,606.7	137,559.3
LCR	15,696.9	9,719.3	8,049.3	2,577.8	6,071.1	13,051.7	19,681.4	8,487.0	19,615.0	2,523.8	-	N/A	N/A	N/A
CIL	6,025	4,370	5,555	8,525	4,117	8,651	3,569	2,568	4,361	4,474	-	N/A	N/A	N/A
ZIA	6,023	4,370	5,460	7,757	4,117	8,366	3,569	2,358	4,361	4,474	-	N/A	N/A	N/A
Import	0.0	0.0	0.0	101.7	1,715.5	2,745.5	785.5	0.0	1,757.1	0.0	-	1,893.0	0.0	1,580.1
CEL	3,991	4,614	4,618	4,584	3,939	6,881	5,726	6,299	4,286	2,097	-	N/A	N/A	N/A
Export	888.8	1105.2	205.5	0.0	0.0	0.0	0.0	2964.7	0.0	360.9	1,580.1	0.0	1,893.0	-
ACP ($/MW-Day)	666.50	666.50	666.50	666.50	666.50	666.50	666.50	666.50	666.50	666.50	666.50			N/A

Values displayed in MW SAC; ERZ: External Resource Zones | Final PRMR values provided at Zonal level given lack of RBDC Opt-Out.

Fall 2025 PRA Results by Zone

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	ERZ	North	South	System
Initial PRMR	17,290.4	12,086.4	10,179.1	8,950.4	7,898.3	17,939.5	20,493.9	8,019.3	21,578.1	5,142.6	N/A	94,838.0	34,740.0	129,578.0
Final PRMR	17,811.9	12,450.7	10,486.0	9,220.4	8,136.0	18,480.2	21,111.9	8,037.4	21,627.1	5,154.2	N/A	97,697.1	34,818.7	132,515.8
Offer Submitted (Including FRAP)	18,893.1	14,291.7	13,615.9	8,887.5	6,839.6	15,518.1	19,517.6	11,000.8	21,112.5	5,516.6	1,582.1	98,835.3	37,940.2	136,775.5
FRAP	4,233.2	9,259.1	582.7	773.3	0.0	983.1	533.1	459.4	153.4	1,518.3	44.6	16,402.6	2,137.6	18,540.2
RBDC Opt-Out	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
Self Scheduled (SS)	4,646.8	3,423.5	10,580.4	7,036.0	6,706.5	10,590.4	16,911.4	9,029.4	17,788.1	3,286.3	1,208.0	60,831.1	30,375.7	91,206.8
Non-SS Offer Cleared	9,019.0	834.8	2,452.8	1,078.2	133.1	3,728.7	1,089.1	1,512.0	2,406.6	254.9	259.6	18,563.3	4,205.5	22,768.8
Committed (Offer Cleared + FRAP)	17,899.0	13,517.4	13,615.9	8,887.5	6,839.6	15,302.2	18,533.6	11,000.8	20,348.1	5,059.5	1,512.2	95,797.1	36,718.7	132,515.8
LCR	14,691.0	6,591.1	6,331.4	2,588.7	4,857.2	11,725.4	18,196.1	5,006.3	18,963.6	2,577.6	-	N/A	N/A	N/A
CIL	5,740	6,537	7,797	7,773	4,679	8,952	5,115	5,839	4,741	4,508	-	N/A	N/A	N/A
ZIA	5,688	6,537	7,704	7,013	4,679	8,672	5,115	5,675	4,741	4,508	-	N/A	N/A	N/A
Import	0.0	0.0	0.0	332.8	1,296.8	3,178.0	2,578.2	0.0	1,278.9	94.7	-	1,900.0	0.0	1,512.2
CEL	6,115	4,259	5,831	4,309	5,816	5,191	5,168	4,055	4,173	3,164	-	N/A	N/A	N/A
Export	87.2	1,066.8	3,129.9	0.0	0.0	0.0	0.0	2,963.3	0.0	0.0	1,512.2	0.0	1,900.0	-
ACP ($/MW-Day)	91.60	91.60	91.60	91.60	91.60	91.60	91.60	74.09	74.09	74.10	83.24-91.60			N/A

Values displayed in MW SAC; ERZ: External Resource Zones | Final PRMR values provided at Zonal level given lack of RBDC Opt-Out.

Winter 2025/26 PRA Results by Zone

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	ERZ	North	South	System
Initial PRMR	17,823.8	10,789.8	9,889.1	8,549.5	7,954.8	17,939.1	16,123.6	8,545.6	21,864.3	5,136.1	N/A	89,069.7	35,546.0	124,615.7
Final PRMR	18,565.8	11,238.7	10,300.9	8,905.1	8,285.9	18,685.7	16,794.7	9,189.0	23,511.0	5,522.7	N/A	92,776.8	38,222.7	130,999.5
Offer Submitted (Including FRAP)	19,750.7	13,217.2	12,059.1	7,547.1	6,339.9	14,679.5	19,957.3	10,751.9	22,273.0	5,939.7	1,746.5	94,964.8	39,297.1	134,261.9
FRAP	4,683.9	8,342.7	479.4	513.4	0.0	1,176.6	566.3	441.6	130.9	1,822.6	16.1	15,771.2	2,402.3	18,173.5
RBDC Opt-Out	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
Self Scheduled (SS)	5,835.8	3,156.0	10,468.3	6,685.7	6,188.7	9,146.2	18,640.6	10,018.6	18,579.3	4,046.0	1,550.8	61,380.9	32,935.1	94,316.0
Non-SS Offer Cleared	7,977.9	1,062.6	1,044.5	271.5	99.9	4,008.7	397.0	291.7	3,105.5	71.1	179.6	15,007.6	3,502.4	18,510.0
Committed (Offer Cleared + FRAP)	18,497.6	12,561.3	11,992.2	7,470.6	6,288.6	14,331.5	19,603.9	10,751.9	21,815.7	5,939.7	1,746.5	92,159.7	38,839.8	130,999.5
LCR	13,462.0	5,951.6	8,008.4	1,371.4	3,644.7	11,074.8	15,500.2	8,014.7	20,593.7	3,534.1	-	N/A	N/A	N/A
CIL	6,177	6,522	5,877	7,232	4,922	7,927	4,762	3,613	4,418	3,458	-	N/A	N/A	N/A
ZIA	5,575	6,435	5,785	6,457	4,922	7,690	4,762	3,432	4,418	3,458	-	N/A	N/A	N/A
Import	68.0	0.0	0.0	1,434.8	1,997.3	4,354.1	0.0	0.0	1,695.2	0.0	-	617.1	0.0	1,746.5
CEL	2,991	4,706	7,388	4,756	4,814	1,674	5,712	3,602	3,618	2,028	-	N/A	N/A	N/A
Export	0.0	1,322.6	1,691.5	0.0	0.0	0.0	2,809.2	1,562.8	0.0	416.9	1,746.5	0.0	617.1	0.0
ACP ($/MW-Day)	33.20	33.20	33.20	33.20	33.20	33.20	33.20	33.20	33.20	33.20	33.20			N/A

Values displayed in MW SAC; ERZ: External Resource Zones | Final PRMR values provided at Zonal level given lack of RBDC Opt-Out.

Spring 2026 PRA Results by Zone

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	ERZ	North	South	System
Initial PRMR	17,866.7	12,149.2	10,152.2	8,304.0	7,707.9	17,858.6	19,853.2	7,977.8	22,139.8	5,167.9	N/A	93,891.8	35,285.5	129,177.3
Final PRMR	18,174.5	12,358.6	10,327.0	8,447.2	7,841.0	18,166.7	20,195.5	7,955.2	22,076.1	5,157.7	N/A	95,510.5	35,189.0	130,699.5
Offer Submitted (Including FRAP)	18,662.6	14,525.3	12,333.3	9,178.5	6,118.7	15,824.7	19,451.0	11,495.2	21,064.7	5,864.0	1,542.6	97,313.7	38,746.9	136,060.6
FRAP	4,560.6	9,393.4	529.5	629.6	0.0	1,212.4	512.5	475.3	142.1	1,464.3	45.9	16,877.1	2,088.5	18,965.6
RBDC Opt-Out	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
Self Scheduled (SS)	4,600.8	3,602.8	10,816.2	7,415.0	5,968.5	9,967.6	17,621.9	8,476.0	16,778.9	4,073.9	1,260.8	60,972.6	29,609.8	90,582.4
Non-SS Offer Cleared	8,578.5	1,069.5	589.6	1,133.9	150.2	4,001.0	719.2	1,470.2	2,947.5	325.8	166.1	16,372.9	4,778.6	21,151.5
Committed (Offer Cleared + FRAP)	17,739.9	14,065.7	11,935.3	9,178.5	6,118.7	15,181.0	18,853.6	10,421.5	19,868.5	5,864.0	1,472.8	94,222.5	36,477.0	130,699.5
LCR	12,239.1	6,737.5	5,014.7	1,823.8	4,700.3	10,377.1	16,453.6	4,243.1	19,790.5	3,178.8	-	N/A	N/A	N/A
CIL	6,598	6,439	7,829	8,142	4,453	9,457	5,166	6,289	4,855	4,365	-	N/A	N/A	N/A
ZIA	6,396	6,439	7,726	7,373	4,453	9,176	5,166	6,085	4,855	4,365	-	N/A	N/A	N/A
Import	434.5	0.0	0.0	0.0	1,722.2	2,985.6	1,341.9	0.0	2,210.8	0.0	-	1,288.0	0.0	1,472.8
CEL	5,083	6,119	5,936	5,111	5,797	6,425	5,499	3,520	4,146	3,072	-	N/A	N/A	N/A
Export	0.0	1,707.2	1,608.0	731.2	0.0	0.0	0.0	2,465.6	0.0	710.3	1,472.8	0.0	1,288.0	-
ACP ($/MW-Day)	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88	69.88			N/A

Values displayed in MW SAC; ERZ: External Resource Zones | Final PRMR values provided at Zonal level given lack of RBDC Opt-Out.

Summer Supply Offered and Cleared Comparison Trend

	Offered (ZRC)			Cleared (ZRC)		
Planning Resource	**Summer 2023**	**Summer 2024**	**Summer 2025**	**Summer 2023**	**Summer 2024**	**Summer 2025**
Generation	122,375.6	123,395.6	121,015.6	116,989.7	119,479.2	120,738.6
External Resources	4,514.6	4,430.4	3,505.9	4,072.5	4,309.8	3,505.9
Behind the Meter Generation	4,175.2	4,180.2	4,282.8	4,129.4	4,143.5	4,282.8
Demand Resources	8,303.5	8,660.2	9,004.4	7,694.6	8,109.4	9,004.4
Energy Efficiency	5.0	22.5	27.6	5.0	22.5	27.6
Total	**139,373.9**	**140,688.9**	**137,836.3**	**132,891.2**	**136,064.4**	**137,559.3**

ZRC: Zonal Resource Credit

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Fall Supply Offered and Cleared Comparison Trend

	Offered (ZRC)			Cleared (ZRC)		
Planning Resource	**Fall 2023**	**Fall 2024**	**Fall 2025**	**Fall 2023**	**Fall 2024**	**Fall 2025**
Generation	121,403.5	119,745.3	122,283.4	111,713.8	111,791.5	118,309.5
External Resources	4,095.4	4,366.8	2,833.5	3,979.6	3,990.2	2,763.6
Behind the Meter Generation	3,874.2	3,877.9	3,646.8	3,842.8	3,789.7	3,646.8
Demand Resources	6,999.2	6,866.1	7,983.7	6,254.4	5,957.5	7,767.8
Energy Efficiency	4.9	22.5	28.1	4.8	22.5	28.1
Total	**136,377.2**	**134,878.6**	**136,775.5**	**125,795.4**	**125,551.4**	132,515.8

ZRC: Zonal Resource Credit

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Winter Supply Offered and Cleared Comparison Trend

	Offered (ZRC)			Cleared (ZRC)		
Planning Resource	Winter 2023-2024	Winter 2024-2025	Winter 2025-2026	Winter 2023-2024	Winter 2024-2025	Winter 2025-2026
Generation	124,632.7	133,457.4	120,225.1	114,886.6	118,253.8	117,392.0
External Resources	3,937.1	3,973.0	2,808.7	3,334.6	3,313.3	2,793.7
Behind the Meter Generation	3,257.8	3,111.5	3,082.9	3,173.9	2,957.3	3,082.6
Demand Resources	7,644.4	7,866.4	8,112.3	6,702.4	6,822.7	7,698.3
Energy Efficiency	6.7	29.7	32.9	6.7	29.7	32.9
Total	**139,478.7**	**148,438.0**	**134,261.9**	**128,104.2**	**131,376.8**	**130,999.5**

ZRC: Zonal Resource Credit

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Spring Supply Offered and Cleared Comparison Trend

	Offered (ZRC)			Cleared (ZRC)		
Planning Resource	Spring 2024	Spring 2025	Spring 2026	Spring 2024	Spring 2025	Spring 2026
Generation	119,254.7	121,303.8	120,780.6	110,195.8	113,091.4	115,724.7
External Resources	3,794.1	3,481.8	2,640.1	3,409.1	3,406.5	2,570.3
Behind the Meter Generation	4,096.4	4,201.6	4,133.5	4,058.9	4,180.5	4,133.5
Demand Resources	7,282.9	7602.9	8,475.9	6,720.0	7,087.2	8,240.5
Energy Efficiency	5.3	25.0	30.5	5.3	25.0	30.5
Total	**134,433.4**	**136,615.1**	**136,060.6**	**124,389.1**	**127,790.6**	**130,699.5**

ZRC: Zonal Resource Credit

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

2025 PRA pricing compared with Independent Market Monitor (IMM) Conduct Threshold and Cost of New Entry (CONE)

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs	System CONE (Seasonal)	North/Central CONE (Seasonal)	South CONE (Seasonal)
Summer 2025	$666.50											$1,353.84	$1,384.36	$1,282.61
Fall 2025	$91.60							$74.09			$83.24-$91.60	$1,368.71	$1,399.58	$1,296.70
Winter 2025-26	$33.20											$1,383.92	$1,415.13	$1,311.11
Spring 2026	$69.88											$1,353.84	$1,384.36	$1,282.61
Cost of New Entry (Annual)	$127,720	$125,090	$121,220	$126,040	$136,170	$124,360	$130,930	$118,960	$117,710	$117,330	$136,170			
IMM Conduct Threshold*	$34.99	$34.27	$33.21	$34.53	$37.31	$34.07	$35.87	$32.59	$32.25	$32.15	-			

- *Zonal Auction Clearing Prices (ACP) shown in $/MW-day*

**Zonal Resource Credit (ZRC) offers that impact pricing should generally stay below the IMM Conduct Threshold and applies to all seasons.*

ERZ: External Resource Zones

Historical Summer Auction Clearing Price Comparison

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs
2015-2016	$3.48			$150.00	$3.48			$3.29		N/A	N/A
2016-2017	$19.72	$72.00						$2.99			N/A
2017-2018	$1.50										N/A
2018-2019	$1.00	$10.00									N/A
2019-2020	$2.99						$24.30	$2.99			
2020-2021	$5.00						$257.53	$4.75	$6.88	$4.75	$4.89-$5.00
2021-2022	$5.00							$0.01			$2.78-$5.00
2022-2023	$236.66							$2.88			$2.88-236.66
Summer 2023	$10.00										
Summer 2024	$30.00										
Summer 2025	$666.50										

- Auction Clearing Prices shown in $/MW-Day

ERZ: External Resource Zones

Fall Auction Clearing Price Comparison

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs
Fall 2023	$15.00								$59.21	$15.00	
Fall 2024	$15.00				$719.81	$15.00					
Fall 2025	$91.60							$74.09			$83.24-$91.60

- Auction Clearing Prices shown in $/MW-Day
- Price separation present in Fall 2025 between the North and South subregions since the Sub-Regional Import Constraint (SRIC) / Sub-Regional Export Constraint (SREC) bound

ERZ: External Resource Zones

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Winter Auction Clearing Price Comparison

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs
Winter 2023-24	$2.00								$18.88	$2.00	
Winter 2024-25	$0.75										
Winter 2025-26	$33.20										

- Auction Clearing Prices shown in $/MW-Day

ERZ: External Resource Zones

Spring Auction Clearing Price Comparison

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs
Spring 2024	$10.00										
Spring 2025	$34.10				$719.81	$34.10					
Spring 2026	$69.88										

- Auction Clearing Prices shown in $/MW-Day

ERZ: External Resource Zones

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Summer 2025 Capacity

Offered Capacity & Final PRMR (MW)



Cleared Capacity, Imports & Exports (MW)



PRMR: Planning Reserve Margin Requirement
Offers includes Fixed Resource Adequacy Plan (FRAP), Self-scheduled and price sensitive offers
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Fall 2025 Capacity

Offered Capacity & Final PRMR (MW)



Cleared Capacity, Imports & Exports (MW)



PRMR: Planning Reserve Margin Requirement
Offers includes Fixed Resource Adequacy Plan (FRAP), Self-scheduled and price sensitive offers
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Winter 2025/26 Capacity

Offered Capacity & Final PRMR (MW)



Cleared Capacity, Imports & Exports (MW)



PRMR: Planning Reserve Margin Requirement
Offers includes Fixed Resource Adequacy Plan (FRAP), Self-scheduled and price sensitive offers
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Spring 2026 Capacity

Offered Capacity & Final PRMR (MW)



Cleared Capacity, Imports & Exports (MW)



PRMR: Planning Reserve Margin Requirement
Offers includes Fixed Resource Adequacy Plan (FRAP), Self-scheduled and price sensitive offers
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

The 2025 auction resulted in a surplus compared to the PRMR target, in contrast to the 2024 OMS-MISO Survey projection of a shortfall

Summer 2025 auction outcomes vs. 2024 OMS-MISO Survey projection for 2025

- Resource offers in the auction were comparable to "High Certainty" values projected in the OMS-MISO Survey
- Incremental accreditation reductions in the auction were offset by incremental increases in new resource additions
- Notably, initial PRMR was lower (5.5 GW) than projected in the OMS-MISO Survey

2024 OMS-MISO Survey Projection vs. 2025 PRA Actual PRMR Surplus (MW)

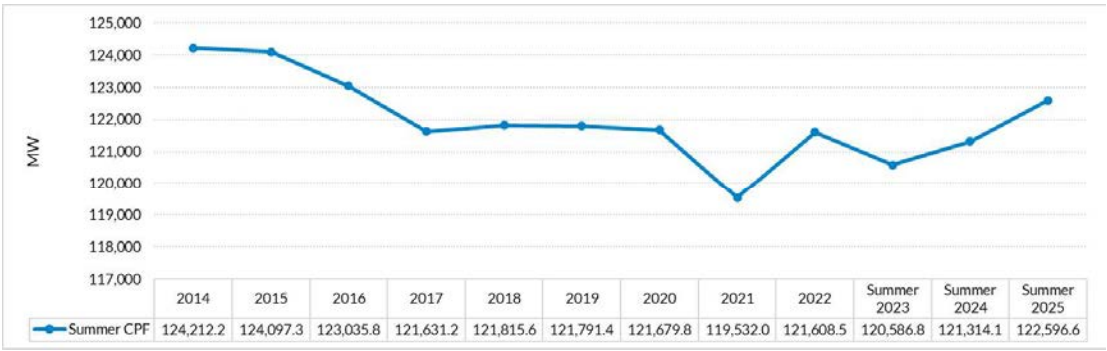


**PRA Shortfall/Surplus relative to Initial PRMR | PRMR: Planning Reserve Margin Requirement*

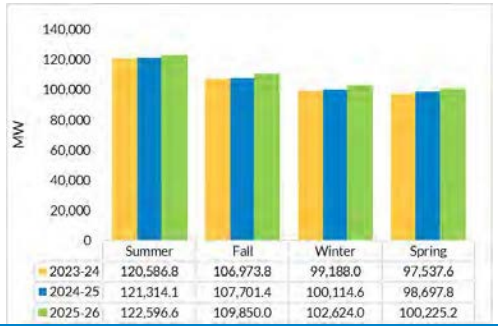
05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Coincident Peak Forecast

Year over year the Summer CPF (+1.3 GW), PRM (-1.1%) and Final PRMR (+1.5 GW) are higher.



	2014	2015	2016	2017	2018	2019	2020	2021	2022	Summer 2023	Summer 2024	Summer 2025
Summer CPF	124,212.2	124,097.3	123,035.8	121,631.2	121,815.6	121,791.4	121,679.8	119,532.0	121,608.5	120,586.8	121,314.1	122,596.6

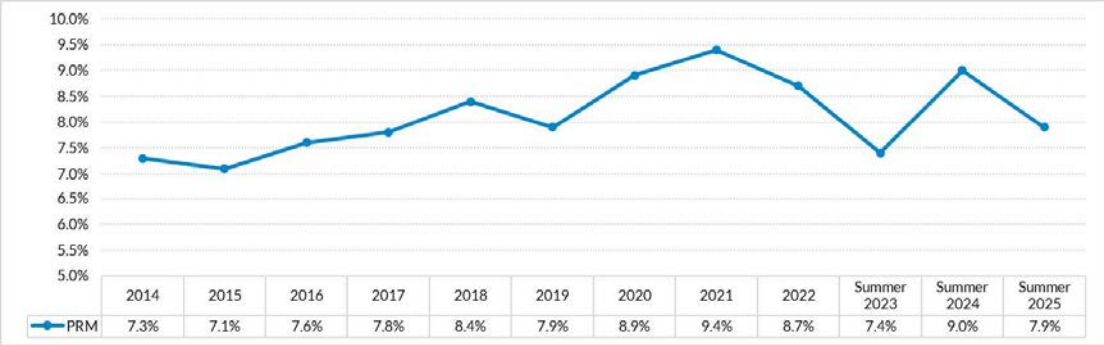


	Summer	Fall	Winter	Spring
2023-24	120,586.8	106,973.8	99,188.0	97,537.6
2024-25	121,314.1	107,701.4	100,114.6	98,697.8
2025-26	122,596.6	109,850.0	102,624.0	100,225.2

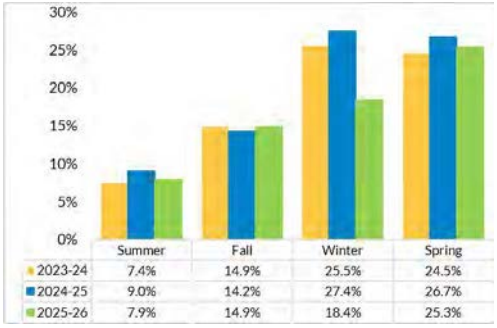
PRMR: Planning Reserve Margin Requirement

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Planning Reserve Margin (%)

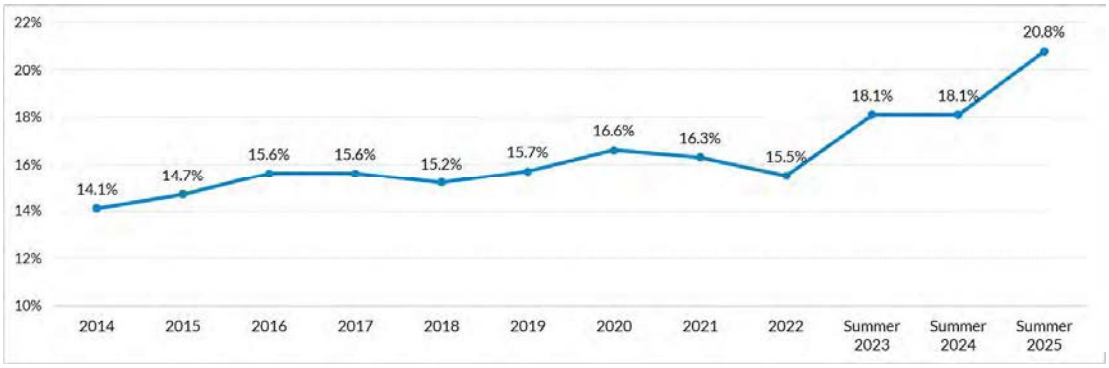


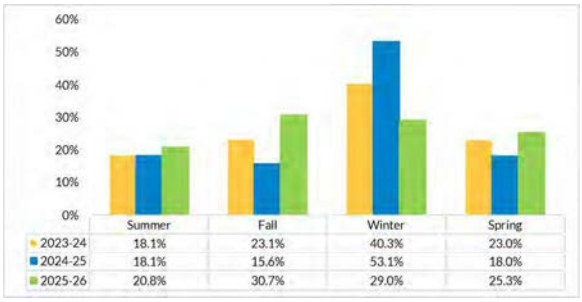
	2014	2015	2016	2017	2018	2019	2020	2021	2022	Summer 2023	Summer 2024	Summer 2025
PRM	7.3%	7.1%	7.6%	7.8%	8.4%	7.9%	8.9%	9.4%	8.7%	7.4%	9.0%	7.9%



	Summer	Fall	Winter	Spring
2023-24	7.4%	14.9%	25.5%	24.5%
2024-25	9.0%	14.2%	27.4%	26.7%
2025-26	7.9%	14.9%	18.4%	25.3%

Wind Effective Load Carrying Capacity (%)





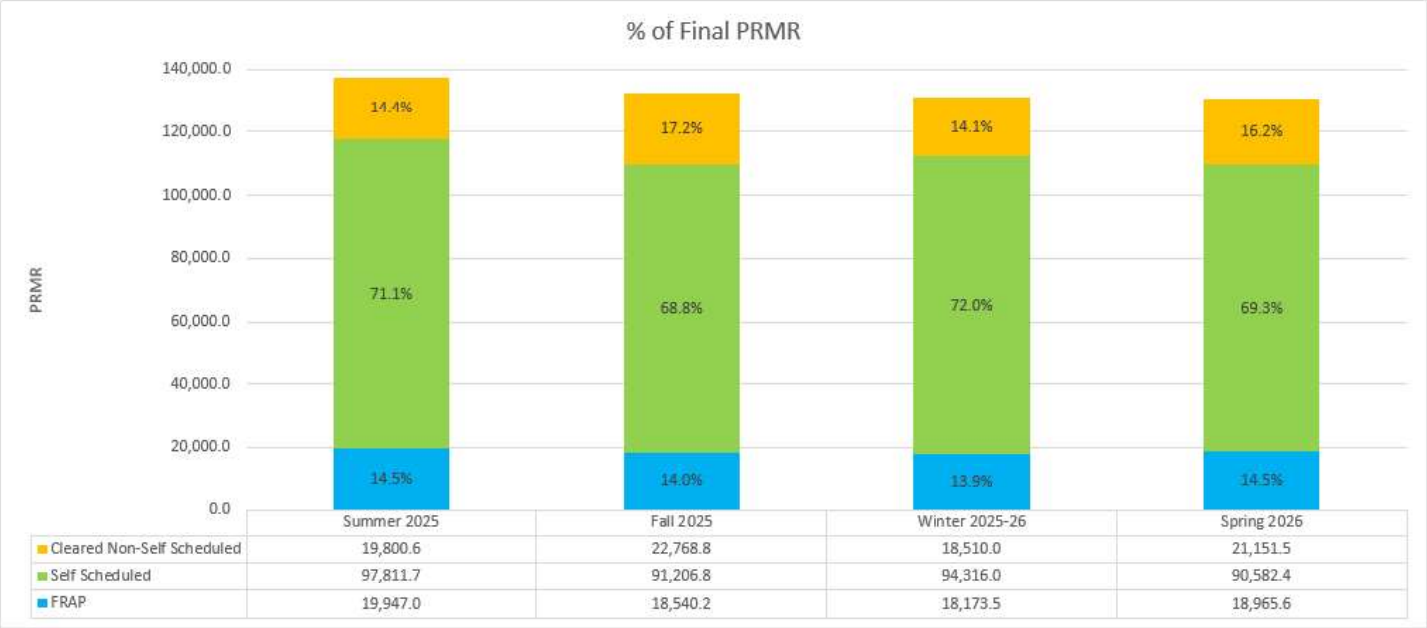
	Summer	Fall	Winter	Spring
2023-24	18.1%	23.1%	40.3%	23.0%
2024-25	18.1%	15.6%	53.1%	18.0%
2025-26	20.8%	30.7%	29.0%	25.3%

- No change to wind or solar accreditation methodology from previous years.
- Methodology applied on a seasonal basis.
- Wind ELCC and new solar capacity is established in the LOLE Study
- New solar class average
  - Summer, fall, spring 50%
  - Winter 5%

ELCC: Effective Load Carrying Capability LOLE: Loss of Load Expectation

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

2025/26 Seasonal Resource Adequacy Requirements are fulfilled similarly across all four seasons

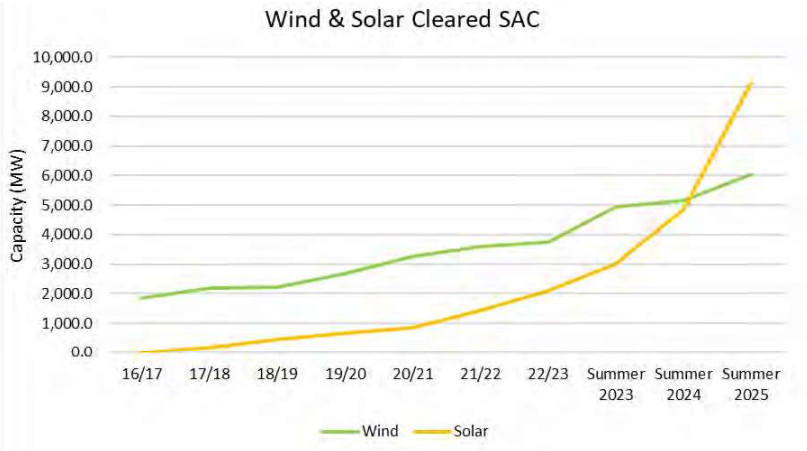


	Summer 2025	Fall 2025	Winter 2025-26	Spring 2026
Cleared Non-Self Scheduled	19,800.6	22,768.8	18,510.0	21,151.5
Self Scheduled	97,811.7	91,206.8	94,316.0	90,582.4
FRAP	19,947.0	18,540.2	18,173.5	18,965.6

PRMR: Planning Reserve Margin Requirement

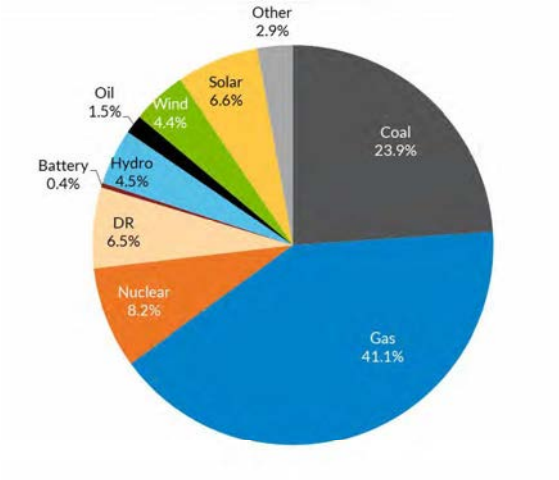
Although conventional generation still comprises most of the capacity, wind and solar continue to grow

- 9.1 GW of solar cleared this year's auction, an increase of 88% from Planning Year 2024/25 (4.9 GW)
- 6 GW of wind cleared this year, an increase of 17% compared to last year (5.2 GW)



Winter final PRMR is 6.6 GW (4.8%) lower than the summer with fewer solar resources to meet final PRMR in the winter versus the summer

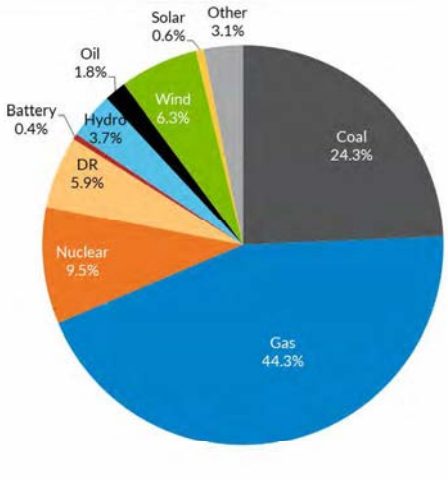
Summer 2025



MISO-wide

Cleared ZRC	Summer 2025	Winter 2025/26	Difference
Coal	32,909.6	31,887.2	1,022.4
Gas	56,470.0	57,990.5	-1,520.5
Nuclear	11,232.1	12,416.7	-1,184.6
DR	9,004.4	7,698.3	1,306.1
Battery	499.2	588.5	-89.3
EE	27.6	32.9	-5.3
Hydro	6,231.3	4,823.7	1,407.6
Oil	2,088.8	2,315.7	-226.9
Wind	6,039.1	8,282.9	-2,243.8
Solar	9,122.8	847.3	8,275.5
Misc	3,934.4	4,115.8	-181.4
PRMR	137,559.3	130,999.5	6,559.8

Winter 2025/26

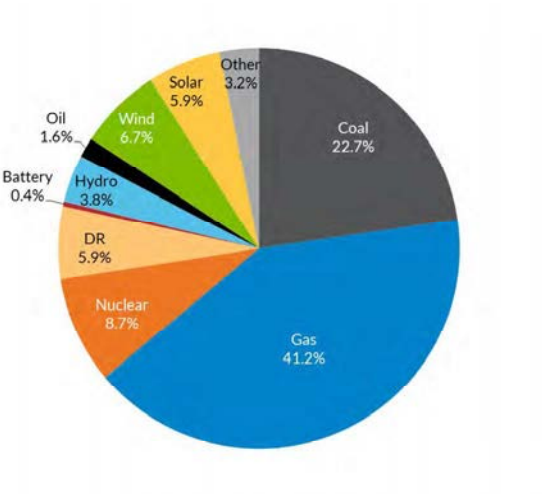


PRMR: Planning Reserve Margin Requirement

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

Fall 2025 and Spring 2026 - Cleared ZRCs and Final PRMR

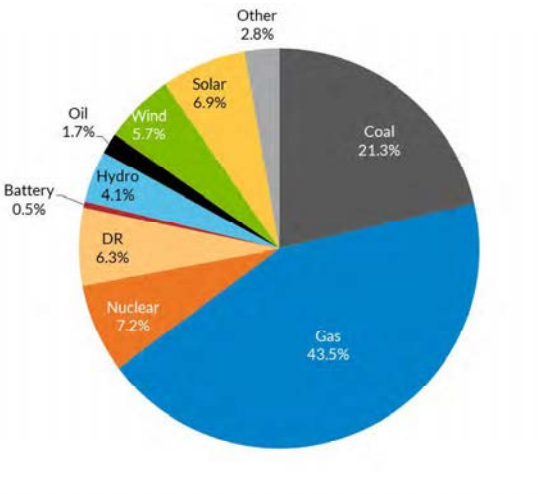
Fall 2025



MISO-Wide

Cleared ZRC	Fall 2025	Spring 2026
Coal	30,038.9	27,886.8
Gas	54,636.4	56,820.7
Nuclear	11,482.1	9,405.4
DR	7,767.8	8,240.5
Battery	497.9	663.3
EE	28.1	30.5
Hydro	5,047.4	5,415.8
Oil	2,123.8	2,190.4
Wind	8,864.8	7,438.0
Solar	7,843.8	8,975.1
Misc	4,184.8	3,633.0
PRMR	132,515.8	130,699.5

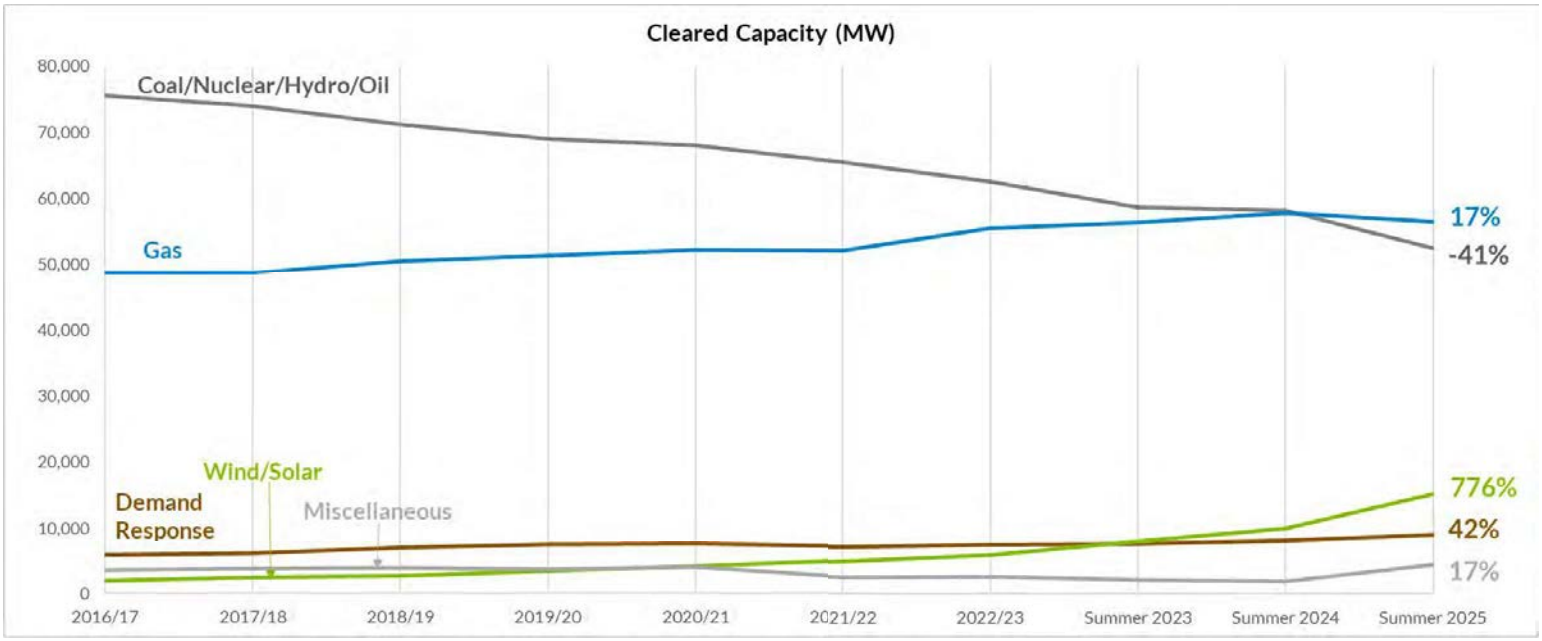
Spring 2026



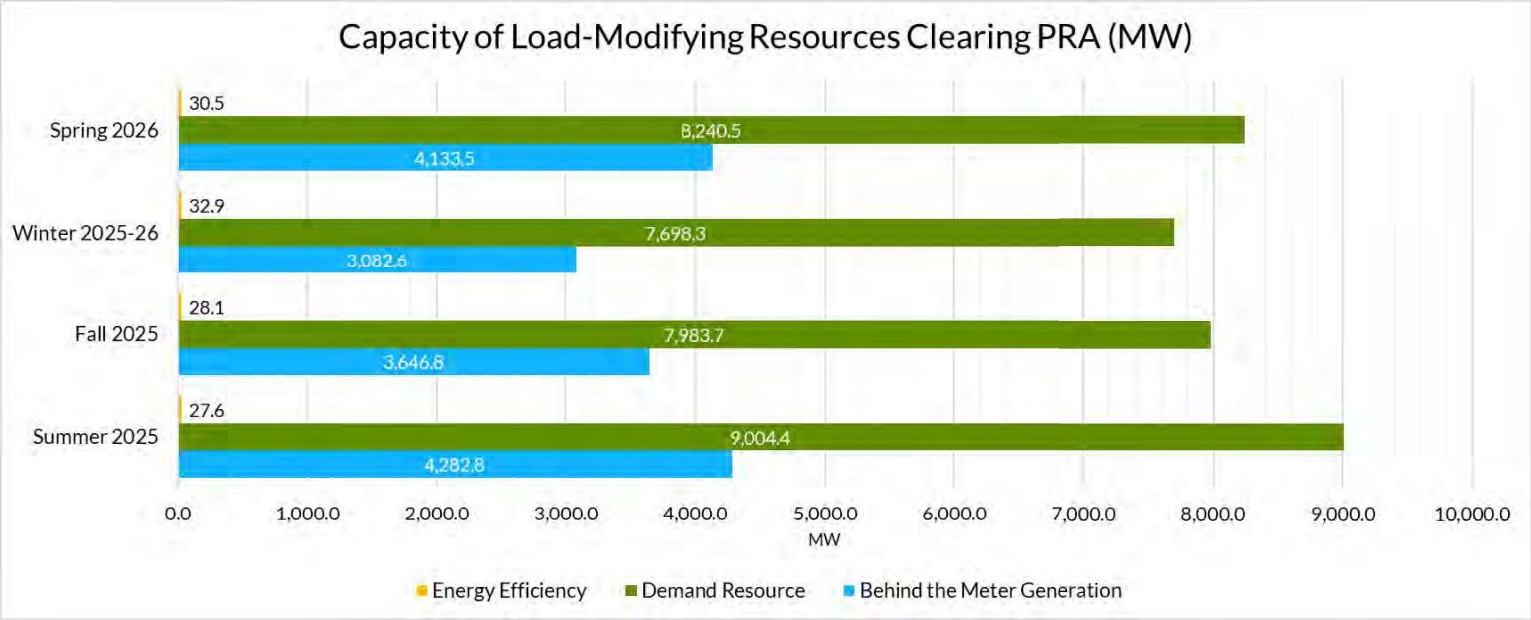
PRMR: Planning Reserve Margin Requirement

05/29/2025: MISO Planning Resource Auction for Planning Year 2025/26 Results Posting

The planning resource mix shows the continuation of a multi-year trend towards less coal/nuclear/hydro/oil and increased gas and non-conventional resources



2025/26 Seasonally Cleared Load Modifying Resources Comparison





Visit MISO's Help Center
for more information
https://help.misoenergy.org/

Attachment C

Collection of MISO Attachment Y materials

Consumers Energy
Count on Us®

A CMS Energy Company

Timothy J. Sparks, P.E.
Vice President Electric Grid Integration

VIA Electronic Mail

December 14,2021

Andrew Witmeier
Director of Resource Utilization
Midcontinent Independent System Operator, Inc.
720 City Center Drive
Carmel, IN 46032

Re: Suspension of Campbell Units 1, 2 & 3

Dear Mr. Witmeier:

Consumers Energy Company ("Company") hereby provides notice to the Midcontinent Independent System Operator, Inc. ("MISO") that it intends to suspend Campbell Units 1, 2 and 3 effective June 1, 2025. Attached is the notice of such intent in accordance with Section 38.2.7 and Attachment Y of MISO's Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff").

Campbell Unit 3 is jointly owned by the Company (93.3%), CPNode CONS.CAMPBELL3, Michigan Public Power Agency (4.8%), CPNode CONS.CA3.MPPA, and Wolverine Power Supply Cooperative (1.9%), CPNode CONS.CA3_WPSC. The Company attests that, pursuant to the relevant Operating Agreements, it is authorized to submit this Attachment Y notice on behalf of all Campbell Unit 3 owners.

In the event you have any questions regarding this matter, please contact Kathy Wetzel at (517) 788-2039.

Regards,

Timothy J. Sparks
Vice President Electric Grid Integration
Consumers Energy Company
1945 W. Parnall Rd.
Jackson, MI 49201

Cc: Kathy Wetzel
Thomas Clark

Electric Supply
Contract/Commitment Cover Sheet

(Note: Contracts, purchase orders, or other commitment instruments will not be signed unless this sheet is completed in full)

Subject/Commitment: MISO Attachment Y Notification of Generating Resources /SCU/ Pseudo-tied Out Generator Change of Status / Including Notification of Rescission Form

Reason: Notice to Suspend Karn Units 3 & 4 effective June 1, 2023.

Check One			
Yes	No*	N/A	
☐	☐	☒	1) Gateway Assessment Tool completed and attached
☒	☐	☐	2) Legal Review / Approval to Form
☐	☐	☒	3) Credit Risk Management Approval
☐	☐	☒	4) Competitive Bid
☐	☐	☒	5) Sole Source Approval completed and attached

*If No is checked or special circumstances apply, please explain:

Legal review by Emerson Hilton.

*Contract Owner: Kathy Wetzel

Department Sign Off
(Signature & Date Required)

ML Metz
Merchant Ops & PSCR

KG Troyer
EGI Contracts & Settlements
Renewables

BD Gallaway
Fuel Supply

TP Clark
Electric Supply

12/14/2021

TJ Sparks
Electric Grid Integration

Form Revised: 04/16/21

*Contract Owner Responsible for Scanning & Placing on SharePoint Site

ATTACHMENT Y

Notification of Generation Resource/SCU/Pseudo-tied Out Generator

Change of Status,

Including Notification of Rescission

This is a notification of change of status of a Generation Resource, Synchronous Condenser Unit ("SCU"), or Pseudo-tied out Generator in accordance with Section 38.2.7.a of the Tariff. An electronic copy of the completed form will be accepted by the Transmission Provider, however, a form will not be considered complete until the original form containing an original signature, including all attachments, is received by the Transmission Provider at the following address: MISO, Attention: Director of Transmission Planning; 720 City Center Drive, Carmel, IN 46032.

The Transmission Provider may request additional information as reasonably necessary to support operations under the Tariff.

Owner of the Generation Resource, SCU or Pseudo-tied out Generator:
Consumers Energy Company (see attached letter re: Campbell Unit 3)

Name of Market Participant: Consumers Energy Company - NERC ID: CETR

Owner's state of organization or incorporation Michigan

Generation Resource/SCU/Pseudo-tied Out Generator [plant and unit number(s)] Campbell Units 1, 2 & 3

Source/Identification of Generation Interconnection Service [name of agreement, parties, date, date filed and docket number, and any other information to identify an agreement] CAMPBELL UNITS 1+2: UMBRELLA GIA BETWEEN CONSUMERS, METC + MISO FERC DOCKET ER21-999. CAMPBELL UNIT 3: FERC DOCKET ER06-1441 FOR MISO SERVICE AGREEMENT NO. 1755

Pursuant to the terms of the MISO Tariff, Owner hereby certifies that it will

[X] Suspend for economic reasons operation of all or a portion of the Generation Resource/SCU/Pseudo-tied out Generator commencing on 1st [day] of June [month] of 2025 [year]

[ ] Rescind the current notice to SuspendThe facility is further described as follows:

Location: West Olive, Michigan

Unit Name	CPNode (if applicable)	Nameplate Capacity(MW)	Change in Capacity(MW)
Campbell Unit 1	CONS.CAMPBELL1	260	260
Campbell Unit 2	CONS.CAMPBELL2	360	360
Campbell Unit 3	CONS.CAMPBELL3	844	844

Owner understands and agrees that this notification is provided in accordance with Section 38.2.7 of the Transmission Provider's Tariff and will not be made public by the Transmission Provider except as provided for under Section 38.2.7 of the Tariff.

The undersigned certifies that he or she is an officer of the owner of the Generation Resource/SCU/Pseudo-tied out Generator, that he or she is authorized to execute and submit this notification, and that the statements contained herein are true and correct.

Signature

Name: TIMOTHY J SPARKS

Title: VP ELECTRIC GRID INTEGRATION

Date:

Contact Information

Email: TIMOTHY.SPARKS@CMSENERGY.COM

Phone: 517 788 1053

Andrew Witmeier
Director, Resource Utilization
317-249-5585
awitmeier@misoenergy.org

VIA OVERNIGHT DELIVERY

March 11, 2022

Timothy J. Sparks
Vice President, Electric Grid Integration
Consumers Energy Company
1945 W. Parnall Rd.
Jackson, MI 49201

Subject: **Approval of Campbell Units 1,2 &3 Attachment Y Suspension Notice**

Dear Mr. Sparks,

On December 14, 2021, Consumers Energy Company submitted an Attachment Y Notice to MISO for the suspension of Campbell Units 1,2 & 3, effective June 1, 2025. After being reviewed for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ("Tariff"), the suspension of Campbell Units 1,2 & 3 would not result in violations of applicable reliability criteria. Therefore, Campbell Units 1,2 & 3 may suspend without the need for the generators to be designated as a System Support Resource ("SSR") units as defined in the Tariff.

As there were no reliability criteria violations, MISO will continue to preserve the confidentiality of the Attachment Y Notice.

Please do not hesitate to contact me if you have any questions regarding this matter.

Respectfully,

Andrew Witmeier
Director, Resource Utilization

VIA EMAIL

Andrew Witmeier
Director of Resource Utilization
Midcontinent Independent System Operator, Inc.
720 City Center Drive
Carmel, IN 46032

May 28, 2025

Re: Modified Suspension Date for Campbell Units 1, 2, & 3

Mr. Witmeier:

On December 14, 2021, Consumers Energy Company ("Consumers Energy") submitted an Attachment Y Notice to the Midcontinent Independent System Operating, Inc. ("MISO") for the suspension of Units 1, 2, and 3 at the J.H. Campbell Generation Complex ("Campbell Plant"), effective June 1, 2025. After reviewing for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ("Tariff"), MISO determined the suspension of Campbell Plant Units 1, 2, and 3, would not result in violations of applicable reliability criteria, as outlined in the Tariff. On March 11, 2022, MISO approved the suspension of Campbell Plant Units 1, 2, and 3 without the need for the generators to be designated as System Support Resource units as defined in the Tariff.

On May 23, 2025, the U.S. Department of Energy ("DOE") issued Order No. 202-25-3 (the "Order"), requiring the Campbell Plant to be available to MISO through August 20, 2025.

In order to comply with the Order, Consumers Energy hereby provides notice to MISO, consistent with Section 38.2.7(d)(ii)(1) of the Tariff, of its intent to modify the current Attachment Y Notice such that the Campbell Plant will now suspend on August 21, 2025.

As noted in Consumers Energy's original Attachment Y Notice, Campbell Unit 3 is jointly owned by Consumers Energy (93.3%), CPNode CONS.CAMPBELL3, Michigan Public Power Agency (4.8%), CPNode CONS.CA3.MPPA, and Wolverine Power Supply Cooperative (1.9%), CPNode CONS.CA3_WPSC. The Company attests that it has notified all Campbell Unit 3 owners of this submittal.

In the event you have any questions regarding this matter, please contact Derek Anspaugh at (517) 788-1869.

Regards,

Sri Maddipati
VP Electric Supply
1945 W. Parnell Rd
Jackson, MI 49901

ATTACHMENT Y

Notification of Generation Resource/SCU/Pseudo-tied Out Generator

Change of Status,

Including Notification of Rescission

This is a notification of change of status of a Generation Resource, Synchronous Condenser Unit ("SCU"), or Pseudo-tied out Generator in accordance with Section 38.2.7.a of the Tariff. An electronic form must be submitted to the Transmission Provider via its online application tool in the manner specified by the Transmission Planning Business Practices Manual (BPM-020), and a form will be considered complete on the date of such online application.

The Transmission Provider may request additional information as reasonably necessary to support operations under the Tariff.

Owner of the Generation Resource, SCU or Pseudo-tied out Generator:
Consumers Energy Company (see attached letter re Campbell 3)

Name of Market Participant: Consumers Energy Company - NERC ID: CETR

Owner's state of organization or incorporation Michigan

Generation Resource/SCU/Pseudo-tied Out Generator [plant and unit number(s)] Campbell Units 1, 2 & 3

Source/Identification of Generation Interconnection Service [name of agreement, parties, date, date filed and docket number, and any other information to identify an agreement]
Campbell Units 1 & 2: Umbrella GIA Between Consumers, METC, and MISO, FERC Docket No. ER24-1359
Campbell Unit 3: FERC Docket No. ER06-1441 for MISO Service Agreement No. 1755

Pursuant to the terms of the MISO Tariff, Owner hereby certifies that it will

[X] Suspend for economic reasons operation of all or a portion of the Generation Resource/SCU/Pseudo-tied out Generator commencing on 21 [day] of August [month] of 2025 [year]

[ ] Rescind the current notice to Suspend

The facility is further described as follows:

Location: West Olive, Michigan

Unit Name	CPNode (if applicable)	Nameplate Capacity(MW)	Change in Capacity(MW)
Campbell Unit 1	CONS.CAMPBELL1	260	260
Campbell Unit 2	CONS.CAMPBELL2	360	360
Campbell Unit 3	CONS.CAMPBELL3	844	844

Owner understands and agrees that this notification is provided in accordance with Section 38.2.7 of the Transmission Provider's Tariff and will not be made public by the Transmission Provider except as provided for under Section 38.2.7 of the Tariff.

The undersigned certifies that he or she is an officer of the owner of the Generation Resource/SCU/Pseudo-tied out Generator, that he or she is authorized to execute and submit this notification, and that the statements contained herein are true and correct.

Signature

Name: Srikanth Maddipati

Title: VP Electric Supply

Date: May 28, 2025

Contact Information

Email: sri.maddipati@cmsenergy.com

Phone: 517-788-0635

From:	Marc Keyser
To:	Rachael H. Moore; Huaitao Zhang; DEREK S. ANSPAUGH; Adam C. French; NICHOLAS B. TENNEY; Emerson J. Hilton
Cc:	Sumit Pal Brar
Subject:	RE: [EXT]RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required
Date:	Friday, May 30, 2025 4:05:01 PM

##CAUTION##: This email originated from outside of CMS/CE. Remember your security awareness training: Stop, think, and use caution before clicking links/attachments.

Rachael: I'm responding back on behalf of the team, after they briefly reviewed with legal here:

we received the Attachment Y, and the new cessation is 8/21/2025. Additionally, you have until 8/21/2027 to submit a new replacement request before the suspension period ends. In other words, the Attachment Y remains as is, still approved, except with a new/different start date.

From: Rachael H. Moore <Rachael.Moore@cmsenergy.com>
Sent: Friday, May 30, 2025 12:15 PM
To: Huaitao Zhang <HZhang@misoenergy.org>; Derek Anspaugh <Derek.Anspaugh@cmsenergy.com>; Adam French <adam.french@cmsenergy.com>; NICHOLAS B. TENNEY <NICHOLAS.TENNEY@cmsenergy.com>; Emerson J. Hilton <Emerson.Hilton@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: RE: [EXT]RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

Warning! This email originated from outside the organization and caution should be used when clicking on links/attachments. If you suspect this email is malicious, use the 'Phish Alert' button.

Thank you, Huaitao. Can you confirm that this modification of the suspension start date provided consistent with Section 38.2.7(d)(ii)(1) of the Tariff does not impact the overall approval of the Attachment Y the Company previously received on March 11, 2022, and that the Company is still approved to enter suspension (now effective 8/21/25)?

Thank you!

Rachael Moore | Senior Attorney
[redacted]

From: Huaitao Zhang <HZhang@misoenergy.org>
Sent: Wednesday, May 28, 2025 1:47 PM

To: Rachael H. Moore <Rachael.Moore@cmsenergy.com>; DEREK S. ANSPAUGH <DEREK.ANSPAUGH@cmsenergy.com>; Adam C. French <ADAM.FRENCH@cmsenergy.com>; NICHOLAS B. TENNEY <NICHOLAS.TENNEY@cmsenergy.com>; Emerson J. Hilton <Emerson.Hilton@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: RE: [EXT]RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

##CAUTION##: This email originated from outside of CMS/CE.
Remember your security awareness training: Stop, think, and use caution before clicking links/attachments.

Rachael,

Thanks for the quick response, and we are all good.

Thanks,
Huaitao

From: Rachael H. Moore <Rachael.Moore@cmsenergy.com>
Sent: Wednesday, May 28, 2025 12:40 PM
To: Huaitao Zhang <HZhang@misoenergy.org>; Derek Anspaugh <Derek.Anspaugh@cmsenergy.com>; Adam French <adam.french@cmsenergy.com>; NICHOLAS B. TENNEY <NICHOLAS.TENNEY@cmsenergy.com>; Emerson J. Hilton <Emerson.Hilton@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: [EXT]RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

> **Warning!** This email originated from outside the organization and caution should be used when clicking on links/attachments. If you suspect this email is malicious, use the 'Phish Alert' button.

Huaitao –

Attached is the modified Attachment Y with the amended suspension start date of 8/21/2025. Please let me know if we should send this notice of Modified Attachment Y to anyone else at MISO or if you would like us to mail a physical copy as well.

Thank you,
Rachael

Rachael Moore | Senior Attorney
[redacted]

From: Rachael H. Moore
Sent: Tuesday, May 27, 2025 11:52 AM
To: Adam C. French <adam.french@cmsenergy.com>; Huaitao Zhang <HZhang@misoenergy.org>; NICHOLAS B. TENNEY <nicholas.tenney@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

Good afternoon,

Yes, I will be working with members of the Company to ensure we have the Attachment Y notice updated by 5/28. Please let me know if there is a specific contact at MISO we should plan to send this to.

Thank you!
Rachael

Rachael Moore | Senior Attorney
[redacted]

From: Adam C. French <ADAM.FRENCH@cmsenergy.com>
Sent: Tuesday, May 27, 2025 11:49 AM
To: Huaitao Zhang <HZhang@misoenergy.org>; NICHOLAS B. TENNEY <NICHOLAS.TENNEY@cmsenergy.com>; Rachael H. Moore <Rachael.Moore@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: RE: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

It is my understanding that is being handled by Rachael Moore
RACHAEL.MOORE@CMSENERGY.COM

From: Huaitao Zhang <HZhang@misoenergy.org>
Sent: Tuesday, May 27, 2025 11:41 AM
To: NICHOLAS B. TENNEY <NICHOLAS.TENNEY@cmsenergy.com>; Adam C. French <ADAM.FRENCH@cmsenergy.com>
Cc: Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>
Subject: FW: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

You don't often get email from hzhang@misoenergy.org. Learn why this is important [aka.ms]

##CAUTION##: This email originated from outside of CMS/CE. Remember your security awareness training: Stop, think, and use caution before clicking links/attachments.

Nick and Adam,

Marc pointed to me that you are the contact for this request.

Thanks,
Huaitao

From: Huaitao Zhang
Sent: Tuesday, May 27, 2025 11:05 AM
To: KATHY S. WETZEL <KATHY.WETZEL@cmsenergy.com>
Cc: timothy.sparks@cmsenergy.com; Sumit Pal Brar <SBrar@misoenergy.org>; Marc Keyser <MKeyser@misoenergy.org>; Jagdesh Shivani <JShivani@misoenergy.org>
Subject: Order from Secretary of Energy to keep Campbell Unit ON for the summer (until Aug 21, 2025) - Action required

Hi Kathy,

Pertain to the Order from Secretary of Energy regarding the suspension/cessation date of Campbell units 1,2&3, MISO requests Consumer Energy to submit the following application updates to MISO by 5/28/2025:

Attachment Y request with suspension start date as 8/21/2025

FYI, the order link is https://www.energy.gov/sites/default/files/2025-05/Midcontinent%20Independent%20System%20Operator%20%28MISO%29%20202%28c%29%20Order_1.pdf [energy.gov]

Thanks,
Huaitao Zhang
Resource Utilization Engineer

Integrity | Collaboration | Commitment | Creativity | Adaptability

Attachment D

Consumers' Responses from June 10, 2025

Question:

23. Absent continued operation of the Campbell Plant, what was Consumers Energy's Zone Resource Credit (ZRC) position for planning year 2025-2026.

Response:

The table below shows our capacity positions using the initial Planning Reserve Margin Requirement (PRMR) for each season of planning year 2025. These numbers do not include any contributions from the Campbell coal-fired generating units.

PY2025	**ZRC**
Summer	272.9
Fall	842.7
Winter	0.0
Spring	4.3

Date: June 10, 2025

Question:

24. How many ZRCs does Consumers anticipate will be accredited for the continued operation of the Campbell Plant?

Response:

At this time we do not anticipate the Campbell units contributing any Zonal Resource Credits to our capacity positions throughout planning year 2025.

Date: June 10, 2025