BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 21

DOE ORDER NO. 202-08-1

The Secretary of Energy
Washington, DC 20585

Order No. 202-08-1

Pursuant to the authority vested in me by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in Texas due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, a shortage of facilities for the transmission of electric energy and other causes, and that issuance of this order will serve to alleviate the emergency and serve the public interest.

As a result of the massive devastation caused by Hurricane Ike, large portions of the areas affected by the hurricane are without electricity, posing a threat to human life and health. It is my judgment that in these circumstances, the order I am issuing today will meet the emergency and serve the public interest because it will alleviate electricity shortages and protect the life and health of the people in the affected areas.

Based on my determination set forth above, I hereby order:

Effective immediately, CenterPoint Energy is authorized and directed to temporarily connect at distribution and transmission level voltages such as 12.5kV, 13.2kV, 25kV, 69kV, 138kV, and 230kV to restore power to Entergy Gulf States, Inc. as well as electric cooperatives and municipal customers within the State of Texas. Pursuant to section 202(d) of the FPA, 16 U.S.C. 824a(d), during the continuance of this order, any person engaged in the transmission and sale of electric energy and not otherwise subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) may, pursuant to this order, make such temporary connections with any public utility subject to the jurisdiction of FERC and shall not become subject to FERC jurisdiction as a result of that temporary connection.

This order shall be effective upon its issuance and shall expire at 12:01 a.m., November 1, 2008.

Issued in Washington, D.C. at 1600 this 14th day of September, 2008.

Samuel W. Bodman
Secretary of Energy

Printed on recycled paper

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 22

DOE ORDER NO. 202-20-1

The Secretary of Energy

Washington, DC 20585

Order No. 202-20-1

Pursuant to the authority vested in me by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in Texas due to Hurricane Laura (13L) making landfall the morning of August 27th as a strong Category 4 Hurricane. Large portions of the areas affected by Hurricane Laura are and will be without reliable electricity for a period of time, posing a threat to human life and health. It is my judgment that in these circumstances, the order I am issuing today will meet the emergency and serve the public interest because it will alleviate electricity shortages and protect the life and health of the people in the affected areas.

On August 23 and 24, 2020, the President issued Emergency Declarations for Louisiana (EM-3538) and Texas (EM-3540), ordering Federal assistance to supplement State and local response efforts due to the emergency conditions resulting from Hurricane Laura. On August 25, 2020, the President amended the emergency declarations for Louisiana and Texas, expanding the declarations to cover emergency protective response actions that State, local, and tribal officials take in the areas affected by Hurricane Laura.

On August 26, 2020, CenterPoint Energy Houston Electric, LLC (CEHE) filed an application requesting that the Secretary of Energy determine that an emergency exists in Texas within the meaning of FPA section 202(c), and issue an order authorizing a temporary connection as necessary for CEHE to assist in the restoration of power to Entergy Texas, Inc. (Entergy) and electric cooperatives and municipal customers within the State of Texas, and for CEHE to receive similar assistance due to the devastating effects of Hurricane Laura making landfall near the Texas-Louisiana border as a dangerous Category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale. The proposed connection would occur via an existing, permanent tie-line authorized by the Federal Power Commission for emergency use only pursuant to section 202(d) of the FPA.[1] The tie-line is maintained in "open" condition on both ends and is only closed in emergency situations that necessitate its use consistent with the FPA and applicable orders. Without this emergency service, restoration of electric service to customers in the area could be delayed.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. As any temporary connection would affect an existing tie-line, it should not result in generation that would exceed emissions limitations. Therefore, this order is not anticipated to result in a conflict with a requirement of any Federal, State, or local environmental law or regulation.

Based on my determination set forth above, I hereby order:

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[1] *See Houston Lighting & Power Co.*, 19 FPC 819 (1958).

Effective immediately, CEHE is authorized and directed to temporarily connect, at transmission and distribution levels such as 12.5 kilovolts (kV), 13.2-kV, 25-kV, 34.5-kV, 69-kV, 138-kV, and 230-kV to the system of Entergy so that CEHE and Entergy may provide emergency assistance to each other if necessary to restore electric service. CEHE will utilize an existing, permanent 138-kV tie-line located between Dayton, Texas and Crosby, Texas, to accomplish the interconnection.

Pursuant to section 202(d) of the Federal Power Act, during the continuance of this order, any person or municipality engaged in the transmission and sale of electric energy and not otherwise subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) may make such temporary connections with any public utility subject to the jurisdiction of FERC, and shall not become subject to FERC jurisdiction as a result of that temporary connection.

CEHE is directed to report all dates that temporary connection of distribution and transmission lines occurred, the location of the temporary connection of distribution or transmission lines, and the quantity of energy delivered (in watt-hours) by October 26, 2020.

This order shall be effective upon its issuance and shall expire at 23:59 Central Daylight Time on October 12, 2020.

Issued in Washington, D.C. at 5:00 PM Eastern Daylight Time on this 27th day of August 2020.

Dan Brouillette
Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 23

DOE ORDER NO. 202-24-1

Department of Energy
Washington, DC 20585

Order No. 202-24-1

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in Florida due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On October 9, 2024, Duke Energy Florida, LLC (Duke), an investor-owned utility, whose service territory includes electric customers in Florida, filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of the bulk electric power system." As of 4 PM EDT on October 9, 2024, Hurricane Milton is a Category 3 storm forecast to remain a major hurricane and expand in size as it approaches the west coast of Florida. The center is likely to make landfall along the west-central coast of Florida during the night on Wednesday, October 9, 2024, or in the early morning on Thursday, October 10, 2024, and move east-northeastward across central Florida through October 10, 2024. Hurricane Milton follows the landfall of Hurricane Helene in Florida on September 26, 2024, which resulted in over 230 deaths in the southeast United States and for which recovery and restoration efforts remain ongoing. As of 5:00 PM EDT on October 9, 2024, Florida was experiencing 118,000 outages related to the approaching Hurricane Milton, with the number increasing rapidly.

On October 7, 2024, President Biden declared that an emergency exists in the State of Florida and ordered Federal assistance to supplement State, tribal, and local response efforts due to the emergency conditions resulting from Hurricane Milton beginning on October 5, 2024, and continuing.

Duke has indicated that its service territory is being impacted by Hurricane Milton. Duke expects that Hurricane Milton will cause hurricane-force-gusts across the St. Petersburg/Tampa metropolitan region at the height of the storm overnight into early Thursday, October 10, 2024. Elsewhere, strong tropical-storm to near hurricane-force-gusts are projected to impact highly populated zones along the I-4 corridor served by Duke. The combination of damaging winds,

torrential rain and subsequent flooding, storm surge at the coast, and possible tornadoes, will result in major power outages, damaging distribution and transmission infrastructure, and threaten several generation stations along the path. Application at 1.

While many generating units in the Duke service territory continue to function adequately under these stressed conditions, several of Duke's generating units are expected to be forced to shut down due to facility limits on wind speeds and storm surge, as well as staffing issues caused by mandatory evacuations. Additionally, Crystal River Units 4 and 5 remain in forced outage from storm surge impacts from Hurricane Helene. Specifically, approximately 4,000 MW of generating units are currently offline and will remain offline during Hurricane Milton. Application at 2.

Additionally, several units at Citrus Combined Cycle, the subject of this Order, may be forced offline by conditions in its Title V operating permit. With projected outages and low demand, in order to keep the Citrus Combined Cycle units online, they would potentially need to operate at low load for an extended period of time, which could result in noncompliance with its Title V permit. If these units are brought offline due to these compliance requirements, they may not be able ramp up quickly enough to meet demand as load increases following power restoration, particularly in light of the amount of generation predicted to be offline due to hurricane impacts. For example, ramp-up times from a cold start could be eight or nine hours, and could be further delayed by pre-generation start-up checks. Additionally, shutting down also increases the risk or equipment failure, as well as the risk of water intrusion due to thermal and pressure gradient changes. If equipment fails or is damaged by Hurricane Milton, units may not be able to start without additional maintenance. In that case, Duke may have to declare an Energy Emergency Alert (EEA) Level 3 and institute rotating load shed. Such impacts would hinder post-hurricane restoration and recovery activities and overall grid reliability. Although Duke would attempt to mitigate such impacts through alternative generation as well as power purchases, it is unknown what will be available following Hurricane Milton and whether the necessary transmission infrastructure will remain for this purpose. Application at 2.

The Florida Reliability Coordinating Council, Inc. (FRCC), the Reliability Coordinator for Duke's service territory and others, filed a formal endorsement on October 9, 2024, of Duke's Application, specifically the need to continue operation of the Specified Resources in Application Exhibit A at low load operation to help reduce the likelihood of any firm load shedding during the hurricane event. FRCC Letter at 1. The endorsement explains:

> It is the FRCC's firm opinion that granting this relief request will provide an immeasurable benefit to this mission and in turn, the public served by the FRCC and its member entities. Allowing this relief will not only serve the reliability of [Duke's] service territory, but also the many local electric cooperatives served by [Duke] and other interconnected electric utilities and service providers.

FRCC Letter at 2.

Description of Mitigation Measures

Duke has indicated that it will attempt to keep the Citrus Combined Cycle units operating at a load level compliant with its Title V permit whenever possible, including attempting to sell power to keep load higher. Duke anticipates needing to continue these efforts through October 13, 2024. Subject to the exceptions included in this Order, Duke has committed to continuing to take such actions, including attempting to sell power, before operating any units in a manner that will result in a conflict with a requirement of any federal, state, or local environmental statute or regulation, including requirements in permits issued pursuant to such laws or regulations.

Request for Order

Duke requests that the Secretary issue an order immediately, effective October 9, 2024, through 00:00 EDT on October 13, 2024, authorizing "continued operation of the Specified Resources" in the Duke service territory. Application at 3. The generating units (Specified Resources) that this Order pertains to are listed on the Order 202-24-1 Resources List, as described below.

ORDER

Given the emergency nature of the expected load stress, the responsibility of Duke to ensure maximum reliability on its system, and the ability of Duke to identify and dispatch generation necessary to meet load requirements, I have determined that, under the conditions specified below, additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on, among other things:

- The emergency nature of the expected load stress caused by the current extreme weather event and its aftermath threatens to cause loss of power to homes and local businesses in the areas that may be affected by curtailments, presenting a risk to public health and safety.
- The expected shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes in the State of Florida and within the region demonstrate the need for the Specified Resources to contribute to system reliability.
- Duke's responsibility to ensure maximum reliability on its system, and, with the authority granted in this Order, its ability to identify and dispatch generation, including the Specified Resources, necessary to meet the load resulting from the extreme weather event and its aftermath.

In line with the anticipated circumstances precipitated by Hurricane Milton, this Order is limited to the period beginning with the issuance of this Order on October 9, 2024, through 00:00 EDT on October 13, 2024. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation on the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. Duke anticipates that this Order may result in exceedance of emissions of Volatile Organic Compounds (VOC), specifically formaldehyde. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by Duke for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From the time this Order is issued on October 9, 2024, to 00:00 EDT on October 13, 2024, in the event that Duke determines that generation from the Specified Resources is necessary to meet the electricity demand that Duke anticipates in Florida during and immediately following this event, I direct Duke to dispatch such unit or units and to order their operation only as needed to maintain the necessary expected generation in the Duke service territory. Specified Resources are those generating units set forth on the Order 202-24-1 Resource List, which the Department shall post on www.energy.gov. Duke is directed to provide updates, if any, to Exhibit A to its Application with the anticipated category of environmental impact(s) (i.e., formaldehyde, sulfur dioxide, nitrogen oxide, mercury, carbon monoxide emissions, wastewater release, other air pollutants) by 21:00 EDT on October 10, 2024.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by Duke for maintaining grid reliability to avoid adverse health and safety impacts to customers from shedding firm customer load. Duke shall exhaust all possible measures to run the Specified Units at a load level in compliance with permit requirements, including attempting to sell power. Duke shall provide a daily notification to the Department (via AskCR@hq.doe.gov) reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

C. All operation of the Specified Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. Duke shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time. By October 20, 2024, Duke shall report all dates between October 9, 2024, and October 13, 2024, inclusive, on which the Specified Resources were operated, the hours of operation, and exceedance of permitting

limits, including formaldehyde, sulfur dioxide, nitrogen oxide, mercury, carbon monoxide, and other air pollutants, as well as exceedances of wastewater release limits. Duke shall submit a final report by November 20, 2024, with any revisions to the information reported on October 20, 2024. The environmental information submitted in the final report shall also include the following information:

(i) Emissions data in pounds per hour for each Specified Resource unit, for each hour of the operational scenario, for CO, NOx, PM10, formaldehyde, VOC, and SO2;

(ii) Emissions data must include emissions (lbs/hr) calculated consistent with reporting obligations pursuant to operating permits, permitted operating/emission limits, and the actual incremental emissions above the permit limits;

(iii) The number and actual hours each day that each Specified Resource unit operated in excess of permit limits or conditions, e.g. "Generator #1; October 10, 2024; 4 hours; 04:00-08:00 EDT";

(iv) Amount, type and formulation of any fuel used by each Specified Resource;

(v) All reporting provided under the Specified Resource's operating permit requirements over the last three years to the United States Environmental Protection Agency or local Air Quality Management District for the location of a Specified Resource that operates pursuant to this Order;

(vi) Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order; and

(vii) Information provided by the Specified Resource describing how the requirements in paragraph C above were met by the Specified Resource while operating under the provisions of this Order.

In addition, Duke shall provide information to the Department quantifying the net revenue associated with generation in excess of environmental limits accruing to the Specified Resources in connection with any order issued by the Department pursuant to Section 202(c) of the Federal Power Act.

E. Duke shall take reasonable measures to inform affected communities where all Specified Resources operate that Duke has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explains clearly what the Order allows Duke to do. At a minimum, Duke shall post a description of this Order on its website (with a link to this Order) and identify the name, municipality or other political subdivision, and zip code of any Specified Resource covered by this Order. In addition, in the event that a Specified Resource operates pursuant to this Order, a general description of the action authorized by this Order will be included in any press release issued by Duke with respect to the extreme weather event and will include a reference to the website posting required by the preceding sentence for further information. Duke shall describe the actions taken to comply with this paragraph in the

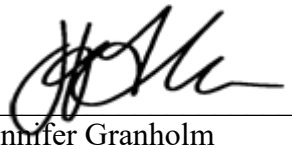
reports delivered to the Department pursuant to paragraph D above.

F. This Order shall not preclude the need for the Specified Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. Duke shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

H. This Order shall be effective upon its issuance, and shall expire at 00:00 EDT on Sunday, October 13, 2024, with the exception of the reporting requirements in paragraph D. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 8:00 PM Eastern Daylight Time on this 9th day of October 2024.



Jennifer Granholm
Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 24

DOE ORDER NO. 202-21-1

Department of Energy
Washington, DC 20585

Order No. 202-21-1

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in Texas due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

On February 14, 2021, the Electric Reliability Council of Texas (ERCOT), the Independent System Operator (ISO) whose service territory includes 90 percent of the electric customers in the state of Texas, filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of bulk electric power system."

ERCOT is in the beginning stages of an unprecedented cold weather event brought on by a rare, southward excursion of the jet stream into the South Central United States. Temperatures for Sunday and Monday in many parts of Texas are forecasted to drop well below the lowest temperatures experienced in several decades, and abnormally low temperatures are expected to persist for several more days. This weather event is expected to result in record winter electricity demand that will exceed even ERCOT's most extreme seasonal load forecasts.

On February 12, 2021, Greg Abbott, the Governor of the State of Texas declared a state of disaster in all 254 Texas counties due to severe weather posing an "imminent threat of widespread and severe property damage, injury, and loss of life due to prolonged freezing temperatures, heavy snow, and freezing rain statewide." On the morning of February 14, ERCOT issued a system-wide conservation notice addressing the expected system emergency and describing steps that homeowners and businesses can take to reduce system demand.[1] ERCOT has also worked with state agencies to take measures that maximize generation availability in Texas. For example, on February 12, the Railroad Commission of Texas issued an Emergency Order pursuant to Texas Utilities Code affecting the gas utility systems in the state. The order specified increasing the priority of gas supplies to ERCOT generators. ERCOT's application also noted that the "Texas Commission on Environmental Quality has indicated that it will provide enforcement discretion to generators in the ERCOT region that may exceed state emissions requirements during emergency conditions."

According to ERCOT, the measures taken by ERCOT and other state agencies may not prove sufficient to avoid rotating outages of as much as 4,000 MW. Moreover,

[1] ERCOT, *Grid Operator Requests Energy Conservation for System Reliability*, www.ercot.com/news/releases/show/225151.

ERCOT has been alerted that numerous generation units will be unable to operate at full capacity without violating federal air quality or other permit limitations.

ERCOT requests that the Secretary issue an order immediately, effective February 14, 2021 through February 19, 2021, authorizing "the provision of additional energy from all generation units subject to emissions or other permit limits" in the ERCOT region. The generating units (Specified Resources) that this Order pertains to are listed on the Order 202-21-1 Resources List, as described below.

Given the emergency nature of the expected load stress, the responsibility of ERCOT to ensure maximum reliability on its system, and the ability of ERCOT to identify and dispatch generation necessary to meet the additional load, I have determined that additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. ERCOT anticipates that this Order may result in exceedance of emissions of sulfur dioxide, nitrogen oxide, mercury, and carbon monoxide emissions, as well as wastewater release limits. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ERCOT for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From February 14, to February 19, 2021, in the event that ERCOT determines that generation from the Specified Resources is necessary to meet the electricity demand that ERCOT anticipates in Texas during this event, I direct ERCOT to dispatch such unit or units and to order their operation only as needed to maintain the reliability of the power grid in the ERCOT region when the demand on the ERCOT system exceeds expected energy and reserve requirements. Specified Resources are those natural gas, coal, or distillate fuel oil generating units set forth on the Order 202-21-1 Resource List, subject to updates directed here and as described in paragraph D, which the Department shall post on www.energy.gov. ERCOT is directed to update Exhibit A to its Application with the anticipated category of environmental impact (i.e. sulfur dioxide, nitrogen oxide, mercury, carbon monoxide emissions, wastewater release, other air pollutants) by 21:00 Central Standard Time on February 15, 2021.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ERCOT for reliability purposes. Consistent with good utility practice, ERCOT shall exhaust all reasonably and

practically available resources, including available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions, to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Specified Resources. ERCOT shall provide a daily notification to the Department reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

In furtherance of the foregoing and, in each case, subject to the exhaustion of all available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions available to support grid reliability:

(i) with respect to any Specified Resource that is an ERCOT Generation Resource or Settlement Only Generator whose operator notifies ERCOT that the unit is unable, or expected to be unable, to produce at its maximum output due to an emission or effluent limit in any federal environmental permit, ERCOT shall ensure that such Specified Resource is only allowed to exceed any such limit during a period for which ERCOT has declared an Energy Emergency Alert (EEA) Level 2 or Level 3. This incremental amount of restricted capacity would be offered at a price no lower than $1,500/MWh. Once ERCOT declares that such an EEA Level 2 or Level 3 event has ended, the unit is required to immediately return to operation within its permitted limits; and

(ii) with respect to any Specified Resource that is an ERCOT Generation Resource whose operator notifies ERCOT that the unit is offline or would need to go offline due to an emission or effluent limit in any federal environmental permit, and to which ERCOT has issued a Reliability Unit Commitment (RUC) instruction, the operator may make all of the unit's capacity available to ERCOT for dispatch during a period for which ERCOT has declared an EEA Level 2 or Level 3. This incremental amount of restricted capacity would be offered at a price no lower than $1,500/MWh. Once ERCOT declares that such an EEA Level 2 or Level 3 event has ended, the unit is required to immediately return to operating at a level below the higher of its minimum operating level or the maximum output allowable under the permitted limit.

In the event ERCOT identifies the need to exceed other relevant environmental permitting levels, ERCOT shall specifically identify such permitting levels and DOE will consider ERCOT's request in good faith.

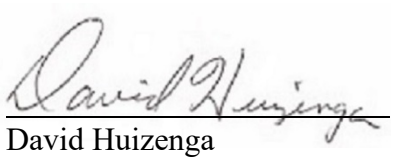
C. All entities must comply with environmental requirements to the maximum extent necessary to operate consistent with the emergency conditions. This Order does not provide relief from an entity's obligations to purchase allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. In the event that ERCOT identifies additional generation units that it deems necessary to operate in excess of federal environmental permitting limits in order to maintain the reliability of the power grid in the ERCOT region when the demand on the ERCOT system exceeds expected energy and reserve requirements, including any such entity to which ERCOT intends to issue a Reliability Unit Commitment (RUC), ERCOT shall provide prompt written notice to the Department of Energy at AskOE@hq.doe.gov identifying in an updated Exhibit A to its Application such additional generation units, the fuel type of such unit, and the anticipated category of environmental impact, at 9:00 Central Standard Time or 21:00 Central Standard Time, whichever follows closest in time to the unit identification by ERCOT to the greatest extent feasible. Such additional generation unit shall be deemed a Specified Resource for the purpose of this Order for the hours prior to the required written notice to the Department, and ERCOT may dispatch such additional generation units, provided that if the Department of Energy notifies ERCOT that its does not approve of such generation unit being designated as a Specified Resource, such generation unit shall not constitute a Specified Resource upon notification from the Department. The Department shall post an updated Order 202-21-1 Resource List as soon as practicable following notification from ERCOT under this paragraph.

E. ERCOT shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time. By March 1, 2021, ERCOT shall report all dates between February 14, 2021, and February 19, 2021, on which the Specified Resources were operated, the hours of operation, and exceedance of permitting limits, including sulfur dioxide, nitrogen oxide, mercury, carbon monoxide, and other air pollutants, as well as exceedances of wastewater release limits. ERCOT shall submit a final report by March 31, 2021, with any revisions to the information reported on March 1, 2021. In addition, ERCOT shall provide information to the Department quantifying the net revenue associated with generation in excess of environmental limits accruing to non-RUC units in connection with orders issued by the Department pursuant to Section 202(c) of the Federal Power Act.

F. This Order shall be effective upon its issuance, and shall expire at 11:59 p.m. Central Standard Time Friday, February 19, 2021, with the exception of the reporting requirements in paragraph E. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 8:51 PM Eastern Standard Time on this 14th day of February, 2021.



David Huizenga
Acting Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 25

DOE ORDER NO. 202-22-3

Department of Energy

Washington, DC 20585

Order No. 202-22-3

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated by email correspondence (Dec. 23, 2022), and for the reasons set forth below, I hereby determine that an emergency exists in Texas due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On December 23, 2022, the Electric Reliability Council of Texas, Inc. (ERCOT), the Independent System Operator (ISO) whose service territory includes 90 percent of the electric customers in the state of Texas, filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of the bulk electric power system."

ERCOT, like many regions across the country, is currently being impacted by a severe winter weather system. For Texas, this severe winter weather system has caused a significant drop in temperatures over the last day. This temperature drop, accompanied by high winds in excess of 40 mph, has resulted in wind chill values across the state generally below ten degrees Fahrenheit, with some areas of Texas experiencing wind chills values well below zero degrees. As a consequence, the demand for electricity in ERCOT rose to an all-time winter peak on the morning of Friday, December 23, 2022, in excess of 74,000 MW. This severely cold weather is expected to last through Sunday morning.

While the vast majority of generating units in the ERCOT region continue to operate without any problem, a small number of units have experienced operating difficulties due to cold weather or gas curtailments. Specifically, approximately 11,000 MW of thermal generating units, 4,000 MW of wind generating units, and 1,700 MW of solar generating units are currently outaged or derated to to the weather conditions. Most of these units are expected to return to service before anticipated demand peak through Saturday, December 24, 2022. However, if these units do not return to service, or if ERCOT experiences additional generating unit outages, it is possible that ERCOT would need to curtail some amount of firm load until 10:00 Central Time on December 25, 2022 in order to maintain the security of the ERCOT system.

Description of Mitigation Measures

ERCOT is taking measures to ensure the supply of generation will continue to be sufficient to meet system demand and reserve requirements. On December 22, 2022, at ERCOT's request, the Texas Commission on Environmental Quality announced that it will provide enforcement discretion to generators in the ERCOT region that may exceed state emissions requirements during emergency conditions. On December 23, 2022, ERCOT directed certain dual-fuel units enrolled in ERCOT's new Firm Fuel Supply Service to begin operating on fuel oil due to natural gas delivery limitations. Moreover, if generating reserves do eventually diminish to a level that requires ERCOT to declare an Energy Emergency Alert (EEA), ERCOT will take additional measures to provide additional reserves prior to exceeding air quality and other federal permit limitations as authorized under this Order, including:

- Utilizing all available DC Tie import capacity
- Issuing a public conservation appeal
- Deploying capacity enrolled in ERCOT's Emergency Response Service
- Instructing transmission and distribution service providers to implement distribution voltage reduction measures and to deploy customers enrolled in load management programs
- Instructing Load Resources providing Responsive Reserve Service (RRS) to curtail their demand, and instruct Generation Resources providing RRS to make their provide additional capacity available for ERCOT's dispatch
- Instructing Energy Storage Resources to suspend charging

According to ERCOT, the measures taken by ERCOT and other state agencies may not prove sufficient to avoid the need to curtail firm load to ensure system reliability.

Request for Order

ERCOT requests that the Secretary issue an order immediately, effective December 23, 2022, through 10:00 Central Time on December 25, 2022, authorizing "the provision of additional energy from the units identified in Exhibit A, as well as any other generating units subject to emissions or other permit limitations" in the ERCOT region. The generating units (Specified Resources) that this Order pertains to are listed on the Order 202-22-3 Resources List, as described below.

ORDER

Given the emergency nature of the expected load stress, the responsibility of ERCOT to ensure maximum reliability on its system, and the ability of ERCOT to identify and dispatch generation necessary to meet the additional load, I have determined that, under the conditions specified below, additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on, among other things:

- The emergency nature of the expected load stress caused by the current cold weather event threatens to cause loss of power to homes and local businesses in the areas that may be affected by curtailments, presenting a risk to public health and safety.
- The expected shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes in the State of Texas and within the ERCOT region demonstrate the need for the Specified Resources to contribute to the reliability of ERCOT.
- ERCOT's responsibility to ensure maximum reliability on its system, and, with the authority granted in this Order, its ability to identify and dispatch generation, including the Specified Resources, necessary to meet the additional load resulting from the cold weather event.

In line with the anticipated circumstances precipitated by the cold weather event, this Order is limited to the period beginning with the issuance of this Order on December 23, 2022 through 10:00 Central Time on December 25, 2022. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation on the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. ERCOT anticipates that this Order may result in exceedance of emissions of sulfur dioxide, nitrogen oxide, mercury, and carbon monoxide emissions, as well as wastewater release limits. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ERCOT for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From the time this Order is issued on December 23, 2022 to 10:00 Central Time on December 25, 2022, in the event that ERCOT determines that generation from the Specified Resources is necessary to meet the electricity demand that ERCOT anticipates in Texas during this event, I direct ERCOT to dispatch such unit or units and to order their operation only as needed to maintain the reliability of the power grid in the ERCOT region when the demand on the ERCOT system exceeds expected energy and reserve requirements. Specified Resources are those generating units set forth on the Order 202-22-3 Resource List, subject to updates directed here and as described in paragraph D, which the Department shall post on www.energy.gov. ERCOT is directed to update Exhibit A to its Application with the anticipated category of environmental impact(s) (i.e., sulfur dioxide, nitrogen oxide, mercury, carbon monoxide emissions, wastewater release, other air pollutants) by 21:00 Central Time on December 25, 2022.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ERCOT for reliability purposes. Consistent with good utility practice, ERCOT shall exhaust all reasonably and practically available resources, including available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions, to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Specified Resources. ERCOT shall provide a daily notification to the Department reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

In furtherance of the foregoing and, in each case, subject to the exhaustion of all available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions available to support grid reliability:

(i) For any Generation Resource or Settlement Only Generator whose operator notifies ERCOT that the unit is unable, or expected to be unable, to produce at its maximum output due to an emissions or other limit in any federal environmental permit at any point before 12:00 Central Time on Saturday, December 24, 2022, and between 18:00 Central Time on Saturday, December 24, 2022 and 10:00 Central Time on Sunday, December 25, 2022, the unit will be allowed to exceed any such limit only during any period for which ERCOT has declared an Energy Emergency Alert (EEA) Level 2 or Level 3. This incremental amount of restricted capacity would be offered at a price no lower than $1,500/MWh. Once ERCOT declares that the EEA Level 2 event has ended, the unit would be required to immediately return to operation within its permitted limits. And at all other times, the unit would be required to operate within its permitted limits.

(ii) For any Generation Resource whose operator notifies ERCOT that the unit is offline or would need to go offline at any point before 12:00 Central Time on Saturday, December 24, 2022, and between 18:00 Central Time on Saturday, December 24, 2022 and 10:00 Central Time on Sunday, December 25, 2022 due to an emissions or other limit in any federal environmental permit, ERCOT may issue a Reliability Unit Commitment (RUC) instruction directing the unit operator to bring the unit online, or to keep the unit online, and to operate at the minimum level at which the Resource can be sustainably operated. In this circumstance, the operator would be allowed to make all of the unit's capacity available to ERCOT for dispatch during any period for which ERCOT has declared an Energy Emergency Alert (EEA) Level 2 or Level 3. This incremental amount of restricted capacity would be offered at a price no lower than $1,500/MWh. Once ERCOT declares that such an EEA Level 2 event has ended, the unit would be required to immediately return to operating at a level below the higher of its minimum operating level or the maximum output allowable under the permitted limit.

C. All operation of the Specified Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. In the event that ERCOT identifies additional generation units that it deems necessary to operate in excess of federal environmental permitting limits in order to maintain the reliability of the power grid in the ERCOT region when the demand on the ERCOT system exceeds expected energy and reserve requirements, including any such entity to which ERCOT intends to issue a Reliability Unit Commitment (RUC), ERCOT shall provide prompt written notice to the Department of Energy at AskCR@hq.doe.gov with the name and location of those units that ERCOT has identified, as well as notice by the same means as an updated Exhibit A to its Application such additional generation units, the fuel type of such unit, and the anticipated category of environmental impact, at 09:00 Central Time or 21:00 Central Time, whichever follows closest in time to the unit identification by ERCOT to the greatest extent feasible. Such additional generation unit shall be deemed a Specified Resource for the purpose of this Order for the hours prior to the required written notice to the Department, and ERCOT may dispatch such additional generation units, provided that if the Department of Energy notifies ERCOT that it does not approve of such generation unit being designated as a Specified Resource, such generation unit shall not constitute a Specified Resource upon notification from the Department. The Department shall post an updated Order 202-22-3 Resource List as soon as practicable following notification from ERCOT under this paragraph.

E. ERCOT shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time. By January 25, 2023, ERCOT shall report all dates between December 23, 2022 and December 25, 2022, inclusive, on which the Specified Resources were operated, the hours of operation, and exceedance of permitting limits, including sulfur dioxide, nitrogen oxide, mercury, carbon monoxide, and other air pollutants, as well as exceedances of wastewater release limits. ERCOT shall submit a final report by February 25, 2023 , with any revisions to the information reported on January 25, 2023. The environmental information submitted in the final report shall also include the following information:

(i) Emissions data in pounds per hour for each Specified Resource unit, for each hour of the operational scenario, for CO, NOx, PM10, VOC, and SO2;

(ii) Emissions data must include emissions (lbs/hr) calculated consistent with reporting obligations pursuant to operating permits, permitted operating/emission limits, and the actual incremental emissions above the permit limits;

(iii) The number and actual hours each day that each Specified Resource unit operated in excess of permit limits or conditions, e.g. "Generator #1; December 24, 2022; 4 hours; 04:00-08:00 CT";

(iv) Amount, type and formulation of any fuel used by each Specified Resource;

(v) All reporting provided under the Specified Resource's operating permit requirements over the last three years to the United States Environmental Protection Agency or local Air Quality Management District for the location of a Specified Resource that operates pursuant to this Order;

(vi) Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order; and

(vii) Information provided by the Specified Resource describing how the requirements in paragraph C above were met by the Specified Resource while operating under the provisions of this Order.

In addition, ERCOT shall provide information to the Department quantifying the net revenue associated with generation in excess of environmental limits accruing to non-RUC units in connection with orders issued by the Department pursuant to Section 202(c) of the Federal Power Act.

F. ERCOT shall take reasonable measures to inform affected communities where all Specified Resources operate that ERCOT has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explains clearly what the Order allows ERCOT to do. At a minimum, ERCOT shall post a description of this Order on its website (with a link to this Order) and identify the name, municipality or other political subdivision, and zip code of Specified Resources covered by this Order, as the Specified Resources may be updated pursuant to paragraph D above. In addition, in the event that a Specified Resource operates pursuant to this Order, a general description of the action authorized by this Order will be included in any press release issued by ERCOT with respect to the cold weather event and will include a reference to the website posting required by the preceding sentence for further information. ERCOT shall describe the actions taken to comply with this paragraph in the reports delivered to the Department pursuant to paragraph E above.

G. This Order shall not preclude the need for the Specified Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

H. ERCOT shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

I. This Order shall be effective upon its issuance, and shall expire at 10:00 Central Time on Sunday, December 25, 2022, with the exception of the reporting requirements in

paragraph E. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 9:30 PM Eastern Standard Time on this 23rd day of December 2022.

Undersecretary of Energy for Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 26

DOE ORDER NO. 202-22-4

Department of Energy

Washington, DC 20585

Order No. 202-22-4

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated by email correspondence (Dec. 23, 2022), and for the reasons set forth below, I hereby determine that an emergency exists in the electricity grid operated by PJM Interconnection, LLC (PJM) due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On December 24, 2022, PJM, the Regional Transmission Operator (RTO) for 65 million people in thirteen states and the District of Columbia (the PJM Region), filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of the bulk electric power system."

The PJM Region, like many regions across the country, is currently being affected by a severe winter weather system. PJM states that this weather system caused a significant drop in temperatures across the PJM Region on December 23, 2022, accompanied by high winds in excess of 40 mph. As a consequence of the impact of wind and decreasing temperatures, the demand for electricity in the PJM Region rose to an unusually high peak load on the evening of December 23, 2022, in excess of 135,000 MW. This severely cold weather is expected to last through Sunday morning.

While the vast majority of generating units in the PJM Region continue to function adequately under these stressed conditions, some units have experienced operating difficulties due to cold weather or fuel limitations, primarily gas. Specifically, approximately 45,000 MW of generating units (the majority of which are thermal) are currently outaged or derated. PJM has expressed its concern that these units will be unable to return to service over at least the next 48 hours, which coincides with the time period for which PJM is requesting this Order. Since these units may not promptly return to service, and in the event PJM experiences additional generating unit outages, PJM states that it may need to curtail some amount of firm load on December 24, December 25, or December 26, 2022 in order to maintain the security and reliability of the PJM system.

Description of Mitigation Measures

In its Application, PJM identifies the measures it is taking to ensure the supply of generation will continue to be sufficient to meet system demand and reserve requirements. On December 20, 2022, PJM issued a cold weather advisory in the PJM Region in anticipation of the forecasted weather conditions. Then on December 23, 2022, PJM issued

a PJM Region-wide cold weather alert which further highlighted PJM's expected need to call higher-than-normal generation resources in light of the anticipated weather.

On December 23, 2022, generating reserves diminished to a level that required PJM to declare an Energy Emergency Alert (EEA) Level 2 and take other emergency actions. PJM states that after having exhausted economic operation, PJM triggered a Maximum Generation Emergency Action to increase the PJM Region generation above the maximum economic level. Further, PJM triggered its load management reduction actions to provide additional load relief by using PJM-controllable load management programs. PJM called on demand response providers and curtailment service providers to reduce load. PJM also issued public appeals for consumers to reduce usage. PJM has continued to employ these emergency actions through December 24, 2022, and anticipates needing to continue them through the order end date that it has requested.

Since December 23, 2022, PJM has also taken additional measures to provide additional reserves, including:

- Reducing exports to neighboring regions and requested shared reserves for neighboring regions; consistent with joint operating agreements and other regulatory requirements, PJM has continued to communicate and collaborate with its interconnected neighboring systems when the demand on the PJM system has exceeded expected energy and reserve requirements and when emergency transfers were required to support PJM's interconnected neighboring systems;
- Issuing additional public conservation appeals;
- Running uneconomic generation during lower load periods to ensure their availability during peak conditions;
- Utilizing its Emergency Procedures to assist in maximizing the pumped storage hydro generation levels;
- Communicating and preparing transmission and distribution service providers to implement distribution voltage reduction measures; and
- Communicating and preparing transmission and distribution service providers to implement firm load shed.

In its Application, PJM committed to continue to take such actions, including utilizing other supply resources before calling upon any generators to operate in excess of permitting levels. According to PJM, it is nevertheless possible that the measures it has and will take may not be sufficient to avoid the need to curtail firm load in order to ensure system reliability.

Request for Order

PJM requests that the Secretary issue an order immediately, effective today, December 24, 2022, through 12:00 p.m. Eastern Time on Monday, December 26, 2022, authorizing the electric generating units identified in Exhibit A, as well as any other

generating units subject to emissions or other permit limitations in the PJM Region to operate up to their maximum generation output levels under the limited circumstances described in this Order, notwithstanding air quality or other permit limitations. The generating units (Specified Resources) that this Order pertains to are listed on the Order 202-22-4 Resources List, as described below.

ORDER

Given the emergency nature of the expected load stress, the responsibility of PJM to ensure maximum reliability on its system, and the ability of PJM to identify and dispatch generation necessary to meet the additional load, I have determined that, under the conditions specified below, additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on, among other things:

- The emergency nature of the expected load stress caused by the current cold weather event threatens to cause loss of power to homes and local businesses in the areas that may be affected by curtailments, presenting a risk to public health and safety.
- The expected shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes in the PJM Region demonstrate the need for the Specified Resources to contribute to the reliability of the PJM Region.
- PJM is responsible to ensure maximum reliability on its system, and, with the authority granted in this Order, its ability to identify and dispatch generation, including the Specified Resources, necessary to meet the additional load resulting from the cold weather event is enhanced.

In line with the anticipated circumstances precipitated by the cold weather event, this Order is limited to the period beginning with the issuance of this Order on December 24, 2022 through 12:00 pm Eastern Time on December 26, 2022. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation on the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. PJM anticipates that this Order may result in exceedance of emissions of sulfur dioxide, nitrogen oxide, mercury, and carbon monoxide emissions, as well as wastewater release limits. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by PJM for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From the time this Order is issued on December 24, 2022, to 12:00 pm Eastern Time on December 26, 2022, in the event that PJM determines that generation from the Specified Resources is necessary to meet the electricity demand that PJM anticipates in the PJM Region during this event, I direct PJM to dispatch such unit or units and to order their operation only as needed to maintain the reliability of the power grid in the PJM Region when the demand on the PJM system exceeds expected energy and reserve requirements. Specified Resources are those generating units set forth on the Order 202-22-4 Resource List, subject to updates directed here and as described in paragraph D, which the Department shall post on www.energy.gov.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by PJM for reliability purposes. Consistent with good utility practice, PJM shall exhaust all reasonably and practically available resources, including available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions, to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Specified Resources. PJM shall provide a daily notification to the Department reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

In furtherance of the foregoing and, in each case, subject to the exhaustion of all available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions available to support grid reliability:

(i) For any generation resource whose operator notifies PJM that the unit is unable, or expected to be unable, to produce at its maximum output due to an emissions or other limit in any federal environmental permit, and during the pendency of a PJM-triggered Maximum Generation Emergency Action, at any point before 12:00 Eastern Time on Monday, December 26, 2022, the unit will be allowed to exceed any such limit only during any period for which PJM has declared an Energy Emergency Alert (EEA) Level 2 or Level 3 (during which time PJM will have triggered a Maximum Generation Emergency Action), except as described in item (iii) below in certain limited circumstances in anticipation of an EEA Level 2. Once PJM declares that the EEA Level 2 event has ended, the unit would be required to immediately return to operation within its permitted limits. And at all other times, the unit would be required to operate within its permitted limits, except for the limited exceptions provided herein for operations in anticipation of an EEA Level 2 to prevent the cycling of units or facilitate the charging or pumping of other resources necessary for the EEA Level 2.

(ii) For any generation resource whose operator notifies PJM that the unit is offline or would need to go offline at any point before 12:00 Eastern Time on Monday, December 26, 2022, due to an emissions or other limit in any

federal environmental permit, PJM may direct the unit operator to bring the unit online, or to keep the unit online, and to operate at the level consistent with its permits but subject to the exceptions set forth in this Order. In this circumstance, the operator is allowed to make all of the unit's capacity available to PJM for dispatch during any period for which PJM has declared an EEA Level 2 or 3 (during which time PJM has triggered a Maximum Generation Emergency Action), except as described in item (iii) below in certain limited circumstances in anticipation of an EEA Level 2. Once PJM declares that such an EEA Level 2 event has ended and the Maximum Generation Emergency Action is discontinued, the unit would be required to immediately return to operating at a level below the higher of its minimum operating level or the maximum output allowable under the permitted limit.

(iii) PJM is hereby granted authority to operate the Specified Units that are combined cycle generating units in certain limited circumstances in advance of declaring an EEA Level 2, Maximum Generation Emergency, or in between such events, where such operation or continued operation of the Specified Resource is reasonably necessary to avoid shutting down and restarting the Specified Unit. PJM has represented that such cycling of units can cause reliability issues regarding restarting, delays, and increased emissions during start up. PJM is further authorized to operate the Specified Units in certain limited circumstances in advance of the declaring an EEA Level 2, Maximum Generation Emergency where such operation or continued operation of the Specified Resource is reasonably necessary to facilitate charging storage resources or pumping for pumped storage facilities that will needed during an anticipated EEA Level 2. PJM is required to take measures to dispatch units for which cycling would otherwise be required in a manner reasonably intended to limit the duration and operating level of those units in such a way as to minimize exceedance of permit limitations consistent with the security and reliability of the PJM Region.

(iv) To minimize adverse environmental impacts as set forth herein, this Order limits operation of dispatched units to the times and within the parameters determined by PJM for reliability purposes. Consistent with good utility practice, and notwithstanding standard merit order dispatch, PJM shall exhaust all reasonably and practically available resources, including available imports, demand response and identified behind-the-meter generation resources selected to minimize an increase in emissions to the extent that such resources provide support to maintain grid reliability prior to dispatching the Specified Resources at levels above their permitted emissions levels. PJM shall provide a daily notification to the Department reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

C. All operation of the Specified Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. In the event that PJM identifies additional generation units that it deems necessary to operate in excess of federal environmental permitting limits in order to maintain the reliability of the power grid in the PJM Region when the demand on the PJM system exceeds expected energy and reserve requirements, PJM shall provide prompt written notice to the Department of Energy at AskCR@hq.doe.gov with the name and location of those units that PJM has identified, as well as additional notice by the same means through updating Exhibit A to its Application with such additional generation units, the fuel type of such unit, and the anticipated category of environmental impact, at 09:00 Eastern Time or 21:00 Eastern Time, whichever follows closest in time to the unit identification by PJM to the greatest extent feasible. Such additional generation unit shall be deemed a Specified Resource for the purpose of this Order for the hours prior to the required written notice to the Department updating Exhibit A, and PJM may dispatch such additional generation units, provided that if the Department of Energy notifies PJM that it does not approve of such generation unit being designated as a Specified Resource, such generation unit shall not constitute a Specified Resource upon notification from the Department. The Department shall post an updated Order 202-22-4 Resource List as soon as practicable following notification from PJM under this paragraph.

E. PJM shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time. By January 26, 2023, PJM shall report all dates between December 24, 2022, and December 26, 2022, inclusive, on which the Specified Resources were operated, the hours of operation, and exceedance of permitting limits, including sulfur dioxide, nitrogen oxide, mercury, carbon monoxide, and other air pollutants, as well as exceedances of wastewater release limits. PJM shall submit a final report by February 27, 2023, with any revisions to the information reported on January 26, 2023. The environmental information submitted in the final report shall also include the following information:

(i) Emissions data in pounds per hour for each Specified Resource unit, for each hour of the operational scenario, for CO, NOx, PM10, VOC, and SO2;

(ii) Emissions data must include emissions (lbs/hr) calculated consistent with reporting obligations pursuant to operating permits, permitted operating/emission limits, and the actual incremental emissions above the permit limits;

(iii) The number and actual hours each day that each Specified Resource unit operated in excess of permit limits or conditions, e.g., "Generator #1; December 25, 2022; 4 hours; 04:00-08:00 CT";

(iv) Amount, type and formulation of any fuel used by each Specified Resource;

(v) All reporting provided under the Specified Resource's operating permit requirements over the last three years to the United States Environmental Protection Agency or local Air Quality Management District for the location of a Specified Resource that operates pursuant to this Order;

(vi) Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order; and

(vii) Information provided by the Specified Resource describing how the requirements in paragraph C above were met by the Specified Resource while operating under the provisions of this Order.

In addition, PJM shall provide information to the Department quantifying the net revenue in aggregate associated with generation in excess of environmental limits in connection with orders issued by the Department pursuant to Section 202(c) of the Federal Power Act.

F. PJM shall take reasonable measures to inform affected communities where all Specified Resources operate that PJM has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explains clearly what the Order allows PJM to do. At a minimum, PJM shall post a description of this Order on its website (with a link to this Order) and identify the name, municipality or other political subdivision, and zip code of Specified Resources covered by this Order, as the Specified Resources may be updated pursuant to paragraph D above. In addition, in the event that a Specified Resource operates pursuant to this Order, a general description of the action authorized by this Order will be included in any press release issued by PJM with respect to the cold weather event and will include a reference to the website posting required by the preceding sentence for further information. PJM shall describe the actions taken to comply with this paragraph in the reports delivered to the Department pursuant to paragraph E above.

G. This Order shall not preclude the need for the Specified Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

H. PJM shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

I. This Order shall be effective upon its issuance, and shall expire at 12:00 Eastern Time on Monday, December 26, 2022, with the exception of the reporting requirements in

paragraph E. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 5:30 PM Eastern Standard Time on this 24th day of December 2022.

Undersecretary of Energy for Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 27

DOE ORDER NO. 202-20-2

Department of Energy

Washington, DC 20585

Order No. 202-20-2

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated to the Deputy Secretary of Energy by paragraph 1.11(A) of Delegation Order No. 00-001.00G (Apr. 10, 2018), and re-delegated to the Assistant Secretary for Electricity on September 6, 2020, and for the reasons set forth below, I hereby determine that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

On September 6, 2020, the California Independent System Operator (CAISO), the Regional Transmission Organization whose service territory includes California and a portion of Nevada, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of bulk electric power system."

Since August, California has experienced several periods of extreme heat, some of which have resulted in rolling blackouts. On September 2, 2020, California Governor Gavin Newsom issued an emergency proclamation to help alleviate the stress on the state's power grid due to an "Extreme Heat Event." In declaring a statutory emergency, the proclamation cited a number of factors and observations, including the following:

- "[B]eginning on September 2, 2020, a significant heat wave struck California, bringing widespread temperatures well in excess of 100 degrees throughout the State;"
- "[T]he National Weather Service [has] issued multiple Excessive Heat Warnings within [California];"
- "[T]he Extreme Heat Event has and will continue to put significant demand and strain on California's energy grid; and"
- "[T]he Extreme Heat Event is expected to last through at least September 7, 2020."

The proclamation authorizes emergency use of stationary generators, portable generators, and "auxiliary engines by ocean-going vessels berthed in California ports," and directs the state's Air Resources Board to "exercise maximum discretion to permit the use of stationary and portable generators or auxiliary ship engines to reduce the strain on the energy infrastructure and increase energy capacity." The proclamation also

suspends "[a]ny permit, regulation or law prohibiting, restricting or penalizing the use of stationary or portable generators or auxiliary ship engines" as allowed by the proclamation order.

On September 3, the CAISO issued a statewide flex alert for September 5-7, encouraging voluntary load reduction between 3:00 p.m. and 9:00 p.m. local time each day. The alert warns that consumers should "be prepared for potential power outages, both planned and unplanned during heat waves, especially in extremely high temperatures that last multiple days," noting that "[h]ot weather can also impact generation and transmission equipment, as it runs harder and longer with less time to cool, which can cause machinery failure." The alert explains that there is little energy available to import due to high heat predicted throughout the West, and that the wildfires in the state may take out transmission lines or cause lines to be shut down for the safety of firefighters in the area.

The CAISO notes that "[e]lectric demand forecasts have continued to increase since the issuance of the California Governor's emergency proclamation and the CAISO balancing authority area has lost additional generation supply because of wildfires." Application at 3. To address the situation, the "CAISO has started to direct all generators in its balancing authority area to produce to their maximum capability during certain times of the day," and has gone so far as to allow, when reliable and safe based on currently operating conditions, "certain generators to generate more than their interconnection capacity to provide additional power to the grid." *Id.* at 3. The impetus for the Application, however, arose on September 5, 2020, when the operator of the natural gas-fired resources identified in Exhibit A of the Application informed the CAISO that it could not produce to its maximum generation capability without exceeding its federal air quality or other permit limitations. *Id.* "The CAISO is informed and believes these limitations involve both permit limitations under federal law for nitrogen oxide emissions and ammonia releases as well as a limitations regarding fuel and ammonia throughput." *Id*.

The CAISO requests "that the Secretary issue an order immediately, effective September 6, 2020, authorizing specific electric generating units located within the CAISO balancing authority area to operate at their maximum generation output levels when directed to do so by the CAISO, notwithstanding air quality or other permit limitations." *Id.* at 1. The generating units specified are units 1 - 5 at the Walnut Creek Energy Park in the City of Industry, California; units 5/6 and 7/8 at the El Segundo Energy Center in El Segundo, California; and units 1 - 4 at the Long Beach Generating Station located in Long Beach, California. *Id.* For purposes of this Order, these units are referred to as the "Specified Resources." Collectively, they represent up to as much as 100 MW. The CAISO requests "such order be entered today, September 6, 2020, and remain effective for a period of seven (7) days, without prejudice to the possible issuance of further orders as necessary to address the emergency…[to] ensure additional supply is

available during a period in which California may continue to experience extreme weather and wildfires that have forced generation out of service." *Id*. at 2.

Given the emergency nature of the expected load stress, the responsibility of the CAISO to ensure maximum reliability on its system, and the ability of the CAISO to identify and dispatch generation necessary to meet the additional load, I have determined that additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. The CAISO anticipates that this Order may result in exceedance of National Ambient Air Quality Standards under the Clean Air Act and notes that the Specified Resources are located in different communities within California and should not result in any disproportionate impact on a single community. *Id.* at 4. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by the CAISO for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. From September 6, 2020, to September 13, 2020, in the event that the CAISO determines that generation from the Specified Resources is necessary to meet the exceptional levels of electricity demand that the CAISO anticipates in California, I direct the CAISO to dispatch such unit or units and to order their operation only as needed to maintain the reliability of the power grid in California between the hours of 14:00 Pacific Daylight Time and 22:00 Pacific Daylight Time on days when the demand on the CAISO system exceeds expected energy and reserve requirements.

B. The CAISO shall select the combination of units that meets the reliability emergency and minimizes environmental impact. Consistent with good utility practice, the CAISO shall exhaust all reasonably and practically available resources, including demand response and identified behind-the-meter generation resources to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Specified Resources.

C. By September 21, 2020, the CAISO shall report all dates between September 6, 2020, and September 13, 2020, on which the Specified Resources were

operated, the hours of operation, and the estimated air emissions (including nitrogen oxides and ammonia releases) and fuel and ammonia throughput associated with operating each unit. The CAISO shall submit a final report by October 13, 2020, with any revisions to the information reported on September 21.

D. This Order shall be effective upon its issuance, and shall expire at 23:59 Pacific Daylight Time on September 13, 2020, with the exception of the reporting requirements in paragraph C. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. this 6th day of September, 2020.

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Bruce Walker
Assistant Secretary for Electricity

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 28

DOE ORDER NO. 202-21-2

Department of Energy

Washington, DC 20585

Order No. 202-21-2

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated to the Deputy Secretary of Energy by paragraph 1.12(A) of Delegation Order No. 00-001.00H (Oct. 2, 2020), and for the reasons set forth below, I hereby determine that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On September 7, 2021, the California Independent System Operator Corporation (CAISO), the Independent System Operator whose service territory includes California and a portion of Nevada, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department or DOE) "to preserve the reliability of [the] bulk electric power system in California."

California has experienced several periods of extreme heat, drought conditions, and wildfires. Such conditions are expected to occur over the next 60 days and threaten the reliable operation of the bulk electric power system in California. Application at 2-3.

Since June 2021, California Governor Gavin Newsom has issued three proclamations of a state of emergency regarding electricity. In declaring a statutory emergency, the proclamations cited a number of factors and observations, including the following as set forth in the July 30 proclamation:

- As a result of drought conditions, "water supplies in California's reservoirs have dropped to levels so low that hydroelectric power plants have had to reduce or cease production, leading to a reduction of nearly 1,000 megawatts of capacity and further exacerbating the drought's impact on California"

- In June and July 2021, states of emergencies were proclaimed due to "record-breaking extreme heat events that hit California and other Western states, increasing residents' demand and putting significant demand and strain on California's energy grid"

- "[A]t the same time as the July 2021 Extreme Heat Event, the Bootleg Fire in Southern-Central Oregon threatened the California-Oregon Intertie, which delivers power from the Pacific Northwest into California, and reduced electricity supply into California by almost 4,000 megawatts"

- Due to "continuing wildfires, ongoing drought, and extreme heat conditions caused by climate change, California currently faces an additional projected energy supply shortage of up to 3,500 megawatts during the afternoon-evening 'net-peak' period of high power demand on days when there are extreme weather conditions, which is even greater than projected in May 2021"

The July 30, 2021 emergency proclamation further describes the extreme climate impacts across the West and their ongoing impacts on electric reliability. The "proclamation identifies an energy supply shortage in California this summer and in the summer of 2022." *Id*. at 4. The proclamation authorizes several measures aimed at mitigating the emergency, including authorizing the California Energy Commission (CEC) "to expedite amendments to existing power plant licenses and issue new licenses to emergency and temporary generators." *Id*. The proclamation also directs the California Air Resources Board (CARB) "to develop and implement a plan to mitigate the effects of additional emissions authorized by the proclamation. The mitigation plan must include plans to invest in programs to improve air quality in communities, with a particular focus on disadvantaged communities, and to reduce risk to sensitive populations." *Id*.

The Application includes a letter from the CARB to DOE regarding the environmental mitigation plan. *Id*. at Exhibit F. In its letter, the CARB confirms to the Department that the state-funded environmental mitigation plan will address emissions authorized by the Order and that the CARB will determine details of environmental mitigation options through a public process. *Id*. Further, the CARB will gather "local perspectives on how best to mitigate the effects of local increases of emissions to potential and historically affected parties." *Id*. The CARB letter also supports the continued application of the requirements under its Mandatory Reporting of Greenhouse Gas Emissions Regulation (MRR) and California's Cap-and-Trade Regulation during the pendency of an order under FPA section 202(c). *Id*.

Description of Mitigation Measures

In its Application, the CAISO described actions it has taken in order to alleviate the generation shortfall, including: 1) denying requests of five existing generating facilities that notified the CAISO of their intent to mothball or retire and designating those facilities as Reliability Must-Run units; 2) declaring a capacity procurement mechanism significant event that triggers authority to procure additional electric generating capacity under its tariff approved by Federal Energy Regulatory Commission; 3) working to accelerate energization of projects in its interconnection queue; and 4) consulting with other California stakeholders in "implementing a utility load reduction program that provides some relief to the bulk power system during stressed grid conditions." *Id*. at 4-5. In addition, the Application explains that the California Department of Water Resources (CDWR) has "undertaken procurement efforts to deploy mobile, modular General Electric TM2500 aero-derivative gas turbine generators at existing generating facility sites," four of which are included as Covered Resources (defined below). *Id*. at 5.

California is also engaged in long term efforts to mitigate the supply shortfall and address the reliability of the bulk electric power system in California. In June 2021, the California Public Utility Commission (CPUC) "issued an order directing its jurisdictional load serving entities to procure 11,500 MW of new electricity resources to come online between the years 2023 and 2026." *Id.* The CPUC order includes requirements that this additional capacity come solely from zero-emission sources, including specific requirements for long-duration storage and clean firm generation. CPUC Decision No. 21-06-035 - Decision Requiring Procurement to Address Mid-Term Reliability (2023-2026), 35-38, 46-48.

The Application describes emergency procedures the CAISO can use to meet insufficient supply in the day-ahead market, such as "restricting transmission and generator maintenance activities, calling for voluntary conservation, requesting additional supply bids to meet expected energy and reserve requirements, seeking emergency assistance from neighboring balancing authorities, and deploying emergency demand response." Application at 5. The CAISO plans to "direct generators to produce more MW than their interconnection capacity for specific hours and day(s) during the emergency event if reliability studies find the transmission system can support their increased output." *Id*. at 5-6. However, the CAISO Application indicates "that these measures may not be sufficient to avoid load curtailments absent issuance of an emergency order." *Id*. at 6.

Request for Order

The CAISO "requests that the Secretary issue the requested emergency order by September 10, 2021, or a[s] soon as possible thereafter, authorizing specific electric generating resources (Covered Resources) located within California to test and operate at their maximum generation output levels when directed to do so by the CAISO, notwithstanding air quality or other permit limitations." *Id*. at 1. The Covered Resources that this Order pertains to are listed below and more fully described in Application Exhibit A – List of Covered Resources:

- Midway Sunset Cogeneration Facility Unit C in Fellows, California (Midway Sunset Unit C);
- The Alamitos Energy Center in Long Beach, California;
- The Huntington Beach Energy Project in Huntington Beach, California;
- The Walnut Creek Energy Park in the City of Industry, California;
- Greenleaf Unit 1 in Yuba City, California (Greenleaf Unit 1); and
- The Roseville Energy Park in Roseville, California (Roseville Energy Park).

The CAISO indicates that "the owners of the Covered Resources will not make additional identified capacity available absent an order from the Secretary under FPA section 202(c)." *Id*. at 6. The CAISO noted that the electric generating units identified in its Application "have de-rated their facilities based on conditions set forth in their permits regarding nitrogen oxide emissions, heat output as well as fuel throughput." Accordingly, the CAISO anticipates that the emergency order it requested "may result in exceedance of National Ambient Air Quality Standards (NAAQS) under the Clean Air Act." *Id*. In addition, the Midway Sunset Unit C is unable to satisfy a permit requirement that it operate in support of an industrial host. *Id*. The new General Electric TM2500 aero-derivative gas turbine generators deployed at the Greenleaf Unit 1 site and Roseville Energy Park do not yet have required best available control technology to control emissions and have not completed permitting processes to obtain their pre-construction permits under Title I, or operating permits under Title V, of the Clean Air Act. *Id*. The CAISO expects that, in the absence of an order under FPA section 202(c), over 200 megawatts of available generating capacity will not be available for dispatch as a result of these constraints. *Id*. "Authorizing these facilities to operate, notwithstanding permit and other limitations, would help mitigate shortages of expected energy and reserve requirements." *Id*.

ORDER

Given the emergency nature of the expected load stress, the responsibility of the CAISO to ensure maximum reliability on its system, and the ability of the CAISO to identify and dispatch generation necessary to meet the additional load, I have determined that additional dispatch of the Covered Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). These factors, including as declared in the Governor's July 30 emergency proclamation and as described in the Application, have led to my determination that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest. In line with the emergency proclamation's anticipation of energy shortages this summer, this Order is limited to a 60-day period. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. The CAISO anticipates that this Order may result in exceedance of NAAQS under the Clean Air Act and other conflicts with environmental law. Based on the CAISO Application, the distance between the Covered Resources is large enough that no two of the Covered Resources are expected to impact the same community. *Id.* at 6-7. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by the CAISO for reliability purposes, and subject to the conditions set forth in this Order.

Based on my determination of an emergency set forth above, I hereby order:

A. From September 10, 2021 to November 9, 2021, in the event that the CAISO determines that generation from the Covered Resources is necessary to preserve the reliability of the bulk electric power system in California, I direct the CAISO to dispatch such unit or units and to order their operation solely under the following conditions:

   i. the issuance and continuation of an Energy Emergency Alert Level 2[1] condition or greater between the hours of 14:00 Pacific Daylight Time and 22:00 Pacific Daylight Time after exhausting all reasonably and practically available resources;

   ii. a transmission emergency[2] that requires operation of the Covered Resource to prevent or mitigate load curtailment during any operating hour; or

   iii. limited testing directed by the CAISO or synchronization of Midway Sunset Unit C, Greenleaf Unit 1, and Roseville Energy Park during periods of lowest electric demand for natural gas resources, as determined by the CAISO.

B. Consistent with good utility practice, the CAISO shall exhaust all reasonably and practically available resources, including demand response and identified behind-the-meter generation resources to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Covered Resources.

C. All operation of the Covered Resources must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators. Covered Resources must comply with the requirements of the CARB MRR and California's Cap-and-Trade regulation, to the extent applicable.

D. The CAISO shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department from time to time. By December 1, 2021, the CAISO shall report source specific data for all dates

[1] For the purposes of this Order, "Energy Emergency Alert Level 2" has the meaning set forth in Section 3.6.4 of the California ISO System Emergency Operating Procedure Version 13.1, Effective Date August 20, 2021 (CAISO Emergency Operating Procedure).
[2] For the purposes of this Order, "transmission emergency" has the meaning set forth in Section 3.5 of the CAISO Emergency Operating Procedure.

between September 10, 2021 and November 9, 2021, on which the Covered Resources were operated, including, for each unit, (1) the hours of operation, as well as the hours in which any permit limit was exceeded and (2) a preliminary description of each permit term that was exceeded and the manner in which such exceedance occurred. The CAISO shall also submit a final report by January 7, 2022, with any revisions to the information reported on December 1, 2021. The environmental information submitted in the final report shall also include the following information:

i. Emissions data in pounds per hour for each Covered Resource unit, for each hour of the operational scenario, for CO, NOx, PM2.5, PM10, volatile organic compounds (VOC), and SO_2;

ii. Emissions data must include the actual emissions (lbs/hr), permitted operating/emission limits, and the actual incremental emissions above the permit limits, except that for emissions units not equipped with continuous emission monitoring systems, actual emissions shall be calculated using source test data;

iii. Stack parameters for each Covered Resource unit: stack height, exit diameter, exit gas temperature, and exit velocity (or volumetric flow rate). Temperature and velocity must be the values applicable to the operations above permit limits;

iv. The actual hours that each Covered Resource unit operated in excess of permit limits or operated without otherwise-required permits;

v. Information provided to the CARB in response to the CARB's development and implementation of the plan to mitigate the effects of additional emissions authorized by the July 30, 2021 proclamation; and

vi. Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order.

E. The CAISO shall inform all affected communities where all Covered Resources operate that the CAISO has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explains clearly what the Order allows the CAISO to do. The CAISO shall describe the actions taken to comply with this paragraph in the reports delivered to the Department pursuant to paragraph D above.

F. This Order shall not preclude the need for any Covered Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. The CAISO shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

H. This Order shall be effective upon its issuance, and shall expire at 23:59 Pacific Daylight Time on November 9, 2021, with the exceptions of paragraphs F and G and the reporting and analysis requirements in paragraphs D and E. Renewal or amendment of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 16:26 Eastern Time on this 10th day of September, 2021.

David M. Turk
Deputy Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 29

DOE ORDER NO. 202-22-1

Department of Energy
Washington, DC 20585

Order No. 202-22-1

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated to the Deputy Secretary of Energy by paragraph 1.12(A) of Delegation Order No. S1-DEL-S2-2022 (Mar. 14, 2022), and further delegated by the Deputy Secretary by email correspondence (Sept. 2, 2022), and for the reasons set forth below, I hereby determine that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On September 1, 2022, the California Independent System Operator Corporation (CAISO), the Independent System Operator whose service territory includes most of California and a portion of Nevada, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department) "to preserve the reliability of the bulk electric power system in California."

California has experienced several periods of extreme heat, drought conditions, and threat of wildfires. Such conditions are expected to occur over the next several days and threaten the reliable operation of the bulk electric power system in California. Application at 2-3.

On August 31, 2022, California Governor Gavin Newsom issued a proclamation declaring a state of emergency regarding electricity from September 2 through September 7, 2022. In declaring a statutory emergency, the proclamation cited a number of factors and observations, including the following:

- A significant heat wave will bring temperatures "in excess of 100 degrees throughout the State and is forecast to bring record temperatures 10–20 degrees above normal throughout the State, exceeding 110 degrees in some areas"

- The extreme heat will put a significant demand and strain on California's energy grid and is forecast to be a "West-wide event" meaning that energy demand will be high across the region and "California will have limited ability to import energy from [out of state]"

- The CAISO issued a Heat Bulletin forecasting high electric demand during the extreme heat event that will "stress the energy grid, with peak load for electricity projected to reach its highest level of the year, exceeding 48,000 megawatts on September 5, 2022"

- The CAISO is forecasting supply deficiencies of "over 3,000 megawatts during evening hours from September 4, 2022, through September 6, 2022" and advised that emergency interventions would allow energy customers to make contingency plans ahead of the Labor Day holiday weekend.

The proclamation authorizes several measures aimed at mitigating the emergency and avoiding jeopardizing public health or safety, including directing the California Air Resources Board (CARB) to "implement its State-funded Climate Heat Impact Response Program (CHIRP) to mitigate emissions from any operation pursuant to this Proclamation." The proclamation also directs the California Energy Commission (CEC) to "provide information requested by [CARB] to assist with its implementation" of CHIRP.

The Application includes a statement that the CAISO prepared its request in consultation with both CEC and CARB. Application at 2. Furthermore, the CAISO states that both state entities have informed the CAISO they will support any reporting DOE may require under an emergency order. *Id.*

Description of Mitigation Measures

In its Application, the CAISO described actions it has taken in order to alleviate the generation shortfall, including: 1) utilizing its day-ahead market to ensure it has secured sufficient supply to meet its demand for the next operating day and its real-time market to increase incremental supply to meet changes in the day-ahead demand forecast; 2) directing generators to produce more megawatts than their interconnection capacity for specific hours and day(s) during the emergency event if reliability studies find the transmission system can support their increased output; 3) denying requests of generating facilities that notified the CAISO of their intent to mothball or retire and designating those facilities as Reliability Must-Run units to run as cost-of-service units under the terms of the CAISO tariff; and 4) working with the owner of Midway Sunset Cogeneration under its Reliability Must Run agreement to deploy emission controls at one of its units and make an additional 80 megawatts available to the CAISO system. *Id*. at 4-5. In addition, the Application explains that the California Department of Water Resources (CDWR) has "deployed [four] mobile, modular General Electric TM2500 aero-derivative gas turbine generators at existing generating facility sites." *Id*. at 4.

California is also engaged in long-term efforts to mitigate the supply shortfall and address the reliability of the bulk electric power system in California in response to increasing climate change-induced heat waves and drought conditions. The California Public Utilities Commission (CPUC) has issued an order directing its jurisdictional load serving entities to procure 11,500 megawatts of new electricity resources to come online between the years 2023 and 2026. *Id.*; *see also* CPUC Decision No. 21-06-035, Decision Requiring Procurement To Address Mid-Term Reliability (2023-2026), June 30, 2021. Additionally, California enacted Assembly Bill 205 this year, which adopts various measures to enhance electric grid reliability, including the creation of a strategic reserve for use to meet electric demand in extreme events, such as heatwaves. Application at 4–5.

The Application describes emergency procedures the CAISO can use to meet insufficient supply in the day-ahead market, such as "restricting transmission and generator maintenance activities, calling for voluntary conservation, requesting additional supply bids to meet expected energy and reserve requirements, seeking emergency assistance from neighboring balancing authorities, and deploying emergency demand response." *Id.* at 5. The CAISO plans to "direct generators to produce more MW than their interconnection capacity for specific hours and day(s) during the emergency event if reliability studies find the transmission system can support their increased output." *Id*. However, the CAISO Application indicates "that these measures may be insufficient to avoid load curtailments in the coming days" and issuing an emergency Order will "provide another tool for the CAISO to help mitigate this risk." *Id*.

Request for Order

The CAISO "requests that the Secretary issue the requested emergency order by Friday, September 2, 2022, or a[s] soon as possible thereafter, authorizing specific electric generating resources (Covered Resources) located within California to operate at their maximum generation output levels between 2:00 p.m. and 10:00 p.m., when directed to do so by the CAISO, notwithstanding air quality or other permit limitations." *Id*. at 1. The Covered Resources that this Order pertains to are the three natural gas-fired electric generating facilities listed below and more fully described in Application Exhibit A – List of Covered Resources:

- The Alamitos Energy Center in Long Beach, California;
- The Huntington Beach Energy Project in Huntington Beach, California;
- The Walnut Creek Energy Park in the City of Industry, California;

The CAISO indicates that "the owners of the Covered Resources cannot make additional identified capacity available absent an order from the Secretary under FPA [section] 202(c)." *Id*. at 5. The CAISO noted that the electric generating units identified in its Application "have de-rated their facilities based on conditions set forth in their permits regarding nitrogen oxide emissions, heat output, and fuel throughput." *Id.* Accordingly, the CAISO anticipates that, if the Covered Resources are dispatched in exceedance of their permit limits pursuant to the emergency order it has requested, there will be an increase in nitrogen oxide, ammonia, and carbon monoxide emissions that "may result in exceedance of National Ambient Air Quality Standards (NAAQS) under the Clean Air Act." *Id*. The CAISO expects that, in the absence of an order under FPA section 202(c), these constraints will collectively preclude CAISO dispatch of approximately 28 megawatts of available generating capacity. *Id*. "Authorizing these facilities to operate, notwithstanding permit and other limitations, would help mitigate shortages of expected energy and reserve requirements." *Id*.

ORDER

Given the emergency nature of the expected load stress and generation shortfall, the responsibility of the CAISO to ensure maximum reliability on its system, and the ability of the CAISO to identify and dispatch generation necessary to meet additional load if an order is issued, I have determined that additional dispatch of the Covered Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). These factors, including as declared in the Governor's August 31 emergency proclamation and as described in the Application, have led to my determination that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest. In line with the emergency proclamation's anticipation of near-term energy shortages, this Order is limited to a 7-day period. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, under the conditions and with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. The CAISO anticipates that this Order may result in exceedance of NAAQS under the Clean Air Act and other conflicts with environmental law. Based on the CAISO Application, while all three Covered Resources are located in Southern California—two in Los Angeles County and one in Orange County—no two Covered Resources are located in the same community. This will limit the cumulative burden of the Order on any one community. *See Id.* at 6. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by the CAISO for reliability purposes, and subject to the conditions set forth in this Order.

Based on my determination of an emergency set forth above, I hereby order:

A. From September 2, 2022, to September 8, 2022, in the event that the CAISO determines that generation from the Covered Resources is necessary to preserve the reliability of the bulk electric power system in California, I direct the CAISO to dispatch such unit or units and to order their operation solely under the following conditions:

   i. the issuance and continuation of an Energy Emergency Alert Level 2[1] condition or greater between the hours of 14:00 Pacific Daylight Time and 22:00 Pacific Daylight Time after exhausting all reasonably and practically available resources; or,

[1] For the purposes of this Order, "Energy Emergency Alert Level 2" has the meaning set forth in Section 3.6.3 of the California ISO System Emergency Operating Procedure, Procedure No. 4420, Version 14.0, Effective Date May 1, 2022 (CAISO Emergency Operating Procedure).

ii. a transmission emergency[2] that requires operation of the Covered Resource to prevent or mitigate load curtailment during any operating hour.

B. Consistent with good utility practice, the CAISO shall exhaust all reasonably and practically available resources, including demand response and identified behind-the-meter generation resources to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Covered Resources.

C. All operation of the Covered Resources must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators. Covered Resources must comply with the requirements of the CARB MRR and California's Cap-and-Trade regulation, to the extent applicable.

D. The CAISO shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department from time to time. By October 10, 2022, the CAISO shall report source-specific data for all dates between September 2, 2022, and September 8, 2022, on which the Covered Resources were operated, including, for each unit, (1) the hours of operation, as well as the hours in which any permit limit was exceeded, and (2) a preliminary description of each permit term that was exceeded and the manner in which such exceedance occurred. The CAISO shall also submit a final report by November 14, 2022, with any revisions to the information reported on December 12, 2022. The environmental information submitted in the final report shall also include the following information:

i. Emissions data in pounds per hour for each Covered Resource unit, for each hour of the operational scenario, for CO, NOx, PM2.5, PM10, volatile organic compounds (VOC), and SO_2;

ii. Emissions data must include the actual emissions (lbs/hr), permitted operating/emission limits, and the actual incremental emissions above the permit limits, except that for emissions units not equipped with continuous emission monitoring systems, actual emissions shall be calculated using source test data;

iii. Stack parameters for each Covered Resource unit: stack height, exit diameter, exit gas temperature, and exit velocity (or volumetric flow

[2] For the purposes of this Order, "transmission emergency" has the meaning set forth in Section 3.5 of the CAISO Emergency Operating Procedure.

rate). Temperature and velocity must be the values applicable to the operations above permit limits;

iv. The actual hours that each Covered Resource unit operated in excess of permit limits or operated without otherwise-required permits;

v. Information provided to the CARB in response to the CARB's development and implementation of the plan to mitigate the effects of additional emissions authorized by the August 31, 2022 proclamation;

vi. Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order; and

vii. Information provided by Covered Resources describing how these requirements were met by the Covered Resources while operating under the provisions of this Order.

E. The CAISO shall inform all affected communities where all Covered Resources operate that the CAISO has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explains clearly what the Order allows the CAISO to do. The CAISO shall describe the actions taken to comply with this paragraph in the reports delivered to the Department pursuant to paragraph D above.

F. This Order shall not preclude the need for any Covered Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. The CAISO shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

H. This Order shall be effective upon its issuance, and shall expire at 23:59 Pacific Daylight Time on September 8, 2022, with the exceptions of paragraphs F and G and the reporting and analysis requirements in paragraphs D and E. Renewal or amendment of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 16:00 Eastern Time on this 2nd day of September, 2022.



Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 30

DOE ORDER NO. 202-22-1 AMENDMENTS

Department of Energy

Washington, DC 20585

Amendment Number 1 to Order No. 202-22-1

On September 2, 2022, because of a shortage of currently operational electric generation facilities, high demand for electricity, and other adverse conditions resulting from an extreme heat event in California, I issued Order No. 202-22-1. Order No. 202-22-1 authorizes the California Independent System Operator (CAISO) to direct the operation of the Covered Resources identified in Order No. 202-22-1 and on the terms set forth therein.

On September 7, 2022, the CAISO submitted a *Request for Modification of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Request for Modification) in which it requested that Order No. 202-22-1 be amended to add two units at Calpine's Greenleaf Unit 1 site in Yuba City, California (the Greenleaf Units) as additional Covered Resources and that the Greenleaf Units be permitted to operate through September 9, 2022, and otherwise in accordance with the terms of Order No. 202-22-1. The two Greenleaf Units are aero-derivative gas turbine generators. Each unit has a nameplate capacity of approximately 30 MW. CAISO reports that the water injection pump failed at the Greenleaf Units on September 6, 2022. Operation of the Greenleaf Units could cause exceedance of their permitted emissions limits, and thus could result in suspension of their operation absent the issuance of an emergency order permitting operation of the Greenleaf Units during specified conditions. CAISO reports that it continues to forecast high electric demand and supply deficiencies during peak demand hours for the next several days.

I find that the circumstances which led to my previous determination that California was experiencing a shortage of electric energy continue and that this Amendment Number 1 to Order No. 202-22-1 will help to meet the emergency conditions in the CAISO control area and serve the public interest as required by FPA section 202(c).

ORDER

For the reasons set forth above, pursuant to Section 202(c) of the Federal Power Act, it is ordered that Order No. 202-22-1 is hereby amended to add the Greenleaf Units as Covered Resources subject to the terms of Order No. 202-22-1, except that the Greenleaf Units may be operated through September 9, 2022. All other terms of Order No. 202-22-1 remain the same and in effect, including Ordering Paragraphs A-H.

Issued in Washington, D.C. on this 7th day of September, 2022.

Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 31

DOE ORDER NO. 202-22-2

Department of Energy
Washington, DC 20585

Order No. 202-22-2

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and delegated to the Deputy Secretary of Energy by paragraph 1.12(A) of Delegation Order No. S1-DEL-S2-2022 (Mar. 14, 2022), and further delegated by the Deputy Secretary by email correspondence (Sept. 2, 2022), and for the reasons set forth below, I hereby determine that an emergency exists in California due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On September 2, 2022, the Balancing Authority of Northern California (BANC) filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Application) with the United States Department of Energy (Department or DOE) "to preserve the reliability of the bulk electric power system in California," and more specifically to allow the BANC Balancing Authority Area (BAA) to request the dispatch of generation within the BANC BAA "that may be necessary for BANC to meet demand in the face of extreme heat." BANC is a joint powers authority whose members include the Sacramento Municipal Utility District and other municipalities, irrigation districts, and public utilities districts. BANC is a registered Balancing Authority with the North American Electric Reliability Corporation and operates as a neighboring BAA to the California Independent System Operator Corporation (CAISO) BAA. On September 4, 2022, BANC filed an *Amended, Supplemented and Clarified Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Amended Application) in response to questions from DOE.

California has experienced several periods of extreme heat, drought conditions, and threat of wildfires. Such conditions are expected to occur over the next several days and threaten the reliable operation of the bulk electric power system in California. The loads from the forecasted heat wave over the next week are expected to push demand for electric energy by BANC members to at or over historical peaks and higher than normally expected planning targets for this time of year. Amended Application at 2.

On August 31, 2022, California Governor Gavin Newsom issued a proclamation declaring a state of emergency regarding electricity from September 2 through September 7, 2022.[1] In declaring a statutory emergency, the proclamation cited a number of factors and observations, including the following:

- A significant heat wave will bring temperatures "in excess of 100 degrees throughout the State and is forecast to bring record temperatures 10–20 degrees

[1] GSS_9534-1E-20220831133826 (ca.gov)

above normal throughout the State, exceeding 110 degrees in some areas (the 'Extreme Heat Event');"

- The extreme heat will put a significant demand and strain on California's energy grid and is forecast to be a "West-wide event" meaning that energy demand will be high across the region and "California will have limited ability to import energy from out-of-state;"

- The CAISO issued a Heat Bulletin forecasting high electric demand during the extreme heat event that will "stress the energy grid, with peak load for electricity projected to reach its highest level of the year, exceeding 48,000 megawatts on September 5, 2022;" and

- The CAISO is forecasting supply deficiencies of "over 3,000 megawatts during evening hours from September 4, 2022, through September 6, 2022" and advised that emergency interventions would allow energy customers to make contingency plans ahead of the Labor Day holiday weekend.

The proclamation authorizes several measures aimed at mitigating the emergency and avoiding jeopardizing public health or safety, including directing the California Air Resources Board (CARB) to "implement its State-funded Climate Heat Impact Response Program (CHIRP) to mitigate emissions from any operation pursuant to this Proclamation." The proclamation also directs the California Energy Commission (CEC) to "provide information requested by [CARB] to assist with its implementation" of CHIRP.

BANC noted that it "has prepared this request in consultation with the California Energy Commission (CEC), the California Governor's Office, and the CAISO." Application at 2.

Description of Mitigation Measures

In its Application, BANC described actions it has taken in order to alleviate the generation shortfall. Electric utilities within BANC, in coordination with CEC, CAISO, and the California Governor's Office, have implemented conservation and other extraordinary efforts to procure additional supply. BANC members have been able to obtain some purchases from the Pacific Northwest (PNW) bilateral wholesale markets to help offset the additional need, but the physical interties with PNW are near physical limits. BANC members have also been making use of demand-side programs, including commercial interruptible load programs, residential peak shaving programs, and public appeals for conservation. Amended Application at 2.

Request for Order

BANC has requested an emergency order to allow the BANC BAA to dispatch the Covered Resource described below within the BANC BAA that may be necessary for

the BANC to meet demand in the face of extreme heat, subject to the terms set forth herein.

The generators for which BANC is seeking this emergency order consist of 24 diesel-fired generator units owned by NTT Global Data Centers Americas (NTT), located at 1312 Striker Ave, Sacramento, CA 95834, known as "CA 2" and more fully described in the Application Exhibit A – List of Covered Resources (NTT Generators or Covered Resource). The Covered Resource plans to participate in the CEC-administered Demand Side Grid Support program that facilitates availability of resources for emergency purposes. Application at 3; Amended Application at 3-4. Therefore, while the Covered Resource has an aggregate installed capacity of 48MW, BANC requests that this emergency order apply only to capacity necessary to supply the load at the NTT facility served by the Covered Resource, up to 26.1 MW (Covered Maximum Output). Amended Application at 3-4.

BANC has requested that the Secretary issue the requested emergency order by Sunday, September 4, 2022, or as soon as possible thereafter, authorizing the Covered Resource to operate at the Covered Maximum Output level between 2:00 p.m. and 10:00 p.m., when directed to do so by BANC, notwithstanding air quality or other permit limitations.

ORDER

Given the emergency nature of the expected load stress and generation shortfall, the responsibility of BANC as the Balancing Authority to balance generation and load in its BAA to ensure maximum reliability on its system, and the ability of BANC to identify and dispatch generation necessary to meet additional load if an order is issued, I have determined that, under the conditions specified below, generation from the Covered Resource is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c) up to the Covered Maximum Output. This determination is based on, among other things:

- The expected shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes in the State of California and within the BANC BAA, including as declared in the Governor's August 31 emergency proclamation and as described in the Application and Amended Application, demonstrate the need for the Covered Resource to contribute to the reliability of the BANC BAA.

- The availability of 26.1 MW of reduced load as enabled by generation from the Covered Resource up to the Covered Maximum Output provides significant assistance by freeing up system generating resources to help alleviate the shortage of generation and meet demand in the BANC BAA.

- The Covered Resource is enrolled in CEC's Demand Side Grid Support (DSGS) program. The DSGS program establishes procedures for qualification, operation, and reporting to ensure that enrolled generation such as the Covered Resource

provides verifiable load reduction and thereby increase available system capacity during energy emergency events.

- The conditions in CEC's DSGS and those specified below restrict operation of the Covered Resource to those circumstances necessary to avoid load shed.

In line with the emergency proclamation's anticipation of near-term energy shortages, this Order is limited to a 5-day period, from September 4, 2022, through September 8, 2022. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation, under the conditions and with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law, and minimize any adverse environmental impacts. BANC anticipates that this Order may result in exceedance of National Ambient Air Quality Standards (NAAQS) under the Clean Air Act and other conflicts with environmental law. This Order would permit operation of the Covered Resource and corresponding emissions of volatile organic compounds (VOCs), nitrogen oxides (NOx), sulfur dioxide (SO_2), coarse particles (PM10), and carbon monoxide (CO), in circumstances not contemplated by the units' Title V permit. Namely, under its Title V permits, the Covered Resource is permitted to operate at certain emission rates during maintenance and when electric service from the serving utility is interrupted by an unforeseeable event, but not in order to assist the utility in avoiding service interruptions for other customers. The Order would permit operation under grid emergency conditions; however, under the conditions specified below, it would not permit exceedance of the emission limits otherwise applicable to the units constituting the Covered Resource, including limits on the pounds of VOC, NOx, SO_2, PM10, and CO emitted per year.

Based on my determination of an emergency set forth above, I hereby order:

A. From September 4, 2022, to September 8, 2022, in the event that BANC determines that generation from the Covered Resource is necessary to preserve the reliability of the bulk electric power system in California, I direct BANC to dispatch such unit or units and to order their operation solely under the following conditions: the issuance and continuation of an Energy Emergency Alert Level 2[2] condition or greater between the hours of 14:00 Pacific Time and 22:00 Pacific Time after exhausting all reasonably and practically available resources.

B. Consistent with good utility practice, BANC shall exhaust all reasonably and practically available resources, including other demand response and

[2] For the purposes of this Order, "Energy Emergency Alert Level 2" has the meaning set forth in Section 3.6.3 of the California ISO System Emergency Operating Procedure, Procedure No. 4420, Version 14.0, Effective Date May 1, 2022 (CAISO Emergency Operating Procedure).

identified behind-the-meter generation resources to the extent that such resources provide support to maintain grid reliability, prior to dispatching the Covered Resource.

C. All operation of the Covered Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators. The Covered Resource must comply with the requirements of the CARB Mandatory Reporting Regulation and California's Cap-and-Trade regulation, to the extent applicable. This Order allows operation of the Covered Resource under operating conditions not otherwise permitted by the Covered Resource's Title V permit but does not provide relief from the obligation to operate the Covered Resource within the equipment-specific or cumulative emission limit requirements specified in the Covered Resource's Title V permit.

D. BANC shall provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department from time to time. By October 10, 2022, BANC shall report source-specific data for all dates between September 4, 2022, and September 8, 2022, on which the Covered Resource was operated, including, for each unit, (1) the hours of operation, as well as the hours in which any permit limit was exceeded, and (2) a preliminary description of each permit term that was exceeded and the manner in which such exceedance occurred. BANC shall also submit a final report by November 14, 2022, with any revisions to the information reported on December 12, 2022. The environmental information submitted in the final report shall also include the following information:

i. Emissions data in pounds per hour for each Covered Resource unit, for each hour of the operational scenario, for CO, NOx, PM10, VOC, and SO_2;

ii. Emissions data must include emissions (lbs/hr) calculated consistent with reporting obligations pursuant to operating permits, permitted operating/emission limits, and the actual incremental emissions above the permit limits;

iii. The number and actual hours each day that each Covered Resource unit operated in excess of permit limits or conditions, e.g. "Generator #1; September 5, 2022; 4 hours; 18:00-22:00 PT";

iv. Amount, type and formulation of any fuel used by each Covered Resource;

v. All reporting provided over the last three years to the United States Environmental Protection Agency or Sacramento Metropolitan Air Quality Management District pursuant to operating permit requirements;

vi. Information provided to the CARB in response to the CARB's development and implementation of the plan to mitigate the effects of additional emissions authorized by the August 31, 2022 proclamation;

vii. Additional information requested by DOE as it performs any environmental review relating to the issuance of this Order; and

viii. Information provided by the Covered Resource describing how the requirements in paragraph C above were met by the Covered Resource while operating under the provisions of this Order.

E. BANC shall inform all affected communities where the Covered Resource operates that BANC has been issued this Order, in a manner that ensures that as many members of the community as possible are aware of the Order, and explain clearly what the Order allows BANC to do, including potential impacts to the community where the Covered Resource is located and communities adjacent to the Covered Resource. BANC shall describe the actions taken to comply with this paragraph in the reports delivered to the Department pursuant to paragraph D above.

F. This Order shall not preclude the need for the Covered Resource to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. BANC shall be responsible for the reasonable third-party costs of performing analysis of the environmental and environmental justice impacts of this Order, including any analysis conducted pursuant to the National Environmental Policy Act.

H. This Order shall be effective upon its issuance, and shall expire at 23:59 Pacific Time on September 8, 2022, with the exceptions of paragraphs F and G and the reporting and analysis requirements in paragraphs D and E. Renewal or amendment of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 16:20 Eastern Time on this 4th day of September, 2022.



Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 32

DOE ORDER NO. 202-22-2 AMENDMENTS

Department of Energy
Washington, DC 20585

Amendment Number 1 to Order No. 202-22-2

On September 4, 2022, because of a shortage of currently operational electric generating facilities, high demand for electricity, and other adverse conditions resulting from the extreme heat event in California, I issued Order No. 202-22-2. Order No. 202-22-2 authorized the Balancing Authority of Northern California (BANC) to direct the identified electric generating resource (Covered Resources) to operate in BANC's Balancing Authority Area (BAA), under specified conditions, to prevent or mitigate potential power disruptions and provide relief to the bulk power system during stressed grid conditions caused by extreme heat until September 8, 2022. Order No. 202-22-2 expires at the end of the day on September 8, 2022, by its own terms.

On September 7, 2022, BANC submitted a *Request for Extension and Limited Amendment of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Renewal Application) to the Department. In its Renewal Application, BANC requests an extension of Order 202-22-1 through September 11, 2022 and certain modifications to the run time hour limitations contained in Order No. 202-22-2. On September 8, 2022, BANC filed a Revised Request for *Request for Extension and Limited Amendment of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* in response to questions from DOE.

Emergency Situation

In its Renewal Application, BANC states that "the actual heat event has been more severe and records loads have been experienced." The emergency conditions brought about by the ongoing extreme heat event in California have continued and worsened and the supply of electricity is at increased risk for meeting system demand. As stated in its Renewal Application, BANC established a new record peak of approximately 4943 MW on September 6. BANC entered into an EEA-2 as of 1330 hours that same day. During this period BANC had forced outages of significant generation but was able to return units to service in approximately 90 minutes. It is believed that BANC members Roseville and Modesto exceeded their all-time peaks. Consequently, BANC requests the expiration date of Order No. 202-22-2 be extended through September 11, 2022.

In addition to the extension of Order No. 202-22-2, BANC has requested that the Order be modified to remove the 2 PM to 10 PM run time limitation so as to allow additional operational flexibility. BANC specifically requests that the Covered Resource be allowed to run during anytime that they have received notice of an Energy Emergency Alert Level 2 (EEA2) condition or greater. The practical impact of this will be to allow the Covered Resource more notice to follow their protocols for ramping up their diesel-fired generator units. In addition, BANC has requested the ramp down of the Covered Resource could extend beyond the period in which the EEA 2 condition exists. Specifically, the ramp down would commence at the time the EEA 2 condition is declared ended and should be completed as soon as possible consistent with good utility and operational

Consultation

In considering renewal or reissuance of an order under FPA section 202(c) that may conflict with an environmental law or regulation, DOE is required to "consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation" and to include "conditions as such Federal agency determines necessary . . . to the extent practicable." 16 U.S.C. § 824a(c)(4). The Environmental Protection Agency (EPA) is the primary federal agency in this case with expertise in the protected environmental interest, specifically Title V of the Clean Air Act and the Department consulted with EPA after receiving the Renewal Application and EPA did not request any additional conditions be included in this Order. Email from Acting Assistant Administrator Larry Starfield, EPA Office of Enforcement and Compliance Assurance to Kathleen Hogan, Acting Under Secretary for Infrastructure for DOE, September 7, 2022.

Based on the information submitted to the Department, I have determined that an emergency continues to exist in California due to a shortage of electric energy. I find that the issuance of this Order will help to meet the emergency conditions and serve the public interest as required by FPA section 202(c).

ORDER

For the reasons set forth above, pursuant to Section 202(c) of the FPA, I hereby grant BANC's Renewal Application and issue this Order, with modifications as explained below, to extend the expiration date of Order No. 202-22-2 through September 11, 2022.

1. Ordering Paragraph A appearing on page 4 of Order No. 202-22-2 is hereby deleted and replaced in its entirety by the following:

   A. From September 8, 2022, to September 11, 2022, in the event that BANC determines that generation from the Covered Resource is necessary to preserve the reliability of the bulk electric power system in California, I direct BANC to dispatch such unit or units and to order their operation solely under the following conditions: the notification of an Energy Emergency Alert Level 2[1] condition or greater after exhausting all reasonably and practically available resources, together with such reasonable and limited time as is necessary for a Covered Resource to ramp down following an Energy Emergency Alert Level 2 or greater, consistent with good utility practice as directed by the BANC with the goal of limited operation outside of an Energy Emergency Alert Level 2 or greater to the greatest extent possible.

[1] For the purposes of this Order, "Energy Emergency Alert Level 2" has the meaning set forth in Section 3.6.3 of the California ISO System Emergency Operating Procedure, Procedure No. 4420, Version 14.0, Effective Date May 1, 2022 (CAISO Emergency Operating Procedure).

2. The date September 8, 2022 where it appears in Ordering Paragraphs D and H of Order No. 202-22-2 is hereby replaced by the date September 11, 2022.

3. All other terms of Order No. 202-22-2 remain the same and in effect, including Ordering Paragraphs A-H, except as modified herein.

4. This Amendment Number 1 to Order No. 202-22-2 shall be effective upon its issuance, and shall expire at 23:59 Pacific Time on September 11, 2022.

Issued in Washington, D.C. at 16:38 Eastern Time on this 8th day of September, 2022.



Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 33

ROLSMA, *THE NEW RELIABILITY OVERRIDE,* 57 U. CONN. L. REV 789 (2025)

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The New Reliability Override

BENJAMIN ROLSMA

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Article

The New Reliability Override

BENJAMIN ROLSMA

Section 202(c) of the Federal Power Act grants the Secretary of Energy a sweeping authority to exempt electric generation and transmission facilities from any federal, state, or local environmental laws. When Congress first adopted § 202(c) in 1935, it designed the provision as an emergency power that federal regulators could use to force fractious utilities to work together to preserve electricity reliability in times of war or natural disaster. But in the last decade things changed.

This Article, drawing on a novel catalog of all § 202(c) emergencies from the provision's nearly ninety-year history, is the first to comprehensively describe § 202(c). The Article shows that new pressures on the reliability of the American electrical grid, along with an obscure 2015 amendment to the Federal Power Act, transformed § 202(c). No longer is it used to nudge reluctant utilities into action. Instead, starting in the first Trump administration and continuing in the Biden administration, grid operators facing impending blackouts used § 202(c) orders to allow them to run power plants in excess of Clean Air and Clean Water Act pollution limits. And § 202(c) is set to become even more important. Both the Trump and Biden administrations leaned on the provision in proposed policies for the electrical grid—the former to hinder the energy transition and the latter to push it along. This Article tells § 202(c)'s history, describes its transformation, and critically examines some methods for supervising the Department of Energy's use of § 202(c).

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The New Reliability Override

BENJAMIN ROLSMA*

INTRODUCTION

In late December 2022, a "polar vortex" sent temperatures plummeting across the Eastern Seaboard.[1] This weather system put extraordinary strain on the electrical grid by driving up electricity demand and making it harder to run many power plants.[2] On December 23, 2022, PJM Interconnection, the regional transmission organization that manages the grid in most of the Mid-Atlantic, urged customers to "reduce their use of electricity, if health permits, between the hours of 4 a.m. on December 24, 2022 and 10 a.m. on December 25, 2022."[3] In the wee hours of Christmas Eve, PJM initiated emergency procedures to prevent blackouts.[4]

But PJM had a problem. Some power plants that PJM could normally dispatch had mechanical difficulties because of the cold weather, or had

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* Harvard Law School, J.D. 2024; University of Wisconsin–Madison, B.S. 2020. For their invaluable feedback and suggestions, I am grateful to Richard Lazarus, Joshua Macey, Andrew Mergen, Ari Peskoe, and Samantha Strimling. I am also thankful to Kenneth Buell and Tertia Speiser at the Office of Cybersecurity, Energy Security, and Emergency Response in the Department of Energy for being so generous with their time and helpful with their answers to my many questions. And a special thanks to the staff of the *Connecticut Law Review* for their meticulous work and thoughtful edits. All errors, of course, are my own. On April 8, 2025, shortly before this article went to print, President Trump signed an executive order directing the Secretary of Energy to "streamline, systemize, and expedite the Department of Energy's processes for issuing orders under section 202(c) of the Federal Power Act" during "temporary interruption[s] of electricity supply." Exec. Order No. 14262, 90 Fed. Reg. 15521, 15521 (Apr. 8, 2025). Analyzing the order is beyond the scope of this Article, but at the very least the order underlines § 202(c)'s growing importance.

[1] Henry Fountain, *What Is the Polar Vortex? And Other Cold-Weather Climate Questions.*, N.Y. TIMES (Feb. 4, 2023), https://www.nytimes.com/2022/12/22/climate/polar-vortex-winter-cold-weather.html.

[2] *See* Letter from Manu Asthana, President & CEO, PJM Interconnection, LLC, to Jennifer Granholm, Sec'y of Energy, Dep't of Energy 1–3 (Dec. 24, 2022), https://www.energy.gov/sites/default/files/2022-12/PJM%20202%28c%29%20Request.pdf [https://perma.cc/C2N7-BEBC] [hereinafter 2022 PJM Request] (describing the unusual demand for electricity and the limited generating capacity).

[3] Press Release, PJM Interconnection, LLC, PJM Asks Consumers to Conserve Electricity (Dec. 23, 2022), https://www.pjm.com/-/media/about-pjm/newsroom/2022-releases/20221223-news-release-w1-statement-call-for-conservation.ashx.

[4] At 5:00 a.m. on December 24, 2022, PJM declared an Energy Emergency Alert Level 2. Emergency Procedures - Postings, PJM, https://emergencyprocedures.pjm.com/ep/pages/dashboard.jsf (enter "12/20/2022" in the "Effective From" box, and enter "12/30/2022" in the "Effective To" box) (last visited Dec. 30, 2024). EEA levels are a standard process, developed by the North American Electricity Reliability Corporation, for announcing and resolving electricity shortages that meet certain criteria. *See* N. AM. ELEC. RELIABILITY CORP., EOP-011-1 EMERGENCY OPERATIONS 11–12 (Nov. 19, 2015), https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-011-1.pdf. PJM also described its emergency actions in a letter to the Department of Energy. *See* 2022 PJM Request, *supra* note 2, at 1–3.

been unable to obtain enough natural gas.[5] Meanwhile, other plants *could* run, but were not legally allowed to because of "permit restrictions on sulfur dioxide, nitrogen oxide, mercury, carbon monoxide, wastewater release, and other air pollutants (including ammonia)."[6] So, on December 24, PJM sent an urgent letter to the Secretary of Energy requesting permission to operate four different natural gas- and fuel oil-fired power plants in violation of federal environmental laws.[7] At 5:30 p.m. the Department of Energy granted the request.[8] PJM then operated two plants in violation of time restrictions imposed by their Clean Air Act permits—although neither plant ended up exceeding air pollution limits.[9]

The Department's order relied on a little-known emergency authority: § 202(c) of the Federal Power Act.[10] Under § 202(c), the Secretary of Energy has a sweeping power to exempt electric generation and transmission facilities from any federal, state, or local environmental law. During "war" or "an emergency," the Secretary may order the transmission or generation of "electric energy"—and actions taken in compliance with a § 202(c) order are excused from following "any Federal, State, or local environmental law or regulation."[11] No exercise of this broad authority has ever received meaningful judicial review.[12] And despite its sweeping scope, it has largely

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[5] *See* 2022 PJM Request, *supra* note 2, at 2 ("[S]ome units have experienced operating difficulties due to cold weather or fuel limitations, primarily gas. Specifically, approximately 45,000 MW of generating units (the majority of which is thermal) are currently outaged or derated.").

[6] *Id.* at 4.

[7] *See id.* at 3–8 (requesting approval to operate natural gas- and fuel oil-fired power plants). At 9 p.m. the same day, PJM added eight additional power plants to the request. *See* DEP'T OF ENERGY, ORDER NO. 202-22-4, Exhibit A (Dec. 24, 2022), https://www.energy.gov/sites/default/files/2022-12/PJM%20202%28c%29%20Specified%20Resources%20%28Updated%2012-24-22%209PM%29.pdf [https://perma.cc/YG99-2G93].

[8] DEP'T OF ENERGY, ORDER NO. 202-22-4 (Dec. 24, 2022), https://www.energy.gov/sites/default/files/2022-12/PJM%20202%28c%29%20Order.pdf [https://perma.cc/5TEC-GKFT] [hereinafter ORDER NO. 202-22-4].

[9] *See* Draft Memorandum from ICF to Tertia Speiser, Acting Logistics, Fin., & Admin. Section Chief, Off. of Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy 3–6 (Mar. 6, 2024) [hereinafter Draft Memorandum], https://www.energy.gov/sites/default/files/2024-08/sea-07-pjm-special-environmental-analysis-2024-03-06.pdf [https://perma.cc/LF7J-JBW2].

[10] ORDER NO. 202-22-4, *supra* note 8, at 1 (describing the order as having been issued "[p]ursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c)").

[11] Federal Power Act § 202(c), 16 U.S.C. § 824a(c). The Federal Power Act is codified at 16 U.S.C. §§ 791a–828c. It began as the Federal Water Power Act, ch. 285, 41 Stat. 1063 (1920), and took on its modern structure in 1935, see Public Utility Act of 1935, tit. II, ch. 687, 49 Stat. 803, 838–63 (current version at 16 U.S.C. §§ 791a–828c). Although § 202(c) bestows the emergency authority on the "Commission" (referring to the now-defunct Federal Power Commission), Congress has since transferred the power to the Secretary of Energy. *See* Department of Energy Organization Act § 301(b), 42 U.S.C. § 7151a. *See also* Town of Massena v. Niagara Mohawk Power Corp., 8 FERC ¶ 61,199, 61,199 n.5 (1979) (describing the transfer of authority).

[12] Just three cases discuss § 202(c). Two of the cases comment on what counts as an "emergency" under § 202(c) and are discussed in more detail *infra* Part II.C. *See* Otter Tail Power Co. v. Fed. Power Comm'n, 429 F.2d 232, 234 (8th Cir. 1970); Richmond Power & Light v. Fed. Energy Regul. Comm'n,

escaped scholarly attention.[13]

After all, for nearly three quarters of a century, § 202(c) was irregularly invoked. The provision was mostly used to coerce reluctant utilities into supporting electric grid reliability by opening new interconnections. An acute shortage of electricity during the First World War inspired Congress to create § 202(c), passing it into law in 1935.[14] Section 202(c) was used several times during World War II in support of the war effort and a half dozen or so more times from the 1950s through the 2000s.[15] For the most part, § 202(c) appeared in contexts familiar to the Congress that created it: orders requiring interconnection to mitigate electricity shortages caused by "war," "[d]rought," and "other natural emergencies."[16]

But in the last decade, things changed. An array of external factors put pressure on the reliability of the national electrical grid. Tightening environmental rules and shifting economic forces drove many large, old,

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574 F.2d 610, 613–15 (D.C. Cir. 1978). A third dealt with refunds in a FERC proceeding but included a brief discussion of § 202(c) that was not central to the holding. *See* Pub. Utilities Comm'n of Cal. v. Fed. Energy Regul. Comm'n, 462 F.3d 1027, 1064–65 (9th Cir. 2006).

[13] Most discussion of § 202(c) has been brief and has appeared in articles focused on broader issues in administrative law or electricity regulation. *See, e.g.*, Richard S. Wirtz, Note, *Electric-Utility Interconnections: Power to the People*, 21 STAN. L. REV. 1714, 1722 (1969); Carl E. Bagge, *The Federal Power Commission*, 11 B.C. INDUS. & COM. L. REV. 689, 713 & n.139 (1970); A. Robert Thorup, *Electric Range War in Texas: A Case Study in Federal-State Energy Regulation*, 48 GEO. WASH. L. REV. 392, 402–04, 415, 417 (1980); Steven Ferrey, *Broken at Both Ends: The Need to Reconnect Energy and Environment*, 65 SYRACUSE L. REV. 53, 59–61, 72–74 (2014); Steven Ferrey, *Subnational Discretion Mediating New Climate Regulatory Challenges*, 7 SAN DIEGO J. CLIMATE & ENERGY L. 31, 39–40 (2016); Thomas O. McGarity, *The Trump Effect on Power Plant Carbon Dioxide Emissions*, 9 SAN DIEGO J. CLIMATE & ENERGY L. 151, 182–83 (2018). A few, while still focused on other topics, have offered a more detailed analysis of § 202(c) and have critically examined what counts as an "emergency." *See* Jonathan Schneider & Jonathan Trotta, *What We Talk About When We Talk About Resilience*, 39 ENERGY L.J. 353, 387–91 (2018) (describing some uses of § 202(c) and discussing the meaning of "emergency"); James M. Van Nostrand, *Using Emergency Powers to Provide Financial Assistance to Coal and Nuclear Plants*, 11 KY. J. EQUINE AGRIC. & NAT. RES. L. 191, 200–03 (2018) (arguing that closure of coal-fired power plants is not an "emergency"); Sharon B. Jacobs, *The Statutory Separation of Powers*, 129 YALE L.J. 378, 422–27 (2019) (using § 202(c) as an example of congressionally-mandated separation of functions within the executive branch); SHARON JACOBS & ARI PESKOE, HARV. L. SCH. ENV'T & ENERGY L. PROGRAM, ENERGY EMERGENCIES VS. MANUFACTURED CRISES: THE LIMITS OF FEDERAL AUTHORITY TO DISRUPT POWER MARKETS 21–22, 26–31 (June 3, 2019), https://www.ssrn.com/abstract=3420970 (describing some limitations on § 202(c) and a Trump-era attempt to use the provision to support coal-fired power plants); Amy L. Stein, *Energy Emergencies*, 115 NW. U. L. REV. 799, 839–40, 849, 861, 865–66 (2020) (using § 202(c), and other energy-related emergency powers, as a lens for evaluating delegations of authority to the President). One article provides a detailed description of the context around uses of § 202(c) between 2000 and 2005. *See* Susan E. Taylor, *Energy Emergency Powers in a National Interconnected System*, 21 NAT. RES. & ENV'T 43, 43–48, 69 (2006). This Article is the first to focus exclusively on § 202(c), the first to assemble a full record of its pre-2000 uses, and the first to extensively examine § 202(c)'s ability to override environmental rules.

[14] *See infra* Part I.B.

[15] *See infra* Table 2.

[16] S. REP. No. 74-621, at 49 (1935) (describing § 202(c) as giving the Federal Power Commission "a much broader and more complete authority . . . during times of war or other emergency" and commenting that "[d]rought and other natural emergencies have created similar crises").

coal-fired electric generating units out of business.[17] At the same time, extreme weather supercharged by climate change, along with a revolution in sources of electric energy, increased demand for electricity and upped the technical challenges of meeting that demand. Then, in 2015 Congress amended § 202(c), explicitly providing that § 202(c) orders could be used to exempt grid entities from liability under any environmental law.

Amidst those changes, the way the Department of Energy exercised its § 202(c) authority shifted. Section 202(c)'s previous use as a way to require reluctant utilities to resolve temporary shortages of electricity waned.[18] During the first Trump administration and the Biden administration, the Department of Energy has instead used § 202(c) as a "reliability safety valve," exempting electricity generation facilities from certain environmental regulations when grid reliability is threatened.[19] When immediately available options for preserving electric reliability run out, utilities and grid operators (like PJM) now turn to § 202(c), which allows them to squeeze a bit more electricity out of existing infrastructure by lifting limits on air and water pollution.

Some startling figures underline this shift. Between 1970 (just before Congress adopted important federal environmental laws like the modern Clean Air and Clean Water Acts)[20] and 2015, only one § 202(c) order across eight emergencies involved a conflict with environmental rules.[21] Since 2015, the Department of Energy has declared twelve § 202(c) emergencies—and eleven included orders permitting the operation of electric generation units in excess of Clean Air Act or Clean Water Act pollution limits.[22]

Section 202(c)'s role is set to expand. Climate change and the ongoing

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[17] *See infra* Part III.A.

[18] *See infra* Part I.B; Table 1; Table 2 (discussing historical uses of § 202(c)).

[19] *See infra* Part II; Figure 1. The term "reliability safety valve" was first used in conjunction with § 202(c) during debates about the reliability effects of tightened regulations for mercury emissions from coal plants. These debates focused on a particular reliability mechanism that stakeholders hoped that the Environmental Protection Agency would include in its mercury-pollution final rule. *See, e.g.*, *The American Energy Initiative, Part 12: Impacts of the Environmental Protection Agency's New and Proposed Power Sector Regulations on Electric Reliability*: *Hearing Before Subcomm. on Energy & Power of the H. Comm. on Energy & Com.*, 112th Cong. 59–60, 63–64 (2011) (statement of Marc Spitzer, Comm'r, Fed. Energy Regul. Comm'n) (discussing the possibility of a "reliability safety valve" in the proposed mercury rule); *id.* at 216 (statement of Jon Wellinghoff, Chairman, Fed. Energy Regul. Comm'n) (same). But a couple of hearing participants noted that § 202(c) was a separate, preexisting reliability tool (although none of them directly called § 202(c) a "reliability safety valve"). *See id.* at 394–96 (statement of Susan F. Tierney, Managing Principal, Analysis Grp.) (discussing § 202(c)); *id.* at 412–13 (statement of John Hanger, President, Hanger Consulting, LLC) (same); *id.* at 526 (statement of Susan F. Tierney, Managing Principal, Analysis Grp.) (same).

[20] *See* RICHARD J. LAZARUS, THE MAKING OF ENVIRONMENTAL LAW 81–89 (2d ed. 2023) (summarizing significant environmental legislation passed during the 1970s).

[21] *See infra* Table 1; Table 2.

[22] *See infra* Table 1. Even in that single pre-2015 instance, it is somewhat uncertain that there was, in fact, a conflict between environmental rules and the § 202(c) order. *See infra* note 118 and accompanying text.

energy transition, by disrupting the way the electrical grid has historically operated, will ratchet up the pressure on § 202(c). At the same time, regulators are increasingly relying on § 202(c). In two Biden-era rulemakings, the Environmental Protection Agency ("EPA") invoked the provision as an important reliability backstop. EPA's recently finalized rule limiting greenhouse gas emissions from new and existing electric generating units repeatedly cites § 202(c) in response to concerns that the rule could undermine grid reliability.[23] Another rule, this one tightening restrictions on mercury emissions from coal-fired power plants, also cites § 202(c) as a last-ditch way to keep plants open to preserve reliability.[24]

These are fraught developments. Used judiciously, § 202(c) orders can be an important backstop that help to prevent blackouts. However, over the provision's ninety-year history, officials have experimented with aggressive § 202(c) orders lasting months or years in response to "emergencies" that were predictable and predicted. This Article argues that text, historical context, and administrative practice indicate that although § 202(c) is a flexible tool, it is limited to grid crises that are acute and *unexpected* or that happen during wartime.[25] So, using § 202(c) to keep the lights on during a cold snap is within bounds. EPA's greenhouse gas rule, on the other hand, anticipates the possibility of reliability impacts, and then suggests that § 202(c) could be used to mitigate those impacts. But expected problems are not in § 202(c)'s wheelhouse.

A narrow reading of what "emergency" means in § 202(c) is not just good statutory interpretation, it is also good climate policy. Broad readings of "emergency" can be leveraged to undercut decarbonization efforts, just as it was used to bolster them. Indeed, in 2018, Trump administration officials seriously considered using § 202(c) to *require* grid operators to purchase capacity from coal-fired power plants that were on the brink of closure.[26] Also, emergency authorities are a poor substitute for the capital investments and regulatory reforms that are necessary to achieve climate goals—that's because § 202(c) orders are a regulatory carve out that allow

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[23] *See* New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 89 Fed. Reg. 39798, 39915, 40012–16 (May 9, 2024) (codified at 40 C.F.R. pt. 60) [hereinafter NSPS Rule] (suggesting that the Department of Energy (DOE) might use § 202(c) to protect grid reliability).

[24] *See* National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 89 Fed. Reg. 38508, 38526 (May 7, 2024) (codified at 40 C.F.R. pt. 63) [hereinafter MATS Revision] (referencing DOE's § 202(c) authority).

[25] *See infra* Part I.C.1.

[26] JACOBS & PESKOE, *supra* note 13, at 23, 26–28. The details of the plan appeared in a leaked memorandum. *See id.* at 23 ("A leaked DOR document dated May 29, 2018 outlined the rationale for compensating fuel-secure generation facilities, asserting that 'resources that have a secure on-site fuel supply . . . are essential . . . .'"); Leaked Draft Addendum, Dep't of Energy (May 29, 2018), https://www.documentcloud.org/documents/4491203-Grid-Memo.html (discussing purported grid security challenges).

facilities to (briefly) operate in excess of pollution limits. Using the orders too often will undermine the rules to which they provide exceptions.

This Article has three parts. Part I introduces § 202(c)'s technical and legal context, tells the section's history, and describes § 202(c)'s substantive and procedural requirements—including the contested meaning of "emergency." Next, Part II shows how the section has taken its new environmental turn. Finally, Part III looks to the future and discusses how new regulations, changes in the grid's resource mix, and severe weather is raising the salience of § 202(c). It also highlights the risks of § 202(c)'s new role in climate policy and introduces the tools that lawyers and policymakers inside and outside the Department of Energy can use to limit misuse of the emergency provision.

I. FORGED BY WAR: § 202(C)'S PAST

This Part introduces § 202(c). It starts by briefly describing § 202(c)'s context: the intricate North American electrical grid. Then it sketches the origin and use of § 202(c) before outlining § 202(c)'s substance and procedure, with a particular focus on what kinds of events are "emergencies" that can justify § 202(c) orders.

A. *The Grid and Its Participants*

The North American electrical grid is composed of the generation facilities that create electricity and the transmission and distribution infrastructure that carries electricity across the country and delivers it to homes and businesses.[27] These systems—generation, long distance transmission, and last-mile delivery—are connected into local electrical grids, which are in turn connected with each other into three regional groups that ease the movement of electricity across the country, called the Eastern Interconnection, the Western Interconnection, and the Electric Reliability Council of Texas.[28]

Originally, vertically integrated utilities, watched over by regulators, controlled generation, transmission, and distribution of electricity in particular regions.[29] But, starting in the 1970s, this structure broke down and today power generation prices are mostly set in competitive markets.[30] In much of the United States, those markets are run and managed by

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[27] ASHLEY J. LAWSON, CONG. RSCH. SERV., R47521, ELECTRICITY: OVERVIEW AND ISSUES FOR CONGRESS 3–4 (2023).

[28] Sara Hoff, *U.S. Electric System Is Made up of Interconnections and Balancing Authorities*, U.S. ENERGY INFO. ADMIN. (July 20, 2016), https://www.eia.gov/todayinenergy/detail.php?id=27152 [https://perma.cc/7XRM-QYZY].

[29] Matthew R. Christiansen & Joshua C. Macey, *Long Live the Federal Power Act's Bright Line*, 134 HARV. L. REV. 1360, 1374 (2021) (describing this period).

[30] *See id.* at 1374–76 (describing this period of "restructuring" and the role Congress and FERC played in nudging it along); LAWSON, *supra* note 27, at 5 (similar).

consortiums of transmission owners and utilities called independent system operators ("ISOs") or regional transmission organizations ("RTOs").[31]

At every moment the grid's electricity supply must line up perfectly with shifting electricity demand.[32] Even the slightest mismatch will cause blackouts and catastrophe.[33] So, organizations called "balancing authorities" maintain the second-to-second match of supply and demand in regional areas.[34] Sometimes balancing authorities are standalone organizations, but occasionally they do dual service: RTOs both run wholesale electricity markets and serve as the balancing authorities for the regions where they operate.[35]

Connections between parts of the grid help maintain that second-to-second balance in a cost-effective way. When electricity infrastructure in different regions of the country is linked or "interconnected," an uptick in demand in one location can be met by increased generation elsewhere.[36] Interconnection also improves economies of scale. A local utility need not make enormous infrastructure investments in anticipation of rare, maximum demand days. Instead, those moments of peak demand can be met through imported power.[37] Although the grid started out as a smattering of isolated systems, after World War II interconnection accelerated,[38] and today the grid is a (mostly) integrated whole.[39]

Overseeing all of this is a menagerie of regulators, divided by a jurisdictional "bright line."[40] On one side of the line, the federal government,

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[31] *See Electric Power Markets*, FED. ENERGY REGUL. COMM'N, https://www.ferc.gov/electric-power-markets [https://perma.cc/V2GU-8S3A] (last updated May 16, 2023) (describing the ISOs/RTOs and their history).

[32] *See* OFF. OF ENERGY POL'Y & INNOVATION, FED. ENERGY REGUL. COMM'N, ENERGY PRIMER 34 (2023), https://www.ferc.gov/sites/default/files/2024-01/24_Energy-Markets-Primer_0117_DIGITAL_0.pdf [https://perma.cc/2UFY-HTC2] [hereinafter ENERGY PRIMER] ("While technology continues to develop and advance, electric markets can only store a portion of the electricity required to serve electric loads. Thus, the vast majority of electricity must be produced instantaneously as needed.").

[33] *See* Hoff, *supra* note 28 ("If demand and supply fall out of balance, local or even wide-area blackouts can result.").

[34] *See id.* (explaining how these authorities make sure the grid is "finely balanced").

[35] *Id.*

[36] FED. ENERGY REGUL. COMM'N, RELIABILITY PRIMER 10 (2020), https://www.ferc.gov/sites/default/files/2020-04/reliability-primer_1.pdf [https://perma.cc/8N57-Q63B] [hereinafter RELIABILITY PRIMER].

[37] *See* ENERGY PRIMER, *supra* note 32, at 34–35 ("Instead of building and maintaining all of the capacity required to provide energy and sufficient reserves, utilities were able to pool their reserves and could buy power from their neighbors in times of need cutting their costs significantly as a result.").

[38] RELIABILITY PRIMER, *supra* note 36, at 10.

[39] *See* Julie A. Cohn, *Two Years After Devastating Winter Storm, What Can We Say About the Isolated Texas Grid?*, BAKER INST. FOR PUB. POL'Y (Feb. 16, 2023), https://www.bakerinstitute.org/research/two-years-after-devastating-winter-storm-what-can-we-say-about-isolated-texas-grid (explaining the history of interstate power exchanges and the Texas grid's independence); Lincoln L. Davies, Stephanie Lenhart & Anne E. Ralph, *Remaking the Western Grid*, 58 U.C. DAVIS L. REV. ONLINE 61, 84–94 (2025) (describing the ongoing integration of western grid).

[40] Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n, 461 U.S. 375, 392 (1983). For a more detailed overview of the institutions involved in grid governance, see generally ALEXANDRA KLASS, JOSHUA

through the Federal Energy Regulatory Commission ("FERC"), oversees wholesale electricity markets.[41] On the other side, state public utility commissions regulate generation facilities and the retail electricity market.[42] A separate entity, the non-profit North American Electric Reliability Corporation ("NERC"), promulgates reliability standards designed to minimize the risk of blackouts.[43] FERC reviews and approves NERC-produced reliability standards and, once approved by FERC, the standards are mandatory.[44] Although most federal control over the grid is exercised through FERC, the Department of Energy also has a few miscellaneous electricity-related powers—including the ability to issue § 202(c) orders.[45]

B. *Origin and Use of § 202(c)*

Today the Department of Energy uses § 202(c) as a way to waive compliance with environmental rules.[46] But the section's story begins in 1917, more than fifty years before either the Department of Energy or many federal environmental laws existed.[47] What happened?

1. *World War I*

It starts with coal. After the United States entered World War I in 1917, military needs drove up the demand for energy and coal prices climbed.[48] The rise prompted interest from federal regulators in the Wilson administration, who planned to (and eventually did) impose price controls.[49] With below-market prices in the offing, coal production collapsed in August 1917.[50] As the fall of 1917 turned to winter, decreased production, unforgiving price controls, and clumsy decision-making by federal

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MACEY, SHELLEY WELTON & HANNAH WISEMAN, KLEINMAN CTR. FOR ENERGY POL'Y, THE KEY TO ELECTRIC GRID RELIABILITY: MODERNIZING GOVERNANCE (2024), https://kleinmanenergy.upenn.edu/wp-content/uploads/2024/03/KCEP-Paper-15-Key-to-Electric-Grid-Reliability.pdf.

[41] 16 U.S.C. § 824(b)(1). *See also* Christiansen & Macey, *supra* note 29, at 1363 (summarizing this jurisdictional division); Jim Rossi, *Energy Federalism's Aim*, 134 HARV. L. REV. F. 228, 234–44 (2021) (describing complications to the "bright line" doctrine).

[42] Christiansen & Macey, *supra* note 29, at 1363; *cf.* 16 U.S.C. § 824(b) (excepting from federal control "facilities used for the generation of electric energy or . . . facilities used in local distribution").

[43] RELIABILITY PRIMER, *supra* note 36, at 33–35.

[44] 16 U.S.C. § 824o. On NERC, its powers, and its peculiar structure, see generally Joshua C. Macey, Shelley Welton & Hannah Wiseman, *Grid Reliability in the Electric Era*, 41 YALE J. ON REGUL. 164, 189–233 (2024). *See also id.* at 205 (describing the "'unusual' relationship between FERC and NERC").

[45] *See* Jacobs, *supra* note 13, at 415–22 (describing some of the Department of Energy's authorities, including § 202(c)); *id.* at 415 (characterizing the Department of Energy and FERC as "entangle[d]").

[46] *See infra* Part II.

[47] On the creation of the Department of Energy, see *infra* notes 9191–95 and accompanying text. On the advent of modern federal environmental law, see LAZARUS, *supra* note 20, at 81–89.

[48] *See* James P. Johnson, *The Wilsonians as War Managers: Coal and the 1917-18 Winter Crisis*, 9 PROLOGUE: J. NAT'L ARCHIVES 193, 196 (1977) ("In the summer of 1917, spot prices for coal sold on the open market began to skyrocket.").

[49] *Id.* at 198–202.

[50] *Id.* at 201–02.

administrators created a desperate shortage of coal.[51] The shortage hammered the country's coal-reliant electrical grid.[52] Government administrators urged conservation measures to protect wartime industry and utility companies warned of shortages.[53] But regulators blamed more than the coal shortage. For example, in March 1918, Charles E. Stuart, a federal Fuel Administration official, criticized the "individualistic way in which fuel is now consumed" and urged construction of larger power plants and more grid interconnections.[54]

A lengthy 1921 investigation of the power shortage—known as the Keller report—zeroed in on insufficient interconnection.[55] The coal situation, interruptions in hydroelectric supplies, an overreliance on single-customer power plants, and the dramatic increase in demand occasioned by the war had all contributed to a shortage of electricity.[56] But with more interconnection, the grid could have been nimbler. Summarizing the reports, Charles Keller, an Army Corps of Engineers officer, argued that:

> [O]wing to [a] lack of flexible and capacious interconnections between adjacent power systems it was virtually impossible to reduce th[e] shortage by taking advantage of the diversity factor and by releasing for active use part of the installed reserves which interconnection would have rendered safety available . . . .[57]

As one history of the electrical grid puts it, by "the eve of the Roaring Twenties, the idea of large-scale interconnected power systems crossing North America fully captured the interest of engineers, executives, and

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[51] *See id.* at 201–02, 207–08 (blaming Wilson administration officials for the coal shortage for "fail[ing] the nation as war managers"); DAVID M. KENNEDY, OVER HERE: THE FIRST WORLD WAR AND AMERICAN SOCIETY 123 (1982) (ascribing the shortage to "the apparent ineptitude of Fuel Administrator Garfield").

[52] *See* Robert Suits, Nathan Matteson & Elisabeth Moyer, *Energy Transitions in U.S. History 1800–2019*, at 3 (U. Chi., Ctr. for Robust Decision-making on Climate & Energy Pol'y, Working Paper Series, 2020), https://static1.squarespace.com/static/54dcfad0e4b0eaff5e0068bf/t/5fbeba6ffa04221c71019ccc/1606335091993/Suits_Matteson_Moyer_2020_Energy_Transitions.pdf (showing that, in 1918, most electricity generation in the United States was from coal, with the balance supplied by hydropower).

[53] *E.g.*, *Power Plants May Be Taken by Government*, PITTSBURGH POST-GAZETTE, Nov. 11, 1917, at 2.

[54] *Industry Urged to Use Power of Central Plants*, N.Y. TRIBUNE, Mar. 11, 1918, at 7.

[55] *See* CHARLES KELLER, THE POWER SITUATION DURING THE WAR 18–19 (Gov't Printing Off. 1921) (War Dep't Doc. No. 1039). The document consists of five reports from different Army officers, prefaced by a summary report written by Colonel Charles Keller. *See id.*

[56] *See id.* at 42 (report of Major Charles F. Lacombe).

> The main causes for shortage of power supply . . . were: (1) Shortage of fuel principally caused by lack of storage and in some degree possible by deficient railroad transportation or inadequate production. (2) Shortages of water power due to adverse weather conditions in both the winter and summer of 1917–18. (3) Lack of capacity of central electric-power plants to meet the extraordinary war demand.

[57] *Id.* at 18.

government officials alike."[58] This pro-interconnection agenda would inspire § 202(c).

2. *Congress Creates § 202(c)*

In 1935 Congress remade the electricity regulatory framework. Before, electricity was mostly a states-only affair.[59] But the Public Utility Act of 1935[60]—Title II of which created the Federal Power Act[61]—granted a pre-existing independent agency, the Federal Power Commission ("FPC"), control over things on the federal side of the jurisdictional "bright line."[62] The fortified FPC, previously a sleepy licensing agency,[63] now had a sweeping authority to ensure that wholesale electricity rates were "just and reasonable."[64]

However, the FPC's interconnection powers were limited. By early 1935, the Keller report's emphasis on interconnection had developed into a comprehensive critique of the fragmented nature of the American grid.[65] An influential FPC report endorsed Keller's diagnosis of the wartime electricity shortage, emphasized the importance of interconnection, and blamed commercial rivalries and overlapping jurisdictions for the slow pace of grid

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[58] JULIE A. COHN, THE GRID: BIOGRAPHY OF AN AMERICAN TECHNOLOGY 40 (2017).

[59] Christiansen & Macey, *supra* note 29, at 1371; Fed. Energy Regul. Comm'n v. Elec. Power Supply Ass'n, 577 U.S. 260, 265–66 (2016) ("In the early 20th century, state and local agencies oversaw nearly all generation, transmission, and distribution of electricity.").

[60] Public Utility Act of 1935, ch. 687, 49 Stat. 803 (current version at 16 U.S.C. § 824).

[61] RICHARD J. CAMPBELL, CONG. RSCH. SERV., R44783, THE FEDERAL POWER ACT (FPA) AND ELECTRICITY MARKETS 2 (2017) ("Title II of the PUA amended the [Federal Water Power Act] to create the FPA, and granted authority to the FPC to regulate the interstate transmission and sales of electricity and natural gas.").

[62] *See* Public Utility Act of 1935, ch. 687, § 201, 49 Stat. 803, 847–48 (current version at 16 U.S.C. § 824) ("The Commission . . . shall not have jurisdiction . . . over facilities used [only for] intrastate commerce . . . ."); *supra* notes 40–42 and accompanying text (describing the "bright line"). Congress also expanded federal jurisdiction over electricity in part because of a Supreme Court decision, *Public Utilities Commission of Rhode Island v. Attleboro Steam & Electric Co.*, 273 U.S. 83 (1927). *See* Christiansen & Macey, *supra* note 29, at 1371–72 (explaining *Attleboro*'s impact).

[63] *See* Robert D. Baum, The Federal Power Commission and State Utility Regulation 22–28 (American Council on Pub. Affs. 1942) (Ph.D. dissertation, Columbia University) (HeinOnline) (describing the early history of the Federal Power Commission and noting that until an earlier reorganization act in 1930, the Commission "was little more than an interdepartmental coordinating committee" with "[w]eak administrative organization, inadequate control of funds and personnel, and administrative sympathy for . . . private power interests").

[64] Public Utility Act of 1935, ch. 687, § 205(a), 49 Stat. 803, 851 (current version at 16 U.S.C. § 824d(a)).

[65] *See* Horace M. Gray, *The Integration of the Electric Power Industry*, 41 AM. ECON. REV. 538, 538 (1951) ("By 1935, fifteen years of intensive criticism, beginning with the Keller report and terminating with the *National Power Survey*, had exposed the defective organization of the electric power industry and delineated the essential features of an integrated power system." (footnotes omitted)); *id.* at 541 (discussing the *National Power Survey*); FED. POWER COMM'N, POWER SER. NO. 1, NATIONAL POWER SURVEY INTERIM REPORT 54 (1935) (concluding that "studies . . . have gone far enough to show that interconnection as it exists today in the United States is not the result of any definitely planned program. Its growth has been relatively haphazard, handicapped by intercompany rivalry and prejudices and by artificial barriers").

integration.[66] Despite this critique, Congress granted the FPC only modest interconnection authorities.[67] In § 202 of the Federal Power Act, Congress charged the FPC with "promot[ing] and encourag[ing]" voluntary interconnection,[68] but the FPC had little authority to require isolated, intrastate utilities to connect with the national grid.[69]

There was an exception. Congress included an emergency provision in the FPC's section 202 interconnection powers. Section 202(c) provided that:

> During 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 Commission shall have authority, either upon its own motion or upon complaint, with or without notice, hearing, or report, to require by order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest.[70]

The FPC could issue these emergency interconnection orders to any utility, whether within the Commission's jurisdiction or not.[71]

Congress seems to have drafted § 202(c) with the Keller report in mind.

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[66] *See* FED. POWER COMM'N, *supra* note 65, at 49–50*,* 52–54 (discussing interconnection and the restive relationships between utilities).

[67] *Cf.* Gray, *supra* note 65, at 544 ("The Act of 1935, as it finally emerged in mutilated form, made certain genuflections toward integration, but this was largely pretense devoid of all substance and reality.").

[68] Public Utility Act of 1935, ch. 687, § 202(a), 49 Stat. 803, 848 (current version at 16 U.S.C. § 824a(a)).

[69] *See id.* § 202(b) (current version at 16 U.S.C. 824a(b)) (giving the FPC the power to order "a public utility . . . to establish physical connection of its transmission facilities"); *id.* § 201(e) (current version at 16 U.S.C. § 824e) (defining "public utility" as "any person who owns or operates facilities subject to the jurisdiction of the Commission"); Thorup, *supra* note 13, at 402 (explaining this limitation). For a more detailed description of the Federal Power Act's tortured jurisdictional boundaries, see Bagge, *supra* note 13, at 710–11 (summarizing the early history); Jared M. Fleisher, *ERCOT's Jurisdictional Status: A Legal History and Contemporary Appraisal*, 3 TEX. J. OIL GAS & ENERGY L. 4, 7–10 (2008) (summarizing the current doctrine).

[70] Public Utility Act of 1935, ch. 687, § 202(c), 49 Stat. 803, 849 (current version at 16 U.S.C. § 824a(c)). A subsequent sentence in the subsection allowed the FPC to set rates in connection with emergency orders. *See id.*

> If the parties affected by such order fail to agree upon the terms of any arrangement between them in carrying out such order, the Commission, after hearing held either before or after such order takes effect, may prescribe by supplemental order such terms as it finds to be just and reasonable, including the compensation or reimbursement which should be paid to or by any such party.

[71] For orders applying to non-jurisdictional entities, see, for example, Texas Elec. Serv. Co., 9 F.P.C. 1373, 1373–74 (1950). For purposes of this article, "F.P.C." refers to the *Opinions and Decisions of the Federal Power Commission*, the official reporter of the FPC.

Power sector experts emphasized the report in hearings in March and April of 1935. David E. Lilienthal, then director of the Tennessee Valley Authority, endorsed the Keller report as a guide to the shortage of power during the war.[72] So too Dozier A. DeVane, Solicitor for the FPC, cited the Keller report, asserting that it was the "first report that has any discussion of the matter of the question of regional interconnected systems,"[73] and using it as evidence that utility companies were failing to sufficiently integrate when left to their own devices.[74] DeVane also quoted extensively from the Keller report's pro-interconnection conclusion.[75]

A Senate committee report offers the most detailed justification for § 202(c) that appears in the formal legislative history. For "[i]nterconnection and the coordination of facilities," in "this first exercise of Federal power over electric companies," the report argued, the FPC must rely on "voluntary coordination"—with the exception of § 202(c), which was "appropriately limited to periods of war or other emergency."[76] The report explicitly tied the § 202(c) exception to the World War I episode, saying that the provision was "a temporary power designed to avoid a repetition of the conditions during the last war, when a serious power shortage arose."[77] The report also claimed that "[d]rought and other natural emergencies have created similar crises."[78] This last concern appears to be a reference to drought-fueled power shortages experienced in California from 1918 to 1920, and also in 1924.[79] California had limited grid interconnection and most of the state's electricity was produced by hydroelectric plants.[80] So, when drought came, shortages were difficult to mitigate.[81]

3. *The First Eighty Years*

In the decade after its creation, § 202(c) was used to promote interconnection. From 1935 through the summer before the United States

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[72] *Public Utility Holding Companies: Hearings on H.R. 5423 Before the H. Comm. on Interstate and Foreign Com.*, 74th Cong. 1967 (1935) [hereinafter *Hearings on H.R. 5423*] (statement of David E. Lilienthal, Dir., Tenn. Valley Auth.).

[73] *Id*. at 492 (statement of Dozier A. DeVane, Solic., Fed. Power Comm'n).

[74] *See id.* at 541 ("Mr. BULWINKLE. Now, has there been any complaint that any of the utility companies have failed to respond to furnishing their facilities to other companies that you know of? Mr. DEVANE. The strongest complaint you could find in that respect, Mr. Bulwinkle, will be found in Colonel Keller's report I referred to yesterday.").

[75] *Id.* at 2167–68.

[76] S. REP. NO. 74-621, at 19 (1935).

[77] *Id.* at 49.

[78] *Id.*

[79] *See Hearings on H.R. 5423*, *supra* note 72, at 272–74 (statement of Comm'r Frank R. McNinch, Chairman, Fed. Power Comm'n) (discussing these drought-related shortages and raising concerns regarding another shortage occurring elsewhere without regulatory authority to resolve it).

[80] *See id.* (discussing the sources of California's electricity).

[81] *See id.* (summarizing the problems shortages posed).

entered World War II, the FPC issued not one § 202(c) order.[82] Starting in June 1941 through the end of the war, the FPC issued § 202(c) orders in twenty-two separate proceedings,[83] a pace never to be matched again.[84] The inaugural June 1941 order announced that the Commission had "completed a comprehensive survey of the many factors involved in meeting the emergency power situation now prevailing."[85] The Commission declared that "an emergency . . . exists in the southeastern area of the United States, resulting from a sudden increase in the demand for electric energy to meet the requirements of national defense production."[86] Another order, issued the same day, required Florida Power & Light and the Florida Public Service Company to "interconnect" and to "maintain and operate" certain power plants.[87] Other wartime orders followed a similar pattern.[88]

After the war, the FPC used § 202(c) sparingly.[89] All told, the FPC declared just seven § 202(c) emergencies after 1944.[90] Then, in 1977 Congress dissolved the Federal Power Commission and § 202(c) all but

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[82] An index in the back of the FPC's official reporter listed out emergency § 202(c) and 202(d) orders. *See infra* note 83 (citing volumes of the reporter where orders are listed). The first two volumes of the *Opinions and Decisions of the Federal Power Commission*, which covered 1931–1939 and 1939–1941, respectively, identify zero § 202(c) orders from before the war. *See* Index to Orders of Comm'n in Nature of Opinions, 1 F.P.C. 877, 877–86 (1931–1939) (listing no "EMERGENCY" orders); Index to Orders of Comm'n in Nature of Opinions, 2 F.P.C. 1151, 1156–57 (1939–1941) (listing several orders under "EMERGENCY—Section 202 (c) (F.P.A.)," the earliest of which is "Curtailment of the Use of Electric Energy in the Southeastern States, docket No. IT-5703"); Recommendation for Curtailment of Use of Elec. Energy in Se. States, 2 F.P.C. 990, 990 (1941) (declaring that an "emergency, within the meaning of section 202 (c) of the Federal Power Act, exists"). *See also infra* Table 2 (listing all orders invoking § 202(c) during the FPC's existence and showing that no §202(c) order was issued between 1935 and when the United States entered World War II).

[83] *See infra* Table 2 (listing these orders); Index to Orders of Comm'n in Nature of Opinions, 4 F.P.C. 1181, 1190 (1943–1945) (listing zero § 202(c) orders under "EMERGENCY"); Index to Orders of Comm'n in Nature of Opinions, 5 F.P.C. 1063, 1071 (1946) (listing zero § 202(c) orders under "EMERGENCY"); Gray, *supra* note 65, at 545 (discussing World War II-era interconnection orders); *Federal Power Act: Hearings on H.R. 2972 and H.R. 2973 Before the H. Comm. on Interstate and Foreign Commerce*, 80th Cong. 718–20 (1947) [hereinafter *FPA Hearing*] (listing § 202(c) and 202(d) orders from 1941–42). Some sources appear to include numbers higher than twenty-two. That is either because they are counting the number of separate orders, rather than the number of proceedings (a single proceeding can have multiple orders); or because they are counting both § 202(c) *and* § 202(d) orders; or both. *E.g.*, Gray, *supra* note 65, at 545 (asserting that there were forty-five emergency "orders" issued during World War II); *FPA Hearing*, *supra*, at 718–20 (listing *both* § 202(c) *and* § 202(d) orders). I describe my methodology for identifying § 202(c) orders *infra* note 366. One article claims that there have been just "seventeen orders" under § 202(c) "since 1935." Stein, *supra* note 13, at 840. But the list of orders cited to support this proposition, *see id.* at 840 n.216, is incomplete. *See infra* Table 2 (listing several orders not included in the Stein footnote).

[84] *See infra* Figure 1 (displaying the pace of §202(c) emergencies by year).

[85] Recommendation for Curtailment of the Use of Elec. Energy in the Se. States, 2 F.P.C. 990, 990 (1941).

[86] *Id.*

[87] Fla. Power & Light Co., 2 F.P.C. 991, 991 (1941).

[88] *See, e.g.*, Duke Power Co., 2 F.P.C. 992, 992 (1941) (requiring interconnection); Va. Pub. Serv. Co., 2 F.P.C. 1095, 1095–96 (1941) (declaring a § 202(c) emergency in northern Virginia and requiring interconnection).

[89] For rare examples of the FPC using § 202(c) during this time, see Texas Elec. Serv. Co., 9 F.P.C. 1373 (1950); City of Cleveland v. Cleveland Elec. Illuminating Co., 47 F.P.C. 747 (1972).

[90] *See infra* Table 2 (listing these orders).

vanished. The Department of Energy Organization Act[91] split the FPC's functions between two new agencies: the Department of Energy and the Federal Energy Regulatory Commission.[92] Although most of § 202's interconnection powers went to FERC,[93] the emergency § 202(c) power went to the Secretary of Energy.[94] In October 1977, the first Secretary of Energy conferred the § 202(c) power on the Administrator of the Economic Regulatory Administration ("ERA").[95] In 1978 and 1979 the ERA issued two curt formal denials of § 202(c) requests.[96] Although the ERA apparently received other § 202(c) requests,[97] it granted none and in 1994 the ERA ceased to exist.[98] No more § 202(c) orders appeared until the turn of the millennium.[99]

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[91] *See* Jacobs, *supra* note 13, at 409–11 (describing a "proliferation of energy agencies" and the "inevitabl[e]" "consolidatory countermovement"); Department of Energy Organization Act, Pub. L. No. 95-91, 91 Stat. 565 (1977) (codified at 42 U.S.C. §§ 7101–352).

[92] Jacobs, *supra* note 13, at 411.

[93] Department of Energy Organization Act, 42 U.S.C. § 7172(a)(1)(B) ("There are transferred to, and vested in, the Commission . . . the interconnection, under section 202(b), of such Act, of facilities for the generation, transmission, and sale of electric energy (other than emergency interconnection) . . . .").

[94] *See id.*; *id.* § 7151(b) ("Except as provided in subchapter IV, there are transferred to, and vested in, the Secretary the function of the Federal Power Commission . . . .").

[95] DEP'T OF ENERGY, DELEGATION ORDER NO. 0204-4, *reprinted in* 42 Fed. Reg. 60726 (Nov. 29, 1977).

[96] City of Rensselaer, 43 Fed. Reg. 29027–28 (Econ. Regul. Admin. June 28, 1978) (July 5, 1978); Town of Massena, 44 Fed. Reg. 49292–93 (Econ. Regul. Admin. Aug. 15, 1979) (Aug. 22, 1979).

[97] *See* Emergency Interconnection of Electric Facilities and the Transfer of Electricity to Alleviate an Emergency Shortage of Electric Power, 46 Fed. Reg. 39984, 39987 (Aug. 6, 1981) (to be codified at 10 C.F.R. pt. 205) (reporting that "[o]nly six applications were filed . . . since the formation of DOE in 1977").

[98] *Department of Energy. Economic Regulatory Administration. (10/01/1977 - 4/01/1993)*, NAT'L ARCHIVES CATALOG, https://catalog.archives.gov/id/10556262 [https://perma.cc/AZP8-YFQJ] (last visited Feb. 22, 2025).

[99] In a congressional hearing in 2012, Patricia Hoffman, an official at the Department of Energy, confirmed that "[s]ince the Department was formed in 1978, the Secretary has exercised this emergency authority for only six events." *The American Energy Initiative, Part 19: Focus on H.R. 4273, the Resolving Environmental and Grid Reliability Conflicts Act of 2012, and H.R. ———, The Hydropower Regulatory Efficiency Act of 2012*: *Hearing Before the Subcomm. on Energy & Power of the H. Comm. on Energy and Com.*, 112th Cong. 39 (2012) (statement of Patricia Hoffman, Assistant Sec'y, Off. of Elec. Delivery & Energy Reliability, Dep't of Energy) [hereinafter *Reliability Hearing*]. The Department of Energy maintains two webpages that list all its uses of § 202(c). *See* Off. of Cybersecurity, Energy Sec., & Emergency Response, *DOE's Use of Federal Power Act Emergency Authority*, DEP'T OF ENERGY, https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority [https://perma.cc/YZ6W-Y2QA] (last visited Feb. 22, 2025) [hereinafter *DOE Use of FPA Emergency Authority*] (listing emergency orders from 2020 to the present); Off. of Cybersecurity, Energy Sec., & Emergency Response, *DOE's Use of Federal Power Act Emergency Authority – Archived*, DEP'T OF ENERGY, https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority-archived [https://perma.cc/CL2B-MLRA] (last visited Feb. 22, 2025) [hereinafter *DOE Use of FPA Emergency Authority Archive*] (listing emergency orders prior to 2020). The pages list six § 202(c) events through 2012, with the first in 2000. Therefore, the Department issued no § 202(c) orders between 1977 and 2000. *See also infra* Table 1; Table 2 (listing no § 202(c) orders during that time).

Then, in 2000, California's electricity and natural gas markets went haywire, and energy prices climbed dramatically.[100] The crisis was the result of

> flawed market rules; inadequate addition of generating facilities in the preceding years; a drop in available hydropower due to drought conditions; a rupture of a major pipeline supplying natural gas into California; strong growth in the economy and in electricity demand; unusually high temperatures; an increase in unplanned outages of extremely old generating facilities; and market manipulation.[101]

A FERC investigation blamed the market manipulation on Enron,[102] but during the crisis, the Department of Energy turned to § 202(c). Energy generators were reluctant to offer capacity on the electricity markets because investor-owned utilities, clobbered by high prices, were on the brink of bankruptcy.[103]

Fearing blackouts, the California ISO asked the Department of Energy to order generators to sell electricity.[104] The Department obliged in December 2000 and the Secretary declared a § 202(c) emergency, citing "a shortage of currently operational electric generation facilities, a shortage of water used to generate electricity, unusual volatility of electricity and natural gas markets, and . . . other reasons."[105] Follow up orders extended the emergency several times—in the end until the third week of January 2001.[106]

It is almost as if the California energy market fiasco reminded regulators and stakeholders that § 202(c) existed. Three times between 2002 and 2008, the Department issued interconnection orders to Texas entities during

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[100] *See* FED. ENERGY REGUL. COMM'N, DEP'T OF ENERGY, FINAL REPORT ON PRICE MANIPULATION IN WESTERN MARKETS, at ES-1 (2003) (arguing that natural gas and energy prices are linked and fluctuate together, and that the fluctuations in 2000 were in part due to market manipulation).

[101] Order Dismissing Complaints at 9, Californians for Renewable Energy v. Cal. Pub. Utils. Comm'n, 119 FERC ¶ 61,058 (2007) (citing San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Serv., 93 FERC ¶ 61,121 (2000) and San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Serv., 102 FERC ¶ 61,317 (2003)). *See also* Morgan Stanley Cap. Grp. Inc. v. Pub. Util. Dist. No. 1 of Snohomish Cnty., 554 U.S. 527, 539–40 (2008) (quoting the same language); FED. ENERGY REGUL. COMM'N, *supra* note 100, at I-3, I-10–11 (describing similar reasons for the crisis).

[102] FED. ENERGY REGUL. COMM'N, *supra* note 100, at ES-1–2.

[103] Pub. Utils. Comm'n of Cal. v. Fed. Energy Regul. Comm'n, 462 F.3d 1027, 1064 (9th Cir. 2006).

[104] *Id.*

[105] DEP'T OF ENERGY, ORDER PURSUANT TO SECTION 202(C) OF THE FEDERAL POWER ACT 1 (Dec. 14, 2000), https://www.energy.gov/sites/default/files/202%28c%29%20order%20December%2014%2C%202000%20-%20California.pdf [https://perma.cc/3DYB-AY8N] [hereinafter DECEMBER 2000 CAISO ORDER].

[106] *See* Off. of Elec., *Federal Power Act Section 202(c) - California, December 2000*, DEP'T OF ENERGY (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-california-december-2000 [https://perma.cc/5M2X-XRAB] (listing the orders); DEP'T OF ENERGY, AMENDED ORDER PURSUANT TO SECTION 202(C) OF THE FEDERAL POWER ACT (2001) (extending the orders into January 2001), https://www.energy.gov/sites/default/files/202%28c%29%20order%20January%2017%2C%202001%20-%20California.pdf [https://perma.cc/9NB9-A7US]; Taylor, *supra* note 13, at 43–44.

hurricanes, allowing them to draw energy from outside of Texas.[107] Two orders, one in 2002 and another in 2003, directed the operation of the Cross-Sound Cable, a controversial undersea cable linking Connecticut with Long Island.[108] Still, the causes of § 202(c)'s long period of quiet are mysterious; electrical disasters were not unknown between 1977 and 2000.

The next § 202(c) episode—a pivotal one—involved a power plant near the national capital. Mirant, a utility company, operated five coal-fired generation units in Alexandria, Virginia.[109] After air quality modeling mandated by the Virginia Department of Environmental Quality ("VDEQ") showed that the plant would soon exceed several Clean Air Act limits, Mirant announced in August 2005 that it would shutter the facility, at least temporarily.[110] But the plant provided much-needed backup generation capacity.[111] Alarmed, the District of Columbia's local utility regulator, the D.C. Public Service Commission ("DCPSC"), asked the Department of Energy for emergency orders requiring the Mirant plant to remain available to generate power.[112] VDEQ insisted that, if the plant were operated at the levels requested by DCPSC, Mirant would violate VDEQ-administered

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[107] DEP'T OF ENERGY, ORDER NO. 202-05-1 (Sept. 28, 2005), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-05-1%20September%2028%2C%202005%20-%20CenterPoint%20Energy.pdf [https://perma.cc/9RUL-M9TY] (directing interconnection between CenterPoint Energy and Entergy Gulf States after Hurricane Katrina); DEP'T OF ENERGY, ORDER NO. 202-05-2 (Sept. 30, 2005), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-05-2%20September%2030%2C%202005%20-%20TXU%20Electric.pdf [https://perma.cc/V96Q-GXWT] (directing interconnection between TXU Electric and Entergy Gulf States after Hurricane Katrina); DEP'T OF ENERGY, ORDER NO. 202-08-1 (Sept. 14, 2008), https://www.energy.gov/sites/prod/files/202%28c%29%20order%20202-08-1%20September%2014%2C%202008%20-%20CenterPoint%20Energy.pdf [https://perma.cc/86CE-KUS2] [hereinafter ORDER NO. 202-08-1] (directing interconnection between CenterPoint Energy and Entergy Gulf States after Hurricane Ike).

[108] DEP'T OF ENERGY, ORDER NO. 202-02-1 (Aug. 16, 2002), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-02-1%20August%2016%2C%202002%20-%20CSC.pdf [https://perma.cc/L2YKQPL7]; DEP'T OF ENERGY, ORDER NO. 202-03-1 (Aug. 14, 2003), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-03-1%20August%2014%2C%202003%20-%20CSC.pdf [https://perma.cc/GB56-YYWJ].

[109] Taylor, *supra* note 13, at 47–48.

[110] *See id.* at 47 (describing Mirant's temporary closure); Letter from Hula C. Edmonds, Dir. of Operations, Potomac River, Mirant Corp., to Lawrence Mansueti, Dir., State & Reg'l Assistance, Off. of Elec. Delivery & Energy Reliability (Sept. 7, 2005), https://www.energy.gov/oe/articles/mirant-potomac-river-doe-case-oe-05-01 [https://perma.cc/99WQ-Z82X] (describing Mirant's five coal plant units).

[111] *See* Taylor, *supra* note 13, at 47–48 (detailing Mirant's role in supplying electricity to Washington, DC); Letter from Craig A. Glazer, Vice President, Gov't Pol'y, PJM Interconnection, LLC, to Dir., Off. of Air Reg. Dev., Va. Dep't of Env't Quality (Apr. 12, 2004) (included as an attachment in Emergency Petition and Complaint, No. EL05-145-000, D.C. Pub. Serv. Comm'n, 114 FERC ¶ 61,017 (2006)) (describing the importance of keeping the Mirant plant running).

[112] Emergency Petition and Complaint of the District of Columbia Public Service Commission to Avert the Impending Shutdown of the Potomac River Generating Station Power Plant Under EL05-145, at 1–2, *Pub. Serv. Comm'n*, 114 FERC ¶ 61,017 (Aug. 25, 2005). DCPSC filed a single document with both FERC and the Department of Energy including both a request for a § 202(c) order (directed to the Secretary of Energy) and a request for invocation of various other authorities possessed by FERC (directed to the Commission). *Id.* at 1–2.

Clean Air Act permit limits.[113] The Secretary of Energy granted DCPSC's request and ordered the plant to operate at up to full capacity if needed to meet demand.[114] The order punted on the permit violation question, musing that "regulators and Mirant can work together, with the Department, to reduce, and perhaps eliminate, any conflict between environmental goals and electric reliability."[115] But the power plant, operating under the § 202(c) order, violated its permit limits.[116] VDEQ promptly issued Mirant a $31,000 fine.[117] Although it is unclear whether Mirant was, in fact, obliged by the § 202(c) order to violate pollution limits,[118] this between-a-rock-and-a-hard-place[119] story about Mirant's experience would stick.

4. *The FAST Act Amendment*

Ten years later Congress responded to the Mirant episode by passing the "Resolving Environmental and Grid Reliability Conflicts Act" as part of the 2015 FAST Act.[120] Congress designed the amendment to head off future Mirant-like incidents by excusing entities subject to § 202(c) orders from any environmental rules conflicting with those orders. Congress added these two paragraphs to the end of § 202(c):

> With respect to an order issued under this subsection that may result in a conflict with a requirement of any Federal, State, or

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[113] *See* Motion to Intervene and Protest of Robert G. Burnley, Director, Commonwealth of Virginia, Department of Environmental Quality, at 2–4, *Pub. Serv. Comm'n*, 114 FERC ¶ 61,017 (Aug. 29, 2005) (arguing that "the DC PSC is requesting the Commission to order the plant to operate in violation of state and federal laws").

[114] DEP'T OF ENERGY, ORDER NO. 202-05-3, at 10–11 (Dec. 20, 2005), https://www.energy.gov/oe/articles/department-energy-order-no-202-05-3 [https://perma.cc/LN3W-RF8Z] [hereinafter ORDER NO. 202-05-3].

[115] *Id.* at 10. The Department's order would be extended three times, ultimately until July 1, 2007. DEP'T OF ENERGY, ORDER NO. 202-06-2 (Sept. 28, 2006), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-06-2%20September%2028%2C%202006%20-%20Mirant%20Corporation.pdf [https://perma.cc/9HVK-P294] [hereinafter ORDER NO. 202-06-2] (extending to December 1, 2006); DEP'T OF ENERGY, ORDER NO. 202-07-1 (Nov. 22, 2006), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-07-1%20November%2022%2C%202006%20-%20Mirant%20Corporation.pdf [https://perma.cc/D6DL-6L5G] [hereinafter ORDER NO. 202-07-1] (extending to February 1, 2007); DEP'T OF ENERGY, ORDER NO. 202-07-2 (Jan. 31, 2007), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-07-2%20January%2031%2C%202007%20-%20Mirant%20Corporation.pdf [https://perma.cc/HJL5-HR5R] [hereinafter ORDER NO. 202-07-2] (extending to July 1, 2007).

[116] *Reliability Hearing*, *supra* note 99, at 50 & n.3 (statement of Regina McCarthy, Assistant Adm'r of Air & Radiation, Env't Prot. Agency).

[117] *Id.* at 50 n.3.

[118] *Compare id.* at 46 ("this fine was not a violation compelled by the order"), *with id.* at 39 (statement of Patricia Hoffman, Assistant Sec'y, Off. of Elec. Delivery and Energy Reliability, Dep't of Energy) (describing Mirant as having faced a "potential conflict" between the § 202(c) order and an environmental statute), *and id.* at 120, 130, 178–79 (statement of Debra L. Raggio, Vice President & Assistant Gen. Couns., GenOn Energy, Inc.) (insisting that "[w]e would not have had the exceedance but for the order").

[119] Ferrey, *Broken at Both Ends*, *supra* note 13, at 73 (describing Mirant's fine from VDEQ as "the proverbial trap between an energy rock and an environmental hard place").

[120] Fixing America's Surface Transportation (FAST) Act, Pub. L. No. 114-94, § 61002, 129 Stat. 1312, 1772–73 (2015) (amending 16 U.S.C. § 824a(c)–(d)).

> local environmental law or regulation, the Commission shall ensure that such order requires generation, delivery, interchange, or transmission of electric energy only during hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable, is consistent with any applicable Federal, State, or local environmental law or regulation and minimizes any adverse environmental impacts. . . .
>
> To the extent any omission or action taken by a party, that is necessary to comply with an order issued under this subsection, including any omission or action taken to voluntarily comply with such order, results in noncompliance with, or causes such party to not comply with, any Federal, State, or local environmental law or regulation, such omission or action shall not be considered a violation of such environmental law or regulation, or subject such party to any requirement, civil or criminal liability, or a citizen suit under such environmental law or regulation.[121]

Further paragraphs limit § 202(c) orders with environmental conflicts to ninety days but allow the Secretary to extend orders if "necessary to meet the emergency and serve the public interest."[122]

In a 2012 House hearing on the amendment, supporters framed the updates as a modest change vindicating Congress's intent for § 202(c). One claimed that the amendment merely "clarif[ied]" that complying with a § 202(c) order "will not be considered in violation of conflicting environmental laws."[123] Another promised that "this bill . . . is not intended as a way out of compliance with any EPA regulations" while arguing that "it is never acceptable for the Federal Government to require actions from a company that necessitates a choice of which law to violate."[124]

At the hearing, the Mirant Alexandria incident illustrated the problem solved by the amendment.[125] Witnesses (and reports on the amendment) also mentioned a 2001 incident in California involving a different Mirant facility.[126] During the California energy markets crisis, Mirant obtained formal enforcement discretion decisions allowing it to operate a San

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[121] 16 U.S.C. § 824a(c)(2)–(3).

[122] *Id.* § 824a(c)(4)(A).

[123] *Reliability Hearing*, *supra* note 99, at 2 (statement of Rep. Ed Whitfield).

[124] *Id.* at 22 (statement of Rep. Michael F. Doyle). *See also id.* at 25 (statement of Rep. Fred Upton) ("It is like having one police officer telling you to speed up while another sits at the end of the street to give you a ticket.").

[125] *See, e.g.*, *id.* at 23, 39, 42–44, 46, 49–50, 81–82, 84, 107–18, 122–31, 178–81, 192–94 (discussing Mirant).

[126] H.R. REP. NO. 112-586, at 5 (2012); H.R. REP. NO. 113-86, at 4–5 (2013); *Reliability Hearing*, *supra* note 99, at 49 n.2, 127.

Francisco-area power plant in excess of its Clean Air Act limits.[127] This discretion protected Mirant from government fines, but did not limit liability under the Clean Air Act's citizen suit provision.[128] The City of San Francisco and a group of NGOs sued Mirant for its permit violations.[129] Although the San Francisco incident did not involve § 202(c),[130] it perhaps helps explain the amended subsection's unusual provision absolving liability from "citizen suit[s]."[131]

There were hints that the amendment would do more than "clarify" § 202(c). Several committee members referenced the Mercury and Air Toxics Standards for Power Plants, a Clean Air Act rule that was especially costly for large, dirty coal-fired generating units.[132] One Congressman, Representative Michael Doyle, invoking the "MATS rule," worried that "coal-fired power plant retirements are being announced nearly every month."[133] Still, Doyle continued to tie § 202(c) to surprise problems: he argued that "should something go wrong, like an unexpected severe weather event, we have one tool of last resort, emergency orders issued under Section 202(c)."[134] Representative Bobby Rush insisted that "we are requiring our energy companies to undergo a transformation to cleaner, more efficient operating facilities through the MATS standards," and argued that "in order to ensure that we are able to effectively protect our constituents from potential power shortages we must strengthen the language in Section 202C."[135]

C. *Substance and Procedure of § 202(c)*

Here, the workings of § 202(c) are divided into four parts. First, what can count as an "emergency." Second, the kinds of actions that the

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[127] *Reliability Hearing*, *supra* note 99, at 127–28 (statement of Debra L. Raggio, Vice President & Assistant Gen. Couns., GenOn Energy, Inc.).

[128] 42 U.S.C. § 7604(a)(1) (allowing "any person" to "commence a civil action on his own behalf . . . against any person . . . who is alleged to have violated . . . an emission standard or limitation").

[129] *See Reliability Hearing*, *supra* note 99, at 127–28 (statement of Debra L. Raggio, Vice President & Assistant Gen. Couns., GenOn Energy, Inc.) (citing First Amended Complaint for Injunctive and Other Relief and Demand for Jury Trial, City & Cnty. of S.F. v. Mirant Potrero, LLC, No. C-01-2356 (N.D. Cal. Aug. 20, 2001); First Amended Complaint, Bayview Hunters Point Cmty. Advocs. v. Mirant Potrero, LLC, No. C-01-02348 (N.D. Cal. Aug. 20, 2001)).

[130] *See id.* at 91 (statement of Regina McCarthy, Assistant Adm'r of Air & Radiation, Env't Prot. Agency) ("Congressman, can I make one correction? Just for Mr. Olson, the Potrero Utility incident was not related to § 202(c). It was not a § 202(c) issue . . . ."); *id.* at 48 (claiming that EPA knew of no § 202(c) orders requiring violation of environmental laws or regulations).

[131] 16 U.S.C. § 824a(c)(3).

[132] National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units, 77 Fed. Reg. 9304 (Feb. 16, 2012) (codified at 40 C.F.R. pt. 63, subpart UUUUU).

[133] *See Reliability Hearing*, *supra* note 99, at 22 (statement of Rep. Michael F. Doyle).

[134] *See id.*; *cf. id.* at 37 (statement of Rep. Pete Olson) (arguing that the proposed amendment was "extremely relevant today" because EPA, FERC, and the Department of Energy had "acknowledged that grid reliability could be threatened due to accelerated power plant closures").

[135] *Id.* at 189–90 (statement of Rep. Bobby L. Rush).

Department of Energy may mandate in a § 202(c) order. Third, the statutory language that requires the Department to minimize adverse effects when orders involve conflicts with environmental law. Finally, the underdeveloped procedure for obtaining and contesting § 202(c) orders.

1. *"Emergency"*

What counts as an emergency is a central, unsettled question about § 202(c). This subpart introduces a tripartite taxonomy of possible approaches to the meaning of "emergency," and argues that text and historical context strongly suggest that one of those approaches is the right one: that § 202(c) orders are allowed only during wartime or for *unexpected* crises.

There are two situations when orders are permitted: "[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."[136] No order since World War II has invoked "continuance of any war"[137]; instead, the FPC and now the Secretary of Energy have relied on findings of "an emergency."

The statute seems to list out three different sorts of emergencies. An emergency may exist "by reason of [1] a sudden increase in the demand for electric energy, or [2] 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 [3] other causes."[138] The concluding catchall—"other causes"—makes the emergency power exceptionally capacious, if read for all its worth. But, in commentary to one 1974 rulemaking, the FPC endorsed a sensible *ejusdem generis* reading limiting "other causes" to "[o]nly those [causes] which are related to the enumerated statutory causes."[139] Still, the section expressly delegates to "the Commission" (now the Secretary of Energy) the power to determine whether any of these three emergencies exist.[140] That express delegation means the Secretary's emergency declarations are entitled to deference even after *Loper Bright*.[141]

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[136] 16 U.S.C. § 824a(c)(1); *accord* Niagara Mohawk Power Corp., 56 F.P.C. 666, 667–68 (1976) ("[§ 202(c)] emergencies are of two basic types: 1) emergencies as determined by the Commission by reason of one or more [of the factors listed in § 202(c)] . . . 2) emergencies occasioned during wars in which the United States may be engaged.").

[137] 16 U.S.C. § 824a(c)(1). For a World War II-vintage order citing the declarations of war against Germany and Japan, see, for example, Bonneville Power Admin., 3 F.P.C. 920, 920–21 (1943).

[138] 16 U.S.C. § 824a(c)(1).

[139] Amendment of Regulations Under the Federal Power Act; Part 32—Interconnection of Facilities; Emergencies; Transmission to Foreign Country, Order No. 520, 52 F.P.C. 1554, 1558 n.8 (1974).

[140] *Id.* at 1557.

[141] *See* Loper Bright Enters. v. Raimondo, 144 S. Ct. 2244, 2263 (2024).

Across § 202(c)'s history, agency officials have toyed with different meanings of "emergency." Those competing approaches fall into roughly three camps. First, a broad understanding of the types of events that can be emergencies, cabined by the rule that those events must have been *unexpected* or *unanticipated*. Second, a freewheeling approach that allows for lengthy § 202(c) orders whenever the grid is in trouble, whether the problem was anticipated or not. And third, the most restrictive: creating objective criteria for emergencies (this approach is not necessarily incompatible with the first).

Approach 1: Unexpected emergencies only. — The first approach is the correct and most common one, and the one currently reflected in § 202(c)'s implementing regulations. A rule promulgated by the Department of Energy in 1981[142]—still in effect—defines "emergency" 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."[143] An "emergency" might be "the result of weather conditions, acts of God, or unforeseen occurrences not reasonably within the power of the affected 'entity' to prevent."[144] An "emergency" might also be "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."[145]

> In a case involving an agency, of course, the statute's meaning may well be that the agency is authorized to exercise a degree of discretion. Congress has often enacted such statutes. For example, some statutes . . . empower an agency . . . to regulate subject to the limits imposed by a term or phrase that 'leaves agencies with flexibility' . . . .

(quoting Michigan v. EPA, 576 U.S. 743, 752 (2015)); Brett M. Kavanaugh, *Fixing Statutory Interpretation*, 129 HARV. L. REV. 2118, 2153 (2016) (book review); E. Garrett West, *A* Youngstown *for the Administrative State*, 70 ADMIN. L. REV. 629, 666–67 (2018).

[142] Emergency Interconnection of Electric Facilities and the Transfer of Electricity to Alleviate an Emergency Shortage of Electric Power, 46 Fed. Reg. 39984 (Aug. 6, 1981) (codified at 10 C.F.R. §§ 205.370–205.379). The 1981 regulations supplemented an older definition of "emergency," which was shorter and similar, but did not expressly apply to § 202(c) orders. *See* 18 C.F.R. § 32.20 (1980).

> 'Emergency', as used in section 202(d) of the Federal Power Act, is defined to mean the failure of facilities for the generation or transmission of electric energy caused by breakdown, weather conditions, acts of God, or other unforeseen occurrences, not reasonably within the power of the utility affected to prevent, resulting in the cutting off or curtailment of the electric service, or rendering such utility unable to provide adequate service for its customers.

Although this older statutory definition referred to § 202(d), rather than § 202(c), FPC staff seem to have thought it might be relevant to § 202(c) emergencies. *See, e.g.*, Initial Decision of the Presiding Examiner, Pub. Serv. Co. of Ind., Docket No. E-7410 (Feb. 20, 1969), *reprinted in* 50 F.P.C. 1323, 1330–31 [hereinafter Initial Decision, Pub. Serv. Co. of Ind.] (referencing this definition in a discussion about § 202(c)).

[143] 10 C.F.R. § 205.371 (2024).

[144] *Id.*

[145] *Id.*

By using words like "unexpected," "unforeseen," and "sudden," the regulations appear to confine emergencies to situations that cannot be predicted in advance.[146] This reflects the text of the statute. The word "emergency" itself indicates suddenness. As one roughly contemporaneous dictionary defined it, an emergency is "a state of things unexpectedly arising, and urgently demanding immediate action."[147] Hence, § 202(c)'s provision for orders "with *or without* notice, hearing, or report."[148] The first of the three possible emergencies underlines this unexpectedness requirement by referring to "a *sudden* increase in the demand for electric energy."[149]

This reading is reinforced by the only two court decisions that have ever said anything meaningful about § 202(c). In one, *Otter Tail Power Co. v. Federal Power Commission*,[150] the Eighth Circuit rejected a challenge by Otter Tail Power (a utility company) to an FPC order under § 202(b) of the Federal Power Act requiring an interconnection between Otter Tail and a competitor utility.[151] Because the interconnection was to be energized only if some later emergency arose, Otter Tail argued that the FPC should have used § 202(c), not § 202(b).[152] But the court reasoned that "§ 202(b) applies to a crisis which is likely to develop in the foresee[a]ble future but which does not necessitate immediate action"—in contrast with § 202(c), which "enables the Commission to react to a war or national disaster."[153] In the other, *Richmond Power & Light v. FERC*,[154] the D.C. Circuit reviewed the FPC's rejection of a request to declare the 1970s oil embargo a § 202(c) emergency.[155] The court quickly dispatched the argument that "dependence on imported oil leaves this country with a continuing emergency," observing that § 202(c) "speaks of 'temporary' emergencies, epitomized by wartime disturbances."[156]

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[146] *See* JACOBS & PESKOE, *supra* note 13, at 26 (making a similar point); Schneider & Trotta, *supra* note 13, at 389–90 (also making a similar point).

[147] *Emergency*, 3 THE OXFORD ENGLISH DICTIONARY 119 (1st ed. 1913). "Emergency" has retained the same meaning for many years. *See Emergency*, THE CENTURY DICTIONARY 1897 (1889) ("[A] sudden or unexpected happening; an unforeseen occurrence or condition"); *Emergency*, OXFORD ENGLISH DICTIONARY, https://www.oed.com/dictionary/emergency_n (last visited July 29, 2024) ("A juncture that arises or 'turns up'; esp. a state of things unexpectedly arising, and urgently demanding immediate action.").

[148] 16 U.S.C. § 824a(c)(1) (emphasis added).

[149] *Id.* (emphasis added).

[150] 429 F.2d 232 (8th Cir. 1970).

[151] *Id.* at 233.

[152] *Id.* at 234.

[153] *Id.*

[154] 574 F.2d 610 (D.C. Cir. 1978). The caption refers to FERC, but "the events relevant to this case occurred before" FERC's creation and the transfer of FPC proceedings to FERC. *Id.* at 612 n.1.

[155] *Id.* at 614–15.

[156] *Id.* at 615. For similar reasoning, see also Initial Decision, Pub. Serv. Co. of Ind., *supra* note 142, at 1331.

> Search of previous Commission decision under Section 202(c) suggests that the Commission has reserved action under this provision to situations which

Also, the FPC and Department of Energy have almost always issued § 202(c) orders during wartime or because of unexpected events, further bolstering the unexpected-events-only reading.[157] The earliest orders invoked "a sudden increase in the demand for electric energy,"[158] and subsequent orders were during World War II.[159] More recently, the California energy markets crisis was, of course, quite surprising, as were the Texas hurricanes that prompted other orders.[160] Still, agency practice has not always been so restrained.

Approach 2: Emergencies for anything, for any duration. — Another, more aggressive reading of "emergency" has sometimes appeared, although it has almost always been contested. For example, a 1950 order declared a § 202(c) emergency (tersely citing a presidential proclamation related to the Korean War) even though the utilities applying for the order had not claimed "that any emergency exists."[161] One commissioner dissented, pointing out that the utilities had disclaimed any emergency and insisting that the FPC's "records show ample electrical energy in the area."[162] Or in a 1972 FPC decision, the "emergency" was the Cleveland municipal utility's failure to maintain adequate reserve capacity.[163] This was a predictable dilemma that the FPC conceded was caused by factors "both within and without the control of the City."[164] Again, a commissioner dissented, arguing that the "'emergency' now being acted upon is neither more nor less than the 'emergency' which has existed for months or years heretofore."[165] Perhaps these two orders addressed pressing problems with the electricity supply—but they are in tension with the ordinary of meaning of "emergency," which, as suggested above, implies some degree of suddenness or surprise.

> can fairly be termed emergencies arising from sudden physical breakdowns, shortages, or unanticipated demands. In no case has the Commission taken affirmative action under Section 202(c) in a situation such as the instant one where a supplier having the capacity to provide electric power has notified the purchaser that it will no longer supply him with electric power after a certain date . . . .

(footnote omitted).

[157] *Cf., e.g.*, Cnty. of Maui v. Haw. Wildlife Fund, 140 S. Ct. 1462, 1472 (2020) ("[L]ongstanding regulatory practice undermines the Ninth Circuit's broad interpretation of the statute.").

[158] Recommendation for Curtailment of the Use of Elec. Energy in the Se. States, 2 F.P.C. 990, 990 (1941).

[159] *Infra* Table 2 (listing all FPC-era § 202(c) orders).

[160] *See supra* note 107 and accompanying text (discussing the California energy market fiasco and its effect on Texas).

[161] Texas Elec. Serv. Co., 9 F.P.C. 1373, 1373–74 (1950) (citing Proclamation No. 2914, 15 Fed. Reg. 9029 (Dec. 19, 1950)); *id.* at 1374 (Buchanan, Comm'r, dissenting) ("The application neither claims nor shows any emergency. To the contrary, it flatly asserts 'the companies do not represent that any emergency exists.'").

[162] *Id.* (Buchanan, Comm'r, dissenting).

[163] *See* City of Cleveland v. Cleveland Elec. Illuminating Co., 47 F.P.C. 747, 748 (1972) ("It appears that the City has an emergency by virtue of the shortage of facilities for the generation of electric energy whenever the largest unit is out of service.").

[164] *Id.*

[165] *Id.* at 751 (Carver, Comm'r, dissenting).

More recently, during the first Trump administration, a leaked Department of Energy memo showed that Department officials had seriously considered announcing that the possible retirement of a few coal-fired power plants (made uneconomical by inexpensive natural gas) was a § 202(c) emergency.[166] The memo came to naught, but it embraced a reading of § 202(c) unbounded by whether the emergency was unanticipated. The memo argued that § 202(c) was designed "not merely to react to actual disasters, but to act in a preventative manner."[167]

Under this broader understanding of "emergency," emergencies also need not be that temporary. The Mirant Alexandria emergency lasted more than a year and a half.[168] And another series of orders, discussed in more detail below, lasted almost two years.[169] Deeper in § 202(c)'s history are longer emergencies still. For instance, one of the very first § 202(c) orders directed the Florida Power & Light Company to interconnect with the Florida Public Service Company.[170] The order had no expiration date; thirteen years later the FPC finally terminated the order.[171]

Approach 3: Objective emergencies. — The FPC experimented briefly with a more rigorous approach. In January 1974, amid the OPEC oil embargo and energy crisis, a group of utilities petitioned the FPC for a § 202(c) order to facilitate fuel conservation and energy transfer measures.[172] But the Commission refused to declare a § 202(c) emergency.[173] Instead, in August 1974 it announced its intent to adopt new implementing regulations for § 202(c), saying that "[r]ecent events, particularly those of the 1973 Arab oil embargo, underscore the need for regulations of this type."[174] Apparently worried about overuse of § 202(c), the proposal insisted that "electric utility control dispatching centers" were able "to transfer substantial blocks of power and energy among systems under . . . various types of emergency conditions."[175] The final rule, adopted in November 1974,[176] set more objective criteria for emergency declarations.[177] For example, there may be an "inadequate fuel or energy supply" if "[s]ystem coal stocks are reduced to 30 days (or less) of normal

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[166] *See* JACOBS & PESKOE, *supra* note 13, at 26–28.

[167] Untitled Memorandum 37 (May 29, 2018), https://www.documentcloud.org/documents/4491203-Grid-Memo.html.

[168] ORDER NO. 202-05-3, *supra* note 114, at 10, 12; ORDER NO. 202-07-2, *supra* note 115, at 8.

[169] *See infra* notes 217–224 and accompanying text (discussing the Dominion Energy orders).

[170] Fla. Power & Light Co., 2 F.P.C. 991, 991 (1941).

[171] Fla. Power & Light Co., 13 F.P.C. 1231, 1231 (1954).

[172] New England Power Pool Participants (*Coal-by-Wire*), 52 F.P.C. 410, 410 (1974). On the history of the embargo, see GIULIANO GARAVINI, THE RISE AND FALL OF OPEC IN THE TWENTIETH CENTURY 216–53 (2019) (recounting how "Arab crude oil production had dropped from 20.3 million barrels per day in September, to 15.8 million barrels per day in November 1973").

[173] *Coal-by-Wire*, 52 F.P.C. at 410.

[174] Emergency Actions Pursuant to Section 202(c) of the Federal Power Act, 39 Fed. Reg. 31654, 31654 (proposed Aug. 30, 1974) (to be codified at 18 C.F.R. pt. 32).

[175] *Id.*

[176] Order No. 520, 52 F.P.C. 1554 (1974) (codified at 18 C.F.R. §§ 32.60–32.62 (1980)).

[177] 18 C.F.R. § 32.62(a) (1980).

burn days and a continued downward trend in stocks is projected."[178] But oil embargo anxieties faded, and by 1978, the FPC no longer existed. In 1990, FERC deleted these regulations, explaining only that "the Commission's jurisdiction over these matters was transferred to the Secretary of Energy."[179] The Department of Energy never replaced them.

2. *What May Be Ordered*

If an emergency exists, what can a § 202(c) order command? The text itself lists five things: temporary connection of facilities, generation of electricity, delivery of electricity, interchange of electricity, and transmission of electricity.[180] But the five can be reduced to two groups: First, orders requiring the movement of electricity already generated; then, second, orders requiring the generation of electricity. Historically, most orders have fallen into the first category, especially orders requiring new interconnections or transmission across pre-existing infrastructure.[181] There have, though, occasionally been generation orders.[182] And since 2015, as is discussed below, § 202(c) orders have shifted almost entirely from interconnection to generation.[183]

In practice, orders can go beyond the five narrow categories. Orders may—and often do—require reports on implementation.[184] Also, the Department of Energy frequently delegates certain order implementation decisions to regional ISOs, RTOs, or balancing authorities.[185] One World War II-vintage order authorized a hydropower license amendment so that the Niagara Falls Power Company could divert additional water through its turbines.[186] And so, as used, orders will often extend beyond the narrow confines of the text of § 202(c) to accomplish the broader goal of mitigating

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[178] *Id.* § 32.62(c)(1). The regulations set similar criteria for shortages of other types of fuel, including natural gas, fuel oil, and hydropower. *See id.* § 32.62(c).

[179] Deletion of Procedural Regulations for Transmission Electricity to a Foreign Country and for Emergency Connection of Facilities, 55 Fed. Reg. 3943 (Feb. 6, 1990).

[180] 16 U.S.C. § 824a(c)(1). *See also* Stein, *supra* note 13, at 840 n.213 (listing the five permissible emergency circumstances).

[181] *See infra* Table 1.

[182] *See, e.g.*, Duke Power Co., 2 F.P.C. 1055, 1056 (1941) (ordering that "Duke Power Company continue to deliver . . . electric energy in an aggregate amount per week equivalent to that delivered during the week ending October 18, 1941").

[183] *See infra* Part II.B; Figure 1 (showing that ten generation orders were issued between 2015 and 2022).

[184] *See, e.g.*, ORDER NO. 202-05-3, *supra* note 114, at 11 (requiring a post-order report). Reports are also required by regulation. 10 C.F.R. § 205.377 (2024).

[185] *See, e.g.*, DECEMBER 2000 CAISO ORDER, *supra* note 105, at 2–3 (delegating authority but requiring pre-approval from the Department); *Waiver of Certain Provisions of Order Pursuant to Section 202(c) of the Federal Power Act*, DEP'T OF ENERGY (Jan. 16, 2001), https://www.energy.gov/sites/default/files/202%28c%29%20order%20January%2016%2C%202001%20-%20California.pdf [https://perma.cc/P3FU-GCRV] (revising the pre-approval requirement); DEP'T OF ENERGY, ORDER NO. 202-20-2 (Sept. 6, 2020), https://www.energy.gov/sites/default/files/2020/09/f78/CAISO%20202c%20Order_1.pdf [https://perma.cc/KRD5-VRSG] [hereinafter ORDER NO. 202-20-2] (delegating to CAISO the authority to dispatch units and to "select the combination of units that meets the reliability emergency and minimizes environmental impact").

[186] Niagara Falls Power Co., 2 F.P.C. 461, 465 (1941).

the emergency.

3. *Minimizing Adverse Effects*

Along with its nonliability language, the 2015 amendment introduced some safeguards, triggered when an order conflicts with environmental rules.[187] First, such orders must be limited to the "hours necessary to meet the emergency and serve the public interest."[188] Second, they must be consistent with the environmental rules "to the maximum extent practicable."[189] Third, they must "minimize[] any adverse environmental impacts."[190] And, fourth, they can last no longer than ninety days.[191] Orders can be renewed, as long as they meet two additional conditions. One is that an extension is permitted only if the Secretary[192] "determines" it is "necessary to meet the emergency and serve the public interest."[193] The other is that, when issuing an extension, the Secretary must "consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation, and shall include in any such renewed or reissued order such conditions as such Federal agency determines necessary to minimize any adverse environmental impacts to the extent practicable."[194] Any recommended conditions must be made public,[195] but they need not be imposed if the Secretary determines they "would prevent the order from adequately addressing the emergency necessitating such order."[196]

Yet the protections are riddled with outs. Because the propriety of extensions is committed to the "determin[ation]" of the Secretary, who has the power to decide whether extensions "serve the public interest," the

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[187] *See* 16 U.S.C. § 824a(c)(2)–(4) (limiting certain requirements to when there is a "conflict" or "noncompliance" with "any Federal, State, or local environmental law or regulation").

[188] *Id.* § 824a(c)(2).

[189] *Id.*

[190] *Id.*

[191] *Id.* § 824a(c)(4)(A).

[192] The amended language still refers to the "Commission," but I refer here to the "Secretary" because of the 1977 transfer of authority.

[193] 16 U.S.C. § 824a(c)(4)(A).

[194] *Id.* § 824a(c)(4)(B). The statute offers no guidance on how to determine which federal agency is *the* "primary" agency. So far, (c)(4)(B) consultations have occurred in just three emergencies. *See* DEP'T OF ENERGY, AMENDMENT NUMBER 1 TO ORDER NO. 202-22-2, at 2 (Sept. 8, 2022), https://www.energy.gov/sites/default/files/2022-09/Amendment%20No.%201%20to%20Order%20202-22-2%20sb%20A_S3%20Hogan.pdf [https://perma.cc/X7R5-7YUV] [hereinafter ORDER NO. 202-22-2 AMENDMENT 1] (referring to consultation with EPA); DEP'T OF ENERGY, AMENDMENT NUMBER 2 TO ORDER NO. 202-22-1, at 1–2 (Sept. 8, 2022), https://www.energy.gov/sites/default/files/2022-09/Amendment%202%20to%20Order%20202-22-1_FINAL_9.8.2022%20sb%20A_S3%20Hogan.pdf [https://perma.cc/6Y9G-439F] [hereinafter ORDER NO. 202-22-1 AMENDMENT 2] (likewise referring to consultation with EPA); Email from Larry Starfield, Acting Ass't Admin., Off. Enf't & Compliance Assurances, Env't Prot. Agency, to Pat Hoffman, Acting Under Sec'y for Sci. & Energy, Dep't of Energy (Sept. 11, 2017), https://www.energy.gov/sites/default/files/2017/09/f36/2017-9-11%20EPA%20consultation%20renewal.pdf [https://perma.cc/95LK-C97N] [hereinafter *Dominion Consultation Email*] (likewise referring to consultation with EPA). All three were with the EPA regarding waivers of Clean Air Act rules.

[195] 16 U.S.C. § 824a(c)(4)(B).

[196] *Id.*

Secretary has broad discretionary power over whether to grant them.[197] With no overall limit on the number of extensions, orders can in principle be renewed indefinitely. Similarly, whether to accept conditions proposed after consultation depends on (as mentioned above) the Secretary's "determin[ation]" as to whether the conditions prevent "adequately addressing the emergency."[198] The baked-in discretion for the Secretary means it is unclear how much bite the safeguards really have.[199]

4. *Ad Hoc and Ex Parte Procedure*

Since the 1977 reorganization, § 202(c) has operated in a procedural gray zone. Before the Federal Power Commission's dissolution, that agency's robust body of procedural rules guided requests for and issuances of orders. But since then, the Energy Department's § 202(c) proceedings have been ad hoc and sometimes ex parte. Now, the Department maintains no formal docket for § 202(c) orders and no formal filing mechanism.[200] Even when orders are issued, sometimes all the notice is an after-the-order scan posted to the Department's website—although more recent orders have been followed months later by formal notices in the *Federal Register*.[201] Proceedings require no public notice or participation. Section 202(c) itself permits orders "either upon [the Secretary's] own motion or upon complaint, with or without notice, hearing, or report."[202] In at least one order the Department has interpreted this to mean that "[t]he Administrative Procedure Act's prohibitions on ex parte communications in an adjudicatory proceeding . . . do not apply to DOE's [§] 202(c) proceedings."[203] Recently, this scant procedure has been used for a new kind of § 202(c) order.

II. THE ENVIRONMENTAL TURN: § 202(C)'S PRESENT

During the Trump and Biden administrations, the Department of Energy has taken § 202(c) in a new direction. The earlier crop of § 202(c) orders

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[197] *Id.* § 824a(c)(4)(A).

[198] *Id.* § 824a(c)(4)(B).

[199] During the 2012 hearings on the amendment, Gina McCarthy, then Assistant Administrator for Air and Radiation at EPA, soon to be EPA Administrator, warned that the amendments would "significantly decrease[] current incentives for input from EPA and the State and local environmental officials on how best to craft orders that are more, rather than less, environmentally sensitive." *Reliability Hearing*, *supra* note 99, at 47 (statement of Regina A. McCarthy, Assistant Admin. of Air & Radiation, Env't Prot. Agency).

[200] Instead, a webpage asks that "comments and requests related to FPA section 202(c) . . . be sent via email to AskCR@hq.doe.gov." *DOE Use of FPA Emergency Authority*, *supra* note 99.

[201] For example, the only information published online or in print by the Department of Energy about a September 2008 order to CenterPoint Energy is a scan of the order, which covered barely a single sheet of paper. *See* ORDER NO. 202-08-1, *supra* note 107. On the other hand, the Department followed several recent orders with notices in the *Federal Register*. *See, e.g.*, Emergency Order Issued to the Electric Reliability Council of Texas, Inc. (ERCOT), 88 Fed. Reg. 67740 (Oct. 2, 2023); Emergency Order Issued to PJM Interconnection, L.L.C., 88 Fed. Reg. 10103 (Feb. 16, 2023).

[202] 16 U.S.C. § 824a(c)(1).

[203] ORDER NO. 202-05-3, *supra* note 114, at 2 n.4 (citation omitted) (citing 5 U.S.C. § 557(d)(l)).

focused on interconnection and were mostly issued during World War II. Since 2015, all § 202(c) orders—save one—have required generation (not interconnection) and have waived compliance with at least some environmental rules. This Part explores the environmental turn.

A. *Different Emergencies*

At first glance, the post-FAST Act § 202(c) orders involve a familiar parade of emergencies. The first of these, from 2017, cited a "lightning-caused fire" and flooding that caused construction delays for a new replacement unit.[204] Five cited dramatic increases in demand caused by unusual heat waves.[205] Two orders to the Texas grid operator, ERCOT, and a third to PJM Interconnection all cited increases in demand and pressure on supply caused by unusually cold weather.[206]

But underlying all these orders is a new problem. Not a lack of interconnection, but the constraints of environmental law. In response to the lightning strike, heat waves, and cold waves, the requests have *not* been for orders requiring the movement of electricity around the grid to meet the shortage; instead, grid entities are asking for permission to run generation units in excess of environmental limits.

Take the 2017 lightning strike order. The Grand River Dam Authority ("GRDA") is a utility in Oklahoma.[207] Most of its generation capacity comes from the Grand River Energy Center, a facility with both coal- and natural gas-fired generation units.[208] In a § 202(c) request letter to the Department

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[204] DEP'T OF ENERGY, ORDER NO. 202-17-1 (Apr. 14, 2017), https://www.energy.gov/sites/default/files/2017/04/f34/Oklahoma.pdf [https://perma.cc/2DGH-9YT9] [hereinafter ORDER NO. 202-17-1].

[205] *See* ORDER NO. 202-20-2, *supra* note 185 (citing "extreme heat"); DEP'T OF ENERGY, ORDER NO. 202-21-2 (Sept. 10, 2021), https://www.energy.gov/sites/default/files/2021-09/EXEC-2021-005025%20-%20Order%20202-21-2%20-%20signed%209-10-21.pdf [https://perma.cc/AR6W-DZTD] [hereinafter ORDER NO. 202-21-2] (citing "extreme heat, drought conditions, and wildfires"); DEP'T OF ENERGY, ORDER NO. 202-22-1 (Sept. 2, 2022), https://www.energy.gov/sites/default/files/2022-09/Order%20202-22-1%20final.pdf [https://perma.cc/Y6WP-PTHZ] [hereinafter ORDER NO. 202-22-1] (citing "extreme heat, drought conditions, and threat of wildfires"); DEP'T OF ENERGY, ORDER NO. 202-22-2 (Sept. 4, 2022), https://www.energy.gov/sites/default/files/2022-09/Order%20202-22-2%20Final%20for%20BANC%20.pdf [https://perma.cc/6XRT-WSVX] [hereinafter ORDER NO. 202-22-2] (citing "extreme heat, drought conditions, and threat of wildfires"); DEP'T OF ENERGY, ORDER NO. 202-23-1 (Sept. 7, 2023), https://www.energy.gov/sites/default/files/2023-09/ERCOT%20202%28c%29%20Order.pdf [https://perma.cc/8BNH-FYQ4] [hereinafter ORDER NO. 202-23-1] (citing "a sustained heat wave").

[206] *See* DEP'T OF ENERGY, ORDER NO. 202-21-1 (Feb. 14, 2021), https://www.energy.gov/sites/default/files/2021/02/f82/DOE%20202%28c%29%20Emergency%20Order%20-%20ERCOT%2002.14.2021.pdf [https://perma.cc/NU3X-NMJ8] [hereinafter ORDER NO. 202-21-1] (citing "an unprecedented cold weather event"; to ERCOT); DEP'T OF ENERGY, ORDER NO. 202-22-3 (Dec. 23, 2022), https://www.energy.gov/sites/default/files/2022-12/Department%20of%20Energy%20Order%20No.%20202-22-3signed.pdf [https://perma.cc/SV83-8AFG] [hereinafter ORDER NO. 202-22-3] (citing "a severe winter weather system"; to ERCOT); ORDER NO. 202-22-4, *supra* note 8 (citing "a severe winter weather system"; to PJM Interconnection).

[207] Letter from Daniel S. Sullivan, Chief Exec. Officer, Grand River Dam Auth., to James Richard Perry, Sec'y, Dep't of Energy 2 (Apr. 11, 2017), https://www.energy.gov/sites/default/files/2017/05/f34/GRDA%20public%20202%28c%29%20letter.pdf [https://perma.cc/TYW6-X54U].

[208] *Id.*

of Energy, GRDA said that the Mercury and Air Toxics Standards ("MATS") were the reason for its request. Because MATS "would have required substantial upgrades" to a coal-fired unit, Unit No. 1, GRDA decided to shutter Unit No. 1 and construct a new, natural gas-fired Unit No. 3.[209] But the new unit was not scheduled to become available until May 2017, well after the MATS compliance deadline.[210] So, to protect grid reliability, GRDA requested and received from EPA in April 2016 an Administrative Order deferring MATS compliance until April 2017.[211] Then, a lightning strike in July 2016 damaged Unit No. 2, a second coal-fired generator, and floods caused supply shortages that pushed Unit No. 3's completion into June 2017.[212] So, once Unit No. 1 closed in compliance with the EPA order, GRDA would fall out of compliance with a NERC reliability standard.[213] GRDA therefore requested a § 202(c) order permitting Unit No. 1 to run—despite its MATS-violating emissions—if needed to prevent blackouts.[214] Three days later, the Department granted the request,[215] although in the end GRDA never needed to use the newly obtained flexibility.[216]

A series of orders in 2017 had even less to do with natural disasters. A utility, Dominion Energy, had operated a pair of large coal-fired units at its Yorktown plant near Norfolk, Virginia since the 1950s.[217] After the MATS rule, rather than upgrade the Yorktown units with costly emissions controls, Dominion planned to create a new transmission line to bring in electricity from elsewhere.[218] To keep the Yorktown Units open during the planning

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[209] *Id.*

[210] *Id.*

[211] *Id.* (citing Administrative Compliance Order, Grand River Dam Auth., No. AED-CAA-113(a)-2016-0002 (EPA Off. Enf't & Compliance Assurance Apr. 18, 2016)).

[212] *Id.* at 1, 8.

[213] *Id.* at 5 (citing N. Am. Elec. Reliability Corp., *VAR-001-4.1 — Voltage and Reactive Control*, https://www.nerc.com/pa/Stand/Reliability%20Standards/VAR-001-4.1.pdf (last updated Nov. 13, 2015)).

[214] *Id.* at 2.

[215] ORDER NO. 202-17-1, *supra* note 204.

[216] Email from Kenneth Buell, Deputy Dir., Off. Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy, to author (May 17, 2024, 08:48 AM) (on file with author) ("Order 202-17-1 GRDA – Was Not Used, [email notification July 20, 2017]" (alterations in original)) [hereinafter 202(c) Usage Email].

[217] Darren Sweeney, *Dominion Shuts Down Nearly 2,000 MW of Coal, Oil Capacity in Virginia*, S&P GLOB.: MKT. INTEL. (May 31, 2023), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/dominion-shuts-down-nearly-2-000-mw-of-coal-oil-capacity-in-virginia-75993976 (showing that two smaller coal-burning plants at Yorktown that had operated since the mid-1950s were retired in 2019).

[218] *See* Letter from Steven R. Pincus, Assoc. Gen. Counsel, PJM Interconnection, LLC., to James Richard Perry, Sec'y, Dep't of Energy 16–17 (June 13, 2017), https://www.energy.gov/sites/prod/files/2017/07/f35/PUBLIC-DOE%20FPA%20202%28c%29%20Emergency%20Application%20Dominion%20Yorktown%201%20%202%20-6-13..._0.pdf [https://perma.cc/42EV-WJXV] [hereinafter *Dominion Request*] (arguing that compliance with MATS "would be prohibitively expensive[]" and that it would "take too long to permit and construct" pollution-control facilities). First, Dominion decided to shutter the Yorktown units because of MATS. *Id.* at 5 ("The deactivation of Yorktown Units is prompted

and construction phase of the transmission line, Dominion, like GRDA, obtained time-limited enforcement deferrals from EPA.[219] But the permits were delayed[220] and EPA's deferrals were running out. So, Dominion and the regional grid operator, PJM Interconnection, requested a § 202(c) order requiring the Yorktown units to continue operating beyond the end of EPA's enforcement discretion.[221] Four days later, the Department granted the request.[222] The Secretary agreed that there was an emergency and wrote that "[e]lectric . . . reliability is at risk" because without the availability of the Yorktown units, Dominion and PJM could violate a NERC reliability standard.[223] The orders would be extended six times for a total of twenty-one months before Dominion completed the transmission line.[224]

The heat and cold wave orders also faulted environmental limits. For example, one order to the California ISO ("CAISO") issued during a heat wave noted that the "impetus for the Application, however, arose . . . when the operator of [certain] natural gas-fired [generation facilities] informed the CAISO that it could not produce to its maximum generation capability without exceeding its federal air quality or other permit limitations."[225] Or, during a 2022 cold snap in Texas, ERCOT requested (and was granted) a § 202(c) order because the electricity supply was tight and ERCOT had been "notified by one generation owner that some of its generating units are currently limited in their power output due to emissions, effluent, and other limits established by federal environmental permits."[226]

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by the . . . Mercury and Air Toxics Standards . . . ."). Next, PJM Interconnection, the regional grid operator, notified Dominion "that the deactivation of Yorktown Units 1 & 2 respectively would adversely affect the PJM transmission system absent the installation of certain transmission upgrades." *Id.* at 16.

[219] *See id.* at 5–6 (arguing that it was necessary to leave the Yorktown Units open to "maintain transmission system reliability" and to "keep the power grid stable in the North Hampton Roads").

[220] *See id.* at 3 (referring to "significant delays associated with Dominion obtaining permitting approval for the PJM-ordered transmission upgrades"); Nat'l Parks Conservation Ass'n v. Semonite, 282 F. Supp. 3d 284 (D.D.C. 2017).

[221] *Dominion Request*, *supra* note 218, at 12–13.

[222] DEP'T OF ENERGY, ORDER NO. 202-17-2 (June 16, 2017), https://www.energy.gov/sites/prod/files/2017/08/f35/Order%20Number%20202-17-2_0_0.pdf [https://perma.cc/YK99-RSDW] [hereinafter ORDER NO. 202-17-2].

[223] *Id.* at 2 (citing N. AM. ELEC. RELIABILITY CORP., *TPL-001-4 — Transmission System Planning Performance Requirements*, https://www.nerc.com/pa/Stand/Reliability%20Standards/TPL-001-4.pdf (last updated Nov. 26, 2014)).

[224] JACOBS & PESKOE, *supra* note 13, at 32. *See also Skiffes Creek Timeline*, DOMINION ENERGY, https://www.dominionenergy.com/projects-and-facilities/electric-projects/power-line-projects/skiffes-creek/timeline (last visited Jan. 10, 2024) (reporting that Dominion energized the transmission line in February 2018).

[225] ORDER NO. 202-20-2, *supra* note 185, at 2.

[226] Letter from Pablo Vegas, President & Chief Exec. Officer, ERCOT, to Jennifer Granholm, Sec'y, Dep't of Energy, at 2 (Dec. 23, 2022), https://www.energy.gov/sites/default/files/2022-12/ERCOT%20DOE_202c%2012.23.22.pdf [https://perma.cc/TTG3-XKJC] [hereinafter ERCOT 2022 Request]; ORDER NO. 202-22-3, *supra* note 206.

B. *Different Orders*

What is ordered has adjusted with the changing emergencies. Now, "order" is a misnomer; the Department of Energy is not directing reluctant utilities to interconnect, but bestowing exemptions (in the form of orders to generate electricity), usually from the Clean Air Act. Since 2015, of twelve § 202(c) emergencies, eleven ordered generation of electricity that would cause violations of environmental rules.[227] Two of those—the GRDA and Dominion orders—allowed for continued operation in violation of mercury and air toxics standards.[228] The Dominion order also allowed the Yorktown units to operate without fully complying with Clean Water Act standards for cooling water intake structures, as well as an unspecified municipal permit requirement.[229] At least eight orders—those issued during heat or cold waves—required generators to operate in excess of Clean Air Act permit requirements imposed as part of controls on criteria pollutants under the National Ambient Air Quality Standards.[230] Those eight orders allowed for otherwise-illegal emissions of nitrogen oxides, a class of ozone precursors.[231] Others variously provided for carbon monoxide and ammonia emissions, as well as air opacity violations.[232] One order also referenced unspecified Clean Water Act pollution discharge limitations.[233]

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[227] *See infra* Table 1.

[228] *See id.*

[229] *See id.*; *see also* Clean Water Act § 316(b), 33 U.S.C. § 1326 (requiring the "best technology available for minimizing adverse environmental impact" for cooling water intake structures).

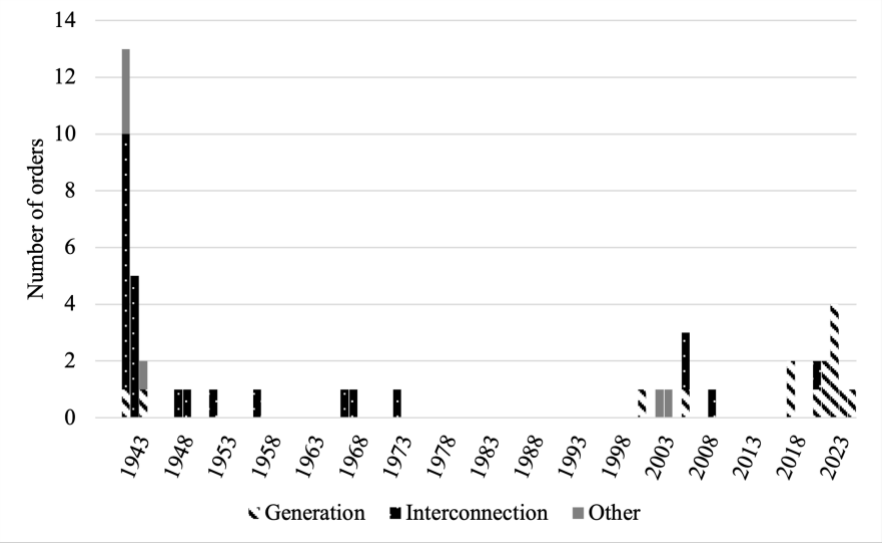
[230] *See infra* Table 1.

[231] *See id.*

[232] *See id.*

[233] *See id.* (ERCOT, February 2021).

Figure 1: § 202(c) emergencies by order type per year[234]



Contrast this with pre-2015 orders. Between 2000 and 2014, there were seven § 202(c) emergencies.[235] Just two ordered generation—and one of those was for Mirant Alexandria, the episode that prompted the 2015 amendments. The rest either allowed electricity to flow into Texas or required use of the Connecticut-to-Long Island Cross Sound Cable.[236] Looking back to the days of the Federal Power Commission, as Figure 1, above, shows,[237] the shift in the type of § 202(c) orders is even more dramatic. There is a spike of orders immediately before and during World War II. Almost all those decisions ordered interconnections.[238] Then, in the

[234] Each separate docket or order series in which the FPC or the Department of Energy issued a § 202(c) order is counted as a separate emergency. So, each emergency on this graph corresponds with a single row in *infra* Table 1 or Table 2. However, note that this methodology produces a perhaps misleading spike in 1941. In a never repeated practice, the FPC issued ten distinct orders on June 27, 1941, pursuant to a single emergency declaration but on separate dockets. The single emergency declaration was contained in the recommendation-only decision, *Recommendation for the Curtailment of the Use of Electric Energy in the Southeastern States*, 2 F.P.C. 990 (1941). The nine other June 27, 1941, § 202(c) decisions *did* order actions, but referred back to *Recommendation for Curtailment* as describing the emergency that justified the orders. *See* sources cited in *infra* Table 2.

Orders directing an entity to both generate electricity and provide transmission or distribution are classified as "generation." Orders directing an entity to both interconnect and provide transmission or distribution are classified as "interconnection." Orders requiring neither generation nor interconnection (for example, an order requiring only delivery to a specific customer, *see, e.g.*, Duke Power Co., 2 F.P.C. 1055 (1941); Niagara Falls Power Co., 2 F.P.C. 461 (1941)) are classified as "other." The two recommendation "orders," Recommendation for the Curtailment of the Use of Electric Energy in the Se. States, 2 F.P.C. 990 (1941) and Tenn. Valley Auth., 2 F.P.C. 997 (1941), are omitted from the chart.

[235] *Infra* Table 1.

[236] *Id.*

[237] *See also infra* Table 2 (listing the details of FPC-era § 202(c) orders).

[238] *Supra* Figure 1.

period after the war and before the dissolution of the FPC, the Commission used § 202(c) just seven times—in every case to order interconnection.[239] Against this historical backdrop, the relative burst of *generation* orders after 2015 is even more striking.

C. *Evolving Safeguards*

The Department of Energy has enforced some informal procedural safeguards for this new sort of § 202(c) orders. Orders have consistently required reporting on any pollution exceedances. For example, the 2017 GRDA order required GRDA to "report to the Department all dates on which Unit No. 1 is run during the effectiveness of this Order and the [associated] emissions."[240] More typical of recent orders is one to ERCOT from 2023, which requires a preliminary report and final report on emissions.[241] But these reports themselves are of limited utility because the Department of Energy has refused to make most of them public, citing "the presence of business sensitive material in the reports."[242] Still, separate from these requestor-submitted reports, during the entirety of the Biden administration the Department published brief summaries of § 202(c) orders and their aftermath in the *Federal Register*. These summaries describe the emergency, the order, and often, whether the pollution limit waivers were actually used.[243]

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[239] *Id.*; *infra* Table 2.

[240] ORDER NO. 202-17-1, *supra* note 204, at 2.

[241] ORDER NO. 202-23-1, *supra* note 205, at 6 (requiring ERCOT to "submit a final report by November 6, 2023, with any revisions to the information reported on October 6, 2023"). For other similar requirements, see ORDER NO. 202-22-4, *supra* note 8, at 6; ORDER NO. 202-22-3, *supra* note 206, at 5; ORDER NO. 202-22-2, *supra* note 205, at 5.

[242] Email from Kenneth Buell, Deputy Dir., Off. Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy, to author (Feb. 26, 2024, 9:12 AM) (on file with author) [hereinafter *Report Email*]. For example, Order No. 202-22-1 required a final report by November 14, 2022. ORDER NO. 202-22-1, *supra* note 205, at 5. Until February 2024, a Department of Energy webpage about the order promised that "[t]his page will be updated when CAISO[] files reports in accordance with this order." *Federal Power Act Section 202(c): CAISO September 2022*, DEP'T OF ENERGY (Feb. 26, 2024, 10:33 AM), https://www.energy.gov/ceser/federal-power-act-section-202c-caiso-september-2022 [https://perma.cc/JG2F-58TR] (on file with author). But after I inquired about the promised reports, this notice was removed. *Compare id.* (describing the notice), *with Federal Power Act Section 202(c): CAISO September 2022*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-caiso-september-2022 [https://perma.cc/J7WC-R2C2] (last visited July 29, 2024) [hereinafter *CAISO Sept. 2022*] (omitting the notice). A Department official wrote that the Department "is unable to make the reports available on [its] website due to the presence of business sensitive material in the reports." *Report Email, supra*. In a subsequent email, he added that, "[a]t this juncture, we do not anticipate requiring or doing a redacted version of the reports, and we will be removing the statement that the reports will be posted from the website." Email from Kenneth Buell, Deputy Dir., Off. Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy, to author (Feb. 26, 2024, 9:44 AM) (on file with author).

[243] *See, e.g.*, Emergency Order Issued to the Electric Reliability Council of Texas, Inc. (ERCOT), to Operate Power Generating Facilities Under Limited Circumstances in Texas as a Result of Extreme Weather, 88 Fed. Reg. 67740 (Oct. 2, 2023) (illustrating the information included in summaries); Emergency Order Issued to PJM Interconnection, LLC. to Operate Power Generating Facilities Under Limited Circumstances in the PJM Region as a Result of Extreme Weather, 88 Fed. Reg. 10103 (Feb.

Orders have also adopted sophisticated rules about when, exactly, pollution exceedances are allowed. The GRDA and Dominion orders incorporated by reference intricate unit dispatch conditions already included in earlier EPA enforcement deferral orders.[244] More recent cold and heat wave orders have generally allowed for pollution exceedances only after grid operators exhaust all other resources and only if the operator has declared an energy emergency of a certain level of severity.[245]

Under the Biden administration, the Department also introduced a grab bag of additional tools. With that, some requests proactively provided information about whether vulnerable populations would be at risk because of pollution exceedances.[246] Orders also required environmental justice assessments after the emergency resolves[247] and required utilities to provide public notice to residents around affected units.[248] At least some of these practices—and certainly environmental justice assessments—are unlikely to continue in the second Trump administration.[249]

The Department also adopted a more rigorous National Environmental Policy Act ("NEPA")[250] process for § 202(c) orders. NEPA requires that federal agencies develop an environmental impact assessment for "major Federal actions significantly affecting the quality of the human

16, 2023) (same). No *Federal Register* notice has (yet) been published for one Biden-era order—an October 2024 order to Duke Energy. DEP'T OF ENERGY, ORDER NO. 202-24-1 (Oct. 9, 2024), https://www.energy.gov/sites/default/files/2024-10/Duke%20202%28c%29%20Order_100924%20FINAL_JMG%20signed.pdf [https://perma.cc/RCD7-Z8D4]. But a Department of Energy webpage refers to a *Federal Register* notice, suggesting that one may still be forthcoming. *See Federal Power Act Section 202(c): Duke Energy Florida October 2024*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-duke-energy-florida-october-2024 [https://perma.cc/KCN9-AHKY] (last visited Mar. 19, 2025) [hereinafter *Federal Power Act Section 202(c): Duke Energy Florida October 2024*] ("Though it is not intended or expected, should any discrepancy occur between the document posted here and the document published in the Federal Register, the Federal Register publication controls.").

[244] *See* ORDER NO. 202-17-1, *supra* note 204, at 2 ("This Order will continue the operational limitations described in [the] EPA Administrative Compliance Order . . . ."); ORDER NO. 202-17-2, *supra* note 222, at 2 (similar).

[245] For example, Order No. 202-23-1 and Order No. 202-22-4 allowed dispatch of exempted units only after the grid operator declared an Energy Emergency Alert Level 2 or 3. ORDER NO. 202-23-1, *supra* note 205, at 4; ORDER NO. 202-22-4, *supra* note 8, at 4. *See also supra* note 4 (describing EEA levels).

[246] *See, e.g.*, Letter from Mark Rothleder, Senior Vice President & Chief Operating Officer, Cal. Indep. Sys. Operator Corp., to Jennifer Granholm, Sec'y, Dep't of Energy 6–7 (Sept. 7, 2021), https://www.energy.gov/sites/default/files/2021-09/CAISO%20202%20Request_09062021.pdf [https://perma.cc/MDK9-TF6C] [hereinafter CAISO 2021 Request] ("The relief requested is necessary to access additional generating capacity but should not create a disproportionate impact on any individual community[.]").

[247] *See, e.g.*, ORDER NO. 202-23-1, *supra* note 205, at 7 (describing environmental justice impact requirements); ORDER NO. 202-22-4, *supra* note 8, at 7 (same).

[248] *See, e.g.*, ORDER NO. 202-22-1, *supra* note 242, at 6 (describing public notice requirement); ORDER NO. 202-22-2, *supra* note 205, at 6 (same).

[249] *Cf., e.g.*, Exec. Order No. 14151, 90 Fed. Reg. 8339, 8339 (Jan. 20, 2025) (directing agencies to "terminate, to the maximum extent allowed by law, all . . . 'environmental justice' offices and positions").

[250] National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (1970) (codified as amended in scattered sections of 42 U.S.C.).

environment."[251] However, assessments are not required for actions that fall under a "categorical exclusion"—a group of actions that do not generally significantly affect the environment.[252] During the Dominion § 202(c) orders, the Department of Energy declined to perform an environmental impact assessment on the grounds that the orders fell under a categorical exclusion for "power management activities" of "generating projects" that "remain within normal operating limits."[253] The Department invoked the same categorical exclusion for a 2020 order.[254]

In contrast, during the Biden administration, whenever the environmental waivers under § 202(c) orders were actually used, the Department ordered the completion of a Special Environmental Analysis ("SEA"), a document prepared when an action *does* have "significant environmental impact," but an emergency situation prevents completion of an environmental impact assessment before the action is taken.[255] So far, the Department has completed and publicly released two § 202(c) SEAs and has released one draft SEA.[256] These documents include much of the important information contained in the confidential final reports, such as which generating units were operated and the exact amount of pollutants released.

* * *

Section 202(c) emergencies have changed. Since the 2015 amendments, emergency orders have nearly always involved conflict with environmental rules—not problems transferring power around the grid. In keeping with that shift, orders now usually direct generation of electricity, rather than interconnection. The Department of Energy has implemented some new

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[251] 42 U.S.C. § 4331(C). For more on the structure and function of NEPA, see generally ROBERT V. PERCIVAL, CHRISTOPHER H. SCHROEDER, ALAN S, MILLER & JAMES P. LEAPE, ENVIRONMENTAL REGULATION 813–93 (9th ed. 2021); KRISTEN HITE, CONG. RSCH. SERV., R47205, JUDICIAL REVIEW AND THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (2022).

[252] *See* PERCIVAL, SCHROEDER, MILLER & LEAPE, *supra* note 251, at 851 (describing categorical exclusions).

[253] Dep't of Energy, *Records of Categorical Exclusion Determination, Order No. 202-18-3*, at 3 (Feb. 27, 2018), https://www.energy.gov/sites/prod/files/2018/03/f49/02_27_2018_CX_PJM%20202-18-3.pdf [https://perma.cc/Y6DB-C24Z] (quoting 10 C.F.R. pt. 1021, subpart D, app. B4.4).

[254] Dep't of Energy, *Records of Categorical Exclusion Determination: Order No. 202-20-2* (Sept. 6, 2020), https://www.energy.gov/sites/default/files/2020/09/f78/CX-270545.pdf [https://perma.cc/2SYG-L8BW].

[255] 40 C.F.R. § 1506.12; *see infra* Table 1 (noting that SEAs were prepared for the February 2021 ERCOT, September 2022 BANC, and December 2022 PJM orders, which all involved permit breaches).

[256] DEP'T OF ENERGY, AIR QUALITY AND ENVIRONMENTAL JUSTICE ANALYSIS MEMORANDUM (2021), https://www.energy.gov/sites/default/files/2022-01/sea-05-ercot-air-quality-and-ej-analysis-2021-07-21.pdf [https://perma.cc/J58Y-XLG8]. The Department also prepared an SEA for the Mirant Alexandria orders. *See* DEP'T OF ENERGY, 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 [https://perma.cc/RJ4G-JEVT] (detailing the special environmental analysis); Memorandum from ICF, to Tertia Speiser, NEPA Compliance Officer, Off. Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy (Apr. 19, 2024), https://www.energy.gov/sites/default/files/2024-08/sea-07-banc-special-environmental-analysis-2024-04-19.pdf [https://perma.cc/R7H8-GKJK]; Draft Memorandum, *supra* note 9.

procedural safeguards, but these protections are fragile and contingent. Expect more changes ahead.

III. EMERGENCIES DURING CLIMATE CHANGE: § 202(C)'S FUTURE

Regulations, economic shifts, and extreme weather driven by the changing climate will all put pressure on the reliability of the national electrical grid. And recently finalized Clean Air Act rules have expressly relied on § 202(c) as a reliability safety valve. This Part details these developments and then suggests ways to supervise § 202(c)'s use.

A. *New Challenges: Greenhouse Gas Regulation and Beyond*

The grid is under pressure from all sides. Some of that is regulatory, including EPA's new rule limiting greenhouse gas emissions from electric generating units. After the Supreme Court struck down a previous effort to reduce greenhouse gas emissions from the electricity sector in *West Virginia v. EPA*,[257] in the summer of 2024 EPA finalized new rules under section 111 of the Clean Air Act that require greenhouse gas emissions controls for new, modified, and existing fossil fuel-fired electric plants.[258] Under the rule, many power facilities will need to use sometimes costly technology, like carbon capture and storage or hydrogen co-firing.[259] When EPA proposed the rule, the agency acknowledged that it could have reliability effects: old and dirty (but high capacity) plants might not make economic sense to outfit with new emissions controls.[260]

Although EPA struck an optimistic note on reliability in the section 111 proposal,[261] grid operators were not so sure. The CEO of PJM

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[257] 597 U.S. 697, 734–35 (2022) (rejecting the Clean Power Plan).

[258] *See* NSPS Rule, *supra* note 23 (describing the details of the new rule).

[259] *See* Carrie Jenks & Sara Dewey, *EPA's Final CO_2 Standards for the Power Sector: Robust Regulatory Record Sets the Stage for Legal Challenges*, HARV. L. SCH. ENV'T & ENERGY L. PROGRAM 1 (2024), https://eelp.law.harvard.edu/wp-content/uploads/2024/08/Power-Sector-GHG-Rule-Summary-EPA-final-May10-update-.pdf (describing the new technologies power facilities will need to use). Although the initial proposed rule includes standards for existing natural gas-fired units, the EPA subsequently announced that existing natural gas power plants would be excluded. *See* Jean Chemnick, *Biden's EPA Postponing Major Piece of Power Plant Climate Rule*, POLITICOPRO (Feb. 29, 2024, 6:56 PM), https://subscriber.politicopro.com /article/2024/02/29/epa-weakens-gas-power-plant-climate-rule-00144309 (describing the support and criticism of the exclusion).

[260] *See* New Source Performance Standards for Greenhouse Gas Emissions, 88 Fed. Reg. 33240, 33415–16 (May 23, 2023) [hereinafter NSPS Proposed Rule] (discussing grid reliability considerations).

[261] *See id.* at 33415.

> As explained in this preamble, these proposed actions take account of the rapidly evolving power sector and extensive input received from power companies and other stakeholders on the future of these regulated sources, while ensuring that new natural gas-fired combustion turbines and existing steam EGUs achieve significant and cost-effective reductions in GHG emissions through the application of adequately demonstrated control technologies. Preserving the ability of power companies and grid operators to maintain system reliability has been a paramount consideration in the development of these proposed actions.

Interconnection, the grid operator for much of the mid-Atlantic and Midwest, told a Senate committee hearing that generation unit retirements driven "in large part by state laws and federal environmental initiatives that create a clear near-term, date-certain requirement for generation to comply or retire" are outpacing the addition of clean energy sources.[262] A comment on the proposed rule from four ISOs/RTOs[263] likewise argued that relatively high costs of compliance would drive retirements that would not be matched by new generation capacity.[264] So, the final rule includes several compliance flexibility mechanisms designed to preserve reliability.[265] Those flexibilities include formal enforcement discretion, and a "short-term reliability emergency mechanism" that loosens emission standards during grid emergencies.[266] There is also a "reliability assurance mechanism" that can allow existing facilities to secure extended compliance deadlines.[267] The second Trump administration has promised to rethink the rule about greenhouse gas emissions from generating units.[268] But there's a good chance that even the revised rule will still have enough teeth to drive some unit retirements.[269]

Other changes, including some regulatory, are also causing capacity constraints and unit retirements. For example, NERC's 2023 Summer Reliability Assessment reported that power units in Texas could hit generation limits because of pollution controls on nitrogen oxides imposed by the EPA's rule on cross-boundary air pollution, the Good Neighbor Plan.[270] Tightened regulations on coal ash under the Clean Water Act and

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[262] *PJM Interconnection*, *Testimony of Manu Asthana President and CEO, PJM Interconnection Before the Senate Comm. on Energy & Nat. Res.*, 6 (2023), https://www.energy.senate.gov/services/files/2098C524-7B71-4D39-BFF1-295E6E75BDB7 [https://perma.cc/A2WA-PVP8]; *see also id.* at 9–10 (describing the use of markets and competition to reinforce grid reliability).

[263] PJM Interconnection, ERCOT, Midcontinent Independent System Operator, and Southwest Power Pool.

[264] *See* Joint ISOs/RTOs, Joint Comments on New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units 1–3 (Aug. 8, 2023), https://www.pjm.com/-/media/DotCom/documents/other-fed-state/20230808-comments-of-joint-isos-rtos-docket-epa-hq-oar-2023-0072.ashx.

[265] *See* NSPS Rule, *supra* note 23, at 39803, 40011–20 (describing grid reliability considerations).

[266] *Id.* at 40014–17.

[267] *Id.* at 40017–20.

[268] *Trump EPA Announces Reconsideration of Biden-Harris Rule, "Clean Power Plan 2.0", that Prioritized Shutting Down Power Plants While Raising Costs on American Families*, ENV'T PROT. AGENCY (Mar. 12, 2025), https://www.epa.gov/newsreleases/trump-epa-announces-reconsideration-biden-harris-rule-clean-power-plan-20-prioritized [https://perma.cc/8K8K-DEAT].

[269] *See* Dan Farber, LEGALPLANET, *The Legal Complexities of Deregulating Power Plant Carbon Emissions* (Mar. 10, 2025), https://legal-planet.org/2025/03/10/the-legal-complexities-of-deregulating-power-plant-carbon-emissions/ (explaining that "[w]e are likely to end up with a Trump rule that is much weaker than the Biden rule, but not as weak as EPA's effort in the first Trump Administration," and that "[t]his matters because even a very weak rule may require significant investments in improving powerplant efficiency, which could result in some plant closures").

[270] N. AM. ELEC. RELIABILITY CORP., 2023 SUMMER RELIABILITY ASSESSMENT 28 (2023), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2023.pdf. Those concerns were temporarily alleviated when the Fifth Circuit stayed part of the Plan. *Id.*; Texas v. EPA,

the Resource Conservation and Recovery Act are also raising costs and encouraging utilities to shutter coal plants.[271] And new, tighter rules for mercury emissions from lignite-fired facilities could also drive plant closures and have reliability effects.[272] A FERC staff reliability report points to these regulatory pressures, and frets that "changes to resource availability are a potential reliability challenge."[273] Still, perhaps the most influential driver of large unit retirements is competition from low-cost natural gas, which handily outcompetes coal.[274]

In response to all these pressures, utilities are turning to solar and wind. But costs and permitting delays have made it remarkably difficult to bring new clean energy online. A January 2024 survey of utility-scale wind and

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No. 23-60069, 2023 WL 7204840, at *11 (5th Cir. May 1, 2023). Another portion of the Plan was also stayed by the Supreme Court in *Ohio v. EPA*, 144 S. Ct. 2040, 2058 (2024), and the second Trump administration has promised to rethink the cross-boundary pollution rule, see *Trump EPA Announces Plan to Work with States on SIPs to Improve Air Quality and Reconsider "Good Neighbor Plan"*, ENV'T PROT. AGENCY (Mar. 12, 2025), https://www.epa.gov/newsreleases/trump-epa-announces-plan-work-states-sips-improve-air-quality-and-reconsider-good [https://perma.cc/D3VW-4S4V] (announcing that EPA "is tackling the troubled 'Good Neighbor Plan'").

[271] *See* Ethan Howland, *EPA Proposes Stricter Wastewater Discharge Limits for Coal-Fired Power Plants*, UTIL. DIVE (Mar. 8, 2023), https://www.utilitydive.com/news/epa-wastewater-discharge-coal-power-plants/644422/ ("The U.S. coal-fired power plant fleet is in decline, partly because of the cost of complying with environmental regulations."); *see also PJM Outlines for EPA the Need to Coordinate Outages Resulting from Coal Combustion Rule*, PJM INSIDE LINES (Mar. 30, 2022), https://insidelines.pjm.com/pjm-outlines-for-epa-the-need-to-coordinate-outages-resulting-from-coal-combustion-rule/ (reporting that the Coal Combustion Residual Rule, intended to prevent coal ash pollution, has spurred a reduction of coal facilities). The second Trump administration is likewise adjusting or reconsidering these rules. *See EPA Launches Biggest Deregulatory Action in U.S. History*, ENV'T PROT. AGENCY (Mar. 12, 2025), https://www.epa.gov/newsreleases/epa-launches-biggest-deregulatory-action-us-history [https://perma.cc/WR28-FU4Y] (announcing plans to reconsider "limitations, guidelines and standards (ELG) for the Steam Electric Power Generating Industry to ensure low-cost electricity while protecting water resources" and to "[p]rioritiz[e] coal ash program to expedite state permit reviews and update coal ash regulations").

[272] *See* MATS Revision, *supra* note 24, at 38526 (noting that although "EPA disagrees that this rule would threaten resource adequacy," "it is possible that some EGU owners may conclude that retiring a particular EGU and replacing it with new capacity is a more economic option"). "EGU" means "electric generating unit." *Id.* at 38508. These rules too will be rethought. *See Trump EPA to Reconsider Biden-Harris MATS Regulation that Targeted Coal-Fired Power Plants to Be Shut Down*, ENV'T PROT. AGENCY (Mar. 12, 2025), https://www.epa.gov/newsreleases/trump-epa-reconsider-biden-harris-mats-regulation-targeted-coal-fired-power-plants-be [https://perma.cc/73BQ-MEX5] [hereinafter *Trump EPA to Reconsider Biden-Harris MATS Regulation*] (announcing that EPA "will reconsider the Mercury and Air Toxics Standards (MATS) from the Biden-Harris Administration").

[273] FED. ENERGY REGUL. COMM'N STAFF, 2023 SUMMER ENERGY MARKET AND ELECTRIC RELIABILITY ASSESSMENT 50 (2023), https://www.ferc.gov/sites/default/files/2023-05/23_Summer-Assessment_0517_1745.pdf [https://perma.cc/LE6Z-N2T9].

[274] *Id.* (noting that "some thermal resources face increasingly challenging economic conditions, including competition from new resources and storage"); *see also* DEP'T OF ENERGY, STAFF REPORT TO THE SECRETARY ON ELECTRICITY MARKETS AND RELIABILITY 21 (2017), https://www.energy.gov/sites/default/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf [https://perma.cc/PWM5-APMA] ("No new coal plants have been built for domestic utility electricity production since 2014 because new coal plants are more expensive to build and operate than natural gas-fired plants." (footnotes omitted)); *id.* at 24 ("The primary recent drivers of coal plant retirement announcements include low natural gas prices and new environmental regulations—especially the Mercury and Air Toxics Standards (MATS), Clean Water Act Section 316(b), and the Coal Combustion Residuals rule." (quoting Ed Malley, *Coal Power Plant Post-Retirement Options*, POWER (Sept. 1, 2016), https://www.powermag.com/coal-power-plant-post-retirement-options/)).

solar developers found that about half of solar and wind siting applications faced delays of at least six months; about a third were cancelled altogether.[275] On average, new generation projects sit for five years in the "interconnection queue,"[276] waiting for approval to connect to the grid.[277] At every turn, projects face opposition, litigation, and increased costs.[278] So, the current pace of generation facility construction is just not fast enough to keep up.[279] And even when utility-scale wind and solar facilities *are* constructed, their intermittent power generation can have reliability impacts without the right transmission line and infrastructure upgrades.[280]

There are also demand-side challenges. The severe weather that figured in most of the post-2015 § 202(c) orders is becoming more frequent, driving extreme spikes in demand. For example, during the February 2021 cold snap in Texas, demand in ERCOT reached its highest wintertime peak ever.[281] Although it is difficult to link specific weather events (like the February 2021 winter storm) to climate change, higher global temperatures increase the likelihood of catastrophic weather.[282] That means colder cold snaps and

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[275] ROBI NILSON, BEN HOEN & JOE RAND, LAWRENCE BERKELEY NAT'L LAB'Y, SURVEY OF UTILITY-SCALE WIND AND SOLAR DEVELOPERS 1 (2024).

[276] "The interconnection queue is the process by which prospective generation projects are grouped and ordered by transmission planners to evaluate the potential impacts of new generation projects on the existing power grid. The list of prospective generation projects is often referred to as the interconnection queue." Stephen M. Fisher, Note, *Reforming Interconnection Queue Management Under FERC Order No. 2003*, 26 YALE J. ON REGUL. 117, 118 n.2 (2009).

[277] Emma Penrod, *US Grid Interconnection Backlog Jumps 40%, with Wait Times Expected to Grow as IRA Spurs More Renewables*, UTIL. DIVE (Apr. 11, 2023), https://www.utilitydive.com/news/grid-interconnection-queue-berkeley-lab-lbnl-watt-coalition-wind-solar-renewables/647287/.

[278] *See* J.B. Ruhl & James Salzman, *The Greens' Dilemma: Building Tomorrow's Climate Infrastructure Today*, 73 EMORY L.J. 1, 35–45 (2023) (describing the many challenges to generation facility construction, including litigation, local opposition, and insufficient transmission infrastructure).

[279] *See id.* at 82 n.480 (explaining that, even if all the infrastructure funded by the Inflation Reduction Act and Infrastructure Investment and Jobs Act were built, the resulting emissions reduction would still be below the fifty percent goal).

[280] *See, e.g.*, Peter Behr, *Low-Carbon Shift Raises Risk of Blackouts, Grid Execs Warn*, E&E NEWS (Apr. 3, 2024, 6:38 AM), https://subscriber.politicopro.com/article/eenews/2024/04/03/grid-leaders-warn-that-low-carbon-shift-raises-blackout-risks-00150203 ("Executives of U.S. regional power grids are warning they face new and unprecedented challenges as energy demand grows and the industry takes on the enormous shift to carbon-free electricity."); Debra Warady, Tyler Hodge & Lindsay Aramayo, *As Texas Wind and Solar Capacity Increase, Energy Curtailments Are Also Likely to Rise*, U.S. ENERGY INFO. ADMIN. (July 13, 2023), https://www.eia.gov/todayinenergy/detail.php?id=57100 (projecting an increase in wind and solar curtailments due to limited transmission line capacity). *But see* Alexandra Klass, Joshua Macey, Shelley Welton & Hannah Wiseman, *Grid Reliability Through Clean Energy*, 74 STAN. L. REV. 969, 980 (2022) (arguing that "[t]he project of creating a clean, reliable grid is often treated as a technical challenge," but that "it is equally—or largely—a challenge of law and governance").

[281] Keith Everhart & Gergely Molnar, *Severe Power Cuts in Texas Highlight Energy Security Risks Related to Extreme Weather Events*, INT'L ENERGY AGENCY (Feb. 18, 2021), https://www.iea.org/commentaries/severe-power-cuts-in-texas-highlight-energy-security-risks-related-to-extreme-weather-events [https://perma.cc/684F-VQDX] ("The day-ahead forecast peak for 15 February stood at 74.5 GW, which is almost 10 GW above the previous all-time winter peak of 65.9 GW on 17 January 2018 . . . .").

[282] *See, e.g.*, Eric Wolff, Debra Kahn & Zack Colman, *Texas and California Built Different Power Grids, but Neither Stood Up to Climate Change*, POLITICOPRO (Feb. 19, 2021, 12:55 PM), https://subscriber.politicopro.com/article/2021/02/19/texas-and-california-built-different-power-grids-but-neither-stood-up-to-climate-change-1364579 (explaining the scientific research linking climate change, and rising global temperatures, to an elevated risk of extreme weather events).

hotter summers—both of which send electricity demand sky high. Grid operators, obliged to keep supply and demand in line and operations within NERC guidelines, will therefore increasingly turn to § 202(c) to make the numbers add up.

B. *Planning on Emergencies?*

EPA agrees that § 202(c) is part of maintaining grid reliability during the energy transition. The section 111 rule for greenhouse gas emissions from electric generating units includes, as described above, extra flexibility and enforcement discretion to help keep the lights on. However, the reliability assurance mechanism and the short-term reliability mechanism for existing sources will be available only if states choose to include it in their state implementation plans.[283] EPA seems to anticipate that not every state will adopt these mechanisms, or at least that they will not cover all possible reliability issues. The rule's preamble notes that states adopting the short-term reliability mechanism "*could* make it available for sources to use without needing action by DOE under section 202(c)."[284] It adds, "section 202(c) would continue to be available for sources subject to this rule for emergency situations where EPA's short-term reliability mechanism would not apply."[285] Another rule, this one a revision to MATS that puts further restrictions on emissions from lignite coal plants, also briefly invokes § 202(c) to assuage reliability concerns. Although EPA found no reason to think the MATS revision would degrade reliability, the rule's preamble says that if reliability problems *do* arise, extended deadlines are possible, and then, facilities may "obtain, if warranted, an emergency order from the Department of Energy pursuant to section 202(c)."[286] The advent of the second Trump administration makes it even more likely that § 202(c) will be used to ease regulatory compliance: EPA has already signaled that it will use at least one emergency Clean Air Act authority to pull back regulations before it can complete the full rulemaking process.[287]

In the section 111 rule, EPA appears to sign-on to a broad definition of § 202(c) emergencies. The rule's preamble asserts that "Congress provided section 202(c) as the *primary* mechanism to ensure that when generation is needed to meet an emergency, environmental protections will not prevent a

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[283] NSPS Rule, *supra* note 23, at 40015, 40017.

[284] *Id.* at 40013 (emphasis added).

[285] *Id.* The short-term reliability mechanism is available only during EEA Level 2 or 3 emergencies, but "certain emergency conditions . . . may occur outside any EEA-2 or EEA-3 event." *Id.* at 40016.

[286] MATS Revision, *supra* note 24, at 38526.

[287] *See Trump EPA to Reconsider Biden-Harris MATS Regulation*, *supra* note 272 (saying that, with respect to the MATS rule, "[t]he Trump Administration is considering a 2-year compliance exemption via Section 112(i)(4) of the Clean Air Act for affected power plants while EPA goes through the rulemaking process"); 42 U.S.C. § 7412(i)(4) (authorizing "[t]he President" to "exempt any stationary source from compliance with any standard or limitation under this section for a period of not more than 2 years," provided that "the President determines that the technology to implement such standard is not available and that it is in the national security interests of the United States to do so").

source from meeting that need."[288] EPA applauds the provision's recent uses, saying that it is an "effective mechanism" and citing orders in 2022 to PJM and the California Independent System Operator as evidence that § 202(c) "work[s] well."[289] Those brief orders were ordinary enough, but EPA also approvingly references the lengthy MATS-era Dominion Energy and GRDA orders, noting that "202(c) has also been used to allow generators to remain online pending completion of infrastructure needed to facilitate reliable replacement of those generators."[290]

NERC has also emphasized the importance of § 202(c). Its 2022 Long-Term Reliability Assessment highlighted the reliability risks of decreased generation capacity, as well as "the need to consider extreme [weather] scenarios in resource planning."[291] The report urged "[r]egulatory and policy-setting organizations" to "use their full suite of tools to manage the pace of retirements and ensure replacement infrastructure can be timely developed and placed in service"; it added that, "[i]f needed, the Department of Energy should use its 202(c) authority as called upon by electric system operators."[292]

Some of the reliability events that EPA and NERC seem to be worried about are extreme weather and other unanticipated emergencies, and therefore consistent with the best reading of § 202(c). These are just the dilemmas the 1935 and 2015 Congresses designed § 202(c) to meet. The World War I coal shortages, the 1920s California droughts, the 2000 California energy market crisis, and unseasonable 2021 and 2022 Texas cold snaps are all acute, temporary, and unexpected events. Even the 2005 Mirant orders, which lasted more than a year, involved a surprise: that the Mirant power plant would close entirely.[293] Suspending environmental rules is a new twist, but adding this flexibility was exactly the point of the 2015 amendment, and most environmental rule waivers have been brief, and resulted in no excess emissions.[294]

The role for § 202(c) previewed during the MATS rule and embraced in the section 111 rule is potentially different. Using § 202(c) to resolve *anticipated* reliability challenges caused by environmental rules distorts the meaning of "emergency." Rather than unexpected shortages, these are long expected difficulties. Worse, lengthy "emergencies" undermine the rules to which § 202(c) orders provide an exception. An expansive understanding of what can be an emergency also legitimizes other aggressive emergency orders that are much more counterproductive—like the order to keep coal-

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[288] NSPS Rule, *supra* note 23, at 40012 (emphasis added).

[289] *Id.* at 40012–13.

[290] *Id.* at 40013.

[291] N. AM. ELEC. RELIABILITY CORP., 2022 LONG-TERM RELIABILITY ASSESSMENT 13 (2022), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf.

[292] *Id.*

[293] *See supra* notes 109–119 and accompanying text (describing the 2005 Mirant Orders).

[294] *See infra* Table 1 (showing that most waivers are relatively short).

fired facilities in business that was floated during the first Trump administration.[295] Some § 202(c) orders could be prompted by regulatory challenges, while remaining licit. The GRDA order, for example, was only necessary because of a surprise, inopportune lightning strike. But the months-long, slow-moving Dominion Energy "emergency" stretches the boundaries of § 202(c).

Depending on compliance flexibilities (including § 202(c)) to assuage reliability concerns underlines the need for broader reforms. The lengthy Dominion Energy emergency is illustrative. There, Dominion Energy decided to wind down dirty coal-fired power plants rather than install pollution control equipment required by MATS.[296] PJM, the regional grid operator, insisted that Dominion Energy first construct a new switching station and transmission lines—upgrades that were necessary to keep the local grid within reliability standards.[297] But the upgrades were stalled by permit delays and opposition from conservation groups.[298] Something had to give, and what gave was the MATS standards. These kinds of dilemmas have and will occur countless times as the grid shifts to clean energy sources. Sometimes, as with Dominion Energy, something will have to give—and that's when utilities may turn to § 202(c).

C. *Supervising § 202(c)*

New pressures make adequate supervision of § 202(c) orders all the more important, to ensure that orders stay within the boundaries of *unexpected* emergencies. This Section describes two possible sources of supervision: changes in Department of Energy procedure and regulations, and external routes for challenging § 202(c) orders through litigation.

1. *Internal Supervision*

The Department of Energy can build on and reinforce its existing § 202(c) processes. Although the Department adopted some implementing regulations in 1981, these have not been updated since the 2015 amendments, and are often ignored. There is a list of mandatory information to be provided by applicants,[299] but applicants have simply not supplied all the required information in recent § 202(c) requests.[300] Meanwhile, the Department of Energy has had to request additional information relevant to

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[295] *See supra* notes 166–167 and accompanying text.

[296] *See supra* notes 217–226 and accompanying text.

[297] *See supra* notes 217–226 and accompanying text (describing PJM's role).

[298] *See supra* notes 217–226 and accompanying text (listing obstacles that stalled transmission-upgrade approval).

[299] 10 C.F.R. § 205.373 (2024).

[300] *See, e.g.*, ERCOT 2022 Request, *supra* note 226; CAISO 2021 Request, *supra* note 246. The fact that these requests were missing ostensibly required information, like "[t]he status of all interruptible customers for each of the past 30 days and the anticipated status of these customers for each day of the expected duration of the emergency," 10 C.F.R. § 205.373(d)(3), appeared to occasion no comment from the Department of Energy.

environmental exemptions—information that the regulations do not require (and could not have anticipated in 1981). For example, in September 2022, the Balancing Authority of Northern California ("BANC") requested a § 202(c) order permitting it to dispatch certain generation units in violation of Clean Air Act permits.[301] A day later, apparently in response to requests from the Department, BANC submitted a supplemental letter providing more specific details about the exact permit requirements it sought an exemption from, describing how BANC would dispatch the units, clarifying when dispatch could occur, and explaining that the units were not in "a disadvantaged community."[302] The regulations do require post-order reports on, for example, associated costs and the amount of electricity delivered.[303] Yet information like whether pollution limits were actually exceeded, and if they were by how much is not explicitly required.[304]

Section 202(c)'s corner of the Code of Federal Regulations should be amended to reflect the environmental turn and to preserve transparency and accountability. While the Department *now* inquires about dispatch triggers, other emergency measures available, the environmental laws implicated, and environmental justice implications, it need not always do so, and it is not required to by the statutory text. The Department, would-be requestors, and the public would all be served by codifying and clarifying the information to be provided when an applicant seeks a § 202(c) order.

The Department should also codify its NEPA philosophy for § 202(c) orders. During the Biden administration, its approach was simple enough: when there were actual permit exceedances, the Department prepared, after the fact, an SEA analyzing the environmental consequences of the order.[305] When no exceedances occurred, no NEPA analysis happened.[306] This is the right balance to strike. For fast-moving situations, to require any kind of NEPA process pre-order would defeat the utility of having an emergency power at all. At the same time, some assessment is necessary both to inform future agency decision-making, and to alert the public about what happened. Yet this practice, too, is nowhere memorialized and is not mandatory. It remains to be seen whether the second Trump administration will keep up this approach.

These new de facto safeguards and transparency are a recent development. During the first Trump administration, the Department

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[301] Letter from James R. Shetler, Gen. Manager, Balancing Auth. of N. Cal., to Jennifer Granholm, Sec'y of Energy, Dep't of Energy 1–3 (Sept. 2, 2022), https://www.energy.gov/sites/default/files/2022-09/DOE%20Waiver_BANC_FINAL.pdf [https://perma.cc/V3ZE-DNWF].

[302] Letter from James R. Shetler, Gen. Manager, Balancing Auth. of N. Cal., to Jennifer Granholm, Sec'y of Energy, Dep't of Energy 3–4 (Sept. 3, 2022), https://www.energy.gov/sites/default/files/2022-09/BANCAmendmentCombinedFinal.pdf [https://perma.cc/EY3P-35Q6].

[303] 10 C.F.R. § 205.377 (2024).

[304] *See, e.g.*, ORDER NO. 202-23-1, *supra* note 205, at 6–7 (requesting reports on exceedances).

[305] *See infra* Table 1 (identifying whether a NEPA SEA was prepared for each breached permit).

[306] *See infra* Table 1 (showing that, generally, no NEPA SEA is prepared where there were no exceedances during a § 202(c) emergency).

invoked a NEPA categorical exclusion and declined to prepare a post-order environmental assessment for the many-month Dominion Energy emergency.[307] Still, the Department publicly posted reports from Dominion about how often the plant was used and what its emissions levels were.[308] After a 2020 order to the California ISO, the Department also invoked a categorical exclusion[309]—even though at least one unit operated in violation of Clean Air Act permit limits.[310] Unlike with Dominion, the Department has refused to release even a redacted version of the final report for that order, meaning that no public information is available about which units exceeded permit limits or by how much.[307] Without regulatory changes, the Department could quickly return to this older, opaque approach.

2. *External Supervision*

Actors outside the Department of Energy can also police § 202(c) through an (almost) never tested route: litigation. The Federal Power Act, in § 313, sets up a two-step route for judicial review of the merits of § 202(c) orders.[311] First, a party "aggrieved by an order issued by the Commission" may apply to the agency for a rehearing; the agency can respond to the rehearing petition, granting or denying it and (perhaps) abrogating or modifying the order.[312] After thirty days, or after a decision on the rehearing petition, whichever is earlier, a party who is "aggrieved by an order issued by the Commission . . . may obtain review of such order" either in the court of appeals where the party is located or in the U.S. Court of Appeals for the District of Columbia.[313] The court taking jurisdiction of the review may

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[307] *See supra* note 253 and accompanying text (showing that the Department of Energy may circumvent the often-lengthy NEPA process if a categorical exclusion applies, as in the Dominion § 202(c) orders); *supra* notes 251–252 and accompanying text (describing NEPA and categorical exclusions).

[308] *See* Off. of Elec., *Federal Power Act Section 202(c) – PJM Interconnection & Dominion Energy Virginia, 2017*, DEP'T OF ENERGY (June 19, 2017), https://www.energy.gov/oe/articles/federal-power-act-section-202c-pjm-interconnection-dominion-energy-virginia-2017 [https://perma.cc/W6W5-QSTX] [hereinafter *PJM & Dominion 2017*] (listing reports on the operations of Dominion Energy's Yorktown units).

[309] ORDER NO. 202-20-2, *supra* note 185.

[310] 202(c) Usage Email, *supra* note 216 ("CAISO, September 2020. . . . This Order was used; NEPA CX; [Final report filed 9/21/20, business confidential]" (second alteration in original)).

[307] Email from Tertia Speiser, Off. Cybersecurity, Energy Sec., & Emergency Response, Dep't of Energy, to author (May 17, 2024, 9:48 AM) (on file with author) ("[Q:] Is there any plan to release a redacted version of the final report for the September 2020 CAISO order or some other public-facing documentation of how it was used? [A:] No.").

[311] *See* 16 U.S.C. § 825*l*(a)–(b) (providing for judicial review). This is also the *only* route for obtaining judicial review on the merits. *See* 5 U.S.C. § 703.

> The form of proceeding for judicial review is the special statutory review proceeding relevant to the subject matter in a court specified by statute or, in the absence or inadequacy thereof, any applicable form of legal action, including actions for declaratory judgments or writs of prohibitory or mandatory injunction or habeas corpus, in a court of competent jurisdiction.

[312] 16 U.S.C. § 825*l*(a).

[313] *Id.* § 825*l*(b).

"affirm, modify, or set aside such order in whole or in part"—but the court may only consider objections that the party "urged before the Commission" in an application for rehearing.[314] Although § 313 still refers to the "Commission," the Department of Energy has understood § 313 to apply to Department orders issued pursuant to the Federal Power Act.[315] So far, no § 202(c) order has been subject to judicial review under this scheme.[316]

On four occasions since 1977, outside parties have petitioned for rehearing. All four were stymied—and judicial review blocked—by procedural shenanigans. In both 2002 and 2003, after the Department issued orders requiring the use of the Cross-Sound Cable (a politically contentious undersea transmission link between Connecticut and Long Island), the Connecticut Attorney General filed petitions for rehearing with the Department.[317] On both occasions the Secretary of Energy granted the petition for rehearing for the "limited purpose" of "afford[ing] additional time for consideration,"[318] waited until the challenged § 202(c) order expired, and then denied the petition for rehearing as moot.[319] Later, during the Mirant Alexandria § 202(c) emergency, the City of Alexandria and the Virginia Department of Environmental Quality submitted petitions for rehearing.[320] The Department granted the petition "for the limited purpose of further consideration,"[321] three times extended the emergency while refusing to take action either way on the petition for rehearing,[322] and then denied the petition as moot once the final extension expired.[323] During the

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[314] *Id.*

[315] *See, e.g.*, DEP'T OF ENERGY, ORDER NO. 202-06-1 (Feb. 17, 2006), https://www.energy.gov/oe/articles/department-energy-emergency-order-no-202-06-01 [https://perma.cc/C92D-LSSQ] [hereinafter ORDER NO. 202-06-1] (granting a petition for rehearing pursuant to § 313 "for the limited purpose of further consideration"); DEP'T OF ENERGY, ORDER NO. 202-02-1B (Nov. 13, 2002), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-02-1B%20November%2013%2C%202002%20-%20CSC.pdf [https://perma.cc/J6SQ-MYC3] [hereinafter ORDER NO. 202-02-1B] (similar).

[316] *Richmond Power & Light v. FERC*, 574 F.2d 610 (D.C. Cir. 1978), discussed earlier, involved review pursuant to § 313 of a decision *not* to issue a § 202(c) order. *See supra* notes 154–156 and accompanying text; *Richmond Power*, 574 F.2d at 614–15 (discussing § 202(c)); *id.* at 614 n.14 (citing 16 U.S.C. § 825*l*(b)).

[317] ORDER NO. 202-02-1B, *supra* note 315; DEP'T OF ENERGY, ORDER NO. 202-03-4 (May 7, 2004), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-03-4%20May%207%2C%202004%20-%20CSC.pdf [https://perma.cc/EZ9V-BJUA] [hereinafter ORDER NO. 202-03-4].

[318] DEP'T OF ENERGY, ORDER NO. 202-02-1A (Sept. 17, 2002), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-02-1A%20September%2017%2C%202002%20-%20CSC.pdf [https://perma.cc/VUC6-DPRA]; DEP'T OF ENERGY, ORDER NO. 202-03-3 (Sept. 26, 2003), https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-03-3%20September%2026%2C%202003%20-%20CSC.pdf [https://perma.cc/2J74-LLR3].

[319] ORDER NO. 202-02-1B, *supra* note 315; ORDER NO. 202-03-4, *supra* note 317.

[320] *See* ORDER NO. 202-06-1, *supra* note 315 (regarding "the Mirant Potomac River Generating Station").

[321] *Id.*

[322] *See* ORDER NO. 202-06-2, *supra* note 115 ("The rehearing requests continue under consideration and no action is being taken on those requests by the issuance of this order."); ORDER NO. 202-07-1, *supra* note 115 (same); ORDER NO. 202-07-2, *supra* note 115 (same).

[323] DEP'T OF ENERGY, ORDER NO. 202-07-3 (July 2, 2007), https://www.energy.gov/oe/articles/department-energy-order-no-202-07-3 [https://perma.cc/K8NP-2KPS].

Dominion Energy emergency, the Sierra Club petitioned for rehearing and the Department again delayed, then denied, the petition as moot.[324] The Sierra Club submitted a renewed petition for rehearing which the Department ultimately denied on the merits a few months before the emergency expired.[325] The Sierra Club did not seek judicial review.

The Department's delay tactic follows FERC's practice of pushing off judicial review using so-called "tolling orders." Until recently, FERC, facing petitions for rehearing under § 313 of the Federal Power Act or an identical provision of the Natural Gas Act, would regularly issue orders "grant[ing] [rehearing] for the limited purpose of further consideration" on the theory that this failure to issue a decision on the merits of the rehearing petition would prevent judicial review.[326] But in 2020 the D.C. Circuit held that judicial review *was* available after the issuance of tolling orders.[327] So, any future would-be § 202(c) challengers will likely avoid the Department's favored procedural obstacle.

Outside review on the merits, two kinds of collateral attacks are available. First, § 202(c) orders may implicate FERC's authority over energy rate setting. Section 206 of the Federal Power Act confers on FERC the power to set "just and reasonable" rates.[328] And if there are *un*just and *un*reasonable wholesale rates, "any person" who is "adversely affected" may file a complaint with FERC.[329] Should there be § 202(c) orders requiring the purchase or sale of expensive wholesale energy from, for example, high-cost generators that run only because of the order, that might be unjust and unreasonable, teeing up a corrective order from FERC (and, possibly, an

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[324] *See* DEP'T OF ENERGY, ORDER NO. 202-17-3 (Aug. 11, 2017), https://www.energy.gov/sites/prod/files/2017/08/f35/Order%20202-17-3%20signed.pdf [https://perma.cc/HY9J-LSHT] (granting for further consideration); DEP'T OF ENERGY, ORDER NO. 202-17-5 (Sept. 15, 2017), https://www.energy.gov/sites/prod/files/2017/09/f36/EXEC-2017-007186%20Order%20No%20202-17-5.pdf [https://perma.cc/H5M3-SLTV] (denying as moot).

[325] *See* DEP'T OF ENERGY, SUMMARY OF FINDINGS: DEPARTMENT OF ENERGY ORDER NO. 202-18-1, at 2, 15 (2017), https://www.energy.gov/sites/prod/files/2017/11/f46/Summary%20of%20Findings%20Order%20No.%20202-18-1.pdf [https://perma.cc/A6SH-3CGK] ("The September Order is tailored to accomplish those goals. Accordingly, Sierra Club's petition for rehearing is denied.").

[326] Allegheny Def. Project v. Fed. Energy Regul. Comm'n, 964 F.3d 1, 6 (D.C. Cir. 2020) (second alteration in original); *see id.* at 9 (describing FERC's frequent use of tolling orders).

[327] *Id.* at 3–4 ("We hold that, under the plain statutory language and context, such tolling orders are not the kind of action on a rehearing application that can fend off a deemed denial and the opportunity for judicial review."). *Allegheny Defense* was about § 19 of the Natural Gas Act, not the Federal Power Act. *See id.* at 9; 15 U.S.C. § 717r. However, § 19 and § 313 are materially identical. *Compare* 16 U.S.C. § 825*l*, *with* 15 U.S.C. § 717r(a)–(c). FERC has treated *Allegheny Defense* as applying with equal force to petitions for rehearing under the Federal Power Act. *See, e.g.*, ISO New England Inc., 179 FERC ¶ 62,035 (2022) (applying *Allegheny* to 16 U.S.C. § 825*l*(a)); NYC Energy LLC, 173 FERC ¶ 61,193 (2020) (same). In general, courts treat decisions about the Natural Gas Act and the Federal Power Act as relevant for both laws. *See* Hughes v. Talen Energy Mktg., LLC, 578 U.S. 150, 164 n.10 (2016) ("This Court has routinely relied on NGA cases in determining the scope of the FPA, and vice versa.").

[328] 16 U.S.C. § 824e(a).

[329] *See* Spire STL Pipeline LLC, 174 FERC ¶ 61,058, P 9 (2021); 16 U.S.C. § 824e(a) (outlining FERC's rate-setting power); 18 C.F.R. § 385.102(d) (2024) (defining "person" broadly).

appeal from FERC to the courts).[330]

Second, despite § 202(c)'s curious language barring "citizen suit[s],"[331] § 202(c) orders may be vulnerable to outside NEPA litigation. So far, as discussed above, the Department of Energy has attempted to satisfy its NEPA obligations by either completing Special Environmental Analyses (environmental analyses prepared *after* an action is taken, rather than before, as is the usual course) or determining that a categorical exclusion applies (which allows the Department to avoid a NEPA analysis altogether).[332] Yet these conclusions are far from obvious. Although NEPA must operate differently during time-crunched emergencies, that justification fades when (as with Dominion) an "emergency" drags on for months. The Department's NEPA decision-making—as long as it has reached the stage of final agency action—can be challenged in court, and if the NEPA analysis is flawed, then the Department's decision could be vacated or enjoined.[333] Because the suit would be against the Department of Energy, rather than the utility or grid operator that is the subject of the § 202(c) order, and because NEPA suits are not "citizen suits,"[334] § 202(c)'s limit on environmental law liability should not apply.

The § 202(c)(4)(B) consultation provision could prove important. NEPA itself requires that the agency leading an environmental review "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved."[335] Internal disagreements, revealed in consultation documents, have been fruitful material for litigation. When consulting agencies express skepticism of a proposed decision, courts are more likely to find NEPA violations.[336] So too, disagreements revealed in § 202(c)

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[330] *See* JACOBS & PESKOE, *supra* note 13, at 25 ("Should DOE ultimately issue an order using its emergency authorities that compels purchases of wholesale energy, the resulting contracts would likely be challenged at FERC as unjust and unreasonable . . . .").

[331] 16 U.S.C. § 824a(c)(3).

[332] *See supra* notes 253–256 and accompanying text (detailing DOE's efforts).

[333] *See* HITE, *supra* note 251, at 6, 9–10 (explaining the remedies a plaintiff may seek).

[334] NEPA has no citizen suit provision, and suits from private parties are instead brought under the Administrative Procedure Act. *See id.* at 6 (citing Lujan v. Nat'l Wildlife Fed'n, 497 U.S. 871, 882 (1990)).

[335] 42 U.S.C. § 4332(C); *see also* 16 U.S.C. § 824a(c)(4)(B).

> In renewing or reissuing [a § 202(c) order], the Commission shall consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation, and shall include in any such renewed or reissued order such conditions as such Federal agency determines necessary to minimize any adverse environmental impacts to the extent practicable. The conditions, if any, submitted by such Federal agency shall be made available to the public.

[336] *See, e.g.*, Sierra Club v. U.S. Army Corps of Eng'rs, 701 F.2d 1011, 1021–22, 1049 (2d Cir. 1983) (finding NEPA violations in part because, after the mandatory consultation, an agency had opposed the Army Corps' decision to issue the permit). On the role of consulting agency comments in NEPA litigation, see Michael C. Blumm & Stephen R. Brown, *Pluralism and the Environment: The Role of*

consultations could be used as powerful evidence that the Department of Energy acted arbitrarily and capriciously. But the political context of extension requests makes agency disagreement unlikely. The NEPA process is common and routine. But § 202(c) extension requests (as with the Dominion emergency) often occur in the context of possible widespread blackouts—and so it is more likely that there will be pressure from non-career agency officials to push through emergency extensions. Only a future with more frequent § 202(c) extensions will show whether the interagency consultation requirement has teeth.

These routes for external supervision through litigation not only should be, but as a practical matter *must* be reserved for truly unusual § 202(c) emergencies. Of the nineteen § 202(c) emergencies since 2000, just ten were ten days or shorter.[337] Just three exceeded two months.[338] The tight timelines are themselves evidence that the orders were addressing unexpected, short-term emergencies. However, long-term problems akin to the Dominion emergency could crop up in the future. Then, external supervision would be more plausible on the merits, more practically achievable—and perhaps necessary.

CONCLUSION

Section 202(c) has come a long way. The New Deal Congress that added it into the Federal Power Act was worried about a fragmented electric grid buckling under wartime demand. For most of its life, the Federal Power Commission, and then the Department of Energy, invoked § 202(c) for those sorts of problems: commanding interconnection and transmission to avert unexpected catastrophe. But after Congress amended § 202(c) in 2015, the Secretary of Energy's odd, ill-defined emergency power transformed into a kind of super-waiver for environmental laws. Since 2015, that is just how the Department has used § 202(c), allowing grid operators in a (weather) pinch to squeeze a bit more electricity out of power plants, the Clean Air Act notwithstanding.

These recent uses of § 202(c) are telling. They clarify what we and regulators value most. When confronted with stark, inescapable choices between pollution control and electricity, we choose electricity, every time. And no wonder, given the lives and livelihoods at stake.[339] As the grid

Comment Agencies in NEPA Litigation, 14 HARV. ENV'T L. REV. 277, 282, 287–96 (1990) (reviewing cases), and Michael C. Blumm & Marla Nelson, *Pluralism and the Environment Revisited: The Role of Comment Agencies in NEPA Litigation*, 37 VT. L. REV. 5, 7–8, 11–32 (2012) (same).

[337] *See infra* Table 1 (tabulating the length of § 202(c) emergencies since 2000).

[338] *See id.* (same).

[339] *See* N. AM. ENERGY STANDARDS BD., THE FEBRUARY 2021 COLD WEATHER OUTAGES IN TEXAS AND THE SOUTH CENTRAL UNITED STATES 9 (2021), https://www.naesb.org/pdf4/ferc_nerc_regional_entity_staff_report_feb2021_cold_weather_outages_111621.pdf [https://perma.cc/MA8N-L7MW] (reporting that 210 people died during the February 2021 cold weather electric outages in Texas that prompted Order No. 202-21-1).

evolves to both keep up with demand and cut down on carbon emissions, those moments of crisis will—hopefully—remain rare.

But the new challenges to the grid are shaping up to put the power system's operators in a bind more often. And regulators are also pressuring § 202(c) to transform yet again, this time into a tool that will provide just a bit more compliance flexibility for tough new climate rules—even if the strain on reliability is long expected. Policymakers and courts should heed § 202(c)'s limited scope. It is a flexible emergency power, but Congress did not design it as a catch-all for *all* reliability problems. Yet, inevitably, as large fossil fuel-fired generating units are slated for retirement,[340] reliability-conscious regulators and operators will look to § 202(c), in the process, perhaps, stretching the meaning of "emergency." That means that supervision, both through internal processes, and (if necessary) from outside the Department of Energy, is all the more important.

APPENDIX

Table 1: All § 202(c) emergencies after dissolution of the Federal Power Commission[341]

Ordered entity	Start month	Emergency	Pollution limits waived	Length	Extensions?	Action ordered	NEPA SEA prepared?	Permit limits breached?
Duke Energy Florida, LLC[342]	Oct. 2024	Hurricane Milton	CAA: Formaldehyde permit limits Possibly other CAA and CWA limits	4 days	No	Generation	Not yet	Unknown
ERCOT[343]	Sept. 2023	Heat wave	CAA: NOx, CO, NH_3, and opacity NAAQS permit limits	2 days	No	Generation	No	No

[340] *Cf.* Jack Quinn, *EPA, Utility Strike Deal to Shut Down Last Northeast Coal Plants*, ENERGYWIRE (Mar. 28, 2024), https://subscriber.politicopro.com/article/eenews/2024/03/28/epa-utility-strike-deal-to-shut-down-last-northeast-coal-plants-00149345 (reporting on a recently announced coal-fired power plant closure, which "stirr[ed] a debate about whether fossil fuels are needed to stabilize the region's grid").

[341] I assembled this table based a list of § 202(c) orders provided on two Department of Energy webpages. *See DOE Use of FPA Emergency Authority*, *supra* note 99 (listing orders since 2020); *DOE Use of FPA Emergency Authority Archive*, *supra* note 99 (listing orders prior to 2020). The Department issued no § 202(c) orders between the agency's creation and the December 2000 order to California ISO. *See supra* note 99.

[342] *See Federal Power Act Section 202(c): Duke Energy Florida October 2024*, *supra* note 243 (listing documents relevant to Duke Energy's § 202(c) order). I was unable to learn, before this Article went to print, whether this order was actually used and whether any permit limits were actually breached. Also, as of March 17, 2025, the Department of Energy had not publicly posted any Special Environmental Analysis documents for this order. *See* Off. of NEPA Pol'y & Compliance, *Special Environmental Analyses*, DEP'T OF ENERGY, https://www.energy.gov/nepa/listings/special-environmental-analyses [https://perma.cc/75R6-ZQE5] (last visited Mar. 17, 2025).

[343] *See* Off. of Cybersecurity, Energy Sec., & Emergency Response, *Federal Power Act Section 202(c): ERCOT September 2023*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-ercot-september-2023 [https://perma.cc/Y53P-7J3D] (last visited Feb. 21, 2025) (listing documents relevant to ERCOT's § 202(c) order).

Ordered entity	Start month	Emergency	Pollution limits waived	Length	Extensions?	Action ordered	NEPA SEA prepared?	Permit limits breached?
PJM Interconnect-ion[344]	Dec. 2022	Cold wave	CAA: NOx and CO NAAQS permit limits	3 days	No	Generation	Yes[345]	Yes
ERCOT[346]	Dec. 2022	Cold wave	CAA: NOx, CO, NH_3, and opacity NAAQS permit limits	3 days	No	Generation	No	No
Balancing Authority of Northern California[347]	Sept. 2022	Heat wave	CAA: VOC, NOx, SO_2, PM10, and CONAAQS permit limits	1 week	Yes	Generation	Yes[348]	Yes
California ISO[349]	Sept. 2022	Heat wave	CAA: NOx and CO NAAQS permit limits	10 days	Yes	Generation	No	No
California ISO[350]	Sept. 2021	Heat wave	CAA: NOx NAAQS permit limits; lack of required BACT	2 months	No	Generation	No	No
ERCOT[351]	Feb. 2021	Cold wave	CAA: NOx, CO, and NO_3 NAAQS permit; Hazardous air pollutant permit limits CWA: Unspecified discharge limitations	5 days	No	Generation	Yes	Yes

[344] *See* Off. of Cybersecurity, Energy Sec., & Emergency Response, *Federal Power Act Section 202(c): PJM December 2022*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-pjm-december-2022 [https://perma.cc/4VUM-RU9W] (last visited Feb. 21, 2025) (listing documents relevant to PJM's § 202(c) order).

[345] *See* Draft Memorandum, *supra* note 9, at 2 (presenting conclusions "intended to satisfy the DOE's NEPA requirements").

[346] *See* Off. of Cybersecurity, Energy Sec., & Emergency Response, *Federal Power Act Section 202(c): ERCOT December 2022*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-ercot-december-2022 [https://perma.cc/8SCR-WRQH] (last visited Feb. 21, 2025) (listing documents relevant to ERCOT's § 202(c) order).

[347] *See* Off. of Cybersecurity, Energy Sec., & Emergency Response, *Federal Power Act Section 202(c): BANC September 2022*, DEP'T OF ENERGY, https://www.energy.gov/ceser/federal-power-act-section-202c-banc-september-2022 [https://perma.cc/SCQ8-BR4X] (last visited Feb. 21, 2025) (listing documents relevant to BANC's § 202(c) order).

[348] *See* Memorandum from ICF to Tertia Speiser, *supra* note 256.

[349] *See CAISO Sept. 2022*, *supra* note 242 (listing documents relevant to CAISO's § 202(c) order).

[350] *See* Off. of Elec., *Federal Power Act Section 202(c): CAISO, September 2021*, DEP'T OF ENERGY, https://www.energy.gov/oe/federal-power-act-section-202c-caiso-september-2021 [https://perma.cc/8GES-QT7N] (last visited Feb. 21, 2025) (listing documents relevant to CAISO's § 202(c) order).

[351] *See* Off. of Elec., *Federal Power Act Section 202(c) – ERCOT, February 2021*, DEP'T OF ENERGY (Feb. 15, 2021), https://www.energy.gov/oe/articles/federal-power-act-section-202c-ercot-february-2021 [https://perma.cc/W9DL-BMBT] (listing documents relevant to ERCOT's § 202(c) order).

Ordered entity	Start month	Emergency	Pollution limits waived	Length	Extensions?	Action ordered	NEPA SEA prepared?	Permit limits breached?
California ISO[352]	Sept. 2020	Heat wave	CAA: NOx NAAQS permit limits	1 week	No	Generation	No; formal categorical exclusion determinati-on prepared[353]	Yes[354]
CenterPoint Energy Houston Electric[355]	Aug. 2020	Hurricane	None	1.5 months	No	Non-jurisdictional interconnection	No	N/a
Dominion Energy and PJM Interconnect-ion[356]	June 2017	Transmissio n line delay; MATS	CAA: Mercury Air Toxics Standards CWA: Cooling water intake structure standards Other: municipal permit	21 months	Yes	Generation	No; formal categorical exclusion determinati-on prepared	Yes
Grand River Dam Authority[357]	Apr. 2017	Lightning strike; construction delay; MATS	CAA: Mercury Air Toxics Standards	3 months	No	Generation	No	No[358]
CenterPoint Energy Houston Electric[359]	Sept. 2008	Hurricane Ike	None	2 weeks	No	Non-jurisdictional interconnection	No	N/a
CenterPoint Energy Houston Electric[360]	Sept. 2005	Hurricanes Katrina and Rita	None	4 days	No	Non-jurisdictional interconnection	No	N/a

[352] *See* Off. of Elec., *Federal Power Act Section 202(c) – CAISO, September 2020*, DEP'T OF ENERGY (Sept. 6, 2020), https://www.energy.gov/oe/articles/federal-power-act-section-202c-caiso-september-2020 [https://perma.cc/9G7H-GKQY] (listing documents relevant to CAISO's § 202(c) order).

[353] *See* Off. of NEPA Pol'y & Compliance, *CX-270545: Emergency Order Pursuant to Section 202(c) of the FPA for California Independent System Operator (CAISO)*, DEP'T OF ENERGY (Sept. 6, 2020), https://www.energy.gov/nepa/articles/cx-270545-emergency-order-pursuant-section-202c-fpa-california-independent-system [https://perma.cc/L7HK-XHRL] (applying categorical exclusion).

[354] 202(c) Usage Email, *supra* note 216 ("CAISO, September 2020 . . . This Order was used; NEPA CX; [Final report filed 9/21/20, business confidential]" (second alteration in original)).

[355] *See* Off. of Elec., *Federal Power Act Section 202(c) – CenterPoint Energy Houston Electric, August 2020*, DEP'T OF ENERGY (Aug. 28, 2020), https://www.energy.gov/oe/articles/federal-power-act-section-202c-centerpoint-energy-houston-electric-august-2020 [https://perma.cc/QP6F-X5EK] (listing documents relevant to CenterPoint Energy Houston Electric's § 202(c) order).

[356] *See PJM & Dominion 2017*, *supra* note 308 (listing documents relevant to Dominion Energy and PJM's § 202(c) order, including a series of requests from Dominion Energy Virginia and PJM).

[357] *See* Off. of Elec., *Federal Power Act Section 202(c) – Grand River Dam Authority, April 2017*, DEP'T OF ENERGY (Apr. 14, 2017), https://www.energy.gov/oe/articles/federal-power-act-section-202c-grand-river-dam-authority-april-2017 [https://perma.cc/BJ4B-JZG3] (listing documents relevant to Grand River Dam Authority's § 202(c) order).

[358] 202(c) Usage Email, *supra* note 216 ("Order 202-17-1 GRDA – Was Not Used, [email notification July 20, 2017]" (alteration in original)).

[359] *See DOE Use of FPA Emergency Authority Archive*, *supra* note 99 (listing the Department of Energy's use of § 202(c) from 2000 to 2020, including the September 2008 order issued for CenterPoint Energy Houston Electric).

[360] *See* Off. of Elec., *Federal Power Act Section 202(c) - Hurricane Rita, September 2005*, DEP'T OF ENERGY (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-hurricane-rita-september-2005 [https://perma.cc/V7AM-Y89U] (listing documents relevant to CenterPoint Energy Houston Electric's § 202(c) orders).

Ordered entity	Start month	Emergency	Pollution limits waived	Length	Extensions?	Action ordered	NEPA SEA prepared?	Permit limits breached?
TXU Electric[361]	Sept. 2005	Hurricanes Katrina and Rita	None	2 days	No	Non-jurisdictional interconnection	No	N/a
Mirant Corp.[362]	Dec. 2005	Generation unit closure	None	18 months	Yes	Generation	Yes	Yes
Cross Sound Cable Co.[363]	Aug. 2003	Widespread blackouts in New England	None	9 months	Yes	Transmission	No	N/a
Cross Sound Cable Co.[364]	Aug. 2002	Energy shortage on Long Island	None	1.5 months	No	Transmission	No	N/a
California ISO[365]	Dec. 2000	Electricity and natural gas market crisis	None	1.5 months	Yes	Generation	No	N/a

[361] *See id.* (listing documents relevant to TXU Electric's § 202(c) order).

[362] *See* Off. of Elec., *Federal Power Act Section 202(c) - Mirant Corporation, August 2005*, DEP'T OF ENERGY (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-mirant-corporation-august-2005 [https://perma.cc/MX6Z-Q9VQ] (listing documents relevant to Mirant Corp.'s § 202(c) orders).

[363] *See* Off. of Elec., *Federal Power Act Section 202(c) - Cross-Sound Cable Company, August 2003*, DEP'T OF ENERGY (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-cross-sound-cable-company-august-2003 [https://perma.cc/C4F3-Q4V5] (listing documents relevant to Cross Sound Cable Co.'s § 202(c) orders).

[364] *See* Off. of Elec., *Federal Power Act Section 202(c) - Cross-Sound Cable Company, August 2002*, DEP'T OF ENERGY (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-cross-sound-cable-company-august-2002 [https://perma.cc/V7EG-67KD] (listing documents relevant to Cross Sound Cable Co.'s § 202(c) orders).

[365] *See* Off. of Elec., *supra* note 106 (listing documents relevant to CAISO's § 202(c) orders); Notice of Issuance of Emergency Orders Under Section 202(c) of the Federal Power Act, 65 Fed. Reg. 82989 (Dec. 29, 2000) (reprinting CAISO emergency orders).

Table 2: All § 202(c) emergencies before dissolution of the Federal Power Commission[366]

Ordered entity	Date	Emergency	Length	Extension?	Action ordered
Cleveland Electric Illuminating Co.[367]	March 1972	Possibility of shortages in an isolated electrical system without external interconnection.	Indefinite	No	Interconnection
Kentucky Utilities Co.[368]	August 1967	Possibility of shortages in an isolated electrical system without external interconnection.	Indefinite	No	Interconnection
Georgia Power Co.[369]	April 1966	Inadequate generating facilities under isolated operation.	Five years and nine months	No	Interconnection
Commonwealth Edison Co. and Wisconsin Electric Power Co.[370]	August 1956	Shortage of reserve generating capacity.	Four months	Yes	Interconnection

[366] This table includes all § 202(c) orders issued by the Federal Power Commission and published in the *Federal Power Commission Reports* (initially titled *Opinions and Decisions of the Federal Power Commission*). According to an archivist from the National Archives and Records Administration, all Federal Power Commission orders in the National Archives appear to have been published in the *Reporter*. *See* E-mail from Gene Morris, Archives II Textual Reference Branch, Nat'l Archives & Recs. Admin., to author (Mar. 13, 2024, 3:30 PM) (on file with author).

> This is in response to your request for information about Record Group (RG) 138, Records of the Federal Energy Regulatory Commission (FERC)[.] Specifically, you are interested in the records of the Federal Power Commission (FPC) relating to orders issued by the FPC between 1935 and 1977. We identified four series in RG 138 that have orders within them. . . . Everything in them appears to be published sources. The first two entries consist entirely of bound volumes of FPC reports. Based on our review of the last two entries, any orders that appear here are from published sources.

So, all § 202(c) orders issued by the FPC should appear in the *Reports*.

I identified § 202(c) orders by reviewing the indexes in the *Reports*. Volumes 1 through 41 of the *Reports* include both a "Table of Statutes Cited," which lists all statutory citations in the volume, and an "Index-Digest," which includes brief summaries of orders organized by topic. For volumes 1 through 41, I reviewed all orders that the statutory citation index identified as having cited § 202 or § 202(c). I also reviewed the Index-Digest for entries that mentioned § 202(c) or that included the word "emergency." The remaining volumes, volumes 42 through 59, did not include a statutory citations index. For those volumes, I reviewed the Index-Digest for entries that mentioned § 202(c) or that included the word "emergency." To ensure that no citations in volumes 42 through 59 slipped through the cracks, I also reviewed the results for the search term "(("202 (c)" OR "202(c)" OR "824a (c)" OR "824a(c)")) AND (volshortname:fpowco)" in the U.S. Federal Agency Documents, Decisions, and Appeals database in HeinOnline.

[367] *See* City of Cleveland v. Cleveland Elec. Illuminating Co., 47 F.P.C. 747, 749–50 (1972); City of Cleveland v. Cleveland Elec. Illuminating Co., 49 F.P.C. 118, 124–25, 136 (1973) (modifying order); City of Cleveland v. Cleveland Elec. Illuminating Co., 49 F.P.C. 631, 633 (1973) (denying rehearing and stay).

[368] *See* City of Paris v. Ky. Utils. Co., 38 F.P.C. 269, 290–92 (1967).

[369] *See* Crisp Cnty. Power Comm'n v. Ga. Power Co., 35 F.P.C. 629, 630–31 (1966); Ga. Power Co., 36 F.P.C. 949, 950 (1966) (supplemental order); Crisp Cnty. Power Comm'n v. Ga. Power Co., 47 F.P.C. 137, 138 (1972) (terminating proceeding based on a settlement).

[370] *See* Commonwealth Edison Co., 16 F.P.C. 823, 824 (1956); Commonwealth Edison Co., 16 F.P.C. 999, 999–1000 (1956) (extending order); Commonwealth Edison Co., 16 F.P.C. 1145, 1150 (1956) (dismissing joint application to establish permanent connection for emergency use only).

Ordered entity	Date	Emergency	Length	Extension?	Action ordered
Commonwealth Edison Co.; Wisconsin Electric Power Co.; and Public Service Co. of Northern Illinois[371]	November 1951	Increased demand from heavy concentration of defense industries; limits on construction of new transmission and generation facilities.	Four years and nine months	No	Interconnection
Texas Electric Service Co.; Texas Power & Light Co.; Dallas Power & Light Co.; Community Public Service Co.; and Southwestern Electric Service Co.[372]	April 1948	Increase in demand; shortage of electric facilities; decreased rainfall; in one extension order, the Korean War Presidential emergency declaration.	Four years and eight months	Yes	Interconnection
Puget Sound Power & Light Co.[373]	January 1947	Sudden increase in demand since the return to peacetime activity.	Eight years	No	Interconnection
Dairyland Power Cooperative and Northern States Power Co.[374]	February 1943	Existence of a state of war.	Indefinite	No	Generation and transmission
Bonneville Power Administration and Washington Water Power Co.[375]	February 1943	Existence of a state of war.	Duration of emergency plus 90 days after cessation of hostilities	No	Transmission and delivery
Connecticut Light & Power Co.[376]	November 1942	Existence of a state of war; increase in demand for and shortage of electricity.	Duration of emergency plus 90 days after cessation of hostilities	No	Interconnection
Idaho Power Co. and Malheur Cooperative Electric Ass'n[377]	July 1942	Existence of a state of war; increase in demand for and shortage of electricity.	Indefinite	No	Interconnection and delivery
Florida Power & Light Co. and Clay Electric Cooperative Ass'n, Inc.[378]	May 1942; order expanded December 1942	Existence of a state of war; increase in demand for and shortage of electricity.	Duration of emergency; terminated after twelve years	No	Interconnection
Florida Power Corp. and City of Gainesville, Fla.[379]	May 1942	Existence of a state of war; increase in demand for and shortage of electricity.	Duration of emergency; terminated after twelve years	No	Interconnection
Florida Power & Light Co. and City of Jacksonville, Fla.[380]	May 1942	Existence of a state of war; increase in demand for and shortage of electricity.	Duration of emergency; terminated after twelve years	No	Interconnection

[371] *See* Commonwealth Edison Co., 10 F.P.C. 1506 (1951); Commonwealth Edison Co., 16 F.P.C. 823, 824 (1956) (modifying order based on a different emergency from original order).

[372] *See* Tex. Elec. Serv. Co., 7 F.P.C. 574, 575 (1948); Tex. Elec. Serv. Co., 8 F.P.C. 679, 680 (1949) (extending order); Tex. Elec. Serv. Co., 9 F.P.C. 1373, 1374 (1950) (extending order based on Korean War Presidential emergency declaration).

[373] *See* Puget Sound Power & Light Co., 6 F.P.C. 320, 320 (1947); Puget Sound Power & Light Co., 14 F.P.C. 621, 622 (1955) (terminating emergency authorization).

[374] *See* Dairyland Power Coop., 3 F.P.C. 934, 934–35 (1943).

[375] *See* Bonneville Power Admin., 3 F.P.C. 920, 921–22 (1943); Bonneville Power Admin., 3 F.P.C. 954, 954 (1943) (ordering hearing); Bonneville Power Admin., 4 F.P.C. 410, 410 (1943) (rescinding original order).

[376] *See* Conn. Light & Power Co., 3 F.P.C. 869, 870–71 (1942).

[377] *See* Idaho Power Co., 3 F.P.C. 750, 750 (1942).

[378] *See* Fla. Power & Light Co., 3 F.P.C. 715, 715–16 (1942); Fla. Power & Light Co., 3 F.P.C. 872, 873 (1942) (amending order); Fla. Power & Light Co., 13 F.P.C. 1231, 1231 (1954) (terminating several prior orders).

[379] *See* Fla. Power Corp., 3 F.P.C. 714, 714–15 (1942); *Fla. Power & Light Co.*, 13 F.P.C. at 1231 (terminating several prior orders)..

[380] *See* Fla. Power & Light Co., 3 F.P.C. 712, 712–13 (1942); *Fla. Power & Light Co.*, 13 F.P.C. at 1231 (terminating several prior orders)..

Ordered entity	Date	Emergency	Length	Extension?	Action ordered
Virginia Public Service Co.; Potomac Electric Power Co.; and Braddock Light & Power Co., Inc.[381]	December 1941	Sudden and constantly increasing demand for electricity.	Indefinite	No	Interconnection and delivery
South Carolina Power Co.; Georgia Power Co., Alabama Power Co.; Mississippi Power Co.; Gulf Power Co.; and South Carolina Electric & Gas Co.[382]	November 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Transmission and delivery
Duke Power Co.[383]	October 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Delivery
Niagara Falls Power Co.[384]	September 1941	Urgent need for 25-cycle electric energy to supply essential defense industries.	Indefinite	Yes	License amendment to authorize additional water diversion
Gulf Power Co.; Florida Power Corporation; and Alabama Power Co.[385]	August 1941	Increase in demand for electricity caused by need for national defense production.	One month	No	Interconnection
Carolina Aluminum Co.[386]	June 1941[387]	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Generation and delivery
Tennessee Valley Authority and Cincinnati Gas & Electric Co.[388]	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Recommendation only
Alabama Electric Cooperative; Florida Power Corporation; and Alabama Power Co.[389]	June 1941	Increase in demand for electricity caused by need for national defense production.	Three months	No	Interconnection
Georgia Power & Light Company; Florida Power Corporation; and Georgia Power Co.[390]	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Interconnection
Florida Power Corporation and Florida Power & Light Co.[391]	June 1941	Increase in demand for electricity caused by need for national defense production.	Thirteen years and one month	No	Interconnection
Georgia Power & Light Co. and Georgia Power Co.[392]	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Interconnection
New Orleans Public Service, Inc.; Mississippi Power Co.; and Louisiana Power &	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Interconnection

[381] *See* Va. Pub. Serv. Co., 2 F.P.C. 1095, 1095–96 (1941).

[382] *See* S.C. Power Co., 2 F.P.C. 1060, 1060–61 (1941).

[383] *See* Duke Power Co., 2 F.P.C. 1055, 1055–56 (1941).

[384] *See* Niagara Falls Power Co., 2 F.P.C. 461, 462–64 (1941); Niagara Falls Power Co., 3 F.P.C. 659, 660 (1942) (amending order); Niagara Falls Power Co., 3 FPC 820, 820 (1942) (extending order).

[385] *See* Gulf Power Co., 2 F.P.C. 1021, 1021–22 (1941); Ala. Elec. Coop., 2 F.P.C. 1026, 1026 (1941) (rescinding order).

[386] *See* Carolina Aluminum Co., 2 F.P.C. 998, 998–99 (1941).

[387] The Federal Power Commission issued ten separate § 202(c) orders on June 27, 1941. However, all ten orders were pursuant to a single emergency, declared in a separate order that did not itself order any entities. *See* Recommendation for the Curtailment of the Use of Elec. Energy in the Se. States, 2 F.P.C. 990, 990–91 (1941).

[388] *See* Tenn. Valley Auth., 2 F.P.C. 997, 997–98 (1941).

[389] *See* Ala. Elec. Coop., 2 F.P.C. 996, 996–97 (1941); *Ala. Elec. Coop.*, 2 F.P.C. at 1026 (rescinding order).

[390] *See* Ga. Power & Light Co., 2 F.P.C. 995, 995–96 (1941); Ga. Power & Light Co., 2 F.P.C. 1059, 1059–60 (1941) (amending order).

[391] *See* Fla. Power Corp., 2 F.P.C. 994, 994–95 (1941); Fla. Power Corp., 13 F.P.C. 1231, 1231 (1954) (terminating several prior orders).

[392] *See* Ga. Power & Light Co., 2 F.P.C. 993, 993–94 (1941); *Ga. Power & Light Co.*, 2 F.P.C. at 1059–60 (amending order).

Ordered entity	Date	Emergency	Length	Extension?	Action ordered
Light Co.[393]					
Duke Power Co. and Carolina Aluminum Co.[394]	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Interconnection
Florida Power & Light Co. and Florida Public Service Co.[395]	June 1941	Increase in demand for electricity caused by need for national defense production.	Thirteen years and one month	No	Interconnection
None—emergency declaration only[396]	June 1941	Increase in demand for electricity caused by need for national defense production.	Indefinite	No	Recommendation only

[393] *See* New Orleans Pub. Serv., Inc., 2 F.P.C. 992, 992–93 (1941).

[394] *See* Duke Power Co., 2 F.P.C. 992, 992 (1941).

[395] *See* Fla. Power & Light Co., 2 F.P.C. 991, 991 (1941); *Fla. Power & Light Co.*, 13 F.P.C. at 1231 (terminating several prior orders).

[396] *See* Recommendation for the Curtailment of the Use of Elec. Energy in the Se. States, 2 F.P.C. 990, 990–91 (1941).

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 34

DOE ORDER NO. 202-05-3

United States of America
Department of Energy

District of Columbia Public Service Commission) Docket No. EO-05-01

Order No. 202-05-3

I. Summary

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, a shortage of facilities for the transmission of electric energy and other causes, and that issuance of this order will meet the emergency and serve the public interest. Therefore, Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), are hereby ordered to generate electricity at their Potomac River Generating Station (the "Plant") pursuant to the terms of this order.

II. Procedural History

On August 19, 2005, Mirant submitted to the Virginia Department of Environmental Quality (DEQ) a computerized emissions modeling study Mirant had conducted of its Plant that indicated that emissions from the Plant caused or contributed to significant localized exceedances of the National Ambient Air Quality Standards (NAAQS).[1] Also on August 19, 2005, DEQ issued a letter to Mirant which requested "that Mirant *immediately* undertake such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station, including the potential reduction of levels of operation, or potential shut down of the facility." (emphasis in original). The letter asked Mirant to provide DEQ with a summary of the actions taken and the progress toward eliminating NAAQS exceedances by August 24, 2005. At midnight on August 21, 2005, Mirant reduced production of all units at the Plant to their minimum load, and at midnight on August 24, 2005, Mirant shut down all five of the generating units at the Plant.

On August 24, 2005, the District of Columbia Public Service Commission (DCPSC) filed an *Emergency Petition and Complaint* with both the United States Department of Energy (DOE or Department) and the Federal Energy Regulatory Commission (FERC or Commission) pursuant to the FPA. The DCPSC requested the Secretary of Energy to find that an emergency exists under section 202(c) of the FPA and to issue an order directing Mirant to continue

[1] The Clean Air Act, 42 U.S.C. § 7401 *et seq.*, authorizes the United States Environmental Protection Agency (EPA) to establish NAAQS, 42 U.S.C. §§ 7408-7409, and states that it is the responsibility of the states and local governments for assuring that they are attained, 42 U.S.C. §§ 7401(a)(3) and 7416.

operation of the Plant. The basis for the petition was that the shutdown of the Plant "...will have a drastic and potentially immediate effect on the electric reliability in the greater Washington, D.C., area and could expose hundreds of thousands of consumers, agencies of the Federal Government and critical federal infrastructure to curtailments of electric service, load shedding and, potentially, blackouts." The DCPSC requested that the Commission issue a similar order under sections 207 and 309 of the FPA. Numerous parties filed interventions and comments in response to DCPSC's emergency petition, as well as subsequent comments and responses.[2] Further, both FERC and DOE issued information requests to Mirant, the Potomac Electric Power Company (PEPCO), the company responsible for supplying electricity to retail customers in the District of Columbia, and PJM Interconnection, LLC (PJM), the grid operator responsible for the administration of the bulk power grid and electricity market in the region.[3] In addition to the DCPSC petition proceedings, DOE has hosted and participated in numerous conference calls and meetings to gather information on the shutdown of the Plant and its effect on the reliability of D.C.'s electricity system.[4]

III. Background

The coal-fired Mirant Plant, which began operation in 1949, is located in Alexandria, Virginia, and is capable of producing 482 megawatts of electricity primarily for delivery to Washington, D.C. The Plant consists of five generating units, two of which are cycling units that range in output from 35 MW to 88 MW, and three of which are baseload units that range in output from 35 MW to 102 MW. It is one of only three sources of electricity that serve the central business district of the District of Columbia, many federal institutions, the Georgetown area in D.C., as well as other portions of Northwest, D.C., and the District of Columbia Water and Sewer Authority's Blue Plains Advanced Water Treatment Plant, the largest wastewater

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[2] Several of these filings were only made in the FERC docket and not in DOE's docket. Even though a number of filers did not submit their comments in the DOE docket, the Department has, in the interest of rendering an appropriate and fully informed determination, reviewed all the filings in the FERC docket for any pertinent facts that will assist the Department in making its decision. Also, to the extent the filings contained analysis or legal arguments pertaining to the Department's 202(c) authority, they have been considered in the Department's decision making process.

[3] The data submitted contained Critical Energy Infrastructure Information and was submitted in both confidential and redacted versions, as defined in FERC's rules at 18 C.F.R. § 388.13. All information contained in this order is from public filings in the DOE and FERC dockets.

[4] The Administrative Procedure Act's prohibitions on ex parte communications in an adjudicatory proceeding, 5 U.S.C. § 557(d)(1), do not apply to DOE's 202(c) proceedings, because section 202(c) explicitly authorizes the Department to issue a 202(c) order "either upon its own motion or upon complaint, with or without notice, hearing, or report. . ." 16 U.S.C. § 824a(c).

treatment plant in the world.[5] The other two sources are two 230 kV lines that deliver electricity from other generating sources in the regional electric grid operated by PJM. Although there are other generating units in close physical proximity to the Central D.C. area, (e.g., the Benning Road and Buzzard Point generating facilities, which are dual-fueled oil and natural gas generating power plants, owned by PEPCO) there are no transmission lines that would allow delivery of power from these other units to reach the Central D.C. area. With regard to the sources of power that serve the Central D.C. area, PEPCO owns and operates the transmission lines, and PJM determines electricity demand.

Although Mirant shut down all of the Plant's generating units on August 24, 2005, it has since restarted unit number one which, the Department understands, is currently operating. Mirant is operating the unit on an 8/8/8 basis --- that is, in any given twenty-four hour period, the unit runs for eight hours at its maximum level of 88 MW, eight hours at its minimum level of 35 MW, and has eight hours when it does not run. DOE has been informed that both EPA and DEQ acknowledge that the operation of this unit in this manner does not result in any NAAQS exceedances. In addition, DOE understands that Mirant is taking other steps to increase production at the Plant in a manner which will be acceptable to DEQ and EPA.

PEPCO has applied to the DCPSC to construct two new 230 kV lines that would supply electricity to the Central D.C. area. In the same application, PEPCO has proposed building two new 69kV lines to supply the Blue Plains wastewater treatment plant. PEPCO proposes having the two 69 kV lines installed by the summer 2006 peak season, and the two 230 kV lines installed in 18 to 24 months. The two existing 230 kV lines that supply the Central D.C. area would need to be temporarily taken out of service sequentially in order to connect the new lines to the Central D.C. area. Once completed, these lines apparently would provide a high level of electric reliability in the Central D.C. area, even in the absence of production from the Plant.

IV. Discussion

A. Reliability Issues

The Department has conducted an independent analysis of the electricity reliability situation in the Central D.C. area and has analyzed the Plant's role in ensuring a sufficiently reliable supply of electricity to that area. DOE's analysis was conducted by the Department's Oak Ridge National Laboratory. Under North American Electric Reliability Council standards, at a minimum, the power system must carry at least enough contingency reserves of electricity to cover the most severe single contingency. The standards require that an area's system always be operated with sufficient reserves to compensate for the sudden failure of the area's most important single generator or transmission line.

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[5] For purposes of this order, the area supplied with electricity by these three sources will be referred to as the "Central D.C. area," and the retail customers in this area will be referred to as the "Central D.C. area customers."

Based on the fact that the Central D.C. area has only three sources of supply, the Plant and the two 230 kV transmission lines, the Department's analysis concludes that in order to maintain a minimally reliable electric power system, the Plant must be available to run when one of the 230 kV lines is out of service, because if the remaining line failed there would be no other source of electricity to serve the Central D.C. area load. In addition, the analysis concludes that if one of the 230 kV lines failed unexpectedly, enough generation must be started as rapidly as possible so as to be able to serve all of the Central D.C. area load as a contingency reserve in the event the other line were to fail. The analysis also indicates that the Plant should be operated in such a way as to minimize the amount of time needed to bring it into production.

PEPCO has asserted that:

> Absent the generating capacity of the Plant, if the two 230 kV transmission circuits into the [Central D.C. area] fail, there will be a blackout in much of the District of Columbia until the circuits are repaired or the Plant's generators are restarted and can operate at a level that matches load. All electric customers in Georgetown, Foggy Bottom and major portions of downtown Washington will be affected. The affected customers will also include Blue Plains wastewater treatment plant. It is PEPCO's understanding that within 24 hours of the loss of electric supply, Blue Plains will have no option but to release untreated sewage directly into the Potomac River, which would result in a significant adverse impact to human health, aquatic wildlife and other environmental resources. Affected customers will also include numerous hospitals, schools, universities, commercial buildings, and residential customers. Importantly, numerous federal facilities will lose power, including those critical to the security, safety, and welfare of the whole country, such as the FBI, the Justice Department, the State Department, the Federal Emergency Management Agency, the Department of the Interior, and the Department of Energy to name but a few.[6]

No commenter has disputed these statements by PEPCO, and they have been generally corroborated by DOE's own independent analysis; therefore, DOE will accept them as correct statements of fact. Further, the 230 kV lines do go out of service on occasion; since 2000, there have been 34 one-line outages for maintenance, and seven occasions where one of the lines has tripped unexpectedly. DOE has been informed that, prior to 2000, there were two occasions when both of the lines failed simultaneously.

B. Environmental Issues

Some commenters have asserted that the renewed operation of the Plant would result in NAAQS exceedances and a violation of the Clean Air Act, and that DOE could not issue a 202(c) order which would contravene the Clean Air Act (42 U.S.C. §§ 7401-7626). In response to this assertion, DCPSC, PEPCO and PJM contend that there were no actual monitored

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[6] *See* Potomac Electric Power Company's Leave to Answer and Answer to Comments, FERC Docket No. EL05-145-000 at pages 2 & 3 (September 9, 2005).

exceedances of the NAAQS at the Plant during operation, and that operation of the plant at full power does not exceed the emissions limits contained in the Plant's operating permit and therefore the operation of the Plant pursuant to a DOE order would not violate the Clean Air Act. EPA has shared information with DOE regarding NAAQS modeled results and other environmental issues at the Plant. In response to the environmental concerns raised, this order seeks to minimize, to the extent reasonable, any adverse environmental impacts. Should EPA issue a compliance order directed to operation of the Plant, DOE will consider whether and how this order should conformed to such order.

Another assertion raised is that DOE cannot issue an order without complying with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.* Responders to that assertion stated that NEPA review requirements do not apply because any order would merely require the Plant to operate in the manner and at the level it has historically operated, and thus is not a "major federal action" triggering NEPA. In addition, responders assert that "...the emergency nature of the relief sought in this case permits the [the Secretary] to act without conducting a NEPA analysis, even if it were required."[7] DOE has determined that the emergency circumstances here make it necessary to take action without performing a NEPA analysis. Indeed, in order for an order under FPA section 202(c) to be issued at all, the Secretary of Energy must determine that an emergency exists, and I have made that determination here. DOE has consulted with CEQ about alternative arrangements pursuant to 40 C.F.R. § 1506.11.

C. Other Issues

Commenters opposed to the issuance of a FPA section 202(c) order cited *Richmond Power & Light v. FERC*, 574 F. 2d 610 (D.C. Cir. 1978) as imposing a limit on the Secretary's authority to make an emergency finding under section 202(c). In *Richmond*, the New England Power Pool (NEPOOL) petitioned the Federal Power Commission (the Secretary's predecessor in exercising section 202(c) authority) for an order pursuant to FPA section 202(c) to have utilities east of the Mississippi River with excess electric generating capacity supply NEPOOL with that excess capacity. The request was based on fears of an oil shortage due to the 1973 Arab oil embargo. The Commission responded by holding a conference and a series of meetings which resulted in an agreement among the purchasing, transmitting and supplying utilities and participating state regulatory commissions. As a result of the agreement, NEPOOL moved to withdraw its petition, which the Commission allowed. Richmond Power & Light Company challenged the decision to allow the withdrawal and the court found that the Commission did not abuse its discretion in declining to issue an order under section 202(c), but rather settling on the temporary-voluntary agreement program reached by the interested parties. Instead of limiting its

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[7] District of Columbia Public Service Commission Answer to Motion of the Virginia Department of Environmental Quality at page 24 (October 26, 2005), FERC Docket No. EL05-145-000. *See also* Answer of Potomac Electric Power Company and PJM Interconnection, LLC at page 18, (October13, 2005), FERC Docket No. EL01-145-000.

reach, *Richmond* underscores the discretionary nature of the Secretary's authority under section 202(c).[8]

Another case asserted to limit the Secretary's authority to issue an order under section 202(c) was *National Fuel Gas Supply v. FERC*, 909 F2d 1519 (D.C. Cir. 1990). In that case, National Fuel applied under section 7 of the Natural Gas Act (NGA), 15 U.S.C. § 717 *et seq.*, for a certificate of public convenience and necessity to allow it to make interruptible sales of natural gas. The Commission imposed a condition that National Fuel accept a blanket transportation certificate to provide open access transportation. The court ruled that the Commission was improperly using a NGA section 7 certificate condition in place of an individual or generic proceeding under section 5 of the NGA. The Department does not see the relevance of *National Fuel* here. I am using section 202(c) of the FPA for precisely the type of situation contemplated by section 202(c) of the FPA.

V. Decision

Section 202(c) of the FPA vests in the Secretary of Energy the authority to issue an order when "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 the fuel or water for generating facilities, or other causes...." 16 U.S.C. § 824a(c). DOE's regulations acknowledge that "[e]xtended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency as contemplated by these regulations." 10 C.F.R. § 205.371.

I find that in the circumstances presented here, an emergency exists that justifies the issuance of a section 202(c) order. My determination is not based on any single factor, but on the combination of all relevant facts and circumstances. In particular, I find that an emergency exists because of the reasonable possibility an outage will occur that would cause a blackout, the number and importance of facilities and operations in our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violates applicable reliability standards.

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[8] The facts in *Richmond* and in the current situation are very different. *Richmond* dealt with a wide regional or even national energy shortage situation, while we are considering electricity reliability in a discrete geographic area. The facts here more closely resemble those considered by the Federal Power Commission in *City of Cleveland, Ohio v. Cleveland Electric Illuminating Company*, 47 FPC 747 (1972). In that case, the City of Cleveland petitioned the Commission pursuant to section 202(c) to order an interconnection with Cleveland Electric Illuminating Company to provide services during shortages caused by outages of the City of Cleveland's generating facilities, or delays getting generation on line. The Commission found that the City of Cleveland had an emergency due to periodic shortages of generating facilities caused by outages and ordered the establishment of a 69kV temporary emergency interconnection between the electric systems of the City and Cleveland Electric Illuminating. Similarly, here DOE is ordering the Plant to provide electricity in certain limited situations.

More specifically, if the Mirant plant is not available to generate electricity and one of the two transmission lines serving the Central D.C. area goes out of service, the Central D.C. area would be served by only one transmission line. Should that remaining line fail for any reason, a blackout would occur in the Central D.C. area, potentially for an extended period of time. In fact, if one or both of the transmission lines could not be brought back into service immediately and the only source of energy for the Central D.C. area was the Mirant Plant, in the absence of today's order it would take several hours at a minimum to bring the Plant into full operation.

The outage of one of these two lines is not merely a theortetical possibility. On Friday, December 16, 2005, PJM informed DOE that on the previous night, "one of the two circuits critical to providing service to the District tripped. Continued [electric] service to certain load within the District was at that time entirely dependent on the remaining circuit." As a result, PJM requested dispatch of a second generating unit at the Plant, but Mirant refused to do so. PJM informed DOE that "service was not interrupted because load was low and the remaining circuit performed without incident." Fortunately, full service to the line that had tripped was restored by the morning of December 16. Nonetheless, there can be no assurance that the Central D.C. area will be so lucky next time, either with respect to the timing of the event, the operation of the second transmission line, or the ability to bring the first transmission line back into service.

Furthermore, it is periodically necessary for an outage to occur on one of the transmission lines because of the need to perform maintenance. In fact, maintenance is scheduled on one of the lines in the next few weeks. Thus, as occurred on the night of December 15, 2005 and as will certainly occur again in the future, if the Mirant Plant is not made operational Central D.C. will find itself relying solely on one transmission line. The duration of an outage can range from up to several days (for maintenance) or even longer (up to weeks) if the outage of a line is due to a major equipment failure. Throughout such a period, if the Plant is not fully operational a blackout in Central D.C. is only one step away, i.e., if an event should occur that causes the second line to fail. Such a blackout could last for hours or days.

I recognize that, if past experience is any guide, the simultaneous failure or outage of both transmission lines serving the Central D.C. area is not a high probability. While this event has occurred in the past, it has not happened often. Moreover, the recent tripping of one circuit does not in itself dictate the existence of an emergency justifying issuance of a 202(c) order.

The facilities and functions that would be adversely affected by an extended blackout in this instance, however, is an important consideration. The Central D.C. area includes offices, facilities and operations involved in all three branches of government, and that are critically important to the Nation's national security, law enforcement and regulatory functions. The Central D.C. area also includes hundreds of thousands of residents and workers, and all manner of public safety and protection facilities, including hospitals, police, and fire facilities. Moreover, DOE has been informed that within 24 hours of a blackout in the Central D.C. area, untreated sewage from the Blue Plains Wastewater Treatment plant would be discharged into the Potomac River.

Finally, it is noteworthy that a blackout in the Central D.C. area not only would affect critically important facilities and operations, it could last for an extended period. Depending on the reason for the outage of the transmission lines, the lack of service on those lines accompanied by the lack of generation by the Plant could result in a large portion of the District of Columbia being without electricity for a period that could last hours or days. At the very least, if the two transmission lines were made unavailable with no advance notice and the only source of electricity for the Central D.C. area was the Mirant plant, in the absence of today's order DOE understands it would take at least 28 hours, and likely longer, to bring the Plant into full operation, during which time all or a substantial part of the Central D.C. area would be without electric power The results would be hardship and physical risk to hundreds of thousands of persons from loss of heat, elevator outages, medical equipment failure and numerous other causes. In addition, critical portions of the nation's government would also be severely impacted, with resulting adverse effects on a national scale.

Of course, the fact that the Department did not act immediately on the DCPCS petition does not argue against my finding that an emergency currently exists. After the petition was filed, DOE took several weeks to gather the relevant information, consider the facts, talk with environmental regulatory authorities, and develop an order that balanced the appropriate considerations. As explained in the text of this order, the current facts fully justify my finding that an emergency exists and that this order will meet that emergency. There certainly is nothing in the Federal Power Act that requires me to wait until a blackout actually has occurred, lives are put in jeopardy, and a significant disruption of National government functions already has happened before exercising my section 202(c) authority.

Accordingly, and based on all of the facts and circumstances, I find that an emergency exists justifying the issuance of this order under Federal Power Act section 202(c).

After finding the existence of an emergency, DOE has the authority, "either upon its own motion or upon complaint, with or without notice, hearing, or report, to order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest." 16 U.S.C. § 824a(c). The statute gives the Secretary of Energy broad discretion to fashion the terms of an order that will, in the Secretary's judgment, "best meet the emergency and serve the public interest." Based on the circumstances described above in this order, I hereby direct Mirant to generate electricity at the Plant pursuant to the terms of this order.

While I am issuing this order to help ensure a reliable supply of electric energy to the Central D.C. area, I am cognizant of the concerns that have been expressed concerning the potential adverse environmental consequences of operating the Plant, and of the national interest in attainment of the NAAQS that have been established under the Clean Air Act. Ordering action that may result in even local exceedances of the NAAQS is not a step to be taken lightly. However, it would not be reasonable for the Department of Energy to stand by and take no positive action on the DCPSC petition, even though the Central D.C. area is in danger of an extended blackout and the Department and private parties have available to them the legal and operational tools to prevent such a blackout from occurring. In this order, I have sought to harmonize those interests to the extent reasonable and feasible by ordering Mirant to operate in a

manner that provides reasonable electric reliability, but that also minimizes any adverse environmental consequences from operation of the Plant.

DOE expects that the DCPSC, having sought an emergency order, will take such actions as are within its authority to provide adequate and reliable electric service for the Central D.C. area including, for example, expediting approval of PEPCO transmission system upgrades and instituting demand response programs.[9] Indeed, DOE views this order not as a permanent solution to the Central D.C. area's reliability issues, but rather as a bridge between the current untenable situation and a more permanent solution that must be crafted by appropriate parties, including the DCPCS, FERC, environmental regulatory authorities, and relevant private sector parties. This permanent solution may include the installation of the new transmission lines discussed above, the installation of new pollution control equipment at the Mirant Plant, or other means.

As explained above, in the event that one of the two transmission lines that serve the Central D.C. area is out of service (due either to a necessary planned outage or to unforeseen events) and sufficient electricity from the Mirant power plant were not available, then the Central D.C. area would experience an immediate blackout should the one remaining source of electricity fail. This situation must be avoided, and ordering paragraph A of this order ensures that this situation will be avoided. When an outage is planned, Mirant is to be given advance notice and is required to supply necessary generation throughout the period of the outage.[10] In the event of an unexpected outage, Mirant must provide such generation as soon as possible. In the very unlikely eventuality of both transmission lines failing at the same time, Mirant is required to provide sufficient generation to supply the electrical demands of the affected area as soon as possible.

It is essential to determine the level of operation and other steps that will enable Mirant to rapidly respond to an unplanned transmission line outage. Some commenters have urged the Department to order the Plant to run continuously, even if doing so causes ongoing exceedances of the NAAQS. This would assure a high level of reliability of the electricity supply, but of course would not be tailored to particular circumstances in which operation of the Plant would be most necessary to provide needed reliability for the Central D.C. area and might also cause local air quality concerns. Other commenters have urged the Department to do nothing.

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[9] Demand response programs prompt electricity customers to reduce demand, especially during periods of short supply.

[10] In making certain portions of this order effective only upon notice to Mirant by PEPCO of a planned or unplanned outage of one or both of the 230 kV lines, it is similar to the FPA section 202(c) orders issued during the 2000/2001 California energy crisis. In those, DOE ordered certain entities to generate, deliver, interchange and transmit electricity to the California Independent System Operator (California ISO), but the entities were not required to deliver energy or services unless the California ISO had filed with DOE a certificate that it had been unable to acquire adequate supplies of electricity in the market. *See* Order pursuant to Section 202(c) of the Federal Power Act (December 14, 2000); Order Pursuant to Section 202(c) of the Federal Power Act (January 11, 2001).

The Department is not prepared to order actions that could cause more localized NAAQS exceedances than are necessary in order to assure adequate electric reliability for the Central D.C. area. At the same time, the Department should address the risks that delays in responding to an unplanned transmission line outage would present if measures are available to mitigate that risk. In my judgment, the appropriate balance is struck by (1) requiring Mirant to keep as many units in operation, and take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electrical reliability, as feasible (as further defined in the ordering paragraphs below). Thus, Mirant must take actions to reduce the time it takes to respond to an unplanned outage. This will serve to reduce the risk of a blackout but not at the price of unnecessary exceedances of health-based NAAQS. As Mirant improves its environmental performance, in cooperation with environmental regulators, its ability to react to an unforeseen outage also will improve. Environmental regulators and Mirant can work together, with the Department, to reduce, and perhaps eliminate, any conflict between environmental goals and electric reliability.

This order is effective immediately and will terminate at 12:01 a.m. October 1, 2006. This order may be modified or extended at any time upon order of the Secretary of Energy.

VI. Ordering Paragraphs

For the reasons set forth above, pursuant to section 202(c) of the Federal Power Act, it is hereby ordered that:

A. During any period in which one or both of the 230kV lines serving the Central D.C. area is out of service, whether planned or unplanned, Mirant will operate the Potomac River Generating Plant to produce the amount of power (up to its full capacity) needed to meet demand in the Central D.C. area as specified by PJM for the duration of the outage.

In the event of a planned outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand.

In the event of an unplanned 230 kV line outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand as soon as possible.

When producing electricity pursuant to this paragraph, Mirant shall utilize pollution control equipment and measures to the maximum extent possible to minimize the magnitude and duration of any exceedance of the NAAQS.

B. Mirant shall keep as many units in operation, and shall take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electricity reliability, as "feasible." For purposes of this paragraph, "feasible" means as determined by the Department of Energy, after consideration of the plan submitted by Mirant pursuant to paragraph D of this order and after consultation with the Environmental Protection Agency, without regard to cost and without causing or significantly contributing to any exceedance of the NAAQS.

C. Notice

In instances of scheduled outages of one of the 230kV lines, PEPCO will give advance notice of the planned outage and the estimated duration of such outage to Mirant, PJM, DOE, FERC, EPA, and DEQ. The notice must be sufficiently in advance of the outage to allow Mirant to bring the required amount of generation needed for reliability purposes on line by the time the outage is scheduled. PEPCO will ensure that only those planned outages needed to maintain or enhance the reliability of the 230 kV lines (or to install new lines) are scheduled and that such outages are scheduled to minimize the environmental effects of the operation of the Plant.

PEPCO will notify DOE, PJM, FERC, EPA, and DEQ of any unplanned outage of one or both of the 230 kV lines as soon as possible, but in no event later than two hours after informing Mirant.

In the event of either a planned or unplanned outage, PJM will specify the amount of electricity that Mirant must provide in order to meet demand.

D. Mirant shall submit a plan to DOE, within 10 days of the date of this order, detailing the steps it will take to ensure compliance with this order. This compliance plan shall include, at minimum, information regarding adequate staffing, materials, and supplies; emissions controls; and length of time necessary to start-up the Plant's generating units in the event of an unplanned or planned outage. DOE will review the compliance plan and order additional requirements if necessary.

E. Pursuant to the terms of FPA section 202(c) and DOE regulations at 10 C.F.R. § 205.376, Mirant and its customers should agree to mutually satisfactory terms for any costs incurred by Mirant under this order. If no agreement can be reached, just and reasonable terms shall be established by a supplemental order.

F. DOE expects that the DCPSC will take all reasonable actions to augment electrical reliability and to reduce electricity demand in the Central D.C. area.

G. DOE will periodically reexamine the need for this order with particular emphasis on: (1) Mirant's progress, working with environmental regulators, in reducing emissions and/or the impact of emissions; and (2) whether the DCPSC is taking all reasonable actions available to it to support electricity reliability in the Central D.C. area.

H. Pursuant to section 313 of the Federal Power Act (16 U.S.C. § 8251), any person, State, municipality, or State commission that is a party to this proceeding and is aggrieved by this order may apply for a rehearing within thirty days. Requests for rehearing may be submitted by mail, facsimile, or electronic mail to the following: (1) mail should be directed to Lawrence Mansueti of the Permitting, Siting, and Analysis Division of the Office of Electricity Delivery and Energy Reliability at the United States Department of Energy, Routing Symbol OE-20, 1000

Independence Avenue, S.W., Washington, D.C. 20585; (2) facsimiles may be submitted to 202-586-5860; (3) e-mail may be submitted to Lawrence.Mansueti@hq.doe.gov.

Issued in Washington, D.C. at 1:45 PM this 20th day of December, 2005.

Samuel W. Bodman
Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 35

LETTER REQUEST OF GRAND RIVER DAM AUTHORITY

PUBLIC VERSION

April 11, 2017

The Honorable James Richard Perry
Secretary of Energy
United States Department of Energy
U.S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

Re: Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act

Dear Secretary Perry:

The Grand River Dam Authority ("GRDA"), an agency of the State of Oklahoma, hereby notifies the Department of Energy ("DOE" or "Department") of an imminent shortage of generation resources in its service area that constitutes an emergency within the meaning of Section 202(c) of the Federal Power Act ("FPA")[1] and requests that the Department invoke its emergency authority pursuant to Section 202(c) to alleviate such emergency.

This spring, because of a confluence of events that will result in the unavailability of all generation at GRDA's principal generating facility, the Grand River Energy Center ("GREC"), GRDA will face an unexpected shortage of electric generation resources to address the reactive power needs of its service area. Specifically, from April 16, 2017 to July 15, 2017 (referred to herein as the "Emergency Period"), none of the GREC's three generating units will be online due to: (i) the required closure of Unit No. 1 on April 15, 2017, pursuant to an Administrative Order issued by the Environmental Protection Agency ("EPA"); (ii) a lightning strike that seriously damaged Unit No. 2 on July 1, 2016, rendering it inoperable until August 2017; and (iii) unforeseen delays in the construction of a new generating unit (Unit No. 3) because of key supplier delays in the fabrication of essential project materials due to the August 2016 floods in Louisiana.

Without at least one of these three generating units available to generate electricity to provide reactive power needed for grid reliability during the Emergency Period, GRDA will be unable to meet the reactive power needs of its service area during any low-load, high voltage conditions that occur (hereinafter, GRDA refers to this shortage of available reactive power resources during the Emergency Period as the "Emergency"). This Emergency will require Southwest Power Pool, Inc. ("SPP"), the Reliability Coordinator for GRDA's service area, to reconfigure the transmission system to mitigate the high voltage conditions by opening high voltage transmission lines. This method to address high voltage conditions on the transmission system is not as robust an engineering solution as the ability to operate a generator to provide

[1] 16 U.S.C. § 824a(c).

ADMINISTRATION
PO Box 409, Vinita OK 74301-0409
918-256-5545, 918-256-5289 Fax

COAL-FIRED COMPLEX
PO Box 609, Chouteau OK 74337
918-824-1074, 918-825-7791 Fax

ECOSYSTEMS & EDUCATION CENTER
PO Box 70, Langley OK 74350-0070
918-782-4726, 918-782-4723 Fax

ENGINEERING & TECHNOLOGY CENTER
9933 E 16th Street, Tulsa OK 74128
918-622-2228

ENERGY CONTROL CENTER
ROBERT S. KERR DAM
PO Box 772, Locust Grove OK 74352
918-479-5249, 918-825-1935 Fax

GRDA POLICE, PO Box 70, Langley OK 74350, 918-782-4726, 918-782-4723 Fax

OKLAHOMA CITY
201 NW 63rd St. Suite 305
Oklahoma City OK 73116
405-297-9963, 405-290-7631 Fax

PENSACOLA DAM, PO Box 70, Langley OK 74350, 918-782-3382 Also Fax

SALINA PUMPED STORAGE PROJECT
PO Box 609, Salina OK 74365
918-434-5920 Also Fax

TRANSMISSION HEADQUARTERS
PO Box 1128, Pryor OK 74362
918-825-0280, 918-825-9416 Fax

dynamic reactive power control; opening a transmission line offers only a static solution that poses more reliability risk to the system and does not follow good utility practice to keep the system intact.

Accordingly, GRDA hereby submits this application pursuant to FPA § 202(c) and Subpart W of Part 205 of the Department's regulations[2] for an emergency order to provide reactive power from Unit No. 1 of the GREC from April 16, 2017 to July 15, 2017 consistent with the conditions herein, in the event that Southwest Power Pool, Inc. ("SPP") determines that such generation is needed to maintain grid reliability. As explained below, GRDA is requesting that SPP have the ability to call on Unit No. 1, which would otherwise be offline but available (using natural gas igniters if necessary), only if SPP sees a need for Unit No. 1 to run to address reliability concerns relating to overvoltage conditions.

I. BACKGROUND

GRDA is an agency of the State of Oklahoma, primarily serving public power communities in Oklahoma. Approximately 70 percent of GRDA's total electric energy is generated by the Grand River Energy Center, which is located near Chouteau, Oklahoma. GREC Units No. 1 and 2 are coal-fired generating units (with natural gas-fired igniters), with generating capacities of 490 and 520 megawatts (MW), respectively.

Due in part to EPA's Mercury and Air Toxics Standards (MATS) requirements, which would have required substantial upgrades for Unit No. 1, GRDA determined to retire Unit No. 1 and to construct a new, lower-emitting, natural gas-fired generation unit (Unit No. 3). GRDA is currently in the process of constructing Unit No. 3, which is a highly efficient 495 MW natural gas combined cycle unit. When GRDA commenced construction of Unit No. 3, it was projected to come online in May 2017. To maintain grid reliability during Unit No. 3's construction, EPA issued an Administrative Order ("AO") granting GRDA a one-year extension of the compliance deadline for Unit No. 1 to comply with EPA's MATS requirements. The AO, attached hereto as Attachment A, requires Unit No. 1 to cease operation as a coal-fired unit on April 15, 2017.[3] The AO, issued under Section 113(a)(4) of the Clean Air Act, is nonrenewable.

As GRDA's principal electric generating station, the GREC plays a critical role in meeting all aspects of GRDA's electric load and in providing ancillary services, including reactive power. In particular, Unit No. 1 has traditionally played a key role in generating reactive power to provide local voltage support in GRDA's service area, particularly when Unit No. 2 has been out of service.

In 2014, SPP on six occasions requested either additional capacitive or reactive voltage support from Unit No. 1 to address voltage problems on the transmission system. During a planned maintenance outage of GREC Unit No. 2 for the period October 15, 2014 through November 4, 2014, SPP created a Temporary Operating Guide for Unit No. 1 requiring it to be

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[2] 10 C.F.R. Part 205, Subpart W (2016).

[3] Attachment A also includes an Amendment to the AO to account for increased reliance on Unit No. 1 after the lightning strike at Unit No. 2.

available for dispatch during instances of low load and high voltage. The Operating Guide, attached as Attachment B, stated that "[d]ue to the low load and high voltage in the GRDA area, GRDA Unit #1 generation will be needed. Generation needs to be online in order to ensure voltage stability until GRDA Unit #2 returns from outage."[4] Unit No. 1 was in fact called upon by SPP to provide reactive support during a substantial portion of the period Unit No. 2 was on outage. GRDA's transmission system, along with the conditions that give rise to the need to maintain the availability of Unit No. 1 to address low load, high voltage conditions, have not changed materially since SPP issued the Temporary Operating Guide.

II. APPLICATION FOR EMERGENCY ORDER

As explained below, GRDA requests that DOE determine that an emergency exists within the meaning of FPA § 202(c) with respect to the unavailability of Unit No. 1 during the Emergency Period, and order GRDA to run Unit No. 1 for the purpose of providing reactive power during the Emergency Period in the event that neither Unit No. 2 nor Unit No. 3 is online, and SPP determines that reactive power from Unit No. 1 is needed for purposes of grid reliability.

A. An Emergency Exists Because a Lightning Strike at Unit No. 2, and Unforeseeable Construction Delays at Unit No. 3, Will Leave GRDA Without the Ability to Generate Electricity for Reactive Power During the Emergency Period.

FPA § 202(c) provides that if "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" DOE may issue an order requiring the temporary connections of facilities, and such generation, delivery, interchange, or transmission of electric energy as it deems appropriate to best meet the emergency and serve the public interest. DOE's regulations provide additional detail about what constitutes an "emergency" for purposes of Section 202(c) at 10 C.F.R. § 205.371:

> "Emergency" . . . 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 regulatory action which prohibits the use of certain electric power supply facilities. Actions under this authority are envisioned as meeting a specific inadequate power supply situation. Extended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency as contemplated in these regulations. . . .

[4] *See* SPP Temporary Operating Guide, "GRDA Unit #1 Manual Commitment," Attachment B.

The unavailability of Units No. 1, 2, and 3 at the GREC during the Emergency Period constitutes an emergency within the meaning of Section 202(c) and DOE's regulations. First, without the availability of at least one of these three generating units at the GREC, GRDA will be unable to provide reactive power for local voltage support to maintain grid stability in GRDA's service area in low load, high voltage conditions. In the past, Unit Nos. 1 and 2 have traditionally met GRDA's needs for reactive power. However, these generating units will be offline during the Emergency Period, and Unit No. 3 will still be under construction and therefore not yet online. GRDA has no other means to procure or provide adequate reactive power for local voltage support in its service area during the Emergency Period. GRDA does not own, or have control over, other resources that can provide sufficient reactive power in GRDA's service area to provide adequate voltage support under low load, high voltage conditions. GRDA cannot rely on temporary generation to produce the needed reactive power because of the quantity of potential reactive power that might be needed under low load, high voltage conditions. (For instance, SPP called upon Unit No. 1 to provide more than 100 MVars of reactive power in 2016 under low load, high voltage conditions.)

Further, SPP's ability to address the reactive power needs of GRDA's service area without Unit No. 1 is limited and inadequate. SPP has the ability to reduce reactive power needs during the Emergency Period through reconfiguring its transmission system by opening transmission lines. However, this is not an optimal solution, because it would not allow SPP to maintain its system in an intact state consistent with good utility practice. Opening transmission lines is a less reliable means of addressing reactive power needs than through dynamic reactive power generation resources because of the relative reliability risk it poses; reactive power cannot be controlled as easily through system configuration as it can through dynamic resources to respond to unexpected events, and the system is more vulnerable to outages because the system is not intact. Thus, SPP's ability to address reactive power needs in GRDA's service area without Unit No. 1 is a limited and less robust method to ensure reliability.

Second, this shortage of resources to generate reactive power during the Emergency Period was unexpected and unforeseeable by GRDA, which originally expected to have Unit No. 2 available, and Unit No. 3 coming online, during the Emergency Period. However, Unit No. 2 sustained extensive damage on July 1, 2016 from a fire caused by a lightning strike, which took Unit No. 2 offline. Repairs to Unit No. 2 are ongoing and will not be completed until August 2017. This lightning strike causing the fire at Unit No. 2 was an unforeseeable act of God, the effects of which were not within the power of GRDA to prevent.[5] Likewise, Unit No. 3's commercial operation date has been delayed because of another unforeseeable act of God – the Louisiana floods of August 2016 – which delayed the ability of a key supplier to meet contractual commitments for critical materials for Unit No. 3's construction. Although GRDA planned for the shutdown of Unit No. 1 due to EPA's AO, DOE's regulations note that an emergency can result from "a regulatory action which prohibits the use of certain electric power supply facilities."[6] Collectively, the unavailability of the GREC's three generating units, each for different reasons, over the Emergency Period gives rise to a "shortage of facilities for

[5] 10 C.F.R. § 205.371.
[6] 10 C.F.R. § 205.371.

generating electric energy" within the meaning of Section 202(c) of the FPA for GRDA's service area.

B. GRDA's Shortage of Reactive Power Resources During the Emergency Period Will Imperil Grid Reliability

During low load, high voltage conditions, an inability to provide sufficient reactive power for voltage support can imperil grid reliability by allowing the grid to exceed the range of acceptable system voltage.[7] The inability to schedule sufficient reactive power can constitute a reliability standards violation, because under NERC Reliability Standard VAR-001-4.1 (Voltage and Reactive Control), transmission operators "shall schedule sufficient reactive resources to regulate voltage levels under normal and Contingency conditions."[8] A deficiency of reactive power can lead to disruption of service, because transmission facilities operating at voltages in excess of system voltage limits must be disconnected from other elements of the grid.[9] If transmission facilities operating at excessive voltages are not disconnected, the overvoltages can cause electric arcing due to insulation "flash overs," which can in turn result in physical damage to transmission facilities.[10]

GRDA's impending shortage of reactive power resources increases the risk of service disruption to GRDA's customers due to overvoltage, because the only means SPP will have to address reactive power needs is through reconfiguring the transmission system by opening a transmission line – a step that will mean the system is no longer intact. Good utility practice calls for the system to be maintained intact if possible. Without an intact system, GRDA's system will be more vulnerable to disruption of service or outages as a result of unexpected events. SPP recognized the risks presented by a lack of reactive power resources at the GREC in 2014 when Unit No. 2 was on outage by issuing its Temporary Operating Guide for Unit No. 1. SPP has reaffirmed the importance of maintaining Unit No. 1 beyond April 15, 2017 for mitigation of system voltage issues and local grid reliability in a letter of support for this request, attached hereto as Attachment C.

C. GRDA Provides Power to Significant Regions in Oklahoma, Including Customers of National Significance

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7 At low levels of electric system load, energized transmission lines may act as a capacitive load that increases system voltage.

8 NERC Reliability Standard VAR-001-4.1 (Voltage and Reactive Control), R1 ("Each Transmission Operator shall schedule sufficient reactive resources to regulate voltage levels under normal and Contingency conditions. Transmission Operators can provide sufficient reactive resources through various means including, but not limited to, reactive generation scheduling, transmission line and reactive resource switching, and using controllable load.").

9 *See* Reliability Standard TOP-008-1 (Response to Transmission Limit Violations), R3 ("The Transmission Operator shall disconnect [an] affected facility if the overload on a transmission facility or abnormal voltage or reactive condition persists and equipment is endangered.").

10 FERC Reliability Primer at 25 ("[H]igh voltages can exceed the insulation capabilities of equipment and cause dangerous electric arcs known as "flashovers." These conditions can occur when there is light loading on the system (e.g., less customer demand), causing an excess of reactive power that elevates the voltage beyond safe operating limits.").

GRDA provides electric power on its transmission system to both retail and wholesale customers. GRDA provides retail electric service to 80 industrial and commercial customers, most of which are located in the MidAmerica Industrial Park (MAIP) near Pryor. [redacted] The 9,000 acre MAIP is home to over 80 companies employing over 4,500 people. There are also urgent care, emergency and life flight services within the MAIP boundaries. On the wholesale side, GRDA's largest customer is Western Farmers Electric Cooperative (WFEC) which is responsible for supplying power to [redacted] 18 member Oklahoma distribution cooperatives. GRDA provides power directly to over 16 municipalities, including [redacted] Coffeyville, Kansas, which has a strong industrial base, and the City of Stillwater, which is primarily residential and commercial service. There are 15 hospitals with a combined 1000+ bed-capacity in these cities. GRDA also provides electricity to the Oklahoma Municipal Power Authority (OMPA). Through support of OMPA, GRDA's generation provides a portion of the electric power to an additional 35 participating cities in Oklahoma. Directly and indirectly, GRDA provides electric power support to some portion of 75 of the Oklahoma's 77 counties.

D. Information Required By Section 205.373

Herein, GRDA sets forth the information required under Section 205.373 of DOE's regulations.[11] To ensure that DOE has the information it needs to evaluate GRDA's application, GRDA is providing certain additional information that GRDA deems salient to its application.

(a) Legal Name of Applicant. The applicant is Grand River Dam Authority.

(b) Person to Whom Correspondence Should Be Addressed. Correspondence with respect to this application should be directed to:

Daniel S. Sullivan
Chief Executive Officer
Grand River Dam Authority
P.O. Box 409
Vinita OK 74301-0409
(918)256-5545
dsullivan@grda.com

[11] Certain elements of Section 205.373 address the circumstances of an applicant facing a shortage of real power and the prospect of firm customer curtailment, but do not address GRDA's emergency circumstances, which involve a shortage of reactive power generation during light load conditions. GRDA has indicated where these requirements are Section 205.373 are not applicable to GRDA's circumstances.

(c) Political Subdivision in Which GRDA Operates and Business Conducted. GRDA operates in 24 counties in Northeast Oklahoma. GRDA sells electricity to three customer classes in its service area: municipals, electric cooperatives and industries.

(d) Baseline Data.

(1) Daily peak load and energy requirements for each of the past 30 days, and projections for each day of the Emergency Period: These requirements are not applicable to GRDA's request, which contemplates relief in light load conditions. GRDA is providing information about the reactive power provided by Unit No. 1 in February 2017, the most recent month for which data is available, in Attachment D. GRDA provided reactive power pursuant to an SPP Temporary Operating Guide in the fall of 2014 period to maintain grid reliability. GRDA is providing data on the reactive power provided by Unit No. 1 during this time frame in Attachment E.

(2) All capacity and energy receipts or deliveries to other electric utilities for each of the past 30 days: Not applicable.

(**3) The status of all interruptible customers for each of the past 30 days, and anticipated status during the Emergency Period:** GRDA does not expect to interrupt any customers during the Emergency Period due to a lack of available energy. Interrupting load during the Emergency Period would exacerbate, rather than remedy, the low load, high voltage conditions that present an emergency for GRDA.

(4) All scheduled capacity and energy receipts or deliveries to other electric utilities during the Emergency Period. Not applicable.

(e) A description of the emergency situation, any contingency plan of GRDA, and the current level of implementation. The emergency situation GRDA faces is described above in Section II.A of this Application. Until GRDA can bring GREC Unit No. 2 or No. 3 online, GRDA does not have any contingency plan to provide reactive power for voltage support without Unit No. 1. As explained above in Section II.B, SPP's ability to address GRDA reactive power needs in low-load, high voltage conditions without Unit No. 1 is limited and poses increased reliability risks for GRDA's service area compared to operating Unit No. 1 for voltage support.

(f) A showing that adequate electric service to firm customers cannot be maintained without additional power transfers. Not applicable.

(g) A description of any conservation or load reduction actions that have been implemented. Not applicable. Reducing load via conservation or other load reduction actions under low load, high voltage circumstances would exacerbate, rather than mitigate, emergency overvoltage conditions.

(h) A description of efforts made to obtain additional power through voluntary means and the results of such efforts. GRDA does not have the ability to provide additional

reactive power resources to alleviate the Emergency. GRDA is required to cease operation of Unit No. 1 as a coal-fired unit after April 15, 2017 pursuant to an Administrative Order under Section 113(a)(4) of the Clean Air Act. An order issued under Section 113(a)(4) is nonrenewable, and therefore, EPA does not have authority to extend the compliance deadline in the AO and further delay compliance with MATS for Unit No. 1. Unit No. 2 is undergoing repairs as quickly as possible, but the unit will not be available during the Emergency Period. Construction on Unit No. 3 is not expected to be completed until sometime in June 2017, at the earliest, and may not be available at all during the Emergency Period.

(i) A listing of proposed sources and amounts of power necessary from each source to alleviate the emergency and a listing of any other "entities" that may be directly affected by the requested order. The only generation source that GRDA proposes to alleviate the Emergency is Unit No. 1 of the GREC. Based on historical data, GRDA expects that it could be called upon to absorb up to 120 MVar or more from the grid if called on by SPP for local voltage support in low load, high voltage conditions.

Two entities would be directly affected by GRDA's requested order. First, SPP manages grid operations for GRDA's transmission assets, and thus would be directly responsible for addressing any grid instability resulting from the Emergency. If DOE grants GRDA's request for relief herein, SPP would be able to dispatch Unit No. 1 to absorb reactive power if it determines that such generation is necessary to maintain grid reliability. Second, EPA would be directly affected, because running Unit No. 1 after April 15, 2017, would contravene the terms of EPA's AO and the Clean Air Act, which require GRDA to cease coal-fired operations at Unit No. 1 after April 15, 2017.

(j) Specific proposals to compensate the supplying "entities" for the emergency services requested and to compensate any transmitting "entities" for services necessary to deliver such power. GRDA proposes that, during the Emergency Period, it be compensated for any generation from Unit No. 1 directed by SPP pursuant to a DOE Section 202(c) Order consistent with the terms of the SPP Tariff.

(k) A showing that, to the best of the applicant's knowledge, the requested relief will not unreasonably impair the reliability of any "entity" directly affected by the requested order to render adequate service to its customers. To GRDA's knowledge, ordering reactive power generation from Unit No. 1, which is currently an SPP generating resource, will not impair the reliability of any entity.

(l) Description of the facilities to be used to transfer the requested emergency service to the applicant's system. Not applicable.

(m) A general or key map on a scale not greater than 100 kilometers to the centimeter showing, in separate colors, the territory serviced by each "entity" named in the application; the location of the facilities to be used for the generation and transmission of the requested emergency service; and all connection points between systems. This information is at attached as Attachment F.

(n) An estimate of the construction costs of any proposed temporary facilities and a statement estimating the expected operation and maintenance costs on an annualized basis. Not applicable

(o) Supplemental Information. A letter from SPP in support of GRDA's request for action under FPA Section 202(c) is attached as Attachment C.

E. Compliance with Applicable Environmental Laws Under Section 202(c)(2).

Section 202(c)(2) of the FPA provides that when DOE issues an order under Section 202(c) that results in a conflict with Federal, State, or local environmental law, DOE is required to ensure that the order requires generation, delivery, interchange, or transmission of electric energy only during hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable, is consistent with applicable Federal, State, or local environmental law and minimizes any adverse environmental impacts.[12] Herein, GRDA is requesting authorization to generate electricity to provide reactive power support from Unit No. 1 of the GREC after April 15, 2017, which would contravene EPA's Administrative Order on MATS Compliance for Unit No. 1.[13]

To ensure compliance with the AO to the maximum extent possible and minimize environmental impacts pursuant to Section 202(c)(2), GRDA commits that, in the event DOE issues a Section 202(c) order directing the generation of reactive power from Unit No. 1 of the GREC, GRDA will generate from Unit No. 1 only when called upon by SPP pursuant to DOE's order, and will otherwise keep Unit No. 1 offline. Although Unit No. 1 must burn coal to generate reactive power, GRDA Unit No. 1 has natural gas igniters available to keep Unit No. 1 in a ready state, if necessary. This will ensure compliance with EPA's AO to the maximum extent possible given that the AO does not prohibit the use of natural gas at Unit No. 1. Because GRDA can keep Unit No. 1 ready, Unit No. 1 does not need to maintain a minimum generation level or be synchronized to the grid to be ready to respond if called upon by SPP to provide reactive power. Unit No. 1 can be brought online to generate reactive power from an offline state within 24 hours, which is within the window of notice that SPP would give GRDA to generate reactive power.

Additionally, GRDA commits to cease all generation from Unit No. 1 as soon as GREC Unit No. 3 or Unit No. 2 is brought online, in which case either unit would be able to act as a reactive power resource for GRDA.

F. Request for Designation of Critical Electrical Infrastructure Information

Pursuant to Section 215A of the FPA, GRDA requests that the Department designate the bracketed information in Section II.C as critical electrical infrastructure information protected

[12] 16 U.S.C. § 824a(c)(2).
[13] *See* Attachment A at P 31.

from disclosure under the Freedom of Information Act and other public disclosure laws.[14] The bracketed information includes information relating to the production, generation, and transmission of energy that could be useful to a person in planning an attack on critical infrastructure.[15]

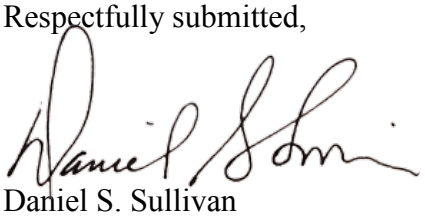
G. Requested Order

As explained herein, GRDA respectfully requests that DOE issue an emergency order directing the generation of electricity to provide reactive power from Unit No. 1 of the GREC from April 16, 2017 to (i) July 15, 2017, or (ii) the date on which GREC No. 3 or No. 2 is brought online, whichever is earlier, in the event that Southwest Power Pool, Inc. ("SPP") determines that generation from Unit No. 1 is needed to maintain grid reliability, subject to the requirements that Unit No. 1 remain offline unless requested to generate by SPP pursuant to a DOE Section 202(c) order.

III. CONCLUSION

GRDA respectfully requests that DOE take the emergency action requested herein as soon as possible to address the imminent shortage of reactive power that GRDA faces in its service area. GRDA stands ready to answer any questions that DOE may have, and to provide any additional information that DOE requires.

Respectfully submitted,



Daniel S. Sullivan
Chief Executive Officer
Grand River Dam Authority

Cc: Patricia A. Hoffman, Principal Deputy Assistant Secretary and Acting Assistant Secretary, DOE Office of Electricity Delivery & Energy Reliability

Attachments

[14] 16 U.S.C. § 824a(c)(2).

[15] *See* 18 C.F.R. § 388.113(d)(1)(i). GRDA requests the bracketed information be designated critical electric infrastructure information for as long as permissible. *See* 18 C.F.R. § 388.113(d)(1)(ii).

PUBLIC VERSION

CERTIFICATE OF SERVICE

I hereby certify that I have this 11th day of April, 2017, caused copies of the foregoing documents to be served on the parties listed below by causing copies of the same to be sent via overnight delivery.

Michael Bardee
Director, Office of Electric Reliability
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Administrator Scott Pruitt
U.S. Environmental Protection Agency
Mail code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Southwest Power Pool, Inc.
c/o Lanny Nickell, Vice President, Engineering
415 North McKinley Street, Suite 140
Little Rock, AR 72205

Ronald W. Ciesiel
General Manager
Southwest Power Pool Regional Entity
201 Worthen Drive
Little Rock, AR 72223

/s/ Nathan Reese
Nathan Reese
Assistant General Counsel
Grand River Dam Authority

Attachment A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR ENFORCEMENT DIVISION, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE
BEFORE THE ADMINISTRATOR

In the Matter of: Grand River Dam Authority, Respondent.	Administrative Compliance Order on Consent AED-CAA-113(a)-2016-0002

ADMINISTRATIVE COMPLIANCE ORDER

A. PRELIMINARY STATEMENT

1. This Administrative Compliance Order ("Order") is issued under the authority vested in the Administrator of the U.S. Environmental Protection Agency ("EPA") by Section 113(a) of the Clean Air Act (the "CAA" or "Act"), 42 U.S.C. § 7413(a)(3) and (4).
2. On the EPA's behalf, Phillip A. Brooks, Division Director of the Air Enforcement Division, Office of Civil Enforcement, Office of Enforcement and Compliance Assurance, U.S. Environmental Protection Agency, is delegated the authority to issue this Order under Section 113(a) of the Act.
3. Respondent is Grand River Dam Authority, an agency of the state of Oklahoma. Respondent is a "person" as defined in Section 302(e) of the Act, 42 U.S.C. § 7602(e). Respondent owns and/or operates the Grand River Energy Center (hereafter, the "Facility"), located in the state of Oklahoma**.**
4. Respondent signs this Order on consent.

B. STATUTORY AND REGULATORY BACKGROUND

5. Section 112 of the CAA, 42 U.S.C. § 7412, authorizes the Administrator of EPA to regulate hazardous air pollutants ("HAPs") which may have an adverse effect on health or the environment.

6. Pursuant to Section 112 of the CAA, the EPA finalized National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Subpart UUUUU on December 16, 2011, 77 FR 9304 (Feb. 16, 2012) (40 C.F.R. Part 63 Subpart UUUUU), commonly known as the "Mercury and Air Toxics Standards." *Id.* (hereafter, "MATS"). The MATS adopt emission limits on mercury, acid gases and other toxic pollutants for affected coal and oil-fired electric generating utility units ("EGUs").
7. Pursuant to 40 C.F.R. § 63.9981, the MATS applies to owners or operators of coal-fired EGUs or oil-fired EGUs as defined in 40 C.F.R. § 63.10042.
8. Pursuant to 40 C.F.R. § 63.2, "owner or operator" is defined as "any person who owns, leases, operates, controls, or supervises a stationary source."
9. Section 111(a)(3) of the Act, 42 U.S.C. § 7411(a)(3), and 40 C.F.R. § 63.2 defines a "stationary source" as "any building, structure, facility, or installation which emits or may emit any air pollutant."
10. Pursuant to 40 C.F.R. § 63.2, "affected source" is defined as "the collection of equipment, activities, or both within a single contiguous area and under common control that is included in a Section 112(c) source category or subcategory for which a Section 112(d) standard or other relevant standard is established pursuant to Section 112 of the Act."
11. Pursuant to 40 C.F.R. § 63.9982, the affected source to which the provisions of the MATS, 40 C.F.R. Part 63, Subpart UUUUU, applies is the collection of all existing coal- or oil-fired EGUs, as defined in 40 C.F.R. § 63.10042, within a subcategory, [and] … each new or reconstructed coal- or oil-fired EGU, as defined in 40 C.F.R. § 63.10042.
12. On December 16, 2011, in parallel with finalizing the MATS, the Office of Enforcement and Compliance Assurance issued a policy memorandum describing its intended approach regarding issuance of Section 113(a) administrative orders ("Orders") to sources that are unable to comply

with the MATS but that may need to operate for up to a year to address a specific and documented reliability concern. *See* The Environmental Protection Agency's Enforcement Response Policy For Use Of Clean Air Act Section 113(a) Administrative Orders In Relation To Electric Reliability And The Mercury and Air Toxics Standard (hereafter, "2011 MATS Enforcement Policy"). The 2011 MATS Enforcement Policy is limited in application to units that are critical for reliability purposes.

13. In issuing the 2011 MATS Enforcement Policy, the EPA believed that there would be few, if any, cases in which affected sources would not be able to comply with the MATS within the compliance period specified by Section 112(i)(3) of the CAA (including, as applicable, any extensions permitted under Section 112(i)(3)(B)), which has proven to be the case. Nonetheless, the EPA acknowledged that there may be isolated instances in which the deactivation or retirement of a unit or a delay in installation of controls due to factors beyond the owner's/operator's control could have an adverse, localized impact on electric reliability that could not be timely predicted or planned for with specificity. In such instances, sources could find themselves in the position of either operating in noncompliance with the MATS or halting operations and thereby potentially impacting electric reliability. Thus, although the EPA generally does not speak publicly to the intended scope of its enforcement efforts in advance of the date when a violation may occur, the Agency issued the 2011 MATS Enforcement Policy to describe the EPA's intended enforcement response in such instances and to provide confidence with respect to electric reliability. The policy is informed, as are EPA's enforcement actions in general, by the need to find an appropriate balance between critical public interests, bearing in mind the resources and process time required for any enforcement response.
14. The 2011 MATS Enforcement Policy specifies that to qualify for an Order in connection with it, an owner/operator must, in summary, provide early written notice of its compliance plans to

the Planning Authority[1] for the area in which the source is located, timely request an Order and provide notice of such request to the EPA, FERC, its Planning Authority, any state public utility or service commission, and any state, tribal or local environmental agencies, with jurisdiction over the area in which the EGU is located, and submit a complete request for an Order.

15. A complete request pursuant to the 2011 MATS Enforcement Policy must include the following elements: copies of the early notice provided to the Planning Authority; written analysis of the reliability risk, which demonstrates that operation of the unit after the MATS Compliance Date is critical to maintaining electric reliability; written concurrence with the reliability analysis by the relevant Planning Authority (or a written explanation of why such concurrence cannot be provided); copies of any written comments received from third parties in favor of, or opposed to, operation of the unit after the MATS Compliance Date; a plan to achieve compliance with the MATS no later than one year after the MATS Compliance Date; and identification of the level of operation required to avoid the reliability risk and proposed operational limits and/or work practices to minimize or mitigate emissions to the extent practicable during non-compliant operation.

16. With respect to the demonstration of reliability risk, the 2011 MATS Enforcement Policy states that the analysis provided in an Order request should demonstrate that operation of the unit after the MATS Compliance Date is critical to maintaining electric reliability, and that failure to operate the unit would: (a) result in the violation of at least one of the reliability criteria required to be filed with the Commission, and, in the case of the Electric Reliability Council of

[1] Planning Authorities are the entities tasked, under NERC reliability standards, with addressing electric reliability through grid planning. In the 2011 MATS Enforcement Policy, Planning Authority was defined as "the entity defined as such in the "Glossary of Terms Used in NERC Reliability Standards," available at: http://www.nerc.com/docs/standards/rs/Reliability_Standards_Complete_Set.pdf, or any successor term thereto approved by FERC, and includes, in relevant jurisdictions, RTOs and ISOs."

Texas, with the Texas Public Utility Commission; or (b) cause reserves to fall below the required system reserve margin.

17. Although the EPA's issuance of an Order is not conditioned upon the approval or concurrence of any entity, in light of the complexity of the electric system and the local nature of many reliability issues, for purposes of using its Section 113(a) Order authority in connection with the 2011 MATS Enforcement Policy, the EPA has sought advice in the identification and/or analysis of reliability risks, as necessary and on a case-by-case basis from reliability experts, including, but not limited to, the Federal Energy Regulatory Commission ("FERC"), Regional Transmission Operators ("RTOs"), Independent System Operators and other Planning Authorities, as EPA indicated it would do in the 2011 MATS Enforcement Policy.
18. The 2011 MATS Enforcement Policy specifically stated that an owner/operator interested in receiving a Section 113(a) administrative order pursuant to the policy should provide FERC with a copy of its complete and timely written request to the EPA.
19. On May 17, 2012, FERC issued a policy statement explaining how it intended to provide advice to the EPA on requests for an administrative order pursuant to the 2011 MATS Enforcement Policy. *See* Policy Statement of the Commission's Role Regarding the Environmental Protection Agency's Mercury and Air Toxics Standards, 139 FERC ¶ 61,131 (2012) ("FERC Policy Statement"). The FERC Policy Statement provided that the Commission will advise the EPA by submitting written Commission comments to the EPA based on the Commission's review of the information provided in an informational filing containing the copy of the request for the administrative order provided to the Commission in an AD docket. *Id.* at Paragraph 21. Further, the FERC Policy Statement indicated that the Commission's comments would provide advice to the EPA on whether, based on the Commission's review of the informational filing, there might be a violation of a Commission-approved Reliability Standard, and may also identify issues

within its jurisdiction other than a potential violation of a Commission-approved Reliability Standard. *Id.*

C. FINDINGS

20. Respondent owns and/or operates an existing coal-fired electric utility steam generating unit, as defined in 40 C.F.R. § 63.10042.
21. Respondent's operation at the Facility is subject to the MATS.
22. On November 28, 2012, Respondent received a one year extension pursuant to 40 C.F.R. 63.6(i)(4)(i)(A) from its permitting authority, extending the date by which it must comply with the MATS to April 15, 2016. *See* November 28, 2012 Letter from Steven A. Thompson, Oklahoma Department of Environmental Quality to Grand River Dam Authority.
23. On February 19, 2015, Respondent submitted a timely and complete request for an Order pursuant to the 2011 MATS Enforcement Policy to the EPA, with a copy to FERC. That request can be found in the FERC AD docket, AD15-6-000 (hereafter "Order Request").
24. Pursuant to the Order Request, Respondent seeks an Order from April 16, 2016 through April 15, 2017, on the grounds that it will not be able to comply with the MATS at Unit No. 1 of the Grand River Energy Center located near Chouteau, Oklahoma, without violating its system reserve margin of 12%, until the construction of a new, highly efficient natural gas-fired combined cycle combustion turbine (Unit No. 3) is completed as a replacement for Unit No. 1. Unit No. 3 will not be operational until shortly after April 16, 2017. *See id.*
25. More specifically, the Order Request states that Respondent, "a load serving member of the Southwest Power Pool (SPP) [Respondent's Planning Authority], states that it will be unable to meet its required reserve margin of 12 percent capacity if Unit No. 1 is retired before new Unit No. 3 becomes operational. Order Request at 6; *see also*, Southwest Power Pool, Criteria 2.1.9 (Minimum Required Capacity Margin) (revised July 29, 2014), available at

http://www.spp.org/publications/SPP%20Criteria%20&%20Appendices%20July%2029,%202014.pdf. Respondent indicates that the untimely loss of Unit No. 1 would prevent it from meeting its basic load obligations by 245 MW. *Id.* Additionally, Respondent states that Unit No. 1 has been used for local voltage support, noting that "there were six instances in 2014 where the GRDA System Operator requested either additional capacitive or reactive voltage support from Unit No. 1 to address voltage problems on the transmission system." Order Request at 7. Respondent further claims that it has "experienced problems under certain conditions obtaining firm or non-firm transmission service to deliver power purchases from outside of the GRDA balancing area" when one or both of its existing units are offline, and without an administrative order, it "is concerned that transmission constraints will make importing sufficient replacement capacity and energy very difficult." *Id.*

26. In a memorandum attached to Respondent's submission, SPP concurred with Respondent's reserve margin assessment. *See* Order Request, Attachment C (SPP January 27, 2014 Memorandum) at 2 ("[a] review of GRDA's supply adequacy without GRDA unit 15-1 indicates that the firm resources available to GRDA fall below their 12% minimum capacity margin requirement in 2016"). Additionally, SPP concurred that SPP "has observed, over the last year, the need to commit GRDA Unit 1 for relief from high voltages … [and that] SPP concurs with GRDA's assessment regarding GRDA Unit 1's criticality for reliability absent other system changes." Order Request, Attachment E (SPP February 6, 2015 Letter) at 1.

27. FERC reviewed the reliability risk presented in the request in accordance with the FERC Policy Statement and on April 16, 2015 found that "the loss of GRDA's Unit No. 1 would result in GRDA falling below the 12 percent capacity reserve requirement stipulated in SPP Criteria 2.1.9 unless GRDA is able to procure replacement capacity for the unit and associated firm transmission service," and "[a]bsent a significant change in future circumstances, [FERC's] view is that GRDA's

Unit No. 1 is needed as requested by GRDA to maintain electric reliability." *See* Commission Comments On Grand River Dam Authority's Request For EPA Administrative Order (April 16, 2015), p. 4, Docket No. AD15-6-000. Additionally, FERC notes that "the reliability of the Bulk-Power System depends in part on whether utilities meet an appropriate planning reserve margin." *Id.*

28. Respondent proposes to minimize emissions by implementing a bidding approach with SPP, in a manner consistent with the SPP Tariff and market rules, to limit the total electricity generated by Unit No. 1 while maintaining its reserve margin. *See* Order Request at 12-13. Specifically, Respondent shall bid Unit No. 1 to achieve a total annual capacity factor of not more than 50% during the period from April 16, 2016 up to April 16, 2017, which is lower than its historical operation as a base load facility of approximately 70% annual capacity. *Id.* Although the monthly capacity factor of Unit No. 1 would vary to allow Respondent to meet its reserve margin requirements throughout the period covered by this Order, Respondent states that reducing the annual capacity factor to 50% will result in approximately 30% lower total emissions during the period from April 16, 2016 up to April 16, 2017. *Id.*

D. ORDER

29. Respondent is ordered to take the actions described in this section of this Order.
30. From April 16, 2016 through April 15, 2017, Respondent shall implement a bidding approach with SPP, while maintaining Respondent's reserve margin, in a manner consistent with the SPP Tariff and market rules, to limit the total electricity generated by Unit No. 1 to achieve a total annual capacity factor of not more than 50% during the period from April 16, 2016 through April 15, 2017.
31. By 11:59 pm April 15, 2017, Respondent shall achieve full compliance with the MATS at Unit No. 1 at the Facility by permanently ceasing operation as a coal-fired unit.

32. Within 30 days of achieving full compliance with the MATS at the Facility, Respondent shall provide written notice to the EPA indicating that compliance has been achieved and the date by which is it was achieved, pursuant to the process specified in paragraph 39 of this Order.

E. OTHER TERMS AND CONDITIONS

33. Respondent admits the jurisdictional allegations contained in Sections A (Preliminary Statement) and B (Statutory and Regulatory Background) of this Order.

34. Respondent neither admits nor denies the findings in Section C (Findings) of this Order.

F. GENERAL PROVISIONS

35. Any violation of this Order may result in a civil administrative or judicial action for an injunction or civil penalties of up to $37,500 per day per violation, or both, as provided in Sections 113(b)(2) and 113(d)(1) of the Act, 42 U.S.C. §§ 7413(b)(2) and 7413(d)(1), as well as criminal sanctions as provided in Section 113(c) of the Act, 42 U.S.C. § 7413(c). The EPA may use any information submitted under this Order in an administrative, civil judicial, or criminal action.

36. Nothing in this Order shall relieve Respondent of the duty of achieving and maintaining compliance with all applicable provisions of the Act or other federal, state or local laws or statutes, nor shall it restrict the EPA's authority to seek compliance with any applicable laws or regulations, nor shall it be construed to be a ruling on, or determination of, any issue related to any federal, state, or local permit.

37. Nothing herein shall be construed to limit the power of the EPA to undertake any action against Respondent or any person in response to conditions that may present an imminent and substantial endangerment to the public health, welfare, or the environment.

38. The provisions of this Order shall apply to and be binding upon Respondent and its officers, directors, employees, agents, trustees, servants, authorized representatives, successors, and assigns. From the Effective Date of this Order until the Termination Date as set out in paragraph

44 below, Respondent must give written notice and a copy of this Order to any successors in interest prior to any transfer of ownership or control of any portion of or interest in the Facility. Simultaneously with such notice, Respondent shall provide written notice of such transfer, assignment, or delegation to the EPA. In the event of any such transfer, assignment, or delegation, Respondent shall not be released from the obligations or liabilities of this Order unless the EPA has provided written approval of the release of said obligations or liabilities.

39. Unless this Order states otherwise, whenever, under the terms of this Order, written notice or other documentation is required to be given, it shall be directed to the individuals specified at the addresses below unless those individuals or their successors give notice of a change of address to the other party in writing:

Phillip A. Brooks
Division Director of the Air Enforcement Division, Office of Civil Enforcement, Office of Enforcement and Compliance Assurance, US Environmental Protection Agency
Mail Code 2242A, Room 1119
1200 Pennsylvania Ave, NW
Washington, DC 20460 mail or 20004 courier (note Room 1119 on courier packages)

Anupa Ahuja
Air Enforcement Section
Mail Code 6EN-AA
US EPA Region 6
1445 Ross Ave
Dallas, TX 75202
Phone: (214)665-2701

Daniel S. Sullivan
Grand River Dam Authority
P.O. Box 409
226 West Dwain Willis Avenue
Vinita, OK 74301
Phone: (918)256-5545

Britt S. Fleming
Van Ness Feldman, LLP
1050 Thomas Jefferson Street, NW
Washington, DC 20007
Phone: (202)298-1863

All notices and submissions shall be considered effective upon receipt.

40. To the extent this Order requires Respondent to submit any information to the EPA, Respondent may assert a business confidentiality claim covering part or all of that information, but only to the extent and only in the manner described in 40 C.F.R. Part 2, Subpart B. The EPA will disclose information submitted under a confidentiality claim only as provided in 40 C.F.R. Part 2, Subpart B. If Respondent does not assert a confidentiality claim, the EPA may make the submitted information available to the public without further notice to Respondent.
41. Each undersigned representative of the Parties certifies that he or she is authorized to enter into the terms and conditions of this Order to execute and bind legally the Parties to this document.

G. EFFECTIVE DATE AND OPPORTUNITY FOR A CONFERENCE

42. Pursuant to Section 113(a)(4) of the Act, an Order does not take effect until the person to whom it has been issued has had an opportunity to confer with the EPA concerning the alleged violations. By signing this Order, Respondent acknowledges and agrees that it has been provided an opportunity to confer with the EPA prior to issuance of this Order. Accordingly, this Order will take effect immediately upon signature by the latter of Respondent or the EPA.

H. JUDICIAL REVIEW

43. Respondent waives any and all remedies, claims for relief and otherwise available rights to judicial or administrative review that Respondent may have with respect to any issue of fact or law set forth in this Order, including any right of judicial review under Section 307(b)(1) of the Clean Air Act, 42 U.S.C. § 7607(b)(1).

I. TERMINATION

44. This Order shall terminate on the earlier of the following (the "Termination Date") at which point Respondent shall operate in compliance with the Act:

    a. 11:59 pm April 15, 2017;

    b. The effective date of any determination by the EPA that Respondent has achieved compliance with all terms of this Order; or

    c. Immediately upon receipt by Respondent of notice from the EPA finding that an imminent and substantial endangerment to public health, welfare, or the environment has occurred.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR ENFORCEMENT DIVISION, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE
BEFORE THE ADMINISTRATOR

In the Matter of: Grand River Dam Authority, Respondent.	Administrative Compliance Order on Consent AED-CAA-113(a)-2016-0002

For United States Environmental Protection Agency, Air Enforcement Division, Office of Enforcement and Compliance Assurance:

4/16/2016
Date

[redacted]
Phillip A. Brooks
Division Director of the Air Enforcement Division, Office of Civil Enforcement, Office of Enforcement and Compliance Assurance,
US Environmental Protection Agency
Mail Code 2242A, Room 1119
1200 Pennsylvania Ave, NW
Washington, DC 20460 mail or 20004 courier (note Room 1119 on courier packages)

For Grand River Dam Authority:

[redacted]
Signature

April 7, 2016
Date

Printed Name: Daniel S. Sullivan
Title: General Manager/CEO
Address: P.O. Box 409, 226 West Dwain Willis Avenue, Vinita, OK 74301

CERTIFICATE OF SERVICE

I certify that the foregoing "Administrative Compliance Order" in the Matter of Grand River Dam Authority, Order AED-CAA-113(a)-2016-0002, was filed and copies of the same were mailed to the parties as indicated below.

Certified Mail

Daniel S. Sullivan
Grand River Dam Authority
P.O. Box 409
226 West Dwain Willis Avenue
Vinita, OK 74301
Phone: (918)256-5545

Britt S. Fleming
Van Ness Feldman, LLP
1050 Thomas Jefferson Street, NW
Washington, DC 20007
Phone: (202)298-1863

Eddie Terrill
Director, Air Quality Division Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

4/18/16
Date

[redacted]
Tawanna Cathey

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR ENFORCEMENT DIVISION, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE
BEFORE THE ADMINISTRATOR

In the Matter of: Grand River Dam Authority, Respondent.	Amendment Administrative Compliance Order on Consent AED-CAA-113(a)-2016-0002

AMENDMENT – ADMINISTRATIVE COMPLIANCE ORDER

A. PRELIMINARY STATEMENT

1. This is an amendment (the "Amendment") to the Administrative Compliance Order on Consent, AED-CAA-113(a)-2016-0002, ("Order") issued on April 16, 2016 by the U.S. Environmental Protection Agency ("EPA") to the Grand River Dam Authority ("Respondent"). A copy of the Order is attached to this Amendment as Attachment A. Unless otherwise indicated, defined terms in this Amendment have the same meaning as in the Order.

B. FINDINGS

2. From July 1, 2016 to July 2, 2016, a series of events arose from causes beyond the control of Respondent that require amendment to the terms of the Order. Specifically, during a storm, there was a lightning strike at the Facility, which resulted in a significant fire that severely damaged Unit 2 and moderately damaged Unit 1. Unit 1 returned to service on July 20, 2016. Unit 2 is not expected to return to service until after Unit 1 permanently ceases operation as a coal-fired unit on April 15, 2017.
3. As a result of Unit 2, a 520 MW unit, being out of service during the period covered by the Order, Respondent will not be able to meet the terms of operation of Unit 1 detailed in the Order without violating the reliability risks described in paragraphs 24 – 28 of the Order. To address those reliability risks, it is necessary to amend the Order to allow for increased

operation of Unit 1. During the period in July when both units were out of service, voltage support was not required and Respondent was able to make other short term power purchases to meet basic load requirements.

C. ORDER

4. Paragraph 30 of the Order is replaced with the following requirement: From April 16, 2016 through April 15, 2017, Respondent shall implement a bidding approach with SPP, while maintaining Respondent's reserve margin, in a manner consistent with the SPP Tariff and market rules, to limit the total electricity generated by Unit No. 1 to achieve a total annual capacity factor of not more than 80% during the period from April 16, 2016 through April 15, 2017.

D. GENERAL PROVISIONS

5. Unless explicitly modified in this Amendment, all provisions of the Order remain in effect.
6. Each undersigned representative of the Parties certifies that he or she is authorized to enter into the terms and conditions of this Amendment to execute and bind legally the Parties to this document.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR ENFORCEMENT DIVISION, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE
BEFORE THE ADMINISTRATOR

In the Matter of: Grand River Dam Authority, Respondent.

Amendment
Administrative Compliance Order on Consent
AED-CAA-113(a)-2016-0002

For United States Environmental Protection Agency, Air Enforcement Division, Office of Enforcement and Compliance Assurance:

9/14/2016
Date

[redacted]
Phillip A. Brooks
Division Director of the Air Enforcement Division, Office of Civil Enforcement, Office of Enforcement and Compliance Assurance,
US Environmental Protection Agency
Mail Code 2242A, Room 1119
1200 Pennsylvania Ave, NW
Washington, DC 20460 mail or 20004 courier (note Room 1119 on courier packages)

For Grand River Dam Authority:

[redacted]
Signature

Sept. 8, 2016
Date

Printed Name: Daniel S. Sullivan
Title: General Manager/CEO
Address: P.O. Box 409, 226 West Dwain Willis Avenue, Vinita, OK 74301

CERTIFICATE OF SERVICE

I certify that the foregoing "Amendment" to the Administrative Compliance Order in the Matter of Grand River Dam Authority, Amendment AED-CAA-113(a)-2016-0002, was filed and copies of the same were mailed to the parties as indicated below.

Certified Mail

Daniel S. Sullivan
Grand River Dam Authority
P.O. Box 409
226 West Dwain Willis Avenue
Vinita, OK 74301
Phone: (918)256-5545

Britt S. Fleming
Van Ness Feldman, LLP
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Phone: (202)298-1863

Eddie Terrill
Director, Air Quality Division Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

_____ _____

Date Tawanna Cathey

Attachment B

Temporary Operating Guide

Title: GRDA Unit #1 Manual Commitment
System Conditions: Intact
Written by: Patrick deLassus (SPP)
Reviewed by: Kevin Sanson (SPP), Jason Smith (SPP), Terry Oxandale (SPP), Will Tootle (SPP), Jeff Wells (GRDA), Mike Stafford (GRDA)

Op-Guide: Effective on: **10/15/2014** Expires on: **11/04/2014**

I. Purpose/Background

Due to the low load and high voltage in the GRDA area, GRDA Unit #1 generation will be needed. Generation needs to be online in order to ensure voltage stability until GRDA Unit #2 returns from outage.

II. Monitoring

IDC FG #	Monitored Element	Contingent Element	Owner	Rating (MVA)
xxxxx	GRDA area (Voltage)	System Intact	GRDA	xxx

III. Mitigation

SPP BA will manually commit the GRDA Unit #1 (GRDA_UNIT_1) in order to provide relief from high voltage. Low load and high voltage are also contributing factors to this commitment. This requirement will be terminated once load levels permit.

If the generation from GRDA Unit #1 is unavailable, or otherwise unable to supply voltage support, reconfiguration plans may be needed. If reconfiguration is deemed necessary, GRDA will determine where to reconfiguration will be effective.

IV. Unit Commitment Details

RESOURCE NAME: GRDA_UNIT_1
Unit Start Time: 10/16/2014 00:00
Unit Online Time (Dispatchable):): **** Extension – Unit is Already Online ****
Unit Release Time (Shutdown): 11/04/2014 00:00 (This will be re-evaluated once GRDA_UNIT_2 returns to service.)
Commit Reason: SPP: LOCAL

The SPP RCs are not obligated to use the directions given above in the recommended order. Depending on the circumstances, the SPP RCs will make the decision on the best and most efficient option that would provide relief adequately.

Attachment C

March 1, 2017

United States Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

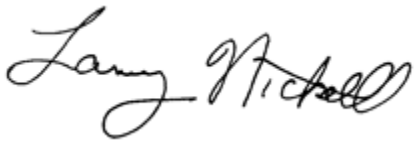
Re: Contribution of GRDA Unit 1 to local grid reliability as demonstrated by recent operating experience in SPP

Dear Sir/Madam:

The Southwest Power Pool, Inc. (SPP) Reliability Coordinator (RC) has observed, historically, the need to commit GRDA Unit 1 for relief from high voltages. In fact, the RC created a Temporary Operating Guide for the period October 15 through November 4 of 2014 stating that during a planned maintenance outage of GRDA Unit 2, GRDA Unit 1 must be available for dispatch during instances of low load and high voltage. GRDA Unit 1 was called upon to provide reactive support during the entire period of the Operating Guide. Although SPP no longer requires the Temporary Operating Guide, it nevertheless continues to believe that during future light load conditions when GRDA Unit 2 is unavailable, the commitment and dispatch of GRDA Unit 1 will be a critical resource in maintaining proper system voltage. Moreover, in the absence of GRDA Unit 2 and until GRDA Unit 3 comes online, SPP believes GRDA Unit 1 provides a valuable contribution to the local area's overall grid reliability. Based on the above, SPP concurs with GRDA's assessment regarding GRDA Unit 1's importance for reliability absent other system changes or until GRDA's Unit 2 and Unit 3 are in service.

Please do not hesitate to contact me should you have questions or would like to request additional information.

Respectfully submitted,



Lanny Nickell
Vice President, Engineering
(501) 614-3232 • Fax: (501) 482-2022 • lnickell@spp.org

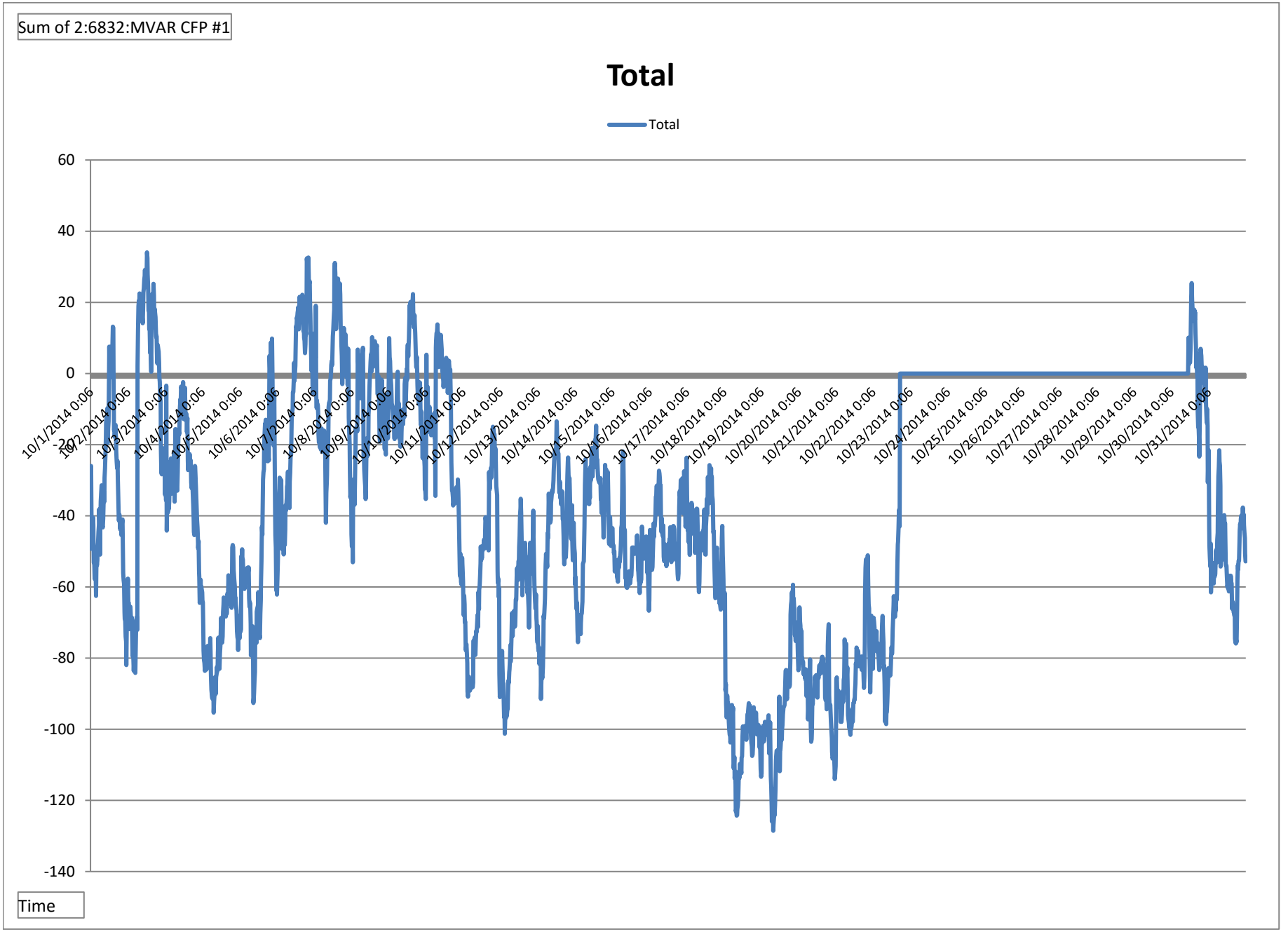
Attachment D

GRDA Unit No. 1 - Reactive Power Production in February 2017

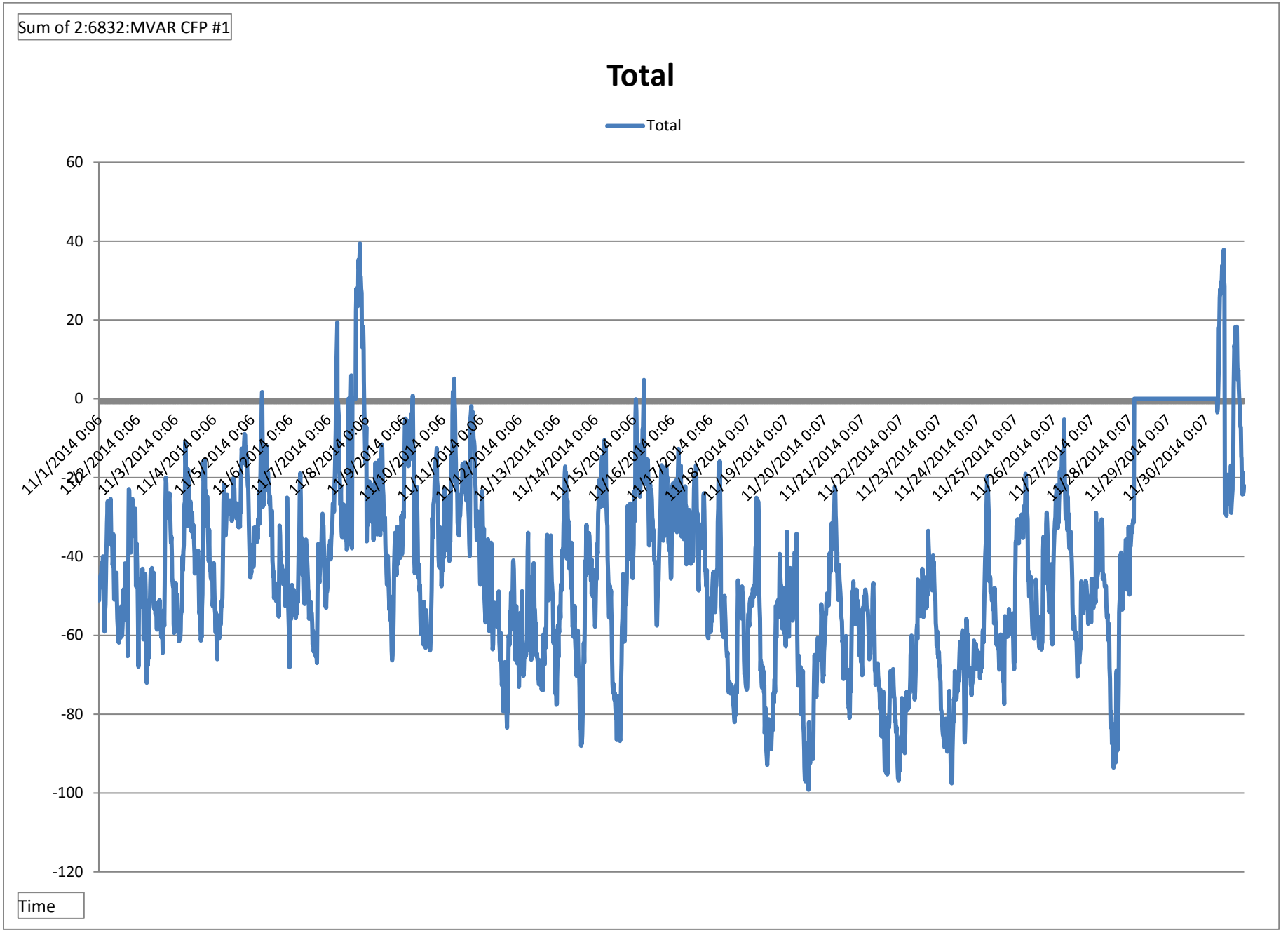


Attachment E

GRDA Unit No. 1 Reactive Power Production in October and November 2014

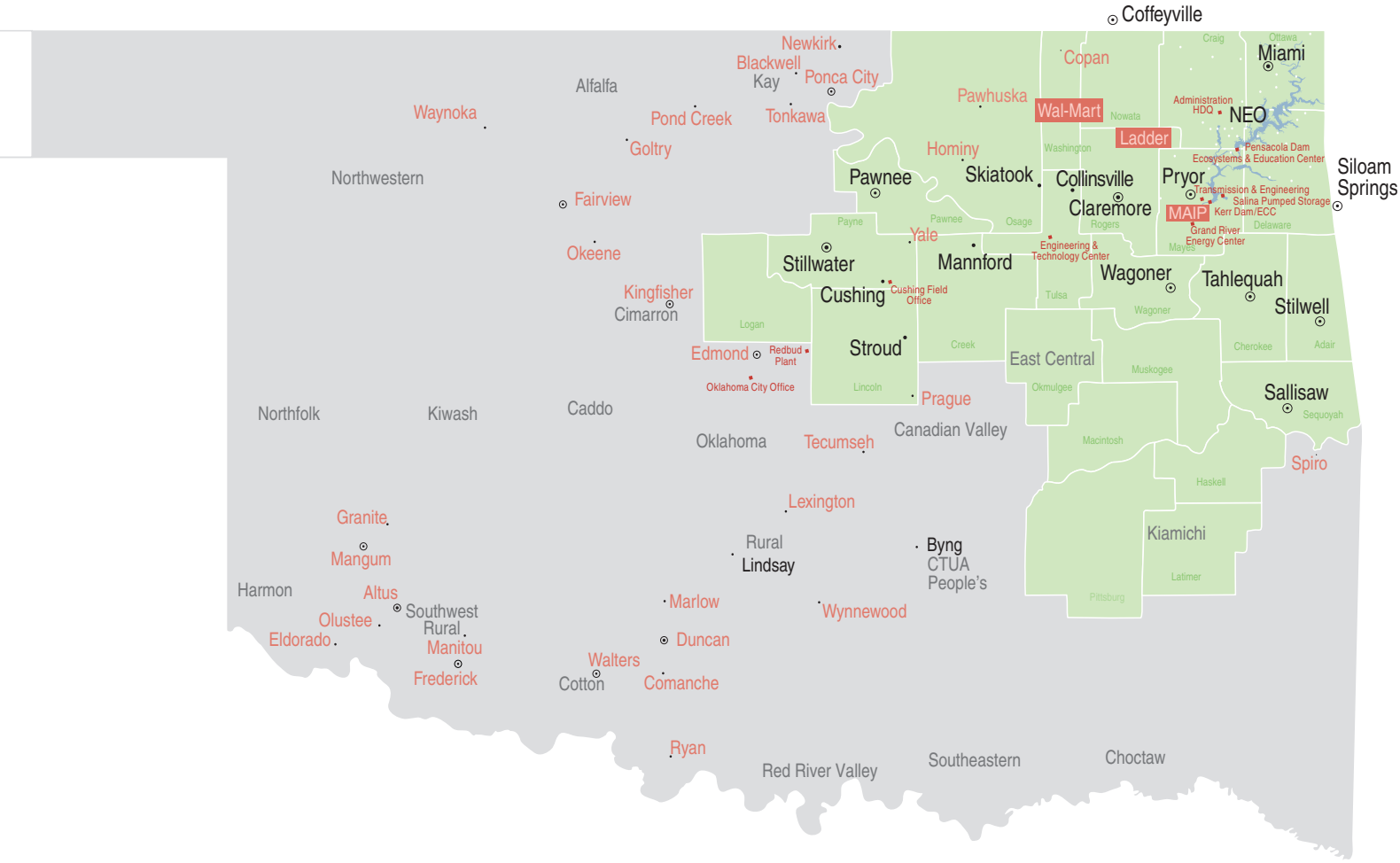


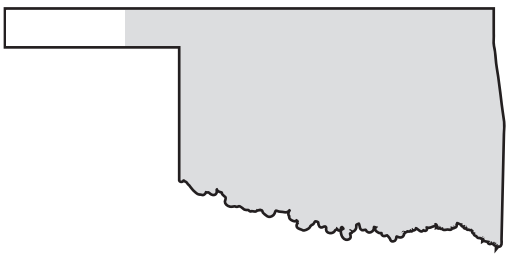
GRDA Unit No. 1 Reactive Power Production in October and November 2014



Attachment F

MAP OF CUSTOMERS AND GRDA FACILITIES





GRDA directly or indirectly provides electricity to some portion of all counties in Oklahoma except for two counties in the panhandle.

Municipal Customers - Served by GRDA in BLACK lettering; many served since 1940s.

Northeast Electric Cooperative - Represented by WHITE DOTS, served since 1946.

Industrial Customers - Represented by ORANGE BOX, Majority located in MidAmerica Industrial Park (MAIP).

Oklahoma Municipal Power Authority - Served since 1985. OMPA's customers in LIGHT ORANGE lettering.

Western Farmers Electric Cooperative - Served since 1983. WFEC's customers in GRAY lettering.

GRDA Facilities - Shown in RED lettering.

See Notes to Financial Statements, Utility Plant for additional information on capital assets.

Source: Grand River Dam Authority

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 36

DOE ORDER NO. 202-17-1

Department of Energy
Washington, DC 20585

Order No. 202-17-1

Pursuant to the authority vested in me by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in Oklahoma due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this order will meet the emergency and serve the public interest.

On April 11, 2017, the Grand River Dam Authority (GRDA), an agency of the state of Oklahoma, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* with the United States Department of Energy (Department) to ensure electric system reliability. The GRDA Grand River Energy Center has three generation units: coal-fired Unit No. 1, coal-fired Unit No. 2, and natural gas combined cycle Unit No. 3. GRDA planned to retire Unit No. 1 effective April 16, 2017, because it is not compliant with the Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards, 40 C.F.R. part 63 subpart UUUUU. GRDA was granted two one-year extensions for compliance, but the EPA is barred under the Clean Air Act from issuing further extensions. 42 U.S.C. § 7413(a)(4). Unit No. 1 is needed, however, because the other Grand River Energy Center units are unavailable. Due to a lightning-caused fire, Unit No. 2 is currently offline for repairs, and due to flooding in Louisiana, Unit No. 3's construction is delayed until mid-July at the earliest. Unit No. 1 is thus GRDA's only available unit to provide dynamic reactive power support to the region's Reliability Coordinator, the Southwest Power Pool, Inc. (SPP), during low-load, high-voltage events.

GRDA's application includes a March 1, 2017 letter of support from SPP in which SPP stated it "concurs with GRDA's assessment regarding GRDA Unit 1's importance for reliability." SPP observed that, in the past, it has needed "to commit GRDA Unit 1 for relief from high voltages" and noted that SPP created a Temporary Operating Guide for October 15-November 4, 2014, when Unit No. 2 was undergoing maintenance, to ensure Unit No. 1 would be available during light load conditions. SPP stated Unit No. 1 "will be a critical resource in maintaining proper system voltage."

Without sufficient reactive power support, electric system reliability is at risk because excessive voltage could force transmission lines offline, consequently leading to other reliability problems, or could cause electric arcing that would damage transmission facilities. The Federal Energy Regulatory Commission, through the North American Electric Reliability Corporation, regulates grid reliability through mandatory reliability standards, several of which are implicated if Unit No. 1 is unavailable to SPP. These include Reliability Standard VAR-001-4.1 (Voltage and Reactive Control) and transmission operations standards.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. The provision of reactive power support necessitates operation of Unit No. 1, but at levels far below maximum output. The Department has consulted with the EPA and reviewed emissions data provided by GRDA. This Order will continue the operational limitations described in EPA Administrative Compliance Order AED-CAA-113(a)-2016-002, as amended.[1] To minimize adverse environmental impacts and remain consistent with the approach taken by the EPA, this Order limits operation of Unit No. 1 to the provision of dynamic reactive power support and not real power generation, and only when called upon by SPP for reliability purposes.

Based on my determination set forth above, I hereby order:

From April 16, 2017 to (1) July 15, 2017, or (2) the date on which GREC Unit No. 3 or No. 2 is brought online, whichever is earlier, in the event that SPP determines that generation from Unit No. 1 is needed to maintain grid reliability, I direct GRDA to generate electricity to provide dynamic reactive power support from Unit No. 1 of the Grand River Energy Center, subject to the requirement that Unit No. 1 remain offline unless requested to generate by SPP. GRDA and SPP are directed to adopt a Temporary Operating Guide for the period of this Order based on the 2014 guide in Attachment B of the April 11 application, with the additional operational limitations set forth above. GRDA is further required to report to the Department all dates on which Unit No. 1 is run during the effectiveness of this Order and the estimated emissions associated with running Unit No. 1.

Issued in Washington, D.C. at 2:35 pm this 14th day of April, 2017.

Rick Perry

Rick Perry
Secretary of Energy

[1] Specifically, Unit No. 1 shall achieve a total annual capacity factor of not more than 80% during the period from July 15, 2016, through July 15, 2017.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 37

DOE ORDER NO. 202-17-2

Department of Energy
Washington, DC 20585

Order No. 202-17-2

Pursuant to the authority vested in me by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in the Commonwealth of Virginia due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

On June 13, 2017, PJM Interconnection, L.L.C. (PJM), the Regional Transmission Organization (RTO) whose service territory includes the North Hampton Roads area east of Richmond, Virginia, filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* with the United States Department of Energy (Department) "to preserve the reliability of [the] bulk power transmission system in the North Hampton Roads area." Virginia Electric and Power Company (Dominion Energy Virginia), the electric utility serving the area, owns two coal-fired units at its Yorktown Power Station (Yorktown Unit 1 and Yorktown Unit 2). In November 2011, and again in October 2012, Dominion Energy Virginia notified PJM of its plan to deactivate both units, effective December 31, 2014, because the units were not equipped to comply with the Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS), 40 C.F.R. part 63 subpart UUUUU. On June 24, 2014, pursuant to 40 C.F.R. 63.6(i)(4)(i)(A), the Virginia Department of Environmental Quality granted Dominion Energy Virginia a one-year MATS compliance extension for Yorktown Units 1 and 2. On April 16, 2016, pursuant to section 113(a) of the Clean Air Act, 42 U.S.C. § 7413(a)(3) and (4), EPA issued an Administrative Compliance Order (ACO) through April 15, 2017. Since the ACO expired, Dominion Energy Virginia has not achieved full compliance with the MATS for Yorktown Units 1 and 2. Section 113(a) of the Clean Air Act bars further compliance extensions.

Due to anticipated heightened electricity demand or peak load conditions associated with hot summer weather, PJM load flow studies indicate that generation from Yorktown Units 1 and 2 will likely be needed to prevent the possibility of uncontrolled power disruptions and shedding of critical loads in the North Hampton Roads area. The application refers to the need to run Yorktown Units 1 and 2 in this situation as "Scenario One." The application also introduces a "Scenario Two," which concerns the need for Yorktown Units 1 and 2 during transmission outages to support construction of system upgrades previously ordered by PJM through its Regional Transmission Expansion Planning Process (RTEPP). Scenario Two will not be applicable until Dominion Energy Virginia obtains permitting approval for the RTEPP upgrade, which the application indicates has not yet occurred.

On June 12, 2017, Dominion Energy Virginia wrote to the Department of Energy that it "agrees with [PJM's] Emergency Request and will operate in accordance with its provisions."

Electric system reliability is at risk during the next ninety days absent the availability of Yorktown Units 1 and 2 during peak load conditions and contingency events detailed in the application. The Federal Energy Regulatory Commission, through the North American Electric Reliability Corporation, regulates grid reliability through mandatory reliability standards, several of which are implicated if Yorktown Units 1 and 2 are unavailable to PJM, including Reliability Standard TPL-001-4 (Transmission System Planning Performance Requirements).

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law or regulation and minimize any adverse environmental impacts. Anticipated load conditions may necessitate operation of Yorktown Units 1 and 2. To minimize adverse environmental impacts and remain consistent with the approach taken by the EPA, this Order authorizes operation of Yorktown Units 1 and 2 only when called upon by PJM for reliability purposes. The Department has consulted with the EPA and authorities in York County, Virginia and has reviewed estimated emissions and water usage data provided by PJM. This Order will continue the operational limitations described in EPA's above-referenced ACO, AED-CAA-113(a)-2016-0005.

Based on my determination set forth above, I hereby order:

From June 16, 2017 to September 14, 2017, in the event that PJM determines that generation from Yorktown Units 1 and 2 is needed to maintain grid reliability, I order Dominion Energy Virginia to operate Units 1 and 2 of the Yorktown Power Station as directed by PJM only as needed to address reliability issues. PJM and Dominion Energy Virginia must develop and implement a dispatch methodology to operate Yorktown Units 1 and 2 only when called upon to address reliability needs. PJM and Dominion Energy Virginia are directed to provide the dispatch methodology to the Department upon implementation, and to report all dates on which Yorktown Units 1 and 2 are operated as well as the estimated emissions and water usage data associated with their operation by September 14, 2017, or the date upon which a renewal request is submitted, whichever occurs first.

Renewal of this Order, should it be needed, must be requested prior to its expiration. If the conditions creating the emergency remain substantially unchanged, a renewal request should be submitted at least 14 calendar days before this Order expires. If the conditions change—for example, if Dominion Energy Virginia obtains all permitting approvals for the RTEPP upgrade and identifies the date on which construction would begin—a renewal request should be submitted a minimum of 21 calendar days in advance of the expiration of this Order.

Issued in Washington, D.C. at 5:14 pm this 16th day of June, 2017.

Rick Perry

Rick Perry
Secretary of Energy

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 38

DOE ORDER NO. 202-17-4 SUMMARY OF FINDINGS

Summary of Findings
Department of Energy Order No. 202-17-4

September 14, 2017

Section 202(c) of the Federal Power Act (FPA) (codified at 16 U.S.C. § 824a(c)), through section 301(b) of the Department of Energy Organization Act (codified at 42 U.S.C. § 7151(b)), authorizes the Secretary of Energy, upon finding "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," to issue an order "requir[ing] . . . such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in [the Secretary's] judgment will best meet the emergency and serve the public interest." 16 U.S.C. § 824a(c)(1). If the order "may result in a conflict with [an] environmental law or regulation," then the Secretary must "ensure that such order requires generation, delivery, interchange, or transmission of electric energy only during hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable, is consistent with any applicable . . . environmental law or regulation and minimizes any adverse environmental impacts." *Id.* § 824a(c)(2). Orders issued under FPA section 202(c) "that may result in a conflict with [an] environmental law or regulation" expire 90 days after they are issued, but the Secretary "may renew or reissue such order[s] . . . for subsequent periods, not to exceed 90 days for each period, as [the Secretary] determines necessary to meet the emergency and serve the public interest." *Id.* § 824a(c)(4)(A).

The Department's regulations implementing FPA section 202(c) define the term "emergency" to mean, among other situations, "a specific inadequate power supply situation." 10 C.F.R. § 205.371. The regulations do not exhaustively list what qualifies as an emergency, but they note specifically that "[e]xtended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency as contemplated in these regulations." *Id.*

On June 13, 2017, PJM filed a *Request for Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Order Application) (included in the docket[1] of this Order) with the Department "to preserve the reliability of [the] bulk power transmission system in the North Hampton Roads area." Virginia Electric and Power Company[2] (Dominion), the electric utility serving the area, owns the coal-fired, power generating Units 1 and 2 at the Yorktown Power Station in Yorktown, Virginia. In November 2011 and October 2012, Dominion notified PJM of its plan to deactivate Units 1 and 2, respectively, effective December 31, 2014, because the units were not equipped to

[1] The docket of this Order is available at https://www.energy.gov/oe/downloads/federal-power-act-section-202c-dominion-energy-virginia-june-2017.
[2] *See* Dominion Energy, Inc., Form 10-Q filing, at 1 (Aug. 3, 2017), included in the docket of this Order.

comply with the Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS), 40 C.F.R. part 63 subpart UUUUU. On June 24, 2014, pursuant to 40 C.F.R. § 63.6(i)(4)(i)(A), the Virginia Department of Environmental Quality granted Dominion a one-year MATS compliance extension for Yorktown Units 1 and 2.

On April 16, 2016, pursuant to section 113(a) of the Clean Air Act, 42 U.S.C. § 7413(a)(3) and (4), the EPA issued an Administrative Compliance Order (ACO) through April 15, 2017. The ACO implemented a 2011 MATS Enforcement Policy regarding issuance of section 113(a) administrative orders to sources that are unable to comply with the MATS but that may need to operate for up to a year to address a specific and documented reliability concern. The 2011 MATS Enforcement Policy was limited in application to units critical for reliability purposes. The EPA found that operation of Yorktown Units 1 and 2 met the policy criteria, as verified by the Federal Energy Regulatory Commission (FERC). Dominion has not achieved full compliance with the MATS for Yorktown Units 1 or 2 since the ACO expired, and section 113(a) of the Clean Air Act bars further compliance extensions.

Since Dominion's decision to retire the coal-fired Yorktown units, PJM has planned for their permanent deactivation by including required transmission upgrades in its own Regional Transmission Expansion Planning Process. PJM is subject to federal reliability standards enforced by the North American Electric Reliability Corporation (NERC), the Electric Reliability Organization designated by FERC. PJM holds the highest-level reliability responsibilities for the system it manages as a certified Reliability Coordinator, Balancing Authority, and Transmission Operator. PJM is also registered with NERC as a Planning Coordinator and Transmission Planner, among other functions. NERC Compliance Registry Active Entities List (updated Sept. 7, 2017), included in the docket of this Order. PJM applies reliability criteria to evaluate transmission system conditions and then develops the transmission solutions needed to ensure compliance with the reliability standards. The PJM Board of Managers approves those solutions in a Regional Transmission Expansion Plan (RTEP). Through its Transmission Expansion Advisory Committee (TEAC) and Sub-Regional RTEP Committees, PJM works with stakeholders throughout the RTEP's development. PJM Manual 14B, "Regional Planning Process," included in the docket of this Order. The PJM Board of Managers approved the transmission upgrades necessitated by the retirement of Yorktown Units 1 and 2 on May 17, 2012. TEAC Recommendations to the PJM Board (PJM Staff Whitepaper), May 2012, at 12, included in the docket of this Order.

PJM's approved solution was the Skiffes Creek Transmission Project, which consists of three components: a 500kV line, a 230kV line rebuild, and a new switching station. United States Army Corps of Engineers (Army Corps), Memorandum for the Record re: Department of the Army Environmental Assessment and Statement of Findings for the Above-Referenced Standard Individual Permit Application, CENAO-WR-RS (NAO-2012-00080 / 13-V0408), at 1, included in the docket of this Order. A

number of issues in the North Hampton Roads area, many of which are interrelated, needed to be addressed to avoid overloading transmission lines with too much power, as detailed in PJM's Deactivation Study. Yorktown Units 1 and 2 Generator Deactivation Notification: Deactivation Study Results – updated June 26, 2017 (PJM Deactivation Study), included in the docket of this Order. *See also Va. Elec. & Power Co.*, Commission Comments on Requests for EPA Administrative Orders, Docket No. AD16-11-000, 153 FERC ¶ 61,265 at PP 14-16 (2015).

PJM completed a series of analyses consistent with RTEP procedures, finding that only the Skiffes Creek Transmission Project—and none of the stakeholder-proposed alternatives—addressed the full range of potential reliability violations. Order Application, app. I, at 16. For example, reliance on operation of the oil-fired Yorktown Unit 3 generator would not address thermal overload and voltage violations on the 230kV and 115kV bulk electric system that PJM identified because of significant environmental operating restrictions and other plant operation constraints associated with that unit, including an 8 percent capacity factor limitation. *See id.*, app. II, at 18. As a result, PJM did not recommend reliance on Yorktown Unit 3 as a sustainable alternative solution to the identified reliability criteria violations. *Id.*

As part of PJM's analyses, Dominion transmission staff provided PJM with an analysis of system needs as well as potential solutions to the retirement of generating units at Yorktown and elsewhere. Dominion Update to Retirement Study Results (Mar. 10, 2012), included in the docket of this Order. Dominion's analysis, which was based on PJM's initial determination of reliability criteria violations that needed to be addressed, was independently validated by PJM and publicly vetted through the PJM stakeholder process before PJM staff recommended that the Board of Managers approve the Skiffes Creek Transmission Project. PJM Staff Whitepaper at 12, included in the docket of this Order.

PJM, as the Regional Transmission Organization (RTO) responsible for transmission system operation across multiple states, including Virginia, maintains its expert determination that the Skiffes Creek Transmission Project is the most effective and efficient solution to address the identified reliability criteria violations. Order Application, app. I, at 16. As recently as March 1, 2017, PJM provided the Army Corps with an analysis of proposed alternatives and found that none of them sufficiently resolved the identified violations. Letter to Col. Jason E. Kelly, U.S. Army Corps of Engineers (Mar. 1, 2017), included in the docket of this Order. PJM's subsequent RTEP materials reaffirm the need for the Skiffes Creek Transmission Project, even considering the updated, steadily rising load forecasts in the recently released 2017 PJM Load Forecast Report (included in the docket of this Order). *See* PJM Interconnection, L.L.C., 2017 RTEP Process Scope & Input Assumptions, rev. 1, at 25-27 (Aug. 3, 2017), included in the docket of this Order.

Construction of the Skiffes Creek Transmission Project began in July 2017 and is expected to take approximately 18-20 months. *Order No. 202-17-2 Renewal Application Filing* (Renewal Application) at 3. Until the Project is completed, a plan known as the North Hampton Remedial Action Scheme (RAS) remains in effect. According to NERC's Glossary of Terms, a RAS is "[a] scheme designed to detect predetermined System conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation ([megawatts] and [megavolt amperes (reactive)]), tripping load, or reconfiguring a System(s)." Glossary of Terms Used in NERC Reliability Standards (updated Aug. 1, 2017), at 24, included in the docket of this Order.

To preserve the grid's reliability, the North Hampton RAS would allow PJM, the grid operator, to drop load—that is, shut off power to certain customers—to prevent voltage collapse. Dominion presented this RAS to PJM in January 2017, and the SERC Reliability Corporation, the NERC-delegated regional reliability enforcement entity, approved it that same month. *See* Dave Rees, *Dominion Virginia Power Sets Plan for Emergency Blackouts*, Daily Press, Jan. 13, 2017, included in the docket of this Order. If Yorktown Units 1 and 2 were unavailable, many N-1-1 contingencies could result in voltage collapse and thermal overloads. New Remedial Action Scheme, North Hampton RAS (Presentation to PJM), at 4, included in the docket of this Order; PJM Deactivation Study, included in the docket of this Order. According to FERC, "An N-1-1 contingency is a sequence of events consisting of an initial loss of a single generator or transmission element, followed by system adjustment, followed by another loss of a single generator or transmission element." *Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators*, Docket No. AD14-14-000, 153 FERC ¶ 61,221 at P 30 n.61 (2015).

The North Hampton RAS is on standby for use at PJM's discretion. If PJM detects the loss of certain facilities, it could trip the remaining feeds to the Yorktown area and drop service to approximately 150,000 customers, preventing voltage collapse. Rotating outages would follow until the system returns to normal operating parameters. New Remedial Action Scheme, North Hampton RAS (Presentation to PJM), at 6, included in the docket of this Order. According to U.S. Census estimates, the region PJM identifies as the North Hampton Roads load area in its Order Application had a population of more than 660,000 as of July 2016. At a minimum, rotating outages under the RAS would therefore impact, directly or indirectly, several hundred thousand people. United States Census Bureau, QuickFacts database, available at https://www.census.gov/quickfacts/fact/table/US/PST045216.

On July 3, 2017, the Army Corps issued a permit to Dominion for the Skiffes Creek Transmission Project pursuant to section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) and section 404 of the Clean Water Act (33 U.S.C. § 1344). On July

10, 2017, Dominion commenced construction of the Skiffes Creek Transmission Project. Renewal Application at 3.

On August 24, 2017, PJM filed its Renewal Application with DOE. The filing included all reports required by Order No. 202-17-2 (included in the docket of this Order). PJM said that construction of the Project was still expected to take 18-20 months, and that periodic transmission outages would be necessary to proceed apace with the Project. The same day, Dominion wrote to the Department that it "agrees with the Renewal Application and will operate in accordance with its provisions." Further, Dominion acknowledged that a 202(c) order "is not a long term solution to the reliability issues in the North Hampton Roads area on the Virginia Peninsula." The Skiffes Creek Transmission Project, underway as of July 2017, is the long-term solution.

On September 7, 2017, the Department received comments from Sierra Club opposing PJM's renewal request. On September 13, 2017, the Department received an answer to Sierra Club's comments from PJM. Both documents are included in the docket of this Order.

Discussion

Order No. 202-17-2 directs operation of Yorktown Units 1 and 2 as needed to address reliability issues, subject to a dispatch methodology submitted to the Department for review. The reliability issues noted in Order No. 202-17-2 were described as Scenario One, increased load due to weather-related temperature extremes, and Scenario Two, decreased transmission capacity required by the RTEP upgrade. Scenario Two was contemplated but not yet applicable when Order No. 202-17-2 was issued because the Army Corps permit application for the Skiffes Creek Transmission Project was still pending. On July 3, the Army Corps issued Permit No. NAO-2012-00080, resulting in the potential need to operate Yorktown Units 1 and 2 to address both Scenario One and Two reliability issues. To date, in accordance with Order No. 202-17-2, PJM has directed operation of Yorktown Units 1 and/or 2 for all or part of 13 days. PJM Interconnection, L.L.C., Report on Yorktown Units 1 and 2 Operations Pursuant to Order No. 202-17-2, Attachment 1, included in the docket of this Order; Telephone call to Steven Pincus, Associate General Counsel, PJM, Sept. 11, 2017.

Scenario One applies when load conditions exceed a certain threshold due to local transmission issues that would cause PJM to operate the system outside its normal operating parameters.[3] Weather-related temperature extremes are one example of such a local transmission issue. Scenario Two is also triggered when load conditions exceed a certain threshold, but the threshold is lowered depending on the particular construction-related transmission outages in effect as the Skiffes Creek Transmission Project is built.

[3] Exact load thresholds were submitted as critical electric infrastructure information and are thus not described here so as not to provide vulnerability information on critical infrastructure.

Because the Project minimizes environmental impacts by utilizing existing transmission line rights-of-way to the extent possible, portions of existing transmission lines must be taken offline for upgrades. Under either scenario, when the relevant thresholds are exceeded, to prevent system overload and uncontrolled power disruptions, PJM must implement the North Hampton RAS. The only sufficient alternative to the RAS and its resulting outages for up to approximately 150,000 customers is the emergency operation of Yorktown Units 1 and 2. The demand response available to PJM is a small fraction of the load threshold and is "not sufficient to ensure reliable service." Order Application, app. II, at 18. Likewise, Dominion has limited demand-side management and curtailment capabilities, insufficient for reliability purposes even when fully deployed. *See id.*, app. III, at 21.

Activating the RAS would immediately interrupt service to load in the North Hampton Roads area. PJM asserts that, according to the RAS, during certain high load conditions, this "load shedding" could result in the loss of roughly 950 MW of electric power—that is, the loss of service to over 150,000 North Hampton Roads area customers. Order Application at 9. This service interruption could last hours or even days. *See* North Hampton RAS Presentation to PJM, at 8, included in the docket of this Order. Activating the RAS is not a gradual approach that presents a wide range of likely impacts; it is an extreme measure with immediate consequences to 150,000 customers. While the RAS is designed to prevent more catastrophic, uncontrolled grid impacts from occurring, load shedding of this magnitude is significant, and would trigger mandatory reporting both to DOE and FERC. DOE Form OE-417 requires reporting within one hour for "[l]oad shedding of 100 Megawatts or more implemented under emergency operational policy," and within six hours for "[l]oss of electric service to more than 50,000 customers for 1 hour or more." This is the same level of reporting triggered by a cyber or other hostile attack on grid resources. Form OE-417, Electric Emergency Incident and Disturbance Report, https://www.oe.netl.doe.gov/docs/OE417_Form_03312018.pdf. Similarly, FERC and NERC mandate notification for a variety of serious events including when a bulk electric system emergency triggers automatic load shedding of 100 MW or more, as in the RAS. *See* North American Electric Reliability Corporation, Reliability Standard EOP-004-3 (Event Reporting), http://www.nerc.com/_layouts/PrintStandard.aspx?standardnumber=EOP-004-3&title=Event%20Reporting.

To underscore the potential impact of RAS activation, the estimated 150,000 impacted customers are counted by meter, not individual. One or more meters could translate to large household or commercial or industrial facilities, including those critical to health and safety systems. Whether counted as 150,000 or that amount multiplied several times over, the anticipated impact of this emergency situation is on par with or exceeds the impacts described in prior 202(c) orders. *Crisp Cnty. Power Comm'n v. Ga. Power Co.*, 35 FPC 629, 630-31 (1966) (ordering interconnection to prevent, in part,

outages lasting more than an hour and affecting 500 to 2,000 customers on Crisp County, Georgia's system). *City of Cleveland, Ohio v. Cleveland Elec. Illuminating Co.*, 47 FPC 747, 749 (1972) (ensuring reliable service was provided to the approximately 20% of the city's consumers). Cleveland's 1970 Census-reported population was 750,903, suggesting that just over 150,000 individuals were affected by the 1972 202(c) order. *See* https://www.census.gov/population/www/documentation/twps0027/tab20.txt. As described earlier, the U.S. Census estimated the population of the North Hampton Roads load area at nearly 661,000 people just over a year ago.

A benefit of the planning efforts mandated by federal reliability standards is that entities such as PJM can accurately forecast the impacts to the bulk power system in steady-state and various contingency event situations. Thus, as reliability planning continues to mature, there should be fewer electric energy shortages that take bulk power system owners, operators, and regulators by surprise. That planners can identify conditions under which shortages may occur, however, does not rule out electric energy shortages constituting emergencies under FPA section 202(c) and the Department's implementing regulations. It is impossible to plan for every contingency, and challenges may arise even when implementing the most prudent plans. FPA section 202(c) affords the Secretary of Energy discretion in finding when an emergency exists and how best to meet the emergency and serve the public interest.

Here, an emergency exists due to the imminent possibility of implementing the North Hampton RAS under a range of both steady-state and contingency events, including potential transmission congestion preventing the delivery of available generation to the North Hampton Roads area. PJM Deactivation Study at 1-2, included in the docket of this Order. The RAS would leave approximately 150,000 customers without power, including residential, industrial, commercial, health and safety facilities, major national defense, and educational institutions. *See* Order Application, app. IV, at 30-31. That creates serious health and safety issues. Issuance of today's Order meets the emergency and serves the public interest.

In these circumstances, transmission outages, like those contemplated for or otherwise in connection with the construction of the Skiffes Creek Transmission Project, constitute an emergency for purposes of a section 202(c) order. As stated earlier, the Department's implementing regulations, in their current form since 1981, contemplate that "[e]xtended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities [may create] an emergency." 10 C.F.R. § 205.371. The regulations add that "[i]n such cases, the impacted 'entity' will be expected to make firm arrangements to resolve the problem until new facilities become available, so that a continuing emergency order is not needed." *Id.* PJM, the impacted entity in this case, requested today's Order. Through the RTEP, PJM made firm arrangements to resolve the problem through the Skiffes Creek Transmission Project, which is now permitted and under construction. That construction was delayed due to events beyond

PJM's control has no bearing on the likelihood of power outages for 150,000 customers. Such a power loss event would also constitute an emergency as contemplated by FERC in its Public Utility Regulatory Policies Act of 1978 regulations, which define "system emergency" as "a condition on a utility's system which is likely to result in imminent significant disruption of service to customers or is imminently likely to endanger life or property." 18 C.F.R. § 292.101(b)(4). The risk faced by 150,000 customers will continue, assuming the Skiffes Creek Transmission Project construction schedule is met, for approximately another 18 months. Today's Order is limited in time and specifically tailored to address an emergency contemplated both in the authorizing statute and the Department's implementing regulations.

Between 2005 and 2007, DOE issued orders under similar circumstances, directing the Mirant Potomac River Generation Station to operate until two new 230kV transmission lines could be built to ensure reliability to a portion of the District of Columbia. *See* Order No. 202-5-3 (relying on DOE regulatory definition of emergency as including extended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities). In a series of orders under FPA section 202(c), the Secretary ordered operation of the generation units while the two existing 230kV lines that supplied the central District of Columbia area were temporarily and sequentially removed from service to connect the new lines. Neither the problems leading up to the closure of the generating units nor the need for a particular transmission solution were unexpected. Nevertheless, the Department found that imminent power shortages, faced if contingency events occurred, constituted an emergency under the Federal Power Act. Order Nos. 202-5-3, 202-6-1, 202-6-2, 202-7-1, and 202-7-2.

In this matter, the likelihood of RAS activation is not theoretical. While Order No. 202-17-2 was in effect, PJM had to call upon Yorktown Units 1 and/or 2 on 13 days over three months. Absent Order No. 202-17-2, the RAS would have been activated instead. The alternatives available to PJM and Dominion are not sufficient to ensure reliability without available capacity from Yorktown Units 1 and 2. As described, PJM and Dominion cannot mobilize adequate alternatives to counter the loss of transmission during construction of the Skiffes Creek Transmission Project. For example, demand response resources, while potentially helpful at the margin, are insufficient to address either Scenario One or Scenario Two. *See* Order Application, app. II, at 18. Further, PJM's recent RTEP Input Assumptions and Scope Whitepaper indicates that Dominion theoretically has up to 130 MW of distributed solar generation available during the summer. 2017 RTEP Process Scope and Input Assumptions, rev. 1, tbl.3.2, at 18 (Aug. 3, 2017), included in the docket of this Order. Outside of ramp-up and ramp-down times, each Yorktown Unit typically ran at 100 MW output or higher, day or night, when operational while Order No. 202-17-2 was in effect. PJM Interconnection, L.L.C., Report on Yorktown Units 1 and 2 Operations Pursuant to Order No. 202-17-2, Attachment 1. Distributed generation is an intermittent resource; even under ideal conditions, with full-capacity, daytime generation and load reduction at the height of the

summer, distributed generation generally would still not have offset the baseload generating capacity needed to ensure reliability on the North Hampton Roads area grid. And any flexibility for scheduling the Skiffes Creek Transmission Project's construction during historically low-load periods ended when the EPA ACO expired, as expeditious completion of the Project is now the priority. Therefore, even if PJM and Dominion made full use of available alternatives, capacity from Yorktown Unit 1, 2, or both would still be necessary to meet the emergency and serve the public interest.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law or regulation be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable, [be] consistent with any applicable . . . environmental law or regulation and minimize[] any adverse environmental impacts." Certain load conditions may necessitate operation of Yorktown Units 1 and 2.

To minimize the hours of operation and adverse environmental impacts, the Order contains certain limitations. First, DOE maintains consistency with EPA's approach in the 2016 ACO by authorizing operation of Yorktown Units 1 and 2 only when called upon by PJM for reliability purposes. The Department consulted with EPA and has reviewed data provided by PJM and Dominion on operations, air emissions, and water usage. This Order will continue the operational limitations described in EPA's above-referenced ACO, AED-CAA-113(a)-2016-0005. Second, DOE requires that PJM and Dominion, consistent with good utility practice, first exhaust all reasonably and practically available resources, including demand response and behind-the-meter generation resources, before operating Yorktown Units 1 and 2. Third, DOE requires continued compliance with the June 27 dispatch methodology, which was reviewed by the Department, and which remains subject to continuing oversight by the Department. In particular, the dispatch methodology establishes Yorktown Units 1 and 2 commitment procedures, describes the utilization and trip conditions of the North Hampton RAS for mitigating congestion on the Virginia Peninsula or North Hampton Roads area, and describes Dominion's mitigation options for the existing James River tower contingency. The dispatch methodology is an operating protocol that limits the ability of PJM to dispatch Yorktown Units 1 and 2 only when needed to mitigate reliability issues associated with scheduled and emergency transmission outages directly related to the Skiffes Creek Transmission Project and other local transmission issues. The EPA ACO recognized that such a dispatch methodology, under which PJM determines when the Yorktown units are needed for reliability issues, serves the objective of minimizing emissions. ACO at 8-9, included in the docket of this Order. Fourth, to track when Yorktown Units 1 and 2 are operated to maintain grid reliability and to monitor associated air emissions and water usage, reports will be required every two weeks going forward. If the Department becomes concerned with PJM or Dominion's compliance with this Order, enforcement actions are available, up to and including termination of the underlying order.

While DOE has constrained PJM's operations with regard to Yorktown Units 1 and 2, it is necessary to preserve reasonable discretion for PJM, as a Transmission Operator, to address the second-to-second operational challenges of grid management. This follows DOE's practice in earlier orders issued under FPA section 202(c), which prioritized reliability concerns as identified and assessed by the operator. For example, Order No. 202-02-1 (Aug. 16, 2002) ordered Cross-Sound Cable Company, LLC to operate a cable across Long Island Sound, limiting "transmission and delivery of . . . electric capacity and/or energy [to that] necessary in the judgment of the New York Independent System Operator [ISO] to meet the supply and essential reserve margin needs of the Long Island Power Authority [LIPA]," but only "in order for LIPA to serve its firm retail customers after it has implemented all available load reduction measures consistent with good utility practice." Order No. 202-03-1 (Aug. 14, 2003) directed operation of the same cable, but specifically ordered the New York ISO and ISO New England to require Cross-Sound Cable Company to operate the cable. That order also required both RTOs to "consult with each other and with appropriate reliability organizations." Today's Order similarly requires PJM to identify and mitigate reliability issues in accordance with DOE's specified operational limitations.

In considering renewal or reissuance of an order under FPA section 202(c) that may conflict with an environmental law or regulation, DOE is required to "consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation" and to include "conditions as such Federal agency determines necessary . . . to the extent practicable." 16 U.S.C. § 824a(c)(4). The EPA is the primary federal agency in this case with expertise in the protected environmental interest, specifically MATS and section 316(b) of the Clean Water Act, and the Department consulted with EPA after receiving the Renewal Application. Email from Acting Assistant Administrator Starfield, Office of Enforcement and Compliance Assurance, to Acting Under Secretary for Science and Energy Hoffman (Sept. 11, 2017), included in the docket of this Order. After consulting with EPA, and consistent with that consultation, the Department found that the only appropriate short-term emissions limitation on Yorktown Units 1 and 2 would be to curtail operating hours to the maximum extent practical for reliability purposes.

Pursuant to the National Environmental Policy Act of 1969, the Department has determined that issuance of this Order fits within the category of actions included in Categorical Exclusion (CX) B4.4 and otherwise meets the requirements for application of a CX. The Order fits within the category of actions because it authorizes "[p]ower marketing services and power management activities (including, but not limited to, storage, load shaping and balancing, seasonal exchanges, and other similar activities), provided that the operations of generating projects would remain within normal operating limits." Records of Categorical Exclusion Determination, Order No. 202-17-4, Sept. 11, 2017, included in the docket of this Order.

For the reasons stated above, the Secretary of Energy finds that an emergency exists threatening imminent electric energy shortages, and that this Order is necessary to address the emergency and serve the public interest in the North Hampton Roads area. The limitations on operation set forth in Order No. 202-17-4 and outlined above are, to the maximum extent practicable, consistent with applicable environmental laws or regulation and minimize any adverse environmental impacts, and the reporting requirements for operations and estimated emissions ensure transparency of implementation.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 39

GRACE HAUSER AFFIDAVIT

UNITED STATES OF AMERICA

BEFORE THE

UNITED STATES DEPARTMENT OF ENERGY

Order No. 202-26-42

AFFIDAVIT OF GRACE MARIE HAUSER

Grace Marie Hauser states that the following information is true and accurate to the best of my knowledge and belief:

1. I work as a technical analyst at the Environmental Defense Fund, a nonprofit environmental organization. Previously, I studied the environmental health impacts of oil and gas wells as a graduate student researcher at the Yale School of Public Health and as a research fellow with the FracTracker Alliance.
2. I have a bachelors degree in environmental sciences from Northwestern University and a masters degree in public health from the Yale School of Public Health.
3. I have used the Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)[1] and the Clean Air Markets Program Data resource (CAMPD)[2] in my work.
4. CAMPD is a web-based repository of unit-level CO2, NOx, SO2, and mercury emissions data for power plants. It is publicly available and maintained by the U.S. Environmental Protection Agency (EPA).
5. The COBRA tool is a web-based model developed and maintained by EPA to estimate the public health benefits due to reductions in air pollutants, namely PM2.5, NOx, SO2, and VOCs. The web version of COBRA uses 2023 data for its baseline emissions.
6. The COBRA tool allows for the modeling of health impacts over time, based on emissions over a particular year, and allows a user to specify particular scenarios of emission controls.
7. COBRA produces a location-specific and facility-specific estimate. This means that the tool measures the health impacts that are related to local meteorological conditions and the population distribution downwind from all generation units at a facility.
8. COBRA's calculated impacts aren't simply a function of tons of air pollutants emitted; they're a function of tons emitted from the particular facility, into the location-specific airshed, across specified times of a year, and affecting the particular population that resides in the neighboring areas.

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[1] U.S. EPA, Clean Air Markets Program Data (CAMPD), https://campd.epa.gov.
[2] U.S. EPA, Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA), https://www.epa.gov/cobra.

9. To estimate the health impacts of running Unit 1 at the Curtis H. Stanton Energy Center ("Stanton Unit 1") during the pendency of DOE Order No. 202-26-42, I used the COBRA tool as follows.
10. I first selected the relevant county in Florida—Orange County.
11. I then identified the relevant sector—Fuel Combustion: Electric Utility—and subsectors—Coal and Bituminous.
12. I am aware that Units 1 and 2 at the Curtis H. Stanton Energy Center are the only coal-fired power plants in Orange County, Florida.
13. I then selected a 100% reduction in each of the relevant pollutants.
14. Together, these parameters reflect the closure of both coal units, Unit 1 and Unit 2, at the Curtis H. Stanton Energy Center.
15. Finally, I selected a discount rate—2%.
16. According to the COBRA tool, those harms include 20-31 excess deaths, as well as thousands of lost school and work days across the states in the contiguous U.S. In total, the COBRA tool estimates that the total monetized value of health effects is between $328 million and $484 million in 2023 dollars.
17. These figures are an estimate for the health benefits over time, for a year's worth of emissions reductions from the closure of both Stanton Unit 1 and Unit 2.
18. These figures also provide an estimate of the health harms resulting from the continued operation of the Curtis H. Stanton Energy Center.
19. To estimate the health impacts of running just Unit 1 at the Curtis H. Stanton Energy Center ("Stanton Unit 1") during the pendency of DOE Order No. 202-26-42, I multiplied the health impacts produced by COBRA by the proportion of the total Curtis H. Stanton Energy Center emissions produced by Staton Unit 1, according to CAMPD data.
20. CAMPD's web-based repository includes unit-level CO2, NOx, SO2, and mercury emissions data of generation facilities.
21. To estimate the proportion of emissions of SO2 and NOx from Unit 1 of the Curtis H. Stanton Energy Center, I used CAMPD as follows.
22. I first selected the relevant data type—Emissions.
23. I then selected the relevant data subtype—Annual Emissions.
24. I then selected the relevant aggregation level—Unit (No Aggregation).
25. I then selected the relevant time period—2023.
26. I then entered the Facility name—Curtis H. Stanton Energy Center (564).
27. The resulting data provides 2023 emissions values for the Curtis H. Stanton Energy Center and is available on the EPA CAMPD website at https://campd.epa.gov/, or by accessing the specific data set at the following web link: https://campd.epa.gov/data/custom-data-download?bookmarkId=1790.
28. According to CAMPD, the annual SO2 emissions from Stanton Unit 1 in 2023 were 847.04 tons, and the annual NOx emissions were 2,140.52 tons; the annual SO2 emissions from Stanton Unit 2 in 2023 were 620.69 tons, and the annual NOx emissions were 1,356.02 tons.

29. Therefore, Stanton Unit 1 was, on average, responsible for 57.7% of SO2 and 61.2% NOx emissions from the Curtis H. Stanton Energy Center's coal generation operations in 2023.
30. As a rough approximation, therefore, Unit 1's total emissions represent somewhere between 57.7% and 61.2% of the total coal generation emission from the Curtis H. Stanton Energy Center in 2023. By applying these proportions to the harms estimated by the COBRA tool, I modeled the harms associated with the continued operation of Stanton Unit 1 for all contiguous U.S. states.
31. By applying the lower 57.7% emissions attribution to the total emission of the Curtis H. Stanton Energy Center, Stanton Unit 1 would be responsible for 11-18 deaths, thousands of missed work/school days, and $189.5-$279.6 million (2023 USD) in monetized health harms.
32. By applying the higher 61.2% emissions attribution to the total emissions of the Curtis H. Stanton Energy Center, Stanton Unit 1 would be responsible for 12-19 deaths, thousands of missed work/school days, and $201.0-$296.5 million (2023 USD) in monetized health harms.
33. This range approach preserves the location- and facility-specific qualities that are essential to a defensible estimate, operates under the reasonable assumption that harms scale proportionately with emissions within this facility, and — critically — avoids the error of assuming a simple 1:1 ratio of emissions to harms.
34. I understand that DOE Order No. 202-26-42 requires Stanton Unit 1 to remain in operation from September 2, 2026, through November 30, 2026.
35. As a rough approximation, the benefits from closing Stanton Unit 1 for the three-month period of DOE Order No. 202-26-42 would be at least one quarter the benefits of a year-long closure.
36. Since Florida is a summer peaking state, the benefits are very likely to be greater than one quarter.
37. To precisely estimate the harm from the continued operation of Stanton Unit 1, one would need to know, or model, which generation resources are displaced by its operation. Such precision is unrealistic. But it is almost certainly true that most of the generation displaced by the continued operation of Stanton Unit 1 comes from natural gas combined cycle plants.
38. The health impacts from running those plants vary depending on location, time of year, and the specific technologies employed by the plant, but they are invariably less than coal.
39. Accordingly, I can conclude that the continued operation of Stanton Unit 1 will have a net harmful effect on public health in Florida.
40. In response to the issuance of Order No. 202-26-30, I reviewed the document titled, *SEC 1 Gross Generation (5_1_25 - 6_23_26)_1*, which was an excel spreadsheet provided by Orlando Utilities Commission, which included an hourly calculation of generation in MW of load served by Stanton Unit 1 from May 1, 2025 – June 23, 2026.
41. At that time, I had determined that the data provided showed that Stanton Unit 1 continued to generate electricity.
42. I also determined that between the date of DOE's issuance of DOE Order No. 202-26-30 on June 4, 2026, and the last date provided in the Orlando Utilities Commission dataset—June 23, 2026—that Stanton Unit 1 increased its average hourly generation output by 242 MW.

43. Based on the same load generation data, I also determined that this generation output shows an increase of 37,498 MW, or 46.2% when compared to the prior year's output from the same time period—June 4, 2025 - June 23, 2025. June 4, 2026 – June 23, 2026 covered the majority of DOE Order No. 202-26-30.

I declare under penalty of perjury that the foregoing is true and correct.

Executed in Chicago, Illinois on October 1, 2026.

Grace Marie Hauser

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 40

BRENNAN CENTER, LIST OF DECLARED NATIONAL EMERGENCIES UNDER THE NATIONAL EMERGENCIES ACT

BRENNAN CENTER FOR JUSTICE

Declared National Emergencies Under the National Emergencies Act

Emergencies that are still in effect today are shaded in the table below.
Emergencies that did *not* involve the International Emergency Economic Powers Act (IEEPA) are indicated with an asterisk (*)

	Declaration	Date	Title	Citation/Status
1.	E.O. 12170	11/14/79	Blocking Iranian Government Property	3 C.F.R., 1979 Comp., pp. 457-458; *most recently continued by notice of 11/05/25, see 90 FR 50735.*
2.	E.O. 12211	04/17/80	Further Prohibitions on Transactions with Iran	3 C.F.R., 1980 Comp., pp. 253-255; *prohibitions revoked but national emergency left in effect by E.O. 12282 of 01/19/81. National emergency does not appear to have ever been terminated or continued.*
3.	E.O. 12444	10/14/83	Continuation of Export Control Regulations	3 C.F.R., 1983 Comp., pp. 214-215; *revoked by E.O. 12451 of 12/20/83.*
4.	E.O. 12470	03/30/84	Continuation of Export Control Regulations	3 C.F.R., 1984 Comp., pp. 168-169; *revoked by E.O. 12525 of 07/12/85.*
5.	E.O. 12513	05/01/85	Prohibiting Trade and Certain Other Transactions Involving Nicaragua	3 C.F.R., 1985 Comp., p. 342; *revoked by E.O. 12707 of 03/13/90.*
6.	E.O. 12532	09/09/85	Prohibiting Trade and Certain Other Transactions Involving South Africa	3 C.F.R., 1985 Comp., pp. 387-391; *revoked by E.O. 12769 of 07/10/91.*
7.	E.O. 12543	01/07/86	Prohibiting Trade and Certain Transactions Involving Libya	3 C.F.R., 1986 Comp., pp. 181-182; *revoked by E.O. 13357 of 09/20/04.*
8.	E.O. 12635	04/08/88	Prohibiting Certain Transactions with Respect to Panama	3 C.F.R., 1988 Comp., pp. 563-564; *revoked by E.O. 12710 of 04/05/90.*
9.	E.O. 12722	08/02/90	Blocking Iraqi Government Property and Prohibiting Transactions with Iraq	3 C.F.R., 1990 Comp., pp. 294-295; *expanded in scope by E.O. 12743 of 01/18/91; revoked by E.O. 13350 of 07/29/04.*

10.	E.O. 12730	09/30/90	Continuation of Export Control Regulations	3 C.F.R., 1990 Comp., pp. 305-306; *revoked by E.O. 12867 of 09/30/93.*
11.	E.O. 12735	11/16/90	Chemical and Biological Weapons Proliferation	3 C.F.R., 1990 Comp., pp. 313-316; *revoked by E.O. 12938 of 11/14/94.*
12.	E.O. 12775	10/04/91	Prohibiting Certain Transactions with Respect to Haiti	3 C.F.R., 1991 Comp., pp. 349-350; *revoked by E.O. 12932 of 10/14/94.*
13.	E.O. 12808	05/30/92	Blocking "Yugoslav Government" Property and Property of the Governments of Serbia and Montenegro	3 C.F.R., 1992 Comp., pp. 305-306; *revoked by E.O. 13304 of 05/28/03.*
14.	E.O. 12865	09/26/93	Prohibiting Certain Transactions Involving UNITA	3 C.F.R., 1993 Comp., pp. 636-638; *revoked by E.O. 13298 of 05/06/03.*
15.	E.O. 12868	09/30/93	Measures to Restrict the Participation by United States Persons in Weapons Proliferation Activities	3 C.F.R., 1993 Comp., pp. 650-651; *revoked by E.O. 12930 of 09/29/94.*
16.	E.O. 12923	06/30/94	Continuation of Export Control Regulations	3 C.F.R., 1994 Comp., pp. 916-917; *revoked by E.O. 12924 of 08/19/94.*
17.	E.O. 12924	08/19/94	Continuation of Export Control Regulations	3 C.F.R., 1994 Comp., pp. 917-919; *revoked by E.O. 13206 of 04/04/01.*
18.	E.O. 12930	09/29/94	Measures to Restrict the Participation by United States Persons in Weapons Proliferation Activities	3 C.F.R., 1994 Comp., pp. 924-925; *revoked by E.O. 12938 of 11/14/94.*
19.	E.O. 12934	10/25/94	Blocking Property and Additional Measures With Respect to the Bosnian Serb- Controlled Areas of the Republic of Bosnia and Herzegovina	3 C.F.R., 1994 Comp., pp. 930-932; *revoked by E.O. 13304 of 05/28/03.*
20.	E.O. 12938	11/14/94	Proliferation of Weapons of Mass Destruction	3 C.F.R., 1994 Comp., pp. 950-954; *amended by E.O. 13094 of 07/30/98, E.O. 13382 of 06/28/05, and E.O. 13883 of 08/01/19; most recently continued by notice of 11/05/25, see 90 FR 50737.*
21.	E.O. 12947	01/23/95	Prohibiting Transactions with Terrorists Who Threaten to Disrupt the Middle East Peace Process	3 C.F.R., 1995 Comp., pp. 319-320; *amended by E.O. 13099 of 08/20/98, E.O. 13224 of 09/23/01, and E.O. 13372 of 02/16/05; revoked by E.O. 13886 of 09/09/19. E.O. 13224 is listed as a separate emergency and remains in effect.*

22.	E.O. 12957	03/15/95	Prohibiting Certain Transactions with Respect to the Development of Iranian Petroleum Resources	3 C.F.R., 1995 Comp., pp. 332-333; *supplemented by E.O. 12959 of 05/06/95; revoked in part by E.O. 13059 of 08/19/97; expanded by E.O. 13553 of 09/28/10, E.O. 13606 of 04/22/12 (amended by E.O. 14312 of 06/30/25), E.O. 13846 of 08/06/18, E.O. 13902 of 01/10/20, E.O. 13949 of 09/21/20, and E.O. 14382 of 02/06/26 (modified by E.O. 14389 of 02/20/26); most recently continued by notice of 03/02/26, see 91 FR 10937. Technically lapsed for two months in 2018, because the 2017 one-year extension was issued on 01/13/17, see 82 FR 6187, and the subsequent renewal notice was not issued until 03/12/18, see 83 FR 11393).*
23.	E.O. 12978	10/21/95	Blocking Assets and Prohibiting Transactions with Significant Narcotics Traffickers	3 C.F.R., 1995 Comp., pp. 415-417; *amended by E.O. 13286 of 02/28/03; most recently continued by notice of 10/16/25, see 90 FR 48391.*
24.	Proc. 6867*	03/01/96	Regulation of the Anchorage and Movement of Vessels with Respect to Cuba	3 C.F.R., 1996 Comp., pp.; *expanded by Proc. 7757 of 02/26/04; modified by Proc. 9398 of 02/24/16 and Proc. 9699 of 02/22/18; most recently continued by notice of 02/13/26, see 91 FR 7799.*
25.	E.O. 13047	05/22/97	Prohibiting New Investment in Burma	3 C.F.R., 1997 Comp., pp. 202-204; *revoked in part by E.O. 13310 of 07/28/03; expanded by E.O. 13448 of 10/18/07, E.O. 13464 of 04/30/08, E.O. 13619 of 07/11/12, and E.O. 13651 of 08/06/13; terminated by E.O. 13742 of 10/07/16.*
26.	E.O. 13067	11/03/97	Blocking Sudanese Government Property and Prohibiting Transactions with Sudan	3 C.F.R., 1997 Comp., pp. 230-231; *expanded by E.O. 13400 of 04/26/06, E.O. 13412 of 10/13/06, and E.O. 14098 of 05/04/23; revoked in part by E.O. 13761 of 01/13/17; most recently continued by notice of 10/16/25, see 90 FR 48393.*

27.	E.O. 13088	06/09/98	Blocking Property of the Governments of the Federal Republic of Yugoslavia (Serbia and Montenegro), the Republic of Serbia, and the Republic of Montenegro, and Prohibiting New Investment in the Republic of Serbia in Response to the Situation in Kosovo	3 C.F.R., 1998 Comp., pp. 191-193; *revoked by E.O. 13304 of 05/28/03.*
28.	E.O. 13129	07/04/99	Blocking Property and Prohibiting Transactions with the Taliban	3 C.F.R. 1999 Comp., pp. 200-203; *revoked by E.O. 13268 of 07/02/02.*
29.	E.O. 13159	06/21/00	Blocking Property of the Government of the Russian Federation Relating to the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons	3 C.F.R. 2000 Comp., pp. 277-278; *expired as of 06/21/13 pursuant to section 202(d) of the National Emergencies Act; E.O. 13617, issued 06/25/12, declared a new national emergency that had the practical effect of protecting the same property and interests blocked by E.O. 13159.*
30.	E.O. 13194	01/18/01	Prohibiting the Importation of Rough Diamonds from Sierra Leone	3 C.F.R. 2001 Comp., pp. 741-743; *expanded by E.O. 12213 of 05/22/01; revoked by E.O. 13324 of 01/15/04.*
31.	E.O. 13219	06/26/01	Blocking Property of Persons Who Threaten International Stabilization Efforts in the Western Balkans	3 C.F.R. 2001 Comp., pp. 778-782; *revised by E.O. 13304 of 05/28/03; scope expanded by E.O. 14033 of 06/08/21 and E.O. 14140 of 01/08/25; most recently continued by notice of 06/22/26, see 91 FR 38233.*
32.	E.O. 13222	08/17/01	Continuation of Export Control Regulations	3 C.F.R. 2001 Comp., pp. 783-784; *originally modified E.O. 12947 of 01/23/95, now revoked; amended by E.O. 13637 of 03/08/13; most recently continued by notice of 08/04/25, see 90 FR 37999.*
33.	Proc. 7463*	09/14/01	Declaration of National Emergency by Reason of Certain Terrorist Attacks	*3 C.F.R. 2001 Comp., p. 263; expanded by E.O. 13223 of 09/14/01;* E.O. 13235 of 11/16/01; and E.O. 13321 of 12/17/03; most recently continued by notice of 08/29/25, see 90 FR 42695.* **Most expansions of authority under this declaration were announced as amendments to E.O. 13223, including: E.O. 13253 of 01/16/02, E.O. 13286 of 02/28/03, and E.O. 13814 of 10/20/17.*

34.	E.O. 13224	09/23/01	Blocking Property and Prohibiting Transactions With Persons Who Commit, Threaten To Commit, or Support Terrorism	3 C.F.R. 2001 Comp., pp. 786-789; *amended by E.O. 13268 of 07/02/02, E.O. 13284 of 01/23/03, E.O. 13372 of 02/16/05, and E.O. 13886 of 09/09/19; most recently continued by notice of 09/08/25, see 90 FR 43903.*
35.	E.O. 13288	03/06/03	Blocking Property of Persons Undermining Democratic Processes or Institutions in Zimbabwe	3 C.F.R. 2003 Comp., pp. 186-191; *amended and superseded in part by E.O. 13391 of 11/22/05; most recently continued by notice of 03/01/23, see 88 FR 13289; terminated by E.O. 14118 of 03/04/24.*
36.	E.O. 13303	5/22/03	Protecting the Development Fund for Iraq and Certain Other Property in Which Iraq has an Interest	3 C.F.R. 2003 Comp., pp. 227-229; *scope expanded by E.O. 13315 of 08/28/03; substantive provisions terminated but emergency left in place by E.O. 13668 of 05/27/14; most recently continued by notice of 05/04/26, see 91 FR 25071.*
37.	E.O. 13338	05/11/04	Blocking Property of Certain Persons and Prohibiting the Export of Certain Goods to Syria	3 C.F.R. 2004 Comp., pp. 168-172; *clarified E.O. 13399 of 04/25/2006; amended by E.O. 13460 of 02/13/08; scope expanded by E.O. 13572 of 04/29/11, E.O. 13573 of 05/18/11, and E.O. 13606 of 04/22/12; most recently continued by notice of 05/07/25, see 90 FR 19619; E.O. 13338 and other E.O.'s listed revoked by E.O. 14312 of 06/30/25.*
38.	E.O. 13348	07/22/04	Blocking Property of Certain Persons and Prohibiting the Importation of Certain Goods from Liberia	3 C.F.R. 2004 Comp., pp. 189-195; *revoked by E.O. 13710 of 11/12/15.*
39.	Proc. 7924*	09/08/05	To Suspend Subchapter IV of Chapter 31 of Title 40, United States Code, Within a Limited Geographic Area in Response to the National Emergency Caused by Hurricane Katrina	*3 C.F.R. 2005 Comp., pp. 104-106; revoked by Proc. 7959 of 11/03/05.* ***This limited declaration did not initially cite the President's authority under the National Emergencies Act, but the revocation proclamation did. For more information, see Prevailing Wage Requirements and the Emergency Suspension of the Davis-Bacon Act, RL33276, Congressional Research Service, February 16, 2006, 4-7.*
40.	E.O. 13396	02/07/06	Blocking Property of Certain Persons Contributing to the Conflict in Côte d'Ivoire	3 C.F.R., 2006 Comp., *pp. 209-213; terminated by E.O. 13739 of 09/14/16.*

41.	E.O. 13405	06/16/06	Blocking Property of Certain Persons Undermining Democratic Processes or Institutions in Belarus	3 C.F.R., 2006 Comp., pp. 231-234; *expanded by E.O. 14038 of 08/09/21; most recently continued by notice of 05/21/26, see 91 FR 31333.*
42.	E.O. 13413	10/27/06	Blocking Property of Certain Persons Contributing to the Conflict in the Democratic Republic of the Congo	3 C.F.R., 2006 Comp., pp. 247-249; *amended by E.O. 13671 of 07/08/14; most recently continued by notice of 10/16/25, see 90 FR 48395.*
43.	E.O. 13441	08/01/07	Blocking Property of Persons Undermining the Sovereignty of Lebanon or Its Democratic Processes and Institutions	72 Fed. Reg. 43499-43501; *most recently continued by notice of 07/25/25, see 90 FR 35825.*
44.	E.O. 13466	06/26/08	Continuing Certain Restrictions With Respect to North Korea and North Korean Nationals	73 Fed. Reg. 36787-36788; *expanded by E.O. 13551 of 08/30/10, E.O. 13570 of 04/18/11, E.O. 13687 of 01/02/15, E.O. 13722 of 03/15/16, and E.O. 13810 of 09/20/17; most recently continued by notice of 06/22/26, see 91 FR 38231.*
45.	Proc. 8443*	10/23/09	Declaration of a National Emergency With Respect to the 2009 H1N1 Influenza Pandemic	74 Fed. Reg. 55439-55440; *does not appear to have ever been terminated or continued.*
46.	E.O. 13536	04/12/10	Blocking Property of Certain Persons Contributing to the Conflict in Somalia	75 Fed. Reg. 19869-19872; *amended by E.O. 13620 of 07/20/12; most recently continued by notice of 04/08/26, see 91 FR 18765.*
47.	E.O. 13566	02/25/11	Blocking Property and Prohibiting Certain Transactions Related to Libya	76 Fed. Reg. 11315-11318; *expanded by E.O. 13726 of 04/19/16; most recently continued by notice of 02/13/26, see 91 FR 7801.*
48.	E.O. 13581	07/24/11	Blocking Property of Transnational Criminal Organizations	76 Fed. Reg. 44757-44759; *expanded by E.O. 13863 of 03/15/19; most recently continued by notice of 07/21/25, see 90 FR 34759.*
49.	E.O. 13611	05/16/12	Blocking Property of Persons Threatening the Peace, Security, or Stability of Yemen	77 Fed. Reg. 29533-29535; *most recently continued by notice of 05/07/26, see 91 FR 25781.*

50.	E.O. 13617	06/25/12	Blocking Property of the Government of the Russian Federation Relating to the Disposition of Highly Enriched Uranium Extracted from Nuclear Weapons	77 Fed. Reg. 38457-38461; *revoked by E.O. 13695 of 05/26/15.*
51.	E.O. 13660	03/06/14	Blocking Property of Certain Persons Contributing to the Situation in Ukraine	79 Fed. Reg. 13491-13495; *expanded by E.O. 13661 of 03/16/14, E.O. 13662 of 03/20/14, and E.O. 14065 of 02/21/22; relied on for additional steps taken in E.O. 13685 of 12/19/14 and E.O. 13849 of 09/20/18; most recently continued by notice of 02/18/26, see 91 FR 8355.*
52.	E.O. 13664	04/03/14	Blocking Property of Certain Persons With Respect to South Sudan	79 Fed. Reg. 19281-19285; *most recently continued by notice of 03/24/26, see 91 FR 15513.*
53.	E.O. 13667	05/12/14	Blocking Property of Certain Persons Contributing to the Conflict in the Central African Republic	79 Fed. Reg. 28385-28391; *most recently continued by notice of 05/04/26, see 91 FR 25069.*
54.	E.O. 13692	03/08/15	Blocking Property and Suspending Entry of Certain Persons Contributing to the Situation in Venezuela	80 Fed. Reg. 12747-12751; *expanded by E.O. 13808 of 08/24/17, E.O. 13827 of 03/19/18, E.O. 13835 of 05/21/18, E.O. 13884 of 08/05/19, and E.O. 14245 of 03/24/25 (modified by E.O. 14389 of 02/20/26); most recently continued by notice of 02/18/26, see 91 FR 8357.*
55.	E.O. 13694	04/01/15	Blocking the Property of Certain Persons Engaging in Significant Malicious Cyber-Enabled Activities	80 Fed. Reg. 18077-18079; *amended by E.O. 13757 of 12/28/16, E.O. 13984 of 01/19/21, E.O. 14110 of 10/30/23 (revoked by E.O. 14148 of 01/20/25), E.O. 14144 of 01/16/25, and E.O. 14306 on 06/06/25; most recently continued by notice of 03/24/26, see 91 FR 15511.*
56.	E.O. 13712	11/22/15	Blocking Property of Certain Persons Contributing to the Situation in Burundi	80 Fed. Reg. 73633-73636; *terminated by E.O. 14054 of 11/18/21.*
57.	E.O. 13818	12/20/17	Blocking the Property of Persons Involved in Serious Human Rights Abuse or Corruption	82 Fed. Reg. 60839-60843; *most recently continued by notice of 12/10/25, see 90 FR 57863.*

58.	E.O. 13848	09/12/18	Imposing Certain Sanctions in the Event of Foreign Interference in a United States Election	83 Fed. Reg. 46843-46848; *most recently continued by notice of 08/29/25, see 90 FR 42697.*
59.	E.O. 13851	11/27/18	Blocking Property of Certain Persons Contributing to the Situation in Nicaragua	83 Fed. Reg. 61505-61507; *relied on for additional steps taken in E.O. 14088 of 10/24/22; most recently continued by notice of 11/20/25, see 90 FR 53193.*
60.	Proc. 9844*	02/15/19	Declaring a National Emergency Concerning the Southern Border of the United States	84 Fed. Reg. 4949-4950; *continued by notice of 01/15/21, see 86 FR 6557; terminated by Proc. 10142 of 01/20/21; reinstated by Proc. 10886 on 01/20/25, see 90 FR 8327.*
61.	E.O. 13873	05/15/19	Executive Order on Securing the Information and Communications Technology and Services Supply Chain	84 Fed. Reg. 22689-22692; *expanded by E.O. 13942 of 08/06/20, E.O. 13943 of 08/06/20, E.O. 13971 of 01/05/21, and E.O. 14034 of 06/09/21; most recently continued by notice of 05/11/26, see 91 FR 27181.*
62.	E.O. 13882	07/26/19	Blocking Property and Suspending Entry of Certain Persons Contributing to the Situation in Mali	84 Fed. Reg. 37055-37058; *most recently continued by notice of 07/21/25, see 90 FR 34757.*
63.	E.O. 13894	10/14/19	Blocking Property and Suspending Entry of Certain Persons Contributing to the Situation in Syria	84 Fed. Reg. 55851-55855; *continued by notice of 09/30/25, see 89 FR 82929; expanded by E.O. 14142 of 01/15/25 and E.O. 14312 of 06/30/25.*
64.	Proc. 9994*	03/13/20	Declaring a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak	85 Fed. Reg. 15337-15338; *expanded by E.O. 13911 of 03/27/20, E.O. 13912 of 03/27/20, and E.O. 13916 of 04/18/20; further expanded by decisions of the Secretary of Homeland Security of 03/20/20 without additional E.O. at 85 FR 16547 (extended on 04/22/22 by 87 FR 24041) and 85 FR 16548 (extended on 04/22/22 by 87 FR 24048); terminated by H.J. Res. 7 on 04/10/23.*
65.	E.O. 13920	05/01/20	Securing the United States Bulk-Power System	85 Fed. Reg. 26595-26599; *suspended for 90 days by E.O. 13990 of 01/20/21 (revoked by E.O. 14148 of 01/20/25); does not appear to have been formally terminated or continued.*

66.	E.O. 13928	06/11/20	International Criminal Court; Blocking Property of Certain Associates	85 Fed. Reg. 36139-36142; *terminated by E.O. 14022 of 04/01/21 (revoked by E.O. 14148 of 01/20/25).*
67.	E.O. 13936	07/14/20	The President's Executive Order on Hong Kong Normalization	85 Fed. Reg. 43413-43417; *most recently continued by notice of 07/10/25, see 90 FR 31129.*
68.	E.O. 13953	09/30/20	Addressing the Threat to the Domestic Supply Chain From Reliance on Critical Minerals From Foreign Adversaries and Supporting the Domestic Mining and Processing Industries	85 Fed. Reg. 62539-62544; *does not appear to have ever been terminated or continued.*
69.	E.O. 13959	11/12/20	Addressing the Threat From Securities Investments That Finance Communist Chinese Military Companies	85 Fed. Reg. 73185-73189; *amended by E.O. 13974 of 01/13/20 and E.O. 14032 of 06/03/21; most recently continued by notice of 11/05/25, see 90 FR 50739.*
70.	E.O. 14014	02/10/21	Blocking Property With Respect to the Situation in Burma	86 Fed. Reg. 9429-9432; *most recently continued by notice of 02/03/26, see 91 FR 5663.*
71.	E.O. 14024	04/15/21	Blocking Property With Respect to Specified Harmful Foreign Activities of the Government of the Russian Federation	86 Fed. Reg. 20249-20252; *expanded by E.O. 14066 of 03/08/22; relied on for additional steps taken in E.O.14039 of 08/20/21, E.O. 14068 of 03/11/22, and E.O. 14071 of 04/06/22; expanded by E.O. 14114 of 12/22/23 and E.O. 14329 on 08/06/25 (modified by E.O. 14389 of 02/20/26); modified by E.O. 14384 of 02/06/26; most recently continued by notice of 03/24/26, see 91 FR 15515.*
72.	E.O. 14046	09/17/21	Imposing Sanctions on Certain Persons With Respect to the Humanitarian and Human Rights Crisis in Ethiopia	86 Fed. Reg. 52389-52393; *most recently continued by notice of 09/08/25, see 90 FR 43901.*
73.	E.O. 14059	12/15/21	Imposing Sanctions on Foreign Persons Involved in the Global Illicit Drug Trade	86 Fed. Reg. 71549-71553; *further authority invoked in E.O. 14097 of 04/27/23; most recently continued by notice of 12/10/25, see 90 FR 57865.*
74.	E.O. 14064	02/11/22	Protecting Certain Property of Da Afghanistan Bank for the Benefit of the People of Afghanistan	87 Fed. Reg. 8391-8393; *most recently continued by notice of 01/20/26, see 91 FR 3311.*

75.	Proc. 10371*	04/21/22	Declaration of National Emergency and Invocation of Emergency Authority Relating to the Regulation of the Anchorage and Movement of Russian-Affiliated Vessels to United States Ports	87 Fed. Reg. 24265-24266; *most recently continued by notice of 04/15/26, see 91 FR 20861.*
76.	E.O. 14078	07/19/22	Bolstering Efforts To Bring Hostages and Wrongfully Detained United States Nationals Home	87 Fed. Reg. 43389-43394; *most recently continued by notice of 07/15/25, see 90 FR 33869.*
77.	E.O. 14105	08/09/23	Addressing United States Investments in Certain National Security Technologies and Products in Countries of Concern	88 Fed. Reg. 54867-548; *most recently continued by notice of 08/06/25, see 90 FR 38601.*
78.	E.O. 14115	02/01/24	Imposing Certain Sanctions on Persons Undermining Peace, Security, and Stability in West Bank	89 Fed. Reg. 7605; *most recently continued by notice of 01/14/25, see 90 FR 5467; terminated by E.O. 14148 on 01/20/25, see 90 FR 8237.*
79.	E.O. 14117	02/28/24	Preventing Access to Americans' Bulk Sensitive Personal Data and United States Government-Related Data by Countries of Concern	89 Fed. Reg. 15421-15430.
80.	E.O. 14144	01/16/25	Strengthening and Promoting Innovation in the Nation's Cybersecurity	90 Fed. Reg. 6755-6771; *this order was a modification of E.O. 14028 of 05/12/2021; further amended by E.O. 14306 on 06/06/25.*
81.	E.O. 14156	01/206	Declaring a National Energy Emergency	90 Fed. Reg. 8433-8437; *expanded by E.O. 14241 of 03/20/25; relied on for additional steps taken in E.O. 14262 of 04/08/25; expanded by E.O. 14386 of 02/11/26, presidential determination 2026-08 of 04/20/26, presidential determination 2026-09 of 04/20/26, presidential determination 2026-10 of 04/20/26, presidential determination 2026-11 of 04/20/26, and presidential determination 2026-12 of 04/20/26; continued by notice of 01/12/26, see 91 FR 1667.*
82.	E.O. 14157	01/20/2025	Designating Cartels and Other Organizations as Foreign Terrorist Organizations and Specially Designated Global Terrorists	90 Fed. Reg. 8439-8440.

83.	Proc. 10886	01/20/2025	Declaring a National Emergency at the Southern Border of the United States	90 Fed. Reg. 8327-8329; *clarified by E.O. 14167 of 01/20/25; further authority invoked by presidential memorandum on 04/11/25; modified by notice of 07/15/25, see 90 FR 37371; continued by notice of 01/12/26, see 91 FR 1665.*
84.	E.O. 14193	02/01/2025	Imposing Duties To Address the Flow of Illicit Drugs Across Our Northern Border	90 Fed. Reg. 9113; *modified by E.O. 14197 of 02/03/25, E.O. 14193 took effect on 03/04/25; amended by E.O. 14226 of 03/02/25, E.O. 14231 of 03/06/25, E.O. 14324 of 07/30/25 (revised by E.O. 14388 of 02/20/26), and E.O. 14325 of 07/31/25; modified by E.O. 14389 of 02/20/26.*
85.	E.O. 14194	02/01/2025	Imposing Duties To Address the Situation at Our Southern Border	90 Fed. Reg. 9117; *modified by E.O. 14198 of 02/03/25, E.O. 14194 to take effect on 03/04/25; amended by E.O. 14227 of 03/02/25; amended by E.O. 14324 on 07/30/25 (revised by E.O. 14388 of 02/20/26); modified by E.O. 14389 of 02/20/26.*
86.	E.O. 14195	02/01/2025	Imposing Duties To Address the Synthetic Opioid Supply Chain in the People's Republic of China	90 Fed. Reg. 9121; *amended by E.O. 14200 of 02/05/25, E.O. 14228 of 03/03/25, E.O. 14256 of 04/02/25, E.O. 14259 of 04/08/25, E.O. 14324 of 07/30/25 (revised by* E.O. 14388 of 02/20/26), *and* E.O. 14357 *of 11/04/25; modified by* E.O. 14389 of 02/20/26.
87.	E.O. 14203	02/06/2025	Imposing Sanctions on the International Criminal Court	90 Fed. Reg. 9369; *continued by notice of 01/20/26, see 91 FR 3309.*
88.	E.O. 14257	04/02/2025	Regulating Imports With a Reciprocal Tariff To Rectify Trade Practices That Contribute to Large and Persistent Annual United States Goods Trade Deficits	*90 Fed. Reg. 15041; amended by E.O. 14259 of 04/08/25; modified by E.O. 14266 of 04/09/25, E.O. 14298 of 05/12/25, E.O. 14309 of 06/16/25 and E.O. 14316 of 07/07/25; amended by E.O. 14324 on 07/30/25 (revised by E.O. 14388 of 02/20/26); modified by E.O. 14326 of 07/31/25, E.O. 14334 of 08/11/25, E.O. 14345 of 09/04/25, E.O. 14346 of 09/05/25, E.O. 14358 of 11/04/25, E.O. 14360 of 11/14/25 and E.O. 14389 of 02/20/26; continued by notice of 03/24/26, see 91 FR 15517.*
89.	E.O. 14323	07/30/2025	Addressing Threats to the United States by the Government of Brazil	90 Fed. Reg. 37739; *modified by E.O. 14361 of 11/20/25 and E.O. 14389 of 02/20/26.*

90.	E.O. 14373	01/09/2026	Safeguarding Venezuelan Oil Revenue for the Good of the American and Venezuelan People	91 Fed. Reg. 2045.
91.	E.O 14380	01/29/2026	Addressing Threats to the United States by the Government of Cuba	91 FR 5085; *modified by E.O. 14389 of 02/20/26; expanded by E.O. 14404 of 04/01/26.*

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 41

DOE, ENERGY DEPT TO USE DEFENSE PRODUCTION ACT FUNDING TO EXPAND COAL CAPACITY

An official website of the United States government Here's how you know

Energy Department to Use Defense Production Act Funding to Expand Coal Capacity at 13 Plants and Build Export Infrastructure

The U.S. Department of Energy today announced it will support 13 American coal-fired power plants and new coal export infrastructure by providing up to $500 million in Defense Production Act Title III (DPA) funds.

Energy.gov

June 4, 2026

Estimated Read Time 2 min

WASHINGTON—The U.S. Department of Energy (DOE) today announced it will support 13 American coal-fired power plants and new coal export infrastructure by providing up to $500 million in Defense Production Act Title III (DPA) funds.

The DPA funding includes up to $425 million for twelve projects selected to expand and reinvigorate America's coal fleet and up to $75 million for the West Gateway Terminal Project, a rail-served marine export terminal capable of handling more than 10 million tons of bulk commodities annually. The West Gateway project in Oakland, California, will expand West Coast export capacity and support energy exports to allied nations including Japan, South Korea, Taiwan, Vietnam, and Malaysia.

The selected projects are intended to strengthen domestic coal mining value chains, support reliable baseload power generation, and enhance the resilience of critical energy infrastructure. By leveraging DPA authorities, DOE is helping ensure the United States maintains the industrial capacity and energy resources needed to strengthen national security.

"To ensure our national security, the United States will continue to support our coal fleet and domestic supply chains," said **U.S. Secretary of Energy Chris Wright**. "For too long, limited West Coast export capacity has constrained America's ability to move coal and other energy resources to global markets. By investing in both coal generation and critical export infrastructure, including the West Gateway Terminal Project, the Energy Department is strengthening U.S. energy security, reinforcing strategic supply chains, and advancing American energy dominance."

"The West Gateway Terminal Project fills a critical infrastructure gap in the U.S. energy export system by providing additional West Coast export capacity for American coal producers," said **DOE Under Secretary of**

Energy Kyle Haustveit. "By expanding access to global markets, the project will support continued growth in U.S. coal exports, improve supply chain resilience, and strengthen energy partnerships with allies throughout the Indo-Pacific region."

Read more about the DPA-funded projects here.

View Previous

Energy Department to Invest $350 Million to Build, Modernize, and Restart Coal Plants

June 4, 2026

View Next

Department of Energy Celebrates First Advanced Reactor Criticality

June 4, 2026

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COAL

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DOENews@hq.doe.gov

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 42

DOE, CLEAN ENERGY RESOURCES TO MEET DATA CENTER ELECTRICITY DEMAND

An official website of the United States government Here's how you know

Clean Energy Resources to Meet Data Center Electricity Demand

The last time the United States experienced rising electricity demand was before the early 2000s due to a growing economy, a growing population, and a corresponding change in consumer adoption of electric products such as air conditioners, computers, and incandescent lighting. During that time, we experienced electricity demand increases of up to 30%. However, that time of intense growth was followed by years of flat electricity demand, primarily due to innovations in and implementation of energy efficiency improvements, and because of economic headwinds and a decline in domestic manufacturing.[1]

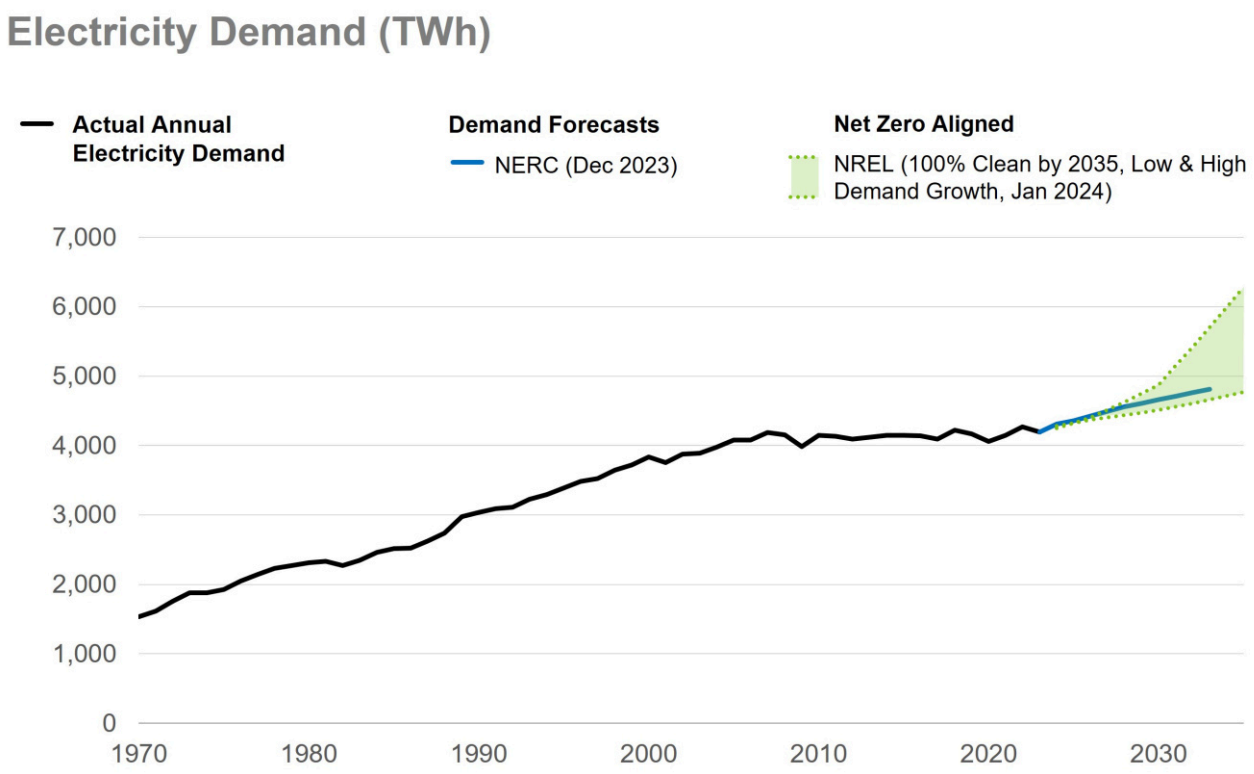
Now, in response to transformations in technologies like artificial intelligence (AI), data center expansion, new domestic manufacturing, and electrification in different sectors, the United States is returning to a period of rising electricity demand, with total energy demand potentially growing ~15-20% in the next decade (See Figure 1).

The U.S. Department of Energy (DOE) has been anticipating and planning for rising electricity demand underscored by the nationwide goal to reach net-zero emissions economy-wide by 2050. To reach this goal, we expect at least a doubling in current electricity demand.[2] Addressing rising electricity demand requires a portfolio approach to meet near-term growth with commercially available technologies, while also paving the way to support long-term growth.

Data center deployment, partly driven by the need to power new AI applications, is a significant factor of near-term electricity demand growth. The Electric Power Research Institute (EPRI) estimates that data centers could grow to consume up to 9% of U.S. electricity generation annually by 2030, up from 4% of total load in 2023.[3] At a national level, data centers are critical to supporting America's economic growth by powering businesses and enabling continued leadership in innovation, including for AI applications.

This blog outlines DOE resources available to help data center developers meet electricity demands with clean energy solutions that can improve flexibility and modernize the grid while maintaining reliability and affordability.

Figure 1: U.S. Electricity Demand (1970-2035)



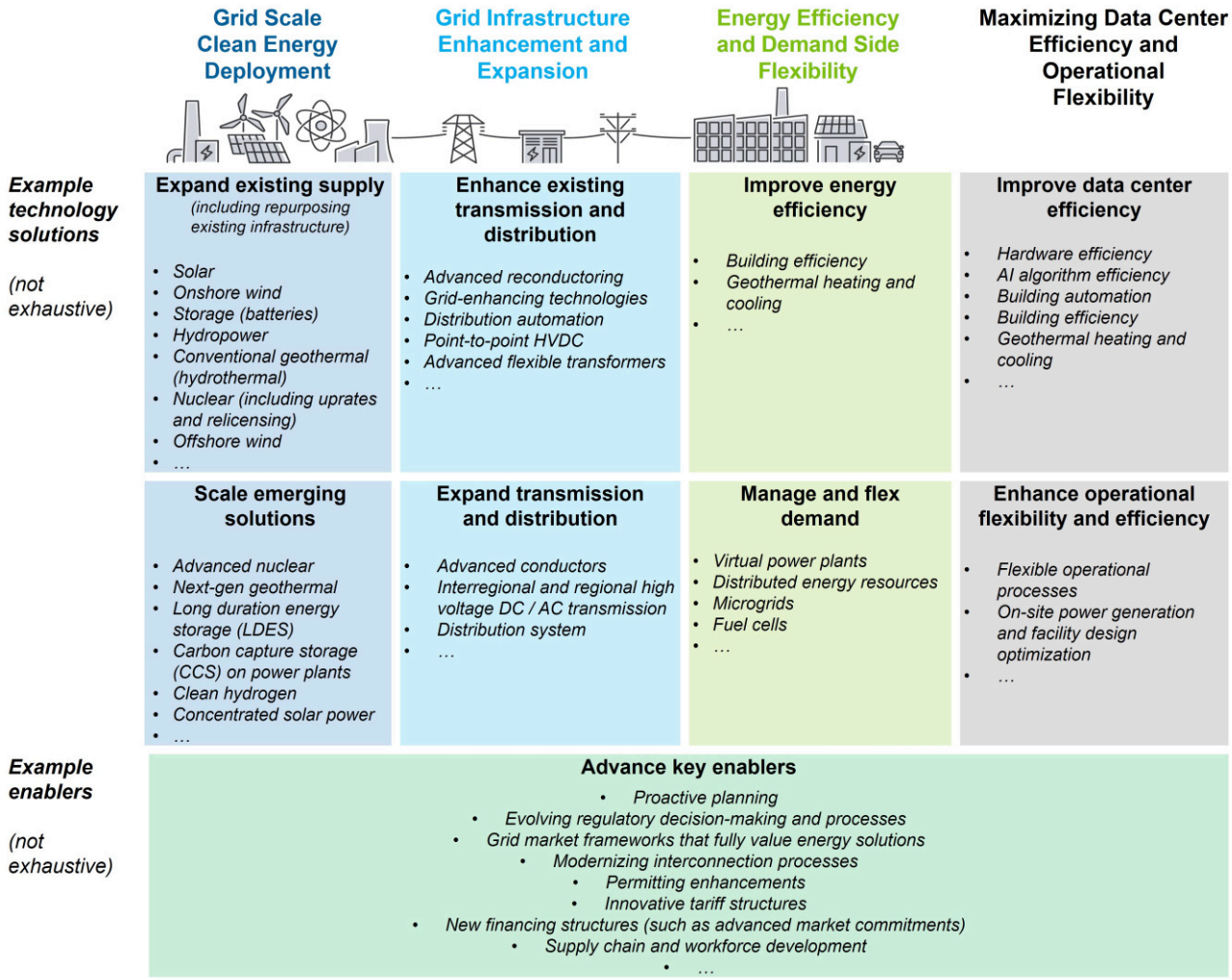
Meeting Data Center Electricity Demand

Data center electricity demand has specific characteristics. It is growing rapidly and varies regionally. Data centers can impact regional grids given the steep increases in load size, may be geographically constrained due to latency requirements, and often require firm power sources to operate continuously. Projections of data center electricity demand growth continue to evolve due to developing use cases and demand for AI and the speed of improvements in energy efficiency. **Building on a series of congressionally mandated reports on data center energy use and efficiencies, DOE's Lawrence Berkeley National Laboratory (LBNL) is assessing current and near-future data center energy consumption and water use.** The report is scheduled to be released at the end of 2024.

A broad suite of tools can be used to meet and manage rising electricity demand and lower overall peak demand (See Figure 2). Approaches that span the whole power system include deploying clean generation and storage technologies; leveraging existing nuclear and hydropower infrastructure; redeveloping retired coal power plant sites; enhancing and expanding grid infrastructure; and maximizing energy efficiency and demand resources. Complementary non-technology-based solutions for managing demand growth include proactive planning, innovative tariff structures, optimizing grid performance, adopting alternative financing structures to fund new energy projects, and supply chain and workforce development. Pursuing key enablers like interconnection and regulatory reforms can unlock the barriers to adopting these energy solutions. DOE's Future of Resource Adequacy Report outlines the portfolio of solutions available to address rising electricity demand in the near and long term, while maintaining system reliability.

Near-term data center driven electricity demand growth is an opportunity to accelerate the build out of clean energy solutions, improve demand flexibility, and modernize the grid while maintaining affordability. Today, solar energy, land-based wind energy, battery storage, and energy efficiency are some of the most rapidly scalable and cost competitive ways to meet increased electricity demand from data centers. Given data centers' need for clean firm power, scaling other energy technologies, such as next-generation geothermal and nuclear, will also be critically important to meet data center electricity demand. With greater investment today, these energy solutions, which are covered by DOE's Pathways to Commercial Liftoff reports, could enable hundreds of gigawatts of capacity on the grid by the mid-2030s and through 2050 to help meet the energy and power needs of data centers and increase the reliability and affordability of the power system.

Figure 2: Examples of Tools to Address Growing Electricity Demand from Data Centers



While the pace and characteristics of data center electricity demand can present challenges in an evolving power system, targeted actions can help the United States maintain a reliable, affordable, secure, and resilient power system. State policymakers, regulators, utilities, data center owners and operators, energy developers, technology providers, grid planners, communities, and the broader grid stakeholder ecosystem all have critical roles to play in accelerating deployments of the solutions needed to support demand growth alongside decarbonization and grid security.

Stakeholders can start acting today to leverage funding opportunities, tax credits, technical reports, and technical assistance to address demand growth and expand our clean energy ecosystem. Detailed below are DOE resources available to support data center electricity needs including:

- Grid Scale Clean Energy Deployment
- Grid Infrastructure Enhancement and Expansion
- Maximizing Energy Efficiency of Data Centers
- Demand Side Flexibility

- Technical Assistance Programs for State and Local Officials, Energy Professionals, Communities, and Large Energy Users

If you have questions on the DOE resources, please feel free to submit them through the businesshub@hq.doe.gov mailbox with the subject "Load Growth".

DOE Resources Available to Support Data Center Electricity Needs

Grid Scale Clean Energy Deployment

Building additional clean energy is a cost-effective way to meet new loads and is necessary for meeting carbon emissions reduction goals. Tax credits such as the Clean Energy Production Tax Credit (§45Y) and Clean Energy Investment Tax Credit (§48E) also can help support clean energy investments on top of existing DOE funding.

Name	Type	Eligibility	Description
Title 17 Innovative Energy Loans (1703)	Loan; Financing Program	Project developers	Loan guarantees for projects that deploy innovative or significantly improved clean energy technologies (e.g., energy generation and storage, transmission and distribution systems, efficient end-use technologies, etc.) or employ innovative manufacturing processes or manufacture innovative technologies at commercial scale.
Title 17 Energy Infrastructure Reinvestment Program (1706)	Loan; Financing Program	Project developers	Direct loans and loan guarantees available to projects that retool, repower, repurpose, or replace energy infrastructure that has ceased operations.
Tribal Energy Financing Program	Loan; Financing Program	Federally recognized Tribes, tribally-owned developers	Direct loans and loan guarantees for energy-related projects available to federally recognized tribes, including Alaska Native village or village

			corporations, or a Tribal Energy Development Organization that is wholly or substantially owned by a federally recognized Indian tribe or Alaska Native Corporation.
Civil Nuclear Credit Program	Grant	Owners or operators of commercial U.S. reactors	Funding to help preserve the existing nuclear fleet at risk of retirement due to economic factors, which can provide carbon-free power to data centers.
Generation III+ Small Modular Reactor Pathway to Deployment Program	Notice of Intent issued to for funding opportunity	Project developers	To spur the necessary industry-wide momentum, DOE intends to offer funding for projects under this solicitation through two tiers: Tier 1 will provide up to $800 million to support up to two first-mover teams of utility, reactor vendor, constructor, and end-users/off-takers committed to deploying a first plant while facilitating a multi-reactor, Gen III+ SMR orderbook. Tier 2 will provide up to $100 million to spur additional Gen III+ SMR deployments by addressing key gaps that have hindered the domestic nuclear industry in areas such as design, licensing, supplier development, and site preparation.
Critical Facility Energy Resilience (CiFER)	Notice of Intent issued for funding opportunity	Project developers	DOE intends to issue a Funding Opportunity Announcement (FOA) seeking applications for financial assistance awards under a competitive pilot demonstration grant program, as authorized in section 3201 of the Energy Act of 2020, for energy storage projects that are wholly U.S.-made, sourced, and supplied.
Hydroelectric Incentive Programs	Grant	Owners or authorized operators of a hydroelectric facility	More than $750 million through three programs to support energy production, energy efficiency improvements, and enhancements at existing hydropower facilities.
Interconnection Innovation e-Xchange (i2X)	Technical Assistance	Interconnection stakeholders	The i2X program enables simpler, faster, and fairer interconnection of clean energy resources via stakeholder engagement, data and analysis, strategic

			roadmaps, and tailored technical assistance.
Non-powered Dam Development Assistance	Technical Assistance	Project developers	Holistic pre-feasibility assessments of non-powered dam retrofits supported by the best available nationwide data and a suite of online tools.
HydroWIRES Calls for Technical Assistance	Technical Assistance	Hydropower hybrids and pumped hydro power developers and other stakeholders	These recurring technical assistance calls aim to pair utilities and hydropower developers with leading national lab capabilities on pumped storage valuation, hydropower hybrid design, hydropower operations, and other grid integration topics.
Rural and Agricultural Income & Savings from Renewable Energy (RAISE) Initiative	Technical Assistance	Farmers, farm associations	Provides technical assistance, market analysis, and business model research to help farmers and communities deploy wind technologies at multiple scales for local and regional consumption with the goals of enabling farmers and small businesses to earn supplemental income, including through farm associations that could develop and own projects financed through fee-for-service models. Includes funding for technology development and commercialization of distributed wind turbines for the agricultural sector.

Grid Infrastructure Expansion and Enhancement

A variety of innovative grid solutions, including those enabled by artificial intelligence (AI), can help utilities and asset owners improve utilization of existing infrastructure. Technologies such as dynamic line ratings, grid topology optimization, and other solutions can meet growing load by more efficiently and intelligently using existing infrastructure.

Name	Type	Eligibility	Description
Grid Resilience and Innovation Partnerships (GRIP)	Grant	Varies by Topic Area; includes states, grid	$10.5 billion in federal funding to support projects that enhance grid resilience and deploy innovative grid

		operators, project developers, and others.	technologies that improve reliability and resilience. This program seeks to support innovative partnerships or innovative technologies to transform the grid and catalyze non-federal public and private sector capital.
Title 17 Innovative Energy Loans (1703)	Loan; Financing Program	Project developers	Loan guarantees for projects that deploy innovative or significantly improved clean energy technologies (e.g., energy generation and storage, transmission and distribution systems, efficient end-use technologies, etc.) or employ innovative manufacturing processes or manufacture innovative technologies at commercial scale.
Title 17 Energy Infrastructure Reinvestment Program (1706)	Loan; Financing Program	Project developers	Direct loans and loan guarantees available to projects that retool, repower, repurpose, or replace energy infrastructure that has ceased operations.
Transmission Facilitation Program	Loan; Financing Program	Project developers	$2.5 billion in commercial support for qualified transmission projects through tools such as capacity contracts, public-private partnerships, and loans.
Transmission Facility Financing Program	Loan; Financing Program	Project developers	$2 billion to pay for the costs of direct loan for the construction and modification of transmission facilities.
Reconductoring Economic & Financial Analysis Tool (REFA)	Tool	Utility transmission planners and grid planners	REFA is a first of its kind tool designed to help utility transmission planners better understand the financial, environmental and economic benefits of reconductoring upgrades, using traditional or advanced conductors.
National Interest Electric Transmission Corridors (NIETC)	Other	Project developers, other stakeholders (anyone may submit information to inform NIETC designation)	Special designation that enables DOE and the Federal Energy Regulatory Commission to use financing and permitting tools to spur construction of transmission projects within a NIETC.

Maximizing Energy Efficiency of Data Centers

Energy efficiency is a key tool in reducing energy consumption from data center facilities. DOE has long been a leader in developing improved cooling technologies, including for data centers. For instance, ARPA-E has an ongoing COOLERCHIPS program focused on commercializing innovative cooling technologies for data centers. DOE national labs have built exascale computing facilities with a Power Usage Efficiency (PUE) of 1.03, demonstrating state of the art techniques for data center efficiency.[4] DOE is also leading the Energy Efficiency Scaling for 2 Decades initiative, with a goal to increase the energy efficiency of the microelectronics that are needed for computation at data centers by a factor of 1000 over 2 decades. DOE is continuing to develop programs to support data center owners in energy efficiency and industrial decarbonization. In addition, tax incentives, such as the 179D Tax Deduction, enable building owners to claim a tax deduction for installing qualifying energy efficient systems in buildings.

Name	Type	Eligibility	Description
Center of Expertise for Energy Efficiency in Data Centers	Technical Assistance	Data center operators, owners, and other stakeholders	Lawrence Berkeley National Laboratory offers assessment tools, trainings on specific technologies and best practices, and certification for data center energy practitioners.

Data Center Energy Practitioner Program (DCEP)	Training and Credentialing	Individuals, groups, organizations, federal employees	The DCEP Program training is a comprehensive program spanning 1-4 days. The DCEP program certifies practitioners as qualified to evaluate the energy status as well as efficiency and decarbonization opportunities in data centers. The curriculum includes several software tools with what-if capabilities to enhance the learning experience. Three credentials are available. • Generalist • IT specialist • HVAC specialist Best practices factsheets and other resources are available through the DCEP website.
Better Plants Initiative	Technical Assistance	Any U.S. based manufacturing company or industrial-scale energy-using organizations	Manufacturers and owners of industrial facilities (including data centers) in the Better Plants Program set energy saving goals, usually 25% over 10 years. Participants receive national recognition, technical support, in-plant trainings, energy saving resources, and other opportunities.
Data Center Accelerator Toolkit	Report/Resource Collection	Data centers	The Data Center Accelerator Toolkit collects guidance, factsheets, best practices, and other resources to help navigate these dynamics, based on the work of DOE's Better Buildings Data Center Accelerator. This toolkit addresses specific barriers and solutions for energy management in 5 primary data center types, including real-world examples for each.

Better Climate Challenge	Technical Assistance	Organizations, such as data center owners or operators, committed to reducing GHG emissions	Owners and operators of commercial and industrial facilities commit to a target of at least 50% reduction in scope 1&2 GHG emissions within 10 years. Participants receive national recognition, direct technical assistance, resources, and opportunities for peer exchange.
Onsite Energy Program	Technical Assistance	Industrial facilities and other large energy users	Provides technical assistance, market analysis, and best practices to help large energy users, including data centers, increase the adoption of onsite clean energy technologies.
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	Direct Support; Technical Assistance	States	$250 million in federal funding to provide capitalization grants to States to establish a revolving loan fund under which the state provides loans and grants for energy efficiency audits, upgrades, and retrofits to increase energy efficiency and improve the comfort of buildings.
50001 Ready	Resource	Facilities and organizations	Energy management program provides guidance and resources for implementing best practices and standard operating procedures aligned with the ISO 50001 energy management system standard.

Demand Side Flexibility

Demand flexibility can help avoid increasing peak demand. Distribution resources, such as virtual power plants, have the potential to increase the efficiency of existing and new grid infrastructure. DOE is accelerating the use of virtual power plants to support grid needs. For example, the Office of Clean Energy Demonstrations Distributed Energy Systems' program provided $50 million for projects that design and operate distributed energy systems that integrate high levels (>25% of peak demand) of variable clean energy resources.

Name	Type	Eligibility	Description

Title 17 Innovative Energy Loans (1703)	Loan; Financing Program	Project developers	Loan guarantees for projects that deploy innovative or significantly improved clean energy technologies (e.g., energy generation and storage, transmission and distribution systems, efficient end-use technologies, etc.) or employ innovative manufacturing processes or manufacture innovative technologies at commercial scale.
Grid Resilience and Innovation Partnerships (GRIP)	Grant	Project developers	$10.5 billion in federal funding to support projects that enhance grid resilience and deploy innovative grid technologies that improve reliability and resilience. This program seeks to support innovative partnerships or innovative technologies to transform the grid and catalyze non-federal public and private sector capital.
Connected Communities 2.0	Grant	Governments, industry stakeholders, communities	$65 million in federal funding to validate grid-edge technology innovations in real-world situations and provide new tools for utilities, grid planners and operators.
Distributed Energy Systems Demonstrations	Financial Assistance	Project developers	$50 million in federal funding to support a portfolio of projects that demonstrate and validate reliable operations and financial value from a range of grid topologies with diverse energy resources and distributed energy systems ownership models.

Technical Assistance Programs for State and Local Officials, Energy Professionals, Communities, and Large Energy Users

DOE and the National Laboratories can provide technical assistance to states to help develop specific solutions and projects to address growing electricity demand.

Name	Type	Eligibility	Description

State Technical Assistance Program	Technical Assistance	Public utility commissions and state energy offices	For State Regulators, offered through a multi-lab consortium including Lawrence Berkeley National Laboratory, National Renewable Energy Laboratory, and Pacific Northwest National Laboratory. This program provides regulators targeted support in addressing regulatory challenges, including developing innovative tariffs structures and regulatory environments to enable efficient deployment of resources for data centers, and in developing regulatory strategies to enable data center operational flexibilities and behind-the-meter resources.
State Energy Program Technical Assistance	Technical Assistance	States, territories, and the District of Columbia	For State Energy Offices, to provide national lab and 3rd party expertise in support of state-led energy initiatives. This can include supporting development of regional plans and solutions for states that want to plan for data center development.
Clean Energy Innovator Fellowship Program	Technical Assistance/Capacity Building	Recent graduates and energy professionals	The program supports recent graduates and energy professionals to spend two years working with eligible Institutions including electric cooperatives, grid operators, municipal utilities, public utility commissions, state energy offices and Tribal entities.
National Association of Regulatory Utility Commissioners (NARUC)-National Association of State Energy	Technical Assistance	Public utility commissions and state energy offices	Provides state energy officials access to DOE and national lab nuclear expertise to inform regulatory and policy questions surrounding the consideration and deployment of new nuclear generation.

Officials (NASEO) Advanced Nuclear State Collaborative			
The Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization	Technical Assistance	Energy communities	Provides technical assistance, resources, and funding guides to support economic revitalization in Energy Communities. The IWG houses resources such as the Coal Power Plant Redevelopment Visualization Tool, which serves as a public database and map to enable state and local economic development officials, project developers, and power plant owners to identify clean energy generation and data center siting opportunities in fossil energy communities.
Renewable Energy Siting through Technical Engagement and Planning (R-STEP)	Technical Assistance	State and local governments, communities	Helps communities better plan for and meaningfully engage in the development of large-scale renewable energy and energy storage projects.
Onsite Energy Technical Assistance Partnerships (TAPs) | Better Buildings Initiative	Technical Assistance	Industrial facilities and other large energy users	DOE's regional network of Onsite Energy Technical Assistance Partnerships helps facilities across the nation integrate the latest onsite energy technologies by providing specialized technical assistance, including initial screenings for multi-technology solutions, more advanced analysis to support project installations, and more.
Supercharging the Electric Grid	Technical Assistance	Industry Stakeholders	Enhances internal and external coordination in the energy industry through resources and best practices, analytical and

			capacity support, and field validations.

[1] Energy Information Administration, Per Capital Residential Electricity Sales in the U.S. Have Fallen Since 2010, 2017.

[2] North American Electric Reliability Corporation (NERC), Electricity Supply and Demand Data, 2023; Energy Information Administration (EIA) Monthly Energy Review; National Renewable Energy Laboratory (NREL) Pathways to 100% Clean Electricity, 2022. Note that electricity demand includes transmission losses and direct use.

[3] EPRI, Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption, 2024.

[4] Oak Ridge Frontier Supercomputer: https://science.osti.gov/-/media/ascr/ascac/pdf/meetings/202207/UpdateFrontier_ASCAC_202207.pdf

NREL Energy Integration Facility: https://www.nrel.gov/computational-science/measuring-efficiency-pue.html

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Notice of Court Orders

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 43

DOI, MEMO FROM DEPUTY CHIEF OF STAFF GREGORY WISCHER

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

JULY 15 2025

Memorandum

To: Assistant Secretaries
Bureau and Office Heads

From: Deputy Chief of Staff – Policy

GREGORY WISCHER
Digitally signed by GREGORY WISCHER
Date: 2025.07.15 10:58:31 -04'00'

Subject: Departmental Review Procedures for Decisions, Actions, Consultations, and Other Undertakings Related to Wind and Solar Energy Facilities

Consistent with Executive Order (EO) 14315, entitled "Ending Market Distorting Subsidies for Unreliable, Foreign-Controlled Energy Sources," EO 14156, entitled "Declaring a National Energy Emergency," Presidential Memorandum, entitled "Temporary Withdrawal of All Areas on the Outer Continental Shelf from Offshore Wind Leasing and Review of the Federal Government's Leasing and Permitting Practices for Wind Projects," Secretary's Order (SO) 3417, entitled "Addressing the National Energy Emergency," and SO 3418, entitled "Unleashing American Energy," all decisions, actions, consultations, and other undertakings—including but not limited to the following—related to wind and solar energy facilities shall require submission to the Office of the Executive Secretariat and Regulatory Affairs, subsequent review by the Office of the Deputy Secretary, and final review by the Office of the Secretary:

1. *Federal Register* notices;
2. notices to proceed;
3. scoping reports;
4. determinations of National Environmental Policy Act (NEPA) adequacy;
5. draft and final environmental assessments;
6. draft, final, and supplemental environmental impact statements;
7. findings of no significant impact;
8. records of decision;
9. approval letters;
10. plans of development;
11. land use plan amendments and revisions;
12. land withdrawals and revocations;
13. areas of critical environmental concern designations;
14. site testing and monitoring authorizations;

15. proposed and final sale notices;
16. lease sales;
17. lease assignments;
18. lease issuances;
19. proofs of construction;
20. site assessment plans;
21. preconstruction environmental surveys;
22. supplemental environmental reports;
23. temporary use permits;
24. access road authorizations;
25. utility corridor concurrences;
26. facility design reports;
27. fabrication and installation reports;
28. certified verification agent approvals;
29. construction and operation plans (COPs);
30. conditions of COP approvals;
31. COP revisions;
32. Engineering and Technical Review Branch recommendation memos;
33. proposed technical and navigational and aviation safety conditions;
34. cable burial risk assessments;
35. oil spill response plans;
36. decommissioning applications;
37. Outer Continental Shelf Lands Act compliance memos;
38. compendium reports;
39. memoranda of agreement;
40. compensatory mitigation plans;
41. historic properties management plans;
42. historic properties treatment plans;
43. performance and reclamation bonding approvals;
44. rental and royalty determinations;
45. cost recovery agreements;
46. financial assurances;
47. rights-of-use and easement;
48. right-of-way (ROW) applications;

49. ROW grants;
50. ROW leases;
51. ROW transfers;
52. leases and ROWs on Tribal lands;
53. Tribal environmental impact reviews;
54. government-to-government Tribal consultations;
55. Wild and Scenic Rivers Act determinations;
56. National Trails System impact evaluations;
57. National Landscape Conservation System coordination;
58. visual impact assessments;
59. visual resource management analyses;
60. cumulative historic resources visual effects analyses;
61. cultural resource consultations;
62. section 106 compliance under the National Historic Preservation Act;
63. consultation under the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and Bald and Golden Eagle Protection Act (BGEPA);
64. permits under the ESA, MBTA, and BGEPA;
65. biological assessments;
66. biological opinions;
67. approval and publication of studies and assessments, including ecological baseline studies;
68. grants; and
69. any other similar or related decisions, actions, consultations, or undertakings.

These review procedures are effectively immediately.

Cc: Deputy Assistant Secretaries
Bureau and Office Deputy Heads
Assistant Secretary Chiefs of Staff
Bureau and Office Chiefs of Staff

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

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Motion to Intervene and Request for Rehearing and Stay of
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EXHIBIT 44

DOI, ORDER NO. 3438

THE SECRETARY OF THE INTERIOR
WASHINGTON

ORDER NO. 3438

Subject: Managing Federal Energy Resources and Protecting the Environment

Sec. 1. **Purpose**. This Order directs the Department of the Interior (Department), consistent with the Federal Land Policy and Management Act (FLPMA) and the Outer Continental Shelf Lands Act (OSCLA), to optimize the use of lands under its direct management, including the Outer Continental Shelf, (hereafter referred to collectively as "Federal lands") by considering, when reviewing a proposed energy project under the National Environmental Policy Act (NEPA), a reasonable range of alternatives that includes projects with capacity densities meeting or exceeding that of the proposed project. For the purposes of this Order, capacity density is defined as the nameplate generation capacity of an energy project multiplied by its projected capacity factor, the product of which is then divided by the total acres of the project area. Ultimately, FLPMA's multiple use mandate for onshore lands, OCSLA's multiple requirements for offshore activities, and NEPA's requirement to consider reasonable alternatives to a proposed action give rise to the question on whether the use of Federal lands for *any* wind and solar projects is consistent with the law, given these projects' encumbrance on other land uses, as well as their disproportionate land use when reasonable project alternatives with higher capacity densities are technically and economically feasible. This Order is consistent with Executive Order (EO) 14156, entitled "Declaring a National Energy Emergency," which directs the Department to exercise its authorities "to facilitate the identification, leasing, siting, production, transportation, refining, and generation of domestic energy resources, including, but not limited to, on Federal lands," and EO 14315, entitled "Ending Market Distorting Subsidies for Unreliable, Foreign-Controlled Energy Sources," which finds, "The proliferation of [wind and solar] projects displaces affordable, reliable, dispatchable domestic energy sources, compromises our electric grid, and denigrates the beauty of our Nation's natural landscape."

Sec. 2. **Authorities**. This Order is issued under the authority of section 2 of the Reorganization Plan No. 3 of 1950 (64 Stat. 1262), as amended; FLPMA (43 U.S.C. §§ 1701 *et seq.*); OCSLA (43 U.S.C. §§ 1331 *et seq.*); NEPA (42 U.S.C. §§ 4331 *et seq.*); EO 14156; and EO 14315.

Sec. 3. **Background**. The Department, via the Bureau of Land Management (BLM), manages 245 million surface acres, which is approximately one-tenth of our Nation's land base. Additionally, the Department manages 3.2 *billion* acres on the Outer Continental Shelf. Under FLPMA, the BLM must manage Federal lands in accordance with multiple use. Specifically, the BLM shall make "the most judicious use of the land for some or all of these resources" and consider "the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values." 43 U.S.C. § 1702(c). Similarly, under OCSLA, the Secretary must ensure that any activity on the Outer Continental Shelf provides for:

- "safety;"
- "protection of the environment," including fisheries, marine mammals, migratory birds, and bald and golden eagles;
- "conservation of the natural resources of the outer Continental Shelf;"
- "coordination with relevant Federal agencies," including the U.S. Department of Defense, the U.S. Department of Transportation, and the U.S. Department of Commerce;
- "protection of national security interests of the United States," including impacts on airports;
- "prevention of interference with reasonable uses," including commercial fishing; and
- "consideration of…any other use of the sea or seabed, including use for a fishery, a sealane, a potential site of a deepwater port, or navigation [.]" 43 U.S.C. § 1337(p)(4).

To ensure the Department optimizes the use of its Federal lands in accordance with these statutes and to "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences" as directed by NEPA, 42 U.S.C. § 1331(b), the Department shall consider energy projects' capacity density in its decision-making, including when considering reasonable alternatives to a proposed energy project. Capacity density is a technology-neutral, objective calculation of how efficiently land is used for energy generation. Simply put, higher capacity density means greater energy generation with less impact to Federal lands. Because energy projects with higher capacity densities have lower Federal land use impacts and therefore disturb far less of the natural environment for fish, birds, and other wildlife, they provide more Federal lands for other uses, fulfilling FLPMA's multiple use mandate and OCSLA's multiple requirements for offshore activities. Moreover, consideration of a project's capacity density better informs the Department and the public of a project's potential environmental impact and energy generation.

Based on common sense, arithmetic, and physics, wind and solar projects are highly inefficient uses of Federal lands. On a technology-neutral basis, wind and solar projects use disproportionate Federal lands relative to their energy generation when compared to other energy sources, like nuclear, gas, and coal. For instance, based on data from the U.S. Energy Information Administration, one advanced nuclear plant (2 x AP1000) produces 33.17 megawatts (MW) per acre, while one offshore wind farm produces approximately 0.006 MW/acre, which is approximately 5,500 times less efficient than one nuclear plant. *See* Appendix. Thus, when there are reasonable alternatives that can generate the same amount of or more energy on far less Federal land, wind and solar projects may unnecessarily and unduly degrade Federal lands.

Considering capacity densities in the Department's decision-making process, including when assessing alternatives to a proposed energy project, also addresses the artificially stimulated proliferation of intermittent energy sources, namely wind and solar projects, as identified by EO 14315. Such proliferation has displaced dispatchable energy sources and destabilized our electric grid, leading President Trump to declare a national energy emergency due to the unusual and extraordinary threat to our Nation's economy, national security, and foreign policy posed by the Nation's insufficient energy production, transportation, refining, and generation. As the U.S. Department of Energy's report titled "Evaluating the Reliability and Security of the United States

Electric Grid," (July 2025) notes, the Nation's energy grid outlook has been undermined by "the accelerated retirement of existing [baseload] generation capacity and the insufficient pace of firm, dispatchable generation additions (partly due to a recent focus on intermittent rather than dispatchable sources of energy)."

Sec. 4. **Directives**. Consistent with the aforementioned statutory authorities, the Department shall only permit those energy projects that are the most appropriate land use when compared to a reasonable range of project alternatives.

To implement this directive and to the extent that the following information is not already requested by Secretary's Order 3437, titled "Ending Preferential Treatment for Unreliable, Foreign-Controlled Energy Sources in Department Decision-Making," the Department shall identify and make the necessary revisions, as appropriate and consistent with applicable law, to any regulations, guidance, policies, or practices, necessary to implement this directive.

a. Within 30 days of the issuance of this Order, each Assistant Secretary, in coordination with the Solicitor, shall submit a report to the Office of the Secretary a list of the actions taken and to be taken to implement this directive,

b. Within 60 days of the issuance of this Order, the Office of the Secretary, in coordination with the Deputy Secretary, the Solicitor, and each Assistant Secretary, shall submit to me a report on the actions taken and to be taken to implement this directive.

Sec. 5. **Implementation**. The Office of the Secretary is responsible for implementing all aspects of this Order, in coordination with the Deputy Secretary, the Solicitor, and applicable Assistant Secretaries or their equivalents.

Sec. 6. **Effect of This Order**. This Order is intended to improve the internal management of the Department; to comply with FLPMA, OCSLA, and NEPA; and to implement EO 14156 and EO 14315. This Order and any resulting reports or recommendations are not intended to, and do not create any right or benefit, substantive or procedural, enforceable at law or equity by a party against the United States, its departments, agencies, instrumentalities or entities, its officers or employees, or any other person. To the extent there is any inconsistency between the provisions of this Order and any Federal laws or regulations, the laws or regulations will control.

Sec. 7. **Effective Date**. This Order is effective immediately and will remain in effect until it is amended, superseded, or revoked, whichever occurs first.

Secretary of the Interior

Date: Aug 1st, 2025

APPENDIX 1

Energy Type[a]	**Capacity Density (MW/Acre)**	**Different Energy Types' Capacity Densities Compared to…**		
		Solar PV with Single-Axis Tracking	**Onshore Wind**	**Offshore Wind**
Advanced Nuclear Plan (2 x AP1000)	33.17	945	2686	5402
Combined Cycle Plant 2x2x1	24.42	696	1977	3977
Small Modular Reactor Nuclear Power Plant	12.66	361	1025	2062
Combined Cycle Plant 1x1x1, Single Shaft	12.48	355	1010	2032
Combined Cycle Plant 1x1x1, Single Shaft, with 95% Carbon Capture	5.40	154	438	880
Combustion Turbine – Simple Cycle Plant (H-class)	4.23	121	343	689
Combustion Turbine – Simple Cycle Plant (Aeroderivative)	2.13	61	173	347
Ultra-Supercritical Coal Plant without Carbon Capture	0.69	20	56	113
Ultra-Supercritical Coal Plant with 95% Carbon Capture	0.64	18	52	105
Geothermal	0.16	4.63	13	26
Solar PV with Single-Axis Tracking and AC-Coupled Battery Storage	0.04	1.16	3	7
Solar PV with Single-Axis Tracking with DC-Coupled Battery Storage	0.04	1.03	3	6
Solar PV with Single-Axis Tracking	0.04	-	3	6
Onshore Wind[b]	0.01	0.35	-	2
Offshore Wind[c]	0.006	0.17	0.5	-

[a] For all energy types other than onshore and offshore wind, the capacity density was calculated using data from the U.S. Energy Information Administration, U.S. Department of Energy, "Capital Cost and Performance Characteristics for Utility-Scale Electric Power Generating Technologies," January 2024, 5-6, 15, 21, 27, 34, 41-42, 48, 63, 67-68, 73, 98, 103-104, 109, https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2025.pdf; and "Table 6.07.A. Capacity Factors for Utility Scale Generators Primarily Using Fossil Fuels," 2024 annual data, U.S. Energy Information Administration, U.S. Department of Energy, accessed July 31, 2025, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=table_6_07_a.

[b] To calculate the capacity density for onshore wind, the midpoint of 4.1 - 13.7 MW/km^2 (0.0166 - 0.0555 MW/acre), or 0.036 MW/acre, was used. This number was then multiplied by a capacity factor of 34.3 percent, with the product being approximately 0.01 MW/acre. See Trieu Mai et al., "Land of Opportunity: Potential for Renewable Energy on Federal Lands," National Renewable Energy Laboratory, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, January 2025, 25, https://docs.nrel.gov/docs/fy25osti/91848.pdf; and "Table 6.07.B. Capacity Factors for Utility Scale Generators Primarily Using Non-Fossil Fuels," 2024 annual data, U.S. Energy Information Administration, U.S. Department of Energy, accessed July 31, 2025, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=table_6_07_b.

[c] To calculate the capacity density for offshore wind, 4.42 MW/km^2 was used and converted to 0.0179 MW/acre and then multiplied by a capacity factor of 34.3 percent. See Daniel Mulas Hernando et al., "Summary Analysis of Different Offshore Wind Capacity Density Drivers in Proposed U.S. Projects and Impacts on Progress Towards State and Federal Deployment Targets," National Renewable Energy Laboratory, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, October 2023, 9, https://docs.nrel.gov/docs/fy24osti/87947.pdf; and "Table 6.07.B. Capacity Factors for Utility Scale Generators Primarily Using Non-Fossil Fuels," 2024 annual data, U.S. Energy Information Administration, U.S. Department of Energy, accessed July 31, 2025, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=table_6_07_b.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 45

DOT, BIDEN-BUTTIGIEG IGNORED THE DANGERS OF WIND TURBINES NEAR RAILROADS & HIGHWAYS

An official website of the United States government Here's how you know

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President Trump's Transportation Secretary Sean P. Duffy: Biden-Buttigieg Ignored the Dangers of Wind Turbines Near Railroads & Highways, Put Climate Religion Ahead of Safety

Tuesday, July 29, 2025

USDOT calls on Congress to investigate why safety recommendations were dropped, the depth of the Biden-Buttigieg scheme

WASHINGTON, D.C. — U.S. Transportation Secretary Sean P. Duffy today announced that the Department of Transportation (USDOT) will restore safety recommendations previously overruled by the Biden-Buttigieg administration for wind turbines built near highways and railroads.

Secretary Duffy and his team recently discovered that Biden-Buttigieg overruled a safety recommendation for dozens of wind energy projects despite concerns that turbines can interfere with radio spectrum frequencies critical to safety.

"Joe Biden and Pete Buttigieg put climate religion ahead of safety – blatantly ignoring engineers who warned of the danger of constructing wind turbines near railroads and highways. That's why I'm immediately implementing a higher standard of safety. What the past administration did is a shame, but it's a pattern for Biden and Buttigieg. They invested over $80 billion on DEI and the Green New Deal while safety was ignored," said **U.S. Transportation Secretary Sean P. Duffy**.

The information USDOT has compiled raises serious questions. In addition to conducting a department-wide review, Secretary Duffy is calling on Congress to investigate.

Secretary Duffy's USDOT will now recommend a minimum 1.2-mile setback for turbines built near highways and railroads following a recent report:

"wind farm deployment could potentially obstruct radio communication links and/or degrades radio RF signal reception by means of lowering signal to noise ratio through several mechanisms and factors such as diffraction, scattering, wind farm density, distance, speed, etc."

Additional Information:

In 2023, the Biden-Buttigieg USDOT found one wind farm proposal close to high-speed passenger and freight rail infrastructure that fell within "one-to-three-mile boundary… may be problematic for train communications in this area and present an undue risk."

In 2024, the Biden-Buttigieg USDOT subsequently "withdraws its previous recommendation of a setback for this project." No explanation was provided for this change.

In total, 33 projects have been uncovered where the original safety recommendation was rescinded.

Secretary Duffy's USDOT is launching a study to collect additional data to inform safety guidelines for wind turbines built near critical transportation infrastructure that use radio frequency dependent safety systems. Further, the Federal Aviation Administration will thoroughly evaluate proposed wind turbines to ensure they do not pose a danger to aviation, including new market entrants like Advanced Air Mobility.

USDOT will provide feedback on windmill siting through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC) Frequency Assignment Subcommittee.

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 46

IRS NOTICE 2025-42

Part III – Administrative, Procedural, and Miscellaneous

Beginning of Construction Requirements for Purposes of the Termination of Clean Electricity Production Credits and Clean Electricity Investment Credits for Applicable Wind and Solar Facilities

Notice 2025-42

SECTION 1. PURPOSE

This notice provides guidance, consistent with Executive Order 14315 of July 7, 2025, *Ending Market Distorting Subsidies for Unreliable, Foreign-Controlled Energy Sources*, 90 F.R. 30821 (Executive Order 14315), regarding when construction of an applicable wind facility or applicable solar facility (each as defined in section 2.02 of this notice) has begun for purposes of determining whether such facility is subject to credit termination provisions added to §§ 45Y and 48E of the Internal Revenue Code (Code)[1] by §§ 70512 and 70513 of Public Law 119-21, 139 Stat. 72 (July 4, 2025), commonly known as the One, Big, Beautiful Bill Act (OBBBA). Section 70512(a) and (l)(4) of the OBBBA terminates the clean electricity production credit determined under § 45Y (§ 45Y credit), and § 70513(a) and (g)(5) of the OBBBA terminates the clean electricity investment credit determined under § 48E (§ 48E credit), in the case of an applicable wind facility or applicable solar facility that is placed in service after December 31, 2027

[1] Unless otherwise specified, all "section" or "§" references are to sections of the Code or the Income Tax Regulations (26 CFR part 1).

(credit termination date). The credit termination date applies to applicable wind and solar facilities the construction of which begins after July 4, 2026 (beginning of construction deadline), the date that is 12 months after the date of enactment of the OBBBA.

SECTION 2. BACKGROUND

.01 Overview of pre-OBBBA §§ 45Y and 48E.

Sections 45Y and 48E were added to the Code by §§ 13701(a) and 13702(a), respectively, of Public Law 117-169, 136 Stat. 1818, 1982 (August 16, 2022), commonly known as the Inflation Reduction Act of 2022. The § 45Y credit is determined with respect to electricity produced by a taxpayer at a "qualified facility" and either sold by the taxpayer to an unrelated party during the taxable year or, if the facility is equipped with a metering device which is owned or operated by an unrelated person, sold, consumed, or stored by the taxpayer during the taxable year. The § 48E credit is determined with respect to a taxpayer's "qualified investment" in a qualified facility. A taxpayer's qualified investment in a qualified facility is determined with respect to the taxpayer's basis in "qualified property" placed in service by the taxpayer that is part of the qualified facility as well as expenditures paid or incurred for certain qualified interconnection property.

Sections 45Y(b)(1)(A) and 48E(b)(3)(A) define a "qualified facility" for purposes of §§ 45Y and 48E, respectively, as a facility which is used for the generation of electricity, which is placed in service after December 31, 2024, and for which the greenhouse gas emissions rate (for § 45Y) or anticipated greenhouse gas emissions rate (for § 48E) is not greater than zero. The Department of the Treasury (Treasury Department) and the

Internal Revenue Service (IRS) published final regulations under §§ 45Y and 48E on January 15, 2025 (90 FR 4006). Sections 1.45Y-2 and 1.48E-2 clarify the definition of a "qualified facility" for purposes of §§ 45Y and 48E, respectively.

Section 45Y(b)(2)(C)(i) requires that the Secretary of the Treasury or the Secretary's delegate annually publish a table that sets forth the greenhouse gas emissions rates for types or categories of facilities, which a taxpayer must use for purposes of § 45Y. The Treasury Department and the IRS published the initial annual table required by § 45Y(b)(2)(C)(i) in Revenue Procedure 2025-14, 2025-7 I.R.B. 770. That table lists both wind facilities and solar facilities as having a greenhouse gas emissions rate of not greater than zero.

As noted in section 2.02 of Notice 2022-61, 87 FR 73580, 2022-52 I.R.B. 560, the IRS has issued several notices, collectively referred to in this notice as the "IRS Notices,"[2] which provide that taxpayers may establish the beginning of construction using the "Physical Work Test" or the "Five Percent Safe Harbor," and may satisfy either the "Continuity Requirement" or the "Continuity Safe Harbor," with respect to the credits determined under §§ 45, 45Q, and 48.

Section 5 of Notice 2022-61 provides guidance, in part, to determine when construction begins for purposes of the credit determined under §§ 45Y and 48E. Section 5 of Notice 2022-61 states that principles similar to those under Notice 2013-29 regarding the Physical Work Test and Five Percent Safe Harbor apply, and taxpayers

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[2] *See* Notice 2013-29, 2013-20 I.R.B. 1085; *clarified by* Notice 2013-60, 2013-44 I.R.B. 431; *clarified and modified by* Notice 2014-46, 2014-36 I.R.B. 520; *updated by* Notice 2015-25, 2015-13 I.R.B. 814; *clarified and modified by* Notice 2016-31, 2016-23 I.R.B. 1025; *updated, clarified, and modified by* Notice 2017-04, 2017-4 I.R.B. 541; Notice 2018-59, 2018-28 I.R.B. 196; *modified by* Notice 2019-43, 2019-31 I.R.B. 487; *modified by* Notice 2020-41, 2020-25 I.R.B. 954*; clarified and modified by* Notice 2021-5, 2021-3 I.R.B. 479; *clarified and modified by* Notice 2021-41, 2021-29 I.R.B. 17; Notice 2020-12, 2020-11 I.R.B. 495.

satisfying either test will be considered to have begun construction. Section 5 of Notice 2022-61 additionally provides, in part, that principles similar to those provided in the IRS Notices regarding the Continuity Requirement and the Continuity Safe Harbor apply for purposes of §§ 45Y and 48E, and that taxpayers may rely on the Continuity Safe Harbor provided the facility is placed in service no more than four calendar years after the calendar year during which construction began.

.02 Overview of OBBBA Changes to §§ 45Y and 48E.

Sections 70512(a) and 70513(a) of the OBBBA added new §§ 45Y(d)(4) and 48E(e)(4), respectively, to the Code. These new Code provisions terminate the § 45Y credit and the § 48E credit, respectively, for applicable wind and solar facilities placed in service after December 31, 2027. For purposes of this notice, the term "applicable wind facility" means an applicable facility as provided in §§ 45Y(d)(4)(B)(i) and 48E(e)(4)(B)(i) (except as provided in § 48E(e)(4)(C) relating to energy storage technology) and "applicable solar facility" means an applicable facility as provided in §§ 45Y(d)(4)(B)(ii) and 48E(e)(4)(B)(ii) (except as provided in § 48E(e)(4)(C)). Sections 70512(l)(4) and 70513(g)(5) of the OBBBA provide that the amendments made by §§ 70512(a) and 70513(a) of the OBBBA, respectively, apply to facilities the construction of which begins after the date which is 12 months after the date of enactment of the OBBBA (that is, July 4, 2026).

.03 Executive Order 14315.

Section 3(a) of Executive Order 14315 directs the Secretary of the Treasury, within 45 days following enactment of the OBBBA, to take action he deems necessary and appropriate to strictly enforce the termination provisions with respect to the § 45Y

credit and the § 48E credit for wind and solar facilities. Such action includes issuing new and revised guidance for applicable wind and solar facilities to ensure that policies concerning "beginning of construction" are not circumvented, including guidance to prevent the artificial acceleration or manipulation of eligibility and to restrict the use of broad safe harbors unless a substantial portion of an applicable wind or solar facility has been built.[3]

The Treasury Department and the IRS have determined that the guidance contained in this notice is necessary and appropriate to properly enforce the credit termination date for applicable wind and solar facilities. Congress provided a beginning of construction deadline after which the new credit termination date for applicable wind and solar facilities applies. This notice provides beginning of construction guidance to prevent taxpayers from circumventing the statutory credit termination date, prevent the artificial manipulation of eligibility for the § 45Y credit and § 48E credit for applicable wind and solar facilities, and ensure that a substantial portion of any applicable wind or solar facility not subject to the credit termination date is built by the beginning of construction deadline. Accordingly, except as provided in section 6 of this notice, the Five Percent Safe Harbor provided under the IRS notices is not available for purposes

[3] In addition, § 3(b) of Executive Order 14315 directs the Secretary of the Treasury, within 45 days following enactment of the OBBBA, to take prompt action as the Secretary of the Treasury deems appropriate and consistent with applicable law to implement the enhanced "Foreign Entity of Concern" restrictions in the OBBBA (also known as "Prohibited Foreign Entities"). Section 70512 of the OBBBA added those new restrictions regarding certain foreign entities in order to qualify for the § 45Y credit and the § 48E credit, among others, and included separate beginning of construction rules for those new provisions. See § 7701(a)(51) and (52) of the Code. The guidance in this notice is not intended to address the beginning of construction rules for the purposes of those foreign entity restrictions. The Treasury Department and the IRS are currently drafting additional guidance as is necessary and appropriate to implement those restrictions, as enacted by the OBBBA.

of determining whether an applicable wind or solar facility has met the beginning of construction deadline and, thus, is not subject to the credit termination date.

SECTION 3. METHOD FOR ESTABLISHING BEGINNING OF CONSTRUCTION

.01 In general. For purposes of the beginning of construction deadline in §§ 70512(l)(4) and 70513(g)(5) of the OBBBA, a taxpayer may establish that construction has begun before July 5, 2026, by satisfying the Physical Work Test as described in section 3.02 of this notice. Except as provided in section 6 of this notice, the Physical Work Test described in section 3.02 of this notice is the sole method that a taxpayer may use for these purposes. The Physical Work Test also requires that a taxpayer maintain a continuous program of construction (Continuity Requirement). Section 4 of this notice discusses the Continuity Requirement and section 4.04 of this notice provides a safe harbor for satisfying this requirement (Continuity Safe Harbor).

.02 Physical Work Test. Construction of an applicable wind or solar facility begins when physical work of a significant nature begins. Work performed by the taxpayer and work performed for the taxpayer by other persons under a binding written contract that is entered into prior to the manufacture, construction, or production of the applicable wind or solar facility for use by the taxpayer in the taxpayer's trade or business (or for the taxpayer's production of income) is taken into account in determining whether construction has begun. See section 5.01 of this notice. Whether physical work of a significant nature has begun with respect to an applicable wind or solar facility before July 5, 2026, will depend on the relevant facts and circumstances.

.03 Physical work of a significant nature. The Physical Work Test requires that physical work of a significant nature be performed. This test focuses on the nature of

the work performed, not the amount or the cost. Provided that physical work performed is of a significant nature, there is no fixed minimum amount of work or monetary or percentage threshold required to satisfy the Physical Work Test. Both off-site and on-site work (performed either by the taxpayer or by another person under a binding written contract) may be taken into account for purposes of demonstrating that physical work of a significant nature has begun.

(1) Off-site physical work of a significant nature. Generally, off-site physical work of a significant nature may include the manufacture of components, mounting equipment, support structures such as racks and rails, inverters, and transformers and other power conditioning equipment.

(2) On-site physical work of a significant nature. The following non-exclusive list of examples is intended to illustrate what constitutes on-site physical work of a significant nature for applicable wind and solar facilities:

(a) Applicable wind facility. On-site physical work of a significant nature begins with the beginning of the excavation for the foundation, the setting of anchor bolts into the ground, or the pouring of the concrete pads of the foundation. If the applicable wind facility's wind turbines and tower units are to be assembled on-site from components manufactured off-site by a person other than the taxpayer and delivered to the site, physical work of a significant nature begins when the manufacture of the components begins at the off-site location, but only if: (i) the manufacturer's work is done pursuant to a binding written contract (as described in section 5.01(1) of this notice); and (ii) these components are not held in the manufacturer's inventory (as described in section 3.05 of this notice). If a manufacturer produces components for multiple applicable facilities,

a reasonable method must be used to associate individual components with particular applicable facilities.

(b) Applicable solar facility. On-site physical work of a significant nature may include the installation of racks or other structures to affix photovoltaic (PV) panels, collectors, or solar cells to a site.

.04 Preliminary activities. Physical work of a significant nature does not include preliminary activities, even if the cost of those preliminary activities is properly included in the depreciable basis of the applicable wind or solar facility. Generally, preliminary activities for applicable wind or solar facilities include, but are not limited to:

(a) planning or designing;

(b) securing financing;

(c) exploring;

(d) researching;

(e) conducting mapping and modeling to assess a resource;

(f) obtaining permits and licenses;

(g) conducting geophysical, gravity, magnetic, seismic and resistivity surveys;

(h) conducting environmental and engineering studies;

(i) clearing a site;

(j) conducting test drilling to determine soil condition (including to test the strength of a foundation);

(k) excavating to change the contour of the land (as distinguished from excavation for a foundation); and

(l) removing existing foundations, turbines, and towers, solar panels, or any components that will no longer be part of the applicable wind or solar facility (including those on or attached to building structures).

.05 Inventory. Physical work of a significant nature does not include work (performed either by the taxpayer or by another person under a binding written contract) to produce a component/part of an applicable wind or solar facility that is either in existing inventory or is normally held in inventory by one selling the component/part to the taxpayer.

SECTION 4. CONTINUITY REQUIREMENT

.01 Continuous program of construction. A taxpayer will satisfy the Continuity Requirement of this section 4 only if the taxpayer maintains a continuous program of construction with respect to an applicable wind or solar facility. A continuous program of construction involves continuing physical work of a significant nature (as described in section 3.03 of this notice). Unless the Continuity Safe Harbor provided in section 4.04 of this notice applies, whether a taxpayer maintains a continuous program of construction to satisfy the Continuity Requirement will be determined by the relevant facts and circumstances.

.02 Excusable disruptions to continuous program of construction. Certain disruptions in a taxpayer's continuous construction to advance towards completion of an applicable wind or solar facility that are beyond the taxpayer's control will not be considered as indicating that a taxpayer has failed to satisfy the Continuity Requirement.

The following is a non-exclusive list of construction disruptions that will not be considered as indicating that a taxpayer has failed to satisfy the Continuity Requirement:

(a) delays due to severe weather conditions;

(b) delays due to natural disasters;

(c) delays in obtaining permits or licenses from federal, state, local, or Indian tribal governments, including, but not limited to, delays in obtaining permits or licenses from the Federal Energy Regulatory Commission (FERC), the Environmental Protection Agency (EPA), the Bureau of Land Management (BLM), and the Federal Aviation Agency (FAA);

(d) delays at the written request of a federal, state, local, or Indian tribal government regarding matters of public safety, security, or similar concerns;

(e) interconnection-related delays, such as those relating to the completion of construction on a new transmission or distribution line or necessary transmission or distribution upgrades to resolve grid congestion issues that may be associated with an applicable wind or solar facility's planned interconnection;

(f) delays in the manufacture of custom components;

(g) delays due to labor stoppages;

(h) delays due to the inability to obtain specialized equipment of limited availability;

(i) delays due to the presence of endangered species;

(j) financing delays; and

(k) delays due to supply shortages.

.03 Timing of excusable disruption determination. In the case of a single project comprised of multiple facilities (as described in section 5.02(2) of this notice), whether an excusable disruption has occurred for purposes of the Continuity Requirement must be determined in the calendar year during which the last of multiple facilities is placed in service. In the case of a single applicable wind or solar facility, whether an excusable disruption has occurred for purposes of the Continuity Requirement must be determined in the calendar year during which the applicable wind or solar facility is placed in service.

.04 Continuity safe harbor: deemed satisfaction of continuity requirement. Except as provided in this section 4.04, if a taxpayer places an applicable wind or solar facility in service by the end of a calendar year that is no more than four calendar years after the calendar year during which construction of the applicable wind or solar facility began (Continuity Safe Harbor Deadline), the applicable wind or solar facility will be considered to satisfy the Continuity Requirement (Continuity Safe Harbor). The excusable disruption rules in section 4.02 of this notice do not apply for purposes of applying the Continuity Safe Harbor. If an applicable wind or solar facility is not placed in service before the end of the fourth calendar year after the calendar year during which construction of the applicable wind or solar facility began, whether the applicable wind or solar facility satisfies the Continuity Requirement under the Physical Work Test will be determined by the relevant facts and circumstances.

For example, if construction begins on an applicable wind or solar facility on August 20, 2025, and the applicable wind or solar facility is placed in service by December 31, 2029, the applicable wind or solar facility will be considered to satisfy the

Continuity Safe Harbor. If the applicable wind or solar facility is not placed in service before January 1, 2030, whether the Continuity Requirement was satisfied will be determined by the relevant facts and circumstances.

SECTION 5. OTHER RULES

.01 Construction by contract. For property that is manufactured, constructed, or produced for the taxpayer by another person under a binding written contract (as described in section 5.01(1) of this notice), the work performed under the contract is taken into account in determining when physical work of a significant nature begins, provided the contract is entered into prior to the work taking place.

(1) Binding written contract. A contract is binding only if it is enforceable under local law against the taxpayer or a predecessor and does not limit damages to a specified amount (for example, by use of a liquidated damages provision). For this purpose, a contractual provision that limits damages to an amount equal to at least five percent of the total contract price will not be treated as limiting damages to a specified amount. For additional guidance regarding the definition of a binding contract, see § 1.168(k)-1(b)(4)(ii)(A)-(D).

(2) Master contract. If a taxpayer enters into a binding written contract for a specific number of components to be manufactured, constructed, or produced for the taxpayer by another person (a “master contract”), and then through a new binding written contract (a “project contract”) the taxpayer assigns its rights to certain components to an affiliated special purpose vehicle that will own the applicable wind or solar facility for which such property is to be used, work performed with respect to the

master contract may be taken into account in determining when physical work of a significant nature begins with respect to the applicable wind or solar facility.

.02 Qualified facility – (1) In general. Physical work of a significant nature with respect to an applicable wind or solar facility must be performed with respect to property included in a qualified facility, as defined in § 1.45Y-2(b) or § 1.48E-2(d), as applicable.

(2) Single project. Solely for purposes of determining whether construction of an applicable wind or solar facility has begun for purposes of this notice, multiple facilities that are operated as part of a single project (along with any property, such as a computer control system, that serves some or all such facilities) will be treated as a single applicable wind or solar facility. Whether multiple facilities are operated as part of a single project will depend on the relevant facts and circumstances. Factors indicating that multiple facilities are operated as part of a single project include, but are not limited to:

(a) The facilities are owned by a single legal entity;

(b) The facilities are constructed on contiguous pieces of land;

(c) The facilities are described in a common power purchase agreement or agreements;

(d) The facilities have a common intertie;

(e) The facilities share a common substation;

(f) The facilities are described in one or more common environmental or other regulatory permits;

(g) The facilities were constructed pursuant to a single master construction contract; and

(h) The construction of the facilities was financed pursuant to the same loan agreement.

(3) Timing of single project determination. The determination of whether multiple facilities are operated as part of a single project and are therefore treated as a single applicable wind or solar facility for purposes of this notice must be made in the calendar year during which the last of the multiple facilities is placed in service.

.03 Property integral to the applicable wind or solar facility. Only physical work of a significant nature on tangible personal property and other tangible property used as an integral part of the activity performed by the applicable wind or solar facility will be considered for purposes of determining whether a taxpayer has begun construction of an applicable wind or solar facility. This includes property integral to the production of electricity, but does not include property used for electrical transmission. See §§ 1.45Y-2(b)(3) and 1.48E-2(d)(3) for additional descriptions of property integral to a qualified facility.

.04 Application of 80/20 rule to retrofitted applicable wind or solar facilities – (1) In general. A retrofitted applicable wind or solar facility may qualify as originally placed in service even though it contains some used components of property, provided the fair market value of the used components of property is not more than 20 percent of the applicable wind or solar facility's total value (the cost of the new components of property plus the value of the used components of property) (80/20 Rule). See §§ 1.45Y-4(d) and 1.48E-4(c). In the case of a single project comprised of multiple facilities (as described in section 5.02(2) of this notice), the 80/20 Rule is applied to each facility comprising the single project. For purposes of the 80/20 Rule, the cost of a new

applicable wind or solar facility includes all properly capitalized costs of the new applicable wind or solar facility.

(2) Beginning of construction. In situations where the 80/20 Rule applies, the Physical Work Test applies only with respect to the work performed on, or amounts paid or incurred for, new components of property used to retrofit an existing applicable wind or solar facility. The total cost of the applicable wind or solar facility does not include the cost of land (including lease payments) or any property that is not part of the applicable wind or solar facility, as described in section 5.03 of this notice.

.05 Transfer of an applicable wind or solar facility – (1) In general. A taxpayer may claim either the § 45Y credit with respect to electricity produced by such taxpayer at an applicable wind or solar facility or the § 48E credit with respect to the taxpayer's qualified investment with respect to an applicable wind or solar facility. Neither § 45Y nor § 48E requires the taxpayer to own the applicable wind or solar facility at the time construction began on the applicable wind or solar facility. Accordingly, except as provided in section 5.05(3) of this notice, a fully or partially developed applicable wind or solar facility may be transferred without losing its qualification under the Physical Work Test for purposes of the § 45Y credit or the § 48E credit.

(2) Relocation of equipment by a taxpayer. A taxpayer may begin construction of an applicable wind or solar facility with the intent to develop the applicable wind or solar facility at a certain site, and thereafter transfer components of property of the applicable wind or solar facility to a different site, complete its development, and place it in service. The work performed or the amounts paid or incurred prior to the site transfer by such a

taxpayer may be taken into account for purposes of determining when the applicable wind or solar facility satisfies the Physical Work Test.

(3) Transfers of equipment between unrelated parties. In the case of a transfer consisting solely of tangible personal property (including contractual rights to such property under a binding written contract) to a transferee not related (within the meaning of §§ 197(f)(9)(C) and 1.197-2(h)(6)) to the transferor, any work performed or amounts paid or incurred by the transferor with respect to such transferred property will not be taken into account with respect to the transferee for purposes of the Physical Work Test.

For example, a developer, X, intends to develop and operate Facility A at a location to be determined. In 2025, X pays or incurs $60,000 to have tangible personal property integral to Facility A manufactured off-site pursuant to a binding written contract. Thereafter, X incurs no further development costs and engages in no further development activity with respect to Facility A. In January 2026, X sells the tangible personal property to another developer, Y, a party unrelated to X. Y is developing and intends to operate Facility B, located on a parcel of land owned by Y. Y incorporates the tangible personal property acquired from X into Facility B. In October 2026, Y places Facility B in service on the parcel of land. The total cost of Facility B is $1,000,000. Work performed for X in 2025 on the tangible personal property cannot be taken into account by Y for purposes of satisfying the Physical Work Test with respect to Facility B, because X and Y are not related persons (within the meaning of §§ 197(f)(9)(C) and 1.197-2(h)(6)) as described in section 5.05(3) of this notice. However, if without regard to the tangible personal property acquired from X, Y has otherwise satisfied the Physical

Work Test with respect to Facility B in 2025, Y will be considered to have begun construction in 2025.

SECTION 6. FIVE PERCENT SAFE HARBOR FOR LOW OUTPUT SOLAR FACILITIES

.01 In general. In the case of a low output solar facility (as defined in section 6.02 of this notice), a taxpayer may establish that construction has begun before July 5, 2026, by satisfying either the Physical Work Test described in section 3.02 of this notice, or by applying principles similar to those provided in section 5 of Notice 2013-29 regarding the Five Percent Safe Harbor (as described in section 2.02(2)(ii) of Notice 2022-61).

.02 Low output solar facility.

(1) Definition. A low output solar facility is an applicable solar facility that has maximum net output of not greater than 1.5 megawatt (MW) (as measured in alternating current) (1.5-Megawatt Maximum). For purposes of the 1.5-Megawatt Maximum, output is measured at the level of the qualified facility.

(2) Property included in an applicable solar facility. An applicable solar facility includes a unit of a qualified solar facility, which, in turn, includes all functionally interdependent components of property owned by the taxpayer that are operated together and that can operate apart from other property to produce electricity. Components of property are functionally interdependent if the placing in service of each of the components is dependent upon the placing in service of each of the other components to produce electricity. A qualified solar facility also includes property owned by the taxpayer that is an integral part of the qualified solar facility. A component of

property owned by the taxpayer is an integral part of the qualified facility if it is used directly in the intended function of the facility and is essential to the completeness of such function. See §§ 1.45Y-2(b)(3) and 1.48E-2(d)(3) for additional descriptions of property integral to a qualified facility.

.03 Measurement of output.

(1) In general. The maximum net output of an applicable solar facility is measured only by nameplate generating capacity (in alternating current) of the unit of qualified facility (as described in §§ 1.45Y-2(b)(2) and 1.48E-2(d)(2)), which does not include the nameplate capacity of any component that is an integral part (as described in §§ 1.45Y-2(b)(3) and 1.48E-2(d)(3)) of the applicable solar facility, at the time the applicable solar facility is placed in service. The nameplate generating capacity of the applicable solar facility is measured independently from any other applicable solar facility that shares an integral part with the applicable solar facility. Notwithstanding this rule, the nameplate generating capacity of two or more applicable solar facilities having integrated operations are measured in the aggregate for purposes of the 1.5-Megawatt Maximum.

(2) Nameplate capacity. For purposes of section 6.02(1) of this notice, the determination of whether a qualified facility has a maximum net output of not greater than 1.5 MW (as measured in alternating current) is based on the nameplate capacity. The nameplate capacity for purposes of the 1.5-Megawatt Maximum is the maximum electrical generating output in megawatts that the unit of qualified facility is capable of producing on a steady state basis and during continuous operation under standard conditions, as measured by the manufacturer and consistent with the definition of

nameplate capacity provided in 40 CFR 96.202. If applicable, taxpayers should use the International Standard Organization (ISO) conditions to measure the maximum electrical generating output of a unit of qualified facility. For applicable solar facilities that generate electricity in direct current, a taxpayer determines whether an applicable solar facility has a maximum net output of not greater than 1.5 MW (in alternating current) by using the lesser of:

(a) The sum of the nameplate generating capacities within the applicable solar facility in direct current, which is deemed the nameplate generating capacity of the unit of applicable solar facility in alternating current; or

(b) The nameplate capacity of the first component of the applicable solar facility that inverts the direct current electricity into alternating current.

(3) Integrated operations. For the purposes of the 1.5-Megawatt Maximum, an applicable solar facility is treated as having integrated operations with one or more other applicable solar facilities of the same technology type if the facilities are:

(a) Owned by the same or related taxpayers;

(b) Placed in service in the same taxable year; and

(c) Transmit electricity generated by the facilities through the same point of interconnection or, if the facilities are not grid-connected or are delivering electricity directly to an end user behind a utility meter, are able to support the same end user.

(4) Related taxpayers. For purposes of section 6.03(3) of this notice, the term "related taxpayers" means members of a group of trades or businesses that are under common control (as defined in § 1.52-1(b)). Related taxpayers are treated as one taxpayer in determining whether an applicable facility has integrated operations.

SECTION 7. EFFECTIVE DATE

This notice is effective for applicable wind and solar facilities the construction of which did not begin (as determined under section 5 of Notice 2022-61) prior to September 2, 2025.

SECTION 8. EFFECT ON OTHER DOCUMENTS

Except as provided in sections 6 and 7 of this notice, this notice modifies Notice 2022-61 to provide that section 5 of such notice is not applicable for determining whether construction of an applicable wind or solar facility began prior to the beginning of construction deadline in §§ 70512(l)(4) and 70513(g)(5) of the OBBBA.

SECTION 9. DRAFTING INFORMATION

The principal author of this notice is the Office of Associate Chief Counsel (Energy, Credits, and Excise Tax); however, other personnel from the Treasury Department and the IRS participated in its development. For further information regarding this notice contact (202) 317-6853 (not a toll-free call).

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 47

ORSTED, REVOLUTION WIND RECEIVES STOP-WORK ORDER FROM US DOI BOEM

This page is also available in Danish. To switch language click here(https://orsted.com/da/company-announcement-list/2025/08/revolution-wind-receives-offshore-stop-work-order--145387701) .

22.08.2025 16:52

Revolution Wind receives offshore stop-work order from US Department of the Interior's Bureau of Ocean Energy Management

(https://www.facebook.com/sharer/sharer.php?u=https%3a%2f%2forsted.com%2fen%2fcompany-announcement-list%2f2025%2f08%2frevolution-wind-receives-offshore-stop-work-order--145387701)
(https://www.linkedin.com/shareArticle?mini=true&url=https%3a%2f%2forsted.com%2fen%2fcompany-announcement-list%2f2025%2f08%2frevolution-wind-receives-offshore-stop-work-order--145387701)

On 22 August 2025, Ørsted's subsidiary Revolution Wind LLC, a 50/50 joint venture with Global Infrastructure Partner's Skyborn Renewables, received an order instructing the project to stop activities on the outer continental shelf related to the Revolution Wind project from the US Department of the Interior's Bureau of Ocean Energy Management (BOEM). Revolution Wind is complying with the order and is taking appropriate steps to stop offshore activities, ensuring the safety of workers and the environment.

The project commenced offshore construction following the final federal approval from BOEM last year. The project is 80% complete with all offshore foundations installed and 45 out of 65 wind turbines installed.

Ørsted is evaluating all options to resolve the matter expeditiously. This includes engagement with relevant permitting agencies for any necessary clarification or resolution as well as through potential legal proceedings, with the aim being to proceed with continued project construction towards COD in the second half of 2026.

Revolution Wind is fully permitted, having secured all required federal and state permits including its Construction and Operations Plan approval letter on 17 November 2023 following reviews that began more than nine years ago. Revolution Wind has 20-year power purchase agreements to deliver 400 MW of electricity to Rhode Island and 304 MW to Connecticut, enough to power over 350,000 homes across both states to meet their growing energy demand. As a reference, South Fork Wind, which is adjacent to Revolution Wind and uses the same turbine technology, delivered reliable energy to New York at a capacity factor of 53% for the first half of 2025, on par with the state's baseload power sources.

Ørsted is investing into American energy generation, grid upgrades, port infrastructure, and a supply chain, including US shipbuilding and manufacturing extending to more than 40 states. Revolution Wind is already employing hundreds of local union workers supporting both on and offshore construction activities. Ørsted's US offshore wind projects have totalled approximately 4 million labour union hours to date, 2 million of which are with Revolution Wind.

Ørsted is evaluating the potential financial implications of this development, considering a range of scenarios, including legal proceedings. Ørsted will, in due course, advise the market on the potential impact of the order on the plan announced on 11 August 2025 (company announcement 12/2025) to conduct a rights issue. Existing shareholders and prospective investors are advised to await further announcements by the company.

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About Ørsted

The Ørsted vision is a world that runs entirely on green energy. Ørsted develops, constructs, and operates offshore and onshore wind farms, solar farms, energy storage facilities, and bioenergy plants. Ørsted is recognised on the CDP Climate Change A List as a global leader on climate action and was the first energy company in the world to have its science-based net-zero emissions target validated by the Science Based Targets initiative (SBTi). Headquartered in Denmark, Ørsted employs approx. 8,300 people. Ørsted's shares are listed on Nasdaq Copenhagen (Orsted). In 2024, the group's revenue was DKK 71.0 billion (EUR 9.5 billion).
Visit orsted.com(http://orsted.com/) or follow us.

Attachments

- Ørsted CA no. 15 2025.pdf(https://via.ritzau.dk/ir-files/13560592/14538770/15983/%C3%98rsted%20CA%20no.%2015%202025.pdf)

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

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EXHIBIT 48

UTILITY DIVE, TRUMP ADMINISTRATION TO REVOKE APPROVAL FOR 2.2-GW MARYLAND OFFSHORE WIND

UTILITY DIVE

DIVE BRIEF

Trump administration to revoke approval for 2.2-GW Maryland Offshore Wind

The Interior Department said it will "reevaluate under the Outer Continental Shelf Lands Act" its decision to approve the project's construction and operations plan and move for a remand by Sept. 12.

Published Aug. 27, 2025



Diana DiGangi
Reporter



Seeking a revocation of Maryland Offshore Wind's construction and operations plan approval is the latest in a series of efforts from the Trump administration to cancel or delay offshore wind projects that received federal approval and are under construction — including Revolution Wind and Empire Wind 1. Getty Images

Dive Brief:

- In a Friday court filing, the Department of the Interior said it intends to revoke the approved construction and operations

plan, or COP, for US Wind's 2.2 GW Maryland Offshore Wind project off the coast of Maryland and Delaware.

- The filing was made in the docket for a complaint filed in February by South Bethany property owner and attorney Edward Bintz, who alleged that the Biden administration's approval of the COP violated the Coastal Zone Management Act.
- "Interior now intends to reevaluate under the Outer Continental Shelf Lands Act its decision to approve the COP and, as a result, will be moving no later than September 12 … for remand of that prior COP approval," Interior said in its filing.

Dive Insight:

The filing came in the form of a motion to stay the case, with Interior arguing that if its motion is granted, "the agency action that Plaintiff challenges will be vacated, and thus his claims will be entirely moot. And even if Interior's motion is denied, the agency's reconsideration of the COP will likely result in significant changes that will impact the positions and arguments of the parties here."

Interior noted that Maryland Offshore Wind's COP is also being challenged in a complaint filed in U.S. District Court for the District of Maryland by the leadership of Ocean City, and said it plans to file its motion for a remand in that case.

"Though the Maryland court dismissed the differently pled [Coastal Zone Management Act] claim in that case, the operative complaint in the Maryland Action still alleges Interior's COP approval was contrary to the [Outer Continental Shelf Lands Act], [Administrative Procedure Act], and Marine Mammal Protection Act," Interior said.

Seeking a revocation of the project's COP is the latest in a series of efforts from the Trump administration to cancel or delay offshore

wind projects that received federal approval under the Biden administration and are under construction.

Interior issued a stop work order, also on Friday, to Revolution Wind – a 700-MW offshore wind farm close to being completed and set to supply energy to Rhode Island and Connecticut.

In April, the administration ordered Equinor to stop work on its 810-MW Empire Wind 1 wind energy project offshore New York. Equinor said the delay cost the company up to $50 million each week, and came close to having to terminate the project before New York Governor Kathy Hochul negotiated with the administration to allow work to resume.

Last week, the U.S. Department of Commerce opened a probe into "the effects on the national security of imports of wind turbines and their parts and components." Capstone analysts said in a note that they expect the Commerce Department to ultimately apply tariffs "likely around 25%-50%, consistent with other Section 232 duties imposed by this administration."

"Offshore wind certainly has taken a beating," said Lauren Collins, a tax partner at Vinson & Elkins. "Both through the One Big Beautiful Bill Act, and recent news on offshore wind projects basically being shuttered even though they're almost done."

Kat Burnham, Rhode Island policy lead at Advanced Energy United, said the Trump administration's "escalating attacks on offshore wind are creating chaos in the energy sector. Pulling back approvals for projects that are already permitted and in some cases nearly built, undermines years of planning, billions of dollars in private investment, and thousands of jobs."

According to the Bureau of Ocean Energy Management, Maryland Offshore Wind's COP "includes up to 114 wind turbine generators, four offshore substations, a meteorological tower, and up to four

offshore export cable corridors with subsea transmission cables making landfall in Sussex County, Delaware … Two phases, known as MarWin and Momentum Wind, already have offshore renewable energy certificates from the State of Maryland."

The 300-MW MarWin project is set to start delivering electricity this year, while the 800-MW Momentum Wind is set to start doing so in 2028.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 49

ISO NEWSWIRE, ISO-NE STATEMENT ON REVOLUTION WIND STOP WORK ORDER

ISO NEWSWIRE
A Wholesale Electricity Industry Update

August 25, 2025

ISO-NE statement on Revolution Wind stop work order

ISO New England is aware of the stop work order received by Revolution Wind. Through the region's wholesale markets, Revolution Wind has committed to helping meet New England's demand for electricity, beginning in 2026. The ISO is expecting this project to come online and it is included in our analyses of near-term and future grid reliability. Delaying the project will increase risks to reliability.

Recent heatwaves in New England drove demand for electricity to very high levels and demonstrated that our region needs all generation resources with market obligations to be available to meet demand and maintain required reserves. Beyond near-term impacts to reliability in the summer and winter peak periods, delays in the availability of new resources will adversely affect New England's economy and industrial growth, including potential future data centers.

As demand for electricity grows, New England must maintain and add to its energy infrastructure. Unpredictable risks and threats to resources—regardless of technology—that have made significant capital investments, secured necessary permits, and are close to completion will stifle future investments, increase costs to consumers, and undermine the power grid's reliability and the region's economy now and in the future.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 50

DOE, RESOURCE ADEQUACY REPORT: EVALUATING THE RELIABILITY AND SECURITY OF THE US ELECTRIC GRID

U.S. DEPARTMENT of ENERGY



Resource Adequacy Report

Evaluating the Reliability and Security of the United States Electric Grid

July 2025

Acknowledgments

This report and associated analysis were prepared for DOE purposes to evaluate both the current state of resource adequacy as well as future pressures resulting from the combination of announced retirements and large load growth.

It was developed in collaboration with and with assistance from the Pacific Northwest National Laboratory (PNNL) and National Renewable Energy Laboratory (NREL). We thank the North American Electric Reliability Corporation (NERC) for providing data used in this study, the Telos Corporation for their assistance in interpreting this data, and the U.S Energy Information Administration (EIA) for their dissemination of historical datasets. In addition, thank you to NREL for providing synthetic weather data created by Evolved Energy Research for the Regional Energy Deployment System (ReEDS) model.

DOE acknowledges that the resource adequacy analysis that was performed in support of this study could benefit greatly from the in-depth engineering assessments which occur at the regional and utility level. The DOE study team built the methodology and analysis upon the best data that was available. However, entities responsible for the maintenance and operation of the grid have access to a range of data and insights that could further enhance the robustness of reliability decisions, including resource adequacy, operational reliability, and resilience.

Historically, the nation's power system planners would have shared electric reliability information with DOE through mechanisms such as EIA-411, which has been discontinued. Thus, one of the key takeaways from this study process is the underscored "call to action" for strengthened regional engagement, collaboration, and robust data exchange which are critical to addressing the urgency of reliability and security concerns that underpin our collective economic and national security.

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List of Acronyms

AI	Artificial Intelligence
CAISO	California Independent System Operator
DOE	U.S. Department of Energy
EIA	Energy Information Administration
EO	Executive Order
EPRI	Electric Power Research Institute
ERCOT	Electric Reliability Council of Texas
EUE	Expected Unserved Energy
FERC	Federal Energy Regulatory Commission
GADS	Generating Availability Data System
ISO	Independent System Operator
ISO-NE	ISO New England Inc.
ITCS	Interregional Transfer Capability Study
LBNL	Lawrence Berkeley National Laboratory
LOLE	Loss of Load Expectation
LOLH	Loss of Load Hours
LTRA	Long-Term Reliability Assessment
MISO	Midcontinent Independent System Operator
NERC	North American Electric Reliability Corporation
NREL	National Renewable Energy Laboratory
NYISO	New York Independent System Operator
PJM	PJM Interconnection, LLC
PNNL	Pacific Northwest National Laboratory
ReEDS	Regional Energy Deployment System
RTO	Regional Transmission Organization
SERC	SERC Reliability Corporation
TPR	Transmission Planning Region
USE	Unserved Energy

Background to this Report

On April 8, 2025, President Trump issued Executive Order 14262, "Strengthening the Reliability and Security of the United States Electric Grid." EO 14262 builds on EO 14156, "Declaring a National Emergency (Jan. 20, 2025)," which declared that the previous administration had driven the Nation into a national energy emergency where a precariously inadequate and intermittent energy supply and increasingly unreliable grid require swift action. The United States' ability to remain at the forefront of technological innovation depends on a reliable supply of energy and the integrity of our Nation's electrical grid.

EO 14262 mandates the development of a uniform methodology for analyzing current and anticipated reserve margins across regions of the bulk power system regulated by the Federal Energy Regulatory Commission (FERC). Among other things, EO 14262 requires that such methodology accredit generation resources based on the historical performance of each generation resource type. This report serves as DOE's response to Section 3(b) of EO 14262 by delivering the required uniform methodology to identify at-risk region(s) and guide reliability interventions. The methodology described herein and any analysis it produces will be assessed on a regular basis to ensure its usefulness for effective action among industry and government decision-makers across the United States.

Executive Summary

Our Nation possesses abundant energy resources and capabilities such as oil and gas, coal, and nuclear. The current administration has made great strides—such as deregulation, permitting reform, and other measures—to enable addition of more energy infrastructure crucial to the utilization of these resources. However, even with these foundational strengths, the accelerated retirement of existing generation capacity and the insufficient pace of firm, dispatchable generation additions (partly due to a recent focus on intermittent rather than dispatchable sources of energy) undermine this energy outlook.

Absent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI) innovation. A failure to power the data centers needed to win the AI arms race or to build the grid infrastructure that ensures our energy independence could result in adversary nations shaping digital norms and controlling digital infrastructure, thereby jeopardizing U.S. economic and national security.

Despite current advancements in the U.S. energy mix, this analysis underscores the urgent necessity of robust and rapid reforms. Such reforms are crucial to powering enough data centers while safeguarding grid reliability and a low cost of living for all Americans.

Key Takeaways

- **Status Quo is Unsustainable**. The status quo of more generation retirements and less dependable replacement generation is neither consistent with winning the AI race and ensuring affordable energy for all Americans, nor with continued grid reliability (ensuring "resource adequacy"). Absent intervention, it is impossible for the nation's bulk power system to meet the AI growth requirements while maintaining a reliable power grid and keeping energy costs low for our citizens.
- **Grid Growth Must Match Pace of AI Innovation**. The magnitude and speed of projected load growth cannot be met with existing approaches to load addition and grid management. The situation necessitates a radical change to unleash the transformative potential of innovation.
- **Retirements Plus Load Growth Increase Risk of Power Outages by 100x in 2030**. The retirement of firm power capacity is exacerbating the resource adequacy problem. 104 GW of firm capacity are set for retirement by 2030. This capacity is not being replaced on a one-to-one basis and losing this generation could lead to significant outages when weather conditions do not accommodate wind and solar generation. In the "plant closures" scenario of this analysis, annual loss of load hours (LOLH) increased by a factor of a hundred.
- **Planned Supply Falls Short, Reliability is at Risk**. The 104 GW of retirements are projected to be replaced by 209 GW of new generation by 2030; however, only 22 GW would come from firm baseload generation sources. Even assuming no retirements, the model found increased risk of outages in 2030 by a factor of 34.

- **Old Tools Won't Solve New Problems.** Antiquated approaches to evaluating resource adequacy do not sufficiently account for the realities of planning and operating modern power grids. At a minimum, modern methods of evaluating resource adequacy need to incorporate frequency, magnitude, and duration of power outages; move beyond exclusively analyzing peak load time periods; and develop integrated models to enable proper analysis of increasing reliance on neighboring grids.

This report clearly demonstrates the need for rapid and robust reform to address resource adequacy issues across the Nation. Inadequate resource adequacy will hinder the development of new manufacturing in America, slow the re-industrialization of the U.S. economy, drive up the cost of living for all Americans, and eliminate the potential to sustain enough data centers to win the AI arms race.

Developing a Uniform Methodology

DOE's resource adequacy methodology assesses the U.S. electric grid's ability to meet future demand through 2030. It provides a forward-looking snapshot of resource adequacy that is tied to electricity supply and new load growth, systematically exploring a range of dimensions that can be compared across regions. As detailed in the methodology section of this report, the model is derived from the North American Electric Reliability Corporation (NERC) Interregional Transfer Capability Study (ITCS) which leverages time-correlated generation and outages based on actual historic data.[1] A deterministic approach[2] simulates system stress in all hours of the year and incorporates varied grid conditions and operating scenarios based on historical events:

- **Demand for Electricity – Assumed Load Growth:** The methodology accounts for the significant impact of data centers, particularly those supporting AI workloads, on electricity demand. Various organizations' projections for incremental data center electricity use by 2030 range widely (35 GW to 108 GW). DOE adopted a national midpoint assumption of 50 GW by 2030, aligning with central projections from Electric Power Research Institute (EPRI)[3] and Lawrence Berkeley National Laboratory (LBNL).[4] This 50 GW was allocated regionally using state-level growth ratios from S&P's forecast,[5] reflecting infrastructure characteristics, siting trends, and market activity; and, mapped to NERC Transmission Planning Regions (TPRs).

1. This model differs from traditional peak hour reliability assessments in that it explicitly simulates grid performance hour-by-hour across multiple weather years with finer geographic detail and optimized inter-regional transfers, and explores various retirement and build-out scenarios. Furthermore, the DOE approach integrates weather-synchronized outage data.
2. Deterministic approaches evaluate resource adequacy using relatively stable or fixed assumptions about the representation of the power system. Probabilistic approaches incorporate data and advanced modeling techniques to represent uncertainty that require more computing power. Deterministic was chosen for this analysis for transparency and to model detailed historic system conditions.
3. EPRI, "Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption," March 2024, https://www.epri.com/research/products/3002028905.
4. Shehabi, A., et al., "2024 United States Data Center Energy Usage Report," https://escholarship.org/uc/item/32d6m0d1.
5. S&P Global – Market Intelligence, "US Datacenters and Energy Report," 2024.

An additional 51 GW of non-data center load was modeled using NERC data, historical loads (2019-2023), and simulated weather years (2007-2013), adjusted by the Energy Information Administration's (EIA) 2022 energy forecast, with interpolation between 2024 and 2033 to estimate 2030 demand.

- **Supply of Electricity – Assumed Generation Retirements and Additions:** Between the current system and the projected 2030 system, the model considers three scenarios for generator retirements and additions. These scenarios were selected to describe the metrics of interest and how they change during certain assumptions of generation growth and retirements.

The resource adequacy standard (or criterion) is the measure that defines the desired level of adequacy needed for a given system. Conceptually, a resource adequacy criterion has two components—metrics and target levels—that determine whether a system is considered adequate. Comprehensive resource adequacy metrics[6] are incorporated in this analysis to capture the magnitude and duration of system stress events:

- **Magnitude of Outages – Normalized Unserved Energy (NUSE):** Measures the amount of unmet electrical energy demand because of insufficient generation or transmission, typically measured in megawatt hours (MWh).

  While USE describes the absolute amount of energy not delivered, it is less useful when comparing systems of different size or across different periods. Normalizing, by dividing by total load over a whole period (for example, a year) allows comparison of these metrics across different system sizes, demand levels, and periods of analysis. For example, 100 MWh of USE in a small, isolated microgrid can be more impactful than 100 MWh of USE in a larger regional grid that serves millions of people. USE is normalized by dividing by total load:

$$\frac{100\ MWh\ (of\ unserved\ energy)}{10{,}000{,}000\ MWh\ (of\ total\ energy\ delivered\ in\ a\ year)} x100 = 0.001\ percent$$

Although the use of NUSE is not standardized in the U.S. today,[7] several system operators domestically and across the world have begun using NUSE as a useful metric.

- **Duration of Outages – Loss of Load Hours (LOLH):** Measures the expected duration of power outages when a system's load exceeds its available generation capacity. At the core, LOLH helps assess how frequently and for how long the power system is likely to experience insufficient supply, providing a picture of reliability in terms of time. LOLH is calculated as both a total and average value per year, in addition to the maximum percentage of load lost in any given hour per year.

6. In the interest of technical accuracy, and separate from their contextualization in the main text, NUSE is more precisely a measure of volume that is expressed as a percentage. Similarly, 2.4 hours of LOLH represents the cumulative sum of distinct periods of load loss, not a singular, continuous duration.
7. There is no common planning criterion for this metric in North America. NERC's Long-Term Reliability Assessment employs a normalized expected unserved energy (NEUE) metric to define target risk levels for each region. Grid operators, such as ISO-NE, have also considered NUSE in energy adequacy studies. For example, see ISO-NE, "Regional Energy Shortfall Threshold (REST): ISO's Current Thinking Regarding Tail Selection," April 2025, https://www.iso-ne.com/static-assets/documents/100022/a09_rest_april_2025.pdf.

Reliability Standard

DOE's methodology recognizes that the traditional 1-in-10 loss of load expectation (LOLE) criterion is insufficient for a complete assessment of resource adequacy and risk profile. This antiquated criterion is not calculated uniformly and fails to adequately account for crucial factors such as the duration and magnitude of potential outages.[8] To provide a comprehensive understanding of system reliability and, specifically, to complement current resource adequacy standards while informing the creation of new criteria, the methodology uses the following reliability standard:

- **Duration of Outages:** No more than 2.4 hours of lost load in an individual year.[9] This translates into one day of lost load in ten years to meet the 1-in-10 criteria.

- **Magnitude of Outages:** No more than an NUSE of 0.002%.[10] This means that the total amount of energy that cannot be supplied to customers is 0.002% of the total energy demanded in a given year.

Achieving Reliability Standard

- **Perfect Capacity Surplus/Deficit:** Defined as the amount of generation capacity (in MW) a region would need to achieve specified threshold conditions. Based on these thresholds, this standard helps answer the hypothetical question of how much more (or less) power plant capacity is needed for a power system to be considered "perfectly reliable" according to pre-defined standards. This methodology employs this perfect capacity metric to identify the amount of capacity needed to remedy potential shortfalls (or excesses) in generation.

Key Results Summary

This analysis developed three separate cases for 2030. The "**Plant Closures"** case assumes all announced retirements occur plus mature generation additions based on NERC's Tier 1 resources category,[11] which encompasses completed and under-construction power generation projects, as well as those with firm-signed and approved interconnection service or power purchase agreements. The "**No Plant Closures"** case assumes no retirements plus mature additions. A "**Required Build**" case further compares the impacts of retirements on perfect capacity additions needed to return 2030 to the current system level of reliability.

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8. While 1-in-10 analyses have evolved, industry experts have raised concerns about its effectiveness to address future system risks. Concerns include energy constraints that arise from intermittent resources, increasing battery storage, limited fuel supplies, and the shifting away of peak load periods from times of supply shortfalls.

9. The "1-in-10 year" reliability standard for electricity grids means that, on average, there should be no more than one day (24 hours) of lost load over a ten-year period. This translates to a maximum of 2.4 hours of lost load per year.

10. This analysis targets NUSE below 0.002% for each region because this is the target NERC uses to represent high risk in resource adequacy analyses. Estimates used in industry and analyzed recently range from 0.0001% to 0.003%.

10. Mature generation additions are based on NERC's 2024 LTRA Tier 1 resources, which assume that only projects considered very mature in the development pipeline will be built. For example, Tier 1 additions are those with signed interconnection agreements or power purchase agreements, or included in an integrated resource plan, indicating a high degree of certainty in their addition to the grid. Full details of the retirement and addition assumptions can be found in the methodology section of this report.

DOE ran simulations using 12 different years of historical weather. Every hour was based on actual data for wind, solar, load, and thermal availability to stress test the grid under a range of realistic weather conditions. The benefit of this approach is that it allows for transparent review of how actual conditions manifest themselves in capacity shortfalls. For all scenarios, LOLH and NUSE are calculated and used to compare how they change based on generation growth, retirements, and potential weather conditions.

- **Current System:** Supply of power (generation) and demand for power (load) consistent with 2024 NERC Long-Term Reliability Assessment (LTRA), including 2023 actual generation plus Tier 1 additions for 2024.

- **Plant Closures:** This case assumes 104 GW of announced retirements based on NERC estimates including approximately 71 GW of coal and 25 GW of natural gas, which closely align with retirement numbers in EIA's 2025 Annual Energy Outlook. In addition, this case assumes 100% of 2024 NERC LTRA Tier 1 additions totaling 209 GW are constructed by 2030. This includes 20 GW of new natural gas, 31 GW of additional 4-hour batteries, 124 GW of new solar and 32 GW of incremental wind. Details of the breakdown can be found in Appendix A.

- **No Plant Closures:** This case adds all the Tier 1 NERC additions but assumes no retirements.

- **Required Build:** To understand how much capacity may need to be added to reach reliability targets, the analysis adds hypothetical perfect capacity (which is idealized capacity that has no outages or profile) until a NUSE target of 0.002% is realized in each region. This scenario includes the same assumptions about retirements as our Plant Closures scenario described above.

As shown in the figures and tables below, the model shows a significant decline in all reliability metrics between the current system scenario and the 2030 Plant Closures scenario. Most notably, there is a hundredfold increase in annual LOLH from 8.1 hours per year in the current case to 817 hours per year in the 2030 Plant Closures. In the worst weather year assessed, the total lost load hours increase from 50 hours to 1,316 hours.

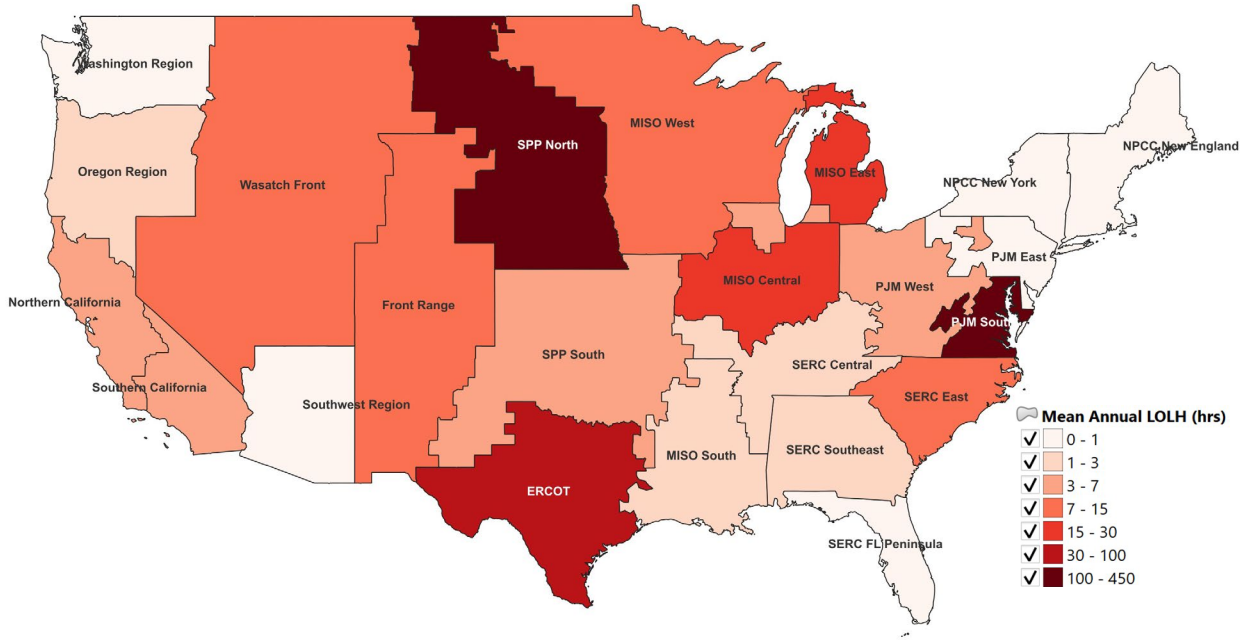


Figure 1. Mean Annual LOLH by Region (2030) – Plant Closures

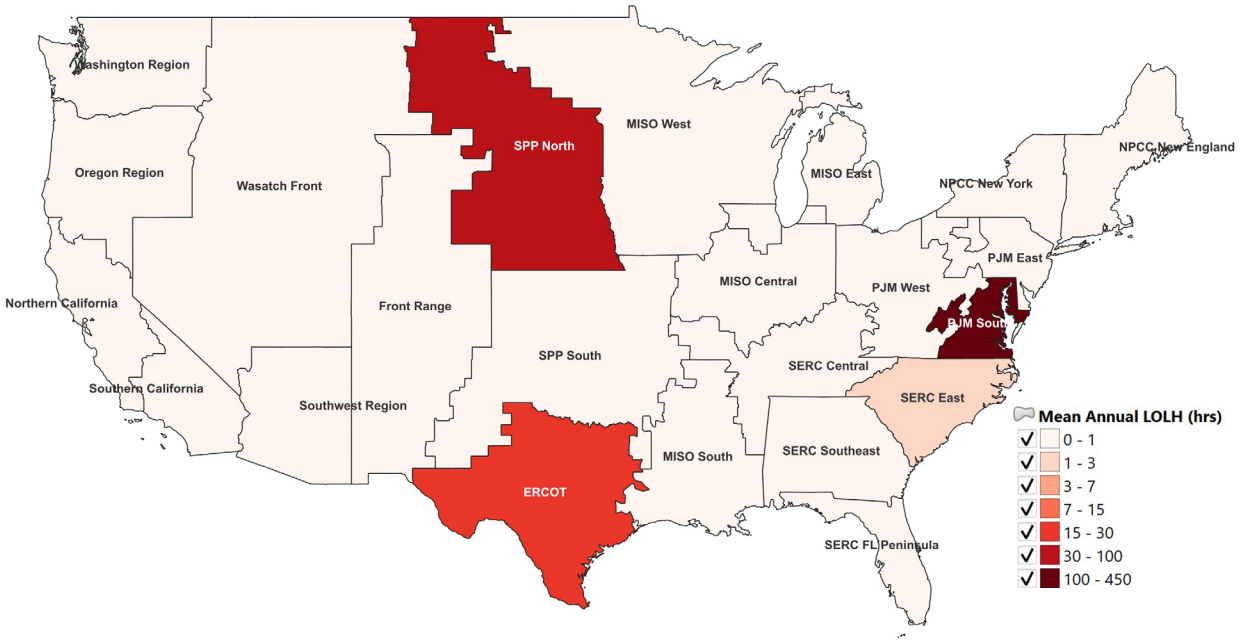


Figure 2. Mean Annual LOLH by Region (2030) – No Plant Closures

Table 1. Summary Metrics Across Cases

Reliability Metric		2030 Projection		
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	8.1	817.7	269.9	13.3
Normalized Unserved Energy (%)	0.0005	0.0465	0.0164	0.00048
WORST WEATHER YEAR				
Annual Loss of Load Hours	50	1316	658	53
Normalized Unserved Load (%)	0.0033	0.1119	0.0552	0.002

Current System Analysis

Analysis of the current system shows all regions except ERCOT have less than 2.4 hours of average loss of load per year and less than 0.002% NUSE. This indicates relative reliability for most regions based on the average indicators of risk used in this study. In the current system case, ERCOT would be expected to experience on average 3.8 LOLH annually going forward and a NUSE of 0.0032%. When looking at metrics in the worst weather years, regions meet or exceed additional criteria. All regions experienced less than 20% of lost load in any hour.

However, PJM, ERCOT,[12] and SPP experienced significant loss of load events during 2021 and 2022 winter storms Uri and Elliot which translated into more than 20 hours of lost load. This results in a concentration of lost load within certain years such that some regions exceeded 3-hours-per-year of lost load. It is worth noting that in the case of PJM and SPP, the current system model shortfalls occurred within subregions rather than for the entire ISO footprint.

12. ERCOT has since winterized its generation fleet and did not suffer any outages during Winter Storm Elliot.

2030 Model Results

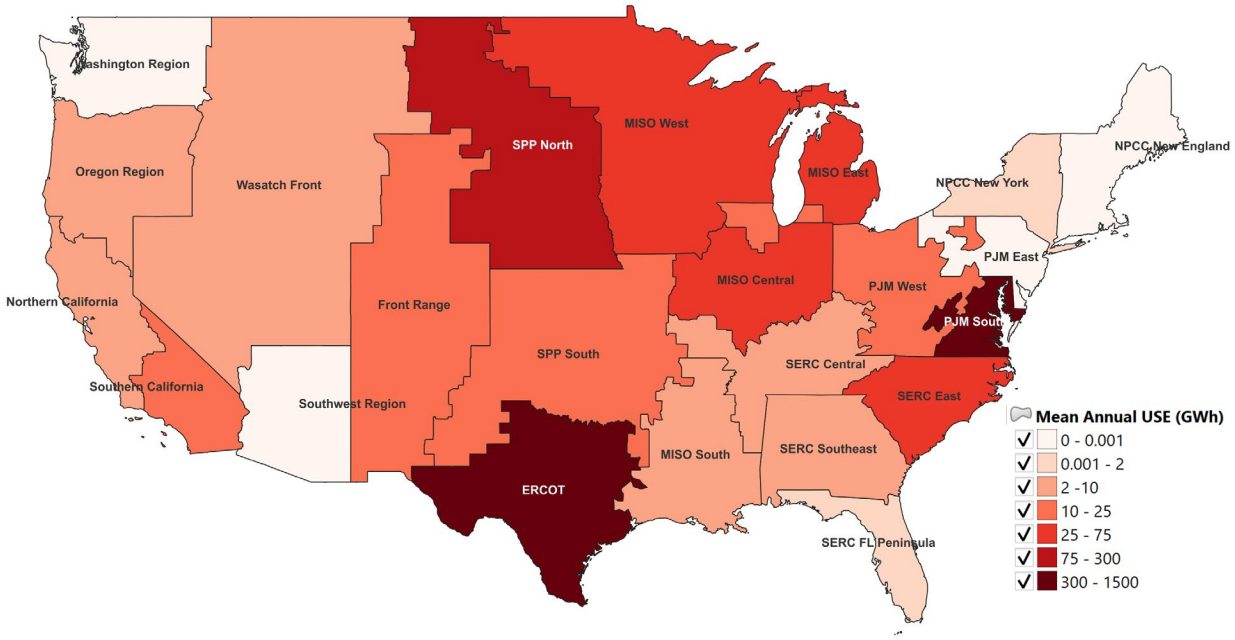


Figure 3. Mean Annual NUSE by Region (2030) -Plant Closures

Key Findings – Plant Closures Case:

- **Systemwide Failures**: All regions except ISO-NE and NYISO failed reliability thresholds. These two regions did not have additional AI/data center (AI/DC) load growth modeled.
- **Loss of Load Hours (LOLH)**: Ranged from 7 hours/year in CAISO to 430 hours/year in PJM.
- **Load Shortfall Severity**: Max shortfall reached as high as 43% of hourly load in PJM; 31% in CAISO.
- **Normalized Unserved Energy**: Normalized values ranged from 0.0032% (non-CAISO West) to 0.1473% (PJM), far exceeding thresholds of 0.002%.
- **Extreme Events**: Most regions experienced ≥3 hours of unserved load in at least one year. PJM had 1,052 hours in its worst year.
- **Spatial Takeaways**: Subregions in PJM, MISO, and SERC met thresholds—indicating possible benefits from transmission—but SPP and CAISO failed in all subregions.

Key Findings – No Plant Closures Case:

- **Improved System Performance**: Most regions avoided loss of load events. PJM, SPP, and SERC still experienced shortfalls.
- **Regional Failures**:

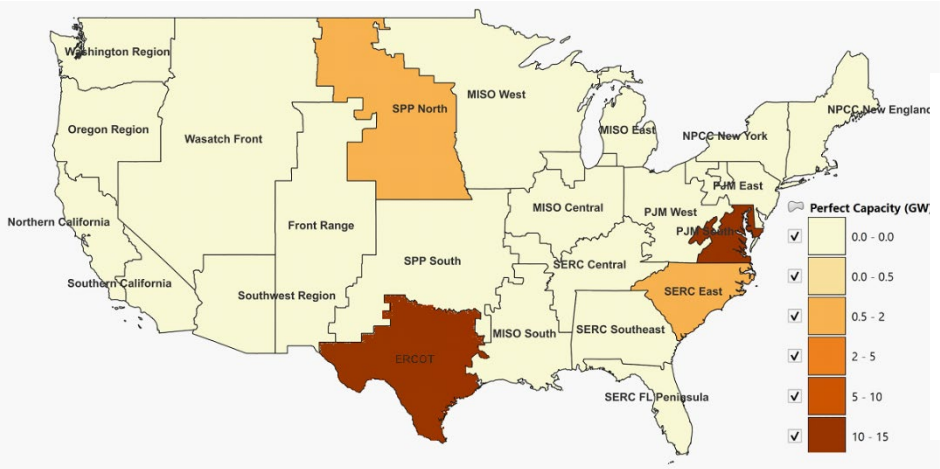
- **PJM**: 214 hours/year average, 0.066% normalized unserved energy, 644 hours in worst year, max 36% of load lost.
- **SPP**: 48 hours/year average, 0.008% normalized unserved energy, max 19% load lost.
- **ERCOT**: 20 average hours, 0.028% normalized unserved energy, 101 max hours/year, peak shortfall of 27%.
- **SERC-East**: Generally adequate (avg. 1 hour/year, 0.0003% NUSE), but Elliot storm in 2022 caused 42 hours of shortfall.

The overall takeaway is that avoiding announced retirements improves grid reliability, but shortfalls persist in PJM, SPP, ERCOT, and SERC, particularly in winter.

Required Build

This required build analysis quantifies "hypothetical capacity," defined as power that is 100% reliable and available that is needed to resolve the shortfalls. Known in industry as “perfect capacity,” this metric is utilized to avoid the complex decision of selecting specific generation technologies, as that is ultimately an optimization of reliability against cost considerations. Nevertheless, it serves as a valuable indicator, illustrating either the magnitude of a resource gap or the scale of large load that will be unable to interconnect. For the Required Build case, this hypothetical capacity was calculated by adding new generating resources to each region until a target of 0.002% of NUSE is reached.

The table below shows the tuned perfect capacity results. For the current system, this analysis identifies an additional 2.4 MW of capacity to meet the NUSE target for PJM, which experiences shortfalls due to the winter storm Elliot historical weather year. By 2030, without considering any generation retirements, an additional 12.5 GW of generating capacity is needed across PJM, SPP, and SERC to reduce shortfalls.



	2024-Current System (MW)	2030-No Plant Closures (MW)
PJM	2400	10,500
SERC-E		500
SPP-N		1,500
ERCOT	1600	10500
Total	4000	23000

Perfect Capacity/Additions

Figure 4. Tuned Perfect Capacity (MW) By Region

1 Modeling Methodology

The methodology uses a zonal PLEXOS[13] model with hourly time-synchronous datasets for load, generation, and interregional transfer for the 23 U.S. subregions (referred to as TPRs in this study)[14] including ERCOT (see Figure 5 below). While ERCOT operates outside of FERC's general jurisdiction,[15] it provides a valuable case for understanding broader reliability and resource adequacy challenges in the U.S. electric grid, and FPA Section 202(c) allows DOE to issue emergency orders to ERCOT.

We base this analysis on actual weather and power plant outage data from 2007 to 2023 using NERC's ITCS[16] base dataset. DOE specifically decided to start this analysis with the ITCS dataset since it is a complete representation of the interconnected electrical system for the lower 48 and it has been thoroughly reviewed by industry experts in a public and transparent process. DOE has in turn made modifications to the dataset to fit the needs of this study. The contents of this section focus on those modifications which DOE implemented for purposes of this study.

PLEXOS is an industry-trusted simulation tool used for energy optimization, resource adequacy, and production cost modeling. This study leverages PLEXOS' ability to exercise an hourly production cost model to determine the balance between loads, generation, and imports for each region. Modeling was carried out using a deterministic approach that evaluates whether a power system has sufficient resources to meet projected demand under a pre-defined set of conditions which correspond to the past few years of real-world events. The model ultimately determines the amount of unmet load if generation resources and imports are not sufficient for meeting the load in each discrete time period.

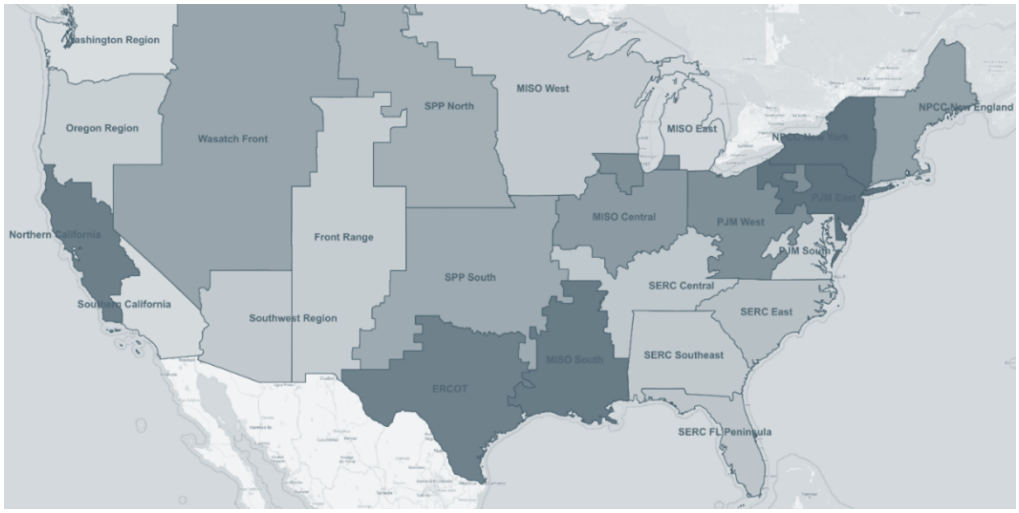


Figure 5. TPRs used in NERC ITCS

13. Energy Exemplar, "PLEXOS," https://www.energyexemplar.com/plexos.
14. The TPRs match the regional subdivisions in the NERC ITCS study, itself based on FERC's transmission planning regions.
15. Transmission within ERCOT is intrastate commerce. 16 U.S.C. § 824(b)(1) (provisions applying to "the transmission of electric energy in interstate commerce").
16. NERC "Integrated Transmission and Capacity System (ITCS)," accessed June 25, 2025, https://www.nerc.com/pa/RAPA/Pages/ITCS.aspx.

This methodology developed a current model and series of scenarios to explore how different assumptions impact resource adequacy. This sensitivity analysis includes assumptions regarding load growth, generation build-outs and retirements, and transfer capabilities. By comparing the results of the current model with the scenario results, we can assess how generation retirements and load growth affect future generation needs.

The assessment uses data from 2007–2013 (synthetic weather data) and 2019–2023 (historical data). A brief summary of the methodological assumptions is provided here, with additional details available in the relevant appendixes.

- **Solar and Wind Availability** – Created from historical output from EIA 930 data, with bias correction of any nonhistorical data to match regional capacity factors, as calibrated to EIA 930 data.[17] Synthetic years used 2018 technology characteristics from NREL based on the Variable Energy Potential (reV) model, then mapped to synthetic weather year data. See Appendix A for more details.

- **Thermal Availability** – Calculated according to NERC LTRA capacity data, adjusted for historical outages and derates, primarily with GADS data. GADS data does not capture historical outages caused by fuel supply interruptions.[18]

- **Hydroelectric Availability** – Historical outputs are processed by NERC to establish monthly power rating limits and energy budgets, but energy budgets are not enforced in alignment with how they were treated in the ITCS. The team evaluated performance under different energy budget restrictions, but did not find significant differences during peak hours, justifying NERC ITCS assumptions that hydroelectric resources could generally be dispatched to peak load conditions. Later work may benefit from exploring drought scenarios or combinations of weather and hydrological years, where energy budgets may be significantly decreased.

- **Outages and Derates** – Data for the actual data period (2019–2023) are based on historical forced outage rates and deratings. Outage and deratings data for the synthetic period (2007–2013) are based on the historical relationships observed between temperature and outages (see Appendix G of the NERC ITCS Final Report for more information).

- **Load Projections and AI Growth** – Load growth through 2030 is assumed to match NERC 2024 ITCS projections, scaling the 12 weather years to meet 2030 projections. Additional AI and data center load is then added according to reports from EPRI and S&P regarding potential futures.

- **Transfer Capabilities and Imports/Exports -** Each subregion is treated as a “copper plate,” with the transfer capacity between each subregion defined by the availability of transmission pathways. It is an approximation that assumes all resources are connected to a single point, simplifying the transmission system within the model. Subregions are generally assumed to exhaust their own capacity before utilizing capacity available from their neighbors. Once the net remaining capacity is at or below 10 percent of load, the subregion begins to use capacity from a neighbor.

17. See ITCS Final Report, Appendix F, for the method that was implemented to scale synthetic weather years 2007–2013.
18. See ITCS Final Report, Appendix G, for outage and derate methods.

  - Imports are assumed to be available up to the minimum total transfer capacity and spare generation in the neighboring subregion.

  - To the extent the remaining capacity after transmission and demand response falls below the 6 percent or 3 percent needed for error forecasting and ancillary services, depending on the scenario, the model projects an energy shortfall. See "Outputs" in the appendix for more details.

  - To ensure that transfers are dispatched only after local resources are exhausted, a wheeling charge of $1,000 is applied for every megawatt-hour of energy transferred between regions through transmission pathways.

- **Storage** – In alignment with the NERC ITCS methodology, storage was split into pumped hydro and battery storage. Pumped hydro was assumed to have 12 hours duration at rated capacity with 30% round-trip losses, while battery storage was assumed to have four hours and 13% round-trip losses. Storage is dispatched as an optimization to minimize USE and demand response usage under various constraints and is recharged during periods of surplus energy.
- **Demand Response –** Demand Response (DR) is treated as a supply-side resource and dynamically scheduled after all other regional resources and imports are exhausted. It is modeled with both capacity (MW) and energy (MWh) limitations and assumed to have three hours of availability at capacity but could be spread across more than three hours up to the energy limit. DR capacity was based on LTRA Form A data submissions for "Controllable and Dispatchable Demand Response – Available", or firm, controllable DR capacity.
- **Retirements** – Retirements as per the NERC LTRA 2024 model. To disaggregate generation capacity from the NERC assessment areas to the ITCS regions, EIA 860 plant level data are used to tabulate generation retirement or addition capacity for each ITCS region and NERC assessment area. Disaggregation fractions are then calculated by technology based on planned retirements through 2030. See Appendix B for further information. Retirements are categorized into two categories:

  1. *Announced Retirements*: Includes both confirmed retirements and announced retirements. Confirmed retirements are generators formally recognized by system operators as having started the official retirement process and are assumed to retire on their expected date. To go from LTRA regions to ITCS regions, weighting factors are derived in the same way as in the generation set, based on EIA retirement data. In addition to confirmed retirements, announced retirements are generators that have publicly stated retirement plans that have not formally notified system operators and initiated the retirement process. This disaggregation method for announced retirements mirrors used for confirmed retirements.[19]

  2. *None*: Removes all retirements (after 2024) for comparison. Delaying or canceling some near-term retirements may not be feasible, but this case can help determine how much retirement contributes to some of the adequacy challenges in some regions.

- **Additions** – Assumes only projects that are very mature in the pipeline (such as those with a signed interconnection agreement) will be built. This data is based on projects

19. If announced retirements were less than or equal to confirmed retirements, the model adjusted the announced retirement to equal confirmed.

designated as Tier 1 in the NERC 2024 LTRA and are mapped to ITCS regions with EIA 860-derived weighting factors similar to those described for the retirements above. See Appendix A for further information.

- **Perfect Capacity Required** - Estimates perfect capacity (which is idealized capacity that has no outages or profile and is described in Section 2) until we reach a pre-defined reliability target. We used a metric of NUSE given the deterministic nature of the model, to be consistent with evolving metrics, and to be consistent with NERC's recent LTRAs. We targeted NUSE of below 0.002% for each region.

1.1 Modeling Resource Adequacy

This model calculates several reliability metrics to assess resource adequacy. These metrics were calculated using PLEXOS simulation outputs, which report the USE (in MWh) for all 8,760 hourly periods in each of the 12 weather years:

- **USE** refers to the amount of electricity demand that could not be met due to insufficient generation and/or transmission capacity. Several USE-derived indicators were considered:
    - *Normalized USE (percentage %):* The total amount of unserved load over 12 years of weather data, normalized by dividing by total load, and reported as a percentage.[20]
    - *Mean Annual USE (GWh)*: The 12-year average of each region's total USE in each weather year. This mean value represents the average annual USE across weather variability.
    - *Mean Max Unserved Power (GW)*: The 12-year average of each region's maximum USE value in each weather year. This mean value characterizes the typical non-coincident peak stress on system reliability.
    - *% Max Unserved Power*: The Mean Max Unserved Power expressed as a percentage of the average native load during those peak unserved hours for each region. This percentage value provides a normalized measure of the severity of peak unserved events relative to demand.
    - *Total number of customers without power*. The Mean Max Unserved Power expressed as the equivalent number of typical U.S. persons assuming a ratio of 17,625 persons/MW lost. This estimation contextualizes the effects of the outage on average Americans.
- **Loss of Load Hours (LOLH)** refers to the number of hours during which the system experiences USE (i.e., any hour with non-zero USE). Two LOLH-based indicators were considered:

20. NUSE can be reported as parts per million or as a percentage (or parts per hundred); though for power system reliability, this would include several zeros after the decimal point.

- *Mean Annual LOLH*: for each weather year and *TPR*, we count the total number of hours with USE across all 8,760 hours, and we then take the average of those 12 totals. *Annual LOLH Distribution* is represented in box and whisker plots for 12 samples, each sample corresponding to a unique weather year.

- *Max Consecutive LOLH (hours)*[21]: The longest continuous period with reported USE in each weather year.

It should be noted that USE is not an indication that reliability coordinators would allow this level of load growth to jeopardize the reliability of the system. Rather, it represents the unrealizable AI and data center load growth under the given assumptions for generator build outs by 2030, generator retirements by 2030, reserve requirements, and potential load growth. These numbers are used as indicators to determine where it may be beneficial to encourage increased generation and transmission capacity to meet an expected need.

This study does not employ common probabilistic industry metrics such as EUE or LOLE due to their reliance on probabilistic modeling. Instead, deterministic equivalents are used.

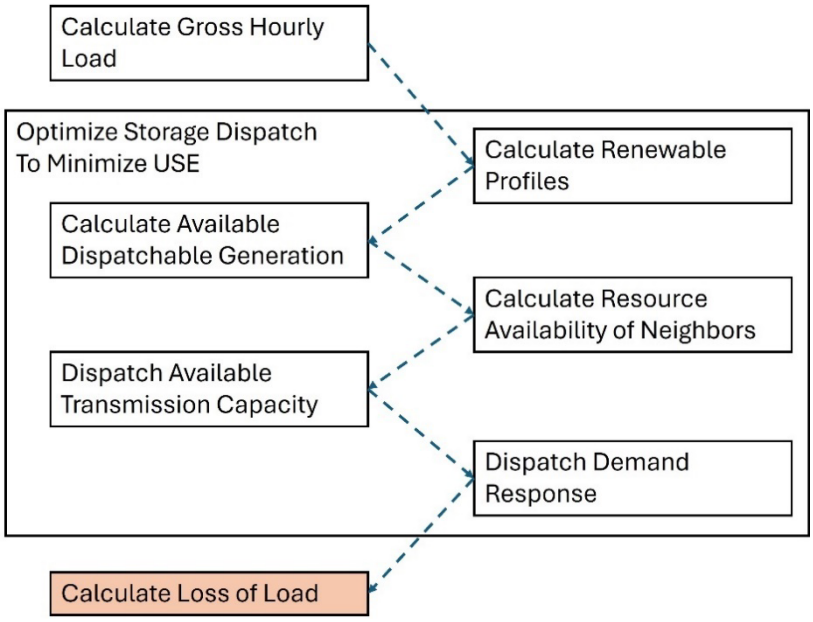


Figure 6. Simplified Overview of Model

21. One caveat on the maximum consecutive LOLH and max USE values is in how storage is dispatched in the model. Storage is dispatched to minimize the overall USE and is indifferent to the peak depth or the duration of the event. This may construe some of the max USE and max consecutive LOLH values to be higher than if storage was dispatched to minimize these values.

1.2 Planning Years and Weather Years

For the planning year (2030), historical weather year data are applied based on conditions between 2007 and 2024 to calculate load, wind and solar generation, and hydro generation. Dispatchable capacity (including dispatchable hydro capacity) is calculated through adjustment of the 2024 LTRA capacity data for historical outages from GADS data. Storage assets are scheduled to arbitrage hourly energy margins or else charge during periods of high energy margins (surplus resources) and discharge during periods of lower energy margins.

1.3 Load Modeling

Data Center Growth

Several utilities and financial and industry analysts identify data centers, particularly those supporting AI workloads, as a key driver of electricity demand growth. Multiple organizations have developed a wide range of projections for U.S. data center electricity use through 2030 and beyond, each using distinct methodologies tailored to their institutional expertise.

These datasets were used to explore reasonable boundaries for what different parts of the economy envision for the future state of AI and data center (AI/DC) load growth. For the purposes of this study, rather than focusing on any specific analysis, a more generic sweep was performed across AI/DC load growth and the various sensitivities that fit within those assumptions, as summarized below:

- McKinsey & Company projects ~10% annual growth in U.S. data center electricity demand, reaching 2,445 TWh by 2050. Their model blends internal scenarios with public signals, including announced projects, capital investment, server shipments, and chip-level power trends, supported by third-party market data.

- Lawrence Berkeley National Laboratory (LBNL) uses a bottom-up approach based on historical and projected IT equipment shipments, paired with assumptions on power draw, utilization, and infrastructure efficiency (PUE, WUE). Their projections through 2028 account for AI hardware adoption, operational shifts, and evolving cooling technologies.

- EPRI combines public data, expert input, and historical trends to define four national growth scenarios, low to higher, for 2023–2030, reflecting data processing demand, efficiency improvements, and AI-driven load impacts.

- S&P Global merges technology and power-sector models, evaluating grid readiness and facility growth under varying demand scenarios. Their forecasts consider AI adoption, efficiency trends, grid and permitting constraints, on-site generation, and offshoring risk, resulting in a wide range of outcomes.

These projections show wide variation, with 2030 electricity demand ranging from approximately 35 GW to 108 GW of average load. Given this uncertainty, including differences in hardware intensity, thermal management, siting assumptions, and behind-the-meter generation, the modeling team adopted a national midpoint assumption of approximately 50 GW by 2030.

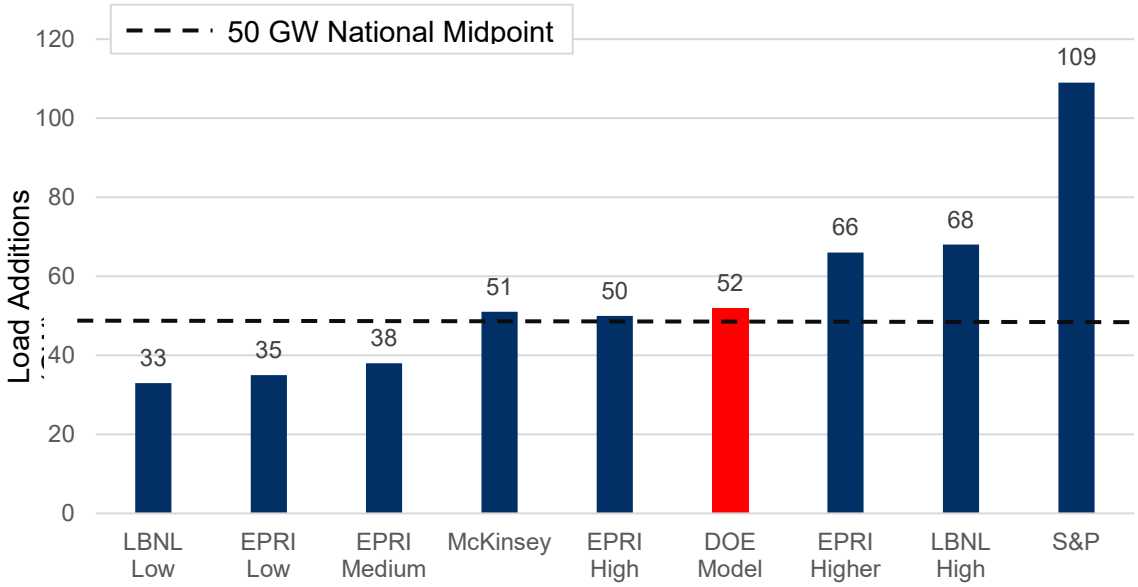


Figure 7. 2024 to 2030 Projected Data Center Load Additions

Figure 2 above displays a benchmark reflecting the median across major studies and aligns with central projections from EPRI and LBNL. Using a single planning midpoint avoids double counting and enables consistent load allocation across national transmission and resource adequacy models.

Data Center Allocation Method

To allocate the 50 GW midpoint regionally, the team used state-level growth ratios from S&P's forecast. These ratios reflect factors such as infrastructure, siting trends, and projected market activity. The modeling team mapped the state-level projections to NERC TPRs, ensuring transparent and repeatable regional allocation. While other methods exist, this approach ensured consistency with the broader modeling framework.

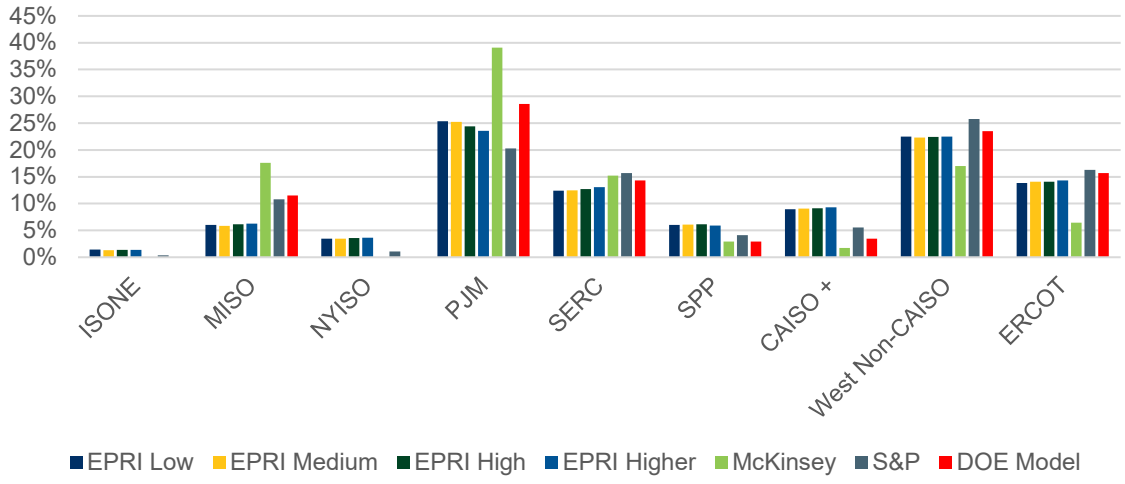


Figure 8. New Data Center Build (% Split by ISO/RTO) (2030 Estimated)

Non-Data Center Load Modeling

The current electricity demand projections were built from NERC data, using historical load (2019–2023) and simulated weather years (2007–2013). These were adjusted based on the EIA's 2022 energy forecast. To estimate 2030 demand, the team interpolated between 2024 and 2033, scaling loads to reflect energy use and seasonal peaks. NERC provided datasets to address anomalies and include behind-the-meter and USE.

Given the rapid emergence of AI/DC loads, additional steps were taken to account for this category of demand. It is difficult to determine how much AI/DC load is already embedded in NERC LTRA forecast, for example, the 2024 LTRA saw more than 50GW increase from 2023, signaling a major shift in utility expectations. To benchmark existing AI/DC contribution, DOE assumed base 2023 AI/DC load equaled the EPRI low-growth case of 166 TWh.

Overall Impact on Projected Peak Load

As a result of the methods applied above, the average year co-incident peak load is projected to grow from a current average peak of 774 GW to 889 GW in 2030. This represents a 15% increase or 2.3% growth rate per year. Excluding the impact of data centers, this would amount to a 51GW increase from 774 GW to 826 GW which represents a 1.1% annual growth rate.

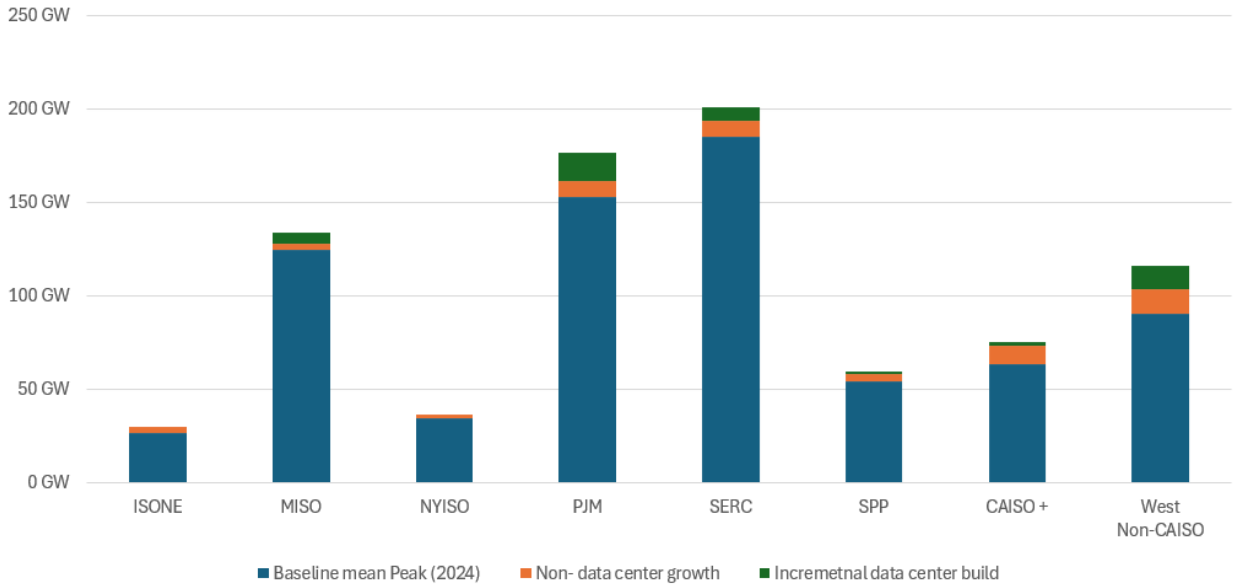


Figure 9. Mean Peak Load by RTO (Current Case vs 2030 Case)

1.4 Transfer Capabilities and Import Export Modeling

The methodology assumes electricity moves between subregions, when conditions start to tighten. Each region has a certain amount of capacity available, and the methodology determines if there is enough to meet the demand. When regions reach a “Tight Margin Level” of 10% of capacity, i.e., if a region’s available capacity is less than 110% of load, it will start transferring from other regions if capacity is available. A scarcity factor is used to determine which regions to transfer from and at what fraction – those with a greater amount of reserve capacity will transfer more. A region is only allowed to export above when it is above the Tight Margin Level.

Total Transfer Capability (TTC) was used and is the sum of the Base Transfer Level and the First Contingency Incremental Transfer Capability. These were derived from scheduled interchange tables or approximated from actual line flows. It should be noted that the TTC does not represent a single line, but rather multiple connections between regions. It is similar to path limits used by many entities but may have different values.

Due to data and privacy limitations, the Canadian power system was not modeled directly as a combination of generation capacity and demand. Instead, actual hourly imports were used from nearly 20 years of historical data, along with recent trends (generally less transfers available during peak hours), to develop daily limits on transfer capabilities. See Appendix B for more details on Canadian transfer limits.

1.5 Perfect Capacity Additions

To understand how much capacity may need to be added to reach approximate reliability targets, we tuned two scenarios by adding hypothetical perfect capacity to reach the reliability threshold based on NUSE.[22] Today, NERC uses a threshold of 0.002% to indicate regions are at high risk of resource adequacy shortfalls. In addition, several system operators, including the Australia Energy Market Operator and Alberta Electric System Operator, are using NUSE thresholds in the range of 0.001% to 0.003%. Several U.S. entities are considering lower thresholds for U.S. power systems in the range of 0.0001% to 0.0002%. [23]

For this analysis, we target NUSE below 0.002% for each region to align with NERC definitions. We iteratively ran the model, hand-tuning the "perfect capacity" to be as small as possible while reaching NUSE values below 0.002% in all regions.[24] As the work was done by hand with a limited number of iterations (15), this should not be considered the minimum possible capacity to accomplish these targets. Further, because the perfect capacity can be located in various places, there would be multiple potential solutions to the problem. These scenarios represent the approximate quantity of perfect capacity each region would require (beyond announced retirements and mature generation additions only) that would lead to Medium or Low risk based on the NERC metrics for USE.

Due to some regions with zero USE, the tuned cases do not reach the same level of adequacy, where the national average is 0.00045% vs. 0.00013%. Due to transmission and siting selection of perfect capacity, there could be many solutions.

22. We are not using the standard term "expected unserved energy" because we are not running a probabilistic model, so we do not have the full understanding of long-term expectations

23. MISO, "Resource Adequacy Metrics and Criteria Roadmap," December 2024. https://cdn.misoenergy.org/Resource%20Adequacy%20Metrics%20and%20Criteria%20Roadmap667168.pdf.

24. NERC, "Evolving Criteria for a Sustainable Power Grid," July 2024. https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Evolving_Planning_Criteria_for_a_Sustainable_Power_Grid.pdf.

2 Regional Analysis

This section presents more regional details on resource adequacy according to this analysis. For each of the nine Regional Transmission Organizations (RTOs) and sub-regions, comprehensive summaries are provided of reliability metrics, load assumptions, and composition of generation stacks.

2.1 MISO[25]

In the current system model and the No Plant Closures cases, MISO did not experience shortfall events. MISO's minimum spare capacity in the tightest year was negative, showing that adequacy was achieved by importing power from neighbors. In the Plant Closures case, MISO experienced significant shortfalls, with key reliability metrics exceeding each of the threshold criteria defined for the study.

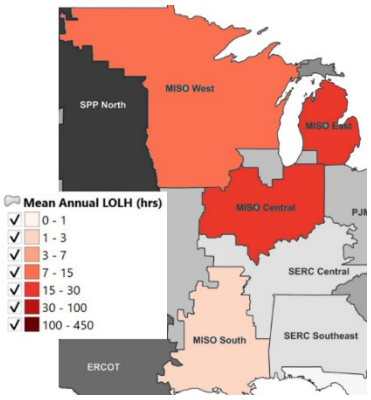


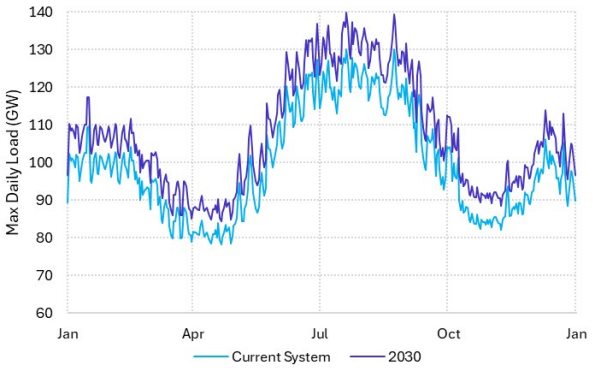
Table 2. Summary of MISO Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	-	37.8	-	-
Normalized Unserved Energy (%)	-	0.0211	-	-
Unserved Load (MWh)	-	157,599	-	-
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	-	124	-	-
Normalized Unserved Load (%)	-	0.0702	-	-
Unserved Load (MWh)	-	524,180	-	-

Load Assumptions

MISO's peak load was roughly 130 GW in the current model and projected to increase to roughly 140 GW by 2030. Approximately 6 GW of this relates to new data centers being installed (12% of U.S. total).

25. Following the initial data collection for this report, MISO issued its 2025 Summer Reliability Assessment. Based on that report, NERC revised evaluations from its 2024 LTRA and reclassified the MISO footprint from being an 'elevated risk' to 'high risk' in the 2028–2031 timeframe, depending on new resource additions/retirements. While DOE's analysis is based on the previously reported figures, DOE is committed to assessing the implications of updated data on overall resource adequacy and providing technical updates on findings, as appropriate.



Subregion	2024	2030
MISO-W	37,913	40,981
MISO-C	35,387	39,243
MISO-S	36,476	38,596
MISO-E	23,167	23,758
Total	**130,136**	**139,846**

Figure 10. MISO Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 207 GW.[26] In 2030, 21 GW of new capacity was added leading to 228 GW of capacity in the No Plant Closures case. In the Plant Closures case, 32 GW of capacity was retired such that net retirements in the Plant Closures case were -11 GW, or 196 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
MISO-W	71,612	67,453	77,605
MISO-C	51,982	47,735	58,823
MISO-S	54,511	52,756	59,710
MISO-E	29,213	28,105	32,255
Total	**207,319**	**196,049**	**228,393**

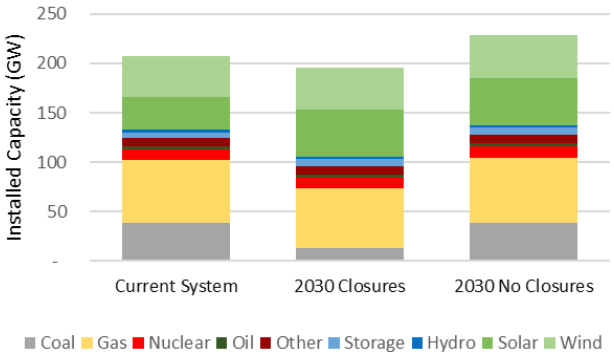


Figure 11. MISO Generation Capacity by Technology and Scenario

MISO's generation mix was comprised primarily of natural gas, coal, wind, and solar. In 2024, natural gas comprised 31% of nameplate, wind comprised 20%, coal 18%, and solar 14%. In 2030, most retirements come from coal and natural gas while additions occur for solar, batteries, and wind. In addition, the model assumed 3 GW of rooftop solar and 8 GW of demand response.

26. The total installed capacity numbers reported in this regional analysis section do not reflect the generating capability of all resources during stress conditions.

Table 3. Nameplate Capacity by MISO Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**37,914**	**64,194**	**11,127**	**2,867**	**8,717**	**5,427**	**2,533**	**32,826**	**41,715**	**207,319**
MISO-W	12,651	13,608	2,753	1,491	2,613	200	777	8,109	29,411	**71,612**
MISO-C	15,050	10,307	2,169	494	2,211	1,272	769	12,361	7,350	**51,982**
MISO-S	5,493	31,052	5,100	589	2,469	54	845	8,315	596	**54,511**
MISO-E	4,720	9,227	1,105	292	1,424	3,901	143	4,042	4,359	**29,213**
Additions	**0**	**2,535**	**0**	**330**	**0**	**1,929**	**0**	**14,354**	**1,926**	**21,074**
MISO-W	0	537	0	172	0	374	0	3,552	1,358	**5,993**
MISO-C	0	407	0	57	0	934	0	5,103	339	**6,841**
MISO-S	0	1,226	0	68	0	9	0	3,868	27	**5,199**
MISO-E	0	364	0	34	0	611	0	1,831	201	**3,042**
Closures	**(24,913)**	**(6,597)**	**0**	**(324)**	**(140)**	**(16)**	**(83)**	**0**	**(272)**	**(32,345)**
MISO-W	(8,313)	(1,398)	0	(168)	(56)	0	(25)	0	(192)	**(10,152)**
MISO-C	(9,889)	(1,059)	0	(56)	(7)	(3)	(25)	0	(48)	**(11,088)**
MISO-S	(3,609)	(3,191)	0	(67)	(55)	(0)	(28)	0	(4)	**(6,954)**
MISO-E	(3,102)	(948)	0	(33)	(21)	(13)	(5)	0	(28)	**(4,150)**

2.2 ISO-NE

In the current system model and the No Plant Closures case, ISO-NE did not experience shortfall events. The region maintained adequacy throughout the study period through reliance on imports. In the Plant Closures case, ISO-NE still did not exceed any key reliability thresholds, despite moderate retirements. This finding is partly due to the absence of additional AI or data center load growth modeled in the region. Accordingly, no additional perfect capacity was deemed necessary by 2030 to meet the study's reliability standards.

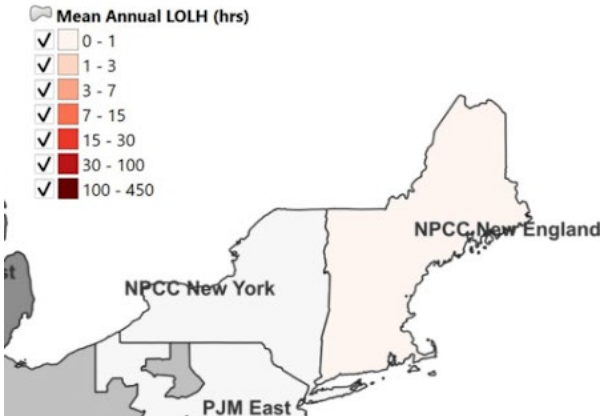
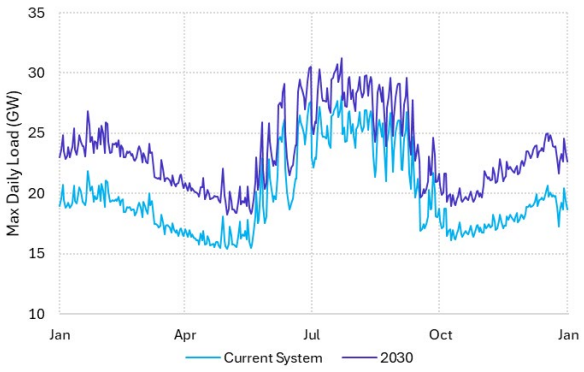


Table 4. Summary of ISO-NE Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	-	-	-	-
Normalized Unserved Energy (%)	-	-	-	-
Unserved Load (MWh)	-	-	-	-
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	-	-	-	-
Normalized Unserved Load (%)	-	-	-	-
Unserved Load (MWh)	-	-	-	-
Max Unserved Load (MW)	-	-	-	-

Load Assumptions

ISO-NE's peak load was roughly 28 GW in the current model and projected to increase to roughly 31 GW by 2030. No additional AI/DCs were projected to be installed.



Subregion	2024	2030
ISO-NE	28,128	31,261
Total	**28,128**	**31,261**

Figure 12. ISO-NE Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 40 GW. In 2030, 5.5 GW of new capacity was added leading to 45.5 GW of capacity in the No Plant Closures case. In the Plant Closures case, 2.7 GW of capacity was retired such that net generation change in the Plant Closures case was +11 GW, or 42.8 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
ISO-NE	39,979	42,845	45,534
Total	**39,979**	**42,845**	**45,534**

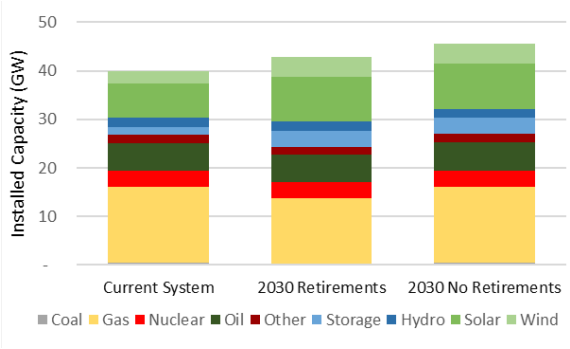


Figure 13. ISO-NE Generation Capacity by Technology and Scenario

ISO-NE's generation mix was comprised primarily of natural gas, solar, oil, and nuclear. In 2024, natural gas comprised 39% of nameplate, solar comprised 17%, oil 14%, and nuclear 8%. In 2030, most retirements come from coal and natural gas while additions occur for solar, storage, and wind. The model assumed nearly 2 GW of rooftop solar and 1.6 GW of energy storage.

Table 5. Nameplate Capacity by ISO-NE Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**541**	**15,494**	**3,331**	**5,710**	**1,712**	**1,628**	**1,911**	**7,099**	**2,553**	**39,979**
ISONE	541	15,494	3,331	5,710	1,712	1,628	1,911	7,099	2,553	**39,979**
Additions	**0**	**90**	**0**	**181**	**0**	**1,607**	**0**	**2,183**	**1,495**	**5,555**
ISONE	0	90	0	181	0	1,607	0	2,183	1,495	**5,555**
Closures	**(534)**	**(1,875)**	**0**	**(203)**	**(77)**	**0**	**0**	**0**	**0**	**(2,690)**
ISONE	(534)	(1,875)	0	(203)	(77)	0	0	0	0	**(2,690)**

2.3 NYISO

In both the current system model and the No Plant Closures case, NYISO maintained reliability and did not exceed any shortfall thresholds. Adequacy was preserved through reliance on imports. In the Plant Closures case, NYISO experienced shortfalls but average annual LOLH remaining well below the 2.4-hour threshold and NUSE under the 0.002% standard. The worst weather year produced only 6 hours of lost load and a peak unserved load of 914 MW. Given the modest impact of retirements and no additional AI/data center load modeled, the study concluded that NYISO would not require additional perfect capacity to remain reliable through 2030.

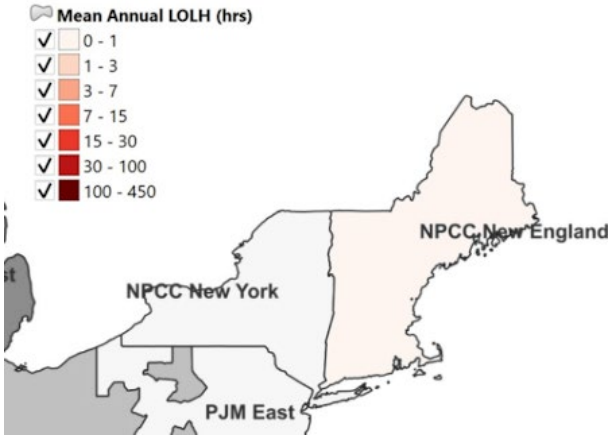
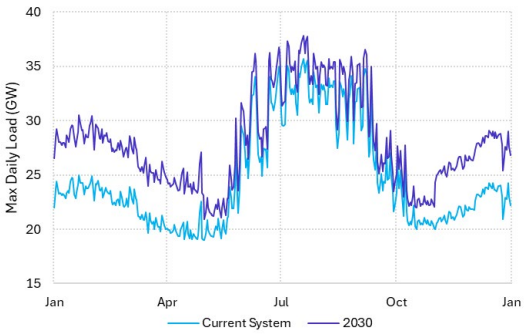


Table 6. Summary of NYISO Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	0.2	0.5	-	-
Normalized Unserved Energy (%)	0.00001	0.0001	-	-
Unserved Load (MWh)	18	209	-	-
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	2	6	-	-
Normalized Unserved Load (%)	0.0001	0.0013	-	-
Unserved Load (MWh)	216	2,505	-	-
Max Unserved Load (MW)	194	914	-	-

Load Assumptions

NYISO's peak load was roughly 36 GW in the current system model and projected to increase to roughly 38 GW by 2030. No additional AI/DCs were projected to be installed.



Subregion	2024	2030
NYISO	35,669	37,844
Total	**35,669**	**37,844**

Figure 14. NYISO Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 46 GW. In 2030, 5.5 GW of new capacity was added leading to 51 GW of capacity in the No Plant Closures case. In the Plant Closures case, 1 GW of capacity was retired such that net generation in the Plant Closures case was +4 GW, or 50 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
NYISO	45,924	50,396	51,444
Total	**45,924**	**50,396**	**51,444**

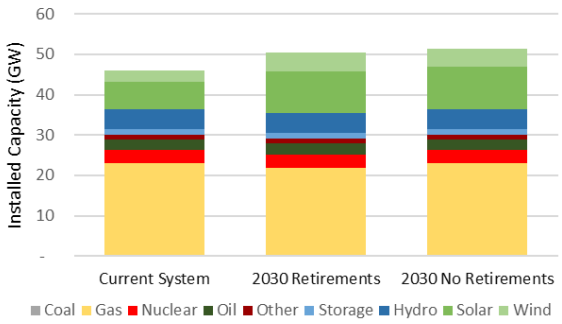


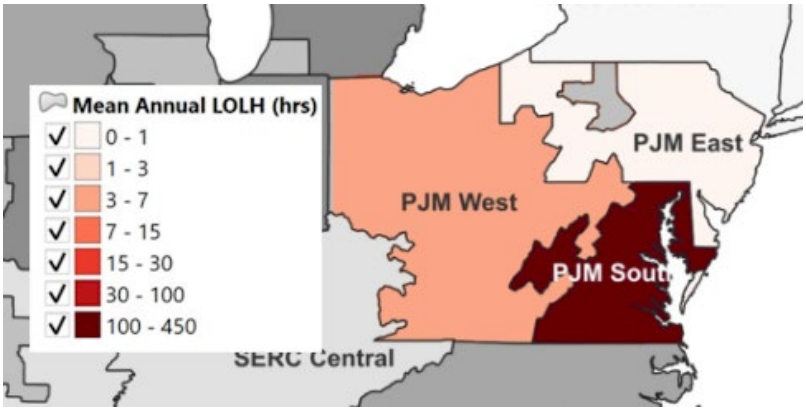
Figure 15. NYISO Generation Capacity by Technology and Scenario

NYISO's generation mix was comprised primarily of natural gas, solar, and hydro. In 2024, natural gas comprised 50% of total nameplate generation, solar comprised 14%, and hydro 11%. In 2030, most retirements come from natural gas while additions occur for solar and wind. The model assumed 6 GW of rooftop solar and nearly 1 GW of demand response.

Table 7. Nameplate Capacity by NYISO Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**0**	**22,937**	**3,330**	**2,631**	**1,194**	**1,460**	**4,915**	**6,749**	**2,706**	**45,924**
NYISO	0	22,937	3,330	2,631	1,194	1,460	4,915	6,749	2,706	**45,924**
Additions	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**3,604**	**1,902**	**5,521**
NYISO	0	0	0	15	0	0	0	3,604	1,902	**5,521**
Closures	**0**	**(1,030)**	**0**	**(19)**	**0**	**0**	**0**	**0**	**0**	**(1,049)**
NYISO	0	(1,030)	0	(19)	0	0	0	0	0	**(1,049)**

2.4 PJM



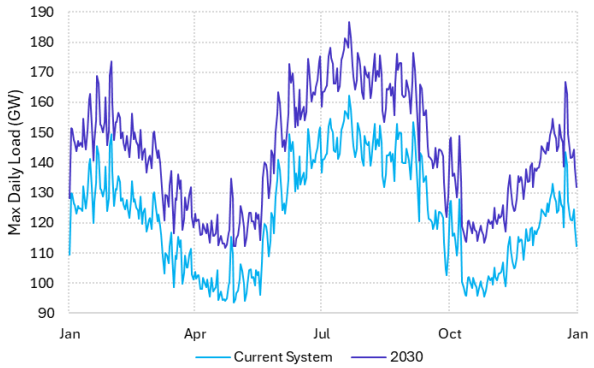
In the current system model, PJM experienced shortfalls, but they were below the required threshold. In the No Plant Closures case, shortfalls increased dramatically, with 214 average annual LOLH and peak unserved load reaching 17,620 MW, indicating growing strain even without retirements. In the Plant Closures case, reliability metrics worsened significantly, with annual LOLH surging to over 430 hours per year and NUSE reaching 0.1473%—over 70 times the accepted threshold. During the worst weather year, 1,052 hours of load were shed. To restore reliability, the study found that PJM would require 10,500 MW of additional perfect capacity by 2030.

Table 8. Summary of PJM Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	2.4	430.3	213.7	1.4
Normalized Unserved Energy (%)	0.0008	0.1473	0.0657	0.0003
Unserved Load (MWh)	6,891	1,453,513	647,893	2,536
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	29	1,052	644	17
Normalized Unserved Load (%)	0.0100	0.4580	0.2703	0.0031
Unserved Load (MWh)	82,687	1,453,513	647,893	2,536
Max Unserved Load (MW)	4,975	21,335	17,620	4,162

Load Assumptions

PJM's peak load was roughly 162 GW in the current system model and projected to increase to roughly 187 GW by 2030. Approximately 15 GW of this relates to new AI/DC being installed (29% of U.S. total), primarily in PJM-S.



Subregion	2024	2030
PJM-W	81,541	92,378
PJM-S	39,904	51,151
PJM-E	41,003	43,118
Total	**162,269**	**186,627**

Figure 16. PJM Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 215 GW. In 2030, 39 GW of new capacity was added leading to 254 GW of capacity in the No Plant Closures case. In the Plant Closures case, 17 GW of capacity was retired such that net generation in the Plant Closures case was +22 GW, or 237 GW of overall nameplate capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
PJM-W	114,467	123,100	135,810
PJM-S	39,951	48,850	50,667
PJM-E	60,221	64,848	67,027
Total	**214,638**	**236,798**	**253,504**

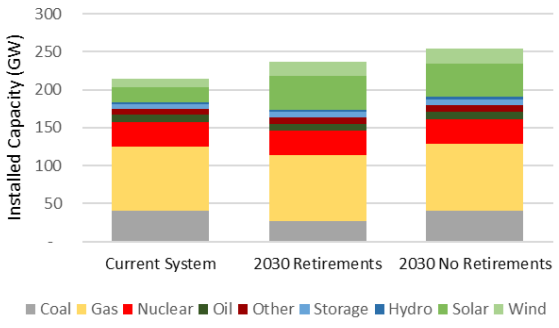


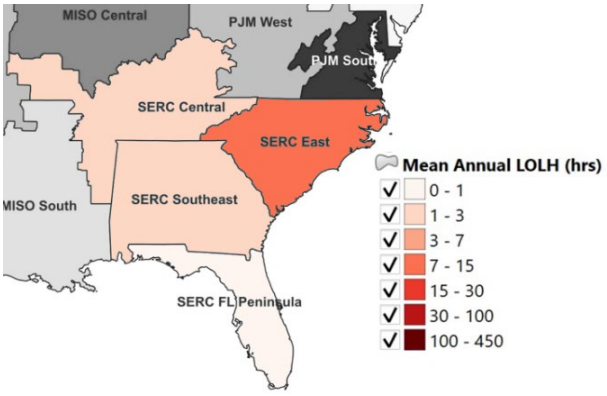
Figure 17. PJM Generation Capacity by Technology and Scenario

PJM's generation mix was comprised primarily of natural gas, coal, and nuclear. In 2024, natural gas comprised 39% of nameplate, coal comprised 19%, and nuclear 15%. In 2030, most retirements come from coal and some natural gas and oil while significant additions occur for solar plus lesser additions of wind, storage, and natural gas. The model assumed 9 GW of rooftop solar and 7 GW of demand response.

Table 9. Nameplate Capacity by PJM Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**39,915**	**84,381**	**32,535**	**9,875**	**8,248**	**5,400**	**3,071**	**19,495**	**11,718**	**214,638**
PJM-W	34,917	39,056	16,557	1,933	3,926	383	1,252	6,379	10,065	**114,467**
PJM-S	2,391	15,038	5,288	3,985	2,303	3,085	1,070	6,430	360	**39,951**
PJM-E	2,608	30,287	10,690	3,956	2,019	1,932	749	6,686	1,294	**60,221**
Additions	**0**	**4,499**	**0**	**32**	**317**	**1,938**	**0**	**24,991**	**7,089**	**38,866**
PJM-W	0	2,082	0	6	135	855	0	12,176	6,089	**21,343**
PJM-S	0	802	0	13	102	726	0	8,856	218	**10,717**
PJM-E	0	1,615	0	13	81	357	0	3,958	783	**6,806**
Closures	**(13,253)**	**(1,652)**	**0**	**(1,790)**	**(11)**	**0**	**0**	**0**	**0**	**(16,706)**
PJM-W	(11,593)	(765)	0	(350)	(1)	0	0	0	0	**(12,710)**
PJM-S	(794)	(294)	0	(722)	(6)	0	0	0	0	**(1,817)**
PJM-E	(866)	(593)	0	(717)	(3)	0	0	0	0	**(2,179)**

2.5 SERC



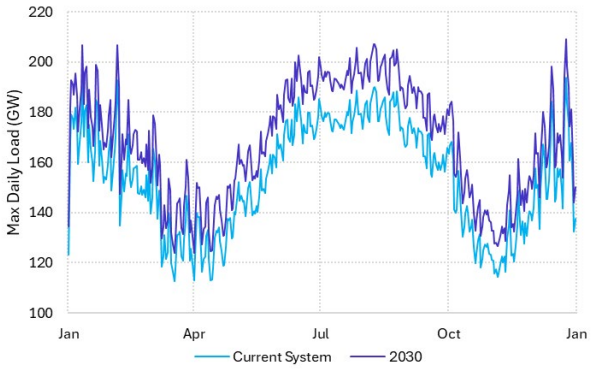
In the current system model and the No Plant Closures case, SERC maintained overall adequacy, though some subregions—particularly SERC-East—faced emerging winter reliability risks. In the Plant Closures case, shortfalls became more severe, with SERC-East experiencing increased unserved energy and loss of load hours during extreme cold events, including 42 hours of outages in a single winter storm. The analysis identified that planned retirements, combined with rising winter load from electrification, would stress the system. To restore reliability in SERC-East, the study found that 500 MW of additional perfect capacity would be needed by 2030. Other SERC subregions performed adequately, but continued monitoring is warranted due to shifting seasonal peaks and fuel supply vulnerabilities.

Table 10. Summary of SERC Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	0.3	8.1	1.2	0.8
Normalized Unserved Energy (%)	0.0001	0.0041	0.0004	0.0002
Unserved Load (MWh)	489	44,514	3,748	2,373
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	4	42	14	10
Normalized Unserved Load (%)	0.0006	0.0428	0.0042	0.0026
Unserved Load (MWh)	5,683	465,392	44,977	2,373
Max Unserved Load (MW)	2,373	19,381	6,359	5,859

Load Assumptions

SERC's peak load was roughly 193 GW in the current system model and projected to increase to roughly 209 GW by 2030. Approximately 7.5 GW of this relates to new AI/DCs being installed (14% of U.S. total).



Subregion	2024	2030
SERC-C	50,787	52,153
SERC-SE	48,235	54,174
SERC-FL	58,882	62,572
SERC-E	51,693	56,313
Total	**193,654**	**209,269**

Figure 18. SERC Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 254 GW. In 2030, 26 GW of new capacity was added leading to 279 GW of capacity in the No Plant Closures case. In the Plant Closures case, 19 GW of capacity was retired such that net generation change in the Plant Closures case was +7 GW, or 260 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
SERC-C	53,978	54,014	59,660
SERC-SE	67,073	64,768	69,478
SERC-FL	72,714	83,127	86,173
SERC-E	59,914	58,513	63,973
Total	**253,680**	**260,423**	**279,285**

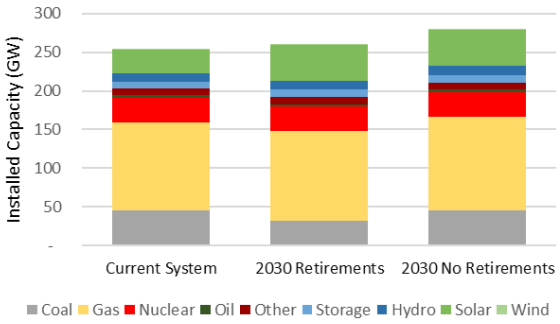


Figure 19. SERC Generation Capacity by Technology and Scenario

SERC's generation mix was comprised primarily of natural gas, coal, nuclear, and solar. In 2024, natural gas comprised 45% of nameplate, coal comprised 18%, nuclear 12%, and solar 11%. In 2030, most retirements come from coal and natural gas while additions occur for solar and some storage. The model assumed 3 GW of rooftop solar and 8 GW of demand response.

Table 11. Nameplate Capacity by SERC Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**45,747**	**113,334**	**31,702**	**4,063**	**8,779**	**7,469**	**11,425**	**30,180**	**982**	**253,680**
SERC-C	13,348	20,127	8,280	148	1,887	1,884	4,995	2,328	982	**53,978**
SERC-SE	13,275	29,866	8,018	915	2,493	1,662	3,260	7,584	0	**67,073**
SERC-FL	4,346	47,002	3,502	1,957	3,198	538	0	12,172	0	**72,714**
SERC-E	14,777	16,340	11,902	1,044	1,202	3,384	3,170	8,096	0	**59,914**
Additions	**0**	**6,898**	**0**	**0**	**381**	**2,254**	**0**	**16,073**	**0**	**25,606**
SERC-C	0	4,831	0	0	0	80	0	771	0	**5,682**
SERC-SE	0	906	0	0	19	0	0	3,135	0	**4,059**
SERC-FL	0	1,161	0	0	218	1,670	0	10,410	0	**13,459**
SERC-E	0	0	0	0	144	504	0	1,757	0	**2,405**
Closures	**(14,075)**	**(4,115)**	**0**	**(672)**	**0**	**0**	**0**	**0**	**0**	**(18,862)**
SERC-C	(4,465)	(1,181)	0	0	0	0	0	0	0	**(5,646)**
SERC-SE	(5,160)	(124)	0	(176)	0	0	0	0	0	**(5,460)**
SERC-FL	(1,495)	(1,071)	0	(480)	0	0	0	0	0	**(3,046)**
SERC-E	(2,955)	(1,739)	0	(16)	0	0	0	0	0	**(4,710)**

2.6 SPP

In the current system model, SPP experienced shortfalls, but they were below the required threshold. Adequacy was preserved through reliance on imports. In the No Plant Closures case, SPP experienced persistent reliability challenges, with average annual LOLH reaching approximately 48 hours per year and peak hourly shortfalls affecting up to 19% of demand. In the Plant Closures case, system conditions deteriorated further, with unserved energy and outage hours increasing substantially. These shortfalls were concentrated in the northern subregion, which lacks the firm generation and import capacity needed to meet peak winter demand. The analysis determined that 1,500 MW of additional perfect capacity would be needed in SPP by 2030 to restore reliability.

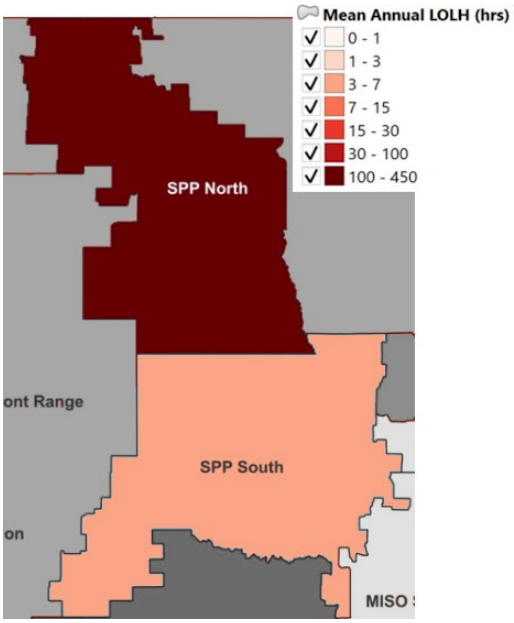
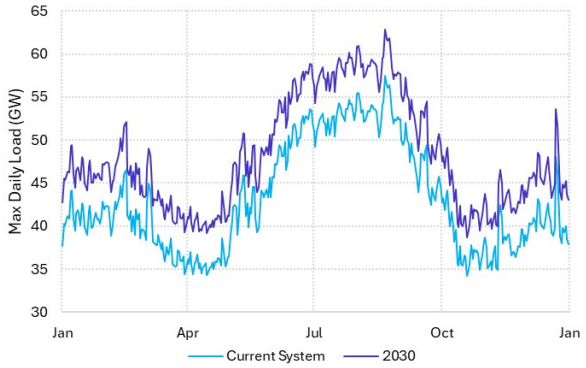


Table 12. Summary of SPP Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	1.7	379.6	47.8	2.4
Normalized Unserved Energy (%)	0.0002	0.0911	0.0081	0.0002
Unserved Load (MWh)	541	313,797	27,697	803
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	20	556	186	26
Normalized Unserved Load (%)	0.0022	0.2629	0.0475	0.0027
Unserved Load (MWh)	6,492	907,518	163,775	9,433
Max Unserved Load (MW)	606	13,263	2,432	762

Load Assumptions

SPP's peak load was roughly 57 GW in the current system model and projected to increase to roughly 63 GW by 2030. Approximately 1.5 GW of this relates to new AI/DCs being installed (3% of U.S. total).



Subregion	2024	2030
SPP-N	12,668	14,676
SPP-S	44,898	48,337
Total	**57,449**	**62,891**

Figure 20. SPP Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was 95 GW. In 2030, 15 GW of new capacity was added leading to 110 GW of capacity in the No Plant Closures case. In the Plant Closures case, 7 GW of capacity was retired such that net generation change in the 2030 Plant Closures case was +8 GW, or 103 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
SPP-N	20,065	20,679	22,385
SPP-S	75,078	82,451	88,064
Total	**95,142**	**103,130**	**110,449**

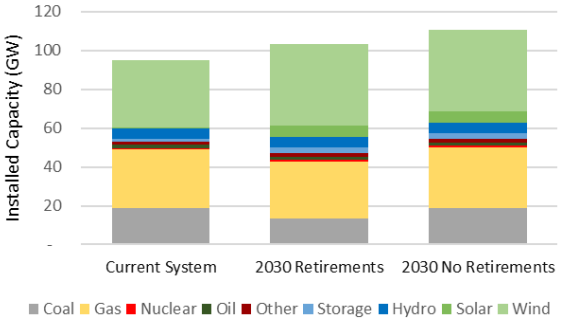


Figure 21. SPP Generation Capacity by Technology and Scenario

SPP's generation mix was comprised primarily of wind, natural gas, and coal. In 2024, wind comprised 36% of nameplate, natural gas comprised 32%, and coal 20%. In the 2030 case, most retirements come from coal and natural gas while additions occur for wind, solar, storage, and natural gas. The model assumed almost no rooftop solar and 1.3 GW of demand response.

Table 13. Nameplate Capacity by SPP Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**18,919**	**30,003**	**769**	**1,626**	**1,718**	**1,522**	**5,123**	**774**	**34,689**	**95,142**
SPP-N	5,089	3,467	304	504	519	8	3,041	91	7,041	**20,065**
SPP-S	13,829	26,536	465	1,121	1,199	1,514	2,082	683	27,649	**75,078**
Additions	**0**	**1,094**	**0**	**7**	**462**	**1,390**	**0**	**5,288**	**7,066**	**15,306**
SPP-N	0	126	0	2	114	11	0	633	1,434	**2,320**
SPP-S	0	968	0	5	348	1,379	0	4,655	5,632	**12,987**
Closures	**(5,530)**	**(1,732)**	**0**	**(56)**	**0**	**0**	**0**	**0**	**0**	**(7,318)**
SPP-N	(1,488)	(200)	0	(17)	0	0	0	0	0	**(1,705)**
SPP-S	(4,042)	(1,532)	0	(39)	0	0	0	0	0	**(5,613)**

2.7 CAISO+

In the current system and No Plant Closures cases, CAISO+ did not experience major reliability issues, though adequacy was often maintained through significant imports during tight conditions. In the Plant Closures case, however, the region faced substantial shortfalls, particularly during summer evening hours when solar output declines. Average LOLH reached 7 hours per year, and the worst-case year showed load shed events affecting up to 31% of demand. The NUSE exceeded reliability thresholds, signaling the system's vulnerability to high load and low renewable output periods.

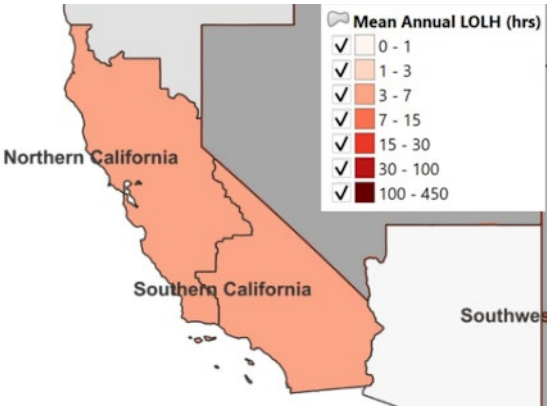
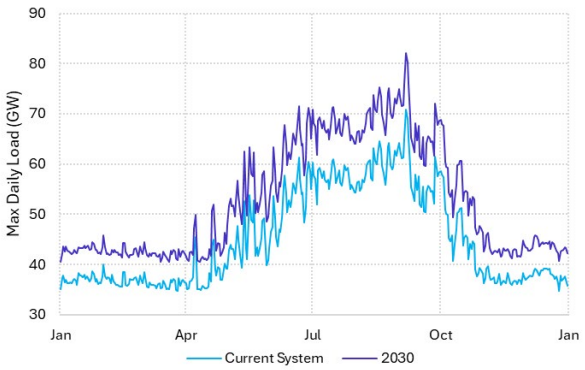


Table 14. Summary of CAISO+ Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	-	6.8	-	-
Normalized Unserved Energy (%)	-	0.0062	-	-
Unserved Load (MWh)	-	23,488	-	-
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	-	21	-	-
Normalized Unserved Load (%)	-	0.0195	-	-
Unserved Load (MWh)	-	73,462	-	-
Max Unserved Load (MW)	-	12,391	-	-

Load Assumptions

CAISO+'s peak load was roughly 79 GW in the current system model and projected to increase to roughly 82 GW by 2030. Approximately 2 GW of this relates to new AI/DCs being installed (4% of U.S. total).



Subregion	2024	2030
CALI-N	29,366	34,066
CALI-S	41,986	48,666
Total	**70,815**	**82,146**

Figure 22. CAISO+ Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was approximately 117 GW. In 2030, 14 GW of new capacity was added leading to 131 GW of capacity in the No Plant Closures case. In the Plant Closures case, 8 GW of capacity was retired such that net closures in the Plant Closures case were +6 GW, or 123 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
CALI-N	47,059	48,897	52,501
CALI-S	69,866	74,041	78,308
Total	**116,925**	**122,938**	**130,809**

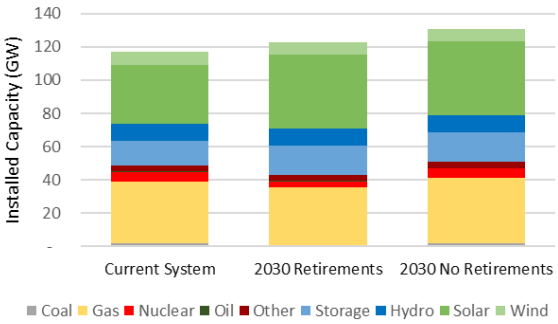


Figure 23. CAISO+ Generation Capacity by Technology and Scenario

CAISO+'s generation mix was comprised primarily of natural gas, solar, storage, and hydro. In 2024, natural gas comprised 32% of nameplate, solar comprised 31%, storage 13%, and hydro 9%. In 2030, most retirements come from coal, natural gas, and nuclear while additions occur for solar and storage. The model assumed 10 GW of rooftop solar and less than 1 GW of demand response.

Table 15. Nameplate Capacity by CAISO+ Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**1,816**	**37,434**	**5,582**	**185**	**3,594**	**14,670**	**10,211**	**35,661**	**7,773**	**116,925**
CALI-N	0	12,942	5,582	165	1,872	4,639	8,727	11,759	1,373	**47,059**
CALI-S	1,816	24,492	0	20	1,722	10,031	1,483	23,902	6,400	**69,866**
Additions	**0**	**2,126**	**0**	**0**	**92**	**3,161**	**0**	**8,507**	**0**	**13,885**
CALI-N	0	735	0	0	44	757	0	3,906	0	**5,442**
CALI-S	0	1,391	0	0	48	2,404	0	4,600	0	**8,442**
Closures	**(1,800)**	**(3,771)**	**(2,300)**	**0**	**0**	**0**	**0**	**0**	**0**	**(7,871)**
CALI-N	0	(1,304)	(2,300)	0	0	0	0	0	0	**(3,604)**
CALI-S	(1,800)	(2,467)	0	0	0	0	0	0	0	**(4,267)**

2.8 West Non-CAISO

In both the current system and No Plant Closures cases, the West Non-CAISO region maintained adequacy on average. In the Plant Closures case, the region's reliability declined, with annual LOLH increasing and peak shortfalls in the worst year affecting up to 20% of hourly load in some subregions. While overall NUSE normalized unserved energy remained just above the 0.002% threshold, specific areas, especially those with limited local resources and constrained transmission, exceeded acceptable risk levels. These reliability gaps were primarily driven by increasing reliance on variable energy resources without sufficient firm generation.

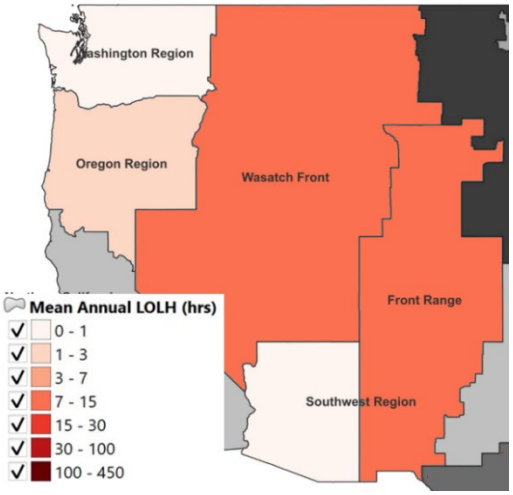
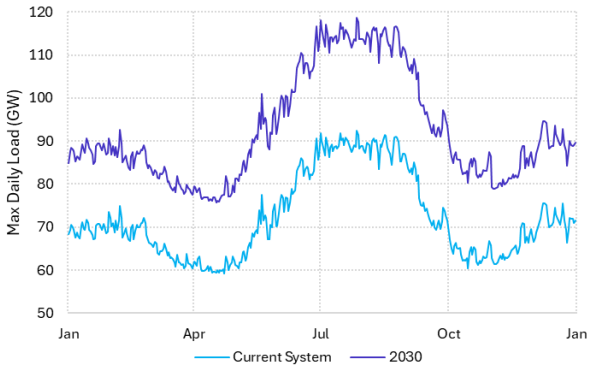


Table 16. Summary of West Non-CAISO Reliability Metrics

Reliability Metric	Current System	2030 Projection		
		Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	-	17.8	-	-
Normalized Unserved Energy (%)	-	0.0032	-	-
Unserved Load (MWh)	-	21,785	-	-
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	-	47	-	-
Normalized Unserved Load (%)	-	0.0098	-	-
Unserved Load (MWh)	-	66,248	-	-
Max Unserved Load (MW)	-	5,071	-	-

Load Assumptions

West Non-CAISO's peak load was roughly 92 GW in the current system model and projected to increase to roughly 119 GW by 2030. Approximately 12 GW of this relates to new AI/DCs being installed (24% of U.S. total).



Subregion	2024	2030
WASHINGTON	20,756	23,187
OREGON	11,337	16,080
SOUTHWEST	23,388	30,169
WASATCH	27,161	35,440
FRONT R	20,119	24,996
Total	**92,448**	**118,657**

Figure 24. West Non-CAISO Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was 178 GW. In 2030, 29 GW of new capacity was added leading to 207 GW of capacity in the No Plant Closures case. In the Plant Closures case, 13 GW of capacity was retired such that net generation change in the Plant Closures case was 16 GW, or 193 GW of overall installed capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
WASHINGTON	35,207	36,588	37,573
OREGON	19,068	21,689	22,081
SOUTHWEST	42,335	47,022	49,158
WASATCH	42,746	45,175	50,251
FRONT R	38,572	43,011	47,844
Total	**177,929**	**193,485**	**206,908**

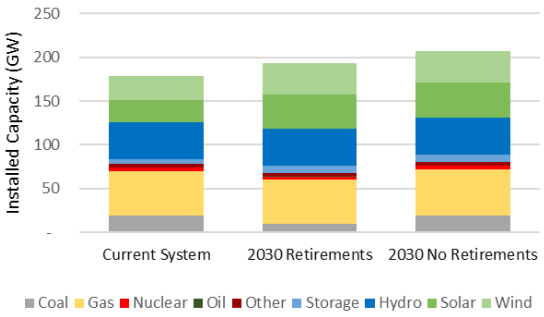


Figure 25. West Non-CAISO Generation Capacity by Technology and Scenario

West Non-CAISO's generation mix was comprised primarily of natural gas, hydro, wind, solar, and coal. In 2024, natural gas comprised 28% of nameplate, hydro comprised 24%, wind 15%, solar 13%, and coal 11%. In 2030, most retirements come from coal and natural gas while additions occur for solar, wind, storage, and natural gas. The model assumed 6 GW of rooftop solar and over 1 GW of demand response.

Table 17. Nameplate Capacity by West Non-CAISO Subregion and Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**19,850**	**49,969**	**3,820**	**644**	**4,114**	**5,104**	**42,476**	**24,652**	**27,298**	**177,929**
WASHINGTON	560	3,919	1,096	17	595	489	24,402	1,438	2,690	**35,207**
OREGON	0	3,915	0	6	456	482	8,253	2,517	3,440	**19,068**
SOUTHWEST	4,842	17,985	2,724	323	1,316	2,349	1,019	8,093	3,685	**42,335**
WASATCH	7,033	14,061	0	87	1,433	1,194	7,587	7,299	4,052	**42,746**
FRONT R	7,415	10,089	0	211	314	590	1,215	5,306	13,432	**38,572**
Additions	**0**	**2,320**	**0**	**1**	**8**	**2,932**	**0**	**14,759**	**8,959**	**28,979**
WASHINGTON	0	246	0	0	0	109	0	1,059	952	**2,366**
OREGON	0	246	0	0	0	150	0	1,399	1,218	**3,013**
SOUTHWEST	0	309	0	0	0	2,338	0	3,578	599	**6,823**
WASATCH	0	884	0	0	7	233	0	4,946	1,435	**7,505**
FRONT R	0	634	0	0	0	102	0	3,779	4,756	**9,271**
Closures	**(9,673)**	**(2,540)**	**0**	**(6)**	**(311)**	**(170)**	**(627)**	**0**	**(95)**	**(13,422)**
WASHINGTON	(317)	(195)	0	(0)	(66)	(28)	(369)	0	(11)	**(986)**
OREGON	0	(195)	0	(0)	(58)	0	(125)	0	(14)	**(392)**
SOUTHWEST	(1,185)	(951)	0	0	0	0	0	0	0	**(2,136)**
WASATCH	(3,978)	(699)	0	(2)	(178)	(89)	(115)	0	(16)	**(5,077)**
FRONT R	(4,194)	(501)	0	(4)	(8)	(53)	(18)	0	(54)	**(4,832)**

2.9 ERCOT

In the current system model, ERCOT exceeded reliability thresholds, with 3.8 annual Loss of Load Hours and a NUSE of 0.0032%, indicating stress even before future retirements and load growth. In the No Plant Closures case, conditions worsened as average LOLH rose to 20 hours per year and the worst-case year reached 101 hours, driven by data center growth and limited dispatchable additions. The Plant Closures case intensified these risks, with average annual LOLH rising to 45 hours per year and unserved load reaching 0.066%. Peak shortfalls reached 27% of demand, with outages concentrated in winter when generation is most vulnerable. To meet reliability targets, ERCOT would require 10,500 MW of additional perfect capacity by 2030.

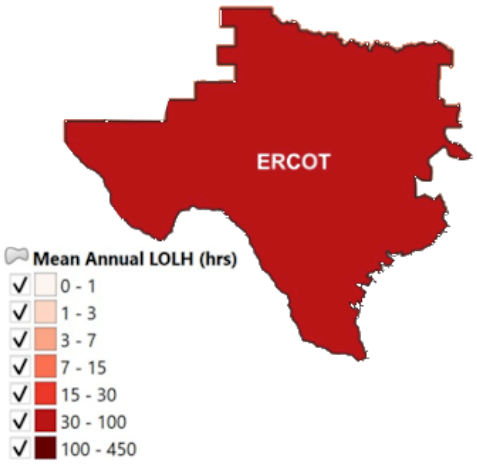
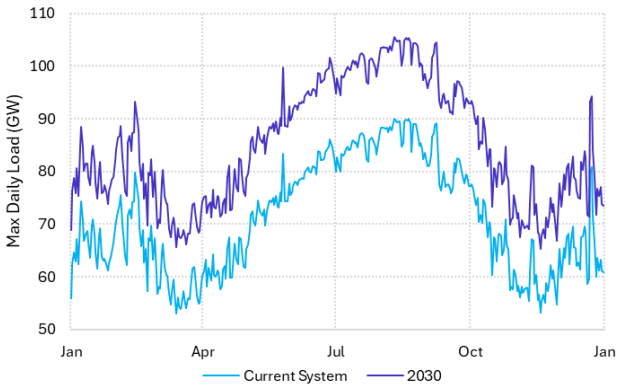


Table 18. Summary of ERCOT Reliability Metrics

Reliability Metric	2030 Projection			
	Current System	Plant Closures	No Plant Closures	Required Build
AVERAGE OVER 12 WEATHER YEARS				
Average Loss of Load Hours	3.8	45.0	20.3	1.0
Normalized Unserved Energy (%)	0.0032	0.0658	0.0284	0.0008
Unserved Load (MWh)	15,378	397,352	171,493	4,899
WORST WEATHER YEAR				
Max Loss of Load Hours in Single Year	30	149	101	12
Normalized Unserved Load (%)	0.0286	0.02895	0.01820	0.0098
Unserved Load (MWh)	136,309	1,741,003	1,093,560	58,787
Max Unserved Load (MW)	10,115	27,156	23,105	8,202

Load Assumptions

ERCOT's peak load was roughly 90 GW in the current system model and projected to increase to roughly 105 GW by 2030. Approximately 8 GW of this relates to new data centers being installed (62% of U.S. total).



Subregion	2024	2030
ERCOT	90,075	105,485
Total	**90,075**	**105,485**

Figure 26. ERCOT Max Daily Load in the Current System versus 2030

Generation Stack

Total installed generating capacity for 2024 was 157 GW. In 2030, 55 GW of new capacity was added leading to 213 GW of capacity in the No Plant Closures case. In the Plant Closures case, 4 GW of capacity was retired such that net generation change in the Plant Closures case was +51 GW, or 208 GW of overall nameplate capacity on the system.

Subregion	Current System	2030 Plant Closures	2030 No Plant Closures
ERCOT	157,490	208,894	212,916
Total	**157,490**	**208,894**	**212,916**

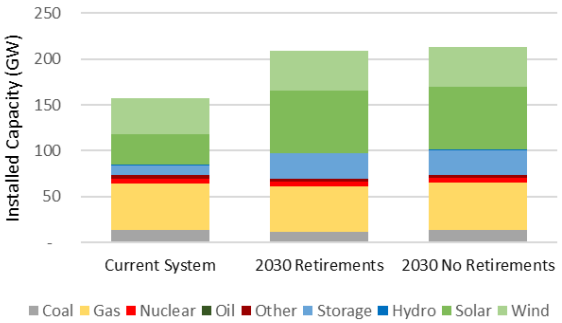


Figure 27. ERCOT Generation Capacity by Technology and Scenario

ERCOT's generation mix was comprised primarily of natural gas, wind, and solar. In 2024, natural gas comprised 32% of nameplate, wind comprised 25%, and solar 22%. In 2030, most retirements come from coal and natural gas while additions occur for solar, storage, and wind. The model assumed 2.5 GW of rooftop solar and 3.5 GW of demand response.

Table 19. Nameplate Capacity for ERCOT and by Technology (MW)

	Coal	Gas	Nuclear	Oil	Other	Storage	Hydro	Solar	Wind	Total
2024	**13,568**	**50,889**	**4,973**	**10**	**3,627**	**10,720**	**583**	**33,589**	**39,532**	**157,490**
ERCOT	13,568	50,889	4,973	10	3,627	10,720	583	33,589	39,532	**157,490**
Additions	**0**	**569**	**0**	**0**	**0**	**16,538**	**0**	**34,681**	**3,638**	**55,426**
ERCOT	0	569	0	0	0	16,538	0	34,681	3,638	**55,426**
Closures	**(2,000)**	**(2,022)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**(4,022)**
ERCOT	(2,000)	(2,022)	0	0	0	0	0	0	0	**(4,022)**

Appendix A - Generation Calibration and Forecast

The study team started with the grid model from the NERC ITCS, which was published in 2024 with reference to NERC 2023 LTRA capacity.[27] This zonal ITCS model serves as the starting point for the network topology (covering 23 U.S regions), transmission capacity between zones, and general modeling assumptions. The resource mix and retirements in the ITCS model were updated for this study to reflect the various 2030 scenarios discussed previously. Prior to developing the 2030 scenarios, the study team also updated the 2024 ITCS model to ensure consistency in the current model assumptions.

2024 Resource Mix

Because there were noted changes in assumed capacity additions between the 2023 and 2024 LTRAs[28], the ITCS model was updated with the 2024 LTRA data, provided directly by NERC to the study team. The 2024 LTRA dataset, reported at the NERC assessment area level—which is more aggregated in some areas than the ITCS regional structure (covering 13 U.S. regions; see Figure A.1)—includes both existing resource capacities[29] and Tier 1, 2, and 3 planned additions for each year from 2024 to 2033. As explained below, to incorporate this data into the ITCS model, a mapping process was developed to disaggregate generation capacities from the NERC assessment areas to the more granular ITCS regions by technology type. To preserve the daily or monthly adjustments to generator availability for certain categories (wind, solar, hybrid, hydropower, batteries, and other) by using the ITCS methods, the nameplate LTRA capacity was used. For all other categories (mostly thermal generators), summer and winter on-peak capacity contributions were used.

27. NERC, “Interregional Transfer Capability Study (ITCS).” https://www.nerc.com/pa/RAPA/Documents/ITCS_Final_Report.pdf.

28. NERC, “2024 Long-Term Reliability Assessment,” December, 2024, 24. https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Long%20Term%20Reliability%20Assessment_2024.pdf.

29. Capacities are reported for both winter and summer seasonal ratings, along with nameplate values.

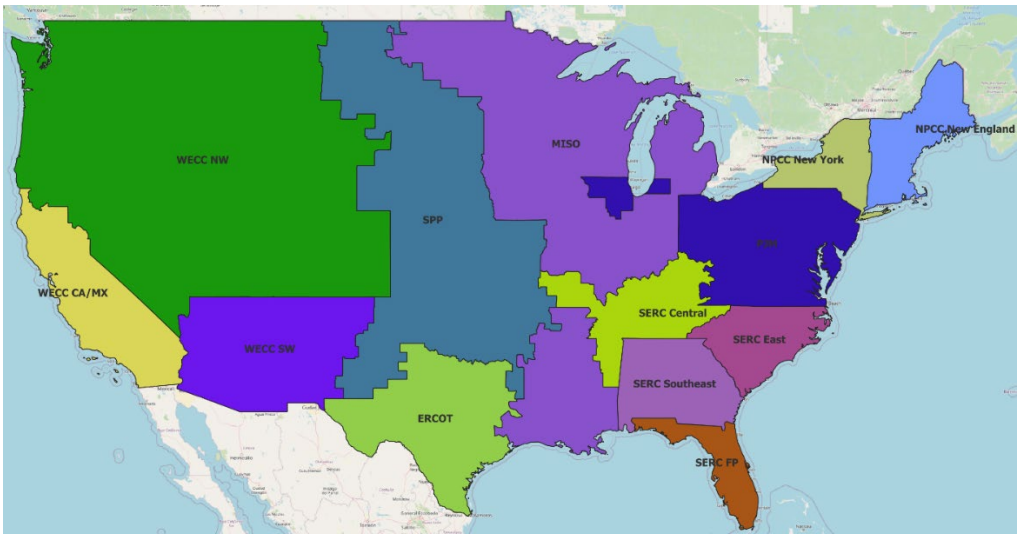


Figure A.1. NERC assessment areas.

To disaggregate generation capacity from the NERC assessment areas to the ITCS regions, EIA 860 plant-level data were used to tabulate the generation capacity for each ITCS region and NERC assessment area. The geographical boundaries for the NERC assessment areas and the ITCS regions were constructed based on ReEDS zones.[30] Disaggregation fractions were then calculated by technology type using the combined existing capacity and planned additions through 2030 from EIA 860 data as of December 2024. Specifically, to compute each fraction, an ITCS region's total (existing plus planned) capacity was divided by the corresponding total capacity across all ITCS regions within the same mapped NERC assessment area and fuel type group:

$$Fraction_{rf} = \frac{Capacity_{rf}}{\sum_{r' \in ITCS(R)} Capacity_{r'f}} \qquad \textit{(Equation.1)}$$

Where $Capacity_{rf}$ is the capacity of fuel type f in ITCS region r and $ITCS(R)$ is the set of all ITCS regions mapped to the same NERC assessment area R. The denominator is the total capacity of that fuel type across all ITCS regions mapped to R.

Note that in cases where NERC assessment areas align one-to-one with ITCS regions, no mapping was required. Table A.1 summarizes which areas exhibited a direct one-to-one matching and which required disaggregation (1-to-many) or aggregation (many-to-one) to align with the ITCS regional structure.

An exception to this general approach is the case of the Front Range ITCS region, which geographically spans across two NERC assessment areas—WECC-NW and WECC-SW—resulting in two-to-one mapping. For this case, a separate allocation method was used: Plant-level data from EIA 860 were analyzed to determine the proportion of Front Range capacity located in each NERC area. These proportions were then used to derive custom weighting factors for allocating capacities from both WECC-NW and WECC-SW into the Front Range region.

30. NREL, "Regional Energy Development System," https://www.nrel.gov/analysis/reeds/.

Table A.1. Mapping of NERC assessment areas to ITCS regions.

NERC Area	ITCS Region	Match
ERCOT	ERCOT	1 to 1
NPCC-New England	NPCC-New England	1 to 1
NPCC-New York	NPCC-New York	1 to 1
SERC-C	SERC-C	1 to 1
SERC-E	SERC-E	1 to 1
SERC-FP	SERC-FP	1 to 1
SERC-SE	SERC-SE	1 to 1
WECC-SW	Southwest Region	1 to 1
MISO	MISO Central	1 to 4
MISO	MISO East	
MISO	MISO South	
MISO	MISO West	
SPP	SPP North	1 to 2
SPP	SPP South	
WECC-CAMX	Southern California	1 to 2
WECC-CAMX	Northern California	
WECC-NW	Oregon Region	1 to 3
WECC-NW	Washington Region	
WECC-NW	Wasatch Front	
WECC-NW	Front Range	2 to 1
WECC-SW	Front Range	

Table A.2 and Figure A.2 show the same combined capacities by ITCS region and NERC planning region, respectively.

Table A.2. Existing and Tier 1 capacities by NERC assessment area (in MW) in 2024.

2024 Exsting + Tier 1			Coal	NG	Nuclear	Oil	Biomass	Geo	Other	Pumped Storage	Battery	Hydro	Solar	Wind	DR	DGPV	Total
EAST	**Total**		**143,035**	**330,342**	**82,793**	**26,771**	**3,624**	**-**	**991**	**19,607**	**3,298**	**28,980**	**72,757**	**94,364**	**25,753**	**24,367**	**856,682**
	ISONE	**Total**	541	15,494	3,331	5,710	818	-	233	1,571	57	1,911	3,386	2,553	661	3,713	39,979
	MISO	**Total**	**37,914**	**64,194**	**11,127**	**2,867**	**613**	**-**	**329**	**4,396**	**1,031**	**2,533**	**29,777**	**41,715**	**7,775**	**3,049**	**207,319**
		MISO-W	12,651	13,608	2,753	1,491	244	-	2	-	200	777	7,368	29,411	2,367	741	71,612
		MISO-C	15,050	10,307	2,169	494	32	-	152	773	499	769	10,587	7,350	2,026	1,774	51,982
		MISO-S	5,493	31,052	5,100	589	243	-	117	49	5	845	8,024	596	2,109	291	54,511
		MISO-E	4,720	9,227	1,105	292	94	-	57	3,574	327	143	3,799	4,359	1,273	243	29,213
	NYISO	**Total**	-	22,937	3,330	2,631	334	-	-	1,400	60	4,915	1,039	2,706	860	5,710	45,924
	PJM	**Total**	**39,915**	**84,381**	**32,535**	**9,875**	**851**	**-**	**-**	**5,062**	**338**	**3,071**	**10,892**	**11,718**	**7,397**	**8,603**	**214,638**
		PJM-W	34,917	39,056	16,557	1,933	112	-	-	234	149	1,252	5,780	10,065	3,814	599	114,467
		PJM-S	2,391	15,038	5,288	3,985	479	-	-	2,958	127	1,070	3,932	360	1,824	2,498	39,951
		PJM-E	2,608	30,287	10,690	3,956	260	-	-	1,870	62	749	1,180	1,294	1,759	5,506	60,221
	SERC	**Total**	**45,747**	**113,334**	**31,702**	**4,063**	**989**	**-**	**83**	**6,701**	**768**	**11,425**	**26,959**	**982**	**7,707**	**3,221**	**253,680**
		SERC-C	13,348	20,127	8,280	148	36	-	-	1,784	100	4,995	2,308	982	1,851	20	53,978
		SERC-SE	13,275	29,866	8,018	915	424	-	-	1,548	115	3,260	7,267	-	2,069	317	67,073
		SERC-FL	4,346	47,002	3,502	1,957	310	-	83	-	538	-	10,121	-	2,804	2,051	72,714
		SERC-E	14,777	16,340	11,902	1,044	219	-	-	3,369	15	3,170	7,263	-	983	833	59,914
	SPP	**Total**	**18,919**	**30,003**	**769**	**1,626**	**20**	**-**	**345**	**477**	**1,044**	**5,123**	**703**	**34,689**	**1,353**	**71**	**95,142**
		SPP-N	5,089	3,467	304	504	1	-	185	-	8	3,041	84	7,041	333	7	20,065
		SPP-S	13,829	26,536	465	1,121	19	-	160	477	1,037	2,082	619	27,649	1,020	64	75,078
ERCOT	**Total**		**13,568**	**50,889**	**4,973**	**10**	**163**	**-**	**-**	**-**	**10,720**	**583**	**31,058**	**39,532**	**3,464**	**2,531**	**157,490**
	ERCOT	**Total**	13,568	50,889	4,973	10	163	-	-	-	10,720	583	31,058	39,532	3,464	2,531	157,490
WEST	**Total**		**21,666**	**87,403**	**9,403**	**829**	**1,565**	**4,093**	**106**	**4,536**	**15,238**	**52,687**	**44,042**	**35,071**	**1,944**	**16,271**	**294,854**
	CAISO+	**Total**	**1,816**	**37,434**	**5,582**	**185**	**726**	**2,004**	**35**	**3,514**	**11,156**	**10,211**	**25,614**	**7,773**	**829**	**10,047**	**116,925**
		CALI-N	-	12,942	5,582	165	465	1,049	9	1,967	2,672	8,727	6,723	1,373	349	5,036	47,059
		CALI-S	1,816	24,492	-	20	261	955	26	1,547	8,484	1,483	18,891	6,400	480	5,011	69,866
	Non-CA WECC	**Total**	**19,850**	**49,969**	**3,820**	**644**	**839**	**2,089**	**71**	**1,022**	**4,082**	**42,476**	**18,428**	**27,298**	**1,115**	**6,224**	**177,929**
		WA	560	3,919	1,096	17	352	-	-	140	350	24,402	1,052	2,690	243	386	35,207
		OR	-	3,915	-	6	293	21	-	-	482	8,253	2,145	3,440	141	372	19,068
		SOUTHWEST	4,842	17,985	2,724	323	102	1,047	-	176	2,173	1,019	5,641	3,685	168	2,452	42,335
		WASATCH	7,033	14,061	-	87	56	1,011	61	444	750	7,587	5,625	4,052	305	1,674	42,746
		FRONT R	7,415	10,089	-	211	36	10	10	262	328	1,215	3,966	13,432	258	1,340	38,572
		Total	**178,268**	**468,635**	**97,169**	**27,610**	**5,353**	**4,093**	**1,096**	**24,144**	**29,256**	**82,249**	**147,856**	**168,966**	**31,161**	**43,169**	**1,309,026**

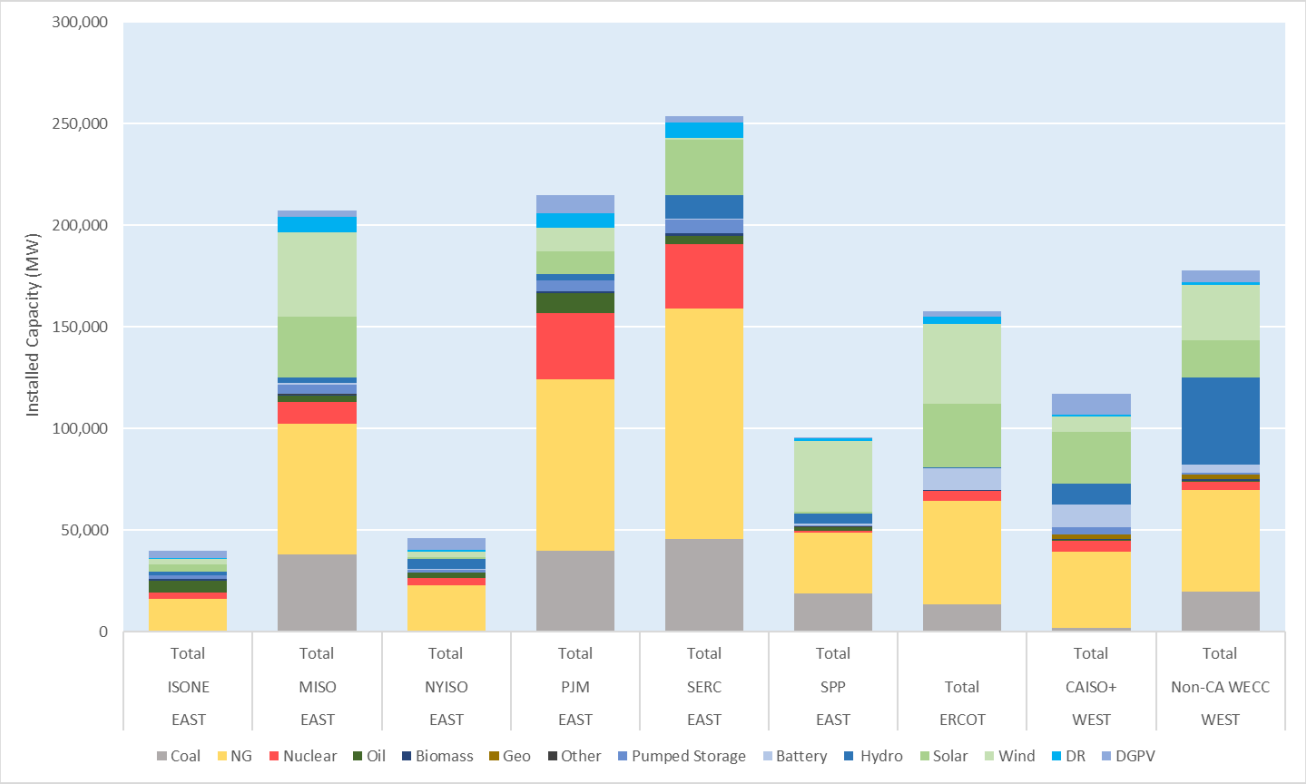


Figure A.2. Existing and Tier 1 capacities by NERC assessment area in 2024.

Forecasting 2030 Resource Mixes

To develop the 2030 ITCS generation portfolio, the study team added new capacity builds and removed planned retirements.

(i) *Tier 1*: Assumes that only projects considered very mature in the development pipeline—such as those with signed interconnection agreements—will be built. This results in minimal capacity additions beyond 2026. The data are based on projects designated as Tier 1 in the 2024 LTRA data for the year 2030.

Retirements

To project which units will retire by 2030, the study team primarily used the LTRA 2024 data and cross-checked it with EIA data. The assessment areas were disaggregated to ITCS zones based on the ratios of projected retirements in EIA 860 data. The three scenarios modeled are as follows:

(i) *Announced*: Assumes that in addition to confirmed retirements, generators that have publicly announced retirement plans but have not formally notified system operators have also begun the retirement process. This is based on data from the 2024 LTRA, which were collected by the NERC team from sources like news announcements, public disclosures, etc.

(ii) *None*: Assumes that there are no retirements between 2024 and 2030 for comparison. Delaying or canceling some near-term retirements may not be feasible, but this case can help determine how much retirements contribute to resource adequacy challenges in regions where rapid AI and data center growth is expected.

Generation Stack for Each Scenario

Finally, when summing all potential future changes, the team arrived at a generation stack for each of the various scenarios to be studied. The first figure provides a visual comparison of all the cases, which vary from 1,309 GW to 1,519 GW total generation capacity for the entire continental United States, to enable the exploration of a range of potential generation futures. The tables below provide breakdowns by ITCS region and by resource type.

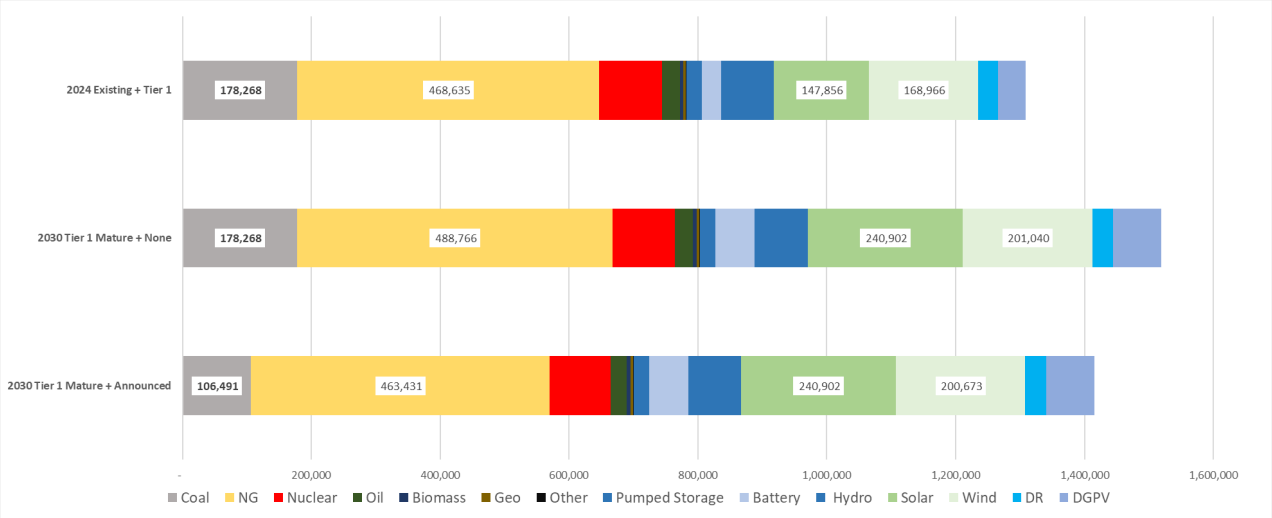


Figure A.9. Comparison of 2030 generation stacks for the various scenarios.

Table A.4. 2030 generation stack for Tier 1 mature + announced retirements.

2030 Tier 1 Mature + Announced			Coal	NG	Nuclear	Oil	Biomass	Geo	Other	Pumped Storage	Battery	Hydro	Solar	Wind	DR	DGPV	Total
EAST	**Total**		**84,730**	**328,457**	**82,793**	**24,272**	**3,473**	**-**	**991**	**19,591**	**12,415**	**28,897**	**126,849**	**113,568**	**26,837**	**36,768**	**889,641**
	ISONE	**Total**	7	13,708	3,331	5,687	741	-	233	1,571	1,664	1,911	3,676	4,048	661	5,606	42,845
	MISO	**Total**	**13,001**	**60,132**	**11,127**	**2,873**	**473**	**-**	**329**	**4,380**	**2,960**	**2,450**	**44,132**	**43,369**	**7,775**	**3,049**	**196,049**
		MISO-W	4,338	12,747	2,753	1,494	188	-	2	-	574	751	10,920	30,577	2,367	741	67,453
		MISO-C	5,161	9,655	2,169	495	25	-	152	770	1,433	743	15,690	7,642	2,026	1,774	47,735
		MISO-S	1,883	29,087	5,100	591	187	-	117	49	14	817	11,892	619	2,109	291	52,756
		MISO-E	1,619	8,643	1,105	293	72	-	57	3,561	938	138	5,630	4,531	1,273	243	28,105
	NYISO	**Total**	-	21,907	3,330	2,628	334	-	-	1,400	60	4,915	1,159	4,608	860	9,194	50,396
	PJM	**Total**	**26,662**	**87,228**	**32,535**	**8,117**	**917**	**-**	**-**	**5,062**	**2,276**	**3,071**	**33,530**	**18,807**	**7,638**	**10,955**	**236,798**
		PJM-W	23,323	40,373	16,557	1,589	120	-	-	234	1,004	1,252	17,793	16,153	3,939	762	123,100
		PJM-S	1,597	15,546	5,288	3,276	516	-	-	2,958	853	1,070	12,105	577	1,883	3,181	48,850
		PJM-E	1,742	31,309	10,690	3,252	280	-	-	1,870	419	749	3,632	2,076	1,816	7,012	64,848
	SERC	**Total**	**31,672**	**116,117**	**31,702**	**3,391**	**989**	**-**	**83**	**6,701**	**3,021**	**11,425**	**38,360**	**982**	**8,088**	**7,893**	**260,423**
		SERC-C	8,883	23,777	8,280	148	36	-	-	1,784	180	4,995	3,070	982	1,851	29	54,014
		SERC-SE	10,321	28,127	8,018	899	424	-	-	1,548	618	3,260	9,024	-	2,213	317	64,768
		SERC-FL	2,851	47,092	3,502	1,477	310	-	83	-	2,208	-	16,717	-	3,022	5,865	83,127
		SERC-E	9,617	17,122	11,902	868	219	-	-	3,369	15	3,170	9,549	-	1,002	1,682	58,513
	SPP	**Total**	**13,389**	**29,365**	**769**	**1,576**	**20**	**-**	**345**	**477**	**2,434**	**5,123**	**5,991**	**41,755**	**1,815**	**71**	**103,130**
		SPP-N	3,602	3,394	304	489	1	-	185	-	18	3,041	717	8,475	447	7	20,679
		SPP-S	9,787	25,971	465	1,087	19	-	160	477	2,416	2,082	5,274	33,280	1,368	64	82,451
ERCOT	**Total**		**11,568**	**49,436**	**4,973**	**10**	**163**	**-**	**-**	**-**	**27,258**	**583**	**62,406**	**43,169**	**3,464**	**5,864**	**208,894**
	ERCOT	**Total**	11,568	49,436	4,973	10	163	-	-	-	27,258	583	62,406	43,169	3,464	5,864	208,894
WEST	**Total**		**10,193**	**85,538**	**7,103**	**823**	**1,427**	**3,983**	**106**	**4,366**	**21,330**	**52,060**	**51,648**	**43,935**	**1,981**	**31,931**	**316,424**
	CAISO+	**Total**	**16**	**35,789**	**3,282**	**185**	**726**	**2,059**	**35**	**3,514**	**14,316**	**10,211**	**27,112**	**7,773**	**866**	**17,055**	**122,938**
		CALI-N	-	12,373	3,282	165	465	1,078	9	1,967	3,429	8,727	7,116	1,373	364	8,549	48,897
		CALI-S	16	23,416	-	20	261	982	26	1,547	10,887	1,483	19,996	6,400	501	8,506	74,041
	Non-CA WECC	**Total**	**10,177**	**49,749**	**3,820**	**639**	**701**	**1,924**	**71**	**852**	**7,014**	**41,849**	**24,536**	**36,162**	**1,115**	**14,876**	**193,485**
		WA	243	3,971	1,096	16	286	-	-	111	459	24,033	1,404	3,631	243	1,092	36,588
		OR	-	3,967	-	6	238	18	-	-	632	8,128	2,865	4,644	141	1,051	21,689
		SOUTHWEST	3,657	17,343	2,724	323	102	1,047	-	176	4,511	1,019	7,460	4,284	168	4,211	47,022
		WASATCH	3,055	14,247	-	86	45	850	61	355	983	7,472	7,512	5,470	305	4,733	45,175
		FRONT R	3,221	10,222	-	208	30	8	10	209	430	1,197	5,296	18,133	258	3,789	43,011
		Total	**106,491**	**463,431**	**94,869**	**25,106**	**5,063**	**3,983**	**1,096**	**23,958**	**61,003**	**81,539**	**240,902**	**200,673**	**32,282**	**74,563**	**1,414,959**

Table A.5. 2030 generation stack for Tier 1 mature + no retirements.

2030 Tier 1 Mature + No Retirements			Coal	NG	Nuclear	Oil	Biomass	Geo	Other	Pumped Storage	Battery	Hydro	Solar	Wind	DR	DGPV	Total
EAST	**Total**		**143,035**	**345,459**	**82,793**	**27,336**	**3,701**	**-**	**991**	**19,607**	**12,415**	**28,980**	**126,849**	**113,840**	**26,837**	**36,768**	**968,610**
	ISONE	**Total**	541	15,584	3,331	5,891	818	-	233	1,571	1,664	1,911	3,676	4,048	661	5,606	45,534
	MISO	**Total**	**37,914**	**66,729**	**11,127**	**3,197**	**613**	**-**	**329**	**4,396**	**2,960**	**2,533**	**44,132**	**43,641**	**7,775**	**3,049**	**228,393**
		MISO-W	12,651	14,145	2,753	1,662	244	-	2	-	574	777	10,920	30,768	2,367	741	77,605
		MISO-C	15,050	10,714	2,169	551	32	-	152	773	1,433	769	15,690	7,690	2,026	1,774	58,823
		MISO-S	5,493	32,278	5,100	657	243	-	117	49	14	845	11,892	623	2,109	291	59,710
		MISO-E	4,720	9,592	1,105	326	94	-	57	3,574	938	143	5,630	4,560	1,273	243	32,255
	NYISO	**Total**	-	22,937	3,330	2,646	334	-	-	1,400	60	4,915	1,159	4,608	860	9,194	51,444
	PJM	**Total**	**39,915**	**88,880**	**32,535**	**9,907**	**928**	**-**	**-**	**5,062**	**2,276**	**3,071**	**33,530**	**18,807**	**7,638**	**10,955**	**253,504**
		PJM-W	34,917	41,138	16,557	1,939	122	-	-	234	1,004	1,252	17,793	16,153	3,939	762	135,810
		PJM-S	2,391	15,840	5,288	3,998	522	-	-	2,958	853	1,070	12,105	577	1,883	3,181	50,667
		PJM-E	2,608	31,902	10,690	3,969	284	-	-	1,870	419	749	3,632	2,076	1,816	7,012	67,027
	SERC	**Total**	**45,747**	**120,232**	**31,702**	**4,063**	**989**	**-**	**83**	**6,701**	**3,021**	**11,425**	**38,360**	**982**	**8,088**	**7,893**	**279,285**
		SERC-C	13,348	24,958	8,280	148	36	-	-	1,784	180	4,995	3,070	982	1,851	29	59,660
		SERC-SE	13,275	29,866	8,018	915	424	-	-	1,548	618	3,260	9,024	-	2,213	317	69,478
		SERC-FL	4,346	48,163	3,502	1,957	310	-	83	-	2,208	-	16,717	-	3,022	5,865	86,173
		SERC-E	14,777	17,246	11,902	1,044	219	-	-	3,369	15	3,170	9,549	-	1,002	1,682	63,973
	SPP	**Total**	**18,919**	**31,098**	**769**	**1,632**	**20**	**-**	**345**	**477**	**2,434**	**5,123**	**5,991**	**41,755**	**1,815**	**71**	**110,449**
		SPP-N	5,089	3,594	304	506	1	-	185	-	18	3,041	717	8,475	447	7	22,385
		SPP-S	13,829	27,504	465	1,126	19	-	160	477	2,416	2,082	5,274	33,280	1,368	64	88,064
ERCOT	**Total**		**13,568**	**51,458**	**4,973**	**10**	**163**	**-**	**-**	**-**	**27,258**	**583**	**62,406**	**43,169**	**3,464**	**5,864**	**212,916**
	ERCOT	**Total**	13,568	51,458	4,973	10	163	-	-	-	27,258	583	62,406	43,169	3,464	5,864	212,916
WEST	**Total**		**21,666**	**91,849**	**9,403**	**829**	**1,565**	**4,156**	**106**	**4,536**	**21,330**	**52,687**	**51,648**	**44,030**	**1,981**	**31,931**	**337,717**
	CAISO+	**Total**	**1,816**	**39,560**	**5,582**	**185**	**726**	**2,059**	**35**	**3,514**	**14,316**	**10,211**	**27,112**	**7,773**	**866**	**17,055**	**130,809**
		CALI-N	-	13,677	5,582	165	465	1,078	9	1,967	3,429	8,727	7,116	1,373	364	8,549	52,501
		CALI-S	1,816	25,883	-	20	261	982	26	1,547	10,887	1,483	19,996	6,400	501	8,506	78,308
	Non-CA WECC	**Total**	**19,850**	**52,289**	**3,820**	**645**	**839**	**2,097**	**71**	**1,022**	**7,014**	**42,476**	**24,536**	**36,257**	**1,115**	**14,876**	**206,908**
		WA	560	4,166	1,096	17	352	-	-	140	459	24,402	1,404	3,642	243	1,092	37,573
		OR	-	4,161	-	6	293	22	-	-	632	8,253	2,865	4,658	141	1,051	22,081
		SOUTHWEST	4,842	18,294	2,724	323	102	1,047	-	176	4,511	1,019	7,460	4,284	168	4,211	49,158
		WASATCH	7,033	14,945	-	88	56	1,018	61	444	983	7,587	7,512	5,486	305	4,733	50,251
		FRONT R	7,415	10,723	-	212	36	10	10	262	430	1,215	5,296	18,187	258	3,789	47,844
		Total	**178,268**	**488,766**	**97,169**	**28,175**	**5,429**	**4,156**	**1,096**	**24,144**	**61,003**	**82,249**	**240,902**	**201,040**	**32,282**	**74,563**	**1,519,243**

Appendix B - Representing Canadian Transfer Limits

Introduction

The reliability and stability of cross-border electricity interconnections between the United States and Canada are critical to ensuring continuous power delivery amid evolving demands and variable supply conditions. In recent years, increased integration of wind and solar generation, coupled with extreme weather events, has introduced significant uncertainties in regional power flows.

This report describes the development and implementation of a machine learning (ML)-based model designed to project the maximum daily energy transfer (MaxFlow) across major United States–Canada interfaces, such as BPA–BC Hydro and NYISO–Ontario. Leveraging 15 years of high-resolution load and generation data, summarizing it into key daily statistics, and training a robust eXtreme Gradient Boosting (XGBoost) regressor can allow data-driven predictions to be captured with quantified uncertainty.

The project team provided percentile-based forecasts—25, 50, and 75 percent—to support both conservative and strategic planning. The conservative methodology (25 percent) was used for this report to ensure availability when needed.

The subsequent sections detail the methodology used for data processing and feature engineering, the architecture and training of the predictive model, and the validation metrics and feature importance analyses used. Future enhancements could include incorporating weather patterns, neighboring-region dynamics, and fuel-specific generation profiles to further strengthen predictive performance and support grid resilience.

Methodology

This section describes the ML approach used to build the MaxFlow prediction model.

Dataset Collection and Preparation

Data were collected for hourly and derived daily load and generation over a 15-year period (2010–2024), comprising 8,760 hourly observations annually. Hourly interconnection flow rates were collected for the same years across all major United States–Canada interfaces.[1–17]

Underlying Hypothesis

The team hypothesized that the MaxFlow between interconnected regions is critically influenced by regional load and generation extrema (maximum and minimum) and their variability. These statistics reflect grid stress conditions, influencing interregional energy flow. Additionally, nonlinear interactions due to imbalances in adjacent regions further affect energy transfer dynamics.

Regression Model

The XGBoost regression model was chosen because of its ability to capture complex, nonlinear relationships, regularization capability to prevent overfitting, high speed and performance, fast convergence, built-in handling of missing data, and ease of confidence interval approximation.

XGBoost builds many small decision trees, one after another. Each new tree learns to correct the mistakes of the previous ensemble by focusing on which predictions had the greatest error. Instead of creating one large, complex tree, it combines many simpler trees—each making a modest adjustment—so that, together, they capture nonlinear patterns and interactions. Regularization (penalties for tree size and leaf adjustments) prevents overfitting, and a "learning rate" scales each tree's contribution so that improvements are made gradually. The final prediction is simply the sum of all those small corrections.

Model Training, Validation, and Assessment

Figure B.1 shows the data analysis and prediction process, which ties together seven stages—from raw CSV loading through outlier filtering, feature engineering, projecting to 2030, rebuilding 2030 features, training an XGBoost model, and finally making and evaluating the 2030 flow forecasts with quantiles. Each stage feeds into the next, ensuring that the features used for training mirror exactly those that will be available for future (2030) predictions.

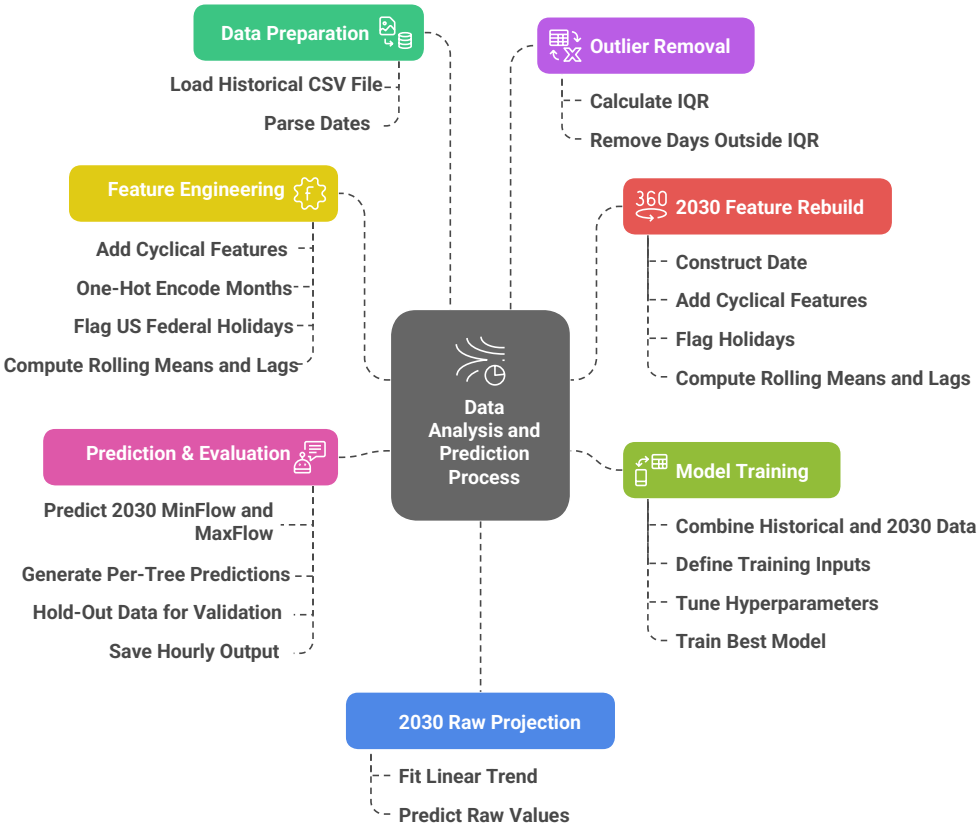


Figure B.1. Data analysis and prediction process.

Example Feature Importance for Predicting MaxFlow from Ontario to NYISO

The trained ML/XGBoost model can be used for predicting the desired year's MaxFlow. In addition, feature importance analysis can be added to assess the contribution of each variable.

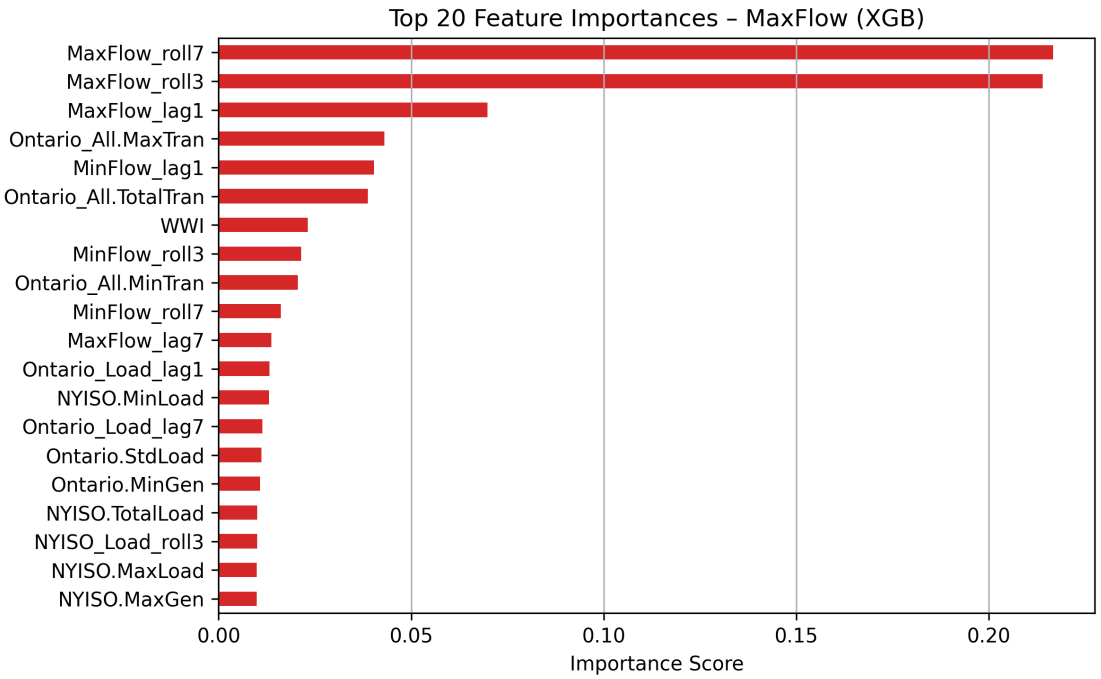


Figure B.2. Feature importance for predicting the hourly maximum energy transfer (MaxFlow) between NYISO and Ontario. XGB = eXtreme Gradient Boosting.

The feature importance plot shows that MaxFlow rolling/lagging features and Ontario_All.MaxTran are the dominant predictors of MaxFlow, meaning temporal patterns and Ontario's peak transfer capacity strongly influence interregional flow limits. Weather-related variables (WWI, e.g., temperature, humidity, etc.) and Ontario_All.TotalTran also rank highly. The 2030 MaxFlow prediction plot shows seasonal fluctuations, with higher values early and late in the year. The red shaded area represents a 95 percent confidence interval for the predictions.

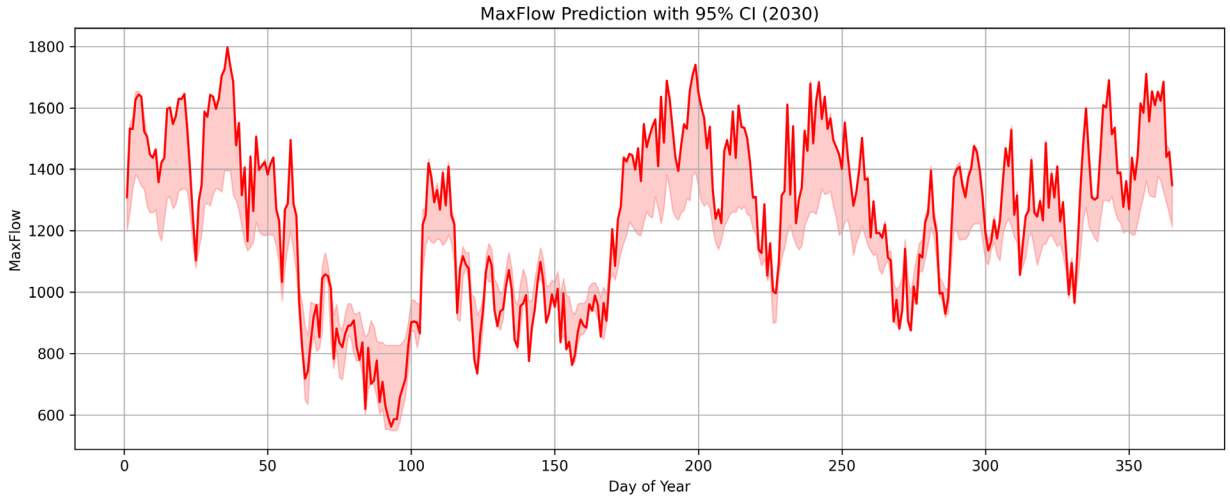


Figure B.3. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI).

Model Performance

Validating model performance on unseen data is essential to ensure the model's reliability and generalizability. The following evaluation examines how well the XGBoost model predicts minimum energy transfer (MinFlow) and MaxFlow on the validation split, highlighting strengths and areas for improvement.

Rigorous performance evaluation is a fundamental step in any ML workflow. From quantifying error metrics (root mean square error and mean absolute error) and goodness-of-fit (R^2) on both training and validation splits, it is possible to identify overfitting, assess generalization, and guide model refinement. Table B.1 shows XGBoost model performance for the Ontario–NYISO transfer limit.

Table B.1. eXtreme Gradient Boosting model performance for the Ontario–NYISO transfer limit.

Metric	Value	Explanation
MinFlow RMSE (Train)	69.2528	Root mean square error (RMSE) on training data for minimum energy transfer (MinFlow)
MinFlow R^2 (Train)	0.9651	R^2 on training data for MinFlow (higher → better fit)
MinFlow RMSE (Validation)	163.6642	RMSE on held-out data for MinFlow
MinFlow R^2 (Validation)	0.8073	R^2 on held-out data for MinFlow (higher → better generalization)
MaxFlow RMSE (Train)	114.4234	RMSE on training data for maximum energy transfer (MaxFlow)
MaxFlow R^2 (Train)	0.8838	R^2 on training data for MaxFlow (higher → better fit)
MaxFlow RMSE (Validation)	144.9614	RMSE on held-out data for MaxFlow
MaxFlow R^2 (Validation)	0.8178	R^2 on held-out data for MaxFlow (higher → better generalization)

Overall, the XGBoost model delivers excellent in-sample as well as out-of-sample accuracy. Similar outputs are available for each transfer limit.

Maximum flow predictions: Ontario to New York

Ontario and NYISO are connected through multiple high-voltage interconnections, which collectively provide a total transfer capability of up to 2,500 MW, subject to individual tie-line limits. Table B.2 outlines the data sources, preparation process, and assumptions used in creating datasets for the prediction models.

Table B.2. Ontario to New York transmission flow data and assumptions overview.

	Description
Data source	https://www.ieso.ca/power-data/data-directory
Data preparation	IESO public hourly inter-tie schedule flow data can be accessed for the years spanning from 2002 to 2023.
Assumptions	Positive flow indicates that Ontario is exporting to NY, and negative flow indicates that Ontario is importing from NY.

Figure B.4 illustrates the historical monthly MaxFlow for Ontario from 2007 through 2024, alongside 2030 projected quartile scenarios (Q1, Q2, and Q3). Analyzing these trends helps assess future reliability and facilitates capacity planning under varying conditions.

Historical monthly peaks (2007–2023) reveal a clear seasonal cycle for ONT–NYISO transfers: flows typically increase in late winter/early spring (February–April) and again in late fall/early winter (November–December). Over 16 years, the average spring peaks hovered around 1,700–1,900 MW, with occasional spikes above 2,200 MW. The 2030 forecast for Q1, Q2, and Q3 aligns with this pattern, predicting a springtime peak near 1,800 MW, a summer trough around 1,400 MW, and a modest late-summer uptick near 1,500 MW.

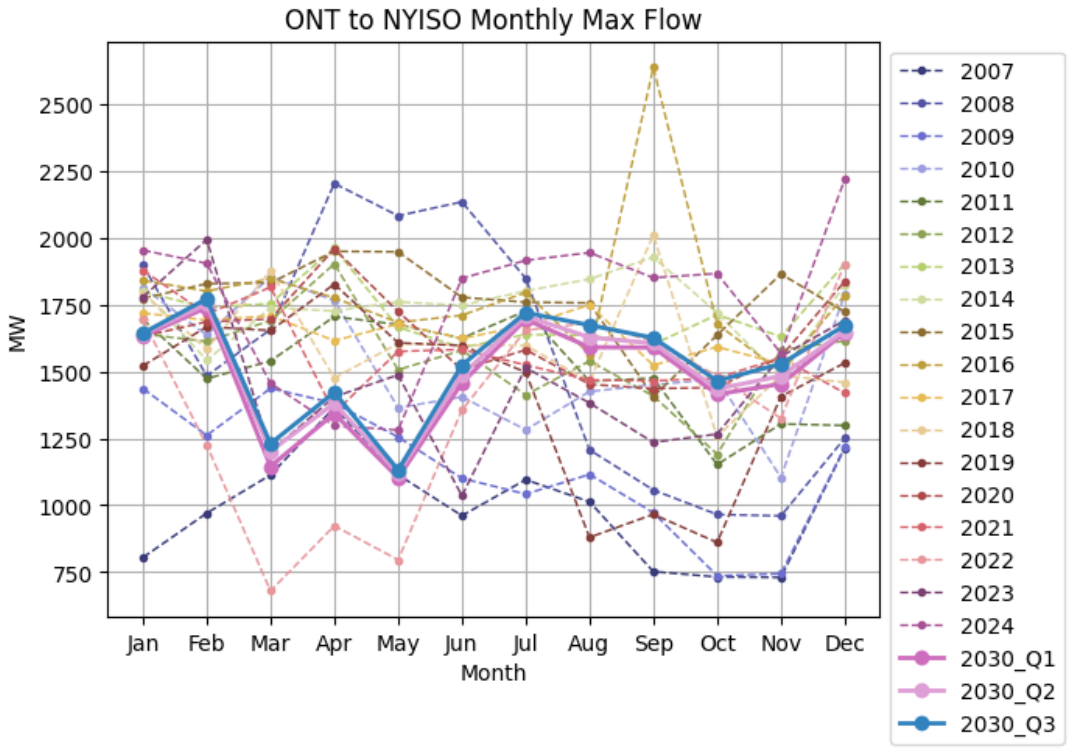


Figure B.4. Monthly maximum energy transfer between Ontario (ONT) and New York (NYISO).

The team used robust validation metrics to justify these results. When trained on daily data from the 2010–2024 period—incorporating projected 2030 loads, seasonal flags, and holiday effects—the XGBoost model achieved $R^2 > 0.80$ and a root mean square error below 150 MW on an unseen 20 percent hold-out dataset. Moreover, the 95 percent confidence intervals for monthly maxima were narrow (approximately ±150 MW), demonstrating low predictive uncertainty. A comparison of predicted maxima with historical extremes revealed that 2030 forecasts consistently fell within (or slightly above) the previous window of variability, implying realistic demand-driven behavior. In summary, the close alignment with historical peaks, strong cross-validated performance, and tight confidence bands collectively validate the results.

Discussion

The reason that the team used ML/XGBoost to approximate the 2030 transfer profiles was to ensure that there would be no violations or inconsistencies between transfer limits, load, and generation. The 15 years of data used were sufficient for having the models learn historical relationships and project them forward to 2030 to capture the underlying trends in load,

generation, and their interactions. The use of such an extensive dataset justifies using ML to establish consistent transfer profiles.

However, in some regions, like Ontario to NYISO, the available data encompassed a shorter time period, and the relationships were only partially captured because of a lack of neighboring-region data. In such cases, it was necessary to incorporate additional predictors, such as rolling and lag features from the transfer limits. Although the direct use of transfer limit data to project future transfer limits would typically be avoided, these engineered features help improve predictions when data coverage is sparse and the model's goodness-of-fit is low.

In all cases, the ML models ensured that these historical relationships were not violated, maintaining internal consistency among load, generation, and transfer limits. Overall, the team relied on ML when long-term data were available for training and projecting load and generation profiles. Rolling and lag features were used to reinforce the model when data availability was limited, but always with the goal of upholding consistent physical relationships in the 2030 projections.

Supplementary Plots for Additional Transfers

This section presents figures and tables showing results and source data information for each transfer listed below:

(iii) Pacific Northwest to British Columbia

(iv) Alberta to Montana

(v) Manitoba to MISO West

(vi) Ontario to MISO West

(vii) Ontario to MISO East

(viii) Ontario to New York

(ix) Hydro-Quebec to New York

(x) Hydro-Quebec to New England

(xi) New Brunswick to New England

The figures show the daily MaxFlow for each transfer that was considered in this analysis.

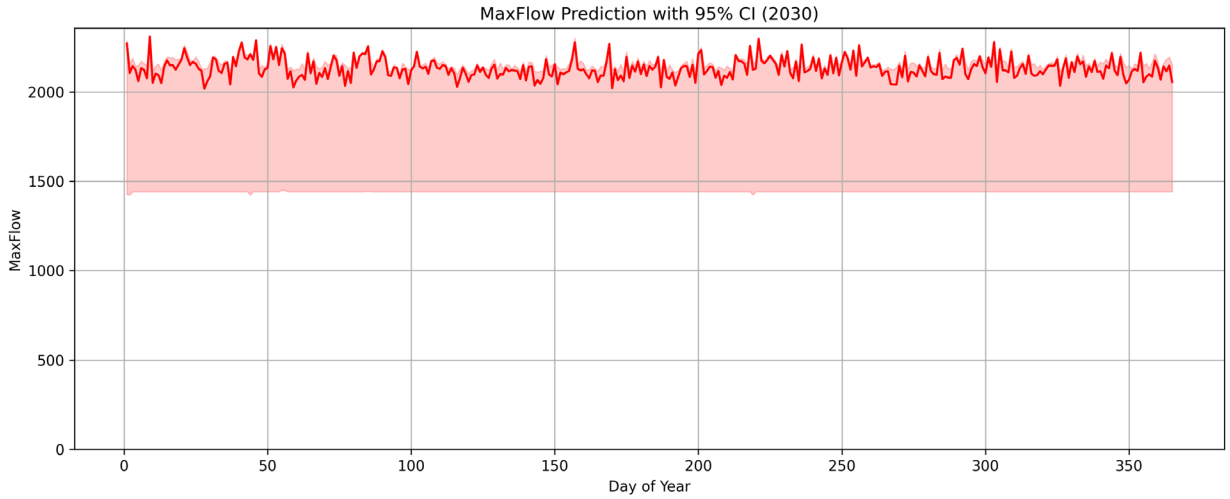


Figure B.5. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between British Columbia and the Pacific Northwest.

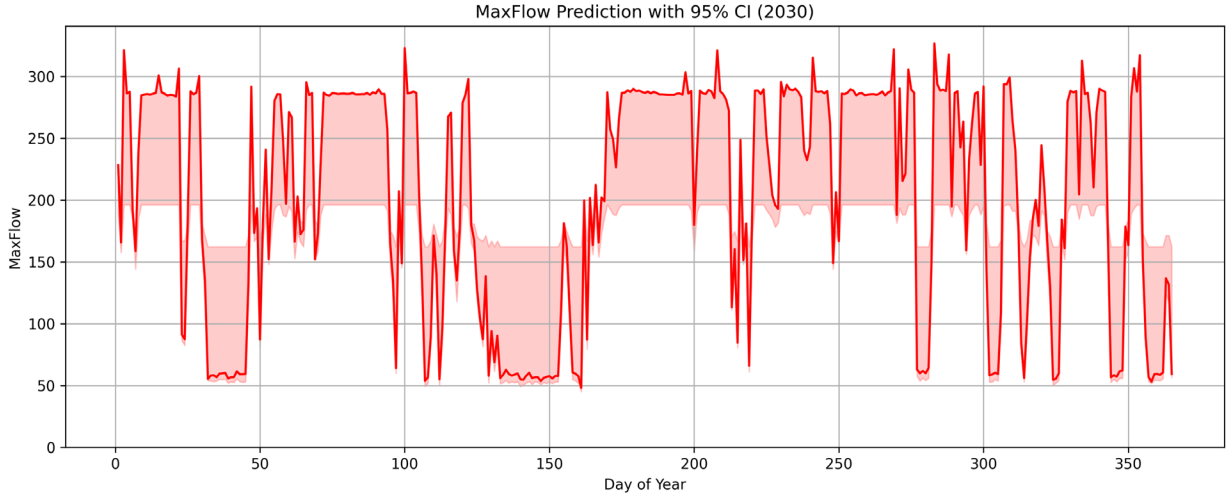


Figure B.6. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between AESO and Montana.

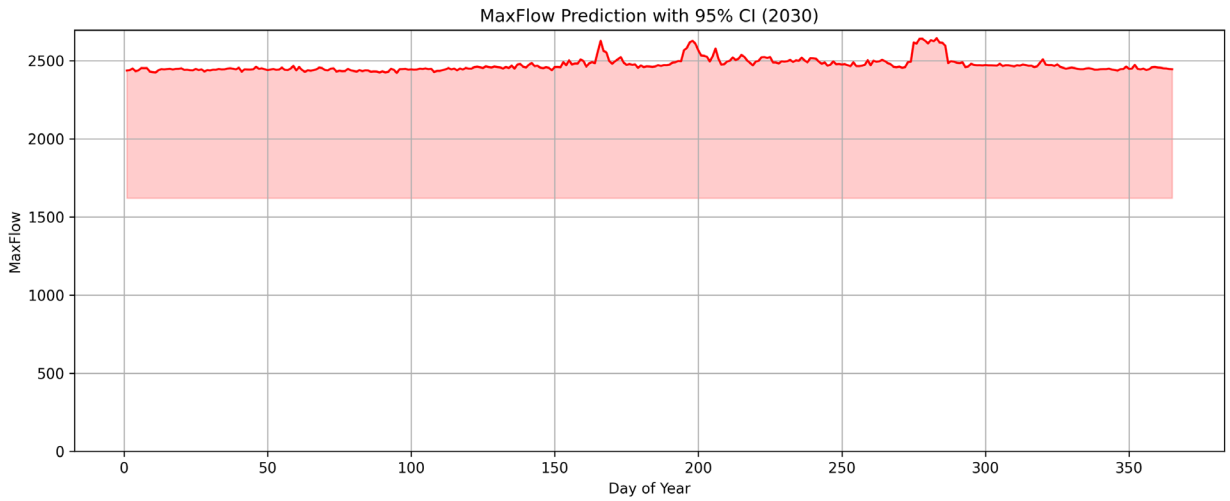


Figure B.7. Projected 2030 maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Manitoba and MISO.

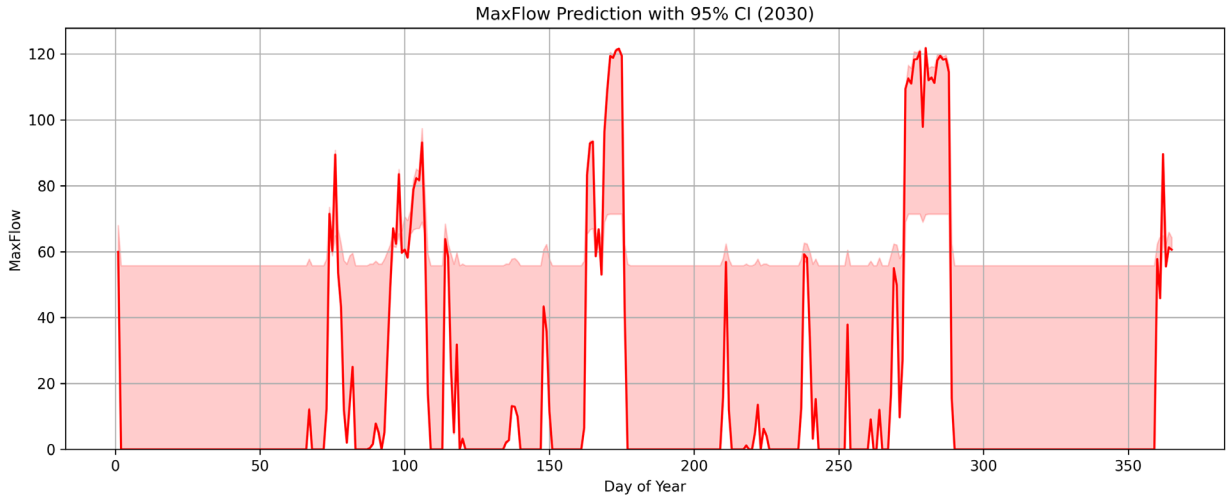


Figure B.8. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Ontario and MISO West.

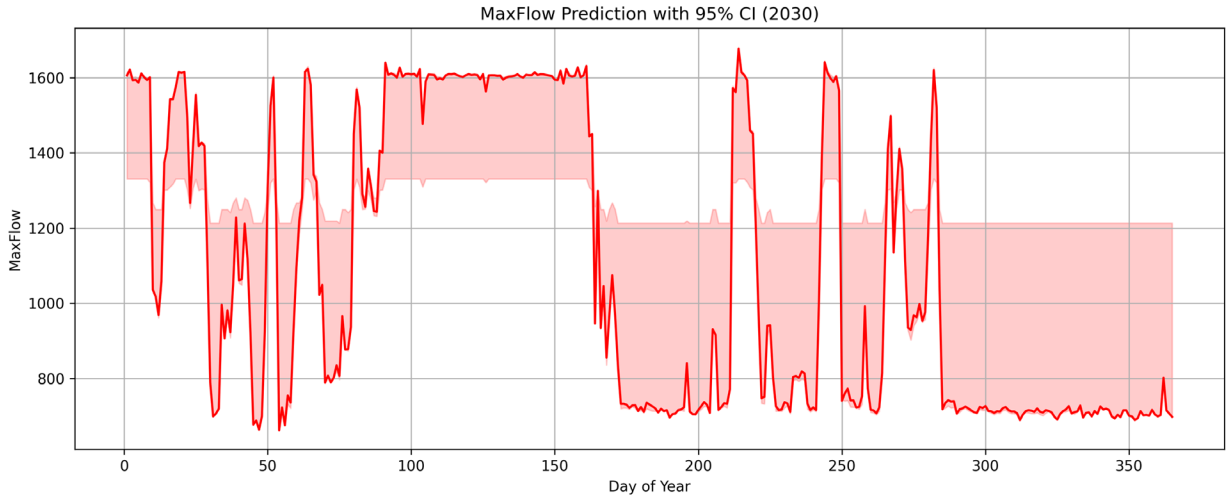


Figure B.9. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Ontario and MISO East.

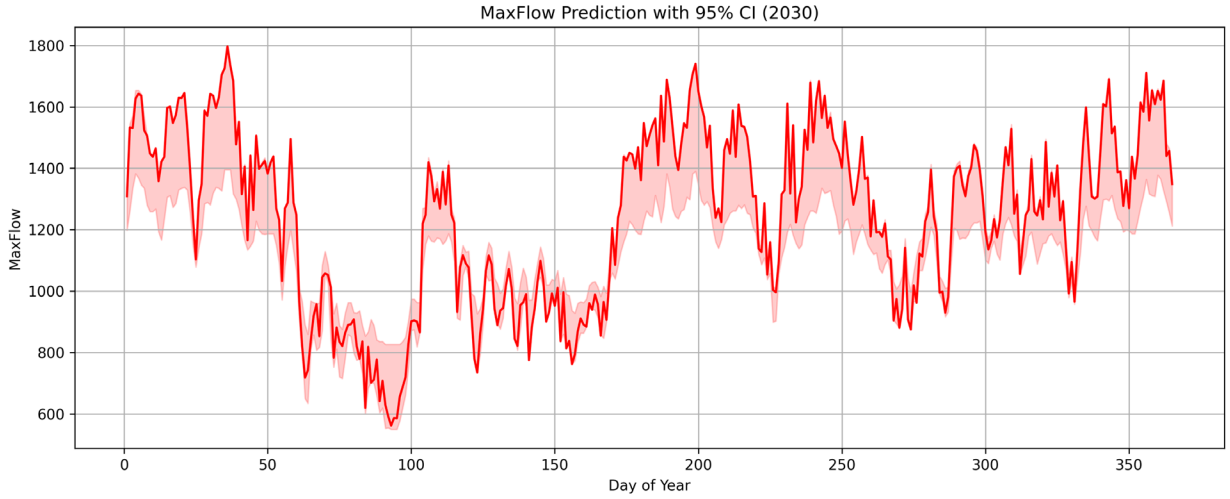


Figure B.10. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Ontario and New York.

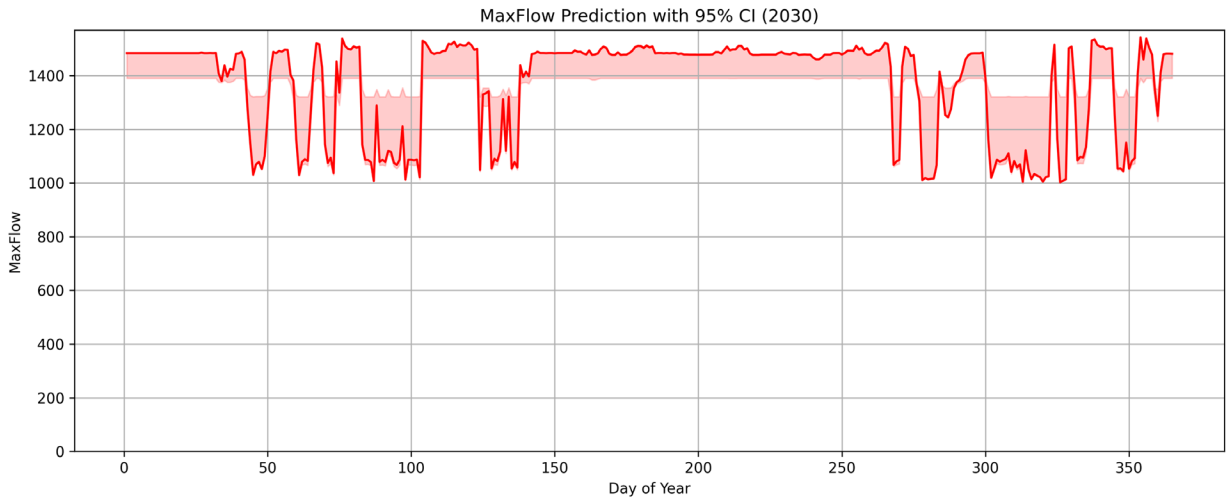


Figure B.11. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Quebec and New York.

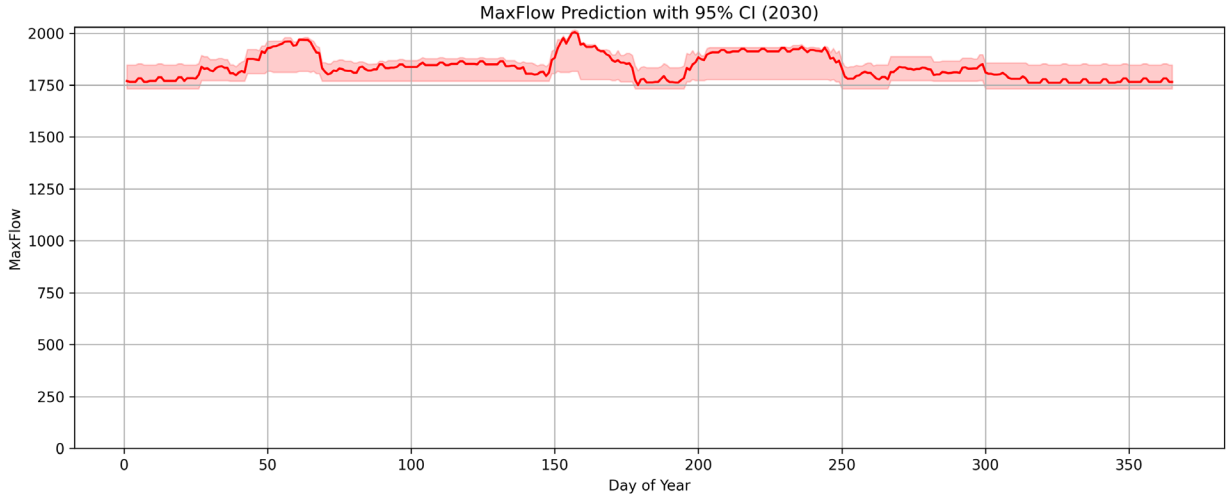


Figure B.12. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between Quebec and New England.

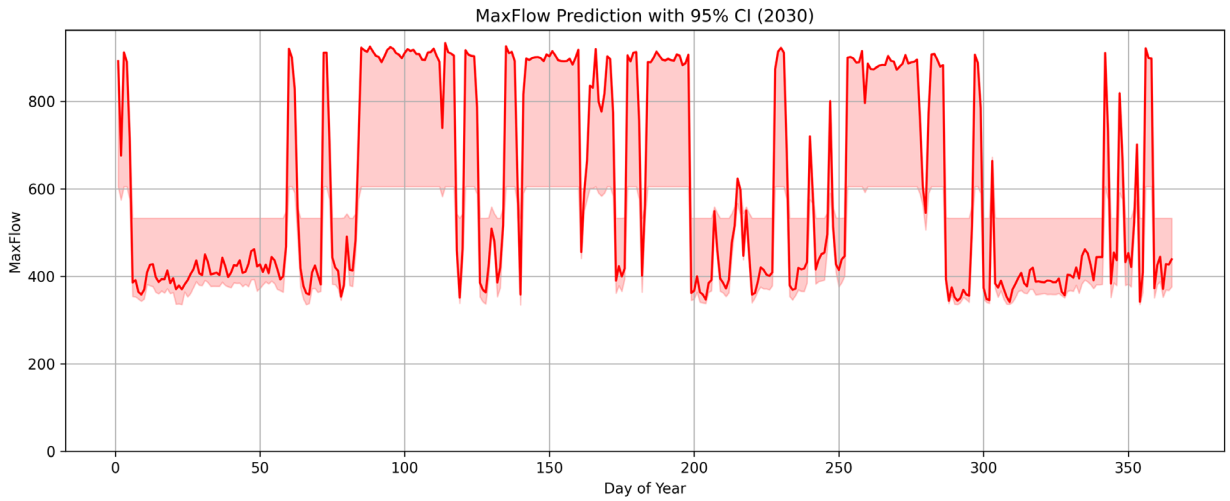


Figure B.13. Projected 2030 daily maximum energy transfer (MaxFlow) with 95 percent confidence interval (CI) between New Brunswick and New England.

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EO 14262

Federal Register / Vol. 90, No. 70 / Monday, April 14, 2025 / Presidential Documents 15521

Presidential Documents

Executive Order 14262 of April 8, 2025

Strengthening the Reliability and Security of the United States Electric Grid

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered:

Section 1. *Purpose.* The United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and an increase in domestic manufacturing. This increase in demand, coupled with existing capacity challenges, places a significant strain on our Nation's electric grid. Lack of reliability in the electric grid puts the national and economic security of the American people at risk. The United States' ability to remain at the forefront of technological innovation depends on a reliable supply of energy from all available electric generation sources and the integrity of our Nation's electric grid.

Sec. 2. *Policy.* It is the policy of the United States to ensure the reliability, resilience, and security of the electric power grid. It is further the policy of the United States that in order to ensure adequate and reliable electric generation in America, to meet growing electricity demand, and to address the national emergency declared pursuant to Executive Order 14156 of January 20, 2025 (Declaring a National Energy Emergency), our electric grid must utilize all available power generation resources, particularly those secure, redundant fuel supplies that are capable of extended operations.

Sec. 3. *Addressing Energy Reliability and Security with Emergency Authority.* (a) 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 is necessary to prevent a complete grid failure, the Secretary of Energy, in consultation with such executive department and agency heads as the Secretary of Energy deems appropriate, shall, to the maximum extent permitted by law, streamline, systemize, and expedite the Department of Energy's processes for issuing orders under section 202(c) of the Federal Power Act during the periods of grid operations described above, including the review and approval of applications by electric generation resources seeking to operate at maximum capacity.

(b) Within 30 days of the date of this order, the Secretary of Energy shall develop a uniform methodology for analyzing current and anticipated reserve margins for all regions of the bulk power system regulated by the Federal Energy Regulatory Commission and shall utilize this methodology to identify current and anticipated regions with reserve margins below acceptable thresholds as identified by the Secretary of Energy. This methodology shall:

(i) analyze sufficiently varied grid conditions and operating scenarios based on historic events to adequately inform the methodology;

(ii) accredit generation resources in such conditions and scenarios based on historical performance of each specific generation resource type in the real time conditions and operating scenarios of each grid scenario; and

(iii) be published, along with any analysis it produces, on the Department of Energy's website within 90 days of the date of this order.

(c) The Secretary of Energy shall establish a process by which the methodology described in subsection (b) of this section, and any analysis and results it produces, are assessed on a regular basis, and a protocol to identify which generation resources within a region are critical to system reliability. This protocol shall additionally:

(i) include all mechanisms available under applicable law, including section 202(c) of the Federal Power Act, to ensure any generation resource identified as critical within an at-risk region is appropriately retained as an available generation resource within the at-risk region; and

(ii) prevent, as the Secretary of Energy deems appropriate and consistent with applicable law, including section 202 of the Federal Power Act, an identified generation resource in excess of 50 megawatts of nameplate capacity from leaving the bulk-power system or converting the source of fuel of such generation resource if such conversion would result in a net reduction in accredited generating capacity, as determined by the reserve margin methodology developed under subsection (b) of this section.

Sec. 4. *General Provisions.* (a) Nothing in this order shall be construed to impair or otherwise affect:

(i) the authority granted by law to an executive department or agency, or the head thereof; or

(ii) the functions of the Director of the Office of Management and Budget relating to budgetary, administrative, or legislative proposals.

(b) This order shall be implemented consistent with applicable law and subject to the availability of appropriations.

(c) This order is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.



THE WHITE HOUSE,
April 8, 2025.

[FR Doc. 2025–06381
Filed 4–11–25; 8:45 am]
Billing code 3395–F4–P

Available at (accessed on 5/27/2025):
https://www.federalregister.gov/documents/2025/04/14/2025-06381/strengthening-the-reliability-and-security-of-the-united-states-electric-grid



U.S. DEPARTMENT of ENERGY

For more information, visit:
energy.gov/topics/reliability

DOE/Publication Number • July, 7 2025

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 51

GRIDLAB, ANAYLSIS: DOE RESOURCE ADEQUACY REPORT

2

GridLab Analysis: Department of Energy Resource Adequacy Report



Ric OConnell

Rethinking Reliability

July 11, 2025

Overview:

This memo provides a high-level overview of the recently released Department of Energy (DOE) Resource Adequacy Report, released on July 7, 2025. This report is a result of the Executive Order from the Trump Administration on Strengthening the Reliability and Security of the Grid, which directed the agency to develop and publish a methodology for "analyzing current and anticipated reserve margins for all regions of the bulk power system regulated by the Federal Energy Regulatory Commission and shall utilize this methodology to identify current and anticipated regions with reserve margins below acceptable thresholds as identified by the Secretary of Energy."

The Executive Order also directs the DOE to prevent generation sources exceeding 50 MW from retiring or converting fuel sources if it would reduce generating capacity in at-risk regions, based on the new methodology. The DOE has so far issued two emergency orders under section 202(c) of the Federal Power Act. These orders directed plant owners and grid operators to delay by 90 days the retirement of the Campbell coal plant in Michigan owned by Consumers Energy and the Eddystone gas and oil plant in Pennsylvania, owned by Constellation. The EO and its methodology report did not include a mechanism for public input.

Bottomline of the DOE report:

The report warns of a 100X increased risk of outages if the forecasted retirements by 2030 take place. The report blames the lack of "firm" generation replacement in the planned supply.

Bottomline of GridLab analysis:

The report's conclusions are problematic since the **report undercounts the resources that are likely to be added to the grid,** and **overstates** the retirements expected. Utilities and markets *already* have plans to meet increased load growth, yet the **DOE report assumes they are doing nothing after 2026**

the **DOE report assumes they are doing nothing after 2026.**

DOE Report Analysis – Key Takeaways:

- The report is based on three key assumptions: (1) the amount of load that will be added to the grid over the next five years, (2) the number of plants assumed to retire, and (3) the amount of new capacity added to the grid. The study used aggressive assumptions regarding load growth and retirements, but conservative assumptions about how much new generation capacity will be added, even assuming no new resources after 2026.
    - Load Growth: The report assumes 50 GW of data center load and allocates it regionally. It does not address flexibility of this load, however, which was recently demonstrated in a report from Duke University to allow for 100 GW of large load additions today with minimal grid impact. The DOE report then adds 51 GW of non-data center load, which means overall load growth by 2030 is 101 GW or 15%. For comparison, EIA assumed 6% growth in their Annual Energy Outlook 2025 high growth case. This is very aggressive load growth, although not necessarily unreasonable, as it is collected from each of the RTOs and utilities.
    - Retirements: The report assumed 104 GW of retirements by 2030, with 3/4 of this coal and 1/4 gas. But the most recent data from the U.S. Energy Information Administration released in June (the EIA 860) has just **half** of this capacity retiring. In the report, the DOE assumed these 50 GW of likely retirements, but included another 50 GW of *announced* retirements, inconsistent with their assumption around capacity additions. Most likely many plants will choose

not to retire due to the changing regulatory and economic landscape, driven by the administration's policies.

- Capacity Additions: The report assumes just 22 GW of new "firm" capacity (narrowly defined as gas) is added which is based on NERC LTRA "Tier 1" – projects with a very high likelihood of success. The report assumes no projects are built post 2026, which is not realistic for a report forecasting to 2030. A more reasonable assumption for capacity additions is the EIA 860 released in June, which has 35 GW of gas additions, and another 53 GW of batteries – **88 GW of firm additions by 2030.**

- The study ignores both utility plans for meeting increased load growth and how markets will respond. In fact, markets and utilities have already responded with plans to add new capacity and fast track new resources. These include PJM's Reliability Resource Initiative, which plans on adding 11 GW of new firm resources by 2030. SPP and MISO both have proposals at FERC (called ERAS) that will likely add another 30 GW of firm resources. Those three regional efforts alone would add roughly twice what the DOE assumed for the entire nation.
- This national report attempts to address what is primarily a regional issue with regional solutions. A handful of regions face pressure due to rising load growth, and those regions have already enacted plans to address this growth. For example, MISO, SPP and PJM have all instituted "fast track" processes to get firm generation online (gas and batteries), which is expected to install 43 GW of new resources by 2030. The DOE report, however, shows just 13.5 GW of new firm resources in those three regions.

DOE Report Assumptions vs. U.S. Energy Information Administration

Energy Information Administration Data:

Previous post
London Calling: How UK Grid Innovation ...

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Why the U.S. Does Not Need New Gas to ...


	DOE Report	EIA 860
Load growth:	101 GW	N/A
Capacity Additions	209 GW	260 GW
Gas Capacity Additions	22 GW	35 GW
Battery Capacity Additions	31 GW	53 GW
Retirements	104 GW	52 GW

Conclusion:

If the DOE report had used more consistent assumptions, it would have likely come to very different conclusions. Utilities and RTOs have planning processes and market mechanisms in place to build new resources in response to higher load growth and the retirement of older, uneconomic plants. The DOE's solution to keep older units online past retirement dates is a crude and expensive approach. The DOE should defer to state planning processes and regional markets to meet the challenge.

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 52

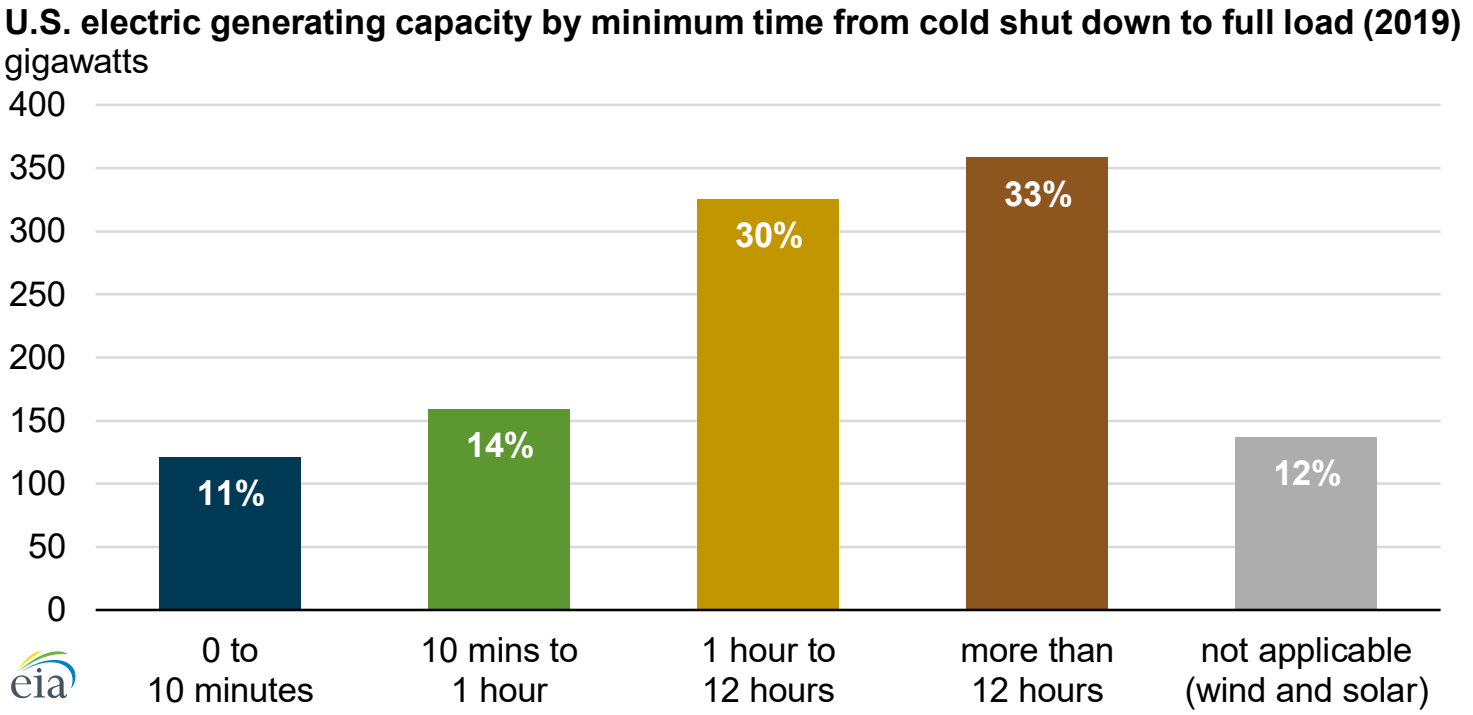
EIA, ABOUT 25% OF US POWER PLANTS CAN START UP WITHIN AN HOUR

U.S. Energy Information Administration

Today in Energy

November 19, 2020

About 25% of U.S. power plants can start up within an hour



Source: U.S. Energy Information Administration, *Annual Electric Generator Inventory*

About 25% of U.S. power plants can start up—going from being shut down to fully operating—within one hour, based on data collected in EIA's annual survey of electric generators. Some power plants, especially those powered by coal and nuclear fuel, require more than half a day to reach full operations. The time it takes a power plant to reach full operations can affect the reliability and operations of the electric grid.

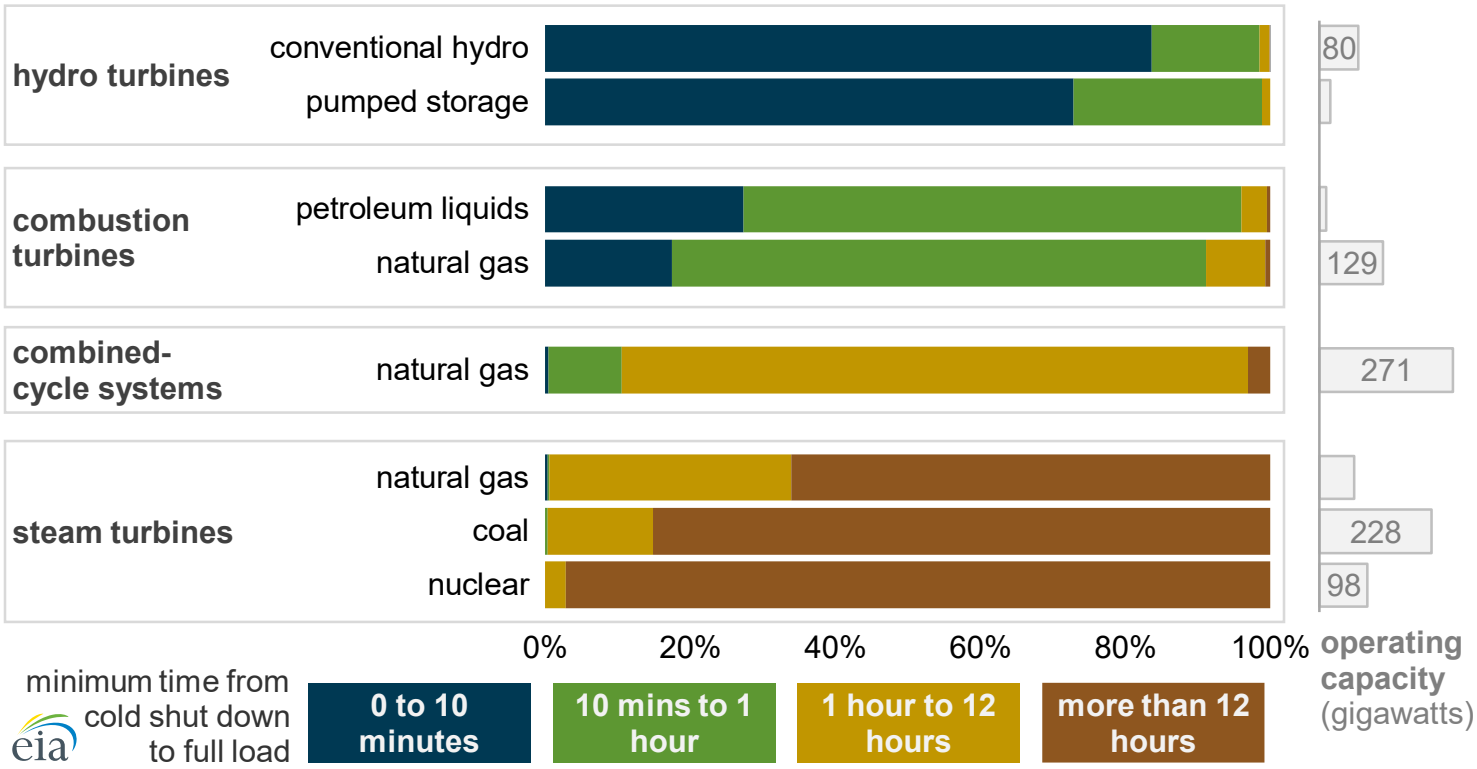
Generator startup time differs across electricity-generating technologies because of the differences in the complexity of electricity generating processes, especially when starting again after all processes have been stopped (cold shut down). A generator's startup time is different from a generator's ramp rate, which reflects how quickly that generator can modify its power output once it's operating.

Most hydroelectric turbines, which use flowing water to spin a turbine, can go from cold start to full operations in less than 10 minutes. Combustion turbines, which use a combusted fuel-air mixture to spin a turbine, are also relatively fast to start up.

Steam turbines often require more time. A fuel heats up water to form steam, and that steam needs to reach certain temperature, pressure, and moisture content thresholds before it can be directed to a turbine that can spin the electricity generator.

Nuclear power plants use steam turbines, but these plants have additional time-intensive processes that involve managing their nuclear fuel. Almost all nuclear power plants require more than 12 hours to reach full operations. Power plants that require more than 12 hours to start up are increasingly rare. Only 4% of the generating capacity that came online from 2010 to 2019 requires more than half a day to reach full load.

U.S. electric generating capacity by minimum time from cold shut down to full load (2019)



Source: U.S. Energy Information Administration, *Annual Electric Generator Inventory*
Note: Only technology/fuel combinations with at least 10 gigawatts of operating capacity are shown.

Natural gas combined-cycle systems, which involve both a steam turbine and a combustion turbine, account for more capacity than any other generating technology in the United States. Most of those systems can reach full operations in between 1 hour to 12 hours, although some can start up within an hour.

The percentage of the generator fleet that does not respond to this question in EIA's survey has doubled—from 6% in 2013, when EIA first collected this data, to 12% in 2019—as a result of the number of utility-scale solar and wind power plants added in recent years. This question is not relevant for these types of plants.

Principal contributor: Owen Comstock

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
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EXHIBIT 53

PEW REPORT

SHORT READS | APRIL 13, 2026

Most new data centers in the U.S. are coming to rural areas

Add Us On Google

BY SKYLER SEETS AND KAITLYN RADDE



Construction continues at a new Meta data center in Beaver Dam, Wisconsin, on March 31. (Joe Timmerman/Wisconsin Watch via Getty Images)

The United States has more than 3,000 operational data centers, and that number is expected to grow substantially in the years ahead. More than 1,500 new data centers are in various stages of development nationwide, according to a Pew Research Center analysis of data from Data Center Map.

About this research

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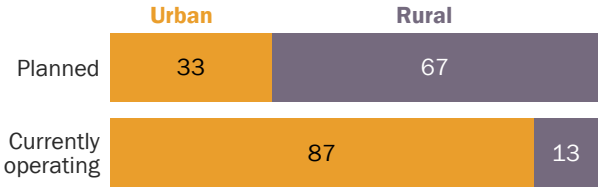
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Americans have mixed feelings about AI summaries in search results

In a shift, most planned data centers in the U.S. are in rural areas

% of data centers in the U.S. that are in ___ areas



Note: Urban/rural categories based on U.S. Census Bureau. Planned category includes data centers listed as "under construction," "planned" or "land banked."
Source: Data Center Map, accessed Feb. 19, 2026.

PEW RESEARCH CENTER

Chart Data Download Image Share

These planned data centers are largely in different parts of the country from those that currently exist:

- 67% of planned data centers are in rural areas, while 87% of existing data centers are in urban ones.
- 39% of planned data centers are in counties that currently don't have any.

South, Midwest lead in planned data centers

Most of the planned construction of U.S. data centers will happen in the South and Midwest. Three-quarters of all planned data centers will be built in these two regions, with the South alone accounting for nearly half of them (48%).

Virginia, Texas and Georgia lead the country in planned data centers

Number of data centers in each state, by operating status

State	Total	Currently operating	Planned
Virginia	685	398	287
Texas	466	296	170
California	331	277	54
Illinois	262	139	123

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State	Total	Currently operating	Planned
Georgia	235	94	141
Ohio	223	166	57
Arizona	184	98	86
New York	154	148	6
Oregon	142	115	27
Washington	135	124	11
Pennsylvania	129	78	51
Florida	128	120	8
North Carolina	113	72	41

Download data as .csv

Note: Planned category includes data centers listed as “under construction,” planned or “land banked.” Only the top 15 states by total are shown.
Source: Data Center Map, accessed Feb. 19, 2026.

PEW RESEARCH CENTER

Chart **Data** Download Image Share

Here’s a look at the regional breakdown of planned and existing data centers:

- The South has 754 planned data centers and 1,209 existing ones – a 62% increase from its current total.
- The Midwest has 419 planned data centers and 655 existing ones – a 64% increase.
- The West has 277 planned data centers and 807 existing ones – a 34% increase.
- The Northeast has 106 planned data centers and 397 existing ones – a 26% increase.

Virginia and Texas have the most planned data centers (287 and 170, respectively). They are followed by Georgia (141), Illinois (123) and Arizona (86).

Virginia and Texas also have the most currently operating data centers (398 and 296, respectively). They are followed by California (277), Ohio (166) and New York (148).

How many Americans live near a data center?

Currently, 38% of Americans live within 5 miles of at least one operational data center.

These structures tend to be built in clusters: Nine-in-ten data centers are within 5 miles of another one. As a result, a majority of Americans who live near one data center also live near at least one more.

Another 4% of Americans don't live near a currently operational data center but live within 5 miles of one that's planned. Taken together, that means 42% of the population lives close to an existing or planned data center.

Related

- *How Americans view data centers' impact in key areas, from the environment to jobs*
- *What we know about energy use at U.S. data centers amid the AI boom*

Living near a data center doesn't have much of an effect on public opinion about the facilities, however. Americans who live near a data center – whether existing or planned – are about as likely as those who do not to say they've heard or read at least a little bit about them. And the two groups of Americans have similar views about the impact that data centers have on things like the environment, home energy costs and local jobs.

Note: Here are the survey questions, the detailed responses and the survey methodology.

Topics

Artificial Intelligence, Emerging Technology, State & Local Government, Technology Policy Issues

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Skyler Seets is a computational social science assistant at Pew Research Center.



Kaitlyn Radde is a computational social science assistant at Pew Research Center.

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 54

OUC 202(C) APPLICATION – BACKUP GENERATORS

January 31, 2026

VIA EMAIL

The Honorable Chris Wright
Secretary of Energy
United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000
Attn: *AskCR@hq.doe.gov*

Re: Request for Emergency Order Under Section 202(c) of the Federal Power Act

Dear Secretary Wright:

Pursuant to Section 202(c) of the Federal Power Act ("FPA") and the regulations promulgated thereunder by the Department of Energy ("Department" or "DOE"), the Orlando Utilities Commission (OUC) respectfully request that the Secretary of Energy ("Secretary") find that an emergency exists within OUC's service area that requires intervention by the Secretary, in the form of a Section 202(c) emergency order, to preserve the reliability of the bulk electric power system. As described in the Secretary's January 22, 2026 letter, "Leveraging Backup Generation Facilities During Energy Emergencies," OUC respectfully requests that the Secretary issue an order immediately, effective January 31, 2026, authorizing certain backup generating units located within OUC's service areas to operate up to their maximum generation output levels under the limited circumstances described below, notwithstanding air emissions or other permit limitations. OUC further requests that the order remain effective through 10:00 a.m. Eastern Standard Time (EST) on February 6, 2026. OUC is requesting the Department issue an order for this duration with this limiting condition because OUC anticipates unusually high load forecasts during this time due to extreme cold weather conditions for all of the State of Florida during this period.

I. Background

On Friday, January 23 and continuing into Monday, January 26, 2026, a significant winter weather event known as Winter Storm Fern brought heavy snow, sleet, and freezing rain, as well as dangerously cold temperatures and wind chills to multiple states, ranging from the southern plains to the eastern United States. As the storm drifted across the East Coast, more Arctic air moved in behind the storm, prolonging the bitter cold, icy conditions for several days. To date, Winter Storm Fern has caused or threatens to cause severe and widespread impacts across multiple regions of the United States, including extreme cold temperatures, freezing precipitation, high winds,

disruptions to electric generation and transmission systems, natural gas supply constraints, and increased demand for electric and water services. On January 31, and February 1, 2026, and the following week, another round of extreme cold is forecasted to impact the southeast, including Peninsular Florida and South Florida and the entirety of OUC's service territory. As such, customer demand is projected to exceed record-breaking thresholds for OUC on Sunday, February 1, 2026, and again on Monday, February 2, 2026, and which may continue throughout the following week.

While the vast majority of generating units available to cover the load in OUC's service territory continue to function adequately under these stressed conditions, some units will be limited in providing the generation needed by the system conditions and limitations in their environmental permits. As a result, OUC is concerned that under these conditions the system may not have sufficient generation available to meet this unusually high demand and may be forced to curtail load in order to maintain security and reliability of the grid.

OUC has identified several non-essential commercial and industrial customers as well as city and county-owned wastewater and water facilities that have back-up generation that is available and subject to deployment to help reduce demand and potentially avoid the need for any firm load shedding that may be required during this extreme cold weather event.

Subject to the exceptions requested herein, OUC commits to continuing to take such actions, including utilizing other supply resources, before operating any units or calling on any generator to operate any units in a manner that will result in a conflict with a requirement of any federal, state, or local environmental statute or regulation, including requirements in permits issued pursuant to such laws or regulations. Even with the requested order, however, it is possible that OUC will have no choice but to curtail firm load to ensure system reliability.

II. Relief Requested

In an effort to further reduce load, non-essential customer-owned or operated backup generation facilities, as well as city and county-owned wastewater and water facilities, within the OUC's service areas may be available to disconnect from the grid and operate during this emergency (the "Specified Resources"). However, these units may be limited in their power output due to emissions and other limits established by federal and state environmental and other laws and permits. Specifically, the operation of the Specified Resources could result in emissions of NOx, carbon monoxide, and volatile organic compounds exceeding regulatory limits when operated continuously in support of the cold weather emergency. These exceedances could be the result of combustion concerns or supply issues for materials such as Diesel Emission Fluid (DEF) which helps to minimize emissions. Additionally, the units could exceed run hour limitations in their permits or as described in applicable regulations, causing such units to be placed in a category of greater regulatory scrutiny and control, due to extended run times to meet the needs of the electric grid during this cold weather emergency. Extended run periods could also cause a unit to exceed a specified maintenance interval while operating in support of this emergency.

Because the output from the units subject to these restrictions and regulatory treatment could help to reduce electric demand and potentially avoid the need for any firm load shedding that may be required during this extreme cold weather emergency, OUC seeks an immediate order from the Department authorizing the operation of the Specified Resources regardless of emissions or other permit limitations and excluding these run time hours for the emergency from compliance limits and other regulatory consideration. This relief would be available only under the following limited circumstances:

- For any unit that is unable, or expected to be unable, to produce at its maximum output in compliance with environmental statute, regulation, or permit for the duration of the order, the unit will be allowed to operate at maximum output regardless only during any period for which EEA Level 2 or Level 3 is in effect in the impacted OUC service areas, except as described in the bullet below in certain limited circumstances in anticipation of an EEA Level 2 or above. Once it is declared that the EEA Level 2 (or above) event has ended, the units would be required to immediately return to operation within their permitted limits, except for the limited exceptions provided herein for operation in anticipation of an EEA Level to prevent the cycling of units. At all other times, the units would be required to operate within their permitted limits.

- Exception: OUC seeks authority for the Specified Resources to operate in certain limited circumstances in advance of a declared EEA Level 2, or in between such events, where such operation or continued operation of the Specified Resource is reasonably necessary to avoid shutting down and restarting the Specified Resource, because such cycling of units can cause reliability issues regarding restarting, delays, and increased emissions during start up.

- To minimize adverse environmental impacts as set forth herein, this request for an order limits operation of the Specified Resources to the times and within the parameters identified in this request and as determined by OUC or the statewide security coordinator, as necessary for grid reliability to avoid adverse health and safety impacts to customers from shedding firm customer load. Consistent with good utility practices, OUC shall exhaust all reasonably and practically available resources, including available imports, demand response and identified behind-the-meter generation resources selected to minimize an increase in emissions to the extent that such resources provide support to maintain grid reliability prior to calling on Specified Resources to potentially operate at levels in excess of environmental permits.

- OUC will provide such additional information regarding the environmental impacts of the order and its compliance with the conditions of the order, in each case as requested by the Department of Energy from time to time.

OUC requests this order because it is committed to public health and safety, takes its compliance obligations seriously, and understands the importance of the environmental permit requirements that are at issue. In this case, the risk of power outages in extremely cold temperatures is a more imminent and prominent threat to the communities in OUC's service area than the temporary exceedances of those permit limits that would be allowed under the order. Authorizing the generation resources to operate notwithstanding permit and other limitations may reduce the likelihood that OUC will need to curtail load.

This request is narrowly tailored to allow only the exceedances that are necessary to ensure reliability during the limited timeframe of this request. Limiting the requested allowance to situations described above will ensure that the operation of the generation resources in excess of environmental permit limits will be a last resort to maintain grid stability, thus minimizing any environmental impact to the greatest degree possible.

OUC greatly appreciates the Department of Energy's expedited consideration of this request and commits to respond to any requests for additional information on an expedited basis. Please do not hesitate to contact me if you have any questions or require additional information in order to act on this request.

Respectfully Submitted,

Clint Bullock
General Manager and CEO

cc: rebecca.michael@hq.doe.gov
tim.kocher@hq.doe.gov
angelo.mastrogiacomo@hq.doe.gov

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 55

OUC 202(C) APPLICATION

January 31, 2026

VIA EMAIL

The Honorable Chris Wright
Secretary of Energy
United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000
Attn: *AskCR@hq.doe.gov*

Re: Request for Emergency Order Under Section 202(c) of the Federal Power Act

Dear Secretary Wright:

Pursuant to Section 202(c) of the Federal Power Act ("FPA") and the regulations promulgated thereunder by the Department of Energy ("Department" or "DOE"), the Orlando Utilities Commission (OUC) respectfully request that the Secretary of Energy ("Secretary") find that an emergency exists within OUC's service area that requires intervention by the Secretary, in the form of a Section 202(c) emergency order, to preserve the reliability of the bulk electric power system. OUC respectfully requests that the Secretary issue an order immediately, effective January 31, 2026, authorizing certain electric generating units supplying power to OUC's service area to operate up to their maximum generation output levels under the limited circumstances described in this letter, notwithstanding air emissions or other permit limitations. OUC further requests that the order remain effective through 10:00 a.m. Eastern Standard Time (EST) on February 6, 2026. OUC is requesting the Department issue an order for this duration with this limiting condition because OUC anticipates unusually high load forecasts during this time due to extreme cold weather conditions for all of the State of Florida during this period.

I. Background

On Friday, January 23 and continuing into Monday, January 26, 2026, a significant winter weather event known as Winter Storm Fern brought heavy snow, sleet, and freezing rain, as well as dangerously cold temperatures and wind chills to multiple states, ranging from the southern plains to the eastern United States. As the storm drifted across the East Coast, more Arctic air moved in behind the storm, prolonging the bitter cold, icy conditions for several days. To date, Winter Storm Fern has caused or threatens to cause severe and widespread impacts across multiple regions of the United States, including extreme cold temperatures, freezing precipitation, high winds,

disruptions to electric generation and transmission systems, natural gas supply constraints, and increased demand for electric and water services. On January 31, and February 1, 2026, and the following week, another round of extreme cold is forecasted to impact the southeast, including Peninsular Florida and South Florida and the entirety of OUC's service territory. As such, customer demand is projected to exceed record-breaking thresholds for OUC on Sunday, February 1, 2026, and again on Monday, February 2, 2026, and which may continue throughout the following week.

While the vast majority of generating units available to cover the load in OUC's service territory continue to function adequately under these stressed conditions, some units will be limited in providing the generation needed by the system conditions and limitations in their environmental permits. As a result, OUC is concerned that under these conditions the system may not have sufficient generation available to meet this unusually high demand and may be forced to curtail load in order to maintain security and reliability of the grid.

II. Relief Requested

Because the output from all of the generation units available to OUC would help to reduce the need for any firm load shedding that may be required during this extreme cold weather event, OUC seeks an immediate order from the Department authorizing the provision of additional energy from the generation units as described in Exhibit A ("Specified Resources"), regardless of emissions or other permit limitations.

To minimize adverse environmental impacts as set forth herein, this order would limit operation of dispatched units to the times and within the parameters determined by OUC as necessary for grid reliability to avoid adverse health and safety impacts to customers from shedding firm customer load. Consistent with good utility practices, OUC shall exhaust all reasonably and practically available resources, including available imports, demand response and identified behind-the-meter generation resources selected to minimize an increase in emissions to the extent that such resources provide support to maintain grid reliability prior to dispatching the generation resources at levels in violation of environmental laws.

OUC requests this order because it is committed to public health and safety, takes its compliance obligations seriously, and understands the importance of the environmental permit requirements that are at issue. In this case, the risk of power outages in extremely cold temperatures is a more imminent and prominent threat to the communities in OUC's service area than the temporary exceedances of those permit limits that would be allowed under the order. Authorizing the generation resources to operate notwithstanding permit and other limitations may reduce the likelihood that OUC will need to curtail load. This request is narrowly tailored to allow only the exceedances that are necessary to ensure reliability during the limited timeframe of this request. Limiting the requested allowance to situations described above will ensure that the operation of

the Specified Resources in excess of environmental permit limits will be a last resort to maintain grid stability, thus minimizing any environmental impact to the greatest degree possible.

OUC greatly appreciates the Department of Energy's expedited consideration of this request and commits to respond to any requests for additional information on an expedited basis. Please do not hesitate to contact me if you have any questions or require additional information in order to act on this request.

Respectfully Submitted,

Clint Bullock
General Manager and CEO

cc: rebecca.michael@hq.doe.gov
tim.kocher@hq.doe.gov
angelo.mastrogiacomo@hq.doe.gov

EXHIBIT A
(List of Specified Resources)

Unit Location	Nominal rating MW's	Primary Fuel	Backup Fuel
IND RVR CT A	36	Natual Gas	Diesel
IND RVR CT B	36	Natual Gas	Diesel
IND RVR CT C	110	Natual Gas	Diesel
IND RVR CT D	110	Natual Gas	Diesel
OSCEOLA-CT1	157	Natual Gas	Diesel
OSCEOLA-CT2	157	Natual Gas	Diesel
OSCEOLA-CT3	157	Natual Gas	Diesel
STANTON #1	470	Coal	NA
STANTON #2	490	Coal	NA
STANTON A-CC	665	Natual Gas	Diesel
STANTON B-CC	310	Natual Gas	Diesel

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 56

RATEPAYER PROTECTION PLEDGE

HAPPY 250TH BIRTHDAY, AMERICA!

THE WHITE HOUSE

NEWS GALLERY LIVESTREAM TRUMP ACCOUNTS SAVE AMERICA INVESTMENTS CONTA

RELEASES

Ratepayer Protection Pledge

The White House

March 4, 2026

America's continued economic and technological leadership depends on reliable, large-scale data center infrastructure built here at home. Data center infrastructure is the foundation of the internet, cloud computing, and artificial intelligence (AI), and supports our economic and national security. As that infrastructure grows and the related electricity demand increases, the American people should not be footing the bill for the benefit of private companies. Instead, the data center boom should be leveraged to address affordability and benefit all American households and businesses.

President Trump is calling on the leading United States hyperscalers and AI companies to build, bring, or buy all of the energy needed for building and operating data centers, paying the full cost of their energy and infrastructure, no matter what.

As part of the Ratepayer Protection Pledge, companies agree to protect American consumers from price hikes due to data center energy and infrastructure requirements, and lower electricity costs for consumers in the long term, including by:

1. Building, Bringing, or Buying New Power Supply

- **WHAT**: Companies will build, bring, or buy the new generation resources and electricity needed to satisfy their new energy demands, paying the full cost of those resources whether by building, or buying from, new or otherwise additive power plants. Where possible, these companies will also add more capacity that serves the broader public by increasing supply.
- **WHY**: This advances self-sufficiency and protects Americans from higher prices.

2. Paying for New Power Delivery Infrastructure Upgrades

- **WHAT**: Companies will pay for all new power delivery infrastructure upgrades required to service their data centers, including adequate network upgrade costs to ensure that these expenses are not passed on to the ordinary household.

- **WHY**: This way, data centers can benefit all ratepayers and the grid.

3. Paying Whether They Use the Power or Not

- **WHAT:** Companies will voluntarily negotiate new, separate rate structures with their utilities and relevant State governments wherever they build data centers. Importantly, they will pay these rates for the power and related infrastructure that are brought online to service their data centers, whether they use the electricity or not.
- **WHY**: This will protect the American people from increased utility bills as a result of the development of these data centers.

4. Investing in Local Job Creation and Workforce Development

- **WHAT**: Companies will invest in the local communities in which they build data centers. This includes hiring from within the local community and establishing programs to develop relevant skills.
- **WHY:** This allows all American workers to benefit from the oncoming technological boom at every step from construction to operation.

5. Contributing to Electric and Community Resilience

- **WHAT**: Companies will coordinate with grid operators to contribute to a more reliable grid and, whenever possible, make available their backup generation resources at times of scarcity to prevent blackouts and power shortages in their communities.
- **WHY**: Consumers will benefit from enhanced grid resilience from data center power resources in times of emergency.

Related

Ratepayer Protection Pledge Proclamation

Presidential Actions, Proclamations | March 4, 2026
Fact Sheet: President Donald J. Trump Advances Energy Affordability with the Ratepayer Protection Pledge

Fact Sheets | March 4, 2026
President Trump Secures Historic Commitment to Keep Electricity Costs Down Amid Data Center Boom

Releases | March 5, 2026
Presidential Message on Critical Infrastructure Security and Resilience Month

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 57

ENERGY INNOVATION REPORT



ENERGY INNOVATION
POLICY & TECHNOLOGY LLC®

DODGING THE FIRM FIXATION FOR DATA CENTERS AND THE GRID

Eric G. Gimon

Senior Fellow, Energy Innovation

November 2025

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I would like to thank my Energy Innovation colleagues for their patient review and feedback on various drafts of this report. I would also like to acknowledge the Energy Systems Integration Group for their conferences, taskforce meetings, and webinars which helped me get started on my research.

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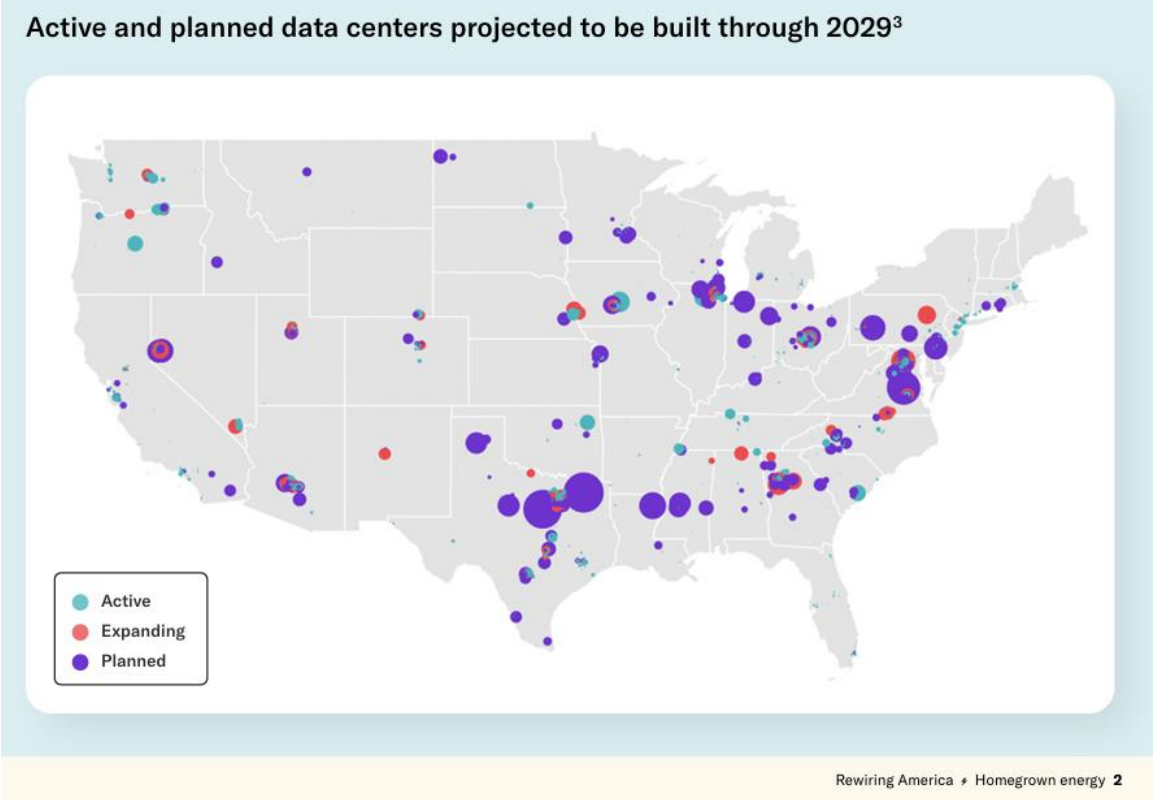
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EXECUTIVE SUMMARY

In multiple states[1,2] (see Figure 1) massive new data center campuses and a coterie of smaller ones have reversed years of flat or declining electricity demand, leaving utilities and policymakers scrambling for solutions.

Figure 1 Existing and Projected data centers from Rewiring America's "Homegrown Energy" report[3].



Faced with this onslaught of new demand, many utilities and developers are depending on old habits by adding new gas plants, refurbishing coal units, or turning to nuclear partnerships along with extensive grid upgrades near new load centers – the "firm fixation."

It reflects a belief that only firm resources and major transmission upgrades can handle data centers' needs. Yet this approach overlooks two essential truths: (1) power plants and data centers are both parts of a larger, interconnected system, and (2) data center loads, especially those driven by artificial intelligence (AI), are far more dynamic than the flat, baseload profiles they are often assumed to be. Firm fixation leads utilities and regulators to default to outdated firm-generation solutions instead of modern, modular approaches that consider the full complexities of today's power grid. At the scale of even the most compact new data centers, connecting to the grid is no small matter.

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Regardless of approach, three features of recent growth are well known to the electricity industry and policy community, and to some extent the wider public. First, new data center load is being amplified by extreme investment interest in AI. Second, incremental load tends to be highly concentrated due to the nature of the growing individual server need for power and the geographic concentration of data centers. Third, the data center industry's appetite for new growth is so large, and other facility capital costs so high that new project owners are willing to pay more for power than average existing electricity consumers.

In a 2024 brief, Energy Innovation proposed instead that a portfolio of solutions – clean energy portfolios, advanced transmission technologies, demand-side flexibility, and efficiency – could work together to obviate the need to rush to meet demand with new fossil generation.[4] Reality so far has deviated significantly from this vision, setting up the power sector for failure: Either new demand will not be met or the negative cost and performance impacts of doing so on other grid users will challenge electricity markets and other long-standing arrangements in a dangerous manner.

The mad scramble to meet data center demand using traditional but crude resource investment methods can create potential missed opportunities to manage load growth that come from a deeper understanding of data centers. Of course, their electricity demand is problematic because it is concentrated, growing fast, and willing to outspend other users. However, it is also far more complex than the flat, 24/7 block it is often assumed to be. This primer identifies six defining features that provide a more nuanced version picture of data centers:

- **Agency and Split Incentives** – Multiple actors (developers, operators, and tenants) and ownership or usage types of data centers create a divided responsibility over grid interaction and access to energy-saving incentives that complicates energy decisions.
- **Clustering** – Facilities tend to concentrate geographically, amplifying local grid stress and transmission costs while creating systemic planning challenges.
- **Consumption Profiles** – Loads are not 24/7 blocks. Instead, they are choppy, with swings of hundreds of megawatts over short intervals, undermining assumptions of steady baseload behavior and potentially affecting the stability of the grid if safeguards are not put in place.
- **Flexibility** – While some AI-driven workloads can be scheduled for off-peak hours, this flexibility is uneven across facility types and even within users in the same data center campuses. While modest levels of curtailment or load-shifting based demand response during peak hours could ease interconnection bottlenecks and peak demand requirements, these may work best in combination with battery energy storage to overcome split incentives and other complexities.

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- **Backup Requirements** – Current reliance on diesel for backup generation is unsustainable. Batteries and longer-duration storage are cleaner, more scalable options that provide knock-on benefits for the grid if allowed to participate as both backup and demand response.
- **Modularity** – Data centers grow in phases just as demand grows in phases rather than all at once, aligning poorly with "lumpy" firm large one-time investments in dispatchable power plants and infrastructure upgrades, while fitting well with modular renewables and battery deployments.

When examined as a whole, these features undermine the firm fixation logic. One-to-one matching of data centers with dedicated or "captive" firm power plants is particularly unwise for both the power generator and the new data centers, even given their willingness to pay for speed-to-power. Relying on captive plants for all supply such as pairing a nuclear plant with a large data center exposes them to outages, inflexibility, and stranded-asset risks, while hybrid co-location deals still rely heavily on the broader grid.

Most new demand will need to be served fully or in-part through the bulk power system, requiring upgrades in three key areas: **connection infrastructure, grid services (especially peak capacity), and bulk electricity supply.**

Once this is established, it's clear that data centers can tap the grid's advantages as a "system of systems" that pools variable demand and generation resources solutions together and ensures supply and demand match in real-time. As peak demand rises, this crucial service must be met, but not necessarily by firm generation. A deeper understanding of data center demand attributes yields a more complete solution set which includes data center flexibility, onsite storage, portfolios of clean energy, and others.

The challenges data centers pose include lengthy interconnection queues, peak stress, price impacts, and rising emissions – but these are not insurmountable. Three core lessons emerge for policymakers and stakeholders:

- The process of connecting any new **large load is a key leverage point.** It is the moment to ensure consumption tariffs reflect cost causation, encourage flexibility, and align incentives without imposing unworkable burdens later. Interconnection is the moment of maximum leverage: not to extract unreasonable concessions, but to ensure new entrants cover the full costs of the infrastructure they trigger, and to nudge data center developers towards solutions such as flexible demand or local storage that relieves local bottlenecks and supports the broader grid. Likewise, developers and customers should lean toward local fixes that speed access to the grid, improve power quality, and ease broader impacts—reducing the likelihood of being saddled with extraordinary requirements later.

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- **Demand side is a resource hiding in plain sight**. Household electrification and distributed resources can free up tens of gigawatts (GW) at costs comparable to new gas plants and on a faster timetable, offering a more pragmatic and equitable path to integration. Yet at the state and regional level, policy innovation still lags behind. However, several widespread mechanisms exist to channel data center owners and operators' willingness to pay into new solutions that help other existing customers accommodate rapid data center load growth in a fair, fast and equitable way. Because grid connection bottlenecks can be managed by multiple possible combinations of diverse resources, data centers don't need to do all the work of mitigating their grid impacts onsite or through a single counterparty. Once a data center has invested in flexibility and equipment to resolve local connection issues, additional constraints such as upstream transmission and grid services bottlenecks as well as large incremental amounts of annual electricity delivery can be addressed with demand-side solutions from other grid users. A recent report from Rewiring America proposes that many of the resources needed to meet data center load growth could come from sponsoring household upgrades instead of new generation.[5]
- **Storage and flexibility deliver a two-for-one win.** Batteries and managed demand not only ease all manner of data center impacts but can also accelerate renewable integration, providing cleaner, faster, and cheaper capacity than firm fossil solutions. Because batteries are increasingly essential for buffering, backup, and power quality, they also provide a built-in solution for integrating variable renewables—a two-for-one advantage. Furthermore, these renewable-plus-battery solutions can capitalize upon existing surplus interconnection to more quickly connect data centers to the grid in co-located arrangements.

This report challenges the electricity and data center industries to move beyond a firm fixation and adopt solutions that leverage the full capabilities of modern power systems.

The next section describes six defining features of data centers: agency, clustering, consumption profile, flexibility, backup needs, and modularity. We then pivot to explaining why traditional firm responses fall short within the broader context of how the modern grid supplies power to consumers, especially large, new consumers. We will look at how new, modular solutions can meet digital demand more effectively. These steps will depend on a more nuanced understanding of data centers, as opposed to how they are often imagined.

Our hope is that this information will empower policymakers to make wiser decisions when faced with AI growth and proposed public investments, avoiding a firm fixation on simplistic approaches and reaching for more realistic answers that embrace the full complexities of the challenge that rapid data center load growth presents today. By moving beyond simplistic assumptions, policymakers can avoid overcommitting to

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outdated firm resources and instead adopt strategies that embrace modularity, flexibility, and clean energy. We want to leave policymakers with three key takeaways to avoid falling into a firm power matching fallacy and to instead embrace the ability to mix and match resources to meet data center needs.

What began as a major strain on the grid can become the catalyst for building a smarter one, supporting both the digital economy's explosive growth and the clean energy transition.

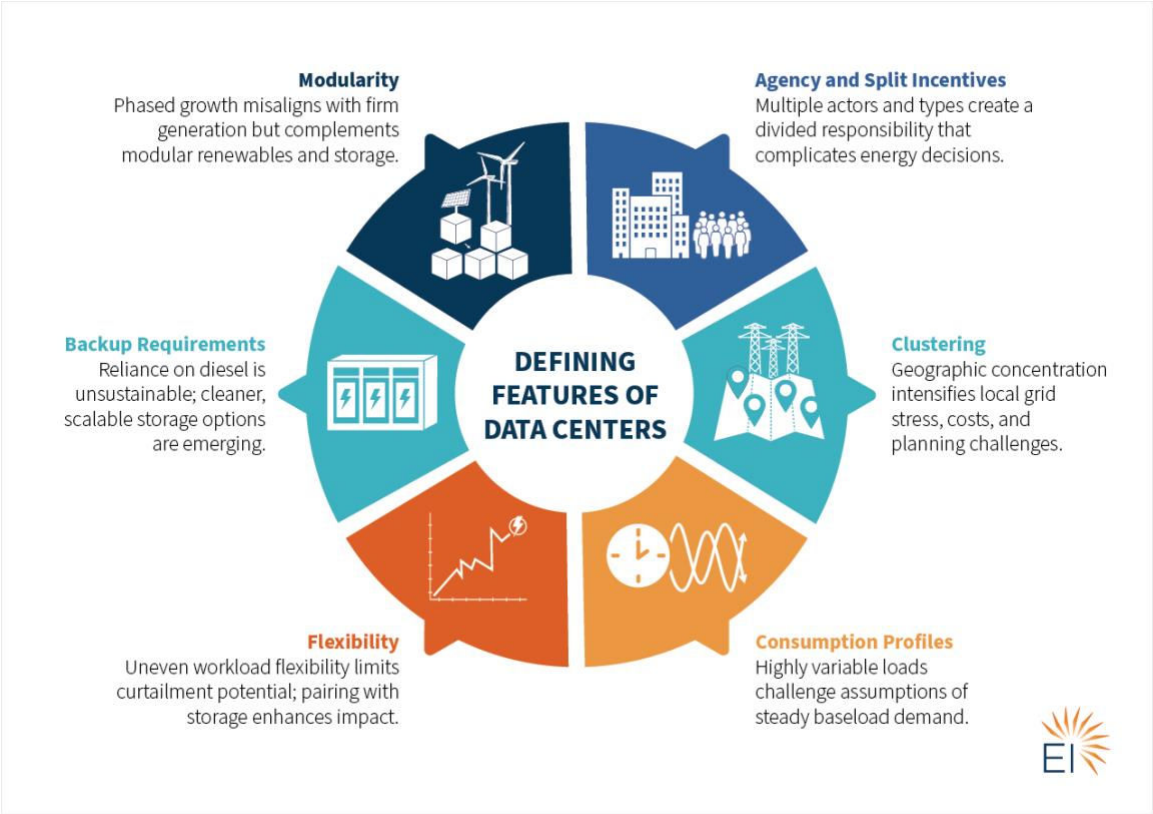
COMMERCIAL AND INDUSTRIAL REALITIES THAT APPLY TO DATA CENTERS

Actual data centers are not the simple "flat 24/7 block of demand" people imagine.

Six different demand features of data centers explain the diversity of data center types (agency, clustering, and profile) and their internal workings (flexibility, backup, and modularity).

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Figure 2 Actual data centers are not the simple "flat 24/7 block of demand" people imagine.



Data Center Feature 1: Agency and the split-incentive problem

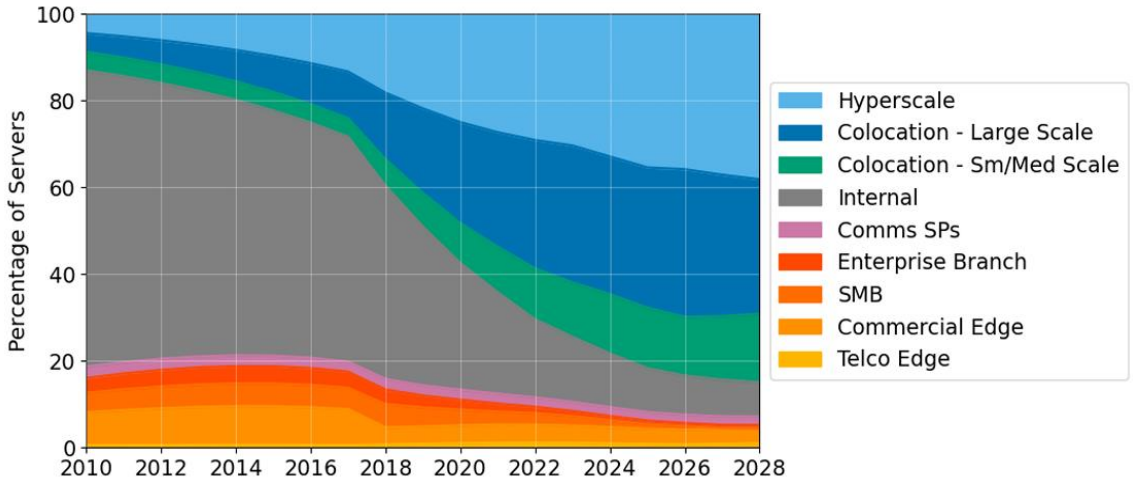
Planning *and* operating *a data center* involves many decision-makers. *Some data centers (often called co-locations or "colos") are facilities where customers can rent space to house their servers and equipment or just run their software on provided equipment. This means the facility is developed and owned by a different company* from those *that rent rack space, buy* computing *capacity, and ultimately consume electricity. Multiple actors force complicated decisions around electricity supply.*

If we want new data centers to adapt their development approach to better integrate with the grid and increase their "speed-to-power," policymakers must understand the planning, construction, and operation of modern data centers. Many different actors are involved, creating a classic split-incentive problem. Loosely speaking, apart from the users or clients, three groups of actors dictate the energy and resource impacts of data centers: developers, facility operators, and service providers. These tend to be separate entities. Overlap sometimes occurs, but usually not enough to prevent split-incentive

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issues. More than half (and an even larger fraction of the current pipeline)[6] of data centers are categorized as co-location facilities—large facilities that rent out space to multiple separate entities.

Figure 3 Distribution of server types by data center type. 2024 United States Data Center Energy Usage Report[7]



We illustrate the split incentives by cataloguing some of the key concerns for each of the three types of decision-makers in the life of a data center. In early stages, data center development is mostly a real estate bet: developers acquire land, water, and electric connection rights and then these rights pass on to the projects they sell. The natural incentive for developers is to keep the range of future owners they could sell to as wide as possible. Hence, they are unlikely to want to enter contracts or agreements (or support legislation) that might prematurely impair any of the land, water, and power consumption rights for their projects. For example, they may not want to agree to be a flexible consumer in return for faster interconnection (load interconnection currently takes three to 11 years) because that might scare off some prospective buyers.

Similarly, owner/operators that lease capacity to data centers customers do not necessarily have much insight into how flexible these customers are or how their customers' usage pattern might change over time. They are conservative about aspects such as whether the tenant-user would be interested in avoiding on-peak usage, participating in time-varying rates, accessing clean energy tariffs, or participating in a demand-response program. Obviously, renters must abide by some rules (via master service agreements or service-level agreements[i]) about behavior that impacts power quality (voltage, frequency, harmonics, transients, etc.) or broader

[i] A master service agreement is an umbrella standardized contractual framework between a utility and the "customer of record" (which could be a data center owner/operator, a tenant/end-customer, or a special purpose entity created to hold the contract) across multiple facilities in the utility's territory. A load serving agreement is more specific to power delivery at a given site.

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electrical concerns (like grounding, interference, and surge protection), but that still leaves a lot of uncertainty for the data center owner/operator. Violations may also pass undetected until a severe problem occurs.

Because data centers are also large electricity consumers, utilities will want to know if contracts are backed by the ultimate users (e.g., hyperscalersii) or an intermediate company that could go bankrupt or disappear. Grid investments involve assets with multi-decadal lifetimes, while the service life of cutting-edge chips can be two to three years. Utilities and their regulators have a strong interest in recovering any incremental costs of investments needed to serve data centers and will look for contractual arrangements to make this happen.

Data Center Feature 2: Clustering, data centers are attracted by similar conditions or to each other

Data center locations tend to be concentrated in a few regions rather than evenly distributed. This clustering amplifies stress on already energy-dense grids. The main drivers are favorable conditions—reliable power, dense fiber, skilled workforce, tax regimes, and land—but anchor investments by hyperscalers or AI campuses could also accelerate the process. Policymakers should avoid treating projects as one-offs and consider the likelihood of a single facility snowballing into a larger cluster.

"Clustering" describes how data centers in the U.S. tend to collect in a handful of regions rather than being evenly distributed. Clustering creates stress for the bulk power system because it takes already energy-dense loads and adds even more load nearby. The easiest explanation for clustering is that it derives from favorable existing conditions: reliable electricity, dense fiber connectivity, neighboring trained workforce, supportive tax regimes, and land availability.

Large anchor projects also draw in more data center development: Once a hyperscaler or AI training facility establishes itself, it signals viability, brings new infrastructure, and lowers costs for additional entrants. Policymakers wanting to provide support for a big project by promises of jobs and tax revenue, risk underestimating the impacts of this attractive force as welcoming one project may quickly lead to a cascade of follow-on facilities, with both outsized benefits and mounting strains.[8]

Recent history reveals a pattern whereby anchor investments amplify favorable local conditions into enduring centers of digital infrastructure. Northern Virginia's "Data Center Alley" grew from early fiber and internet exchange into the world's largest concentration of data centers. Amazon Web Services (AWS) was an early and steady

---

[ii] A hyperscaler is a cloud service provider or operator that builds and manages massive data center networks supporting millions of virtual servers and petabytes of data, operating globally and designed to scale seamlessly across regions. Examples might include Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), Meta (Facebook), Apple, Alibaba Cloud, and Tencent Cloud.

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investor in this cluster.[iii] Today, Data Center Alley reportedly handles roughly ~70 percent of the world's internet traffic, contains over 12 million square feet of commissioned data center space, and sustains hundreds of megawatts of power load.[9]. Reno's Tahoe-Reno Industrial Center became a global hub after Switch and Apple established major campuses, followed by Google and others[10]. Central Ohio offers a newer case: Google and AWS each invested in major builds, quickly attracting colocation providers.[11]. Atlanta and Phoenix look to be on similar paths[12].

In theory, diverse types of data centers should reinforce these patterns. Colocation facilities are drawn to network-dense hubs where they can maximize interconnection to other facilities. For example, enterprise servers might want to easily connect to multiple cloud providers—providers of cornerstone internet services stand to benefit from the reduced latency proximity affords, especially for content delivery like streaming video and games and so on. Hyperscalers could function as anchors, just like a department store in a shopping mall, investing billions into single campuses that create the vendor ecosystems others rely on. However, AI-focused facilities, with their unprecedented power needs, can also reshape the landscape by displacing other data centers competing for the same power network and generation resources.[13]

Electric power infrastructure both attracts and is stressed by clustering. Access to transmission lines and substations is a prerequisite, but as clusters grow, demand can overwhelm grids. Northern Virginia now faces multi-year waits for new hookups[14]. Reno's growth has raised water concerns and left Nevada utilities facing a potential doubling in necessary electrical infrastructure (also spurring them toward large renewable additions)[15]. Ohio illustrates the stakes most vividly: By March 2023, the utility AEP Ohio imposed a moratorium on new data center service agreements in Central Ohio, pending further study citing grid strain. Eventually regulators approved a new tariff[16] requiring data centers to pay for 85 percent of subscribed capacity whether it is used or not, with penalties for cancellation or under-performance and a four-year on-ramp[iv]. Clustering behavior can easily outrun planning and force regulators into reactive steps, introducing delays before more pro-active policies and tariffs can be put in place.

The policy lesson is not to avoid clusters—after all, they bring new jobs, tax revenue, and digital infrastructure—but to keep a skeptical eye on benefits claimed by developers and focus on smart planning. This should consider the multiple interests of stakeholders affected by a data center cluster and work in advance to align land use,

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[iii] AWS is certainly not the only part of this story but has been called out as a major player. Dan Swinhoe, "The Amazon Factor in Virginia," Data Center Dynamics, November 6, 2024, https://www.datacenterdynamics.com/en/analysis/the-amazon-factor-in-virginia/. Amazon also touts its $51.9 billion investment in Virginia between 2011 and 2021 (capital + operations) in its data center infrastructure in Fairfax, Loudoun, and Prince William counties. Roger Wehner, "Learn About AWS's Long-Term Commitment to Virginia," Amazon, June 7, 2023, https://www.aboutamazon.com/news/aws/aws-commitment-to-virginia.

[iv] Under the decision, new data centers can access up to 50 percent capacity in the first year, 65 percent in the second, 80 percent in the third, and 90 percent in the fourth before getting full access to the grid.

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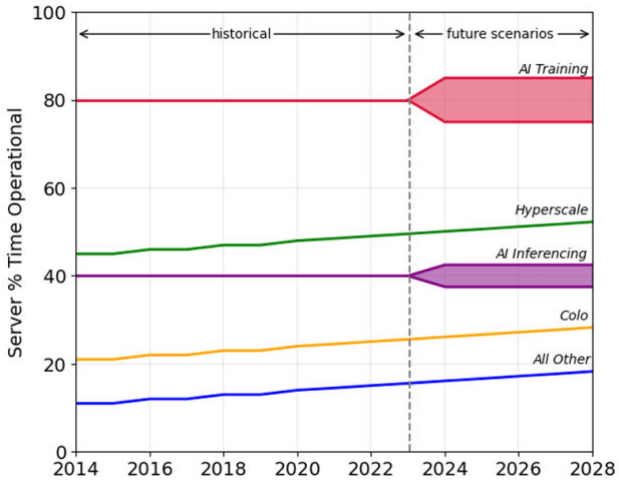
grid upgrades, generation, flexible loads, and permitting frameworks, ensuring that benefits can be captured without bottlenecks or backlash once clusters grow.

Data Center Feature 3: Consumption profile

Data center electricity usage is not steady or 24/7. Up close, it can be quite choppy and challenging. Batteries could act as a buffer—a keystone solution to managing power quality.

Data centers exhibit considerable variability, especially going between operational and idle states. In Lawrence Berkeley National Laboratory's (LBNL) 2024 United States Data Center Energy Usage Report, the authors explain that in 2014 colos reported 21 percent utilization rates, hyperscalers 45 percent – rising to an estimated 35 percent and 50 percent respectively in 2027. The same report models AI learning centers and AI inferencing at 80 percent and 40 percent utilization rates, respectively. These don't directly translate into electricity consumption load factors because some electricity is used for other purposes like cooling that don't follow a 1:1 relationship with computing load.

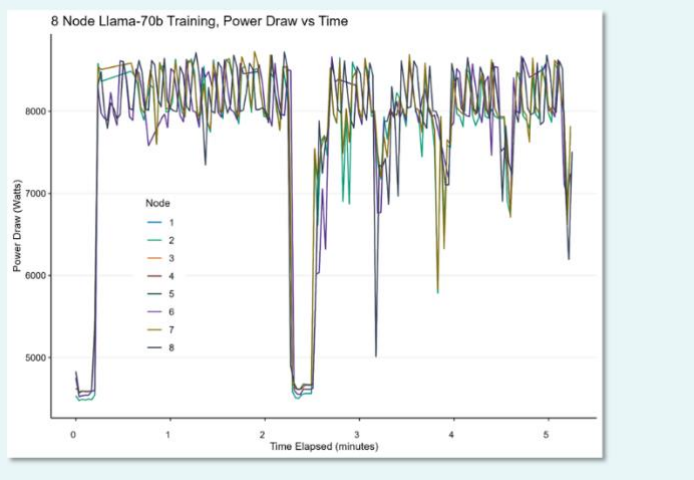
Figure 4 Server utilization by data center type. 2024 United States Data Center Energy Usage Report (LBNL).



Even looking at the whole power consumption profile of a data center, it's important to differentiate between actual load factor (the percentage of possible 24/7 full power use that a data center in fact uses) and availability (the percentage of maximum power a data center expects to have if it wants it, i.e., the *option* to use power). Whether power comes from on-site generation or from the grid, it needs to be prepared to provide power when the data center wants it, and back off when the data center doesn't.

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Figure 5 8 Node trace of power consumption in an AI learning cluster. 2024 United States Data Center Energy Usage Report (LBNL).



Big swings in data center demand will clearly be a challenge, even for the most flexible on-site generation. Given the scale at which many data centers operate, these swings can still create problems for large regional grids[v]. The CEO of Hitachi Energy reportedly commented "there can be swings of 200, 300 MW within a ten-minute period as data centers move from learn vs stop learn mode, and that these types of swings would not be acceptable from other grid customers."

At smaller time scales, large numbers of similar chips in one place switch on and off and can create an aggregate resonance effect[vi]. Existing electrical standards are inadequate for screening out these behaviors, and utilities may not have sufficient sensors to properly trace back issues to a particular data center. In aggregate, the evidence points to data centers deteriorating power quality metrics in their environs.[17]

More research needs to be done that focuses on new large digital loads, including variable generation resources with inverters that center around things like low-voltage ride through or fault clearing. For more information, context, and solutions on some of the challenges with interconnecting these large loads, see GridLab's recent Practical Guidance and Considerations for Large Load Interconnections.

Data centers are not a "perfect baseload" fit to directly couple with large mechanical generators or even the grid, and they will need significant electrical equipment to buffer this connection and prevent extra wear and tear on co-located generation or nearby grid users. Even if some data centers can learn to be flexible, incorporating battery energy storage, especially as the hardware cost decreases, will likely become a key element in managing data center impacts on the grid. When good wind and solar resources are available nearby, batteries can play a dual role in managing both load and generation variability at multiple time scales. Consider the Lancium Clean Campus in under construction in Abilene, Texas: "In addition to the 1.2 GW grid interconnection,

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[v] See the GridLab report *Practical Guidance and Considerations for Large Load Interconnections*, with special attention to July 2024 Northern Virginia Data Center Event called out in Figure 1.2.

[vi] Some of these resonance issues can potentially be solved by on-chip energy management and storage. Rouslan Dimitrov et al., "How New GB300 NVL72 Features Provide Steady Power for AI," Nvidia, July 28, 2025, https://developer.nvidia.com/blog/how-new-gb300-nvl72-features-provide-steady-power-for-ai/?utm.

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Lancium's power plan for the site includes large-scale behind-the-meter battery storage and solar resources, which serve to ensure grid reliability, and economic and carbon optimization."[18]

Data Center Feature 4: Flexibility, or the lack thereof

Flexibility could be key to quickly connecting new data centers, especially those involved with AI learning. Managed demand is possible, but on-site batteries may be a better solution where split incentives or onsite needs make demand control too rigid or complex.

Data centers can be flexible, but different functions involve different levels of flexibility. This is probably hardest to achieve for co-location data centers because the third-party owner which interfaces with the grid and with utilities is not the one deciding what servers inside its facility are doing. Additionally, data centers are tasked with fluctuating sets of applications, creating uncertainty about how reliable or persistent demand management can be as a means of providing flexibility.

Data centers fully owned by large hyperscalers provide a higher degree of control over the whole facility. But the diversity of services being provided, often with low latency (response times) needs, may create constraints on what the hyperscaler can do. Hyperscale data centers provide both regular services—like AWS' cloud computing—and AI workloads such as inference, which involves answering client queries using pre-processed AI models.

For AI learning data centers, which create these large learning models, the goal is to cram as many chips as possible into the same square mile with the fastest internal connectivity so that the collection can operate as one big parallel machine[19]. Much of the possible flexibility here comes from adjusting the timing of computing batches, yet matching these adjustments to power supply flexibility needs is not a given, especially when considering that data center operators will want to prioritize computation over flexibility. This is a consequence of the relatively larger size of the capital investment in computing hardware versus energy generation and distribution for most applications.

Flexibility is a particularly important quality for data centers because they are such a large component of load growth, and just a little flexibility would reduce the need for new peaking resources and speed up interconnection[20]. A 2025 analysis[21] by the Nicholas Institute for Energy, Environment & Sustainability at Duke University finds that just 0.5 percent to 1 percent flexibility opens significant space on the grid: 98 GW of new load could be integrated at an average annual load curtailment rate of 0.5 percent, and 126 GW at a rate of one percent. This level of flexibility is similar to what is provided by demand-response programs that exist today for other loads, but as far as speeding up interconnection, it may be the AI-driven hyperscalers and learning centers, acting more directly under their owners' control and schedules, that can achieve more.

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AI loads are fundamentally more flexible than generic data center loads because they can be processed in batches, easily scheduled, and often internally orchestrated. For example, in a presentation[22] to the Texas grid operator Electric Reliability Council of Texas (ERCOT), the company Emerald AI demonstrated how it could implement flexibility at a data center. The company argued there is enormous potential to control AI data center load, and that "major hyperscalers are amenable to curtailing up to 25 percent for up to 200 hours in return for priority interconnection of 1 GW."

No one knows if any particular data center's operations will remain stable enough to guarantee a given level of flexibility or willingness to curtail over the lifetime of matching local grid upgrades. In some cases, the data center load can be flexible (willing to forgo some batches of work) but not exactly in the way that best serves the local grid. Some amount of local battery energy storage (providing multiple value streams like integrating local on-site variable energy, backup, and power quality services) could also help data centers be more flexible at their grid interface, especially those with less direct control over internal processes.

Data Center Feature 5: Backup needed for disturbances and outages

Most data centers require backup. Demand flexibility and short-duration batteries can either eliminate or lighten the load for traditional backup solutions.

Many data center customers aspire to high availability—as much as 99.999 percent uptime—hence the need for backup power to take over in case of any grid failure. The Uptime Institute, a widely followed source for industry tier certification in data center design, build, and operations,[23] defines four reliability tiers (I through IV) with increasing expectations for performance under challenging conditions, with an eye towards worst-case scenario planning. Many data centers serving enterprise needs require at least a Tier III level of reliability, either because of a direct need, like maintaining accessibility to data under adverse conditions, or as a proxy for operational trustworthiness. For mission-critical operations—major banks, stock exchanges, the military, or hyperscalers serving global customers—a Tier IV level of availability may be required.

Because Tier III and Tier IV facilities require 72 and 96 hours of on-site power capacity, respectively, simple economics dictate that backup is usually in the form of diesel generators with fuel storage on-site. Batteries can also be used to help ride-through disturbances in power supply,[vii] providing faster response times and reducing fuel and maintenance expenses on diesel. However, with today's technology, battery energy storage systems (BESS) that can cover critical needs for three to four days are not

[vii] In current facilities, this ride-through comes via the uninterrupted power system (UPS) usually provided by old-school lead-acid batteries, but modern lithium-ion battery energy systems can provide these services along-side the bulk of backup power needs.

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economically feasible, especially without some form of on-site generation to sustain their state of charge.[viii]

However, diesel does not scale well: As data centers get much larger, massive tank farms for the generators' on-site fuel require complex fire protection, spill containment, and environmental risk mitigation. Furthermore, many air districts (e.g., Virginia, California, or Oregon) place strict caps on generator run time and cumulative emissions in a site or region. Placing more than a hundred diesel generators on one site creates a cumulative permitting challenge and may well face serious local resistance along with the prospect of delays or outright rejection from regulators. Somewhat cleaner gas generators (turbines[ix] or reciprocating engines) are usually connected to a pipeline and require large propane or liquefied natural gas storage facilities to satisfy on-site capacity requirements.

Some large hyperscalers are opting to target better up-time based on statistical estimates rather than explicit proxies for reliability. For example, Microsoft has publicly committed to reducing the use of diesel generators by 2030. To that end, it contracted with Saft, a subsidiary of TotalEnergies, to install four battery energy storage systems, each in groups of four megawatt hours (MWh) and capable of 80 minutes of on-site power, to replace diesel backup.[24] In the U.S., Microsoft's newest Azure region in San Jose, California is also being built diesel-free, but is using natural gas turbines for backup (plus batteries for ride-through). In general, the U.S. grid is quite reliable, with the one-in-ten reliability standard[x] mostly achieved at the transmission service level.[xi] Most outages that do occur are less than one or two hours, so a battery can carry enough of the backup burden to get the facility to a high level of reliability while hardly, if ever, using on-site generation.

As longer-duration storage solutions like Form's 100-hour battery [25] or thermal batteries[26] connected to local renewables and steam turbines in local energy parks[27] emerge, data centers will be able to free themselves from fossil fuel backups while taking advantage of integrated design to combine multiple uses of batteries for flexibility, power quality, and backup.

[viii] To see how this is done in detail, see the NREL Vulcan platform demonstration in collaboration with Verrus. Deepthi Vaidhynathan et al., "Vulcan Test Platform: Demonstrating the Data Center as a Flexible Grid Asset" (National Renewable Energy Laboratory, June 2025), https://www.nrel.gov/docs/fy25osti/94844.pdf.

[ix] Although gas turbines face significant supply chain cost and delivery challenges currently. GridLab, *Gas Turbine Cost Report*, https://gridlab.org/gas-turbine-cost-report/.

[x] The one-in-ten reliability standard is a standard that applies for the bulk power system (i.e. transmission level) requiring transmission planners, system operators and reliability planners to aim for nor more than one "event" of involuntary load-shedding in ten years. If one "event" was 24 hours, that is already 99.97 percent up-time.

[xi] Actual recent figures for grid performance are quite good (see table 1.1). North American Electric Reliability Corporation, *2024 State of Reliability*, June 2024, https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2024_Technical_Assessment.pdf.

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Data Center Feature 6: Modularity—data centers are built in phases

Data centers expand in discrete phases, from racks to halls to entire campuses, with uncertain demand and rapidly rising power density. This modular growth pattern matches well with the modularity of renewables-plus-batteries deployment, which can be built in parallel to meet incremental load without the risks of lumpy firm power investments.

For utilities and data center developers, timing capital investments can be challenging. Matching these investments with energy supply for their increasingly electric power sub-components compounds the challenge. Building a new data center means committing to constructing a large building and grid capacity without knowing if consumers will come, how quickly they will deploy, or how their consumption will evolve over time. Tenants in a co-location situation, hyperscalers, and AI data centers may not immediately have all the chips available (or face some other bottleneck) so may want to deploy in phases: slowly building up electrical demand over time until reaching full capacity, if all the anticipated demand materializes. With a chip service life of around two to three years, the balance between increased efficiency and increased computing power may mean newer chips could either increase or decrease electricity demand in each physical asset footprint.[xii]

The digital world's infrastructure is itself modular—built from discrete, substitutable units. Data centers are not just abstract systems of bytes and tokens; they are also collections of tangible components: chips, servers, and, above all, racks. The rack is the main unit of reference: a cabinet holding multiple slender servers or "rack units." Racks are grouped into "pods" of 20–30, and an enterprise client might deploy a couple of pods at a time in either a dedicated or co-location facility. Some tenants lease only a handful of racks in a shared space, while hyperscalers may build entire halls of 200–400 racks, with multiple halls forming a single phase of expansion on a large campus[28].

The modular nature of data centers lets developers manage financial risk by building in phases, with the option to add new capacity quickly but in a planned way. Each phase, however, carries high stakes not only in capital cost but also in power demand. A 2024 Uptime Institute report[29], states finds that four- to six-kilowatt (kW) racks remain common, with a trend towards higher consumption today. Meanwhile, AI applications and high- performance computing are pushing the development of liquid-cooled racks with incredible increases in power density. Vertiv, an Ohio-based company that designs, manufactures, and services critical infrastructure for data centers, reported in its 2024 Investor Event Presentation[30] that extreme rack densities already reach 250 kW

[xii] This is certainly a question in flux. Google has reported that over a recent 12-month period, the energy footprint of the Median Gemini Apps text prompt dropped by 33x! At a given facility this can be achieved by increased throughput or reduced energy use, or both. Amin Vahdat and Jeff Dean, "Measuring the Environmental Impact of AI Inference," Google Cloud, August 21, 2025, https://cloud.google.com/blog/products/infrastructure/measuring-the-environmental-impact-of-ai-inference.

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per rack today and could exceed one MW within five years. That means a space the size of a bedroom closet could consume more power than a thousand average homes. As a result, a single phase of development for a data center might range from on the low end at 250 kW (two-dozen at 10–12 kW per rack) on the low end to 250 MW at the high end (a 1,000 liquid-cooled 250 kW racks) at the high end, with extra overhead for cooling.

The extreme end of data center development is exemplified by data center developer Vantage's recently announced plans [31] to build its $25 billion Frontier campus situated on 1,200 acres in Shackleford County, Texas, with an eventual total consumption of 1.4 GWs—close to average total consumptions of the states of either Rhode Island or Delaware. And this project is not alone: a September 2025 ERCOT staff report[32] to ERCOT's board details 130 GW of non-crypto data center load in the interconnection queue through 2030.[33] In the last few years, Texas has met new additional load with new, mostly clean generation. Of the 428 GWs of generation requests as of August 31, 2025, 204 GWs are for wind and solar and 180 GWs are for energy storage (together 90 percent of all requests).

Data center development may come in all levels of power consumption. However, because developers rarely build, install, and commission data centers in a single phase, projects of all sizes need a power supply that can grow and expand with them. When covering the incremental energy demand from a new data center, a large new single firm resource is an unwieldy indivisible capital investment. A modular approach with renewables plus batteries reduces risk and provides better economics: You're not committing to a single lump-sum investment in a 500 MW gas turbine; you can phase investments, optimize based on real usage, and spread spending—and risk—over time.

With computing loads that grow unevenly, modular investments let operators respond dynamically—deploy more solar, wind, or storage as AI racks come online. As a bonus, you can avoid supply chain bottlenecks because incremental installation bypasses the big lead times and equipment backlogs associated with large generator orders, enabling continuous expansion without project delays. Just as data centers grow in discrete steps, modular renewables and batteries let the grid grow in parallel.

These six features highlight why data center demand is complex, not just a flat, 24/7 block of constant load. We now turn to how supply options can, and cannot, match this demand.

THE BEST WAY TO MEET DATA CENTER DEMAND IS DIVERSE RESOURCE PORTFOLIOS

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When thinking about how to supply new demand from the rapidly growing data center industry, the key point to remember is **one-to-one matching with "firm" resources will not "solve" the load growth needs from data** centers.

In this section, we explain why single, stand-alone generation resource matching for any given industrial load has rarely been the historical course, and how and why that might change. We then describe the three resource buckets that new data center projects need to acquire to use the existing bulk power system. Finally, we discuss how the data center demand features described in the preceding section create further challenges and barriers in acquiring these resources.

Debunking the one-to-one matching myth

If you imagine data centers as large capital assets running power through expensive electronics 24/7, it seems natural to imagine a dedicated "captive" 24/7 power plant built to match this demand, with historical precedent for this one-to-one matching. For example, in the post-war era aluminum producer Alcoa built smelters near cheap grid sources of hydropower in New York and the Pacific Northwest along with captive coal plants in Indiana and Texas to feed the company's aluminum smelters and mills. Today, industrial facilities use on-site combined-heat-and-power (CHP) plants to consume both the electricity and waste heat from fuel-driven power plants to operate industrial facilities with high end-use efficiency, and thus lower energy costs. According to the U.S. Energy Information Administration's (EIA) latest Manufacturing Energy Consumption Survey from 2022, U.S. manufacturers produce around 17 percent of their electricity needs on-site (Table 11.1) and that on-site generation is 97 percent co-generation (Table 11.3).[xiii]

Single plants may not "play nice" with data centers

The demand characteristics of data centers described in the prior section raise immediate concerns regarding matching a captive plant with a data center. For example, while a data center may want 24/7 availability, its actual consumption will ramp up and down significantly with a profile that a large, single on-site generator might struggle to meet. Many fossil generators have a minimum dispatch level they cannot fall below, and "ramp rates" limits dictate how quickly they can adjust up and down. Furthermore, a modular, phased build-out does not lend itself to a single matching resource because in order to provide sufficient power for the full buildout,

[xiii] This survey defines co-generation as "the production of electrical energy and another form of useful energy, such as heat or steam, through the sequential use of energy. Cogeneration includes electricity generated from fossil fuels, such as natural gas, fuel oils, and coal; wood; and other biomass." In practice, the steam/heat is the main other energy output, so co-generation is often used as synonymous with CHP.

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the single resource would have to operate at lower, inefficient, dispatch levels during earlier phases of data center construction and operation.

Beyond a mismatch with the demand characteristics of data centers described in the prior section, there are additional reasons to question using a captive plant as a 1-1 match for a data center.

Captive power plants are not highly reliable alone

Table 4 from the North American Electric Reliability Corporation (NERC) 2024 State of Reliability Overview [34], shows the recent weighted forced outage rate (rate of unexpected failure) was 11.7 percent for coal, 7.7 percent for gas, 6.4 percent for hydro, and 2 percent for nuclear. Another relevant consideration is planned maintenance, like cleaning out coal boilers, maintaining and inspecting gas turbines, or refueling nuclear plants every 18-24 months.[xiv] This means a single supposedly "firm" plant will be unavailable for a double-digit percentage of time—not what data centers are looking for.

If an industry is set on self-supply, one strategy is to over-supply generation. Alcoa's Warrick, Indiana aluminum smelter and mill built three captive 144 MW coal plants alongside a 300 MW coal unit shared 50/50 with the local utility Vectren. With a total capacity of 732 MW but serving a local load of 550 MW,[35] the facility was clearly resilient to losing one unit and still running. But this effectively meant carrying 25 percent more capacity than necessary, without a guarantee of full reliability. Alcoa mitigated this extra cost by selling excess power to the grid and importing power from Unit 4 or the broader grid when necessary. This illustrates the general case that a grid connection remains both a sink for surplus and an important backup option; most on-site power is not fully independent and large loads will still want interconnection to the bulk power system. In fact, payment for grid backup (usually called "standby rates") is a common feature of CHP tariffs.[36].

What happens when the power plant is no longer needed?

An interesting postscript to the Alcoa Warrick plant story is that Alcoa announced it would shut down its aluminum smelter in 2016 (although it had partial restarts post 2018) because of poor market conditions [37] and transferred major rolling mill and finishing operations to Kaiser Aluminum in 2021.[38] It is now left with an unattractive coal generation asset, whose generation capacity now exceeds Alcoa's local demand and

[xiv] This is on average a 32-day process. Aaron Larson, "Planning Is Key to Successful Nuclear Refueling Outages," POWER Magazine, September 1, 2023, https://www.powermag.com/planning-is-key-to-successful-nuclear-refueling-outages/.

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will likely struggle to sell surplus capacity in the broader power market along with most coal assets,[39] which comes with significant environmental remediation liabilities.[xv]

This is always the risk with a captive power plant: One day the load will vanish because of changing economics. Investors will want to know if Plan B exists and that the captive plant is in and of itself an attractive asset with a bright future.

Co-location of prime power generation assets with data centers today

Grid bottlenecks create considerable talk about co-locating "prime power" generation[xvi] with new data centers. This might include leveraging existing nearby assets (for example, the Talen-Susquehanna deal which co-locates a data center next to a nuclear plant[40]), restarting mothballed generators, or building new on-site resources (such as gas plants). But these arrangements are not true one-to-one matches of generation with load, since they still depend heavily on a grid connection for full functionality, sometimes at the expense of other consumers.

For example, in the Talen-Susquehanna deal, the data center is physically adjacent to a pair of nuclear units. It is unlikely the units' output will ramp precisely in step with data center consumption. Therefore, matching local supply with demand creates net output—nuclear output minus on-site data center consumption—variability which must be managed by the grid operator. During the refueling of one nuclear unit, the other must pick up the data center load, thereby reducing exports to the grid. In effect, the grid acts as backup.

Hybrid arrangements using on-site power together with the grid can address bottlenecks. They combine physical and financial hedges. The Talen-Susquehanna deal, for instance, was eventually reshaped into a power purchase agreement after regulatory push-back.[41]. These hybrid deals share many of the properties—and many of the drawbacks—of other on-site generation deals discussed above.

If land is available, the best way to provide on-site prime power is not with a single firm resource but by using an energy park[42] with renewables and batteries, with backup from longer- duration storage and/or gas generators.[43] Then most of the generation is

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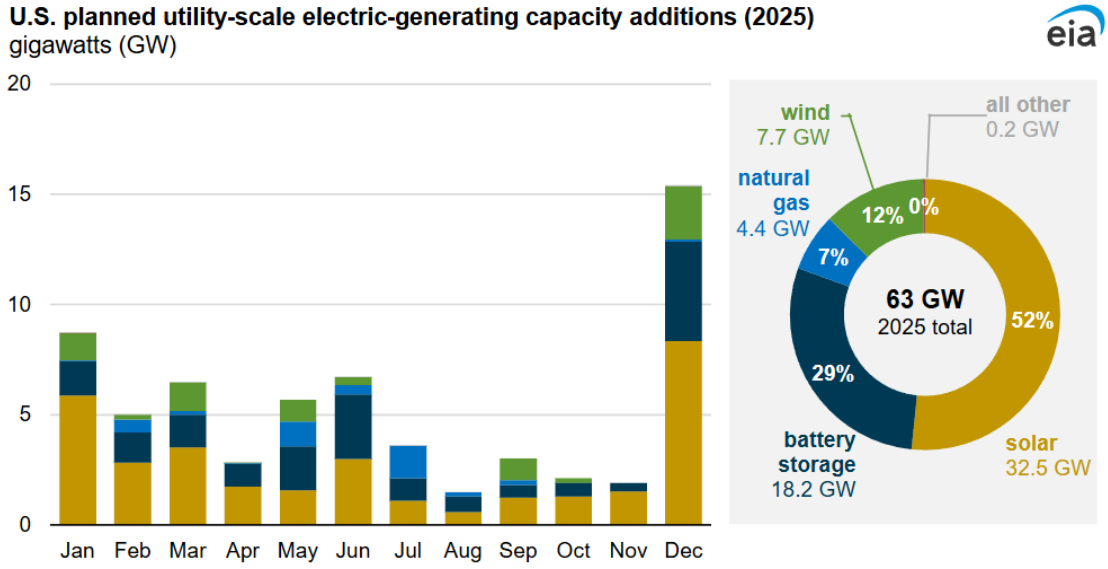
In 2024, Sierra Club and Environmental Integrity Project intervened in a case against Alcoa Warrick for "100+ permit violations" in 2022 and 2023, including releases of mercury, aluminum, chlorine, copper, fluoride, nickel, and zinc into the Ohio River. Environmental Integrity Project, "Groups Intervene in State Action to Stop Aluminum Smelting Plant's Illegal Dumping of Heavy Metals in Ohio River," February 21, 2024, https://environmentalintegrity.org/news/groups-intervene-in-state-action-to-stop-aluminum-smelting-plants-illegal-dumping-of-heavy-metals-in-ohio-river. There are also lingering questions regarding compliance for Warrick's "ash ponds" under the Environmental Protection Agency's Coal Combustion Residuals rules. Hoosier Environmental Council, "Today's EPA Action Means More Coal Ash Cleanup for Indiana" (press release), April 25, 2024, https://www.hecweb.org/wp-content/uploads/2024/04/PRESS-RELEASE-Todays-EPA-Action-Means-More-Coal-Ash-Cleanup-for-Indiana.pdf.

[xvi] Prime power is the continuous everyday power that powers the data center, as opposed to backup power There is also "bridge power" which is local generation which acts as prime power until a grid connection is put in place, and then becomes either backup or just a part of the supply portfolio.

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clean, faster, and cheaper to deploy than other generation and helpful for hyperscaler emissions commitments. In addition, the combined resource is more reliable, with fewer large points of failure than a handful of fossil units – a good Plan B if load never fully materializes or decreases. Included energy park resources would reflect a microcosm of trends in the wider U.S. market where the large majority of generation coming online[44] and waiting in interconnection queues are renewables and batteries.[45]

Figure 6 Solar, battery storage to lead new U.S. generating capacity additions in 2025. US EIA.



Data source: U.S. Energy Information Administration, *Preliminary Monthly Electric Generator Inventory*, December 2024

Providing new electricity supply for data centers from the bulk power grid

Given that most data centers will need to get some, if not all, of their power from the bulk power system, it is helpful to review how large commercial or industrial loads do this. The power grid is a system of systems including physical transmission and distribution poles and wires, the generation and loads they connect, operations and dispatch, power markets, and power purchase agreements.

As soon as a large new load decides to connect to the bulk power system, its needs can be disaggregated and met in many ways.

The grid resources a new data center project must collect to successfully draw from the bulk power system fall into three broad buckets: connection, grid services, and bulk electricity.

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New large data centers will require connection and network upgrades

How data centers connect to the grid depends on their size: scale matters. Smaller enterprise and co-location data centers (tens of MW or less) will often connect to a distribution system's high-end network (i.e., somewhere between 13.8 and 69 kilovolts) and may tie into an existing distribution substation with a new feeder. The utility typically owns and operates the primary substation equipment, while the data center customer owns the step-down transformer to its facility. The local utility conducts the impact studies and plans local upgrades to ensure compliance with NERC standards. Too many connections in the same area may trigger transmission upgrades and inclusion in transmission planning studies. In some geographies, like Virginia, this may involve an independent system operator (ISO) such as PJM [xvii] in planning and approving upgrades.

Larger data center campuses will have their own complex internal grid that connects directly to a bulk power system transmission substation. The data center must file a large load interconnection request with the local transmission owner or ISO. Tariffs and agreements will include matters like covering study costs, equipment ownership, and who pays for upgrades. The state may also require approvals for siting, environmental review, and cost recovery. The connection process can become long and painstaking once local capacity on the grid becomes tight. In Virginia's Dominion utility territory, data centers larger than 100 MW face up to a seven- year wait for power hookups.[46]

One important feature of new connection costs is that they are usually covered by the new load because cost causality is clear. Unfortunately, this may not hold true for more upstream transmission impacts where transmission upgrade costs are traditionally socialized more widely. A recent Natural Resources Defense Council (NRDC) report[47] tells the story in PJM: "Tight supply conditions led PJM to approve a $5 billion transmission expansion project to meet new data center demand in Virginia, where data centers already account for around a quarter of the state's electricity demand. The costs for this project were distributed by the Federal Energy Regulatory Commission (FERC), PJM, and utilities using varying cost allocation methods. Maryland residential customers were left with a bill of approximately $330 million, and Virginia residents had to foot $1.25 billion for transmission designed largely for a handful of data center customers in only a small region of the state."

Data centers create new stresses on a bulk power system planned around peak demand; they also consume other grid services

The main grid service data centers require regardless of size is peak capacity: the ability to serve up to their maximum interconnection rating during periods of system peak.

[xvii] Also referred to as a regional transmission operator, PJM covers 13 states in the mid-Atlantic and is one of the largest power markets in the world.

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Going back to PJM (often a source of current examples because it already serves so many data centers), the ISO's board chair communicated about future reliability concerns because: "PJM's 2025 long-term load forecast shows a peak load growth of 32 GW from 2024 to 2030. Of this, approximately 30 GW is projected to be from data centers."[48]

PJM's conundrum is how to keep the grid reliable as data center demand grows faster than new generation. Its "non-capacity-backed load" proposal would classify very large new loads (less than 50 MW) as customers outside the capacity market.[49]. The idea is to avoid shifting costs to others, but critics say that the 50 MW cutoff is arbitrary, curtailment rules could distort market signals, and contract and siting decisions may be disrupted.[50]. PJM is still debating whether the non-capacity-backed load should be voluntary or mandatory in shortage zones before filing at FERC for the 2028/29 delivery year.[51]

One challenge with resources like peak capacity is that once a project has been approved for interconnection, been built, and paid its share of costs, it becomes a load like any other. At that point, it is very difficult for the market to discriminate against it without creating efficiency concerns or legal risks. Data centers do more than strain peak supply; like all large loads with some variation, they also draw on ancillary services and other grid management resources.

If incremental demand is not met with increased supply, prices and emissions will rise

As the recent Nicholas Institute report[52] points out, some amount of flexibility from data centers could significantly reduce costs and delays associated with connection and peak demand constraints from new data centers. The report estimates peak load bottlenecks could be avoided for around 100 GW of so-called "curtailment-enabled headroom" on the U.S. grid. However, even if data centers avoid consumption during the most problematic hours, they still need power the rest of the time. Absent new supply on those same grids, the extra generation available off-peak will be from more expensive, and typically dirtier, marginal generation units.

Data centers' need to draw most of their power from existing units is thus a problem for other electricity customers because absent new matching supply, it will drive up their wholesale electricity costs. It is also problematic for the data centers themselves, which frequently are tied to corporations that have carbon reduction goals which are incompatible with increased emissions from existing fossil power plants. Conversely, new supply (especially cheap and clean supply) arriving quickly enough to offset data center consumption without requiring a large amount of new grid infrastructure creates potential for "beneficial electrification[53]" where more power over the same wires reduces other consumers' costs[54].

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Further consequences: Challenges and barriers specific to data centers

Connecting large new data center loads through the lens of three resource buckets faces three broad challenges required by all such loads. But these resource buckets also interact with the six more specific data center demand characteristics outlined in the preceding section.

Connection challenges specific to data centers

Because the source of many connection issues—or at least more expensive upgrades—come down to a limited set of hours and circumstances, flexibility is often cited as a master key for easing or speeding up connection. But flexibility is not always as simple to implement as first imagined, and other connection challenges specific to data centers are not necessarily circumvented with a touch of flexibility.

- **Agency:** Especially for co-location data centers, the operator is stuck between wanting to be more flexible to satisfy grid constraints and the imperative to be as generic as possible in contracts with tenants to accommodate as broad a class of customers as possible. Typical quality of service and service-level agreements also act as a barrier for to tapping flexibility.[55] Intervenors in public utility cases also question whether policies for ensuring new data centers cover all their incremental costs are effective[56].
- **Clustering:** Clustering leads to many data centers on the same part of the grid, necessitating more upstream transmission upgrades, as in the Virginia case mentioned cited by NRDC, mentioned above.
- **Consumption profile:** Big swings in power demand and power quality impacts on other consumers make data centers trickier for utilities and transmission providers to study and interconnect than simple 24/7 constant loads. Standard protection schemes and the collective behavior of 60 data centers recently caused a large reliability problem in Virginia in July 2024 when these data centers all dropped off the grid at once and caused a sudden surge in excess electricity that strained grid resources.[57]
- **Flexibility:** Some data centers are not flexible at all; others could be flexible but not in a manner consistent or predictable enough to satisfy the engineers running interconnection studies. These engineers are only likely to be satisfied after adding sophisticated energy management systems and large batteries, along with the promise of judicious backup power.
- **Backup:** As mentioned, backup power could be leveraged to facilitate connection or provide so-called "bridge power"[58] for data centers that cannot wait for interconnection. Unfortunately, backup power (used either for

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flexibility or bridge power) tends to be dirty, leading to siting and local community environmental concerns.[5960]

- **Modularity:** With a modular or phased build-out, a data center may ask up front for a large enough connection to accommodate all future phases, leading to stranded asset risk if all phases do not materialize.

Grid services challenges specific to data centers

Just as for solving connection issues, flexibility can help tamper the impact of new data centers on system-wide needs like peak capacity issues. A large overlap exists between local grid and larger grid issues with peak planning. However, as described in the prior section, flexibility is not always easy to implement or deploy in a manner which solves all challenges. Furthermore, the specific features of data centers tend to create additional challenges beyond help from simple load flexibility measures.

- **Agency:** Utilities often see new fossil resources like gas peakers as the easiest way to resolve new peak demand issues from data centers.[61] Because gas turbines are increasingly expensive, this may not be a good deal for other utility customers and may also entrench future emissions, working against many data center providers' and host states' clean power goals. Because eventual data center owner/operators tend to build where developers have prepared the ground, the fact that these developers may perceive emissions goals as secondary to "speed-to-power," and that utilities choose their own procurement path creates an agency mismatch.
- **Clustering:** The clustering of data centers tends to amplify their effects on the regional grid, with sharper surges in demand for grid services that cannot be accommodated fast enough through new resources builds.
- **Consumption profile:** While data centers don't run all the time, they plan their infrastructure for peak computing demand. This creates a knock-on effect for the bulk power system, which plans for peak power demand.
- **Flexibility:** Flexibility is not always a simple feature to implement or deploy.
- **Backup:** On-site backup power is a poor substitute for system resources because of expense as well as siting and local environmental concerns.
- **Modularity:** While the broader grid is in a good position to adjust to a phased build out of data center demand, this requires either coordination with the local utility or strong forward signals in the market to avoid disruptive demand shocks for grid services.

Bulk electricity challenges specific to data centers

Certain subcategories here (consumption profile, flexibility, modularity) concern time domains that do not apply when considering total annual consumption.

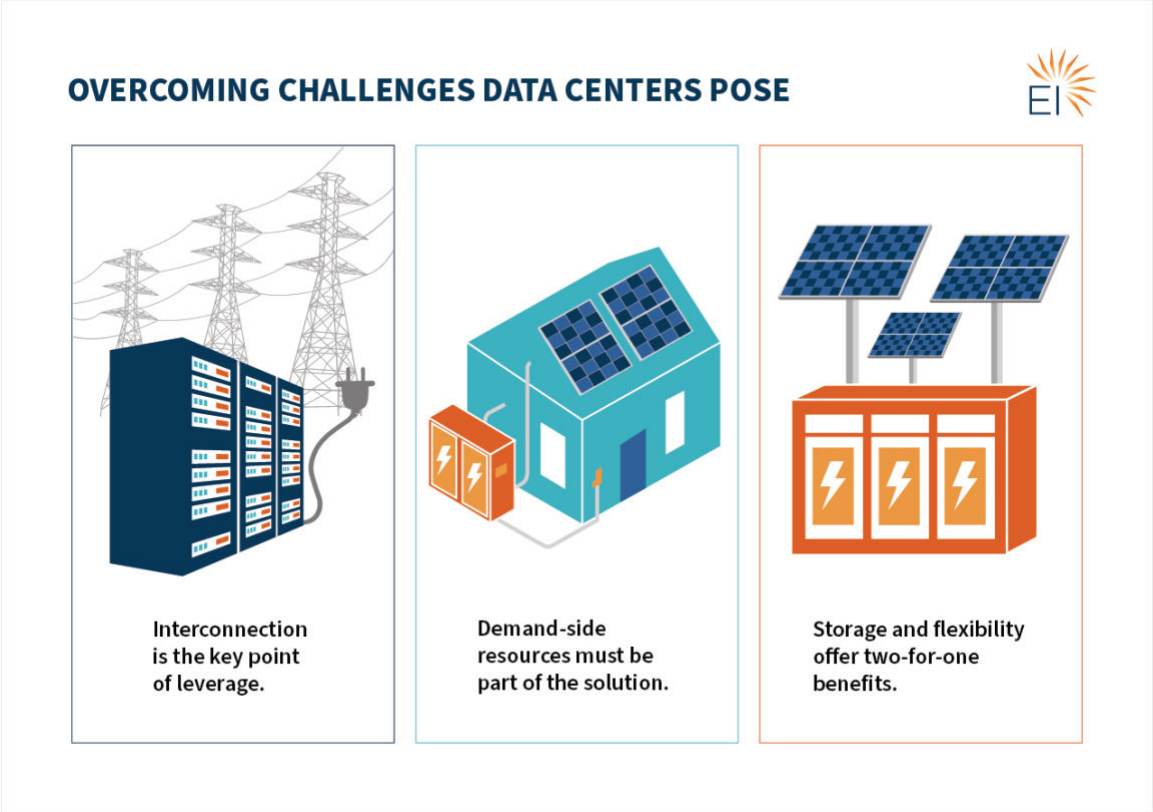
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- **Agency:** As with grid connection and services, intermediate entities between electricity provisioners and data center owner/operators with emissions goals may not consider the environmental impacts of reliance on using spare capacity from existing marginal resources.
- **Clustering:** Clustering means more annual electricity drawn from the same grid. This creates a greater need for new supply, amplifying the problems of price and emissions increases.
- **Consumption profile:** A variable but not necessarily predictable profile for large data center loads could create new challenges for grid operators, even at off-peak times.
- **Flexibility:** Data center demand flexibility could potentially alleviate emission concerns by targeting off-peak consumption more towards time periods with lower marginal emissions. This requires an extra layer of control on top of whatever that data center might have already committed to ease grid connection and mitigate impacts on grid operational resources.
- **Backup:** Supplying too much of the actual annual electricity use from backup power creates problematic environmental impacts.

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TAKEAWAYS FOR POLICYMAKERS AND OTHER STAKEHOLDERS

Figure 7 Three key takeaways



Many organizations (Clean Air Task Force/Brattle,[62] GridLab,[63] NRDC,[64] the Bipartisan Policy Center,[65] and the Regulatory Assistance Project[66]) have provided detailed and useful guides for coping with the challenges of meeting new data center loads.

This section distills the key lessons from the features and challenges discussed above.

Interconnection is the key point of leverage to influence when and how data centers join the grid

Accommodating large, dense new loads affects every grid participant, and the challenges show up at multiple scales. Geographically, they range from the substation where the data center connects to the entire interconnected system. In time, they span from sub-second transients to hours of local and bulk stress to the accumulation of annual demand.

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When issues are tied directly to a data center's load or its immediate connection, cost-causation principles are easier to apply. But at larger scales, like meeting new annual demand or rising peaks across a region, the problem is less about the nature of data centers than the pace and size of their growth. At that point, they can reasonably argue for being treated like any other customer buying power "at the pump," without special obligations.

This tension is what policymakers need to keep in mind. Interconnection is the moment of maximum leverage: not to extract unreasonable concessions, but to ensure new entrants cover the infrastructure costs they trigger, and to nudge them toward implementing solutions like flexible demand or local storage that relieve local bottlenecks and support the broader grid. Likewise, developers and customers should lean toward local fixes that speed access to the grid, improve power quality, and ease broader impacts—reducing the likelihood of being saddled with extraordinary requirements later.

Using other demand-side resources

In one of our earlier reports on meeting the load growth challenge,[67] we pointed out the importance of using demand-side resources to meet this challenge most efficiently. Often the discussion of demand-side solutions focuses on direct measures at a data center, especially in the wake of the efficiencies revealed in the DeepSeek announcement.[68] However, data centers can meet their resource needs with other demand-side resources elsewhere on the grid. Recently, Voltus, an aggregator of distributed energy resources (DERs), announced a deal with Cloverleaf Infrastructure—a data center developer—to meet new capacity needs from data centers with market-accredited capacity from DERs.[69] This kind of transaction compensates other existing customers and thus helps accommodate the rapid rise of data center loads fairly, speedily, and equitably. Since connecting to the grid can involve mixing and matching resources to relieve bottlenecks, once a data center has invested in the flexibility and extra equipment needed to resolve local connection issues, there is no reason why more upstream connection issues, grid services bottlenecks, and the need for a large amount of annual electricity delivery cannot be resolved with demand-side solutions from other grid users.

A recent Rewiring America report proposes many of the resources to meet data center load growth could come from sponsoring household upgrades.[70] The report finds that if hyperscalers paid 50 percent of the up-front cost of installing heat pumps in the tens of millions of U.S. households that currently use inefficient electric heating, cooling, and water heating, they could free up a total 30 GW of capacity on the grid. In addition, if hyperscalers paid 30 percent of the up-front cost of rooftop solar and storage in every single-family household in the U.S., they could add 109 GW of capacity on the grid. The cost of these upgrades would be comparable to the report's estimate of $315/kW-year to build and operate a new gas power plant.

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Storage and flexibility relieve data center challenges; they can also ease interconnection of new variable renewables

On-site prime generation solutions built around renewables and flexibility (modulating demand and using batteries) may provide cheaper, cleaner, and faster means for meeting new and existing data center demand. Because batteries are increasingly essential for buffering, backup, and power quality, they also provide a built-in solution for integrating variable renewables—offering a two-for-one advantage.

Furthermore, these renewable-plus-battery solutions can take advantage of existing surplus interconnection[71] to more quickly connect data centers to the grid in "power couples."[72]

By exploring the nuanced solutions, policymakers can avoid overcommitting to outdated firm resources and instead adopt strategies that embrace modularity, flexibility, and clean energy. Doing so will support both the digital economy's explosive growth and the clean energy transition.

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 58

NARUC COAL REPORT



Recent Changes to U.S. Coal Plant Operations and Current Compensation Practices

National Association of Regulatory Utility Commissioners | January 2020

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- Hon. Jeremy Oden, Alabama Public Service Commission
- Hon. Kara B. Fornstrom, Wyoming Public Service Commission
- Hon. ToNola Brown-Bland, North Carolina Utilities Commission
- Hon. Ethan Kimbrel, Illinois Commerce Commission
- Hon. Brian Kroshus, North Dakota Public Service Commission
- Hon. Talina Mathews, Kentucky Public Service Commission
- Hon. Tony O'Donnell, Montana Public Service Commission
- Jim Zolnierek, Illinois Commerce Commission
- Danielle Sass Byrnett, NARUC Center for Partnerships & Innovation
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Executive Summary

Over the last decade, the U.S. electric power sector has gone through one of the most dramatic changes in its existence. The combination of low natural gas prices as a result of the shale gas revolution and significant reduction in construction and operating costs for renewable resources, in part due to federal tax credits such as the production tax credit and investment tax credit mainly benefitting wind and solar, respectively, has resulted in a significant shift away from coal-fired generation, and instead towards natural gas and renewable generation.

Furthermore, the operating profile of existing coal-fired electric generating units has changed significantly. As new natural gas combined cycle plants have become increasingly more efficient and cheaper to operate than older existing coal-fired power plants, coal units continue to lose baseload generation share and more frequently operate as load-following, or cycling, resources. These trends are of particular importance to state public utility commissions (commissions). Functioning as economic regulators, commissions oversee investments in a reliable, efficient system while balancing emissions goals, customer demands, and other policy objectives. Changes to coal plant operations as a result of increased competition from other fuel sources may have a bearing on system reliability and economics, and therefore constitute an important area for commissions to monitor.

Increased cycling operations of coal plants, including more frequent startups and shutdowns, as well as faster changes in unit output, have a considerable impact on the reliability and cost of the plant. More frequent cycling increases wear-and-tear of plant equipment and can lead to shorter equipment lifespan due to thermal fatigue, thermal expansion, increased corrosion, and increased cost of start-up fuel. Without proper maintenance of the plant during these operations, unexpected plant outages become more frequent.

Despite the increase in plant operating costs due to cycling, there exist numerous options for plant operators to minimize the financial impact and optimize the plant's operation. One option for mitigating the effects of flexible operation is for plants to implement system modifications that recover plant efficiency lost to continuous cycling operation. Examples include sliding pressure operation, variable-speed drives for the primary cycle and auxiliary equipment, and boiler draft control schemes and operating philosophy.

Other options include establishing and following cycle chemistry guidelines for flexible operations, accurate damage estimation, flexible operation studies, and plant operator coaching. Additionally, areas to minimize coal plant cycling costs, outside the control of coal plant operators, include the increased deployment of energy storage and demand-side management resources and curtailing wind and solar generation during times of high generation or low demand.

Most of the cycling cost mitigation strategies require significant capital investment. However, recent market developments have undercut the profitability of existing coal-fired power plants and reduced the amount of working capital plant owners are able or willing to spend on the maintenance necessary to ensure plant reliability.

While they are currently being discussed, no specific market mechanisms to compensate unit flexibility provided by fossil fuel power plants exist in the Electric Reliability Council of Texas (ERCOT) and Southwest Power Pool (SPP) power markets, the two independent system operators (ISO) with the largest share of intermittent renewable energy resources in their generation mix. However, without any additional source of revenue for coal plants (e.g., for providing necessary operational flexibility for these power markets), more coal retirements due to poor economics

are likely, increasing the risk of potential power outages in states like Texas. In areas with regulated utilities, the increased cost of coal plant cycling is being passed on to utility customers. Any market mechanisms that financially reward the flexibility of coal-fired generating units will arguably result in lower overall system costs while ensuring the reliable operation of the electric power grid.

Thoughtful market mechanisms that financially compensate coal-fired generating units for providing essential market balancing attributes, such as short-term generation flexibility, could arguably result in lower electric retail rates for end-use customers while equally, if not more importantly, helping to ensure reliable operation of the nation's electric power grid.

Introduction

Over the last ten years, the U.S. electric power system has gone through significant changes, creating new challenges for various stakeholders, including state public utility commissions (commissions). Following the Great Recession from 2007 to 2009, demand for electricity has mostly remained flat due to changes in consumer behavior and a heightened focus on energy efficiency and conservation. Additionally, technical advancements in hydraulic fracturing and horizontal drilling have revolutionized the U.S. natural gas and oil industry, resulting in record domestic production of natural gas and crude oil.

Subsequently, pricing for both commodities has decreased substantially. The shale gas revolution has created an environment where natural gas-fired power plants in the U.S. are becoming increasingly more cost-competitive with their coal-fired counterparts, resulting in a major shift from coal to natural gas generation.

Additionally, climate change has arguably been one of the most discussed topics of this decade and will likely be a leading global issue going forward. Societal pressure to move to zero-emissions energy sources, combined with renewable energy mandates, tax incentives for renewable development, and significant cost reductions for wind and solar technologies, have resulted in the continued addition of new wind and solar generating facilities across the country. With intermittent resources accounting for over one-third of total generation in some states, traditional baseload generators have been forced to be more flexible in their operating profile and complement fluctuations in generation from intermittent renewable sources.

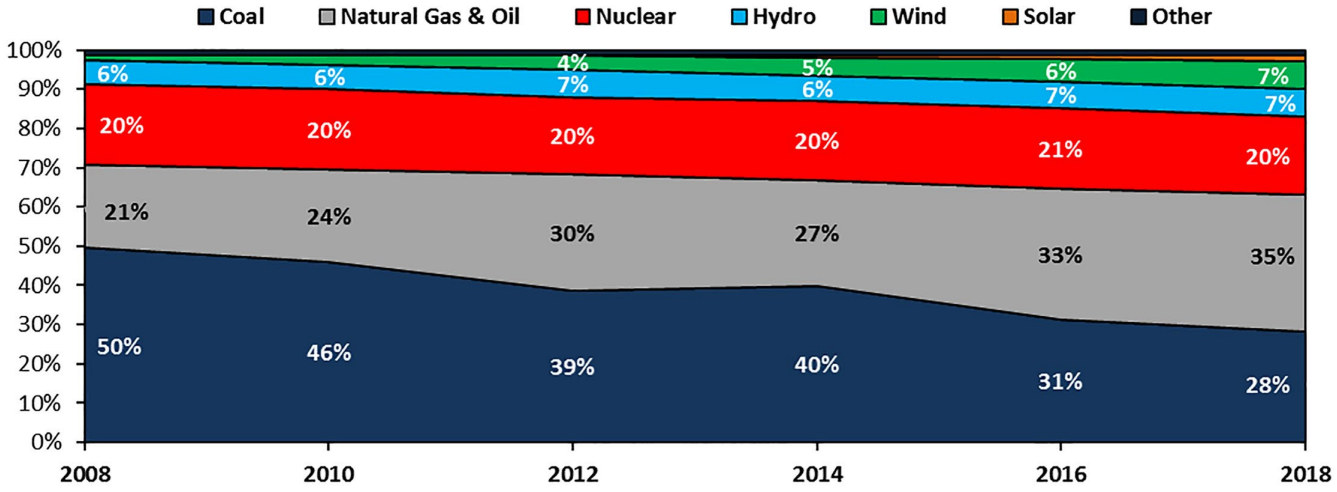
These conditions have resulted in new challenges for commissions. As economic regulators, they are charged with overseeing the reliable, safe, and affordable operation of the electricity generation and delivery system. The asset life for electric generation can span decades, making today's decisions impactful for customers well into the future. Similarly, commissioners inherit a system of assets at various stages in their operating lifespans. As new generation sources become competitive with coal — a fuel that was, for much of the twentieth century, one of the cheapest sources of electricity — commissions can benefit from two things: (1) a more complete understanding of how coal generation is or can be responding to competition, and (2) a discussion of an important attribute of the electricity system: flexibility. This paper focuses on operational changes experienced by U.S. coal-fired power plants as a result of high renewable penetration. The report also explores how fossil fuel plant flexibility is currently procured and compensated. Future research in this area may consider options for states to maintain flexible, reliable, and affordable electricity.

Overview of the Changes in the U.S. Electric Power System between 2008 and 2018

Over the last decade, the U.S. electric generating fleet has experienced some significant changes. Cheap natural gas, as a result of the shale gas revolution and falling construction and production costs for new wind and solar generation, in conjunction with public policy initiatives supporting renewables, have caused a shift from coal-fired power generation to natural gas and renewable generation.

As shown in **Exhibit 1,** in 2008, electric generation from coal-fired power plants accounted for 50% of total U.S. electric generation. Natural gas and oil generation accounted for 21%, and non-hydro renewable generation accounted for less than 2% of total generation. A decade later, the generation mix has changed dramatically. In 2018, coal-fired power plants accounted for just 28% of the total electricity produced in the U.S., while natural gas and oil's share increased to 35% and non-hydro renewable's share to 10%. This shift, which shows little sign of slowing, is creating both new opportunities and challenges for stakeholders.

EXHIBIT 1: U.S. ELECTRIC GENERATION[1] MIX – 2008 TO 2018[2]



In 2018, U.S. coal generation dropped by more than 40% from 2001 levels, while natural gas and renewable generation more than doubled their combined generation during the same period. Since renewable generation from wind and solar is generally considered non-dispatchable and is widely perceived as a nominally zero marginal cost resource, any available generation from these resources is on a "take-when-available" agreement and is displacing baseload coal generation at the bottom of the dispatch stack.[3]

In addition, the fall of natural gas prices and the resulting wave of new natural gas combined cycle power plants (CCGTs) have increased the competition between coal-fired and natural gas-fired generation for meeting baseload power needs. As a result of the shift from coal to natural gas and non-hydro renewables and resulting change in the

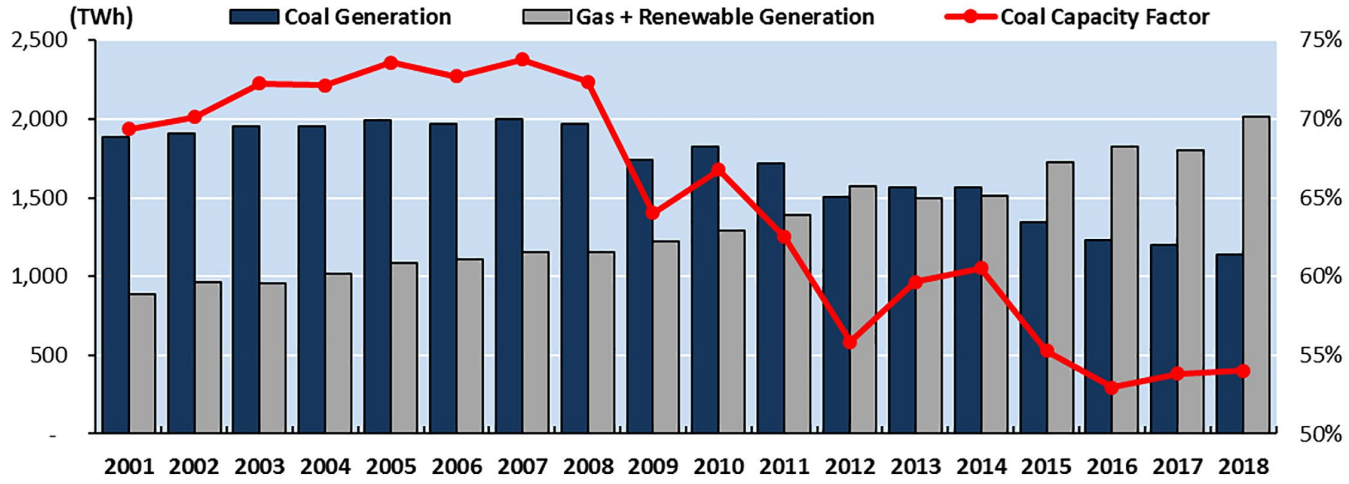
1 Generation throughout this report refers to the amount of electricity generated in a certain period measured MWh. Capacity refers to the maximum generation output a unit can generate in one hour, measured in MW.

2 Source: Department of Energy - Energy Information Administration (EIA) Annual Form-923 data

3 Some power markets have experienced times when renewable generation was greater than the total electricity demand at that time, forcing the system operator to curtail (i.e., stop from generating electricity) renewable generation.

economic dispatch order, coal plant utilization rates, also referred to as capacity factors,[4] have dropped from a high of 74% in 2007 to just 54% in 2018, as shown in **Exhibit 2.**

EXHIBIT 2: U.S. COAL GENERATION AND CAPACITY FACTOR VS. COMBINED NATURAL GAS & RENEWABLE GENERATION[5]



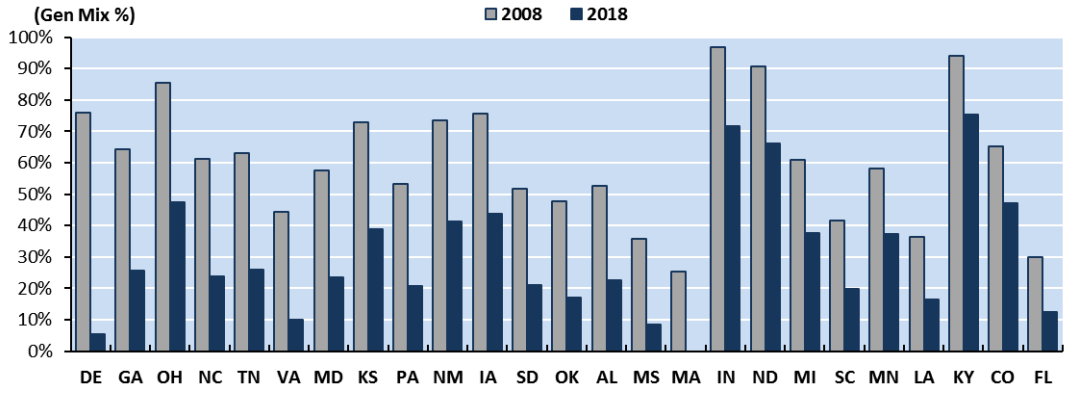
It should be noted that the magnitude of this shift from coal to natural gas and non-hydro renewable generation varies from state to state. From 2008 to 2018, all but one state (Alaska) experienced a drop in their coal generation share. **Exhibit 3** shows the top 25 states with the largest reduction in coal generation share between 2008 and 2018. Some states have seen their in-state coal generation share drop from the most dominant to just a minor role in 2018. For example, Virginia's coal fleet accounted for more than half of the total in-state generation in 2003. By 2018, that share dropped below 10%, while natural gas generation increased from 14% to 55% over the same period.

Other states with significant coal generation declines include Delaware (-71% generation share decline between 2008 and 2018), Georgia (-39%), and Ohio (-38%). On the other hand, states like Washington, Arkansas, and Nebraska, have seen only modest declines (<4%) of coal generation over the same period.

4 Capacity factor measures the utilization of a generating unit over time. For example, an electric generating unit with a generating capacity of 100 MW is capable of generating 100 MW per hour, or 876,000 MWh per year. If the same unit only generated 438,000 MWh during the year, it only generated 50% of the electricity it is theoretically capable of. Therefore, its capacity factor is 50%.

5 Source: Annual EIA Form-923 and Form 860 Data

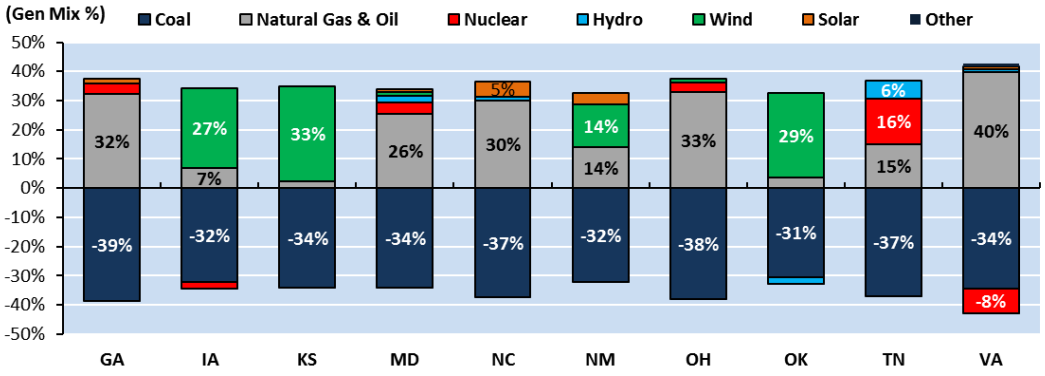
EXHIBIT 3: TOP 25 DECLINES IN COAL GENERATION SHARE BY STATE – 2008 VS. 2018[6]



While the magnitude of coal displacement varies from state to state, so does the source of replacement energy, as shown in **Exhibit 4.** For example, in Georgia, the vast majority of the 39% loss in coal generation over the last 11 years has been replaced by natural gas generation. In states like Iowa, Kansas, and Oklahoma, which have substantial wind resources, coal has been displaced predominantly by wind generation.

Lastly, another group of states has used falling costs of natural gas and renewable generation to diversify their in-state generation mix significantly. For example, New Mexico replaced the loss of 32% of coal generation share with equal parts natural gas and wind generation (14% each), as well as 4% from new solar generation. Tennessee, which is home to the recently-completed Watts Bar 2 nuclear reactor, also added significant amounts of natural gas and hydro generation to displace coal generation.

EXHIBIT 4: REPLACEMENT OF COAL GENERATION MIX SHARE BY OTHER FUELS FOR VARIOUS STATES – 2008 VS. 2018[7]



6 Source: Annual EIA Form-923 Data

7 Source: Annual EIA Form-923 Data

Operational Changes at Coal Plants between 2008 and 2018

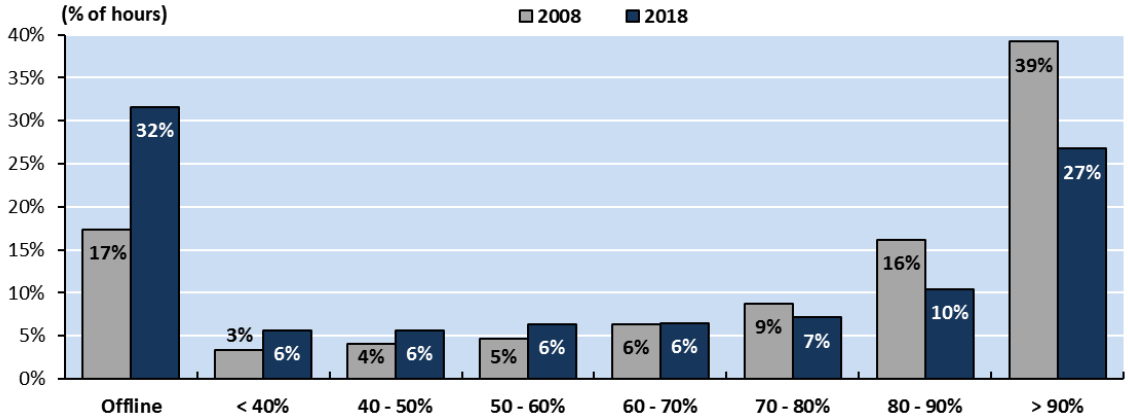
These dramatic changes in the generation mix have significant impacts on the operation of the remaining coal-fired generating fleet. To highlight these differences, this report presents an in-depth analysis of hourly gross generation data from EPA's Continuous Emission Monitoring System (EPA CEMS) for all operating coal-fired electric generating units (EGUs) in 2008 and 2018. Plants with only partial-year data (due to reporting requirements, in-year retirements, or online dates) and glaring reporting errors were excluded. In total, the hourly generation dataset included 8.1 million observations for 927 EGUs across 43 states in 2008 and 4.7 million observations for 531 EGUs across 42 states in 2018. 2008 marked the last year of historically "normal" coal plant operation (as indicated by the 72% capacity factor for the U.S. coal fleet shown in **Exhibit 2**) and was, therefore, chosen as comparison to current market conditions.

The analysis focused on four key metrics for coal plant operations: (1) gross capacity factor by segment, (2) number of hot, warm, and cold starts, and average duration that the coal unit was offline, (3) maximum turndown rate, defined as the *lowest* safe power output level, and (4) hourly ramping rates. Differences in these metrics were analyzed on a state level, in addition to the age and size of the coal plant. Highlights of the results are presented below.

As shown in **Exhibit 5,** the distribution of hourly capacity factors for the U.S. coal fleet has changed dramatically over the last decade. As described earlier, the annual capacity factor for the U.S. coal fleet dropped from 72% in 2008 to 54% in 2018. However, annual capacity factors do not provide sufficient detail on the actual operation of individual coal-fired EGUs. For example, an EGU that operates at a 100% capacity factor for half of the year, while offline the other half, has the same capacity factor as an EGU cycling equally between 30% and 70% capacity factors for the entire year. Exhibit 5 highlights a few significant shifts in operations for the U.S. coal fleet.

First, as a result of higher wind penetration, increased competition with natural gas-fired EGUs, and overall higher ramping and startup and shutdown costs (as described later in this report), coal plant operators in 2018 more often chose to keep the EGU offline and only brought it online when favorable market conditions persisted over a more extended period of time, such as high wholesale power prices during elevated demand periods. Therefore, coal units were offline an additional 14% of the time compared to 2008. Second, when online, coal-fired EGUs in 2018 operated at much lower capacity factors than their 2008 counterparts. Coal units operated only 37% of the time above 80% of their gross capacity, which is considered the highest efficiency range for most coal-fired EGUs. In 2008, the U.S. coal fleet operated during more than 55% of all hours in that same range. Additionally, coal plants in 2018 operated more often at lower capacity factors near maximum turndown levels, the utilization level at which boiler temperatures and pressures are being maintained so that the unit can ramp up more quickly in response to changes (increased demand) in electric load and/or decreased wind output. In 2018, coal plants operated more than 18% of the time at capacity factors below 60%, compared to just 12% of the time in 2008.

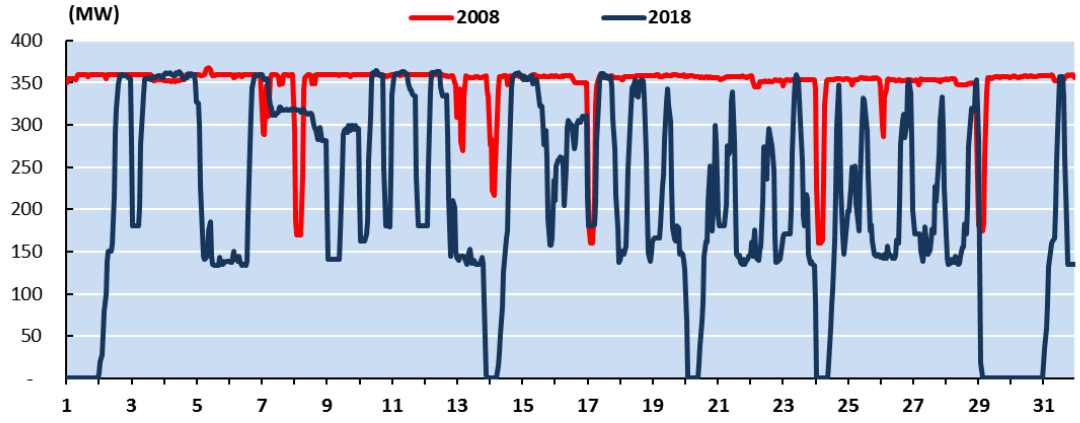
EXHIBIT 5: DISTRIBUTION OF HOURLY CAPACITY FACTOR FOR U.S. COAL-FIRED EGUS – 2008 VS. 2018[8]



An example of such an operation change is presented in **Exhibit 6.** Exhibit 6 shows the hourly gross generation profile of Xcel Energy's 350-MW Harrington unit 1, located in Texas, for the months of December 2008 and December 2018. As mentioned earlier (and in greater detail below), Texas has added a significant amount of wind generation and natural gas-fired generating capacity over the last decade. During December 2008, Harrington 1 remained relatively steady output near its maximum capacity throughout the month, with just eight turndowns, and it never fell below 150 MW.

Conversely, in December 2018, Harrington 1's gross generation output varied significantly. First, the unit was offline five times during the month of December. Second, when online, the unit cycled almost continuously between the maximum and minimum unit output, depending on current load requirements. The data also shows that plant operators turned down the unit to much lower levels than in 2008, with output falling below 150 MW on multiple occasions. Examples like these are much more frequent in 2018 than in previous years and are likely to become more numerous as more wind and solar resources are added to the generation mix.

EXHIBIT 6: XCEL ENERGY'S HARRINGTON UNIT 1 HOURLY GROSS GENERATION DURING DECEMBER[9]



8 Source: EVA Analysis of Environmental Protection Agency (EPA) Continuous Emissions Monitoring System (CEMS) Hourly Data

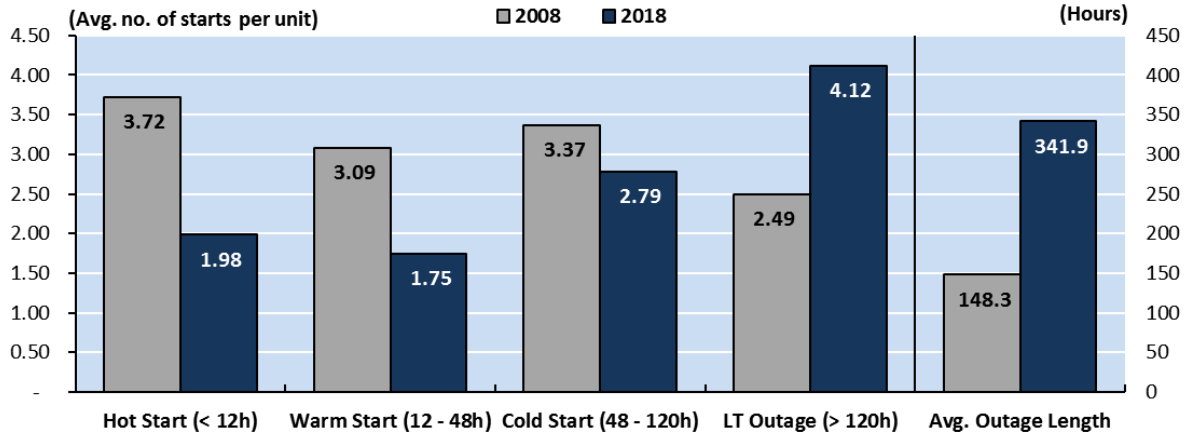
9 Source: EPA CEMS Hourly Data

Operating a coal-fired EGU below its optimal boiler design utilization rate has adverse effects on both the efficiency of the unit and its structural integrity. At lower utilization rates, coal units consume more fuel to produce the same amount of electricity, resulting in both higher fuel costs and emissions of SO_2, NO_x, and CO_2. Additionally, more frequent and faster load changes increase the stress on the boiler equipment and shorten the time between maintenance outages for the unit. The impacts are described in more detail in the next section.

Another metric to consider when assessing the flexibility of coal-fired EGUs and the impacts of unit cycling are its number of hot, warm, and cold starts. Hot starts are typically defined to have very high (700°F to 900°F) boiler and turbine temperatures and occur after 8 to 12 hours offline. Warm starts generally have boiler and turbine temperatures between 250°F and 700°F and occur after the unit has been offline for 12 to 48 hours. Starts at ambient temperatures are considered cold starts after the boiler was offline for 48 to 120 hours.[10] These definitions vary from unit to unit based on design, unit size, and manufacturer.

Generally, the colder the temperature of the boiler and turbine, the higher the startup cost of the unit. **Exhibit 7** shows the comparison between the average number of hot, warm, and cold starts for all U.S. coal-fired EGUs, as well as the average number of long-term outages and the average length of outages between starts in 2008 and 2018. Although the total average amount of starts per unit is similar between 2008 and 2018 (12.67 vs. 10.64 total starts per year respectively), Exhibit 7 clearly shows a shift away from more frequent starts at various temperature levels to longer-term outages (greater than 120 hours, or five days). On average, coal-fired EGUs in 2018 experienced less than four hot and warm starts (starts after being offline for less than 48 hours), compared to almost eight such starts in 2008. Conversely, coal units in 2018 have experienced long-term outages (greater than five days) more frequently, with over four such outages per year compared to just 2.5 per year in 2008. Finally, the average outage length for U.S. coal units in 2018 has more than doubled from less than 150 hours (approximately six days) per outage to over 340 hours per outage (approximately 14 days).

EXHIBIT 7: AVERAGE NUMBER OF STARTS PER COAL-FIRED EGU – 2008 VS. 2018[11]



10 Source: Lefton S A, Besuner P M, Grimsrud G P, Kuntz T A (2010) *Experience in cycling cost analysis of power plants in North America and Europe.*

11 Source: EVA Analysis of EPA CEMS Data

A third metric to consider when analyzing the operational changes the U.S. coal fleet experienced over the previous decade is the rate of change of generation output over a period of time, also known as ramp rates. Ramp rates can vary significantly between plant and fuel types. **Exhibit 8** shows various flexibility capabilities by technology type, according to IEA.

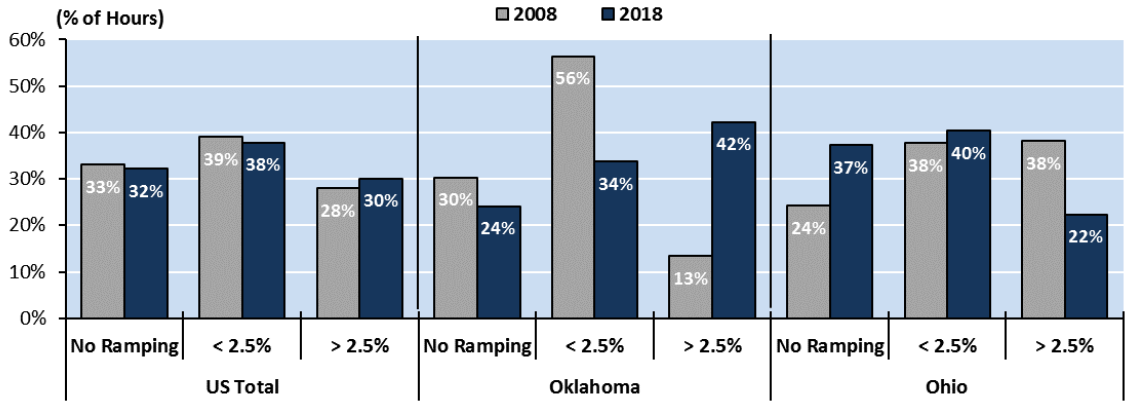
EXHIBIT 8: CAPABILITY OF DIFFERENT POWER GENERATING TECHNOLOGIES TO PROVIDE FLEXIBILITY[12]

Plant Type	Start-up time	Max Change in 30secs, %	Max ramp rate, %/min
Simple Cycle CT	10 - 20 min	20 - 30	20
Combined Cycle CT	30 - 60 min	10 - 20	5 - 10
Coal Plant	1 - 10 h	5 - 10	1 - 5
Nuclear Plant	2 h - 2 d	< 5	1 - 5

Although coal plants are far more flexible than nuclear power plants, they are generally less flexible than their natural gas-fired competition. Simple cycle and combined cycle natural gas-fired combustion turbines (CTs) have much shorter start-up times than coal-fired units as well as faster ramp rates and spinning capabilities. (For this report, ramp rates refer to the hourly change in gross electric output.) The ramp rates listed above are maximum ramp rates that also depend on the unit's specific design characteristics. Frequent ramping of a unit at these maximum ramp rates can significantly shorten the life of the unit before certain parts need to be replaced. The analysis in this report focuses on hourly changes in output for the coal units in 2008 and 2018 and does not make any inference on the maximum ramping capabilities of these units.

Exhibit 9 shows the average distribution of hourly ramp rates (when online) for the U.S. coal fleet in 2008 and 2018 in three categories: no ramping (i.e., no change in output from the previous hour), less than 2.5% change in output, and greater than 2.5% change in gross electric output.

EXHIBIT 9: AVERAGE DISTRIBUTION OF HOURLY RAMP RATES FOR THE U.S. COAL FLEET AND TWO SPECIFIC STATES – 2008 VS. 2018[13]



12 Source: International Energy Agency – Clean Coal Centre (2016) *Levelling the intermittency of renewables with coal.*

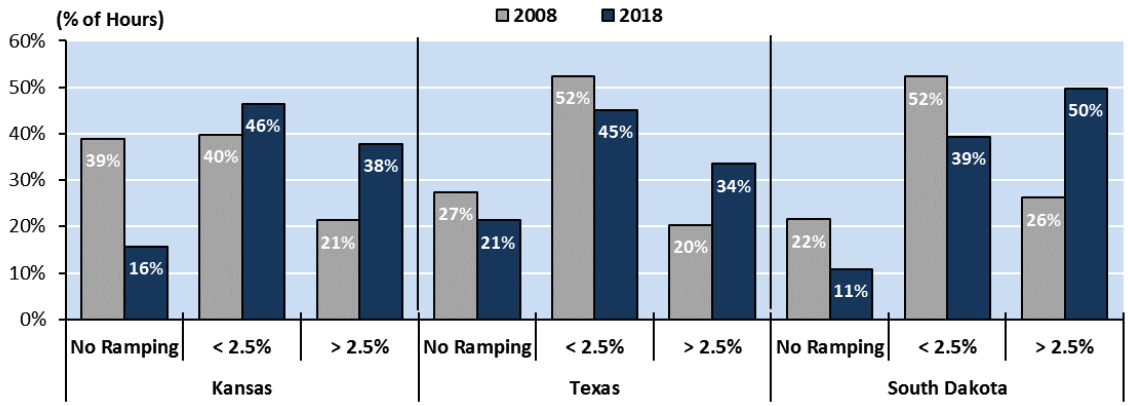
13 Source: EVA Analysis of EPA CEMS Data

As shown in **Exhibit 9,** there is little change in ramp rates for the average coal unit when comparing the ramp rates on a national level between 2008 and 2018. For all three categories, the 2018 values are within two percentage points of its 2008 counterparts, indicating little change on a national level. However, there are significant differences on a regional level.

Between 2008 and 2018, Oklahoma's coal fleet lost more than 30% of generation share, mostly to new wind resources in the state. Since little to no new peaking units have come online in the state since 2008, the responsibility of balancing the possible sudden loss of wind generation fell on the remaining Oklahoma coal units. As a result, Oklahoma's coal units have significantly increased their share of output changes greater than 2.5%, from 13% in 2008 to over 42% in 2018. Conversely, the percentage of ramping at less than 2.5% has fallen tremendously, from 56% in 2008 to 34% in 2018.

As shown in **Exhibit 10,** other states where coal generation was mainly displaced by wind with almost no new peaking capacity have seen similar developments. For example, in Kansas, the number of times an average coal unit in the state ramped up or down at rates greater than 2.5% increased from 21% in 2008 to 36% in 2018.

EXHIBIT 10: AVERAGE DISTRIBUTION OF HOURLY RAMP RATES COAL FLEET IN WIND STATES – 2008 VS. 2018[14]

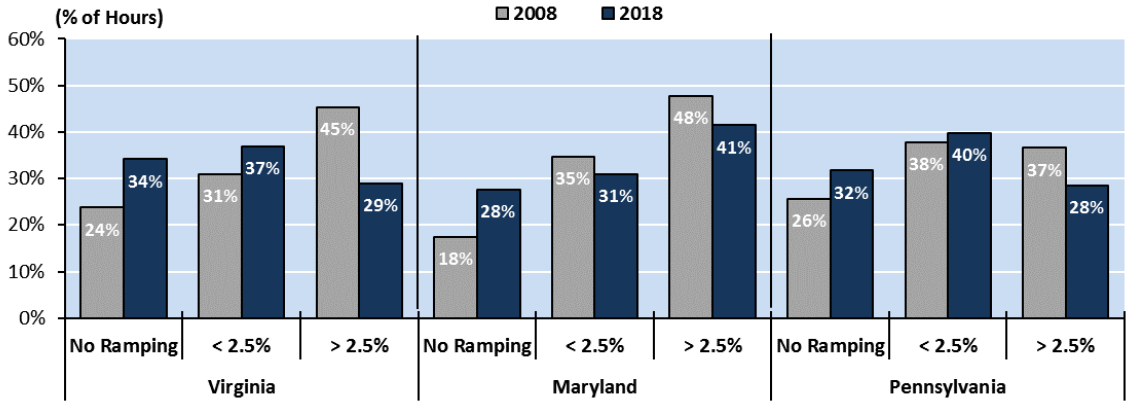


On the other hand, coal units in states where coal has been displaced mainly by new natural gas simple cycle and combined cycle power plants have been subject to less ramping at higher percentages. In Ohio, coal's generation share fell by 38 percentage points between 2008 and 2018, while natural gas's share increased by 33 percentage points over the same period. With cheap natural gas supply in the region, Ohio's new and highly efficient natural gas power plants are more economical to operate than most of the remaining in-state coal fleet. As a result, Ohio natural gas plants are being dispatched ahead of most of the Ohio coal fleet, while also providing flexibility support. Ohio coal plants are mainly called upon during times of high electricity demand to provide additional baseload generation, while the new natural gas plants provide load-following support. As a result, as seen in Exhibit 9, coal's ramp rates above 2.5% have fallen between 2008 and 2018, from 38% to 22%, respectively. Conversely, hours during which coal plants did not ramp at all increased from 24% in 2008 to 37% in 2018.

14 Source: EVA Analysis of EPA CEMS Data

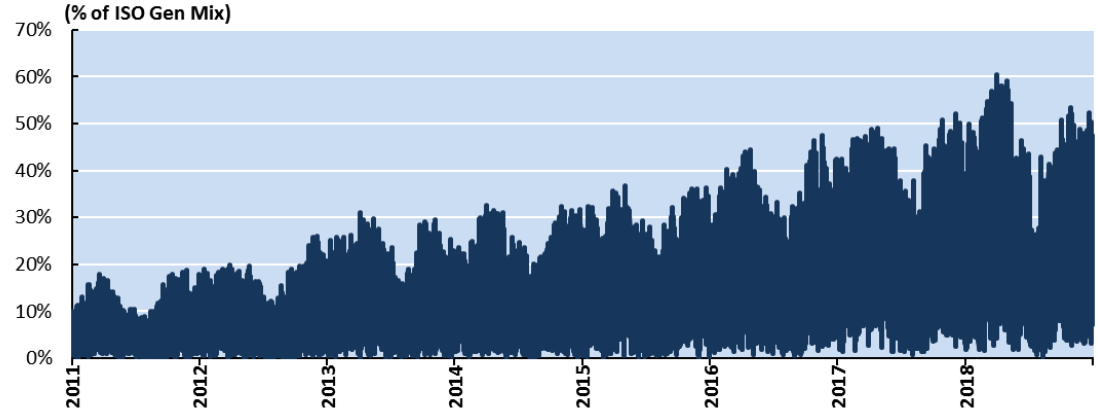
Again, states where electric generation shifted predominantly from coal to natural gas have seen similar developments, as shown in **Exhibit 11.** For example, in Virginia, another state where coal has been displaced mainly by natural gas, the share of ramp rates for coal units greater than 2.5% has fallen since 2008, from 45% to just 29% in 2018.

EXHIBIT 11: AVERAGE DISTRIBUTION OF HOURLY RAMP RATES COAL FLEET IN NATURAL GAS STATES – 2008 VS. 2018[15]



High ramp rate requirements for coal units in states with a significant share of wind generation already will continue to increase as more wind resources are added to the generation mix. **Exhibit 12** shows the hourly wind generation share in the SPP, the ISO for states with some of the highest percentages of wind generation in 2018, including Kansas, Oklahoma, and both of the Dakotas. In 2018, the generation share of wind rose to 60% on March 31 and fell to almost zero on August 8, with fluctuations of more than 9 GWh of generation in six hours on February 17. With coal still accounting for more than two-thirds of fossil fuel generation in SPP, that variation in wind generation is being balanced mostly by coal-fired EGUs.

EXHIBIT 12: HOURLY WIND GENERATION SHARE IN SPP – 2011 TO 2018[16]

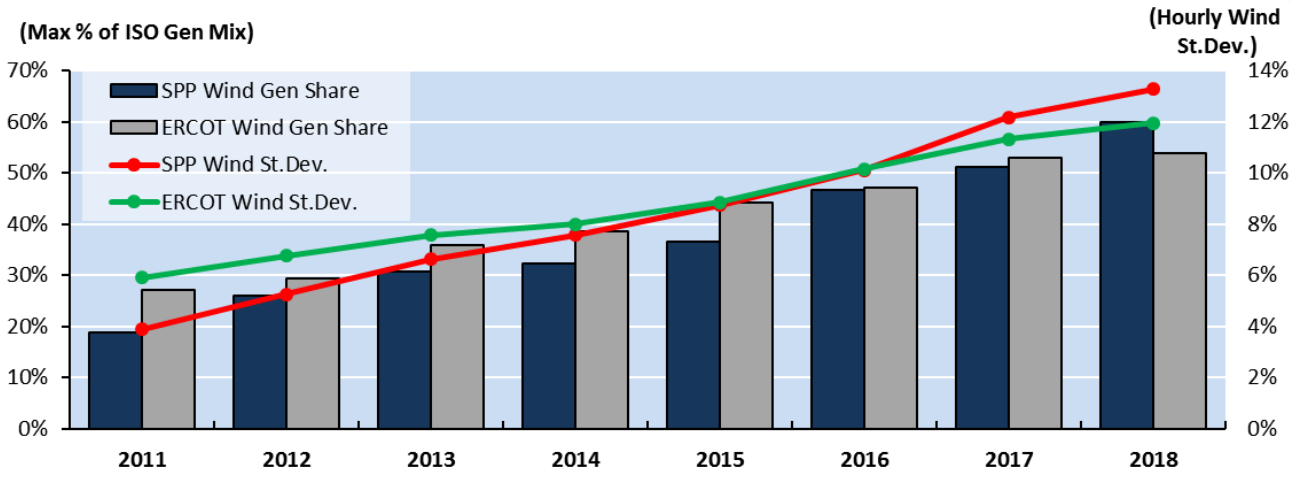


15 Source: EVA Analysis of EPA CEMS Data

16 Source: Southwest Power Pool (SPP) Hourly Generation Mix Data

As more wind generation is being added to the electric power system, utilities and ISOs, such as ERCOT and SPP, have to balance more considerable amounts of the variable generation with dispatchable generating units such as coal and natural gas. **Exhibit 13** shows the trend since 2011 in annual wind generation share for ERCOT and SPP, as well as the standard deviation for hourly wind generation for the two ISOs. Although wind developers and ISOs attempt to diversify wind farms locationally to minimize the variability of wind output, wind variability has continued to increase significantly in both ISOs. In 2011, when hourly wind output peaked at just 20% of SPP's generation, the standard deviation for the hourly generation mix share from wind was below 4%. In 2018, however, when the peak hourly generation share of wind increased to 60%, the standard deviation more than tripled to over 13%. As more wind is added to the ISO's generation mix, flexibility from dispatchable resources such as coal and natural gas has become more critical.

EXHIBIT 13: MAX HOURLY WIND GENERATION SHARE & STANDARD DEVIATION FOR ERCOT & SPP ISO – 2011 TO 2018[17]

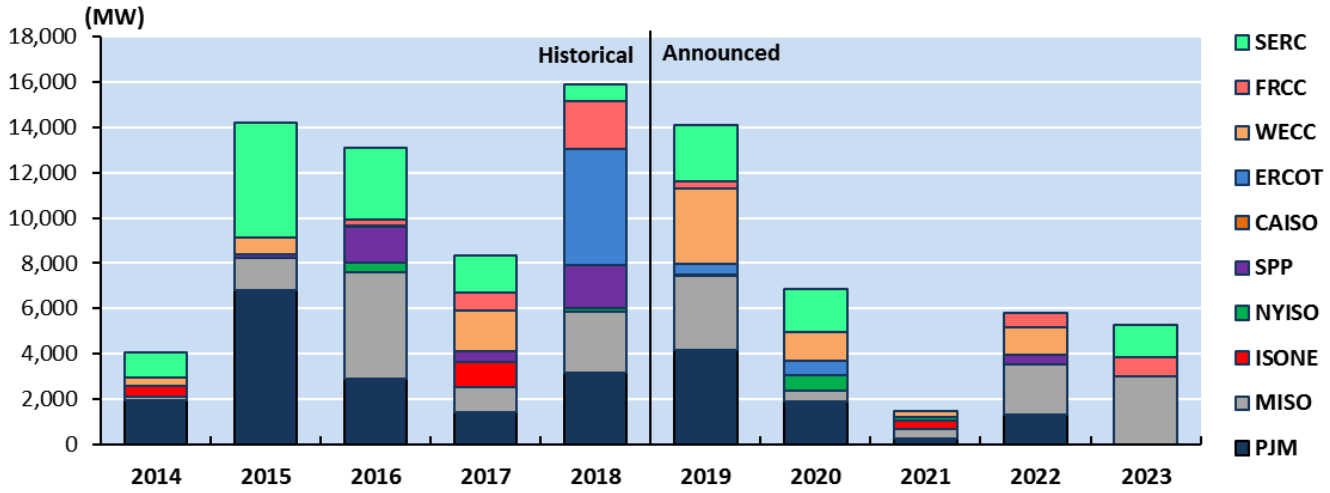


Despite the increased importance of flexible and dispatchable generation to balance the variability of a growing renewable fleet, more and more coal plants are being retired in power markets with an ever-increasing share of renewable generation. **Exhibit 14** shows historical and announced coal retirements by power market. In 2018, a record 16 GW of coal-fired generation retired, more than in any other previous year. 2019 follows close behind with another 14 GW of coal capacity either already retired or scheduled to retire. More than 30 GW of additional coal capacity have already retired or are announced to retire by 2023 in MISO, ERCOT, and SPP alone, the three power markets with the highest share of wind generation in 2018. Unlike the massive amounts of coal retirements in 2015 and 2016 due to the compliance deadline for the EPA Mercury and Air Toxics Standard (MATS), these coal retirements are mainly due to reduced revenues as a result of lower utilization rates. The next section discusses the structural and financial implications of increased cycling of coal-fired power plants and

17 Source: EVA Analysis of SPP and ERCOT Hourly Generation Mix Data

how coal plant owners are, or are not, currently compensated for providing much needed operational flexibility to the grid.

EXHIBIT 14: HISTORICAL COAL RETIREMENTS BY POWER MARKET – 2008 TO 2018[18]



18 Source: EVA Power Plant Tracking System Database

The Costs and Implications of Coal Plant Cycling

As described in the previous section, coal-fired power plants are operating less frequently in baseload operation, where they provide a constant level of electric output with minimal variation. Instead, they are asked to provide more operational flexibility in response to higher shares of intermittent generating resources, such as wind and solar entering the market.

There are two main types of coal plant cycling practices to facilitate changes in output, as mentioned previously: completely shutting down the coal unit or changing its electric output to follow load. As both types imply a diversion from designed operating practices, operating costs for coal-fired power plants are expected to increase (substantially in some cases) as revenue from decreased energy market payments falls. These operational changes and other factors associated with more flexible operation can have the following effects on coal-fired EGUs:

- Increased wear-and-tear on high-temperature and high-pressure plant components and associated costs
- Increased wear-and-tear on balance-of-plant components and related costs
- Shorter periods between maintenance time but more prolonged outages
- Decreased thermal efficiency at high turndown levels
- Increased fuel costs due to more frequent and inefficient unit starts, which require start-up fuel
- Difficulties in maintaining optimal steam chemistry leading to accelerated corrosion
- Potential for catalyst fouling on NO_x control equipment
- Long-term loss of critical equipment life
- Efficiency losses during startup through synchronization and loading to zero load
- Increased risk of human error in plant operations

Exhibit 15 shows the typical costs for a medium-sized coal-fired power plant during various types of operation, based on previous studies analyzing the financial implications of the increased wear-and-tear and associated maintenance and capital costs listed above.

EXHIBIT 15: TYPICAL STARTUP AND CYCLING COSTS FOR A MEDIUM-SIZED COAL-FIRED POWER PLANT ($2019)[19]

Type of Start	Cost category	Cost estimates ($/MW)		
		Expected	Low	High
Hot Start (1–23 h offline)	Maintenance and capital	$ 128	$ 102	$ 162
	Forced outage	$ 60	$ 48	$ 76
	Start-up fuel	$ 20	$ 14	$ 30
	Auxiliary power	$ 11	$ 8	$ 13
	Efficiency loss from low and variable load operation	$ 5	$ 4	$ 8
	Water chemistry cost and support	$ 1	$ 1	$ 2
	Total cycling cost	**$ 225**	**$ 178**	**$ 291**
Warm Start (24 - 120 h offline)	Maintenance and capital	$ 137	$ 109	$ 170
	Forced outage	$ 65	$ 51	$ 80
	Start-up fuel	$ 43	$ 30	$ 57
	Auxiliary power	$ 23	$ 18	$ 28
	Efficiency loss from low and variable load operation	$ 6	$ 5	$ 9
	Water chemistry cost and support	$ 6	$ 4	$ 9
	Total cycling cost	**$ 277**	**$ 217**	**$ 351**
Cold Start (> 120 h offline)	Maintenance and capital	$ 205	$ 162	$ 255
	Forced outage	$ 96	$ 76	$ 120
	Start-up fuel	$ 64	$ 45	$ 24
	Auxiliary power	$ 29	$ 23	$ 36
	Efficiency loss from low and variable load operation	$ 6	$ 5	$ 10
	Water chemistry cost and support	$ 17	$ 13	$ 21
	Total cycling cost	**$ 417**	**$ 325**	**$ 465**
Load follow down to 36% of Capacity	Maintenance and capital	$ 20	$ 12	$ 31
	Forced outage	$ 9	$ 6	$ 15
	Efficiency loss from low and variable load operation	$ 1	$ 1	$ 2
	Mill cycle gas	$ 2	$ 19	$ 50
	Total cycling cost	**$ 32**	**$ 19**	**$ 50**

As shown in **Exhibit 15,** expected costs for cold starts can be almost double the startup cost for a hot start when the remaining temperature in the boiler and turbine system are still significantly higher. However, even hot starts can range from $89,000 to $145,500 per start for a 500 MW coal-fired EGU. These costs can also vary significantly between coal units based on differences in boiler size and design (subcritical vs. supercritical). The highest cost

19 Source: Lefton S A, Hilleman D (2011). *Make your plant ready for cycling operations.* http://www.powermag.com/make-your-plant-ready-for-cycling-operations/

category for all four operation types above is "maintenance and capital." According to a previous study from the National Renewable Energy Laboratory (NREL), there is a trade-off between high capital and maintenance costs and corresponding lower equipment-forced outage rates (EFORd).

According to a study by the Electric Power Research Institute (EPRI)[20], some of the **damage mechanisms** that occur due to increased load-following and on/off operations include:

- **Thermal fatigue.** This phenomenon, caused by frequent changes in equipment temperature, can produce cracking in thick-walled components, especially castings such as turbine valves and casings. Also affected are boiler superheater and reheater headers, where ligament cracking is commonly seen between tube stubs. These headers are expensive, thick-walled vessels operating under high steam pressure, making this damage of particular concern to plant owners.

- **Thermal expansion.** Several systems in a coal plant consist of components that undergo high thermal growth relative to surrounding components. The most notable example of this phenomenon is the enormous movement of boiler structures relative to the cooler support framework. These support ties are designed to accommodate growth, but are subject to accelerated life consumption if the frequency of thermal cycling increases.

- **Corrosion-related Issues.** Two-shifting, or any other operation that challenges the ability of a plant to maintain water chemistry, can lead to increased corrosion and accelerated component failure. Increased levels of dissolved oxygen in feedwater can be the result of condenser leaks, aggravated by more frequent shutdowns.

- **Fireside corrosion.** Load cycling and relatively quick ramp rates under staged conditions will hurt both fireside corrosion and circumferential cracking.

- **Rotor bore cracking.** When subjected to transients in the temperature of the admitted steam, the high-pressure and intermediate-pressure steam turbine rotors can suffer thermo-mechanical stress excursions, resulting in low-cycle fatigue damage. This damage can result either from introducing hot steam to a relatively cold rotor exterior, or the opposite.

The more accurately costs to repair or replace the issues described above can be predicted and included in the current unit dispatch operation methodology, the lower the risk for a particular coal-fired EGU to experience an unexpected equipment failure and unit outage, and miss out on potentially significant energy revenues.

Numerous studies have explored how to mitigate flexible operation damage. Some of the suggested **mitigation strategies** to reduce the damage and associated costs extensive cycling has on coal plants include:

- **Efficiency improvements.** One option for mitigating the effects of flexible operation is for plants to implement system modifications that recover plant efficiency lost to continuous cycling operation. Mitigation examples

20 Source: Hesler S (2011) *Mitigating the effects of flexible operation on coal-fired power plants.* http://www.powermag.com/mitigating-the-effects-of-flexible-operation-on-coal-fired-powerplants/

include: sliding pressure operation, variable-speed drives for the primary cycle and auxiliary equipment, and changes to boiler draft control schemes and operating philosophy. However, many plants today do not have sufficient capital, whether internally or through the investment community, available to undertake these major system modifications.

- **Establishing and following cycle chemistry guidelines for flexible operations.** An area of particular concern for plants under cycling duty is following appropriate cycle chemistry guideline limits during plant startup, shutdown, and layup. Proper protection of the entire steam circuit (boiler, piping, feedwater, and turbine) is critical during these modes of flexible operation. Correct layup procedures, combined with appropriate chemical treatment during shutdown and startup, will significantly reduce corrosion and deposits in the steam cycle equipment, including the boiler, steam-touched tubing, and the turbine.

- **Accurate damage estimation.** Estimates can be made of damage costs per start to inform the plant's trading position. Cost estimates are based on increased routine maintenance costs, damage to major components, and estimated cost of consumables per start.

- **Flexible operation studies.** These studies reduce component damage through procedure optimization and design modification. Included in the reviews are: an initial appraisal of plant-specific risk areas, installation of additional instrumentation, flexible operation trials, assessment of thermal transients, changes to operating procedures and design to address issues identified, repeat tests to confirm success, and detailed stress analysis to inform strategy going forward.

- **Operator coaching.** Simplified damage algorithms for creep and fatigue are also developed for operator coaching. Plant data for critical components are screened to identify and understand the most damaging operational conditions. Operators can then seek to minimize the extent of such conditions during future unit starts. Proper operator training can reduce the risk of human error during increased coal plant cycling operations.

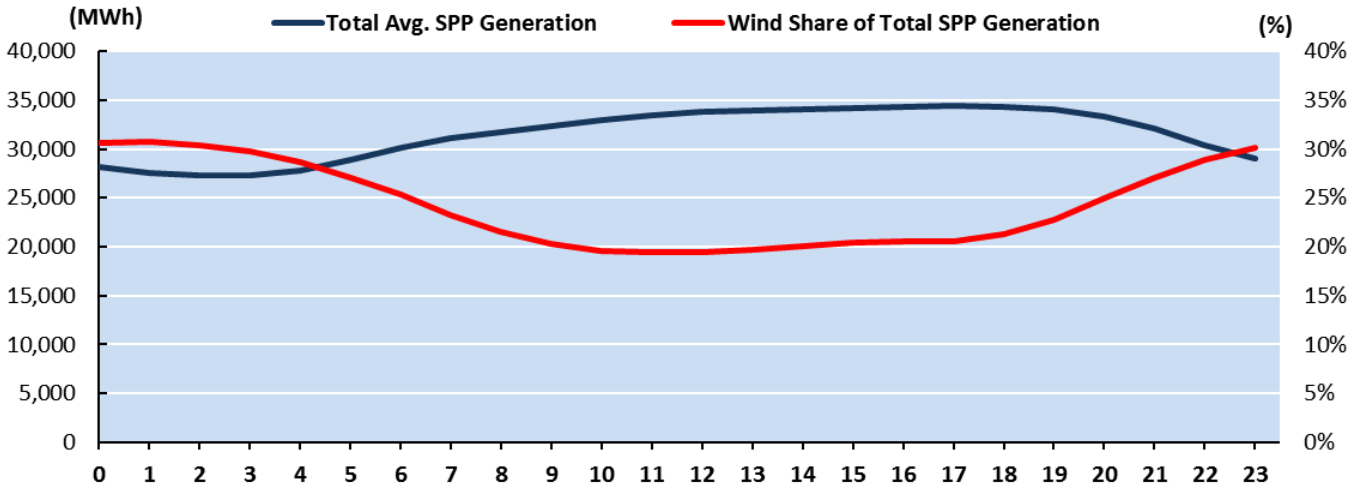
Other areas to minimize coal plant cycling costs, outside the control of coal plant owners, include increased deployment of energy storage and demand-side management resources to shift some of the renewable generation from wind and solar to peak demand hours or reduce the demand fluctuations over the course of the day. A more drastic approach is to curtail wind and solar generation during times of high generation or low demand to minimize the requirement for fossil fuel plant cycling.

Current Financial Compensation Practices for Plant Flexibility Operation

The previous section described various mitigation strategies to counteract the increased maintenance and capital costs due to increased coal plant cycling and shutdowns/startups. Most of these mitigation strategies require significant amounts of additional capital investments by coal plant owners. Recent market developments described previously, including increased renewable generation from wind and solar and low natural gas prices due to the shale gas revolution, have eroded the revenue stream of coal plants significantly. Still, maintaining a flexible baseload fleet is vital to complement the variability of wind generation and keep electricity reliable and affordable, especially during times when new natural gas power plants face additional regulatory hurdles.

One issue with wind generation in SPP is shown in **Exhibit 16.** Exhibit 16 shows the average hourly total generation for SPP during a 24-hour cycle in 2018 along with the wind generation share during those same hours. In 2018, wind supplied over 30% of the generation between 11 pm and 3 am, while dropping to just 20% between 10 am and 5 pm. Conversely, demand for electricity in SPP reaches its low point at 3 am and starts to climb throughout the day, before beginning to decline again around 6 pm. Therefore, during peak electricity demand times, wind generation in SPP is generally at its lowest, requiring other generating resources such as coal and natural gas to increase generation accordingly.

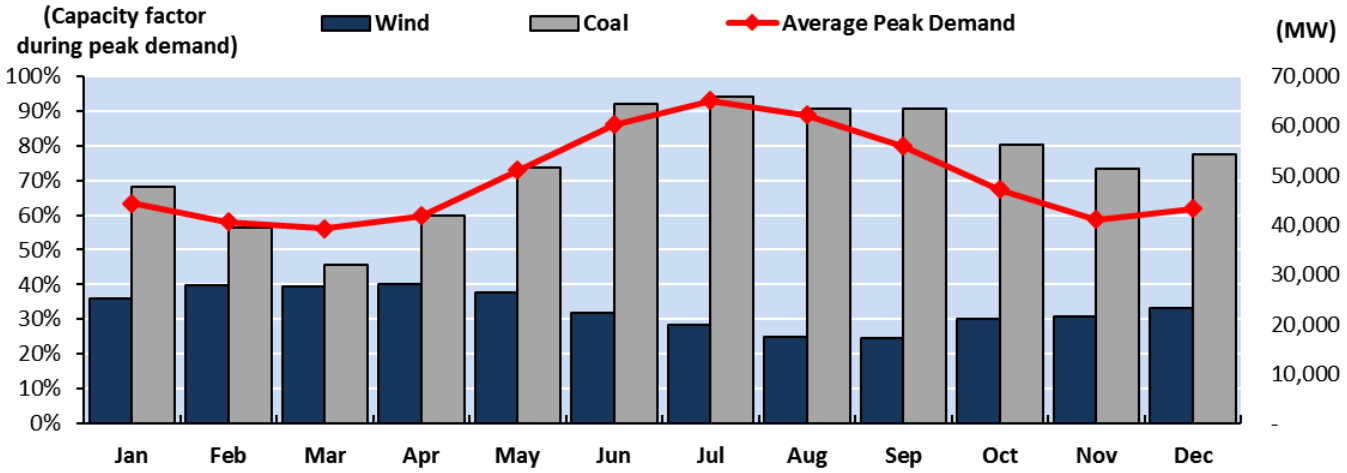
EXHIBIT 16: 2018 AVERAGE HOURLY SPP GENERATION VS. WIND GENERATION SHARE[21]



Additionally, wind generation varies significantly from month to month. Exhibit 17 shows the average capacity factors for both coal and wind and during peak demand hours by month for ERCOT for the years 2016 through 2018. Wind generation tends to achieve its highest capacity factors during the spring and fall seasons while being at its lowest during the hot summer months. On the other hand, demand for electricity reaches its peak during the hot summer months when the use of air conditioning drives up demand. Again, due to the seasonality of wind, additional generating resources are needed to increase generation to ensure reliable electricity delivery.

21 Source: SPP Hourly Generation Mix Data

EXHIBIT 17: AVERAGE CAPACITY FACTOR OF WIND AND COAL GENERATION DURING PEAK DEMAND HOURS IN ERCOT BY MONTH – 2016 TO 2018[22]



Historically, as shown in **Exhibit 17,** coal-fired EGUs operated at full capacity during high demand seasons, such as summer and winter, while frequently cycling between minimum load and full load during the shoulder months when online. During shoulder months, power prices during off-peak hours (late night to early morning hours) would sometimes drop below the coal unit's operating costs, therefore losing money during those hours. However, coal unit operators would accept the overnight losses to be available during peak demand hours, subsequently having the opportunity to recoup lost revenue.

The shale gas revolution and the increased development of renewable generating resources have changed this equation dramatically. As a review, power prices in deregulated power markets are set by the EGU that provides the marginal MWh to meet electricity demand at that time. As the dispatch cost for wind is essentially zero, the increased share of wind generation has caused off-peak power prices to decline in recent years. Additionally, on-peak power prices have fallen at even higher rates, as natural gas prices have plummeted, reducing the dispatch costs for combustion turbines which historically used to be the marginal resources and set the on-peak power prices. In some regions, dispatch costs for combustion turbines and combined cycle power plants have dropped well below coal-fired power plants, leaving an increasing number of coal plants "out-of-the-money."

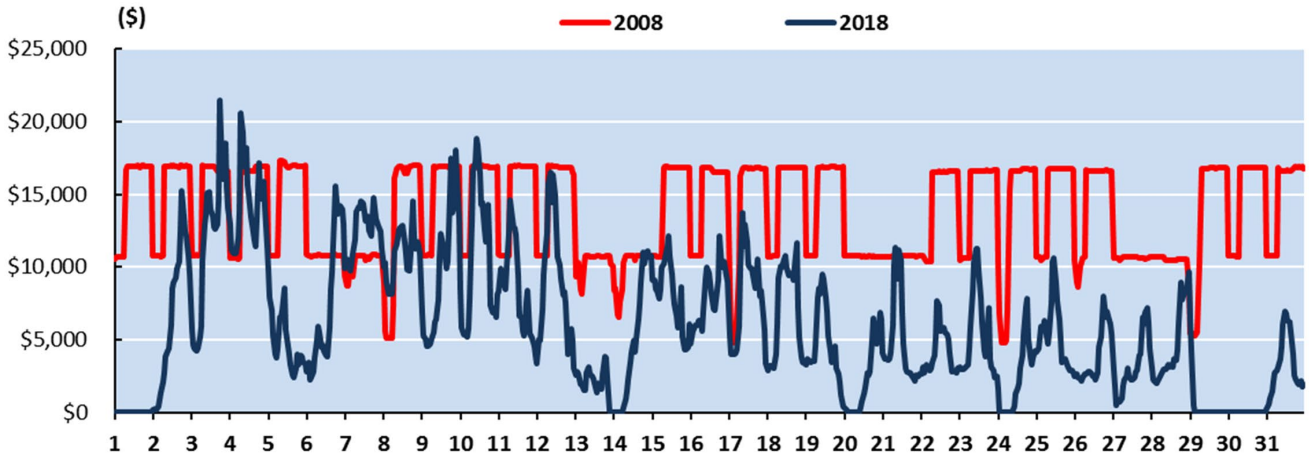
As a result, coal plants frequently find themselves in a vicious cycle. Due to the low revenue expectation during on-peak hours and to minimize losses during off-peak hours, coal plants more often shut down operations for longer periods and only return to service when more extended periods of profitability are expected. However, the longer coal-fired EGUs remain offline, the more expensive it becomes to return them to service. In fact, cold starts are often more than three times more expensive than hot starts, increasing the capital and maintenance costs associated with operating the unit. On the other hand, lower revenues due to lower wholesale power prices and lower plant utilization rates have reduced the working capital for many coal plant operators, therefore limiting the amount of available capital to spend on maintenance or to make significant improvements to reduce the overall cycling cost of the unit.

22 Source: ERCOT Hourly Generation Mix Data

Consequently, the combination of falling on-peak and off-peak power prices and increased cycling operations have significantly eroded the economic viability of many coal-fired power plants across the country, even though they can provide essential reliability and flexibility services.

Xcel's Harrington 1 coal-fired unit in Texas, the example from earlier, provides a useful case study of this issue. In December 2008, the EGU operated at a capacity factor of 94.7%, had zero shutdowns over the course of the month, and its average hourly ramp rate was 1.1%. In December 2018, these numbers were drastically different. Harrington 1's capacity factor dropped to 57.1%. It experienced five different startups (three hot starts and two warm starts), and its average hourly ramp rate increased to 4.9%. Additionally, on-peak and off-peak power prices for SPP-South, where Harrington is located, dropped 38% and 23% between December 2008 and 2018, respectively. **Exhibit 18** shows Harrington's estimated hourly energy revenue for the month of December in 2008 and 2018.

EXHIBIT 18: ESTIMATED ENERGY REVENUE FOR XCEL ENERGY'S HARRINGTON 1 COAL UNIT – DECEMBER 2008 & 2018[23]



As shown in **Exhibit 6,** Harrington 1 operated at full capacity almost all of December 2008 and generated over $10 million in energy revenue as a result. In December 2018, however, as power prices collapsed and Harrington 1 operated at much lower utilization rates, its energy revenue fell to $4.5 million. Including the additional costs of approximately $500,000 for the two warm starts and three hot starts, Harrington 1 generated more than $6 million less in net revenue in December 2018 compared to 2008. This does not include any additional O&M requirements to offset the greater stress on plant equipment due to the more frequent cycling operations.

As is recognized by market participants in both regulated and deregulated power markets, it is of utmost importance to retain a significant amount of electric generating capacity above peak electricity demand to account for unexpected losses in variable energy generation from wind and solar, unscheduled fossil plant outages, and under-forecasts of load. This amount of excess capacity is referred to as the reserve margin. Because wind resources tend to be at lower generation levels during peak demand hours as described previously, wind resources are rated at lower capacity

23 Source: S&P Global Platts Megawatt Daily Power Price Data

values than other resources. While some power markets such as PJM provide capacity payments to generating resources to provide capacity when needed, the two markets with the highest share of intermittent renewable generation, SPP and ERCOT, do not have capacity markets. Both markets are considered energy-only markets (although SPP does have a resource adequacy requirement tariff).

Both ERCOT and SPP acknowledged in their latest State of the Market Reports[24] that it is in the best interest for the market to develop compensation mechanisms or products to pay for capacity to cover uncertainties, such as the loss of the significant amount of generation during high demand times, as was the case in ERCOT this summer. The independent market monitor for ERCOT acknowledged that in 2018, coal units in ERCOT received just enough revenue from energy and ancillary services to cover operating costs.[25]

The other two major independent power markets with significant coal generation, PJM and MISO, are also in the process of developing new market mechanisms to better support and compensate the coal plants in their markets for the reliability and flexibility they provide. MISO, for example, is currently exploring the introduction of a so-called multi-day operating margin forecast. The forecast provides key power market metrics such as expected renewable generation, forecasted load, and scheduled plant outages for the next seven days to allow plant operators to make commitment decisions well ahead of the day-ahead market auction. PJM, on the other hand, tries to minimize the financial losses coal plants incur overnight. As mentioned previously, many coal plants cannot turn off completely overnight as they have to be available during peak demand hours in the morning. However, with the rise in renewable generation and drop in natural gas prices, off-peak power prices during the late night/early morning hours have dropped well below the operating costs of many of these coal plants, forcing them to incur huge losses these plants are struggling to recoup during the day. PJM is working on a pricing tool that allows certain baseload power plants to receive higher prices during off-peak hours to ensure they provide flexible and reliable generation during the day.

Regulated Utilities

Regulatory mechanisms minimize the financial exposure regulated utilities face compared to their merchant counterparts. However, they do experience their own unique struggles. Regulated utilities generally have two options to recover the costs for operating their generating fleet.

First, every few years, regulated utilities forecast their expenditures for maintaining affordable and reliable electricity supply, and request an electric rate adjustment through a "rate case" to recoup their expected capital expenditures and guarantee a set rate of return. However, there is generally no true-up to previous rate cases. If a utility greatly underestimated the costs to operate its generation fleet during its last rate case, the utility incurs these costs with no possibility to recoup those losses. Regulated utilities do use past projections versus performance measures to inform their next rate adjustment.

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24 Southwest Power Pool. "State of the Market 2018" (May 2019) https://www.spp.org/documents/59861/2018%20annual%20state%20of%20the%20market%20report.pdf

25 Potomac Economics. "State of the Market Report for ERCOT Electricity Markets" (June 2019) https://www.potomaceconomics.com/wp-content/uploads/2019/06/2018-State-of-the-Market-Report.pdf

The second option for utilities to recoup their investments in their generating fleet is through short-term adjustments. Based on the state, these adjustments vary in name and frequency. For example, in Alabama, regulated utilities can recover increased fuel or purchased power expenditures through the Energy Cost Recovery Rider. In other states, such as Wyoming, utilities are also allowed to recover some of their increased O&M costs through annual adjustment riders. However, in states where capital expenditures for increased O&M caused by operational changes at coal-fired power plants discussed throughout this report can only be recovered through projected going-forward costs as part of a rate case, some utilities have likely incurred some unexpected losses over the last decade.

As the example in Texas this summer has shown, sufficient backup flexible capacity is needed to ensure reliable electricity supply during peak demand times, coupled with a higher-than-expected loss of variable generation from wind or solar. Without any other market mechanisms incentivizing new capacity entry into the market, keeping existing fossil generation from retiring becomes paramount. Even in regulated states, continued operation of and investment in existing coal-fired power plants can oftentimes be the more economical choice than building a new natural gas plant. Besides the technology options discussed in this report to make existing coal plants more flexible and efficient, new technologies begin to emerge and provide viable alternatives to natural gas peaking resources in the near future. According to a recent report from Bloomberg New Energy Finance, lithium-ion battery prices have dropped faster than projected, from over $1,100/kWh in 2010 to $156/kWh in 2019.[26] As the industry focuses on bringing new energy storage and flexible generation to commercial operation, utilities focus on maintaining the existing fleet of fossil resources to bridge that timing gap.

Regulators in California are now pursuing a similar strategy. In order to achieve its aggressive GHG emission reduction goal, California required utilities to invest in new non-hydro renewable generation heavily, mainly solar and, to a lesser extent, wind, while also banning new natural gas generation from entering the market. As older fossil plants have retired over the last few years due to the loss of energy revenue and increased operating costs, California's reserve margin began to shrink, and the risk of a potential loss of load increased. Now, regulators in California required existing natural gas generation to continue operating and provide much-needed backup flexible generation while new non-GHG emitting energy storage resources such as battery storage enter the market.[27]

26 BNEF. "Battery Pack Prices Fall As Market Ramps Up With Market Average At $156/kWh In 2019" (December 2019) https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/?sf113554299=1

27 http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M312/K522/312522263.PDF

Conclusion

In summary, it is worth highlighting the following points:

- Coal plant operations have changed dramatically over the last decade, forced by changing market dynamics due to low natural gas prices and increased generation from intermittent renewable energy resources such as wind and solar.

- While not originally designed to be load-following, many coal plants are capable of providing flexible generation at efficient and cost-effective levels to complement increased renewable generation. Additionally, technology improvements exist to increase the efficiency and flexibility of existing coal plants that are oftentimes more economical than building new generation capacity.

- However, the current market and regulatory mechanisms are not sufficient to offset some or all of the increased one-time and ongoing costs for coal-fired power plant operators to support this change in plant operations. Power markets and regulatory commissions provide different options to help mitigate the issue and are focusing on developing new mechanisms or making changes to existing ones.

- Recent examples in Texas and California have shown the necessity of maintaining existing generating resources to provide much-needed flexible and reliable generation while new energy storage technologies are being developed and deployed.

Appendix

EXHIBIT 19: GENERATION MIX BY STATE – 2008 VS. 2018

	2008							2018						
	Coal	Natural Gas & Oil	Nuclear	Hydro	Wind	Solar	Other	Coal	Natural Gas & Oil	Nuclear	Hydro	Wind	Solar	Other
US Total	**50%**	**21%**	**20%**	**6%**	**1%**	**0%**	**1%**	**28%**	**35%**	**20%**	**7%**	**7%**	**2%**	**1%**
Alaska	6%	76%	0%	18%	0%	0%	0%	9%	64%	0%	24%	2%	0%	0%
Alabama	53%	15%	28%	4%	0%	0%	0%	23%	41%	28%	8%	0%	0%	0%
Arkansas	49%	15%	27%	9%	0%	0%	0%	46%	29%	19%	5%	0%	0%	0%
Arizona	37%	33%	25%	6%	0%	0%	0%	27%	33%	28%	6%	1%	5%	0%
California	1%	56%	17%	13%	3%	0%	9%	0%	44%	10%	14%	8%	15%	9%
Colorado	65%	25%	0%	3%	6%	0%	0%	47%	30%	0%	3%	18%	2%	0%
Connecticut	15%	28%	51%	2%	0%	0%	5%	1%	50%	44%	1%	0%	0%	3%
District Of Columbia	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Delaware	76%	22%	0%	0%	0%	0%	2%	6%	92%	0%	0%	0%	1%	1%
Florida	30%	53%	15%	0%	0%	0%	2%	13%	72%	12%	0%	0%	1%	2%
Georgia	64%	10%	24%	1%	0%	0%	0%	26%	42%	28%	2%	0%	2%	1%
Hawaii	15%	79%	0%	0%	2%	0%	3%	14%	71%	0%	1%	6%	2%	7%
Iowa	76%	4%	10%	2%	8%	0%	0%	44%	12%	8%	2%	35%	0%	0%
Idaho	0%	15%	0%	82%	2%	0%	1%	0%	18%	0%	62%	15%	3%	1%
Illinois	48%	2%	48%	0%	1%	0%	0%	31%	8%	53%	0%	7%	0%	0%
Indiana	97%	3%	0%	0%	0%	0%	0%	72%	22%	0%	0%	5%	0%	0%
Kansas	73%	5%	18%	0%	4%	0%	0%	39%	7%	17%	0%	36%	0%	0%
Kentucky	94%	4%	0%	2%	0%	0%	0%	75%	18%	0%	6%	0%	0%	0%
Louisiana	36%	39%	23%	2%	0%	0%	0%	17%	58%	24%	1%	0%	0%	0%
Massachusetts	25%	55%	14%	1%	0%	0%	5%	0%	68%	16%	2%	1%	5%	7%
Maryland	58%	5%	31%	4%	0%	0%	1%	23%	31%	35%	7%	1%	1%	2%
Maine	1%	47%	0%	32%	1%	0%	18%	1%	22%	0%	35%	26%	0%	17%
Michigan	61%	9%	28%	0%	0%	0%	2%	38%	28%	27%	1%	5%	0%	2%
Minnesota	58%	6%	25%	1%	8%	0%	2%	37%	15%	24%	2%	18%	2%	2%
Missouri	81%	6%	10%	3%	0%	0%	0%	73%	8%	13%	2%	4%	0%	0%
Mississippi	36%	44%	20%	0%	0%	0%	0%	9%	80%	11%	0%	0%	1%	0%
Montana	62%	2%	0%	34%	2%	0%	0%	48%	3%	0%	39%	8%	0%	1%
North Carolina	61%	4%	32%	2%	0%	0%	0%	24%	34%	32%	4%	0%	5%	1%
North Dakota	91%	0%	0%	4%	5%	0%	0%	66%	2%	0%	6%	26%	0%	0%
Nebraska	66%	2%	29%	1%	1%	0%	0%	63%	3%	15%	4%	14%	0%	0%
New Hampshire	15%	31%	41%	7%	0%	0%	5%	4%	18%	58%	9%	2%	0%	9%
New Jersey	14%	33%	51%	0%	0%	0%	2%	2%	52%	43%	0%	0%	2%	2%
New Mexico	74%	21%	0%	1%	4%	0%	0%	41%	35%	0%	1%	19%	4%	0%
Nevada	22%	68%	0%	5%	0%	0%	4%	6%	67%	0%	5%	1%	12%	9%
New York	13%	34%	31%	19%	1%	0%	2%	1%	38%	33%	23%	3%	0%	2%
Ohio	86%	3%	11%	0%	0%	0%	0%	47%	35%	15%	0%	1%	0%	0%
Oklahoma	48%	44%	0%	5%	3%	0%	0%	17%	48%	0%	3%	32%	0%	0%
Oregon	7%	29%	0%	59%	4%	0%	1%	2%	27%	0%	57%	11%	1%	1%
Pennsylvania	53%	9%	36%	1%	0%	0%	1%	21%	36%	39%	1%	2%	0%	1%
Rhode Island	0%	98%	0%	0%	0%	0%	2%	0%	93%	0%	0%	2%	1%	3%
South Carolina	42%	6%	52%	0%	0%	0%	0%	20%	23%	54%	2%	0%	1%	1%
South Dakota	52%	4%	0%	42%	2%	0%	0%	21%	9%	0%	46%	24%	0%	0%
Tennessee	63%	1%	31%	6%	0%	0%	0%	26%	16%	46%	12%	0%	0%	0%
Texas	40%	44%	11%	0%	4%	0%	0%	26%	46%	10%	0%	18%	1%	0%
Utah	82%	16%	0%	1%	0%	0%	1%	66%	21%	0%	3%	2%	6%	2%
Virginia	44%	15%	40%	0%	0%	0%	1%	10%	54%	32%	0%	0%	1%	3%
Vermont	0%	0%	72%	22%	0%	0%	6%	0%	0%	0%	59%	17%	6%	18%
Washington	8%	9%	8%	71%	3%	0%	1%	5%	9%	8%	71%	6%	0%	0%
Wisconsin	66%	9%	20%	2%	1%	0%	1%	50%	26%	15%	4%	3%	0%	1%
West Virginia	98%	0%	0%	1%	0%	0%	0%	94%	2%	0%	2%	3%	0%	0%
Wyoming	96%	0%	0%	2%	2%	0%	0%	87%	1%	0%	2%	9%	0%	0%

EXHIBIT 20: AVERAGE UTILIZATION DISTRIBUTION BY STATE – 2008 VS. 2018

	2008						2018					
	Offline	< 40%	40 - 60%	60 - 80%	> 80%	Avg. Turndown	Offline	< 40%	40 - 60%	60 - 80%	> 80%	Avg. Turndown
US Total	**17%**	**3%**	**9%**	**15%**	**55%**	**52%**	**32%**	**6%**	**12%**	**14%**	**37%**	**43%**
Alabama	13%	3%	11%	16%	58%	50%	34%	9%	17%	11%	29%	43%
Arkansas	15%	2%	5%	9%	70%	53%	20%	4%	9%	12%	55%	43%
Arizona	7%	1%	2%	9%	81%	70%	15%	8%	13%	29%	36%	44%
Colorado	11%	1%	5%	12%	71%	63%	20%	0%	12%	27%	41%	57%
Connecticut	7%	6%	3%	3%	81%	36%	85%	4%	1%	2%	8%	12%
Delaware	18%	13%	15%	19%	34%	35%	85%	2%	7%	2%	4%	10%
Florida	19%	3%	12%	15%	52%	52%	33%	11%	14%	14%	28%	35%
Georgia	11%	5%	23%	16%	44%	46%	54%	8%	13%	9%	15%	34%
Iowa	21%	3%	12%	24%	40%	50%	30%	7%	12%	10%	42%	35%
Illinois	14%	3%	10%	15%	57%	53%	28%	5%	13%	16%	39%	46%
Indiana	18%	3%	8%	13%	59%	52%	30%	4%	12%	13%	41%	46%
Kansas	12%	1%	6%	19%	62%	61%	29%	9%	11%	14%	38%	41%
Kentucky	13%	3%	8%	16%	60%	52%	24%	4%	12%	17%	43%	43%
Louisiana	13%	2%	3%	8%	75%	57%	28%	6%	13%	19%	33%	43%
Maryland	22%	8%	13%	18%	39%	40%	71%	8%	6%	5%	11%	19%
Michigan	16%	3%	11%	22%	48%	51%	35%	3%	15%	20%	26%	43%
Minnesota	21%	3%	9%	20%	47%	52%	20%	2%	21%	16%	42%	49%
Missouri	14%	2%	5%	14%	66%	58%	21%	2%	10%	13%	54%	51%
Mississippi	15%	2%	5%	7%	71%	53%	49%	29%	17%	4%	1%	35%
Montana	12%	2%	4%	11%	72%	55%	30%	4%	4%	19%	42%	46%
North Carolina	31%	7%	13%	11%	38%	39%	54%	12%	9%	7%	19%	33%
North Dakota	10%	0%	1%	8%	80%	75%	11%	0%	7%	13%	67%	69%
Nebraska	9%	1%	11%	33%	47%	56%	16%	5%	20%	14%	44%	42%
New Hampshire	14%	2%	2%	6%	77%	73%	68%	1%	2%	5%	23%	47%
New Jersey	48%	6%	9%	15%	22%	40%	98%	0%	1%	0%	1%	7%
New Mexico	15%	1%	2%	4%	78%	71%	26%	4%	9%	17%	45%	56%
Nevada	19%	2%	3%	7%	69%	57%	36%	19%	10%	13%	22%	38%
New York	10%	1%	5%	14%	70%	59%	88%	3%	2%	2%	6%	24%
Ohio	24%	5%	11%	17%	44%	42%	42%	5%	11%	9%	33%	30%
Oklahoma	12%	2%	4%	10%	72%	57%	43%	6%	11%	9%	30%	39%
Oregon	18%	1%	1%	1%	80%	87%	63%	3%	2%	3%	28%	26%
Pennsylvania	19%	6%	11%	18%	46%	47%	47%	3%	13%	7%	30%	42%
South Carolina	22%	3%	8%	20%	47%	52%	45%	5%	10%	19%	22%	44%
South Dakota	4%	0%	4%	12%	79%	60%	23%	2%	22%	17%	36%	42%
Tennessee	8%	1%	6%	18%	67%	55%	48%	1%	14%	11%	26%	45%
Texas	10%	1%	2%	7%	79%	68%	17%	10%	12%	10%	51%	41%
Utah	6%	1%	2%	7%	85%	75%	8%	16%	12%	16%	48%	37%
Virginia	32%	7%	8%	15%	38%	40%	64%	4%	8%	6%	17%	38%
Washington	23%	1%	2%	2%	72%	71%	43%	3%	7%	11%	37%	40%
Wisconsin	23%	5%	13%	22%	37%	40%	21%	6%	13%	20%	41%	43%
West Virginia	28%	4%	7%	13%	48%	45%	29%	3%	12%	12%	44%	53%
Wyoming	7%	1%	3%	6%	83%	70%	9%	4%	11%	13%	63%	55%

EXHIBIT 21: AVERAGE NUMBER OF STARTS & AVG. OUTAGE LENGTH BY STATE – 2008 VS. 2018

	2008					2018				
	Hot Start (< 12h)	Warm Start (12 - 48h)	Cold Start (48 - 120h)	LT Outage (> 120h)	Avg. Outage Length	Hot Start (< 12h)	Warm Start (12 - 48h)	Cold Start (48 - 120h)	LT Outage (> 120h)	Avg. Outage Length
US Total	**3.7**	**3.1**	**3.4**	**2.5**	**148.3**	**2.0**	**1.7**	**2.8**	**4.1**	**341.9**
Alabama	3.2	2.5	1.5	2.0	147.6	2.7	0.8	1.5	3.5	407.5
Arkansas	2.8	0.8	2.2	2.0	186.8	1.1	1.4	0.4	2.1	542.0
Arizona	4.0	1.5	2.5	0.8	76.8	2.4	1.0	3.1	2.5	170.2
Colorado	2.3	1.6	2.3	1.5	140.7	2.1	0.7	1.0	2.3	372.7
Connecticut	5.0	5.0	3.0	1.0	47.2	3.0	-	2.0	9.0	532.8
Delaware	2.3	3.7	5.0	3.3	114.0	2.0	3.0	7.0	10.0	339.5
Florida	3.9	2.9	2.0	2.5	180.3	2.7	1.6	2.2	3.8	303.7
Georgia	1.9	2.5	1.1	1.6	160.2	1.7	1.4	1.6	2.9	870.1
Iowa	3.8	1.9	3.6	2.3	183.7	2.2	3.5	3.6	3.0	402.1
Illinois	2.7	3.6	3.4	2.1	122.6	2.3	2.9	5.0	4.8	176.4
Indiana	2.9	3.6	3.7	2.6	131.7	1.6	2.0	3.2	4.4	262.3
Kansas	2.8	3.7	2.3	1.1	129.0	1.1	1.7	5.1	3.6	242.6
Kentucky	3.0	4.2	2.7	1.5	120.1	1.7	1.6	2.4	3.6	258.8
Louisiana	2.8	3.3	1.8	1.8	114.1	1.3	2.1	2.6	4.3	268.6
Maryland	7.1	4.4	4.7	3.3	131.8	0.9	0.2	2.6	10.6	536.6
Michigan	2.5	2.8	5.0	2.2	156.9	1.5	0.8	1.3	4.1	597.0
Minnesota	2.5	3.7	3.7	2.5	167.0	2.6	3.9	4.4	4.3	126.8
Missouri	2.9	2.8	2.3	1.7	138.8	1.9	1.9	3.3	3.3	199.8
Mississippi	2.8	1.2	1.0	2.0	296.9	4.0	1.7	1.0	4.7	758.6
Montana	5.0	3.3	1.7	2.4	84.1	3.0	1.7	4.0	2.7	267.3
North Carolina	4.8	5.0	6.0	5.0	145.7	1.1	0.8	3.2	7.1	473.3
North Dakota	2.0	3.2	2.6	1.0	126.7	1.1	2.6	3.2	2.0	131.0
Nebraska	2.5	1.2	1.6	1.7	145.4	1.7	1.6	1.9	3.1	207.1
New Hampshire	1.0	1.2	2.8	2.0	174.3	12.0	5.8	6.0	11.0	221.5
New Jersey	1.9	5.1	6.4	6.0	301.5	3.0	-	-	4.0	1,229.3
New Mexico	6.6	2.5	4.2	1.5	88.4	2.4	3.4	2.8	2.6	280.7
Nevada	6.0	3.0	5.5	2.3	106.2	5.0	1.3	-	2.0	391.4
New York	2.2	1.4	2.5	1.8	127.4	1.5	0.5	3.0	7.5	622.7
Ohio	7.0	3.2	5.2	3.5	234.0	1.3	2.3	4.9	5.9	287.8
Oklahoma	5.0	2.2	2.2	1.8	105.9	3.5	2.7	5.3	8.7	217.6
Oregon	4.0	3.0	3.0	1.0	143.6	1.0	1.0	2.0	4.0	694.4
Pennsylvania	2.0	2.8	3.7	3.6	134.0	1.6	1.1	2.7	6.8	502.4
South Carolina	2.3	3.8	2.7	2.8	176.0	1.0	1.5	3.2	6.2	495.9
South Dakota	-	4.0	1.0	1.0	66.3	1.0	3.0	2.0	2.0	253.5
Tennessee	0.5	0.8	2.2	1.6	131.5	0.4	0.4	0.8	3.7	978.7
Texas	2.2	2.2	1.9	1.3	139.2	2.4	1.7	1.6	2.3	214.9
Utah	3.6	4.4	3.1	0.2	52.3	3.1	1.8	1.5	1.4	111.7
Virginia	13.0	4.0	5.6	5.5	130.1	0.5	0.8	3.7	7.7	462.9
Washington	2.0	3.5	3.0	2.5	191.0	2.0	3.0	3.5	1.0	404.4
Wisconsin	9.8	3.0	3.3	3.3	171.3	1.1	1.6	2.1	3.3	226.3
West Virginia	1.9	4.0	5.2	4.3	165.6	1.0	2.1	4.1	4.3	253.5
Wyoming	4.7	4.0	2.4	0.6	65.9	4.0	2.7	2.2	1.1	88.7

EXHIBIT 22: AVERAGE DISTRIBUTION OF HOURLY RAMP RATES BY STATE – 2008 VS. 2018

	2008			2018		
	No Ramping	< 2.5%	> 2.5%	No Ramping	< 2.5%	> 2.5%
US Total	**33%**	**39%**	**28%**	**32%**	**38%**	**30%**
Alabama	37%	37%	26%	49%	27%	24%
Arkansas	24%	43%	33%	20%	42%	38%
Arizona	44%	37%	19%	37%	27%	35%
Colorado	48%	39%	14%	32%	39%	30%
Connecticut	68%	14%	18%	19%	32%	49%
Delaware	47%	24%	28%	33%	24%	43%
Florida	31%	39%	29%	41%	29%	29%
Georgia	30%	35%	35%	39%	32%	29%
Iowa	35%	34%	31%	29%	38%	33%
Illinois	25%	43%	31%	30%	41%	29%
Indiana	30%	43%	27%	32%	36%	32%
Kansas	39%	40%	21%	16%	46%	38%
Kentucky	32%	40%	28%	32%	38%	29%
Louisiana	22%	57%	21%	19%	49%	32%
Maryland	18%	35%	48%	28%	31%	41%
Michigan	45%	32%	23%	44%	31%	24%
Minnesota	40%	36%	24%	27%	38%	35%
Missouri	38%	40%	22%	24%	46%	30%
Mississippi	30%	44%	26%	46%	27%	27%
Montana	48%	43%	9%	43%	36%	21%
North Carolina	39%	27%	34%	29%	32%	39%
North Dakota	35%	53%	12%	36%	50%	14%
Nebraska	40%	37%	23%	27%	40%	33%
New Hampshire	64%	28%	8%	46%	22%	32%
New Jersey	33%	35%	31%	20%	32%	48%
New Mexico	40%	45%	14%	28%	47%	25%
Nevada	38%	47%	15%	48%	27%	25%
New York	38%	39%	23%	24%	35%	41%
Ohio	24%	38%	38%	37%	40%	22%
Oklahoma	30%	56%	13%	24%	34%	42%
Oregon	32%	65%	3%	30%	46%	24%
Pennsylvania	26%	38%	37%	32%	40%	28%
South Carolina	33%	38%	29%	22%	44%	34%
South Dakota	22%	52%	26%	11%	39%	50%
Tennessee	40%	39%	21%	43%	35%	22%
Texas	27%	52%	20%	21%	45%	34%
Utah	35%	52%	13%	23%	38%	38%
Virginia	24%	31%	45%	34%	37%	29%
Washington	22%	70%	7%	19%	59%	21%
Wisconsin	34%	30%	36%	31%	36%	33%
West Virginia	25%	37%	38%	27%	43%	30%
Wyoming	31%	59%	9%	35%	39%	25%


NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS
DEDICATED TO PUBLIC SERVICE
1889

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 59

IEA FLEXIBILITY REPORT

Increasing the flexibility of coal-fired power plants

Colin Henderson

September 2014

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Increasing the flexibility of coal-fired power plants

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Preface

This report has been produced by IEA Clean Coal Centre and is based on a survey and analysis of published literature, and on information gathered in discussions with interested organisations and individuals. Their assistance is gratefully acknowledged. It should be understood that the views expressed in this report are our own, and are not necessarily shared by those who supplied the information, nor by our member countries.

IEA Clean Coal Centre is an organisation set up under the auspices of the International Energy Agency (IEA) which was itself founded in 1974 by member countries of the Organisation for Economic Co-operation and Development (OECD). The purpose of the IEA is to explore means by which countries interested in minimising their dependence on imported oil can co-operate. In the field of Research, Development and Demonstration over fifty individual projects have been established in partnership between member countries of the IEA.

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Abstract

Increasingly, coal-fired power plants are required to balance power grids by compensating for the variable electricity supply from renewable energy sources. For this, high flexibility is needed, in terms of possessing resilience to frequent start-ups, meeting major and rapid load changes, and providing frequency control duties. This report reviews the means available and under development for achieving flexibility. Potential damage mechanisms are well known, and the necessary flexibility can be achieved with acceptable impacts on component life, efficiency and emissions. Designs are being developed to enable flexibility in future plants.

Acknowledgement

Dr H-J Meier – VGB, Essen

Acronyms and abbreviations

ABS	ammonium bisulphate
ASU	air separation unit
A-USC	advanced ultra-supercritical
CFBC	circulating fluidised bed combustion
ESP	electrostatic precipitator
FDBR	Association of Plant Engineering for Energy, Environment and Process Industry (Germany)
FGD	flue gas desulphurisation
GW	gigawatts
HP	high pressure
IEA	International Energy Agency
IEA CCC	IEA Clean Coal Centre
IGCC	integrated gasification combined cycle
IP	intermediate pressure
LHV	lower heating value
LP	low pressure
MCR	maximum continuous rating
MPa	megapascals
MW	megawatts
PCC	pulverised coal combustion
PID	proportional integral derivative
RH	reheater
SCR	selective catalytic reduction
SH	superheater
SNG	substitute natural gas
USC	ultra-supercritical

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1 Introduction

A recent report from the IEA Clean Coal Centre discussed the growing capacity of renewable energy plants around the world and the effects of their intermittent and highly variable output on the operation of coal-fired plants (Mills, 2011). In the absence of sufficient large-scale electricity storage capability, the effect has been to force coal (and gas) fired units in some countries to deliver greatly varying output to enable the grid system to meet load at all times. The challenges presented by this situation will only increase and become more widespread in the future. For example, Hitachi Power Europe (now Mitsubishi Hitachi Power Systems) has estimated that fluctuations in supply in Germany from renewable power sources will double or triple by the end of the decade, while the demand for electricity from non-renewable sources will have decreased by 50% between 2010 and 2020 (Schultz, 2012). This is against a background of ever-changing system demand during each day (Balling, 2010). A comparison of the 2010 position in Germany with a projection for 2020 in Figure 1 illustrates the magnitude of the expected challenge (Busekrus, 2012).

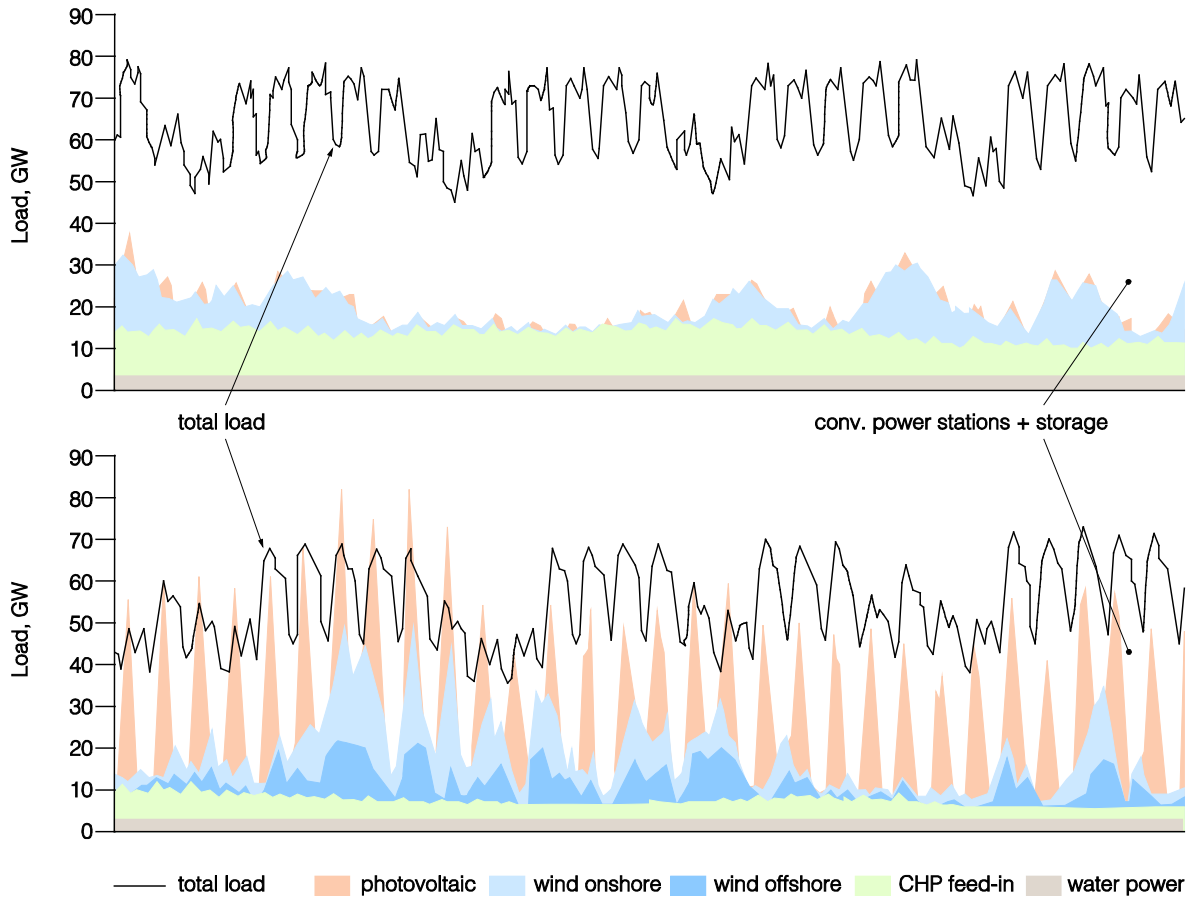


Figure 1 Monthly pattern of load and generation for Germany in 2010 (upper) with prediction for 2020 (lower) (Busekrus, 2012)

There is a wide range of reported values in the literature for the maximum load following rates of coal-fired units. One reason behind this may be that actual and design values can differ. Another reason is that some literature describes the characteristics of one major area of the plant only, for example the

steam generator but not the turbine. Another contributing reason may be a lack of clarity sometimes in whether values refer to the normal load ramp rate capability as opposed to the capability for providing transient output changes to provide grid frequency control – *see later in this chapter*.

Once-through steam generators should in principle be capable of changing load more rapidly than boilers with steam drums. The twin Neurath 1.1 GW lignite-fired once-through USC units recently put into commercial operation in Germany can each change by 500 MW in 15 minutes (Fairley, 2013). This is about 3%/min based on MCR (maximum continuous rating). However, it can be possible to exceed this even with some existing plants, depending on design: 5% of maximum load/min was cited some years ago for a 220 MW unit in the USA after control system changes and tuning (Blankinship, 2003). In this report, as is normally the case in papers citing load change rates, % values are referring to % of maximum load. So, for example, a ramp rate of 2%/min on a 1000 MW plant is a linear 20 MW/min rate of change, whether from 400 MW or from 900 MW.

A presentation by Hitachi (now Mitsubishi Hitachi Power Systems) gives a rate of 7%/min from 40% to 100% output for the steam generators of new hard coal or lignite-fired plants (Busekrus, 2012), while brochures by the company suggest even 10%/min is possible (MHPS, 2014a,b). Babcock Power have reported 7%/min as a typical design value for a once-through boiler in the load range 50–90%, with demonstrated operating experience at this value with the 550 MW bituminous coal-fired unit at Rostock, Germany in two-shifting mode (Vitalis and others, 2000).

Some values from a survey and review conducted by Lindsay and Dragoon (2010) are shown in Table 1, to illustrate the potential for confusion in establishing a representative value for existing practical ramp rates. The EPRI data within that table were from a survey by that organisation of a large number of units in 1982, and, although old, do show considerable differences between maximum and average plant ramping rates, probably indicating a desire to limit plant wear, although there may be other influencing factors. In any case, it is likely that much higher load ramp rates will be required for future large units connected to grids for which the proportion of renewable generation sources continues to climb.

Table 1 Some design and reported plant load ramp rates for coal-fired units (Lindsay and Dragoon, 2010)

		Ramp rate, %/min	
Subcritical	Design	3–5	
Supercritical	Design	7–8	
Reported (EPRI)		**Average**	**Maximum**
Subcritical	180 MW	1.8	3.6
	300 MW	2.0	3.1
	420 MW	1.1	2.9
	540 MW	1.7	2.8
	660 MW	1.3	3.7
Supercritical	420 MW	1.3	4.3
	540 MW	1.1	3.6
	660 MW	1.2	2.0
	780 MW	0.9	3.5
	900 MW	1.0	2.0

The information shown in Table 2 on flexibility characteristics of modern USC PCC and IGCC plants is extracted from a table in a paper based on a study by Foster-Wheeler for the IEA Greenhouse Gas R&D Programme.

Table 2 Flexibility features of power plants (Domenichini and others, 2013)

	Turndown	Cycling capability, start-up to full load	Ramp rate
USC PCC	Minimum boiler load: 25–30%	Very hot start-up: <1h Hot start-up: 1.5–2.5 h Warm start-up: 3-5 h Cold start-up: 6-7 h	30-50% load: 2–3%/min 50-90% load: 4–8%/min 90-100% load: 3–5%/min
IGCC	Minimum environmental GT load: 60%. Process unit/air separation unit (ASU) cold box minimum load: 50%. ASU compressor minimum load: 70%	Cold start-up: 80-90 h Gasification hot start-up: 6-8 h ASU hot start-up: 6 h	Gasification ramp rate: 3–5%/min ASU ramp rate: 3%/min

The indications from the above review are that units can be supplied that can provide higher ramp rates than might commonly be supposed, and that part of the reason for this could be that owners have tended to operate their plants conservatively in this respect. However, an even greater degree of flexibility is expected to be required from coal-fired units in future. The present report focuses on the methods that have been developed to enable them to operate in this manner with least detriment to integrity, efficiency and emissions. It also describes means to achieve systems capable of operating at lower than current loads, so minimising the need for on/off operation or support firing.

Power grids have to maintain their alternating current frequency within defined limits. The synchronous capacity (coal, gas and nuclear) on a grid forms an inertial mass that provides a natural resistance to changes in that frequency when step changes in load or generator trips occur. However, the system also has to have active support to re-match supply to demand within seconds so that the system frequency can be quickly restored after it has begun to change. This primary frequency support function is provided by requiring some plants to be designed and operated in a manner to allow the supply of increased or reduced power on a very short-term reactive basis. This function has to be supplied by synchronous plants, typically some gas and some coal units. The high proportion of intermittent-service renewable energy plants on some grids is resulting in a reduction in the inertia of these grids because such plants do not normally deliver frequency control (Tielens and Van Hertem, no date). As a result, an increasing proportion of a decreasing body of fossil-fired units is now having to provide the service.

Primary frequency control requires extremely fast-changing output capability, for example approximately 1% of rated load per second, although it is needed only over short periods of time. Fossil-fired plants conventionally provide primary control through the turbine governors, which give a response to stabilise the frequency within 10 seconds to a minute, although there are other methods that can be even faster. Secondary control from other synchronous capacity within the grid system then restores frequency over

a timeframe of 1–10 minutes (NERC, 2011). Providing frequency control capability in coal-fired units is discussed in Section 4.4.

This report mostly concentrates on pulverised coal (PC) plants, since these constitute the largest fraction of coal-fired generation capacity around the world. Circulating fluidised bed combustion (CFBC) plants form a much smaller, although growing, proportion. Many of the issues discussed around the steam cycle and steam turbine systems for PC plants are likely to be similar for CFBC. Integrated coal combined cycle (IGCC) systems are small in number, but further ones are planned. Later chapters in the report look at the expected flexibility of plants using these technologies.

The report is organised as follows. Chapter 2 considers the potential detrimental effects, particularly on the boiler and turbine areas, of plants operating flexibly. Chapter 3 describes technical measures that have been developed for increasing flexibility in boilers. Chapter 4 examines the turbine and water/steam systems with respect to means for increasing flexibility. Chapter 5 looks at other areas, including emissions control systems and auxiliaries. Chapter 6 covers control systems and flexibility, while Chapters 7, 8 and 9 consider other types of coal-fired plants: CFBC (circulating fluidised bed combustion), IGCC (integrated gasification combined cycles) and A-USC (advanced ultra-supercritical – 700°C and hotter – PCC systems). Chapter 10 discusses the potential flexibility of carbon capture plants. A summary and the main conclusions from this review are presented in Chapter 11.

2 Potential detrimental effects of flexible operation

There are different approaches that are available to minimise harmful or performance-degrading influences of frequent plant start-ups and fast load swings, but first, this chapter outlines how adverse impacts on equipment can arise. The major process areas of a pulverised coal-fired power generation unit are indicated in Figure 2. Of particular concern in looking at the detrimental effects of flexible operation are the high temperature and high pressure components of plants, but virtually all areas can be affected: plant cycling (on/off and variable output operation) has the potential to impinge on virtually every area. Other parts of the plant that are likely to be affected in various ways, mainly in reduced efficiency, are the auxiliary systems and emissions control systems. Where scope for modifications to better accommodate cyclic operation is limited, as in older plants designed for base load operation, the use of improved monitoring and prediction systems to enable accurate assessments of component lifetimes will become of increasing importance (*see, for example,* Kranz, 2013; Payten, 2012).

Areas with the greatest potential for adverse effects are the boiler and steam turbine systems. When the plant is called upon to operate frequently at rapidly variable output and with frequent shut-downs and start-ups, resultant changes in temperature and pressure give rise to increased stresses on their various components. The consequences are reduced life, reduced performance and increased costs. Nicol (2014) has produced an IEA Clean Coal Centre report recently on the steels used in coal-fired plants, summarising their development, compositions, assessment and performance.

Formerly, when most plants operated on base load, the principal, though not exclusive, mechanism for materials damage to the hot pressure parts was creep, but a combination of creep with other failure mechanisms is to be increasingly expected with rapidly cycling plants (Kranz, 2013). Fatigue is a major contributor, but other harmful processes will add to this.

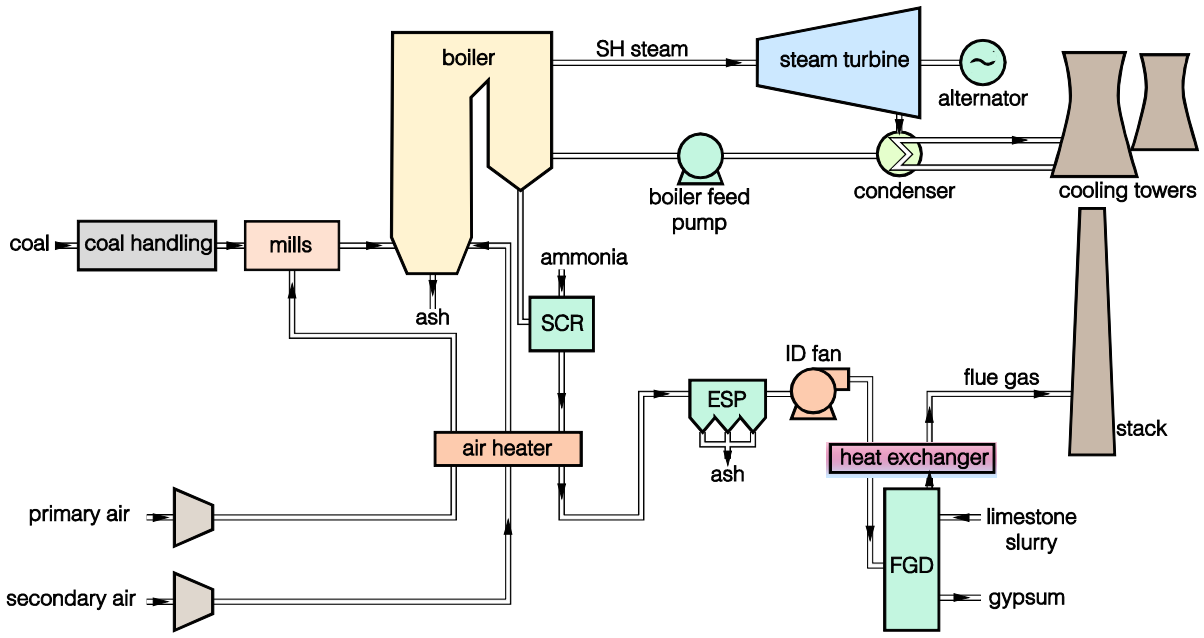


Figure 2 Major process areas of a pulverised coal-fired power plant

The main source of progressive deterioration that occurs when a material is subjected in the laboratory to on/off cycles or variations in loading is fatigue. In power plants, fatigue effects can be enhanced by their occurring in combination with other deterioration mechanisms, particularly creep and corrosion.

Fatigue occurs through the growth of existing flaws or incipient cracks in a material when the stress is applied cyclically. Eventually, if cracks reach a critical size, failure occurs. The number of applications of a given degree of cyclic stress to which a component can be subjected before failure is known as the fatigue life of the component. This is influenced by a variety of factors. Examples are the nature of the material from which it is composed, the temperature, the chemical environment, and the thickness of the component (which can affect temperature gradients). Fatigue is often classified as either high-cycle fatigue, where the number of cycles to failure is large, or low-cycle fatigue, where the number of cycles to failure is small. High-cycle fatigue is characterised by low amplitude, high frequency, elastic (that is, recoverable) strains, whereas low-cycle fatigue is characterised by high amplitude, low frequency, plastic (that is, non-recoverable) strains (DeLuca, no date).

Materials are tested for fatigue life using standard samples that are subjected to cyclic stresses of different amplitudes until they fail. Each test is carried out at a different stress amplitude, and the number of stress cycles to failure is recorded. Cyclic loading is represented in Figure 3, where σ_a is the stress amplitude, and the maximum (σ_{max}), minimum (σ_{min}) and mean (σ_m) stresses are shown.

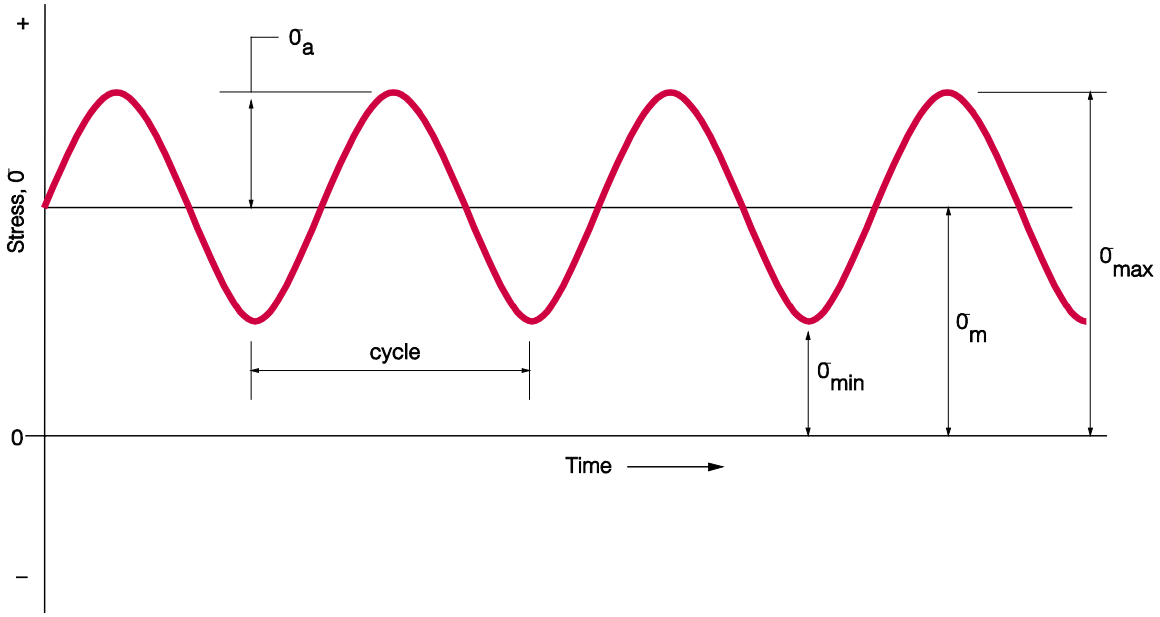


Figure 3 Stress life cycle (Danneman and Lefton, 2009)

From the test data, a graph of stress, S (which has the units of pressure), against the number of cycles to failure, N, known as an S-N curve, is then plotted. Figure 4 shows two examples. As would be expected intuitively, the greater the amplitude of the stress cycle, the shorter will be the life of the test sample. Because materials do not recover when the stress cycle is interrupted (the small cracks will not disappear), the damage to a component constructed from the material is cumulative. For a metal that has

been welded or suffered corrosion or creep damage, the curve shows considerable scatter (Danneman and Lefton, 2009).

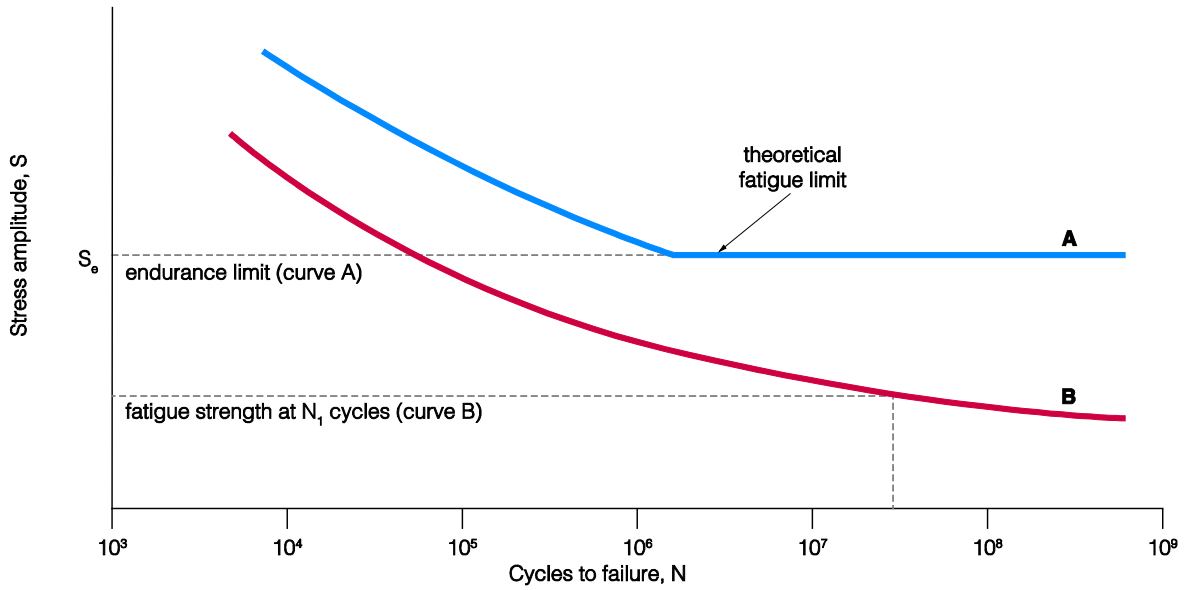


Figure 4 **Typical S-N curve of stress amplitude versus number of cycles to failure for two materials** (Danneman and Lefton, 2009)

There can be a magnitude of stress below which fatigue failure will not occur, regardless of the number of cycles. This is known as the endurance limit, or fatigue limit, and is shown on Figure 4 for material A. An endurance limit does not apply for certain materials, such as aluminium, which will fail eventually at any level of stress cycling. Steels do have a fatigue limit, but there is unfortunately no theoretical lower limit for *corrosion fatigue*, a damage mechanism that has been described as the dominant mode of failure for coal-fired power generation units operating in on/off cycling mode (Danneman and Lefton, 2009).

For thermal cycling fatigue, the number of cycles to failure (N) is related to the range of the temperature cycle (ΔT) thus:

$$N = C/(\Delta T)^{\gamma}.$$

C and γ are constants, characteristic of the material.

In a plant that has been cycling for a number of years, the residual fatigue-related life of the equipment is adequately calculated by taking into account the effects of all the different types of stress encountered. However, for a metal that has been welded, or suffered corrosion or creep damage, the S-N curve exhibits scatter, so predicted fatigue life is subject to more uncertainty (Danneman and Lefton, 2009).

2.1.1 Resultant effects of fatigue on pressure components

The most important areas of likely life-limiting deterioration from fatigue through cycling are the boiler pressure parts and the turbine and its associated equipment. Figure 5 (from Aptech Engineering Services)

shows the different types of load cycles that a unit can suffer and, qualitatively, the relative levels of damage that can occur.

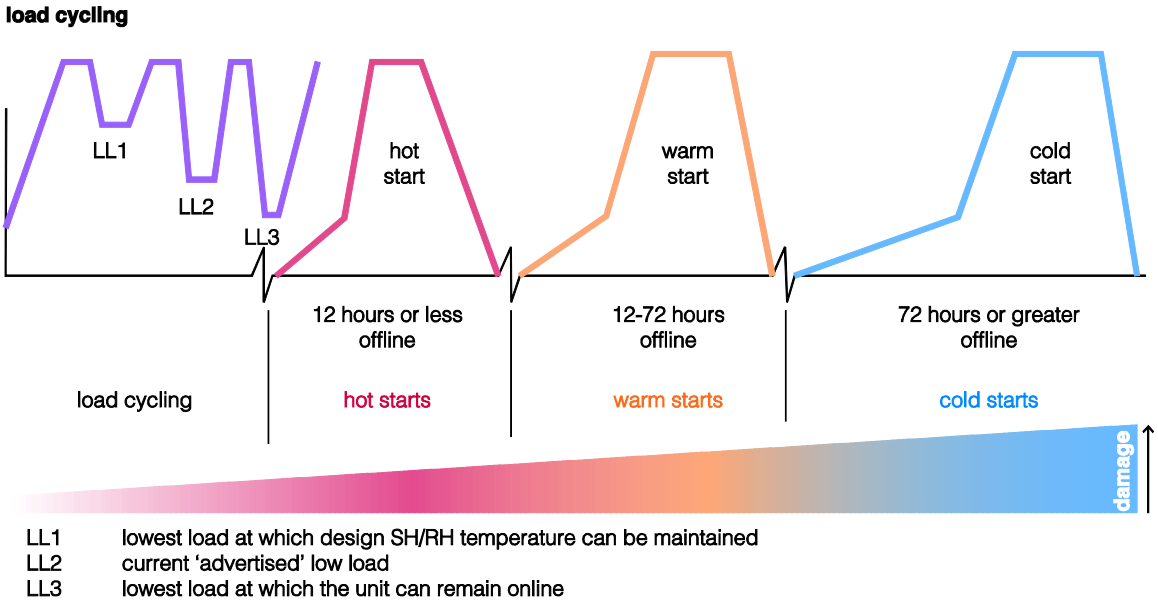


Figure 5 Types of load cycles that a unit can experience and potential relative damage levels (Danneman and Lefton, 2009)

Danneman and Lefton (2009) show that common fatigue-related failures from cycling of existing units in the USA include boiler tube corrosion fatigue, superheater and reheater tube attachment fatigue, turbine blade coating cracking extending into the base metal, and water wall tube membrane cracking. Thermal fatigue, from temperature changes, causes cracks between tube stubs of superheater and reheater headers, as well as damage to turbine rotors and thick-walled castings such as turbine valves and casings (Hesler, 2011).

2.2 Other damage mechanisms and effects of plant cycling

Thermal expansion can itself cause systems to expand so much compared with surrounding components that damage may occur. Examples are membrane wall sections, ductwork, and ties used to support superheat and reheat tubing. Differential expansion also contributes to tube-to-header cracking in superheaters and reheaters (Hesler, 2011).

Low load operation can reduce the flue gas exit temperature from the economiser. This can exacerbate air heater cold-end corrosion, leading to greater cross-leakage within the heater and so lower efficiency (Koza and others, 2011). The low flue gas temperature can also cause problems with maintaining correct conditions in selective catalytic reduction (SCR) systems. The latter is discussed in Section 5.1.

Maintaining boiler feedwater quality is always important, but operating a plant in a cycling mode necessitates additional vigilance. Steps that can be taken when designing or modifying a plant for cycling operation to avoid water quality induced problems include maintaining the correct chemical treatment

programme, implementing condensate polishing, and installing on-line monitoring equipment (Koza and others, 2011).

An example of an operational problem that can arise in steam turbines at reduced load is ventilation. As the steam flow is reduced, a disturbance in the flow spreads upstream from the later stages of the turbine. In this mode, only the front turbine stages set performance, while the rear stages give off power to the fluid. In extreme cases, damage can result, but it is mainly a performance issue (Kwitschinski and others, 2013).

A survey by EPRI found that equipment modifications and changes to operational practice could reduce start-up times significantly. Examples were fitting natural-circulation boilers with circulating systems to pump water around the evaporator when off-load and addition of inter-stage drains to prevent condensate from earlier superheater stages reaching hot final stages (Hesler, 2011).

Mills (2011) has included a useful summary table of impacts of plant cycling, sourced from MMU (2010).

2.3 Summary

Normal power plant operation over time results in creep damage to high temperature and pressure components, but flexible operation introduces thermal and mechanical fatigue stresses also. These, together with corrosion, differential expansion, and other effects, often with synergisms, result in a reduction of the expected life of the pressure parts. The residual fatigue-related life of the equipment can be calculated approximately by taking into account the effects of the different types of stress encountered. Many other parts of plants can be affected by plant cycling in the form of either reduction in life, performance or energy efficiency. These include auxiliary systems and emissions control systems. Means to counter these difficulties have been, and are continuing to be, developed.

3 Increasing flexibility – boiler area

In Germany, where the power grid is already experiencing large variations in generation from the extensive capacity of renewable sources, an action plan for increased flexibility in the nation's coal-fired plants has been developed by the Association of Plant Engineering for Energy, Environment and Process Industry (FDBR, 2013). Among the technical suggestions are a large number concerned with the boiler-related parts of plants. These include, in respect of combustion, combustion system optimisation, retrofitting of replacement start-up and flame support burners that use solid fuels (dry lignite, pulverised coal, waste fuels) instead of expensive oil, and installation of indirect firing systems. These methods are discussed in Section 3.1. Some also target minimising emissions and maximising efficiency during changes in output. Other measures in the action plan concern the pressure parts of the boiler and water/steam and turbine systems. These are covered in Section 3.2 and Chapter 4.

Goerner (2012) has highlighted the following additional considerations in designing for high flexibility:

- extension of the acceptable fuel range;
- improved co-ordination of mill and burner systems;
- reduction of combustion chamber volume and height to facilitate fast-load change and high-efficiency at full and partial loads.

Means for reducing the minimum technical load and for increasing the permissible rate of load change are also needed in designing new plants. This additionally involves extending the primary control range (over which the design superheated and reheated steam parameters are maintained) and stretching the secondary control range down toward the revised, lower technical load – *see* Figure 6, from Vattenfall (Dirschauer, 2012).

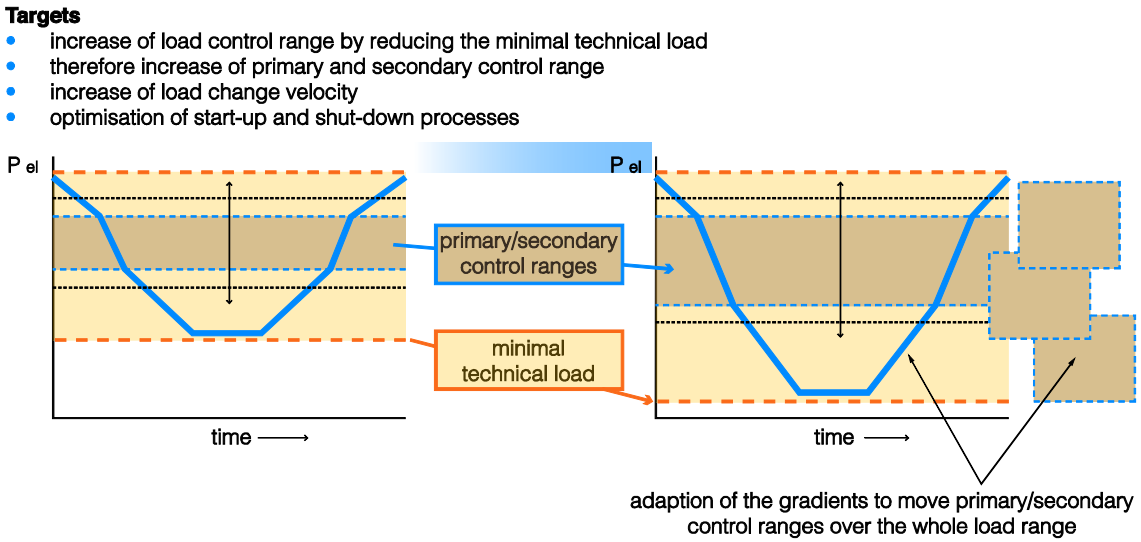


Figure 6 Increasing load range and ramp rate (Dirschauer, 2012)

A critical constraint during rapid ramping is matching steam and turbine metal temperatures. Modern supercritical units provided with sliding pressure operation have advantages in this respect over throttle

control during start-up by establishing a flow to the turbine earlier in the sequence, with lower overall heat input and by retaining high temperatures on shut-down (Hesler, 2011; Lindsay and Dragoon, 2010). Sliding pressure is discussed in Section 4.2.

3.1 Firing systems

Among the various areas to consider in increasing boiler flexibility are changes that can be made to the firing systems. The following sections describe some of the means that can be applied.

3.1.1 Varying number of mills in operation to permit lower loads and greater load range

Providing the capability of very low-load running will minimise the number of cold start-up operations. The combustion system needs to play its part. Conventional firing systems for hard coals have permitted typically 40% boiler load without the need for back-up firing. That is far from the sort of performance that will be needed in future. However, it is possible through changes to mill size and burner operating range to achieve 25% load with two out of four mills operating (*see* Figure 7). Where four mills are supplying tangential corner-fired systems, the minimum load can be further reduced: in recent plants it has been shown that single-mill operation can be realised stably, with turndown to less than 20%, reducing the number of shut-down operations (Brüggemann and Marling, 2012). Provision for turndown to 15% has been provided in this way at Heilbronn Unit 7 (Starkloff and others, 2013).

These examples are from Alstom, but other suppliers also offer suitable burners and single-mill operation for very low load capability (*see, for example,* MHPS, 2014a, 2014b). Better instrumentation, combined with sophisticated control, will also improve minimum load capability (Schröck and Dürr, 2013).

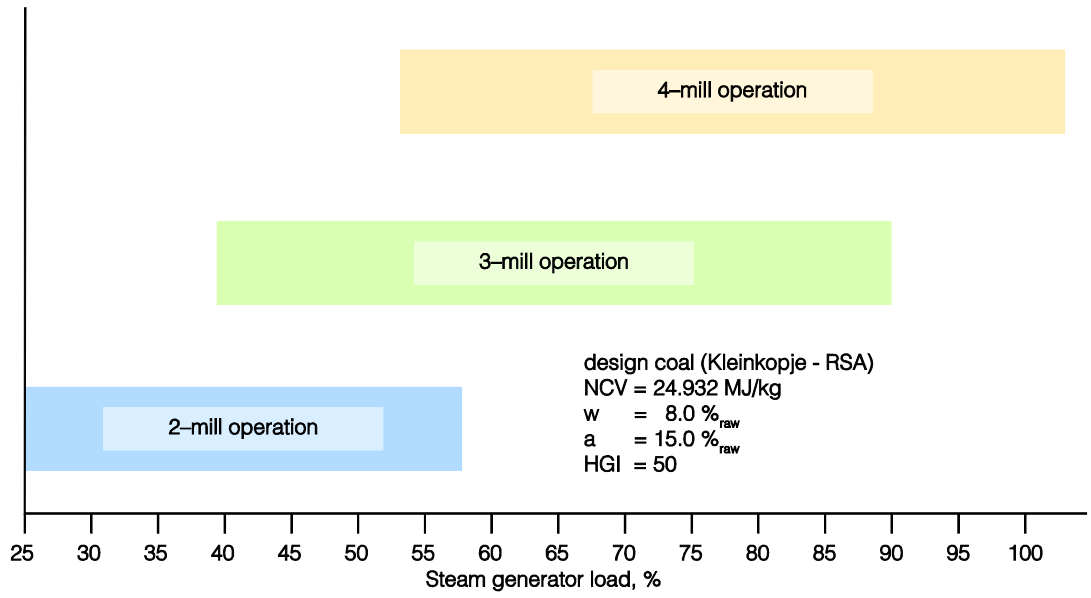


Figure 7 Burner operating range – design with four mills for hard coal (Brüggemann and Marling, 2012)

The use of tilting burners for corner firing gives flexibility in the position of the fireball relative to the heat transfer systems. Higher efficiencies at partial load are realised by reducing the need for reheat

attemperation. Efficiency can be increased by 0.5–1% points. Figure 8 shows how adjustments to the reheat temperature can be made without attemperation.

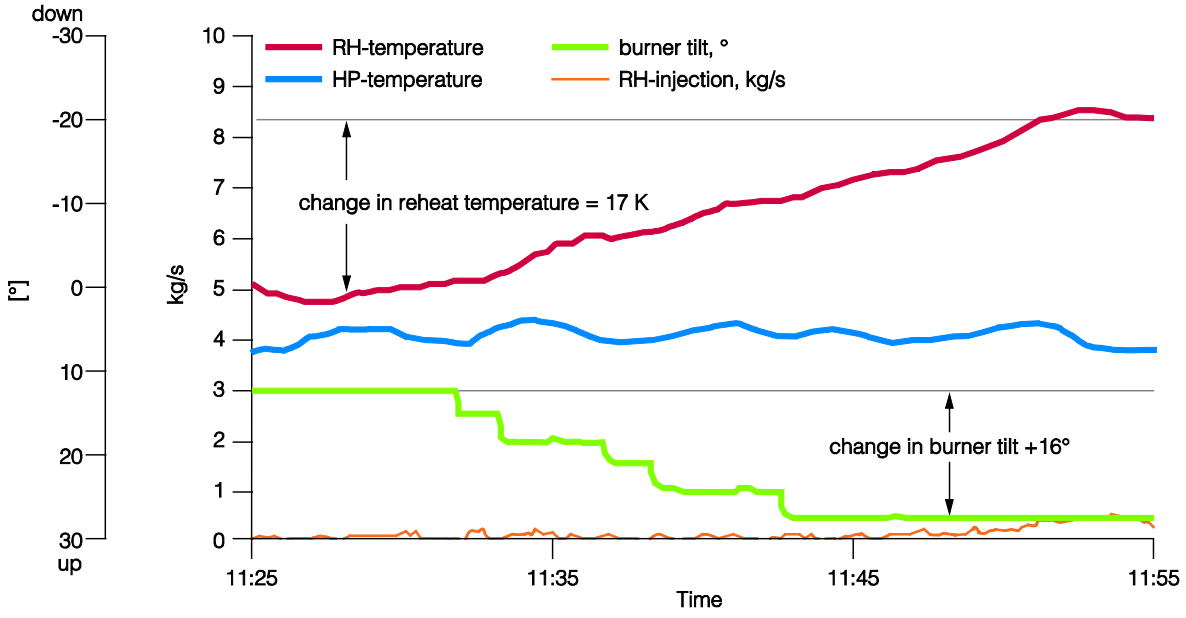


Figure 8 Use of tilting burners to avoid need for reheat attemperation at partial load (Brüggemann and Marling, 2012)

For lignite plants, which may typically have 6–7 beater mills operating at full output, systems are usually designed for a minimum load of 40% for new units (but only down to 50%, for older units), using burner air management and adjustments to the mills and firing systems. Four mills are normally in operation at the 40% load. However, it is possible to achieve a further reduction in minimum output by having only 3 mills in service with fine control of air supply and mill speed adjustments (to ensure flame stability). For example, tests at Vattenfall's lignite-fired Schwarze Pumpe supercritical power plant have indicated that a boiler minimum load of 37% is obtainable (Brüggemann and Schmidt, 2013). This was while the supercritical boiler was still in once-through mode – some water recirculation would also be needed for still lower loads. Reaching a minimum load as low as 35% in both new and existing units is considered possible using these means (Brüggemann and Marling, 2012; Reischke, 2012). Use of lignite after-burners will also reduce the minimum load, give improved stability and extend the permissible fuel range (Reischke, 2012).

Installation of indirect firing systems for hard coals, as well as introduction of lignite drying systems for new designs of lignite boilers, will also enable reductions in the achievable minimum firing and load change rates (Chen and others, 2012; Höhne and others, 2013; Jentsch and others, 2013). These are described in Section 3.1.3.

3.1.2 Increasing the acceptable fuel range with low load operation

Biomass is gaining in application as a cofiring fuel to reduce net CO_2 emissions. Single-mill operation for low load operation is compatible with 10% (thermal) biomass cofiring for large USC units (Brüggemann

and Marling, 2012). Start-up can be optimised by putting mills into operation at an early stage, first at part-load, taking advantage of the measures described in Section 3.1.1. Further savings can be achieved with supplementary burners in the primary air system, to provide additional drying energy and allow mills to be loaded faster. Up to 90% of costly support fuel can be saved by switching very rapidly to minimum stable coal/biomass load during start-up (MHPS, 2014a).

For recent information on the influence of biomass cofiring on the design and operation of coal power plants, *see* a number of reports by the IEA Clean Coal Centre (Fernando, 2009, 2012; Dong, 2012; Barnes, 2012; Sloss, 2010).

In order to burn coals of higher moisture contents and lower caloric values than the design coal range for a plant, it is necessary to provide mills with increased drying capacity. In retrofit situations, this can take the form of larger mills with dynamic classifiers, new primary air fans with greater capacity, and means for additional heating of the primary air.

3.1.3 Installation of indirect firing systems

Indirect firing is a system that has been retrofitted successfully to pulverised coal-fired units in Germany to achieve reduced minimum boiler load, and so extend the operating load range. It can also enable increased ramp rates and better part load efficiency. Indirect firing involves installation of a pulverised coal hopper between the mill and burner, together with additional pipework and valves. By using such an arrangement, the instantaneous firing rate is not determined by the mill output at the time (*see* Figure 9). This separation of milling rate and burner feed rate results in a considerable reduction in the inertia of the firing system. The arrangement can allow a rate of change of firing of up to 10%/min (compared with conventional firing load ramps of 2–5%/min). Indirect firing can also stabilise the combustion process, avoid the need for oil as start-up fuel and enable more power to be usefully diverted to coal grinding when there is less demand for power to be sent out. When installed in conjunction with flexible burners, indirect firing can allow the minimum firing rate to be lowered to below 10% of MCR. Efficiency is also improved at low load as mills can continue to operate in their range of optimum power consumption (Reischke, 2012; FDBR, 2013; MHPS, 2014a,b; Busekrus, 2012).

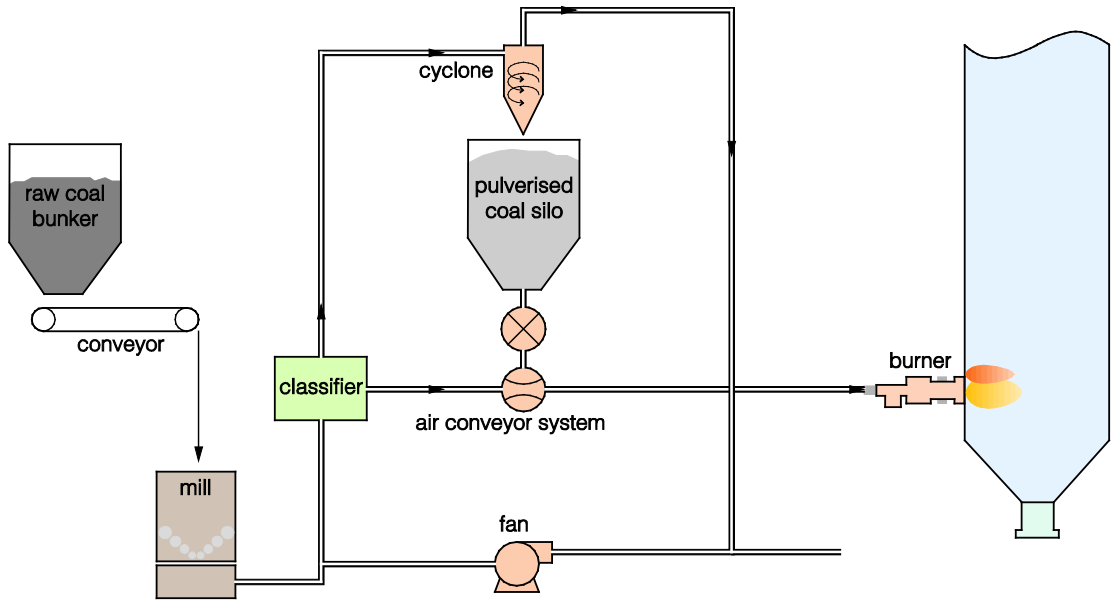


Figure 9 Indirect firing of pulverised coal (Busekrus, 2012)

There can be other benefits of indirect firing also (*see* Table 3).

Table 3 Beneficial effects of installing indirect firing (Busekrus, 2012)

	Direct firing	Indirect firing
Minimum load	25–30%	<10%
Ignition fuel demand	100%	5%
Excess air	15%	<12%
Grinding process	Mills operating at partial load	Mills operating at optimal load

Without installing an indirect firing system with its associated additional valves, pipework and hoppers, it is possible to a more limited extent to improve dynamic performance by simply controlling the coal flow in a conventional configuration that uses vertical spindle coal mills. By varying, within the acceptable range, the grinding pressure of such mills, pulverised coal output can be increased for periods of some minutes by increasing the grinding force. Because the coal feed to the mills cannot be accelerated as quickly, the mills act as energy storage devices (Lindsay and Dragoon, 2010).

Use of lignite pre-drying, while primarily intended to allow higher efficiency, would also provide a method for achieving indirect firing as the dried fuel would be fed to hoppers before firing. This system therefore also provides a capability for increased load change rates and reduced minimum load, as well as a fuel for start-up and combustion stabilisation without the need for fuel oil (Chen and others, 2012; Henderson, 2013; Höhne and others, 2013; Jentsch and others, 2013). The tangential firing arrangement would use corner mounting of the burners for better stability (wall-mounting is used in conventional lignite tangential-fired boilers), and so be akin to hard coal-burning tangential firing systems (Chen and others, 2012). A minimum load of around 30% is suggested by Pinkert and others (2013).

3.1.4 Monitoring and optimisation of combustion

Closer monitoring of the conditions in the furnace is especially important for a unit operating in cyclic mode and when very low loads need to be reached, perhaps with biomass addition. This can allow combustion efficiency to be maximised throughout. An example of the systems available is Zolo's ZoloBOSS technology, based on Tunable Diode Laser Absorption Spectroscopy (TDLAS). This passes laser beams through the furnace between a number of points and spectroscopically analyses the emerging light to monitor the concentrations of H_2O, CO, O_2, CO_2 and the temperature. One of the benefits from such monitoring is the fast response time and reduced need to derive large numbers of correlations (Dubert, 2013; Starke and Williams, 2013).

3.2 Pressure parts

3.2.1 Designing for faster load changes

Tubing and other pressure parts will better withstand the rapid and large changes in temperature associated with on/off and highly variable operation if the thermal gradients are reduced. For this, metal thicknesses need to be made thinner. The number of headers can also be increased. External steam heating or hot storage systems have also been used in Germany to reduce boiler start-up times, while, at Waigaoqiao No 3 in Shanghai, China, an identical adjacent unit can be used for steam heating to speed up start-up of a 1000 MW USC boiler (Henderson, 2013).

More advanced alloys have been developed to enable the metal thicknesses to be reduced, so that the stresses can be reduced in new plants. Former thick-sectioned components made using less advanced steels could only allow output to be adjusted up or down by up to about 3–4%/min. There are differing rates given by various sources, as mentioned earlier, but the highest load rate changes currently suggested by suppliers are as large as 10%/min (FDBR, 2013; MHPS, 2014a,b; Goerner, 2012).

Because the dominant failure mechanism of rapidly cycling units becomes not the development of creep voids, but rather a creep-fatigue interaction, the traditional basis of 200,000 h creep-based design standards is becoming increasingly regarded by plant designers as less applicable. A design life based on 100,000 h, or even less, rather than 200,000 h, without loss of actual plant life for cycling duty, becomes more appropriate due to the lower specific creep strain (Kranz, 2013; Reischke, 2012; Wolff, 2012). Figure 10, from Reischke (2012), shows how the creep lifetime consumption per cycle is significantly reduced by designing components for 100,000 h instead of 200,000 h at full load. Hence, more rapid cycles are possible.

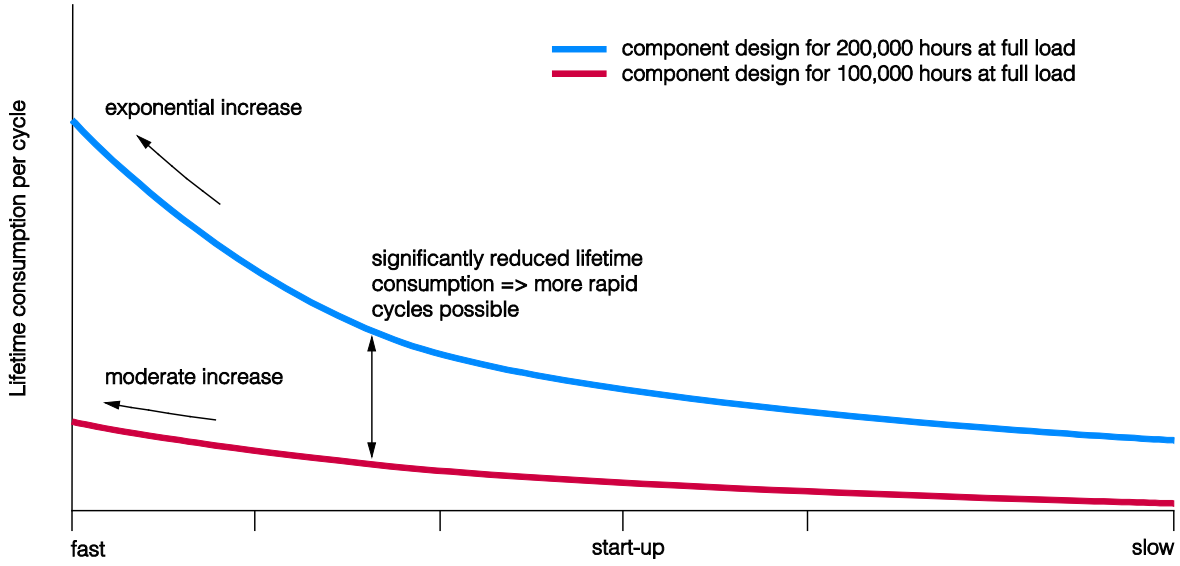


Figure 10 Comparison of lifetime consumption of superheater headers for design creep life of: a) 100,000 h; b) 200,000 h (Reischke, 2012)

Modern calculation methods, such as the Finite Elements Method (FEM) of the European Pressure Equipment Directive (PED), more closely simulate the real gradients in complex structures and facilitate the calculation of the (smaller) design wall thicknesses (Busekrus, 2012; Kranz, 2013). The dimensions and permissible temperature increase rates compatible with acceptable creep rates for a P92 header are shown in Table 4.

Table 4 Dimensions and creep performance of a P92 header (Busekrus, 2012)

Internal diameter, mm	Pressure rating, MPa	Temperature rating, °C	Required thickness according to EN12952-3, for 2.9 K/min gradient, mm	Required thickness, based on modern calculation methods, for 5.1 K/min, mm
255	29.5	615	100	77

3.2.2 Reducing the minimum load

Reducing a boiler's minimum load capability can be achieved through various approaches, for example, for new boilers, by paying special attention to evaporator design and, in existing systems, carrying out economiser modifications. Conditions in the economiser have to be correct, that is, such that there is an adequate degree of sub-cooling of the feedwater to prevent steaming. A reduction in minimum load has been found generally to be possible for existing boilers following assessment (Hamel and Nachtigall, 2012, 2013). The first step is to determine the current minimum technical load, based on thermal input, steam temperatures, flue gas temperatures and stability. This is followed by a feasibility study, involving modelling of the various boiler components, to permit a comparison of potential options. A detailed engineering study of the preferred option is then carried out to confirm costs before implementation.

An example from a case study referred to by Hamel and Nachtigall (2012, 2013) is the adjustment of a steam generator's flue gas temperature after the economiser to achieve the design value at loads down to

30% without economiser steaming. This was done by adding an economiser water-side bypass together with feedwater recirculation pumps and pipework. The same authors show, in another example, the approach adopted to achieve low (20%) load operation through the static and dynamic stabilisation of a spiral wound evaporator of a boiler (Hamel and Nachtigall, 2012, 2013). This included the following elements:

- creation of a thermal model of the boiler;
- analysis of operating data for full and partial load situations;
- calculations of the static and dynamic stability of the spiral evaporator;
- calculations of the static stability for all downstream heating surfaces;
- determination of the stable minimum load in the absence of modifications;
- comparative investigations of the potential advantages and limitations of different stabilisation concepts.

One way of designing for minimum load in designing new boilers is to use internally rifled or ribbed tubing within the evaporator (Reischke, 2012). This enables higher heat transfer rates at lower water flows. Circulating pumps may also be retrofitted to once-through boilers to reduce losses from steam escaping at low loads and during start-up (Schröck and Dürr, 2013). In drum boilers, it may be possible to increase the flow rates in the evaporator to achieve greater stability (FDBR, 2013).

3.3 Plant configuration choices

3.3.1 Using more than one boiler

Configuring a new plant to have more than one boiler supplying the steam to a single turbine will allow a greater degree of flexibility. RWE are developing a plant concept using 2 x 550 MW boilers connected to a single 1100 MW steam turbine for a possible future lignite plant in Germany. This would give high flexibility, with load change rates similar to those of modern gas-fired power plants. A turndown from 1,100 MW to around 175 MW would be possible (Wolff, 2012; Reischke, 2012).

3.3.2 Integrating gas turbines

In Germany, retrofitting of gas turbines equivalent to about 20% of the existing power plant capacity has been carried out at some plants, to enable output, efficiency and load change rate to be increased. They may be added either to create what is fairly similar to a conventional combined cycle or else to provide feedwater heating in a less integrated, lower efficiency, combination (MHPS, 2014b; Gurner, 2012; FDBR, 2013). The energy efficiency of usage of the additional natural gas can reach approximately 80% in some systems, compared with about 60% for a modern dedicated natural gas-fired combined cycle power plant (FDBR, 2013).

4 Increasing flexibility – turbine and water-steam systems

There is much that can be done to make these areas of a plant more durable, able to respond faster and suffer less efficiency losses. Examples are given in this chapter.

4.1 Reducing stresses during start-up

Start-up, especially from cold, places particularly large stresses on many parts of a coal-fired plant. The turbine is no exception in this regard. Very rapid temperature changes need to be kept to the minimum, while component designs can be adapted to suit. Lindsay and Dragoon (2010) have collected together data from published sources on start-up times for different plant conditions. They found that, generally, coal plants required approximately 12 hours to cold start, 4 hours to warm start, and 1 hour to hot start. There was considerable variation, and this was believed to stem from how hot, warm, and cold starts were defined, and whether those times were actually equipment-limited or not.

One of the requirements for flexibility in the turbine is that the very small clearances between stationary and moving components remain almost constant during output changes. This requires careful design, advanced sealing (*see also* Henderson, 2013) and measures for ensuring uniform thermal loading and applies especially during cold start-up operations (Quinkertz and others, 2008).

Turbine bypass systems are a necessity in plants designed for two-shift (on/off) and other flexible forms of operation. They allow all or part of the steam to bypass the HP turbine or LP turbine so that the rate of steam temperature change in the turbine can be managed as the boiler is starting up and shutting down. This allows thermal stresses in the turbine to be reduced (Lindsay and Dragoon, 2010). This is not to be confused with another type of bypass (HP stage bypass), that can be installed for frequency control in new plants and is described later.

The very high temperature and pressure conditions of USC systems necessitate use of thick-walled components so that they possess adequate strength. Unfortunately, this can limit the rate of temperature change consistent with reducing thermal fatigue to acceptable levels. In the turbine, one means used to counter this is steam cooling of the outer casing to keep its temperature 30–40°C lower than that of the inner casing at the corresponding position along the turbine during load changes. The steam for this is bled radially from points along the inner casing. The steam reduces temperature extremes in the outer casing and allows its thickness to be reduced. The result is that cold start-up time is reduced by almost 50% (Almstedt and others, 2007).

4.2 Load following using sliding pressure operation

While, traditionally, throttling has been used to vary output from a turbine while keeping the pressure constant (Lindsay and Dragoon, 2010), sliding pressure operation has become a commonly applied system in modern supercritical once-through systems (Henderson, 2004). A critical constraint on ramping operation is matching steam and turbine metal temperatures, and more rapid output changes can be achieved using sliding pressure. Sliding pressure also offers advantages over throttle control

during start-up, by establishing a flow to the turbine earlier in the sequence, with lower overall heat input and by retaining high temperatures on shutdown.

This is a whole-plant design aspect, since it concerns the boiler as well as turbine systems. At the reduced pressure used for part load operation, when the system is operating subcritically, evaporation occurs in the boiler within a region of tubing that shifts with changes in load as the enthalpy increases in the boiler associated with preheating, evaporation and superheating change with pressure. The decrease in efficiency at reduced load is reduced, as better control of turbine temperatures and wetness is possible than when the governor valves are throttled. In addition, boiler feed pump power consumption is reduced and there are lower stresses on components such as valves.

In practice, a certain degree of throttling is usually also used to maintain some reserve steam to give the capability for meeting sudden increases in power demand (*see also* Section 4.4). Sliding pressure has been used for around twenty years in units in Denmark and in Germany, for example at the Rostock unit in Germany (Vitalis and others, 2000). Sliding pressure once-through boilers are provided with small steam drums for water and steam separation at the (subcritical) conditions of reduced load. Small separator vessels and a recirculating pump are in any case normally provided for start-up (Henderson, 2004).

4.3 Other ways to achieve greater load range and ramp rate

Addition of bypass pipework around feedwater heaters is a convenient modification to increase flexibility. The lower resultant temperature of the feedwater at the economiser inlet can then allow lower loads to be reached without economiser steaming (FDBR, 2013). Economiser steaming can be a problem limiting the extent to which water flow, and so plant load, can be turned down (*see also* Section 3.2.2).

Provision of bypasses around high pressure feedwater heaters, accompanied by the (necessary) closing of the HP bleed steam valves, can also be used to produce *additional* power over about 20-30 minutes. This occurs because the steam flow through the turbine is increased (Wechsung and others, 2012; Lindsay and Dragoon, 2010). Feedwater heater bypass used in this way can provide a means of very rapid response suited for frequency control (*see* Section 4.4).

Of relevance in considering new plant designs, separate HP and IP turbines, as opposed to combined HP/IP systems, are said to make faster load changes possible (Cozza, 2012).

4.4 Rapid response for frequency control

Many coal-fired power units already incorporate the means to provide very rapid output changes of 5% or even up to 10% within a time of no more than about 30 seconds (Reischke, 2012). These are plants that are designated and so designed to provide frequency stabilisation on the grid through primary frequency control. In addition to this very short-term response duty, other units are designated to operate to provide secondary (within several minutes) frequency control. The response of the latter frees up the primary frequency control units making them ready to provide immediate response again. Although not actually the same designated duty, providing secondary frequency control has similar

implications for plant design to providing the capability for meeting large, rapidly changing supply/demand gaps, covered in other sections of this report, so this section concentrates on means for primary frequency control. Retaining some fossil-fired units for primary and secondary frequency control will remain very important in the future, as many renewable energy generators do not provide frequency control. Coal-fired plants designated for frequency control are kept on, and so synchronised, but operating below full load, ready to provide a response when needed.

Methods available for primary frequency control include the well-established means of opening of throttled main steam valves, but also, nowadays, condensate throttling, feedwater heater bypass (*see* Section 4.3) and HP stage bypass. Another alternative is to install a thermal storage system, which can also increase the load range. The latter is described in Section 4.5.

The three Torrevaldaliga North 660 MW USC units commissioned in Italy between 2009 and 2010 have been designed to provide primary frequency control through turbine throttling. Each 25.3 MPa/604°C/612°C (at boiler outlets) unit has the capability for producing a 4% change in power within 30 seconds. The turbines were supplied by MHI Ltd. The response time of the boilers, supplied by Ansaldo Caldaie S.p.A. and Babcock Hitachi Kure (BHK), is approximately 90 seconds. This allows the primary reserve provided by the turbine system to be recovered quickly, with provision of the power reserve for 15 minutes in accordance with the grid requirements (Penati and others, 2011).

The principle of condensate throttling is that the turbine control system opens the governor valves, if not fully open, to utilise the reserve steam storage capacity of the boiler (as in conventional throttling in absence of condensate throttling). The flow of condensate to the low pressure feedwater heaters is reduced at the same time by throttling the main condensate control valve (*see* Figure 11). The flows of extraction steam to the LP feedwater heaters and the deaerator/storage tank are therefore reduced. These actions leave additional steam flow in the turbine, generating the additional power. The response time can be optimised using additional fast acting valves in the extraction steam lines giving a maximum output after about 30 seconds (Cziesla and others, 2009; Quinkertz and others, 2008). The boiler fuel feed rate is also increased. At Waigaoqiao No 3 plant in Shanghai, China, a similar principle has been used on the Siemens turbine in adjusting condensate flow to vary indirectly the flows of extraction steam to enable transient demands to be met efficiently (Henderson, 2013).

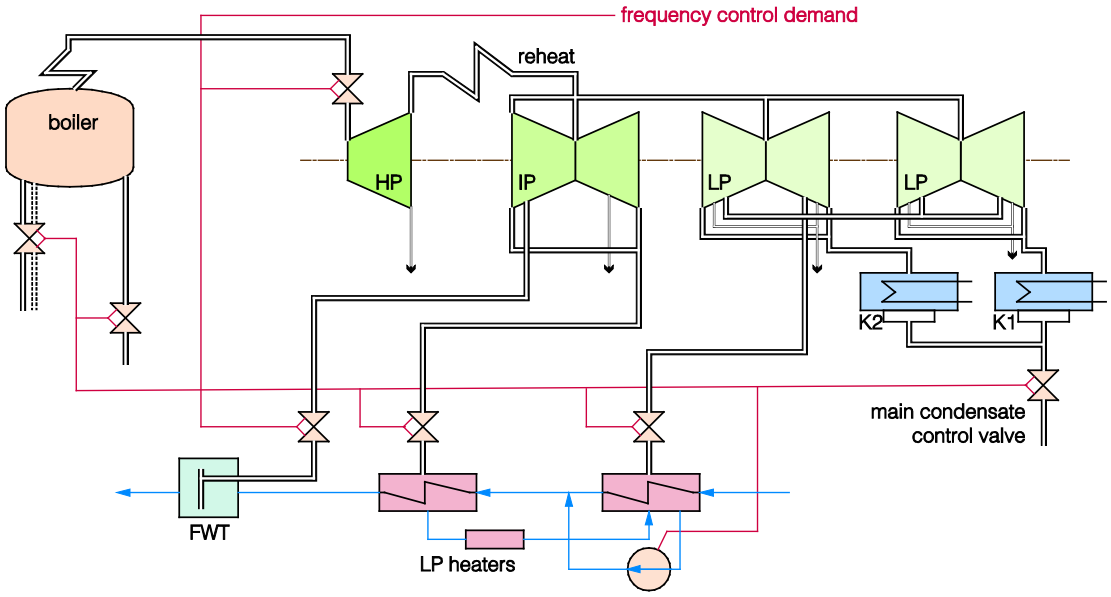


Figure 11 Condensate throttling for rapid response (Cziesla and others, 2009)

Another very rapid response system for primary frequency control that can be supplied with USC steam turbines is HP stage bypass. Figure 12 shows the system in Siemens 600-1200 MW turbines equipped with sliding pressure and full arc admission over the load range. It permits additional HP steam to be admitted to the HP turbine some stages after the first blade row when the bypass valve is opened, also to give full arc admission at that stage. The system is normally designed to give a short-term 5% increase in power. It is however possible to design such systems for an additional 10%, or even, if required, 15% increase in power (Almstedt and others, 2007; Wechsung and others, 2012). Normal operation at 100% MCR is achieved with the stage bypass valve closed. Efficiency falls upon opening it, but providing frequency control is a necessity to stabilise the grid. In any case, the HP stage bypass system is the most efficient means that is available for achieving rapid load increase (1% per second) because throttling losses are at a minimum at both points (Quinkertz and others, 2008). The stage bypass system is available for use within the whole load range. In contrast, throttling is normally operated at around fairly high load. Alstom supply similar systems (Alstom, no date).

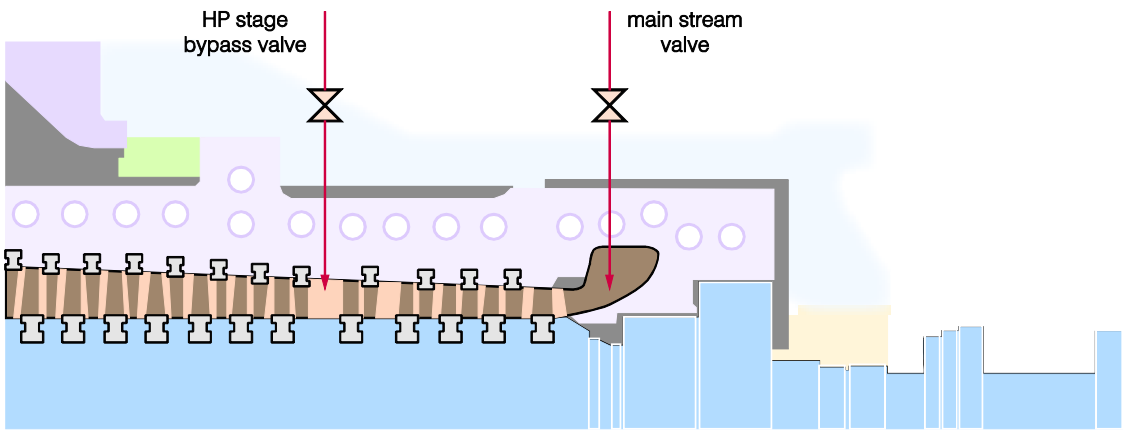


Figure 12 HP stage bypass system for very rapid response (Almstedt and others, 2007)

Alstom show a primary frequency control capability of 10% in 10 seconds as being under development for new and existing plants without expanding on the nature of the system (*see* Table 5) (Reischke, 2012).

Table 5 Flexibility capabilities of coal-fired units (Reischke, 2012)

	State of the art:	Development (new and existing plants):
Start-up:	2–6 hours depending on starting condition	1–4 hours depending on starting condition
Minimum load (hard coal)	New power plants: 25% Existing power plants: 40%	Conventional firing 15–20% Indirect firing 10–15%
Minimum load (Brown coal)	New power plants: 40% Existing power plants: 50%	Conventional firing 35–40% Indirect firing 10–15%
Load change cycles	Moderate	High to very high
(Primary frequency control)	2–5%/30 s possible to 5%/30 s	10%/10 s
(Secondary frequency control)	2–/min	10%/min
Biomass	10% cofiring	100% biomass

Modern control strategies have been said to permit a reduction of boiler inertia by more than 30%, reducing the turbine valve throttling needed for frequency control (Rech and others, 2009).

4.5 Thermal storage systems

Bypass of feedwater heaters has already been described as a way to increase steam flow for up to 30 minutes (*see* Section 4.3) and for frequency control, but even more flexibility can be achieved by installing storage systems for the low pressure or high pressure feedwater. An extended load range, increased ramp rate and provision of an alternative means for primary and secondary frequency control result (FDBR, 2013). Figures 13 and 14 show variants of a system that can be installed that is in principle capable of rapidly providing 5% more power at existing plants (Schuele and others, 2012).

The LP feedwater heaters are provided with a bypass which feeds upright cylindrical storage tanks (*see* Figure 13). These tanks contain both the cold and hot condensate, and any increase in storage of hot water displaces cold water and vice-versa. When power output needs to be reduced, the tanks are filled with hot condensate, taken from the outlet stream of the deaerator/feedwater storage tank. To achieve this, the condensate mass flow through the LP preheaters and the feed water tank is increased. This causes increased extraction of steam from the IP and LP turbines, reducing power output.

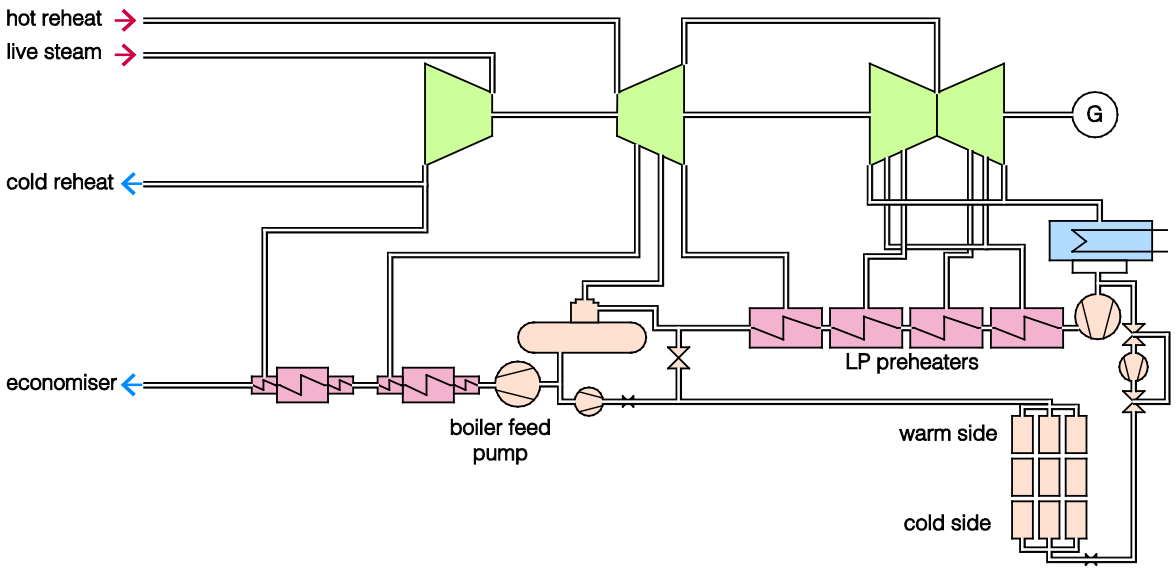


Figure 13 Thermal storage system for increasing plant flexibility (Schuele and others, 2012)

When additional generation is required, the LP feedwater preheaters are bypassed, and the cold condensate from the condenser displaces the hot condensate in the storage tanks. The hot condensate is introduced upstream of the deaerator/feedwater storage tank. Because the LP feedwater heaters are bypassed, they do not draw extraction steam. The hot condensate from the thermal storage tanks is at approximately the same temperature as that of the water in the feedwater tank, so no IP extraction steam is required at this point either. The steam flows through the final stages of the IP turbine and the LP turbine are consequently increased, raising electrical output.

The increase in output is greatest at full load, because then the impact of the reduced extraction steam mass flow is maximised. Approximately 5% of MCR can be produced. The associated capital cost is much lower and the efficiency associated with the system is much greater than for energy storage alternatives such as batteries or compressed air storage. The usable load range is also extended, as there is no need for other means, such as throttling, to provide frequency control (Schuele and others, 2012).

The more involved system in Figure 14, which utilises additional feedwater heaters, enables even greater flexibility. During heat storage, steam from the plant is used to heat the cold condensate from the tanks. In this case, the 'charging' condensate mass flow is independent of the water-steam cycle. The load reduction occurs because of the diversion of IP steam from the turbine. Adding the condensate from the storage preheater to the hot storage condensate reduces the 'charging' time. Power increase is achieved in the same way as for the simpler system, by cold condensate displacing stored hot condensate, which is re-introduced upstream of the feedwater tank.

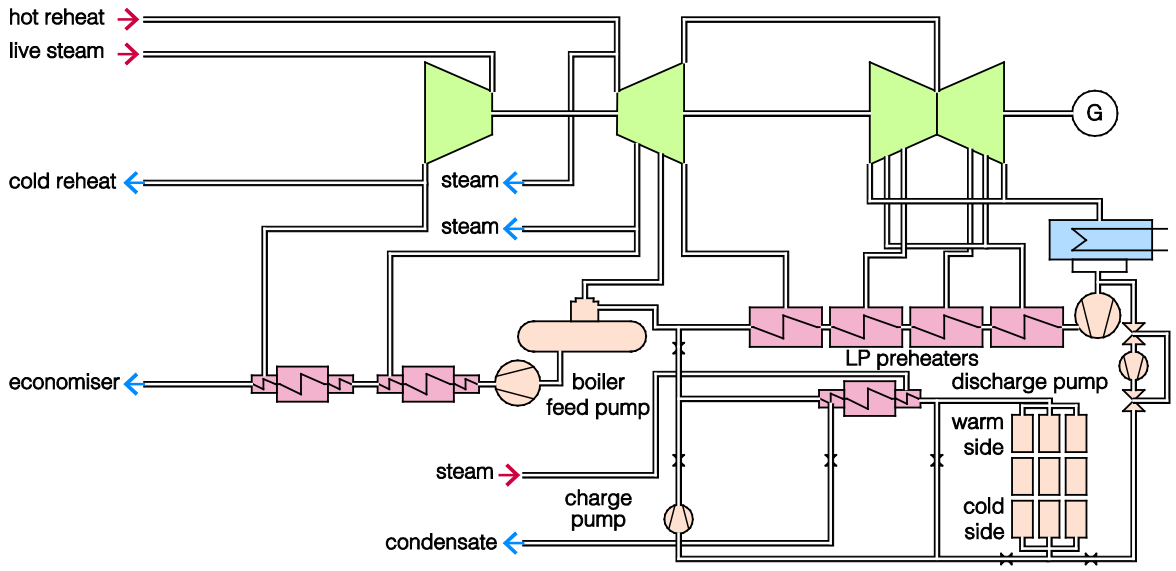


Figure 14 Thermal storage system for increasing plant flexibility (variant) (Schuele and others, 2012)

4.6 Water treatment

Poor water quality causes corrosion, and the likelihood of water quality deterioration is increased as a result of frequent load changes. For once-through boiler systems, all-volatile treatment and oxygenated treatment are used. Boilers operating in a cycling mode are best provided with all-volatile treatment together with full-flow condensate polishing. All-volatile treatment with oxygenating is preferable for ferrous-only based systems. It allows air in-leakage, resulting in dissolved oxygen levels of 1–10 ppb that form a ferric oxide hydrate layer on the magnetite (Nicol, 2014). The dissolved oxygen concentration is controlled by mechanical means, while chemicals such as ammonium hydroxide and hydrazine or other substances can be used as the pH adjuster (Koza and others, 2011). Condensate polishers remove dissolved contaminants, such as sodium and silica, and filter suspended particulates that become detached from heat exchanger internal surfaces during load transitions (Koza and others, 2011).

Operation of makeup water or wastewater clarifiers can be improved by the addition of recirculation lines to allow the maintenance of adequate flow through the clarifier at low load, keeping it ready for increased load operations (Koza and others, 2011).

5 Increasing flexibility – other plant areas

On/off and highly variable load operation affects other parts of the plant also. This chapter describes the potential problems that can arise and how they can be overcome.

5.1 NOx removal systems

The main potential issue with low load operation of plants with selective catalytic reduction (SCR) systems, which are usually placed after the economiser, is the possibility of lower flue gas temperatures occurring. SCR units often use ammonia as reagent, and ammonia control may become difficult during fast load swings, compounded by variable fuel properties. Excess ammonia can then leave with the exit gas stream. This so-called ammonia slip can then lead to ammonium bisulphate (ABS) formation as a sticky liquid that fills catalyst pores, reducing reactivity. ABS may also deposit in the air heater, increasing its pressure drop, and necessitating cleaning. It can even be blown from the air heater into boiler air ducts, where it can influence readings of air flow measurement devices.

To avoid problems with ABS formation, the conventional solution is for a flue gas or water-side economiser bypass to be installed to enable the flue gas temperature at low load to be kept at design value (FDBR, 2013). Such an arrangement can avoid plugging without sacrificing NOx removal performance (Rummenhohl and Davis, 2012; Koza and others, 2011; Moser, 2006). Where units are not, or cannot be, equipped with economiser bypass capabilities, other options are available. One is to monitor continuously the inlet NH_3 and SO_3 concentrations and temperature distribution in the SCR, and to compare these with design conditions. Other possibilities may be to change the fuel sulphur content or, if allowed, the NOx reduction levels at low load, or to modify the inlet temperature distribution using a static mixer (baffle). Adding a heating facility for hot gas carrying components can also be used to give shorter start-up times (FDBR, 2013). Whatever means is used, provided the correct temperature can be maintained, rapid rates of load change can generally be accommodated (Beckmann and Lerke, 2012).

5.2 FGD systems

The chemical processes involved in conventional wet flue gas desulphurisation (FGD) systems require precise control of the reaction conditions, which are influenced by reagent flow, water flow and flue gas temperature. Operation at varying power output can consequently affect the performance and reliability of these plants. The number of shut-downs and start-ups of FGD systems should also be minimised because of the need to purge to avoid slurry solidification. Reducing the number of shut-downs and start-ups is also needed to minimise the accumulation of start-up fuel oil residues on absorber linings, and to avert the lengthy warming up time that is needed by an FGD system.

It can be possible to obtain savings in energy consumption at part load by switching off some circulation pumps. Goerner (2012) suggests updating control systems to reduce the energy demand. However, at low-load, it will be difficult to maintain optimal performance if the reagent flow is fixed. Keeping within

required emissions limits during rapid load changes requires sophisticated control concepts, and an increased liquid/gas ratio may be needed for sufficient SO_2 capture (Beckmann and Lerke, 2012).

5.3 Particulate removal systems

Particulate control systems can usually cope with a plant operating at partial load and rapid load changes without problems. Inlet gas temperatures need however to be watched – they must not fall so low that acidic moisture condenses on particles, causing adherence of solids to fabric filters or a resistivity that is too low for efficient ESP performance. At partial (or full) load, enhanced dust collection may be achieved in electrostatic precipitators by increasing residence time, while energy savings of up to 80% are possible using intelligent control systems for the power supply (Beckmann and Lerke, 2012). Goerner (2012) suggests that flexible plants include modern controls for electrostatic precipitators to reduce their energy consumption. A recent IEA Clean Coal Centre report describes developments in various types of particulate removal systems (Nicol, 2013a).

5.4 Auxiliary systems

During start-up and operation at reduced load, a power plant is at off-design conditions. Consequently, the thermal efficiency is reduced. It is desirable in flexible operation that any efficiency penalties be minimised. Apart from reduced boiler and turbine performance, a penalty can come from excessive power consumption by ancillary systems. Auxiliary systems on older plants designed for base load waste power at low load as drives still draw too much power. Examples are the major fans and the feedwater pumps. Flexible drive motors using variable frequency power supplies are now available for these large consumers in the power plant to reduce the energy losses from this source (FDBR, 2013; MHPS, 2014b; Hesler, 2011; Koza and others, 2011, Lindsay and Dragoon, 2010). Variable frequency drives for cooling tower fans can also help regulate condensate water temperature. Other suggested methods suggested by Goerner (2012) for flexible plants include using superconducting components. However, the latter technology is not widely used and is basically still developmental.

Supplying the auxiliary drives with power at varying frequency enables their operating efficiency to be improved when a plant is operating at reduced load, as mentioned above. At Waigaoqiao No 3 power plant in Shanghai, China, a novel means of achieving this has recently been developed and installed. It consists of a variable frequency turbine (manufactured by Siemens) driven by steam extracted from the main turbine. This follows the change of load to change the frequency supplied to the plant auxiliary systems and has been shown to save a considerable amount of power (Feng, 2014).

6 Control systems for improved flexibility

It is generally worthwhile replacing control and instrumentation systems in older plant to increase efficiency and flexibility. RWE has carried out such retrofits on its 300 MW and 600 MW lignite fired units to achieve greatly increased ramp rates and lower minimum loads. Figure 15 shows the demonstrated and predicted future improvements on a 600 MW unit (Eichholz and others, 2013).

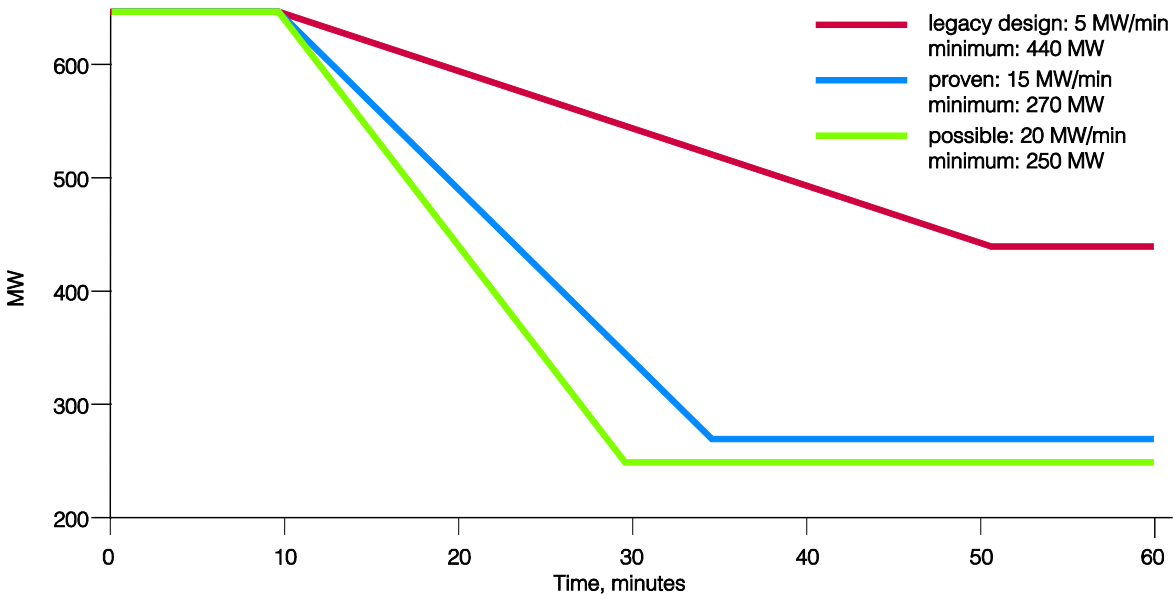


Figure 15 Demonstrated and predicted future improvements in minimum load and ramp rate on 600 MW lignite-fired units from retrofitting modern control systems (Eichholz and others, 2013)

6.1 Boiler control systems

Conventional control schemes are designed to provide responsive control within a unit's normal operating capacities. However, the boiler and steam-side response profiles are significantly affected at low load. Furthermore, conventional control systems may not be able to take into account changes such as those occurring as a plant ages (Wendelberger and others, 2009). Thus, if the dynamic response of the boiler changes over time, control performance will become degraded. In that case, the simple proportional integral derivative (PID) controller has to take corrective actions increasingly frequently. Eventually, the plant's stability and flexibility suffer. Modern systems available now can overcome such difficulties. For example, Siemens Energy has developed a system (advanced process controller – APC) for controlling the main steam pressure by adjusting the fuel flow (Figure 16). This controller is said to reduce commissioning time by more than 50%. The APC is able to stabilise non-stable loops so that it is not necessary to use the steam turbine to help stabilise steam pressure. As a result, the electrical load will follow its set point with a very high degree of accuracy and the APC can act as a full pressure controller, and dynamic tracking of the pressure set point in case of load changes or frequency disturbances is unnecessary (Wendelberger and others, 2009).

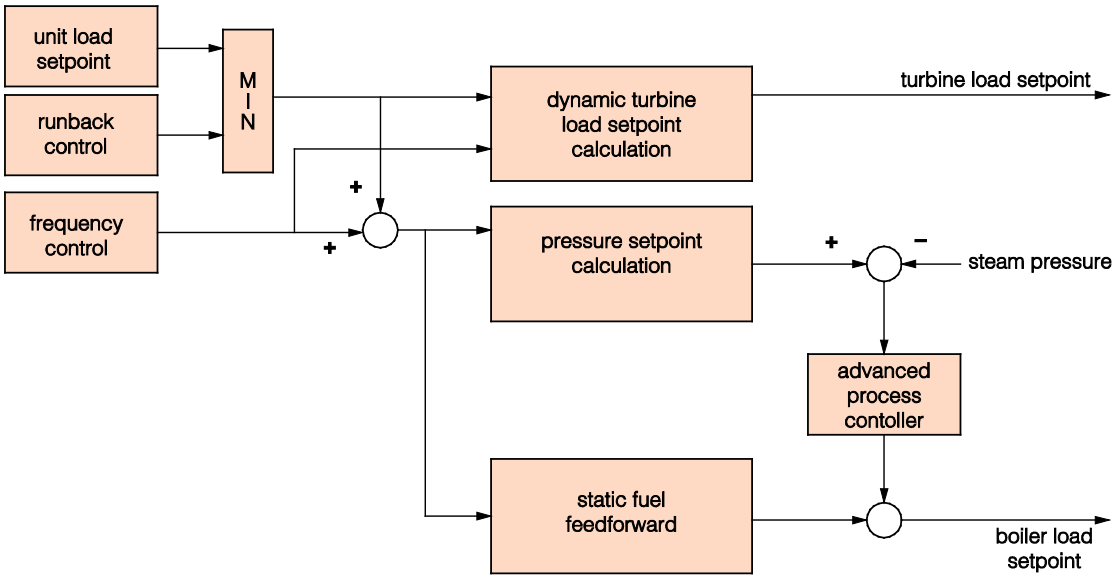


Figure 16 Unit control concept with APC. Source: Siemens AG (Wendelberger and others, 2009)

The authors describe how unit fitted with the APC responded when the load setpoint was increased and then reduced at a load change rate of approximately 5% per minute. The APC was able to stabilise the pressure quickly, and the load followed its set point closely. With the new control structure, control performance levels can be attained that were previously considered to be impossible (Wendelberger and others, 2009). Even further gains can be expected in the future with whole plant controls that use predictive algorithms. These are discussed in Section 6.3.

Schröck and Dürr (2013) describe how modern control systems can enable combining of the operation of multiple units to obtain faster ramp rates (*see* Figure 17) while keeping availability at a maximum. More sophisticated control and instrumentation will also improve minimum load capability, for example, through additional flame monitoring.

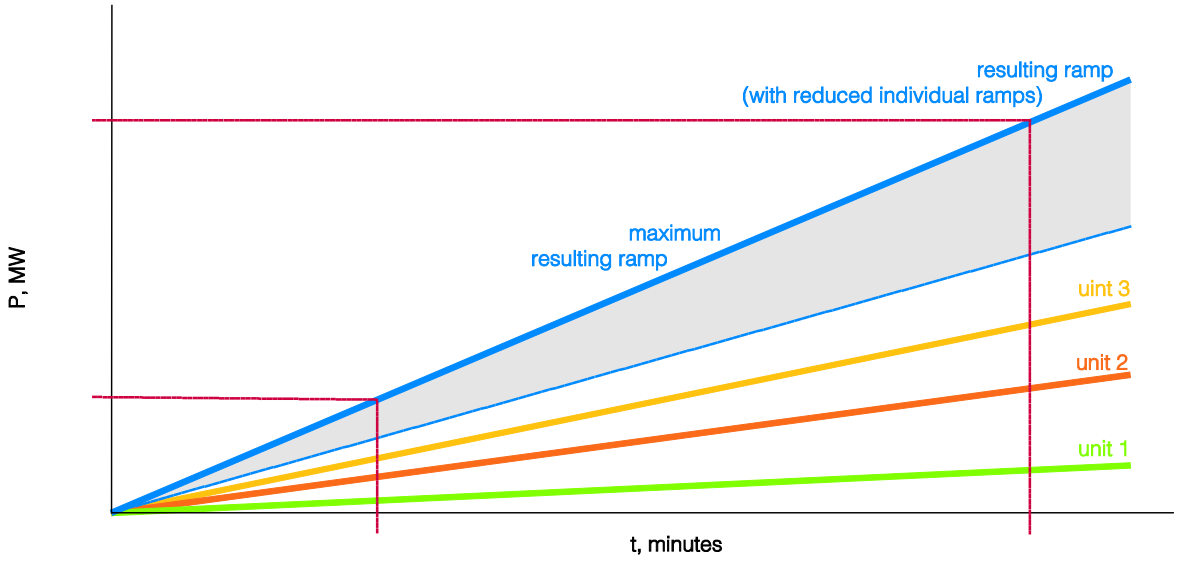


Figure 17 Using control systems to combine multiple units for greater ramp rates (Schröck and Dürr, 2013)

6.2 Turbine control systems

One of the functions of the turbine control system is to handle load changes while maintaining optimum efficiency and turbine life. Monitoring and control of the turbine are vital in preventing excessive thermal and creep-induced fatigue and also to prevent rubbing or excessive clearances resulting from differential expansion (Almstedt and others, 2007). Thus, the minimum requirement is to ensure that all temperatures and pressures remain within determined permitted ranges whatever the output or ramp rate.

Simple systems merely monitor the differential expansion between rotor and casing at a single point, then use a pre-set limit value to warn the operator to restrict conservatively the load change rate to ensure that no rubbing can occur. However, more sophisticated systems use monitored temperature and pressure data to calculate the expansion at different loads so that the associated clearances can be minimised at all times. This allows higher ramp rates, better efficiency and a total absence of rubs (Almstedt and others, 2007; FDBR, 2013).

To minimise thermal stresses, hot start-up has conventionally been carried out with the steam temperature higher than the turbine metal temperatures. However, this wastes steam, which has to be dumped to the condenser as the boiler is brought up to a sufficiently high outlet temperature (480–500°C). Modern units have control systems that enable the steam to be admitted at lower temperatures while the boiler is ramping. This allows the start-up time to be shortened by up to 15 minutes and less energy to be wasted (Quinkertz and others, 2008).

6.3 Plant control with self-learning predictive systems

There are advantages in installing comprehensive high level overall control systems that can co-ordinate the main plant systems by using predictive algorithms. Traditional control systems optimise the combustion process, steam cycle, steam turbine and emission control systems independently. Integration across the whole plant occurs through the actions of the plant operator. Modern automation systems now provide the ability to optimise the whole plant. This is highly beneficial in realising greater flexibility, in reducing stresses on the plant components while maximising efficiency and maintaining minimum emissions during load changes (Breeze, 2013a). Such systems, which are not yet widespread in power plants, may use mechanistic models to utilise the known principles of the various plant components, such as the furnace, boiler and turbine. Fuzzy logic may also be incorporated for less stable processes.

There are other situations where information on plant areas is not known or may not be available for other reasons. For these, a black box model may be used, which produces the predicted relationships from data inputs from around the plant without having access to specific detailed information (Breeze, 2013b). An example of a self-learning control system that operates in this way is ADEX's adaptive predictive technology that has recently been used in simulation of a CO_2 capture oxyfuel CFBC plant as part of a European FP7 project (Flexiburn). The high level control system was shown to work well without identification of the detailed dynamics of individual modules. Although this was a CO_2 capture

application (and so is further discussed in Chapter 10), similar principles can be applied to non-capture coal-fired power plants (Slaven, 2013; Slaven and others, 2013).

6.4 Integration with other plants

Schröck and Dürr (2013) describe the emerging possibility of grids with greater flexibility, with operators employing remote monitoring of major units in an automated, closely co-ordinated mode, taking advantage of advanced control systems and the internet. For example, unavailability from component failure will be capable of being compensated through real-time data availability and forecasts, ultimately using neural networks for early identification of problems. Figure 18 shows the three principal elements of such a system envisaged by Siemens, embracing the local plant and central planning and diagnostics centres.

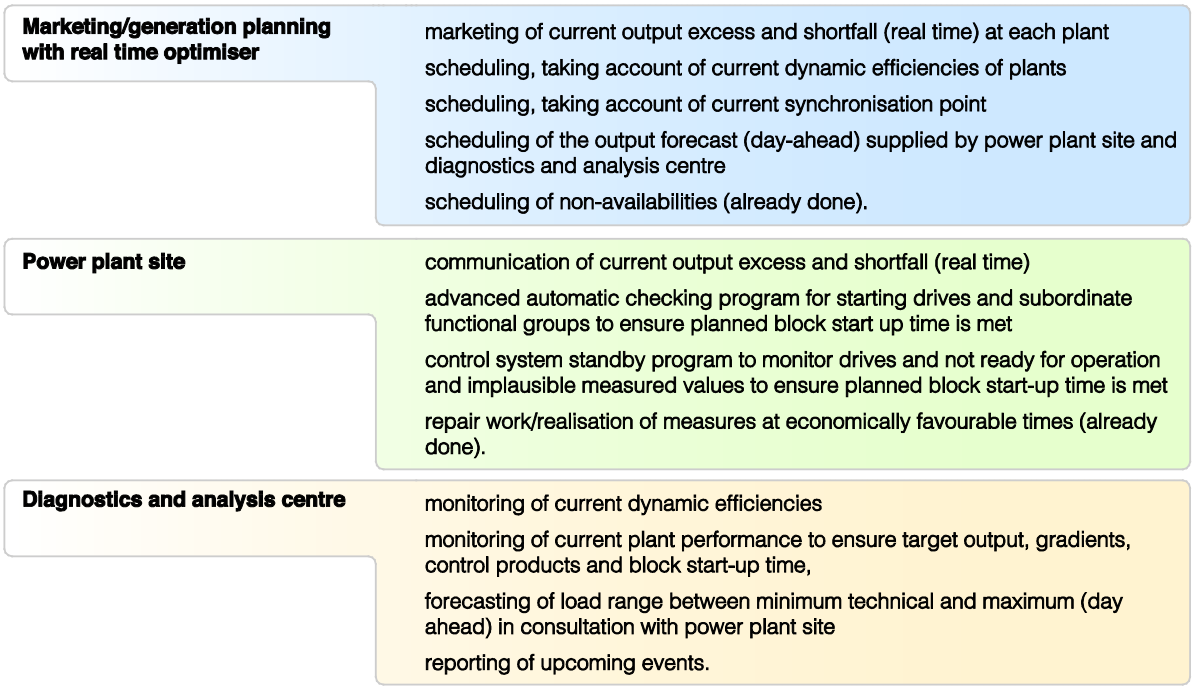


Figure 18 Central and local elements and tasks of future power generation control systems (Schröck and Dürr, 2013)

7 Flexibility of CFBC plants

CFBC (circulating fluidised bed combustion) power plants use similar steam cycles to those of pulverised coal combustion plants, but the combustion system used in them is very different. The fuel is crushed, rather than pulverised, and combustion takes place at lower temperatures than in PCC systems in a highly mobile bed of ash and fuel supported on an upward current of combustion air. Most of the solids are continuously blown out of the bed then recirculated to the combustor. Heat is extracted for steam production from various parts of the system (*see* Figure 19). Limestone is also fed to the combustion system to control SO_2 emissions. Emissions of NOx are intrinsically lower than for PCC.

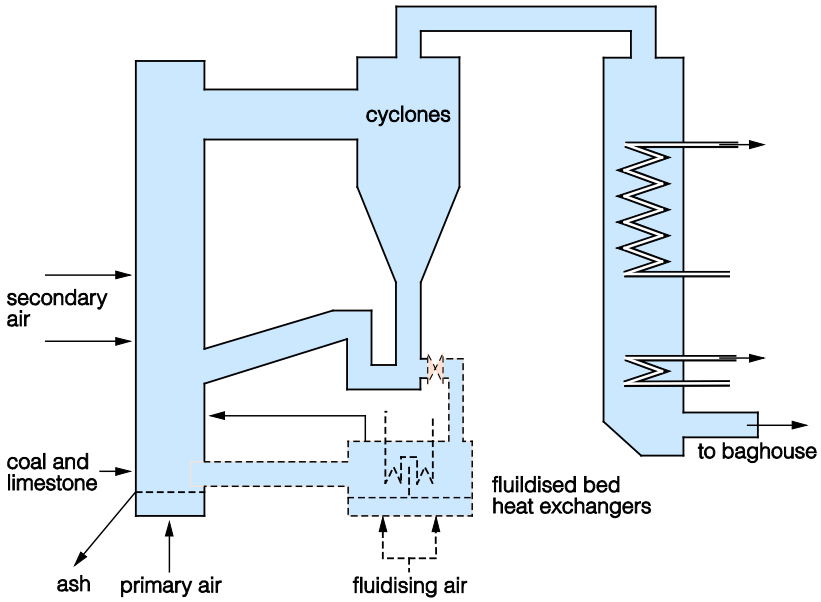


Figure 19 General schematic of a circulating fluidised bed boiler (Lockwood, 2013)

Refractory linings protect the tubing that forms the water-walls of the combustion chamber against erosion. Flue gases leaving the cyclones are generally sent to a conventional convective pass for steam superheating and other heat to the steam cycle. For more detailed descriptions of CFBC, *see* two recent IEA Clean Coal Centre reports, by Zhu (2013) and Lockwood (2013).

The flexibility issues of the turbine and water/steam cycle would be expected to be similar to those of pulverised coal plants. The essential differences from PCC units lie in the boiler and fuel feed and combustion systems. These can limit minimum load to about 40% of MCR in the absence of supplementary fuel. However, load following capabilities can be similar to those of PCC units: part loads down to 25% of MCR and load change rates of up to 7%/min are said to be possible (Mills, 2011).

Start-up times for some units can be longer than for similarly sized PCC plants. CFBC is less well suited to on/off cycling, as the bed temperature needs as far as possible to remain within normal operating range, and there can be potential for refractory damage (Zhu, 2013; Mills, 2011).

Wide or rapid temperature changes occurring during start-up, shut-down or load following can cause damage in the combustor and loop seal areas. However, a number of units have been cycled for some years, apparently without problems. Foster Wheeler offer for their Compact CFBC boilers a reheat steam bypass system for reheat steam temperature control during start-up and shut-down. The design also provides in-duct and over-grid start-up burners to shorten start-up times and save fuel (Mills, 2011).

8 Flexibility of IGCC plants

Coal-fuelled IGCC (integrated gasification combined cycle) power generation uses a combination of gas and steam turbines to produce electricity, rather than simply a steam turbine as in a PCC plant. Figure 20 shows the principle. The feed coal is converted to a fuel gas in a gasifier, which is generally of entrained flow design, fed with oxygen from an air separation plant. The fuel gas is subsequently cleaned of particulates and impurities before firing in the gas turbine to generate power. Hot exhaust gas from the gas turbine is passed through a waste heat boiler, where steam is generated for the steam turbine, which produces additional power. Steam available at suitable pressures from the gas production and cooling stages is also used at various points in the steam cycle.

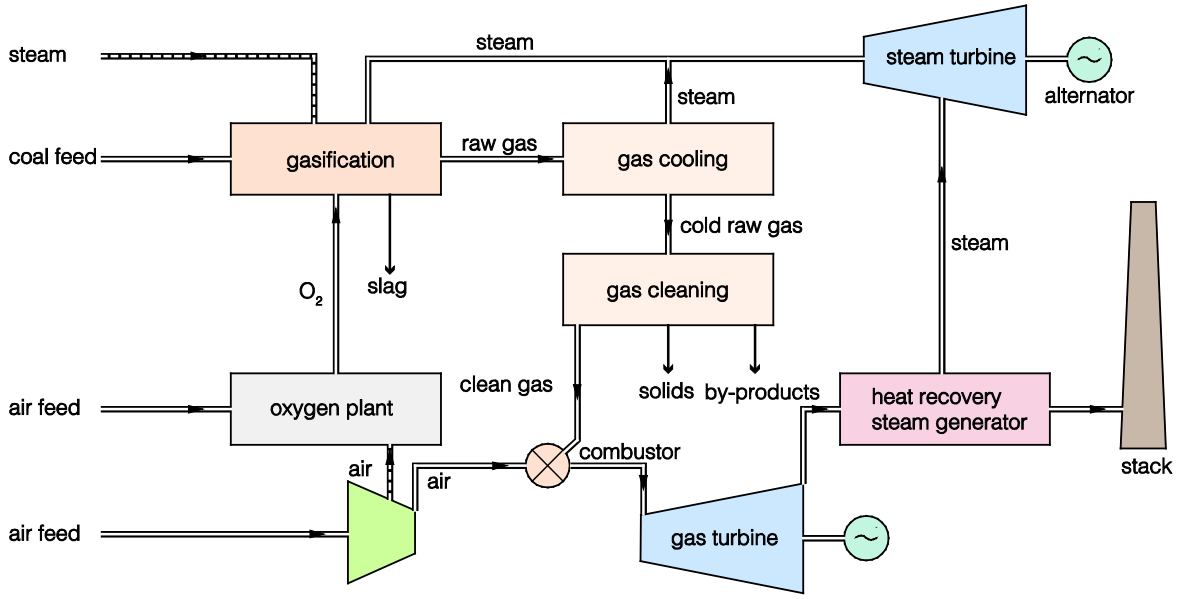


Figure 20 Integrated gasification combined cycle power generation (Henderson, 2008)

Some IGCC power plants supply the air separation unit (ASU) with air extracted from the gas turbine, while others use separate motor driven compressors. Alternatively, a combination of both may be used (partial integration). Higher degrees of integration favour higher thermal efficiencies, but start-up times can be longer, as individual process areas need to be brought on-stream in sequence. Partial integration is probably the best choice of ASU configuration for a standard IGCC as a starting point for achieving flexibility without sacrificing too much efficiency.

IGCC systems have not hitherto been designed specifically for high flexibility and the minimum load is conventionally about 40–50%, mainly determined by the achievable minimum outputs of the entrained flow gasifier and ASU. However, if two gas turbines are installed, this will give more scope for reduction, but the excess syngas needs to be used in some other way. One way is to make provision to store it at times of low load. It can then be fed to the turbine during periods of high electricity demand. Alternatively, at the expense of adding to the complexity, IGCC plants can be designed as polygeneration (multi-product) systems. These are able to vary the balance of multiple products, including electricity,

liquids and synthetic natural gas (SNG). Polygeneration plants are discussed in Chapter 10, and an IEA Clean Coal Centre report is devoted to them (Carpenter, 2008).

Temporary storage of syngas and over-sizing the ASU to allow liquid oxygen and nitrogen storage, where integration allows, are potential means of increasing load range. At low demand, excess power would be used by the oxygen producing plant. Another suggestion has been that natural gas might be added to the syngas to increase ramp rate and output. The ramp rate of a straightforward IGCC system, as shown earlier in Table 2, will be determined by the gasifier and ASU ramp rates, and is, typically, about 3-5%/min, and so not very different from that of many older PCC units (Butler and others, 2013; Chalmers, 2010; Mills, 2011; Domenichini and others, 2013).

Some gasification systems use a largely air feed to the gasifier. An example is MHI's air-blown entrained gasification process. A 250 MW IGCC demonstration (now commercially operating) using the technology at Nakoso in Japan has achieved its design ramp rate of 3%/min and a minimum load of 36%. Start-up time was 15 h. There are plans to reduce the minimum load further (Watanabe, 2012).

Conceptual IGCC designs suggested for greater flexibility include some incorporating electrolysis. These could use excess power from the plant or from the grid, as appropriate, to provide additional hydrogen for the methanation of the syngas to SNG, while integrating heat from the exothermic SNG synthesis within the steam cycle (Butler and others, 2013; Wolfersdorf and others, 2013).

There has been relatively limited experience with IGCC power plants and these were not designed to meet rapidly changing and highly variable loads or rapid start-up or shut-down. It is therefore not yet clear how much operating flexibility will actually be obtainable with development. The fully-integrated Willem-Alexander IGCC plant at Buggenum in the Netherlands was operated as a commercial unit in load-following mode for over ten years until 2013. This plant was closed on 1 April 2013 on economic grounds (Barnes, 2013; Nuon, 2013). If IGCC plants start to be ordered in large numbers, designing for flexibility will become more important and further new approaches to achieving it may emerge.

9 Flexibility of future advanced USC technology

Manufacturers and utilities are working to achieve efficiencies of about 50% (LHV basis) and higher, by using steam conditions of 700–800°C at pressures of 35 MPa in advanced ultra-supercritical (A-USC) pulverised coal-fired plants. Superalloys based on nickel will be used in these systems. They are much more expensive than currently used steels, but only the highest temperature parts would be fabricated from them. Superalloys are already established in gas turbine systems, but component sizes in a coal plant are larger, the chemical environment is different, and pressure stresses are higher. Consequently, new formulations and fabrication methods are necessary. Activities to develop A-USC are in Europe, Japan, the USA, India, China and Russia. An IEA Clean Coal Centre report describes recent developments (Nicol, 2013b).

There is no experience with an operating A-USC plant, but such plants, like all other fossil-fired plants, will almost certainly need to have the capability to operate flexibly to be used in power grids with high capacities of renewable energy units on the system. However, nickel based alloys have the disadvantages of low thermal conductivity and a high thermal expansion coefficient (*see* Figures 21 and 22). These properties would potentially give rise to higher thermally induced stresses during changes of steam temperature than are encountered with the steels used in current plants. Work on the design and development of the superalloy components will have to overcome this if the A-USC plants are to achieve adequate flexibility for use in power markets such as in Europe (Gierschner and others, 2012).

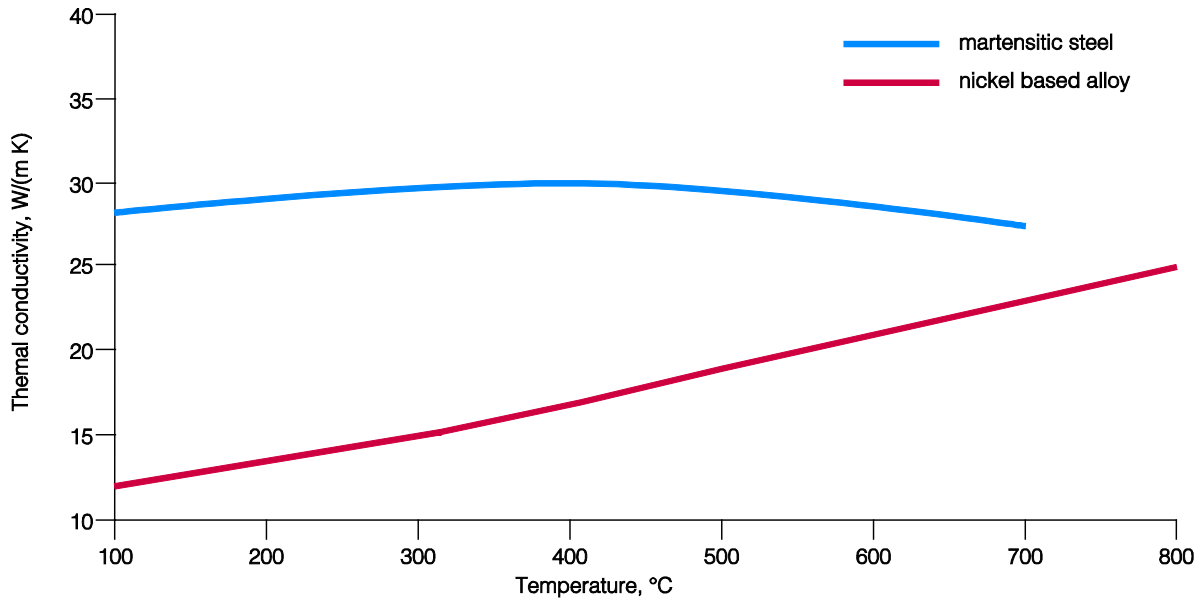


Figure 21 Thermal conductivity of a nickel based alloy and of a martensitic steel (Gierschner and others, 2012)

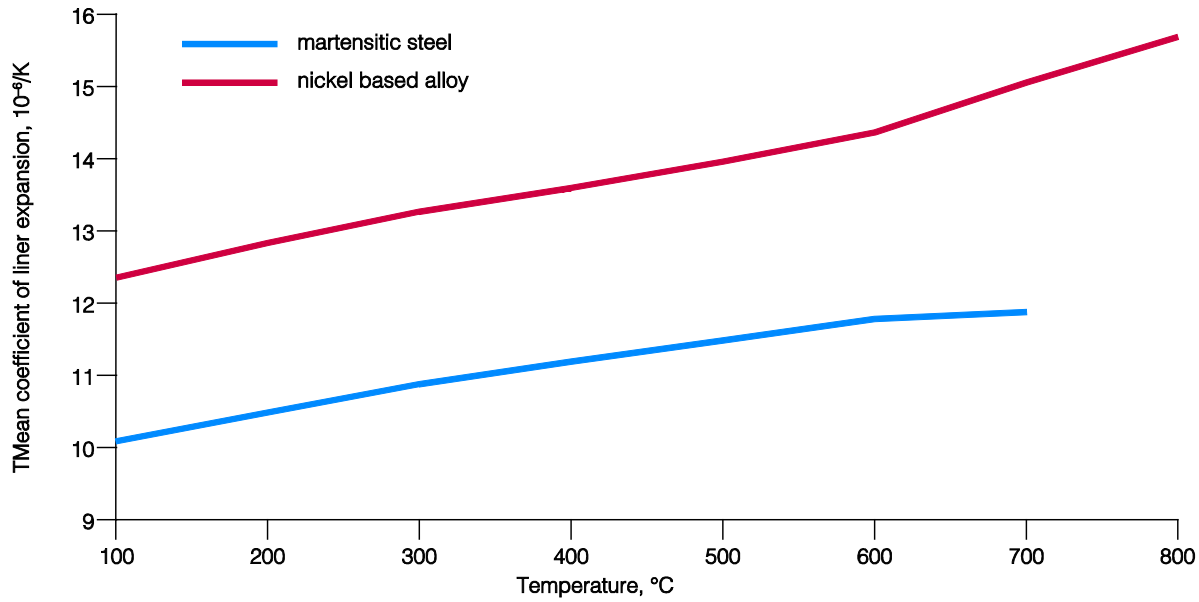


Figure 22 Thermal conductivity of a nickel based alloy and of a martensitic steel (Gierschner and others, 2012)

Table 6, taken from a graphical representation (in Busekrus, 2012), compares predicted start-up times for 600°C and 700°C technologies. A more detailed representation of the cold start-up metrics predicted for a 700°C, 35 MPa A-USC unit, is shown in Figure 23. This includes predictions of parameters such as the feedwater flow, steam flow, steam temperatures, steam pressures and turbine speed over the long run-up in the various areas of the plant. Laboratory test programmes using capacitive creep strain sensors, to assess the creep performance of superalloys, and modelling of creep-fatigue within the MACPLUS part of the A-USC programme in Europe are referred to by Kranz (2013) and Zanin (2013).

Table 6 Predicted start-up time for USC and advanced USC plants, minutes (Busekrus, 2012)

	600°C	700°C
Hot	120	130
Warm	200	300
Cold	320	430

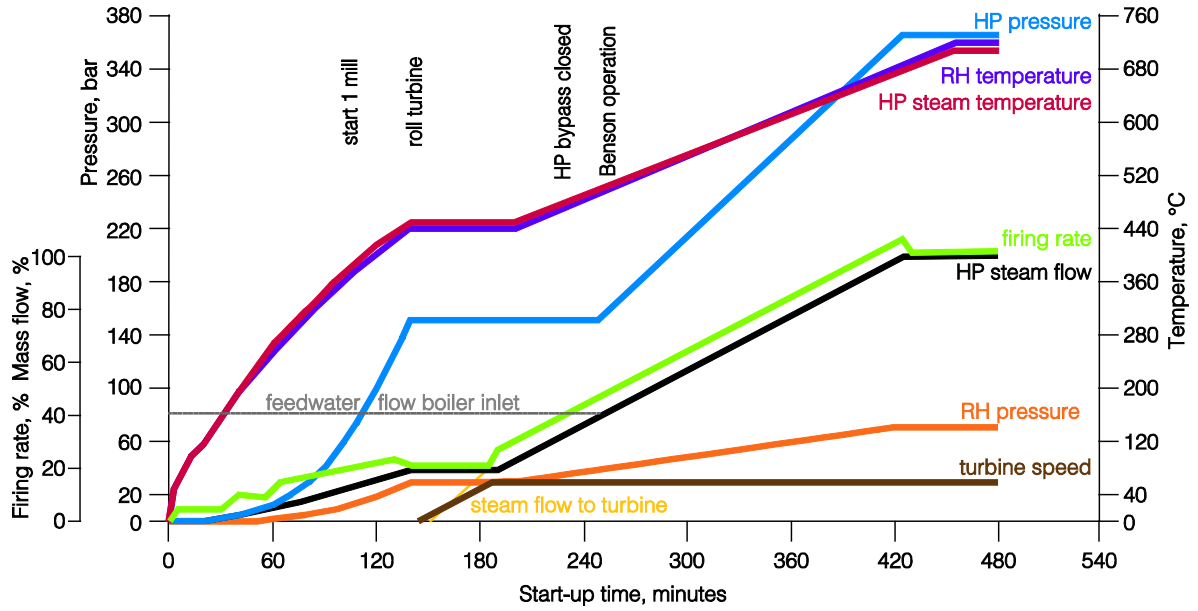


Figure 23 Predicted start-up dynamics for an A-USC (700°C) unit (Busekrus, 2012)

In summary, it not known at this stage for certain how much flexibility A-USC plants would be capable of in practice, but development of the required materials and their associated component fabrication techniques needs to be reconciled with the requirement for it (Wolff, 2012). If it turns out that sufficient flexibility cannot be achieved, such units will need to be restricted to base load application, which will leave them most suited to countries where higher, more stable capacity factors for coal-fired plants are likely to be sustainable, for example, in some Asian countries.

10 Flexibility of future coal-fired power plants with CO_2 capture

Predictions are that coal-fired plants incorporating CO_2 capture and storage (CCS) will be operating in significant numbers from about the mid-2020s, with major deployment during the 2030s (IEA, 2012). A number of IEA Clean Coal Centre reports from recent years described the technologies being developed (*see, for example,* Davidson, 2007, 2009, 2011, 2012). If and when carbon emissions prices become significant, CCS plants should be able to operate at higher capacity factors than plants without CO_2 capture because of their requiring fewer emissions allowances to be purchased. A proportion of these may provide base load, alongside nuclear plants (Davison, 2011). However, some CO_2 capture plants could need to operate flexibly, if wind and solar energy plants are called to operate first to maximise their usage.

Studies are providing indications of how flexible operation of coal-fired CCS plants could be realised, at a cost. Table 7, from a paper based on a study by Foster Wheeler for the IEA Greenhouse Gas R&D Programme, summarises the main techniques being considered.

Table 7 Techniques available for improving the flexibility of CO_2 capture plants (Domenichini and others, 2013)

	USC PCC	IGCC	Oxy-combustion
Turning off CO_2 capture	√	√	–
Co-production and storage of hydrogen	√	–	–
Storage of liquid oxygen	–	√	√
Storage of CO_2 capture solvent	√	–	–
Buffer storage of CO_2 (for constant flow to final storage)	√	√	√

For post-combustion capture plant, a rapid increase in output could be achieved by temporarily diverting the flue gas away from the CO_2 capture unit, if regulations permitted. At the same time, the flow of steam to the solvent regenerators would be turned off, increasing steam flow to the LP cylinders. At times of low demand, the CO_2 capture plant would be reconnected to the flue gas path. The steam cycle would need to be designed to accept the resultant higher flow. It is possible that the ability of such a plant to ramp up in output could be better than that of a plant without capture. However, large vessels for storage of CO_2-laden solvent would be needed if long periods of peak load were to be satisfied. Stored solvent would be regenerated at times of low power demand, when steam would be diverted to the regenerator, and achieving lower than normal minimum loads would then be possible. The large quantity of solvent that would have to be stored would mean that operating at peak output for long periods of time would not be attractive. Different variations would have different part-load efficiencies and economics (Lucquiaud and others, 2009; Chalmers and others, 2011; Mills, 2011; Domenichini and others, 2013; Mac Dowell, 2014).

Integrated gasification combined cycle (IGCC) power plants with CO_2 capture could be designed to allow hydrogen to be produced and stored, for firing in the turbine later. The gas production and power generation processes would thereby be decoupled. Both combined cycle and open cycle hydrogen-fired gas turbines could be used, further increasing flexibility. The gasification, CO_2 capture, transport and storage equipment would operate at base load, which would avoid potential practical difficulties of

flexible operation and reduce costs. However, variable load operation of hydrogen gas turbines would need to be confirmed (Davison, 2012; Domenichini and others, 2013).

Oxygen production consumes considerable quantities of power, and it would be possible to develop IGCC plant designs allowing diversion of excess power to the oxygen producing plant, reducing net plant output, and thereby store the gas for use when demand is high, improving the economics (Chalmers, 2010; Mills, 2011; Butler and others, 2013; Domenichini and others, 2013). The latter could apply to non-capture IGCC plants and there was discussion of this in Chapter 8.

An IGCC plant design including two gas turbines and polygeneration could provide a turndown to 15-25%. This could improve utilisation, efficiency and, possibly, investment costs. If the chemical co-product were to be SNG, this could be stored in the natural gas grid. Figure 24 shows a version of such a system that allows pre-combustion CO_2 capture during operation of the gas turbine. This would require a dynamic operation of the synthesis plant, which is not usual practice (Butler and others, 2013). Variants of this concept, without CO_2 capture and incorporating an electrolysis cycle, were referred to in Chapter 8 (Butler and others, 2013; Wolfersdorf and others, 2013).

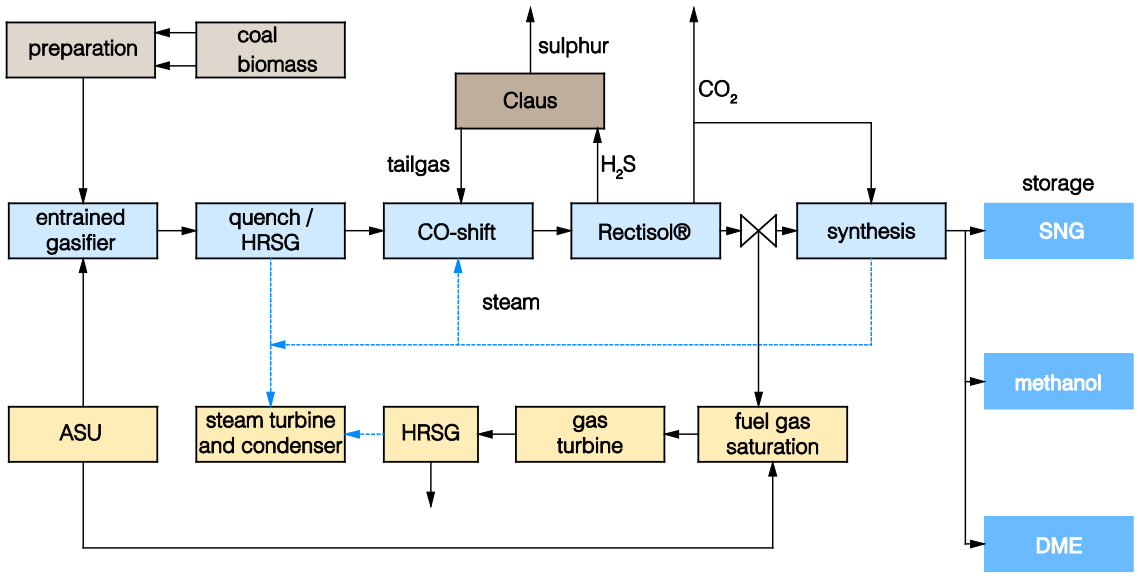


Figure 24 Simplified diagram of an IGCC polygeneration concept with dynamically driven synthesis and CO_2 capture (Butler and others, 2013)

Some gasification systems, such as MHI's process, use air for gasification. A feasibility study has been in progress on adding CO_2 capture after the wet gas clean-up at the 250 MW IGCC plant at Nakoso in Japan (*see* Chapter 8), but increasing the plant's flexibility is not mentioned as a specific aim of the CO_2 capture study (Watanabe, 2012; Barnes, 2013).

In oxy-coal systems, start-up on air will be followed by switching to oxygen plus recycle gas when the boiler has stabilised, which takes 20–30 minutes. Output flexibility within that timescale is likely to lie with temporarily switching off oxygen production and CO_2 capture (compression) and reintroducing air

to the boiler. To add further flexibility and improve the economics there is also the possibility of employing oxygen storage with these plants (Chalmers, 2010; Domenichini and others, 2013).

Slaven and others (2013) have described the particular requirements of an oxy-fuel plant with respect to the control strategy to maintain close co-ordination of the various plant areas during load changes. These include managing:

- changes from oxy to air combustion or vice-versa at start-up, shut-down and as operating requirements vary;
- separate control of recirculating flue gas and oxygen to optimise combustion performance;
- balance between main components (air separation, boiler, CO_2 processing and turbine island) to maximise environmental and economic performance;
- control of flue gas composition prior to entering the gas processing unit.

A high level predictive control system across all plant modules would manage their functions and interfaces and adapt with precision and speed to changing dynamics, adjust appropriate variables to optimise efficiency and environmental performance, and so provide process stability. Such a control system would use adaptive predictive algorithms that would be able to anticipate and control the plant's changing dynamics.

Many of the systems described above could allow the flow of CO_2 to disposal to be maintained relatively constant. This is desirable because CO_2 compressors are typically limited to around 70% turndown. While greater turndown could be achieved by recycling compressed CO_2, this would impose a significant energy penalty (IEAGHG, 2012).

In summary, indications are that it may be possible to design plants incorporating CO_2 capture to have similar flexibility to their non-capture equivalents. However, cost considerations would influence the extent of flexibility realisable in practice. Some systems might allow high flexibility.

11 Summary and conclusions

A previous IEA Clean Coal Centre report considered the growing capacity of renewable energy plants around the world and the effects of their intermittent and highly variable output on the sort of role that coal-fired plants are having to fulfil (Mills, 2011). The effect is to force coal units in some countries to become swing suppliers. They have to deliver widely varying output so that total system supply matches load at all times. They also are being required, increasingly, to provide frequency control for grids because renewable power sources tend to be less well-suited to such duty, and grids are becoming of lower inertia. The challenges presented by this situation will only increase and become more widespread in the future. There is consequently a growing need for flexibility in coal-fired power plants for maintaining security of power supply. This present report focuses on the technical features that are available to enable plants to operate with rapid output changes with minimum detriment to integrity, efficiency and emissions.

There is a wide range of reported values for the load following rates of coal-fired power generation units, with ramp rates as high as 10% of maximum load/minute claimed to be achievable in some systems.

Flexible operation adds thermal and mechanical fatigue stresses to the creep damage that occurs anyway with time in the pressure parts of a coal-fired power plant. These, together with corrosion, differential expansion, and other effects, often synergistically, result in a reduction of the expected life of such components designed for base load. Operators and manufacturers have considered the mechanisms of these detrimental effects, and have come up with solutions. In addition, means of increasing flexibility that were constrained by non-life limiting considerations, such as better firing systems and better auxiliary motor drive systems, have been devised. The result is the availability of new and modified equipment, revised operating procedures, new specifications and further new ideas for making future plant designs more flexible while keeping efficiency as high as possible.

There are many features in specific plant areas that can be incorporated to give better flexibility. These include:

Boiler firing systems – changing to the size and number of mills and fitting of modern burners to achieve lower fuel feed rates to reduce number of shut-downs; introduction of lignite pre-drying (efficiency also improved); installation of hoppers and associated pipework to achieve indirect firing (efficiency at part load is then also improved)

Boiler pressure parts – use of alloys of improved strength to permit thinner section components; installation of external steam preheating to reduce start-up time; reducing minimum load through means such as modified evaporator designs, economiser water-side bypasses together with feedwater recirculation, and increasing the mass flow in the evaporator to achieve greater stability

Ensuring emissions control systems remain effective – installing means to maintain SCR exit temperature within specification at part load to avoid catalyst blocking and damage to the air heater;

minimising shut-downs and start-ups of FGD systems, and modernising control systems to reduce energy demand; for dust separation devices, ensuring adequate temperatures to avoid moisture condensation on particles

Turbine and water-steam systems – providing a turbine bypass so that the rate of steam temperature change can be managed as the boiler is starting up and shutting down, to reduce thermal stresses; use of a steam-cooled turbine outer casing to allow thinner sections for faster start-up; use of sliding pressure boiler-turbine systems for better control of turbine temperatures and reduced stresses; adding feedwater heater bypasses for greater load range; providing condensate throttling, feedwater heater bypass or HP stage bypass for frequency control; adding thermal (feedwater) storage systems for greater load range or frequency control

Control systems – installing new boiler control systems; installing new turbine monitoring and control systems; installing new self-learning control systems that co-ordinate the main plant systems by using predictive algorithms

Auxiliary plant – using flexible drives

Modifying plant configuration – retrofitting gas turbines integrated with the existing water-steam cycle for efficiency increase and increased output range and ramp rate.

The above measures are applicable to PCC (pulverised coal combustion) plants, but the flexibility aspects of the turbine and water-steam systems of CFBC (circulating fluidised bed combustion) plants are essentially the same as for PCC plants. The essential differences from PCC units lie in the boiler and fuel feed and combustion systems. The most flexible CFBC systems can have load change rates similar to those of similarly sized PCC plants, but start-up times can be longer than for PCC because of some tendency to suffer refractory damage from temperature changes.

IGCC (integrated gasification combined cycle) systems have not hitherto been designed specifically for high flexibility, and the minimum load and ramp rate are typically about 40–50% and 3–5%/min, respectively. These are comparable with older pulverised coal systems. Temporary storage of syngas is a possible way to provide more variable output. Another means could be to add facilities for oxygen storage. Some gasification systems use a largely air feed, but this does not appear to affect flexibility. Polygeneration (multi-product) IGCC systems would be able to vary the balance of different products and so allow greater load range, but it is uncertain whether response rate would be increased. There has been limited experience with IGCC power plants but, if they start to be ordered in large numbers, designing for flexibility will become more important and new approaches to achieving it may emerge.

Manufacturers and utilities are working to achieve efficiencies of about 50% (LHV basis) by using steam conditions of 700°C and above in advanced ultra-supercritical (A-USC) plants. There is no experience with an operating A-USC plant, but, like IGCC, they will almost certainly need to have the capability to operate flexibly. This could be difficult, as start-up time would be longer than for current USC units because of the properties of the superalloys that will be needed for the highest temperature components.

If necessary, it may be possible to design plants incorporating CO_2 capture to have similar flexibility to that of their non-capture equivalents, but cost considerations would influence the extent of flexibility realised in practice.

In summary, potential damage mechanisms from plant cycling duty are well known and the technical means exist for conventional combustion-based plants to achieve the necessary flexibility without unacceptable loss of plant life and thermal efficiency. Work is in progress on means to increase the flexibility of future systems. It is important that financial rewards are sufficient to cover the cost of maintaining grid balancing plants so that suitable fossil-fired capacity continues to be available to keep power supplies reliable.

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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 60

FLORIDA DEP LETTER TO US EPA RE REGIONAL HAZE PLAN FOR SECOND IMPLEMENTATION PERIOD

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

Via Electronic Mail and State Planning Electronic Collaboration System

October 8, 2021

Mr. John Blevins
Acting Regional Administrator
U. S. Environmental Protection Agency (EPA) – Region 4
61 Forsyth Street, SW – Mail Code: 9T25
Atlanta, GA 30303-8909

Re: Florida SIP Submittal: Regional Haze Plan for the Second Implementation Period

Dear Mr. Blevins:

In accordance with 40 CFR 51.103, the Department of Environmental Protection (Department) requests approval of a revision to Florida's Regional Haze State Implementation Plan (SIP) for the second implementation period of the U.S. Environmental Protection Agency's (EPA) Regional Haze Rule (RHR).

The SIP revision represents commitments and enforceable actions taken by the Department to address the requirements of the RHR during the second implementation period from 2019 to 2028, towards the goal of attaining natural visibility conditions in Florida's designated federal Class I areas and those federal Class I areas in other states that may be affected by emissions from Florida. Pursuant to 40 CFR 51.308(f), Florida's regional haze plan includes the following elements:

- Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress for each Class I area;
- Documentation of the technical analysis on which Florida is relying to determine reasonable progress, including modeling, emissions, and data analysis;
- Source-specific reasonable progress four-factor analyses and documentation of the source selection process;
- Long-term strategy for regional haze resulting from the reasonable progress analyses;
- Reasonable progress goals;
- A progress report addressing the requirements of 40 CFR 51.308(g)(1) through (5);
- Monitoring strategy and other implementation plan requirements; and

- Documentation of consultation with other states, EPA, and Federal Land Managers (FLMs).

These required elements are contained in the documents labeled *"Florida Regional Haze Plan for the Second Implementation Period"* and Appendices A through I. Appendices A through E include technical support materials and documentation used in developing the regional haze plan. Appendix F includes the documentation of the interagency consultation process. Appendix G includes documentation of the source-specific reasonable progress analyses conducted. Appendix H includes comments from the Federal Land Managers (FLMs) received during the 60-day FLM consultation period. Appendix I includes public comments received during the 30-day public comment period and the Department's response to public comments. The full Table of Appendices, which includes descriptions and file names for each appendix and sub-appendix and indicates which are Florida-specific and which are VISTAS-wide, is available in the *"Florida Regional Haze Plan for the Second Implementation Period"* document. The Florida-specific appendices are:

- Appendix F-1: Florida Consultation Letters to Other VISTAS States
- Appendix F-4: Florida Consultation with MANE-VU
- Appendix G-1: FL DEP Letters to Selected Facilities
- Appendix G-2: Responses Received from Selected Facilities
- Appendix G-3: Facility Permits and Documentation
- Appendix G-4: Florida Certified Smoke Management Plan
- Appendix G-5: Documentation of the Permanent Shutdown of BART and Reasonable Progress Units from the First Implementation Period
- Appendix H: Federal Land Manager Comment Summary
- Appendix I-1: Florida Clinicians for Climate Action Comments
- Appendix I-2: National Parks Conservation Association, Coalition to Protect America's National Parks and Sierra Club Public Comments
- Appendix I-3: Public Comment via Email Campaign
- Appendix I-4: Public Hearing Summary
- Appendix I-5: Response to Public Comments

All appendices are available on the Department's FTP site. The FTP site can be accessed using Windows File Explorer.

All documents, except for Appendices G-3 and G-4, are submitted for adoption into the nonregulatory portion of the SIP in 40 CFR 52.520, table (e). Appendix G-4, Florida's Smoke Management Plan, is included for reference only, and should not be adopted into Florida's SIP.

Appendix G-3 includes, for reference, the full air construction permits issued to Florida facilities to meet reasonable progress requirements. The document "Final 2021-01 - Regional Haze SIP" contains administrative items related to the SIP development process, including source-specific requirements to be incorporated into and removed from Florida's SIP. Through this SIP revision, the Department is requesting to incorporate into the

regulatory portion of Florida's SIP at 40 CFR 52.520, table (d), certain source-specific SO_2 emission limits and permit conditions resulting from the reasonable progress analyses. Details of specific permit conditions to be incorporated into the regulatory portion of the SIP can be found in the SIP submittal.

The Department also requests that source-specific reasonable progress and best available retrofit technology (BART) limits from the first implementation period for specific units be removed from the SIP. These source-specific emission limits are applicable to units that have all permanently shutdown; therefore, removal of these limits from the SIP will not interfere with attainment of the national ambient air quality standards, visibility, or any other Clean Air Act requirement. Details of specific permit conditions to be removed from the regulatory portion of the SIP can found in the SIP submittal.

On June 9, 2021, the Department published in the Florida Administrative Register a notice of opportunity to submit comments regarding this SIP revision, and/or participate in a public hearing, which was held on July 15, 2021. The public hearing summary is included in Appendix I-4.

Attached please find the SIP submittal and *"Florida Regional Haze Plan for the Second Implementation Period"* documents. These two documents as well as all of the appendices have also been made available on the Department's Regional Haze website.

If you have any questions, please contact Ashley Kung at (850) 717-9041 or by email at Ashley.Kung@floridadep.gov.

Sincerely,

Jeffery F. Koerner, Director
Division of Air Resource Management

JFK/ak

cc:
Caroline Freeman, Division Director, Air & Radiation Division, EPA Region 4;
Lynorae Benjamin, Chief, Air Planning & Implementation Branch, EPA Region 4;
Pepa Sassin, Section Chief, Air Regulatory Management Section;
Pearlene Williams, Air Regulatory Management Section;
Michele Notarianni, Air Regulatory Management Section.

Enclosures:
Final 2021-01 - Regional Haze SIP; and
Florida Regional Haze Plan for the Second Implementation Period.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 61

FLORIDA DEP RESPONSE TO PUBLIC COMMENTS

APPENDIX I-5

Florida Department of Environmental Protection
Division of Air Resource Management

Response to Public Comments

Regional Haze Second Implementation Period

The Department received comments regarding emissions from sugarcane burning. Commenters state that the Department must consider emissions from and include emission limitations on pre-harvest sugarcane field burning. Commenters state that pursuant to 40 CFR 51.308(d)(3)(iv), the Department must identify all anthropogenic sources of visibility impairment which should include consideration of all major and minor stationary sources, mobile sources, and area sources, and that the Department must evaluate all sources of visibility impairing pollutants. Commenters state that the Department should require green harvesting as part of basic smoke management practices.

Response: The regional haze rule does not require that the state evaluate all sources of visibility-impairing pollutants through a four-factor analysis. Pursuant to 40 CFR 51.308(f)(2)(i), which applies to plans in the second and subsequent implementation periods, "…The State should consider evaluating major and minor stationary sources or groups of sources, mobile sources, and area sources. The State must include in its implementation plan a description of the criteria it used to determine which sources or groups of sources it evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy..." The Department has the discretion to reasonably select sources for a reasonable progress analysis and is not required to evaluate all sources. The only requirement of the Regional Haze Rule is that the Department must describe the criteria used to determine which sources were evaluated.

As discussed in Section 7.4 in the document *"Florida Regional Haze Plan for the Second Implementation Period"* (Regional Haze Plan) sulfates continue to be the largest contributor to anthropogenic visibility impairment at all affected Class I areas. Therefore, the Department focused its analysis on emissions, the precursor to sulfates, and point sources, the most significant source of SO_2 in Florida, which in 2017 (EPA's most recent National Emissions Inventory) emitted 85% of the SO_2 in Florida. In addition, management of emissions from prescribed burning is addressed in Florida's Smoke Management Plan, which was developed in consultation with the Florida Forest Service. The Florida Forest Service implements the Smoke Management Plan in issuing daily burn authorizations around the state. The Florida Forest recently announced additional protocols for prescribed fire burning, including the burning of pre-harvest sugarcane, that includes taking into account ambient air quality before issuing daily authorizations.

The Department received comments regarding environmental justice (EJ). Commenters state that the Department should analyze the environmental justice impacts of its regional haze SIP and ensure the SIP will reduce emissions and minimize harms to disproportionately impacted communities. For those reasonable progress sources located near a low-income or minority community that suffers disproportionate environmental harms, the Department's four-factor analysis should take into consideration how each considered measure would either increase or

reduce the environmental justice impacts to the community. Commenters note that EPA will be required to ensure that its action on Florida's regional haze plan addresses any disproportionate environmental impacts of the pollution that contributes to haze and therefore, that the Department should facilitate EPA's compliance with these requirements by considering EJ in its SIP.

Response: The requirements of the regional haze rule are that Florida address regional haze in each mandatory Class I Federal area located within Florida and in each mandatory Class I Federal area located outside Florida that may be affected by emissions from within the State. As required by the rule, Florida's long-term strategy and the reasonable progress goals provide for an improvement in visibility for the most impaired days since the baseline period and ensure no degradation in visibility for the clearest days since the baseline period.

Although the rule does not require analysis of environmental justice, EPA's July 2021 regional haze guidance encourages states to consider whether there may be environmental justice impacts when developing the regional haze plan. For the sources in Florida that were selected for analysis, Florida's regional haze SIP requires that either the existing SO_2 limits be incorporated into the SIP to ensure that the facilities will continue to operate at a level that meets reasonable progress, or that new permit limits be incorporated into the SIP requiring the facilities to meet more stringent requirements representing reasonable progress. Emission limits contained in Florida's Regional Haze SIP will provide air quality benefits to the areas around the selected sources in addition to the visibility benefits at Federal Class I areas. As discussed in the Regional Haze Plan in Section 7.2.4, emissions of SO_2 and NO_X in Florida are expected to continue to decrease through 2028, ensuring improved air quality for all affected populations.

With respect to EPA's requirements to address Environmental Justice, the Department expects that EPA will comply with all applicable Executive Orders when considering Florida's Regional Haze SIP; the Department's role is to comply with the requirements of the Regional Haze Rule.

The Department received comments regarding NO_X emissions and nitrates. Commenters state that the Department's analysis used outdated monitoring data that does not represent the shift in nitrate contribution to visibility impairment in the Southeast over the last 5-10 years, and that this shift was not reflected in future predictions. Commenters also stated that the Department should complete a full four-factor analysis of NO_X emissions for Duke Crystal River Units 4 and 5, TECO Big Bend Units 3 and 4, JEA Northside Units 1 and 2, and Seminole Generating Station Units 1 and 2, including consideration of SNCR installation or upgrades.

Response: As shown in Figure 2-9 through Figure 2-13 in the Regional Haze Plan, there has not been a significant shift in the nitrate contribution to visibility impairment in Class I areas in and nearby Florida. Sulfates continue to be the largest contributor to anthropogenic visibility impairment at all affected Class I areas. Therefore, Florida did not analyze NO_X emissions, the precursor to nitrates, but did analyze SO_2 emissions, the precursor to sulfates. As stated in EPA's August 2019 regional haze guidance, "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." The regional haze program is a long-term program with the goal of making reasonable progress toward natural visibility conditions over time. If nitrates become an important contributor to visibility impairment in future years, then NO_X emissions will be evaluated in future implementation periods.

EPA's July 2021 regional haze guidance states that EPA expects states to consider SO_2 and NO_X, and any state choosing not to consider both pollutants should show why such consideration would be unreasonable, especially states that considered both pollutants in the first planning period. The Department only considered SO_2 from point sources in selecting reasonable progress sources in the first implementation period and is only considering SO_2 from point sources in selecting reasonable progress sources in the second implementation period. This is because, as described previously and in Section 7.4 of the Regional Haze Plan, sulfates continue to be the largest contributor to anthropogenic visibility impairment at all Class I areas within Florida and at affected Class I areas nearby Florida, and point sources continue to be the most significant source of SO_2 in Florida.

The Department received comments regarding source selection methodology. Commenters state that the Department used high thresholds and unnecessary filters to select sources, resulting in an unreasonably low number of selected sources. Commenters state that the Department should revise the source selection methodology such that all facilities are fully analyzed. Commenters requested that the Department explain its decision to base source selection on projected 2028 emissions instead of actual emissions and must compare how the suite of selected sources compares with a selection based on historical emissions. Commenters also request that the Department provide unit-level NO_X, SO_2, and PM emissions of all point sources for the last five years. Commenters stated that the Department did not provide reasoned bases to support the 1.00% threshold used in the PSAT analysis. Commenters also state that any facilities the Department eliminated from consideration based on the AOI vs. PSAT fractional bias metric (discussed in Section 7.6.3 of the Regional Haze Plan) should be re-examined, including IFF and Symrise, because the fractional bias metric uses predicted AOI values instead of monitored or measured values.

Response: The regional haze rule does not require states to evaluate all sources of pollutants for a reasonable progress analysis. States have the discretion to determine which sources will be evaluated and the rule requires that states describe the criteria used to determine which sources are evaluated (40 CFR 51.308(f)(2)(i)). Sections 7.4 through 7.6 in the Regional Haze Plan explain the criteria used to select sources and why it results in a reasonable set of sources for analysis, including explaining why the Department's analysis focused on sulfates (it is the largest contributor to visibility impairment at Florida Class I areas), SO_2 emissions (it is the precursor to sulfates), and EGU and non-EGU point sources of SO_2 (these are the largest source of SO_2 emissions in Florida).

Regarding the decision to base source selection on projected 2028 emissions, as discussed on page 17 of EPA's August 2019 regional haze guidance, states may use estimated 2028 emissions to estimate visibility impacts when selecting sources, rather than recent year emissions. The Department did compare the 2028 projected emissions to historical emissions in Section 7.6.5 of the Regional Haze Plan and addressed significant differences. In the periodic progress report due on January 31, 2025, the Department will be required to assess emissions trends and any significant changes in anthropogenic emissions within or outside Florida and to reassess the 2028 projected emissions compared to historical emissions. If there are any significant emissions changes, such as anticipated emissions reductions that do not occur or unanticipated emissions increases, the Department is required to assess whether these changes impede progress on visibility improvement, determine whether the SIP is adequate, and revise the SIP if necessary.

Regarding unit-level point source emissions for the last five years, the Regional Haze Rule does not require that the SIP include five years of unit-level point source data. The Department's 2011 and 2028 modeling runs, however, do include unit-level point source data.

Regarding comments on the thresholds, the Department explains the AOI threshold in Section 7.6.1 and the PSAT threshold in Section 7.6.4 of the Regional Haze Plan. In those sections the Department also explains that the AOI analysis and the PSAT analysis were not the exclusive methods for selecting sources. Florida also evaluated other significant sources that were not identified by the AOI and PSAT screening thresholds to ensure that a reasonable set of sources was selected for analysis.

Regarding comments on the fractional bias metric, although the fractional bias metric normally compares predicted values with observed values, the AoI calculations and PSAT modeled values are sensitivities for which observations are not available. PSAT is considered the most accurate tool available for evaluating source impacts at receptors. Therefore, PSAT modeled values are treated as the "observed" values and the AoI calculations are treated as

the "predicted" values. The fractional bias metric allows for a comparison between PSAT and AoI and shows how well the AoI results match the PSAT modeled values. The data from the fractional bias metric calculation support the statement that for sources within 100 km of a Class I area, the AoI calculation will be at least three times higher than the PSAT modeled value. Therefore, these data support eliminating IFF and Symrise from consideration.

The Department received comments on the effectively-controlled units that were exempt from full four-factor analysis and comments on other units that were not selected for analysis. Specifically, commenters state that the Department wrongly exempted from four-factor analysis the following sources: Duke Crystal River Units 4 and 5, TECO Big Bend Units 3 and 4, Seminole Generating Station Units 1 and 2, Nutrien White Springs SAPs, Mosaic New Wales SAPs, Mosaic Bartow SAPs, Breitburn, and Deerhaven Generating Station. Commenters also stated that Florida should ensure best available controls are required for any source that is analyzed. Commenters also provided additional comments on specific facilities. Commenters stated that the Department only excluded the Breitburn facility because it was more than 300 km from the nearest Class I area. Commenters stated that the Department excluded the Deerhaven Generating Station facility from analysis based on implementation of a fuel co-firing project. Commenters also stated that the Department should not allow OUC Stanton to burn coal beyond 2027. Commenters stated that TECO Big Bend Units 2 and 3 should have enforceable retirements by 2023 in the SIP and that TECO Big Bend Units 3 and 4 should not be allowed to co-fire coal effective immediately. Commenters stated that the Seminole Generating Station facility should have an enforceable requirement to retire by 2028.

Response: Regarding SO_2 emissions for the effectively-controlled units meeting the MATS SO_2 emission limit of 0.2 lb/MMBtu, page 23 of EPA's August 2019 regional haze guidance notes that this limit is "low enough that it is unlikely that an analysis of control measures…would conclude that even more stringent control of SO_2 is necessary to make reasonable progress." Regarding SO_2 emissions from the SAPs, page 22 of the August 2019 regional haze guidance additionally states, "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."

EPA's July 2021 regional haze guidance continues to allow use of the effectively controlled unit criteria within Regional Haze SIPs. EPA did, however, add a requirement that states should consider how the source's actual operations compare to the permitted limits, to determine whether a lower limit could be achieved by the unit. The Department has already completed this comparison for the units meeting the MATS SO_2 limit (see Section 7.6.4.1 of the Regional Haze Plan).

For Nutrien White Springs, SO_2 emissions from SAPs E and F have approached the 3-hour permitted SO_2 emission limit of 2.6 pound per ton of 100% sulfuric acid (lb/ton). Although recently the long-term SO_2 emissions have operated in the range of 1.0-1.1 lb/ton (as compared to the long-term rolling average permit limit of 2.3 lb/ton), this is because the SAPs are operating well below the permitted production rate of 2,750 tons per day. In addition, the D catalyst beds of each SAP is loaded with new, high-efficiency vanadium/cesium catalyst and new vanadium catalyst has been added to the A, B, and C catalyst beds in preparation for the production rate of 2,750 tons per day that has not yet been achieved. All of this serves to decrease SO_2 emissions. However, as the production rate increases closer to the permitted limit of 2,750 tons per day and as the catalyst ages, it is expected that the 365-day rolling average SO_2 emission rate will approach the permitted limit of 2.3 lb/ton. Discussion of the proposed SIP emission limits for Nutrien White Spring has been added to Section 7.6.4.1 of Florida's Regional Haze SIP.

For the New Wales and Bartow facilities, the limits that are being used for Regional Haze purposes are already in Florida's SIP as part of Florida's Maintenance SIP for the Hillsborough-Polk SO_2 Maintenance Area. *See* 85 Fed. Reg. 9,666 (February 20, 2020). The Department is not proposing to include the production-based SO_2 emission limits as discussed in the comments. The SAPs currently operate at up to 99% of their permitted SO_2 caps of 1,090 lbs/hr and 1,100 lbs/hr, respectively. Therefore, the Department considers the current permitted SO_2 limits to be reasonable for all effectively-controlled units at Mosaic New Wales and Mosaic Bartow. Discussion of the proposed SIP emission limits for Mosaic New Wales and Mosaic Bartow has been added to Section 7.6.4.1 of Florida's Regional Haze SIP.

Regarding the comment on best available controls, the Regional Haze Rule does not require best available controls; it requires only measures necessary for reasonable progress.

Regarding specific comments on TECO Big Bend, TECO Big Bend Unit 2 was screened out from analysis due to insignificant SO_2 emissions. TECO Big Bend Units 3 and 4 were selected for analysis and the Department determined that, per EPA's regional haze guidance, these units meet SO_2 limits low enough that it is unlikely that an analysis of control measures would conclude that more stringent control of SO_2 is necessary for reasonable progress. Therefore, additional controls or measures beyond this are not necessary for reasonable progress.

Regarding specific comments on Seminole Generating Station, Units 1 and 2 were both selected for analysis and the Department determined that, per EPA's regional haze guidance, these units meet SO_2 limits low enough that it is unlikely that an analysis of control measures would conclude that more stringent control of SO_2 is necessary for reasonable progress.

Therefore, additional controls or measures beyond this are not necessary for reasonable progress.

Regarding Breitburn, the Department did not request that this facility complete a reasonable progress analysis as this facility was screened out through the AOI process due to its low impact on visibility impairment in Class I areas. AOI analysis accounts for distance from a Class I area, and therefore distance is one of the primary factors in determining a source's contribution to visibility impairment at a Class I area, among other factors. However, distance is not a factor that the Department used by itself to screen out facilities. In fact, there are facilities located more than 300 km from a Class I area that were selected for analysis (e.g. New Wales and Bartow are more than 300 km from Everglades and were selected for impacts at Everglades). The Breitburn facility was screened out through the AOI analysis due to its low estimated contribution to visibility impairment at Class I areas (less than 1%).

Regarding Deerhaven Generating Station, the Department did not request that this facility complete a reasonable progress analysis as this facility was screened out through the AOI analysis due to its low impact on visibility impairment in Class I areas, not because of the planned implementation of the fuel co-firing project.

The Department received general comments on cost-effectiveness calculations and commenters requested that the Department consider this information in the cost-effectiveness calculations. Specifically, commenters note the analyses should include sufficient documentation, such as vendor quotes, actual costs from similar facilities, or generally accepted cost estimates; equipment lives should not be too short; optimization should be required for scrubber; interest rates should not be too high; retrofit factors above 1.0 should be justified; baseline emissions should be realistic; and analyses should not include AFUDC and owners costs.

Response: Regarding documentation, the Department reviewed all cost-effectiveness calculations to determine whether additional information was needed. The Department disagrees that vendor quotes or site-specific information is necessary to estimate costs of compliance. While site-specific cost information is preferred, EPA's August 2019 guidance and the Control Cost Manual note that where site-specific information is not available, states may use generic cost estimates or estimation algorithms in determining costs of compliance. In addition, although EPA recommends that states use the Control Cost Manual as a source of cost estimates and algorithms, EPA does not require states to use it.

Regarding equipment life, interest rates, and cost items used, the Department agrees that in certain cases, as described in Section 7.8.1 and Section 7.8.2 of the Regional Haze Plan, the equipment life estimates, interest rates used, and certain cost items included in the initial analyses were not justified; where the estimated cost-effectiveness values were reasonably

close to being cost-effective, the Department updated the analyses with a 30-year lifetime, a 3.25% bank prime interest rate, and removed any cost items that were not justified. The Department did not revise calculations for control costs where the revised costs would still be significantly above a reasonable cost-effectiveness threshold. Regarding the comment on retrofit factors, none of the analyses used a retrofit factor greater than 1.0.

Regarding baseline emissions, the Department reviewed the emissions used in each analysis to confirm that they were reflective of recent and future expected operations.

The Department received comments on the four-factor analysis facilities and units (Georgia-Pacific Foley Mill, WestRock Panama City Mill, JEA Northside, and WestRock Fernandina Beach Mill). General comments on four-factor analyses include that the Department should require best performing controls in all analyses, and optimization should be required as part of any required scrubber or SCR upgrade. Commenters also provided specific comments about specific facilities. For JEA Northside, commenters state that the Department should require the facility to eliminate the burning of fuel oil in Unit 3 and should require that a four-factor analysis be performed that investigates the cost-effectiveness of optimizing the dry scrubber systems for Units 1 and 2. Commenters also state that the $1,000,000 modification cost to accept lower sulfur fuel is not justified. For WestRock Fernandina Beach, commenters state that the Department should require a four-factor analysis for burning 100% natural gas in Power Boiler No. 7 and that fundamental redesign of the unit is not justification for removing this control measure from consideration. Commenters also noted issues with the Foley Mill and Panama City Mill four-factor analyses and stated that the Department cannot set Reasonable Progress Goals (RPGs) until all four-factor analyses are complete and all reasonable progress controls are determined.

Response: Regarding best performing controls, the regional haze rule does not require best performing or best available controls; it requires only measures necessary for reasonable progress.

Regarding JEA Northside, the Department has completed the four-factor analysis for Unit 3 and determined that the measures necessary for reasonable progress are prohibiting the purchase of fuel oil with greater than 1.0% sulfur content, and to either begin firing only fuel oil with sulfur content less than or equal to 1% in 2026, or shut down the unit by the end of 2028, as discussed in Section 7.8.1.1.5 of the Regional Haze Plan. Even if the modification costs are removed from the cost-effectiveness calculations, the conclusion of the analysis is the same in that the most cost-effective control option is switching to fuel oil with 1.0% or lower sulfur content.

Commenters also noted that some of the costs were redacted and, therefore, they were unable to reproduce the analysis. Under Florida law, trade secrets are allowed to be submitted to government agencies and are exempted from Florida's public records law. The Department did review these costs in an unredacted version sent as trade secrets and determined that they were reasonable estimates.

Regarding Foley Mill and Panama City Mill, the Department commits to submitting a future SIP submittal supplementing this one which will address the four-factor analyses for these two facilities. The Department will assess the documentation provided by the facilities, ensure that technically-feasible control measures are evaluated, ensure baseline emissions used in the analysis are appropriate, and ensure that the cost-effectiveness calculations include only appropriate cost items and factors, including a 30-year lifetime and 3.25% bank prime interest rate. This supplemental SIP will provide additional opportunity for public comment on the four-factor analyses for Foley Mill and Panama City Mill and other items included in the supplemental SIP.

Regarding WestRock Fernandina Beach, the Department will address the analysis of the burning of 100% natural gas as a control measure for Power Boiler No. 7 in the supplemental SIP, which will provide additional opportunity for public comment on the analysis.

Regarding setting the RPGs, the Department has taken the conservative approach of using the 2028 visibility projections as the RPGs, which do not include any four-factor reasonable progress controls, making the RPGs more conservative.

The Department received comments regarding the permit conditions proposed to be incorporated into the SIP. Commenters state that the SIP does not contain provisions to ensure emissions limitations are permanent, enforceable, and apply at all times. Specifically, the Department received comments stating that there is a lack of record keeping and reporting requirements; inadequacies in provisions relying on the MATS rule for compliance; lack of EPA-approved methods for continuous emission monitoring and for determining compliance; references to two permit applications that should be removed; conditions that exclude periods of startup, shutdown, and malfunction; lack of compliance dates; and that the SIP does not allow for use of any credible evidence. Commenters stated that the Department must use its authority under state law and require emission limitations in the SIP that result in reductions of visibility impairing pollutants. Commenters also stated that the Department is incorporating permit limits into the SIP from permits that have either have expired or will expire soon.

Response: Commenters state that the proposed SIP provisions for Duke Crystal River, JEA Northside, Nutrien White Springs, Seminole Generating Station, TECO Big Bend, and WestRock Fernandina Beach lack record keeping and reporting requirements. The permit

conditions for WestRock Fernandina Beach will be updated to include record keeping and reporting requirements sufficient for the Department to monitor and determine the facility's compliance, and this will be included in the supplemental SIP that the Department commits to submitting. For the other facilities listed, each facility's Title V permit contains recordkeeping and reporting requirements sufficient for the Department to monitor and determine the facility's compliance with the permit conditions.

Commenters state that provisions relying on the MATS rule (40 CFR 63, Subpart UUUUU) for compliance are inadequate. The Department disagrees as the MATS rule (which is an applicable requirement for Duke Crystal River Units 4 and 5, Seminole Generating Station Units 1 and 2, and TECO Big Bend Units 3 and 4) requires that the SO_2 CEMS being used for compliance with the Regional Haze SIP limits meet the requirements of 40 CFR Part 60 and Part 75. *See* Table 5 to Subpart UUUUU of Part 63—Performance Testing Requirements.

Commenters state that Florida's proposed SIP does not include specific methodology and requirements in accordance with EPA's regulations for SIPs that rely on continuous emission monitoring (40 CFR 51.214). The Department disagrees with this comment as all emissions limits that are being incorporated into Florida SIP require continuous emission monitoring through various federal programs or other provisions in Florida's SIP.

Commenters state that the proposed SIP conditions for Duke Crystal River Citrus Combined Cycle contain non-EPA methods (ASTM) and that Florida must use EPA-approved methods. The Department disagrees with this comment as the firing of pipeline quality natural gas with no more than 2 grains of sulfur per 100 standard cubic feet is an enforceable emission limitation that requires use of ASTM methods that are incorporated in 40 CFR Part 60, Subpart KKKK and 40 CFR 60.17.

Commenters state that Florida proposes to include two entire permit applications as part of the enforceable requirements (JEA Northside Unit 3 and WestRock Fernandina Beach Mill). The Department is not proposing to incorporate the permit applications, only the permit conditions from the final permits which are included in the Materials to be Incorporated into the SIP section.

Commenters state that the proposed SIP provisions for JEA Northside Units 1 and 2 must not exclude periods of startup, shutdown, and malfunction. JEA Northside Units 1 and 2 are also subject to the MATS rule which includes continuous SO_2 emission limits and work practice standards that are included in the facility's Title V permit. Thus, when combining the SIP limits and MATS limits, this facility is subject to continuous emission limiting standards for SO_2.

Commenters state that the proposed SIP provisions for Nutrien White Springs must not exclude periods of startup, shutdown, and malfunction. The Department disagrees that the proposed SIP limits exclude periods of startup, shutdown, and malfunction as the SIP limits contain a short-term (three-hour) average that excludes periods of startup, shutdown, and malfunction and a long-term (annual) average that includes periods of startup, shutdown, and malfunction. Therefore, the proposed SIP limits for PCS White Springs cover all modes of operation, including periods of startup, shutdown, and malfunction.

Commenters also stated that the permit for Nutrien White Springs includes language about what was "effective" and "enforceable" at the time the permit was issued. The language in the permit was merely noting that the limits applicable to SAP F were already effective and enforceable through the consent order at the time the permit was issued and the limits applicable to SAP E were to become effective either January 1, 2020 or upon production exceeding 2,500 TPD, whichever is earlier. Presently, all limits applicable to SAPs E and F are effective and enforceable; the construction permit just noted the historical compliance timeframes that were applicable in the consent order.

Commenters state that the proposed SIP does not specify compliance dates. The facilities are required to comply with the permit conditions upon issuance of the final permit. Upon EPA's final approval to incorporate the specific permit conditions into the SIP, these SIP limits will be permanent and enforceable by EPA via Florida's SIP.

Commenters state that Florida must amend the SIP to allow for use of any credible evidence (40 CFR 51.212). EPA has determined previously, in its proposed approvals of various infrastructure SIP submittals, that Florida's SIP allows for the use of credible evidence. EPA has not identified any provision in the SIP preventing the use of credible evidence; e.g., see 81 Fed. Reg. 50,416 (August 1, 2016) and 84 Fed. Reg. 68,863 (December 17, 2019).

Commenters state that the Department must use its authority under state law and require emission limitations in the SIP that result in reductions of visibility impairing pollutants at each reasonable progress source, and the Department should not rely only on existing emissions limitations. However, the regional haze rule only requires the Department to include emissions limitations in the SIP that are necessary for reasonable progress, which may include existing emissions limitations. The Department's SIP meets this requirement.

Regarding air construction permit expiration, the air construction permit conditions for all facilities listed in the Materials to be Incorporated into the SIP section have already been incorporated into each facility's respective Title V permit, except for the permit limits for JEA Northside Unit 3 and for WestRock Fernandina Beach Power Boiler No. 7. The relevant permit conditions for these two units will be incorporated into the facility's respective Title V

permits before the air construction permits expire. Under Florida's New Source Review and Title V permitting programs, conditions contained within air construction permits are applicable requirements that extend beyond the expiration of the actual air construction permit. The Department's rules require air construction permits to be incorporated into a facility's Title V permit in a timely manner after demonstrating initial compliance with the conditions therein.

The Department received comments regarding coal retirements and emission reductions. Commenters state that the Department should not rely on coal retirements or emission reductions unless they are codified in the SIP, and that sources with announced retirements must either have practically enforceable provisions in the SIP reflecting permanent closure or must complete a four-factor analysis – specifically, CD McIntosh Unit 3, TECO Big Bend Units 1-3, Duke Crystal River Units 1 and 2, Seminole Generating Station Unit 1 or Unit 2, SJRPP Boilers 1 and 2, and Mosaic Plant City. Commenters also stated that the Department should not allow OUC Stanton to burn coal beyond 2027, and should restrict coal at Deerhaven Generating Station. Commenters state that even if the Department includes an enforceable SIP commitment for these specific retirements, the Department should consider cost-effective controls for these units during the intervening years.

Response: As of 2020, when the Department was finalizing the list of selected sources, TECO Big Bend Unit 1, Duke Crystal River 1 and 2, SJRPP Boilers 1 and 2, and Mosaic Plant City SAPs were already permanently shut down and these units have removed from the Title V operating permits for these facilities. These units may not be restarted and any new units at these facilities would be subject to New Source Review, which includes a requirement to analyze visibility impacts in Class I areas. The remaining facilities and units listed are discussed below:

- **CD McIntosh –** Unit 3 at CD McIntosh, at the time of source selection, was still operating and was required to meet the MATS SO_2 limit; therefore, Unit 3 was "effectively-controlled." The Department did not identify any additional measures as necessary for reasonable progress. However, the facility chose to retire Unit 3 in April 2021; therefore, it was no longer necessary to incorporate the SO_2 emissions limitation into the SIP because the unit was permanently shut down. Unit retirement was not identified as necessary for reasonable progress; therefore, unit retirement does not need to be incorporated into the SIP.
- **TECO Big Bend –** Unit 2 was screened out due to very low SO_2 emissions. Unit 3 was selected for analysis and the MATS limit was identified as necessary for reasonable progress, a limit that will be incorporated into the SIP. Unit retirement or switching to natural gas firing only was not identified as necessary for reasonable progress; therefore, unit retirement or fuel switching do not need to be incorporated into the SIP.

- **Seminole Generating Station –** Units 1 and 2 were both selected for analysis, and for each, the MATS limit was identified as necessary for reasonable progress. Unit retirement was not identified as necessary for reasonable progress; therefore, unit retirement does not need to be incorporated into the SIP. At the time of source selection, Seminole Generating Station was already authorized by permit to replace either Unit 1 or Unit 2 with a new natural gas combined cycle unit. The permit requires that within 300 days after the initial fuel firing in either combustion turbine, either Unit 1 or Unit 2 must be permanently removed from service. Seminole Generating Station began construction on the new NGCC unit in 2020 and the initial fuel firing is expected to occur in early 2022. Therefore, either Unit 1 or Unit 2 is expected to permanently shutdown by early 2023.
- **Deerhaven Generating Station –** This facility was screened out through the AOI analysis due to its low impact on visibility impairment in Class I areas. The Department discussed the fuel co-firing project at Deerhaven Generating Station for informational purposes only to note further emissions decreases that may occur by 2028.
- **OUC Stanton -** This facility was screened out through the AOI analysis due to its low impact on visibility impairment in Class I areas. The Department discussed OUC Stanton's announcement that it will end coal-firing by 2028 for informational purposes only to note further emissions decreases that may occur by 2028.

The future operations of these facilities were noted for informational purposes as part of Florida's requirements for developing a long-term strategy. Consideration of source retirement and replacement schedules is required by 40 CFR 51.308(f)(2)(iv)(C) and were not relied upon as part of Florida's emission reduction measures that are necessary to make reasonable progress (by considering the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected anthropogenic source of visibility impairment). *See* 40 CFR 51.308(f)(2)(i).

The Department received comments regarding the Clean Air Act's anti-backsliding provisions. Commenters state that the SIP violates the Clean Air Act's anti-backsliding requirement because the Department proposes to remove BART and reasonable progress emissions limitation provisions from the SIP without replacing them with equivalent or more stringent requirements. Commenters state that the Department does not provide evidence of the permanent shutdowns and does not make these retirements enforceable in the SIP; therefore, the Department must include evidence in the proposed SIP to support its assertion that the sources have shut down and can no longer operate and include enforceable provisions accordingly directly in the SIP.

Response: The BART and reasonable progress units that have permanently shutdown are no longer allowed to operate under any Title V permit. If any of the BART or reasonable

progress units were to restart operations at these sites, the new emissions units would be treated as new sources for New Source Performance Standard (NSPS) purposes and as new sources under the Department's New Source Review (NSR) program. The NSR program requires new sources to demonstrate that they will not cause or contribute to an air quality problem and requires an analysis of visibility impacts in Class I areas to ensure the project will not significantly contribute to visibility impairment in any Class I area. The Prevention of Significant Deterioration (PSD) program also requires new sources to apply best available control technology (BACT).

The Department is providing documentation of the permanent shutdown of the BART and reasonable progress units in Appendix G-5.

The Department received comments regarding consultation with other states. Commenters stated that Florida did not respond to the MANE-VU Asks and that Florida should implement MANE-VU Asks 1 and 4 in Florida. Commenters stated that the Department should ask that Alabama include practically enforceable emission limitations in its regional haze SIP for Sanders Lead and noted issues with Air Permit No. X034 issued by Alabama Department of Environmental Management to the Sanders Lead facility. Commenters state that Florida should include Georgia's response to its request in its SIP.

Response: The Department's response to the MANE-VU Asks is included in Appendix F-4c and summarized in Section 10.3 of the Regional Haze Plan. As discussed in Section 10.3, the Department disagrees that Florida contributes significantly to any MANE-VU Class I area; therefore, the Department did not implement the MANE-VU's Asks in Florida.

Alabama provided updated emissions from the Sanders Lead facility to confirm that based on recent actual emissions reflective of the source's current and expected future operations (346 tons per year in 2020, the first full year of scrubber operation), the facility has an insignificant impact on visibility impairment in Florida Class I areas, as discussed in Alabama's letter to Florida in Appendix F-1c. Therefore, this facility was screened out from the source selection process and it was not necessary for Florida to request Alabama to perform any further analysis of this source with respect to Florida's Class I areas.

Emissions from Sanders Lead Facility

Year	SO_2 (tons per year)
2009	8,352
2010	9,243
2011	7,951
2012	7,624
2013	7,702
2014	7,456
2015	7,897
2016	8,100
2017	8,020
2018	8,493
2019	5,962
2020	346

Florida has not yet received a response from Georgia with respect to our consultation regarding Plant Bowen. Florida does expect that Georgia will address Florida's consultation request in Georgia's Regional Haze SIP, when it is submitted to EPA.

The Department received additional comments regarding 2028 emissions. Commenters state that the SIP lacks analysis for 2028 emissions inventory projections and future source development. Commenters also state that the Department does not explain or justify the decreases in projected 2028 emissions for the Foley Mill, Breitburn Gas Treating facility, Mosaic South Pierce, Monarch Hill, and Gulf Clean Energy Center.

Response: Regarding analysis of emissions inventory projections and future source development, the source selection and analysis were based on 2028 emissions; therefore, any future source development and subsequent emissions increases or decreases are already taken into account in the modeling and source selection process. Emissions for 2028 were developed considering growth and known or estimated emissions changes due to existing regulations, as described in Appendix B-2a. Section 7.2.4 of the Regional Haze Plan shows the change in emissions by source category between the baseline year of 2011 and projected 2028 emissions.

Regarding the decreases in 2028 emissions for the five listed sources, in Section 7.6.5 of the Regional Haze Plan, the Department included a comparison of the 2028 projected emission to recent actual emissions (2017-2019) and the Department noted differences between 2028 projected emissions and 2017, 2018, and 2019 emissions of 1,000 tons per year or more. The Department notes differences for the five additional facilities below:

- **Foley Mill** – Projected 2028 emissions were 1,520 tons per year, similar to emissions in the base year of 2011. However, actual emissions in recent years have averaged approximately 2,000 tons per year. Notwithstanding the recent increases in SO_2 emissions, the Foley Mill was selected to complete a four-factor analysis. The Department is still in the process of reviewing the Foley Mill's four-factor analysis, which did use more recent emissions for purposes of determining cost effectiveness. The four-factor analysis for Foley Mill will be addressed in the supplemental SIP.
- **Breitburn** – Projected 2028 emissions were 687 tons pear year, similar to the 2011 base year emissions. However, emissions in recent years have been higher, with maximum SO_2 emissions of 1,487 tons per year in 2017. This facility's maximum AOI impact was 0.29% at St. Marks. Using recent actual emissions in the AOI analysis would not change the Department's conclusion to not request that Breitburn complete a source-specific reasonable progress analysis because the maximum AOI impact would be 0.63%, still well below the 5% AOI threshold.
- **Mosaic South Pierce** – Projected 2028 emissions were 1,553 tons of SO_2 per year, which is similar to emissions in 2016 and 2017; however in 2018 and 2019, the SAPs have produced more sulfuric acid and therefore emitted more SO_2, with maximum emissions in 2018 of 2,248 tons per year. Although SO_2 emissions have increased beyond the 1,553 tons per year the Department used in the 2028 projection, the Department does expect emissions from this facility to be reduced in the future as Mosaic is in the process of installing new SO_2 controls at South Pierce similar to the controls installed at Mosaic Bartow and New Wales (i.e., cesium-promoted catalysts). Implementation of these controls on one of the two SAPs at South Pierce has already reduced emissions in 2020 (1,739 tons of SO_2). Once the second SAP has completed the cesium-promoted catalyst upgrade, SO_2 emissions will be within the range of the Department's 2028 projections.
- **Monarch Hill –** Projected 2028 emissions were 175 tons of SO_2 per year, the same as the 2011 base year emissions. However, emissions in recent years have been higher, with maximum SO_2 emissions of 654 tons per year in 2018. The increase in SO_2 emissions from the Monarch Hill landfill are attributable to increases in hydrogen sulfide (H_2S) gas being generated and subsequently collected by the landfill gas collection and control system. The increased generation of H_2S is attributable to disposal of wallboard after hurricanes. The Department does expect SO_2 emissions from the Monarch Hill landfill to decrease in the future, but whether or not this decrease occurs, this facility will be evaluated during the next Regional Haze implementation period.
- **Gulf Clean Energy Center –** Projected 2028 emissions are 572 tpy SO_2. Although recent SO_2 emissions have been as high as 1,128 tpy in 2019, the facility was still firing coal at that time. This facility's permit no longer allows the firing of coal in any of the units and only fires natural gas and limited amounts of fuel oil. Therefore, future emissions are likely to be well below the conservative projection of 572 tpy of SO_2.

The Department received comments regarding EPA regional haze guidance memoranda, including that states should not follow the August 2019 guidance, and that the Department should carefully review and consider the July 2021 guidance and adjust the SIP accordingly.

Response: The Department has reviewed and considered all final EPA regional haze guidance, including the August 2019 guidance and July 2021 guidance, in developing the final SIP. The Department has made efforts, including considerable consultation with EPA, to ensure that the SIP meets the requirements of the regional haze rule.

The Department received comments regarding modeling. Commenters state that the VISTAS modeling inaccurately reflects sulfate concentrations in the Southeast U.S. Commenters state that the modeling uses EGU emissions profiles from 2011 to project the EGU emissions in 2028, inaccurately assuming that EGUs will operate in 2028 as they did in 2011.

Response: Regarding sulfate concentrations in the VISTAS modeling, as discussed in Section 6.5 of the Regional Haze Plan, although model performance for sulfate at each Class I area is biased low on the 20% most-impaired days, the model performance statistics for sulfate are reasonable for regulatory modeling. Additionally, the future year sulfate concentrations are not based on the absolute modeled values, but instead the model is applied in a relative sense through calculation of relative response factors (RRFs). The RRF is the relative change in sulfates between the base year modeled value and future year modeled value. The future year sulfate concentrations are then estimated by multiplying the base year actual monitored value by the RRF. Factors causing bias in the base case will also affect the future case; therefore, using the modeling in a relative sense resolves any problems posed by the underprediction of sulfates, and will not lead to an under-estimation of source contributions.

Regarding the EGU emission profiles, as discussed in Appendix B-2b, the VISTAS approach of maintaining a temporal pattern in 2028 that is consistent with the base year (2011) prevents fabricated emissions increases or decreases between the two years simply as a result of the temporal profile. This is the same approach that EPA uses to project 2028 EGU emissions. In addition, the Department reviewed and updated EGU 2028 emissions using the best available information on expected future operations. The Department explains large differences between recent actual emissions and projected 2028 emissions in Section 7.6.5 of the Regional Haze Plan.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 62

DOE ORDER NO. 202-26-01

Department of Energy
Washington, DC 20585

Order No. 202-26-01

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists in the Electric Reliability Council of Texas, Inc. (ERCOT) region, due to a sudden increase in demand, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. I direct ERCOT (Reliability Coordinator) and its Balancing Authorities and backup generation resources defined below, to comply with this Order.[3] Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

Throughout the United States, demand is outpacing generation supply. Generation resource inadequacy is especially problematic during prolonged winter cold snaps. According to the North American Electric Reliability Corporation (NERC), "[w]inter electricity demand is rising at the fastest rate in recent years," and the "total internal demand for the [bulk power system] is forecast to increase by 20.2 GW (2.5%) over last winter's forecast.[4] While NERC assesses that there are "adequate resources for normal winter peak-load conditions," NERC cautions that "more extreme winter conditions extending over a wide area could result in electricity supply shortfalls."[5] According to NERC, areas in the continental United States are at an elevated risk during extreme cold, which jeopardizes American lives, our economy, and national security.[6]

In its 2025–2026 Winter Reliability Assessment, NERC finds that the ERCOT assessment area is at elevated risk. According to NERC, above-normal winter peak and outage

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] For all geographical or electrical areas of the Bulk Power System, all areas are under the oversight of one and only one Reliability Coordinator. NERC Rules of Procedure, section 501.1.4.1. All Balancing Authorities are under the responsibility of one and only one Reliability Coordinator. *Id.*, section 501.1.4.2. All Loads and generators are under the responsibility and control of one and only one Balancing Authority. *Id.*, section 501.1.4.4.

[4] *2025-2026 Winter Reliability Assessment*, NERC (NERC 2025-2026 Winter Assessment), at 8 (November 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf. The NERC 2025-2026 Winter Assessment "identifies, assesses, and reports on areas of concern regarding the reliability of the North American [bulk power system] for the upcoming winter season." *Id*. at 4.

[5] *Id.* at 5.

[6] *Id.* at 6.

conditions could result in the need for operating mitigations and Energy Emergency Alerts (EEAs). NERC states that strong load growth is driving higher winter electricity demand forecasts and contributing to continued risk of supply shortfalls. For this winter season, NERC explains that ERCOT is expected to continue facing reserve shortage risks, particularly under extreme load conditions that accompany freezing temperatures. NERC cautions that load shedding may be needed under wide-area cold weather events.[7]

Under President Trump's leadership, this administration is determined to take swift and decisive action to protect the American people from tragedies, such as Winter Storm Uri, which resulted in "billions of dollars in damages and over 200 deaths."[8]

In Executive Order 14156, "Declaring a National Energy Emergency," President Trump determined that the "United States' insufficient energy production, transportation, refining, and generation constitutes an unusual and extraordinary threat to our Nation's economy, national security, and foreign policy."[9] In Executive Order 14262, "Strengthening the Reliability and Security of the United States Electric Grid," President Trump emphasized that "the United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and increase in domestic manufacturing."[10] These Executive Orders underscore the dire energy challenges facing the Nation due to growing resource adequacy concerns.

The Department's July 2025 "Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid," issued pursuant to the President's directive in Executive Order 14262, details the myriad challenges affecting the Nation's energy systems. "Absent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI)

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[7] NERC, *2025 – 2026 Winter Reliability Assessment*, at 5-6, 31 (Nov. 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf.

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[9] Executive Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025) (Declaring a National Energy Emergency), https://www.whitehouse.gov/presidential-actions/2025/01/declaring-a-national-energy-emergency/.

[10] Executive Order No. 14262, 90 Fed. Reg. 15521 (Apr. 8, 2025) (Strengthening the Reliability and Security of the United States Electric Grid), https://www.whitehouse.gov/presidential-actions/2025/04/strengthening-the-reliability-and-security-of-the-united-states-electric-grid/.

innovation."[11] The prolific growth of data centers for the development of AI, as well as their immense energy needs, presents a new and increasing source of load growth.

In July 2025, President Trump released America's AI Action Plan for Winning the Race.[12] It recognizes that the "U.S. electric grid is one of the largest and most complex machines on Earth . . . [that] will need to be upgraded to support data centers and other energy-intensive industries of the future."[13] That plan recommended that we stabilize the grid of today as much as possible, including leveraging extant backup power sources to bolster grid reliability during peak demand and optimize existing grid resources as much as possible, including investigating "new and novel ways for large power consumers to manage their power consumption during critical grid periods to enhance reliability and unlock additional power on the system."[14]

NERC-certified Reliability Coordinators and Balancing Authorities[15] are responsible for identifying and addressing emergency conditions on the bulk power system. As discussed below, this is squarely addressed in the mandatory and enforceable NERC Reliability Standard EOP-011-4. Today, calls for voluntary curtailment are authorized under that standard. However, this action gives Reliability Coordinators and Balancing Authorities another tool to avoid the impacts experienced as a result of Winter Storm Uri.

Currently, there are tens of gigawatts of readily available backup generation that have remained largely untapped until now. Deployment of backup generation resources (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system) at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites, can prevent avoidable blackouts, thereby saving lives and reducing costs to the American people.

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[11] Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid, U.S. Department of Energy at 1(July 2025), https://www.energy.gov/sites/default/files/2025-7/DOE%20Final%20EO%20Report%20%28FINAL%20JULY%207%29.pdf.

[12] https://www.whitehouse.gov/wp-content/uploads/2025/07/Americas-AI-Action-Plan.pdf.

[13] *Id.* at 15.

[14] *Id.*

[15] The North American Electric Reliability Corporation (NERC) certifies Reliability Coordinators and Balancing Authorities in accordance with its Rules of Procedures.

APPLICATION OF EOP-011-4

Section 215 of the Federal Power Act[16] established a framework for development and implementation of mandatory and enforceable Reliability Standards that apply to Bulk Power System owners, operators, and users, such as Reliability Coordinators and Balancing Authorities. NERC certifies Reliability Coordinators and Balancing Authorities pursuant to an Organization Certification program set forth in its Rules of Procedure,[17] because of the significant roles these two functional entity category types have in ensuring bulk power system reliability. A Reliability Coordinator is defined as:

> the entity that is the highest level of authority who is responsible for the Reliable Operation of the [Bulk Electric System (BES)], has the Wide Area view of the BES, and has the operating tools, processes, and procedures, including the authority to prevent or mitigate emergency operating situations in both next-day analysis and real-time operations. The Reliability Coordinator has the purview that is broad enough to enable the calculation of Interconnection Reliability Operating Limits, which may be based on the operating parameters of transmission systems beyond any Transmission Operator's vision.[18]

A Balancing Authority is "the responsible entity that integrates resource plans ahead of time, maintains Load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time."[19]

Because of the criticality of their respective roles, Reliability Coordinators and Balancing Authorities are subject to NERC's Organization Certification Program to ensure that they have "the tools, processes, training, and procedures to demonstrate their ability to meet the Requirements/sub-Requirements of all of the Reliability Standards applicable to the function(s) . . . ."[20]

NERC Reliability Standard EOP-011-4 addresses Emergency Operations. Requirement 2 states "[e]ach Balancing Authority shall develop, maintain, and implement one or more Reliability Coordinator-reviewed Operating Plan(s) to mitigate Capacity Emergencies and Energy Emergencies within its Balancing Authority Area." Balancing Authorities are responsible for

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[16] 16 U.S.C. § 824o.

[17] *See generally* NERC Rules of Procedure, https://www.nerc.com/globalassets/who-we-are/rules-of-procedure/nerc-rop-effective-20231128_with-appendicies.pdf; *see also id.* section 500.

[18] NERC Rules of Procedure, Appendix 5B; *see also id.* Appendix 2. Other capitalized terms in this definition also are defined in the NERC Rules of Procedure at Appendix 2.

[19] NERC Rules of Procedure, Appendix 5B; *see also id.* Appendix 2.

[20] NERC Rules of Procedure, section 501.

requesting that their respective Reliability Coordinators issue an Energy Emergency Alert in accordance with Requirement 2 and Attachment 1 to EOP-011-4. Among other things, Balancing Authorities are authorized to make "[p]ublic appeals for voluntary Load reductions" in Requirement 2.2.4. Balancing Authority Operating plans must include provisions in accordance with Requirement 2.2.9 for "Transmission Operators to implement operator-controlled manual Load shedding, undervoltage Load shedding, or underfrequency Load shedding" and provisions in accordance with Requirement 2.2.10 to determine reliability impacts of cold weather conditions.

According to Requirement 5,

> Each Reliability Coordinator that receives an Emergency notification from a Transmission Operator or Balancing Authority within its Reliability Coordinator Area shall notify, within 30 minutes from the time of receiving notification, other Balancing Authorities and Transmission Operators in its Reliability Coordinator Area, and neighboring Reliability Coordinators.

According to Requirement 6,

> Each Reliability Coordinator that has a Balancing Authority experiencing a potential or actual Energy Emergency within its Reliability Coordinator Area shall declare an Energy Emergency Alert, as detailed in Attachment 1.

Attachment 1 provides,

> **Initiation by Reliability Coordinator.** An Energy Emergency Alert (EEA) may be initiated only by a Reliability Coordinator at 1) the Reliability Coordinator's own request, or 2) upon the request of an energy deficient Balancing Authority.

***

To ensure that all Reliability Coordinators clearly understand potential and actual Energy Emergencies in the Interconnection, NERC has established three levels of EEAs. The Reliability Coordinators will use these terms when communicating Energy Emergencies to each other. An EEA is an Emergency procedure, not a daily operating practice, and is not intended as an alternative to compliance with NERC Reliability Standards.

The Reliability Coordinator may declare whatever alert level is necessary, and need not proceed through the alerts sequentially.

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Before requesting an EEA 3, the energy deficient Balancing Authority must make use of all available resources; this includes, but is not limited to:

2.5.1 All available generation units are on line. All generation capable of being on line in the time frame of the Emergency is on line.

2.5.2 Demand-Side Management. Activate Demand-Side Management within provisions of any applicable agreements.

***

3.3.1 Energy deficient Balancing Authority obligations. The energy deficient Balancing Authority, upon notification from its Reliability Coordinator of the situation, will immediately take whatever actions are necessary to mitigate any undue risk to the Interconnection. These actions may include Load shedding.

Of particular note, NERC's 2025-2026 Winter Assessment recognizes that "[p]roactive issuance of winter advisories and other steps directed at generator availability contributed to improved reliability during cold weather events of the past two winters."[21] NERC further cautions that Reliability Coordinators and Balancing Authorities "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."[22]

EMERGENCY SITUATION

Winter Storm Fern poses significant risks to electric reliability in the Reliability Coordinator's footprint. Consistent with NERC's cautionary notes and this Administration's commitment to grid stability, this order seeks to unlock and deploy backup generation resources (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system) at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites as another tool to mitigate any undue risk to the bulk power system. The employment of this backup generation is expected to reduce stress on the grid. This will permit orderly, safe, and secure operations during Winter Storm Fern.

Consistent with my letter issued on January 22, 2026, ERCOT requested today that DOE issue an order pursuant to FPA section 202(c) to allow the deployment of backup generation during emergency conditions.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy 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," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or

[21] NERC 2025-2026 Winter Assessment at 7.

[22] *Id*.

transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."[23] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

I have made the determination that an emergency exists, due to an abrupt, unexpected increase in demand for electric energy relative to prior forecasts, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. As discussed above, taking into account the historical data, past projections and planning, and the projections for the upcoming winter season, together with the increasing demand for electricity that has substantially outpaced net generating capacity additions, a statutory emergency exists this winter across the continental United States. As noted above, NERC has warned that winter electricity demand is rising at the fastest rate in recent years and the total internal demand for the bulk power system is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. Even prolonged cold snaps can be expected to lead to the potential loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety during the upcoming winter.

To best meet the emergency and serve the public interest, backup generation resources shall be made available to run during the emergency conditions specified below.

Based on my determination of an emergency set forth above, I hereby order:

A. From January 24, 2026, the Reliability Coordinator and its Balancing Authorities are authorized to direct backup generation resources at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system), to operate as a last resort before declaring an Energy Emergency Alert (EEA) 3 (i.e., before firm load interruption) or during an EEA 3.[24]

B. This Order requires the operation of the backup generation resources described in paragraph A. Following the conclusion of the EEA conditions described in paragraph A, sufficient time for orderly ramp down is permitted, consistent with industry practices.

[23] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

[24] *See* NERC Reliability Standard EOP-011-4, Attachment 1, at 3.1 ("The Reliability Coordinators and the energy deficient Balancing Authority shall continue to take all actions initiated during EEA 2.").

C. This order is not applicable to any backup generation resource serving a critical reliability or backup need, including those at defense, homeland security, first responder, air traffic control, hospital facilities, 911 call centers, water treatment or wastewater facilities, natural gas pipeline facilities, natural gas gathering facilities, or other similar facilities.

D. To minimize adverse environmental impacts, this Order limits operation of deployed units to the times and within the parameters as determined by the Reliability Coordinator and its Balancing Authorities pursuant to paragraphs A-C.

E. All operations of backup generation resources authorized under this order must otherwise comply with ancillary environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

F. ERCOT shall provide notification to the Department (via AskCR@hq.doe.gov) within one day following the date any backup generation resources have been directed to operate pursuant to this Order. The reporting shall include a list of all backup generation resources directed to operate pursuant to this Order. ERCOT shall provide such additional information regarding the environmental and other impacts of this Order and their compliance with the conditions of this Order, as requested by the Department of Energy from time to time.

G. Each party affected by this order is directed to file with the Federal Energy Regulatory Commission any tariff, tariff revisions or waivers necessary to effectuate this Order, as applicable. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

H. This Order shall not preclude the need for the backup generation resources subject to this Order to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

I. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, any backup generation resource subject to this Order shall not be considered a capacity resource.

J. This Order shall be effective upon its issuance, and shall expire at 11:59 PM EST on January 27, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. at 7:34 PM EST on this 24th day of January 2026.

Chris Wright

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within the NERC Reliability Coordinator.

State	Office	Name
TX	Public Utility Commission of Texas	Thomas Gleeson
		Kathleen Jackson
	Railroad Commission of Texas	Christi Craddick
		Wayne Christian
		Jim Wright

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 63

DOE ORDER NO. 202-26-01A

Department of Energy
Washington, DC 20585

Amended Order No. 202-26-01A

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists in the Electric Reliability Council of Texas, Inc. (ERCOT) region, due to a sudden increase in demand, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. I direct ERCOT (Reliability Coordinator) and its Balancing Authorities and backup generation resources defined below, to comply with this Order.[3] Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

Throughout the United States, demand is outpacing generation supply. Generation resource inadequacy is especially problematic during prolonged winter cold snaps. According to the North American Electric Reliability Corporation (NERC), "[w]inter electricity demand is rising at the fastest rate in recent years," and the "total internal demand for the [bulk power system] is forecast to increase by 20.2 GW (2.5%) over last winter's forecast.[4] While NERC assesses that there are "adequate resources for normal winter peak-load conditions," NERC cautions that "more extreme winter conditions extending over a wide area could result in electricity supply shortfalls."[5] According to NERC, areas in the continental United States are at an elevated risk during extreme cold, which jeopardizes American lives, our economy, and national security.[6]

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conditions could result in the need for operating mitigations and Energy Emergency Alerts (EEAs). NERC states that strong load growth is driving higher winter electricity demand forecasts and contributing to continued risk of supply shortfalls. For this winter season, NERC explains that ERCOT is expected to continue facing reserve shortage risks, particularly under extreme load conditions that accompany freezing temperatures. NERC cautions that load shedding may be needed under wide-area cold weather events.[7]

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Attachment 1 provides,

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2.5.2 Demand-Side Management. Activate Demand-Side Management within provisions of any applicable agreements.

***

3.3.1 Energy deficient Balancing Authority obligations. The energy deficient Balancing Authority, upon notification from its Reliability Coordinator of the situation, will immediately take whatever actions are necessary to mitigate any undue risk to the Interconnection. These actions may include Load shedding.

Of particular note, NERC's 2025-2026 Winter Assessment recognizes that "[p]roactive issuance of winter advisories and other steps directed at generator availability contributed to improved reliability during cold weather events of the past two winters."[21] NERC further cautions that Reliability Coordinators and Balancing Authorities "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."[22]

EMERGENCY SITUATION

Winter Storm Fern poses significant risks to electric reliability in the Reliability Coordinator's footprint. Consistent with NERC's cautionary notes and this Administration's commitment to grid stability, this order seeks to unlock and deploy backup generation resources (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system) at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites as another tool to mitigate any undue risk to the bulk power system. The employment of this backup generation is expected to reduce stress on the grid. This will permit orderly, safe, and secure operations during Winter Storm Fern.

Consistent with my letter issued on January 22, 2026, ERCOT requested today that DOE issue an order pursuant to FPA section 202(c) to allow the deployment of backup generation during emergency conditions.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy 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," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or

[21] NERC 2025-2026 Winter Assessment at 7.

[22] *Id*.

transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."[23] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

I have made the determination that an emergency exists, due to an abrupt, unexpected increase in demand for electric energy relative to prior forecasts, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. As discussed above, taking into account the historical data, past projections and planning, and the projections for the upcoming winter season, together with the increasing demand for electricity that has substantially outpaced net generating capacity additions, a statutory emergency exists this winter across the continental United States. As noted above, NERC has warned that winter electricity demand is rising at the fastest rate in recent years and the total internal demand for the bulk power system is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. Even prolonged cold snaps can be expected to lead to the potential loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety during the upcoming winter.

To best meet the emergency and serve the public interest, backup generation resources shall be made available to run during the emergency conditions specified below.

Based on my determination of an emergency set forth above, I hereby order:

A. From January 24, 2026, the Reliability Coordinator and its Balancing Authorities are authorized to direct backup generation resources at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system), to operate after ERCOT deploys all available market services, except for frequency responsive services, before declaring an Energy Emergency Alert (EEA) 3 (i.e., before firm load interruption) or during an EEA 3.[24]

B. This Order requires the operation of the backup generation resources described in

[23] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

[24] *See* NERC Reliability Standard EOP-011-4, Attachment 1, at 3.1 ("The Reliability Coordinators and the energy deficient Balancing Authority shall continue to take all actions initiated during EEA 2."). *Cf.* Tex. Util. Code § 37.0561(e) ("After the independent organization deploys all available market services, except for frequency responsive services, the independent organization may direct the applicable electric utility or municipally owned utility to require the large load customer to either deploy the customer's on-site backup generating facilities or curtail load. The independent organization shall include a deployment under this section as firm load shed when calculating any price adjustments for reliability deployments.").

paragraph A. Following the conclusion of the EEA conditions described in paragraph A, sufficient time for orderly ramp down is permitted, consistent with industry practices.

C. This order is not applicable to any backup generation resource serving a critical reliability or backup need, including those at defense, homeland security, first responder, air traffic control, hospital facilities, 911 call centers, water treatment or wastewater facilities, natural gas pipeline facilities, natural gas gathering facilities, or other similar facilities.

D. To minimize adverse environmental impacts, this Order limits operation of deployed units to the times and within the parameters as determined by the Reliability Coordinator and its Balancing Authorities pursuant to paragraphs A-C.

E. All operations of backup generation resources authorized under this order must otherwise comply with ancillary environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

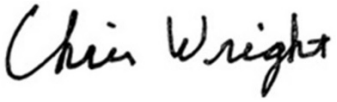
F. ERCOT shall provide notification to the Department (via AskCR@hq.doe.gov) within one day following the date any backup generation resources have been directed to operate pursuant to this Order. The reporting shall include a list of all backup generation resources directed to operate pursuant to this Order. ERCOT shall provide such additional information regarding the environmental and other impacts of this Order and their compliance with the conditions of this Order, as requested by the Department of Energy from time to time.

G. This Order shall not preclude the need for the backup generation resources subject to this Order to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

H. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, any backup generation resource subject to this Order shall not be considered a capacity resource.

I. This Order shall be effective upon its issuance, and shall expire at 11:59 PM EST on January 27, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. at 1:46 PM EST on this 25th day of January 2026.



Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within the NERC Reliability Coordinator.

State	Office	Name
TX	Public Utility Commission of Texas	Thomas Gleeson
		Kathleen Jackson
		Courtney K. Hjaltman
		Morgan Johnson
	Railroad Commission of Texas	Christi Craddick
		Wayne Christian
		Jim Wright

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 64

DOE ORDER NO. 202-26-03

Department of Energy
Washington, DC 20585

Order No. 202-26-03

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists within the ISO New England Inc. (ISO-NE) service territory due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. Issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On January 25, 2026, ISO-NE, the Regional Transmission Organization (RTO) spanning six states,[3] filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act,* (Application) with DOE.[4] ISO-NE has indicated that "[i]n many parts of the ISO-NE Balancing Authority Area, temperatures for January 25, 26, and 27, 2026 are forecasted to drop well below average, and abnormally low temperatures are expected to persist through January 30, 2026."[5] As of the time of filing its Application, ISO-NE is anticipating a "sustained high level of demand for electricity."[6] According to ISO-NE, "[w]hile the vast majority of generating units in the ISO-NE region continue to function adequately, some units may experience difficulty due to emissions/air permitting limitations, or other operating constraints."[7] ISO-NE states that all generating resources may be needed to meet the expected demand of the cold weather event.[8]

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] The six states are Connecticut, Rhode Island, Maine, Massachusetts, New Hampshire, and Vermont.

[4] Application at 1.

[5] *Id.* at 2.

[6] *Id.*

[7] *Id.*

[8] *Id.*

Description of Mitigation Measures

In anticipation of the cold weather event, ISO-NE states that it already issued a cold weather watch.[9] ISO-NE has also indicated that it is prepared to employ measures in its Operating Procedures designed to address abnormal conditions or deficiencies to "ensure the supply of generation will continue to be sufficient to meet demand and reserve."[10]

Request for Order

ISO-NE requests that the Secretary issue an order effective immediately and through January 31, 2026, the expected period to address high load related to Winter Storm Fern, authorizing "the provision of additional energy from all [Specified Resources], as well as any other generating units subject to emissions or other permit limitations."[11] The generating units (Specified Resources) to which this Order related are listed in Exhibit A of the Application for instant Order 202-26-3, as described below.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy 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," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest."[12] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

Given the emergency caused by the expected load stress, the responsibility of ISO-NE to ensure maximum reliability on its system, and the ability of ISO-NE to identify and dispatch generation necessary to meet load requirements, I have determined that, under the conditions specified below, additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on the expected load stress, shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes by Winter Storm Fern and its aftermath, and the potential loss of power to homes and local businesses in the areas that may be affected by curtailments or outages, presenting a risk to public health and safety.

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[9] *Id.* at 2-3.

[10] *Id*. at 2.

[11] *Id.*

[12] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

Consistent with the anticipated circumstances, this Order is limited to the period of time that Winter Storm Fern is expected to impact the ISO-NE service territory. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation under the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. ISO-NE anticipates that this Order may result in exceedance of permit restrictions on emissions, effluent, or other environmental permit limitations.[13] To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ISO-NE for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. In the event that ISO-NE determines that generation from the Specified Resources is necessary to meet the electricity demand that ISO-NE anticipates in its service territory, I direct ISO-NE to dispatch such unit or units and to order their operation only as needed to maintain reliability. Specified Resources are those generating units set forth in Exhibit A to their Application for the instant order (i.e., Order 202-26-3 Resource List), subject to updates directed here and as described in paragraph D, which DOE shall post on www.energy.gov.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ISO-NE for maintaining grid reliability and to the maximum extent practicable is consistent with any applicable environmental law. ISO-NE shall provide a daily notification to DOE (via AskCR@hq.doe.gov) reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

C. All operation of the Specified Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. In the event that ISO-NE identifies additional generation units that it deems necessary to maintain the reliability of the power grid, ISO-NE shall provide prompt written

[13] *Id*. at 1, 4.

notice to DOE at AskCR@hq.doe.gov with the name and location of those units that ISO-NE has identified. Such additional generation unit shall be deemed a Specified Resource for the purpose of this Order for the hours prior to the required written notice to DOE updating Exhibit A of the Application, and ISO-NE may dispatch such additional generation units, provided that if the DOE notifies ISO-NE that it does not approve of such generation unit being designated as a Specified Resource, such generation unit shall not constitute a Specified Resource upon notification from DOE.

E. ISO-NE shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by DOE from time to time.

F. This Order shall not preclude the need for the Specified Resources to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. This Order shall be effective upon its issuance, and shall expire at 11:59PM EST on January 31, 2026, with the exception of the reporting requirements in paragraph D and applicable compliance obligations in paragraph E. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 7:38 AM EST on this 25th day of January 2026.

Chris Wright

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within ISO-NE.

State	Office	Name
CT	Connecticut Public Utilities Regulatory Authority	Thomas Wiehl
		David Arconti
		Janice Beecher
		Holly Cheeseman
		Everett Smith
RI	Rhode Island Public Utilities Commission	Ronald T. Gerwatowski
		Abigail Anthony
		Karen Bradbury
MA	Massachusetts Department of Public Utilities	Jeremy McDiarmid
		Staci Rubin
		Elizabeth Anderson
	Massachusetts Department of Telecommunications and Cable	Karen Charles
VT	Vermont Public Utility Commission	Ed McNamara
		Riley Allen
		Margaret Cheney
	Vermont Department of Public Service	Kerrick Johnson
NH	New Hampshire Public Utilities Commission	Pradip Chattopadhyay
		Mark W. Dell'Orfano
	New Hampshire Department of Energy	Jared S. Chicoine
ME	Maine Public Utilities Commission	Philip L. Bartlett
		Carrie Gilbert
		Patrick Scully

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 65

SEC 1 GEN DATA

SEC Unit 1 Gross Generation (5/1/25 - 6/23/26)	
Time	**Gross MW Load**
5/1/25 0:00	104.4
5/1/25 1:00	99.7
5/1/25 2:00	108.1
5/1/25 3:00	105.8
5/1/25 4:00	106.0
5/1/25 5:00	107.0
5/1/25 6:00	106.1
5/1/25 7:00	106.4
5/1/25 8:00	104.0
5/1/25 9:00	110.4
5/1/25 10:00	110.6
5/1/25 11:00	111.4
5/1/25 12:00	111.2
5/1/25 13:00	112.1
5/1/25 14:00	112.8
5/1/25 15:00	167.8
5/1/25 16:00	173.6
5/1/25 17:00	269.6
5/1/25 18:00	301.3
5/1/25 19:00	401.0
5/1/25 20:00	302.7
5/1/25 21:00	199.0
5/1/25 22:00	104.3
5/1/25 23:00	106.9
5/2/25 0:00	106.3
5/2/25 1:00	105.8
5/2/25 2:00	104.3
5/2/25 3:00	105.7
5/2/25 4:00	104.4
5/2/25 5:00	104.6
5/2/25 6:00	103.7
5/2/25 7:00	104.1
5/2/25 8:00	103.8
5/2/25 9:00	102.9
5/2/25 10:00	101.2
5/2/25 11:00	103.9
5/2/25 12:00	102.1
5/2/25 13:00	104.2
5/2/25 14:00	104.5
5/2/25 15:00	105.9

5/2/25 16:00	106.8
5/2/25 17:00	170.1
5/2/25 18:00	178.0
5/2/25 19:00	182.8
5/2/25 20:00	181.9
5/2/25 21:00	178.4
5/2/25 22:00	238.8
5/2/25 23:00	103.4
5/3/25 0:00	102.1
5/3/25 1:00	100.2
5/3/25 2:00	102.8
5/3/25 3:00	102.0
5/3/25 4:00	100.7
5/3/25 5:00	102.0
5/3/25 6:00	101.6
5/3/25 7:00	102.4
5/3/25 8:00	101.9
5/3/25 9:00	102.5
5/3/25 10:00	100.6
5/3/25 11:00	100.4
5/3/25 12:00	109.2
5/3/25 13:00	109.0
5/3/25 14:00	169.7
5/3/25 15:00	181.5
5/3/25 16:00	235.1
5/3/25 17:00	270.8
5/3/25 18:00	240.0
5/3/25 19:00	239.8
5/3/25 20:00	240.0
5/3/25 21:00	254.0
5/3/25 22:00	309.5
5/3/25 23:00	309.9
5/4/25 0:00	269.3
5/4/25 1:00	228.4
5/4/25 2:00	102.2
5/4/25 3:00	100.2
5/4/25 4:00	102.2
5/4/25 5:00	103.0
5/4/25 6:00	103.5
5/4/25 7:00	102.7
5/4/25 8:00	102.9
5/4/25 9:00	130.4
5/4/25 10:00	131.6

5/4/25 11:00	129.9
5/4/25 12:00	131.9
5/4/25 13:00	131.8
5/4/25 14:00	134.2
5/4/25 15:00	128.7
5/4/25 16:00	134.3
5/4/25 17:00	231.1
5/4/25 18:00	230.7
5/4/25 19:00	310.7
5/4/25 20:00	307.1
5/4/25 21:00	239.2
5/4/25 22:00	100.0
5/4/25 23:00	102.3
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5/5/25 1:00	104.2
5/5/25 2:00	107.1
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5/5/25 11:00	114.7
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5/5/25 13:00	109.5
5/5/25 14:00	147.7
5/5/25 15:00	254.3
5/5/25 16:00	362.7
5/5/25 17:00	407.3
5/5/25 18:00	408.6
5/5/25 19:00	348.4
5/5/25 20:00	350.1
5/5/25 21:00	322.2
5/5/25 22:00	232.8
5/5/25 23:00	99.0
5/6/25 0:00	104.6
5/6/25 1:00	101.2
5/6/25 2:00	101.6
5/6/25 3:00	100.4
5/6/25 4:00	103.9
5/6/25 5:00	100.1

5/6/25 6:00	104.9
5/6/25 7:00	100.1
5/6/25 8:00	101.5
5/6/25 9:00	102.0
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5/6/25 16:00	277.3
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5/6/25 20:00	350.1
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5/7/25 2:00	100.8
5/7/25 3:00	101.1
5/7/25 4:00	103.3
5/7/25 5:00	103.2
5/7/25 6:00	103.9
5/7/25 7:00	133.0
5/7/25 8:00	131.6
5/7/25 9:00	130.5
5/7/25 10:00	132.5
5/7/25 11:00	137.8
5/7/25 12:00	134.0
5/7/25 13:00	134.7
5/7/25 14:00	248.4
5/7/25 15:00	285.9
5/7/25 16:00	383.3
5/7/25 17:00	462.4
5/7/25 18:00	412.6
5/7/25 19:00	410.3
5/7/25 20:00	356.7
5/7/25 21:00	287.5
5/7/25 22:00	103.3
5/7/25 23:00	99.2
5/8/25 0:00	105.8

5/8/25 1:00	103.5
5/8/25 2:00	113.8
5/8/25 3:00	105.1
5/8/25 4:00	104.5
5/8/25 5:00	103.6
5/8/25 6:00	105.4
5/8/25 7:00	104.7
5/8/25 8:00	104.1
5/8/25 9:00	104.2
5/8/25 10:00	100.9
5/8/25 11:00	103.8
5/8/25 12:00	104.2
5/8/25 13:00	105.7
5/8/25 14:00	143.1
5/8/25 15:00	312.2
5/8/25 16:00	353.4
5/8/25 17:00	350.1
5/8/25 18:00	450.4
5/8/25 19:00	349.3
5/8/25 20:00	350.1
5/8/25 21:00	349.8
5/8/25 22:00	185.3
5/8/25 23:00	103.2
5/9/25 0:00	104.3
5/9/25 1:00	107.0
5/9/25 2:00	105.0
5/9/25 3:00	100.9
5/9/25 4:00	104.9
5/9/25 5:00	102.9
5/9/25 6:00	103.8
5/9/25 7:00	102.6
5/9/25 8:00	103.6
5/9/25 9:00	102.4
5/9/25 10:00	104.1
5/9/25 11:00	103.3
5/9/25 12:00	102.3
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5/9/25 16:00	309.8
5/9/25 17:00	361.5
5/9/25 18:00	418.7
5/9/25 19:00	351.2

5/9/25 20:00	252.0
5/9/25 21:00	237.4
5/9/25 22:00	170.4
5/9/25 23:00	170.4
5/10/25 0:00	159.4
5/10/25 1:00	101.1
5/10/25 2:00	101.2
5/10/25 3:00	100.0
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5/10/25 6:00	99.9
5/10/25 7:00	100.3
5/10/25 8:00	104.8
5/10/25 9:00	105.2
5/10/25 10:00	105.0
5/10/25 11:00	105.4
5/10/25 12:00	105.0
5/10/25 13:00	107.5
5/10/25 14:00	106.4
5/10/25 15:00	213.9
5/10/25 16:00	252.5
5/10/25 17:00	250.3
5/10/25 18:00	249.8
5/10/25 19:00	249.9
5/10/25 20:00	249.8
5/10/25 21:00	207.2
5/10/25 22:00	149.8
5/10/25 23:00	142.9
5/11/25 0:00	106.5
5/11/25 1:00	106.1
5/11/25 2:00	106.3
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5/11/25 11:00	106.7
5/11/25 12:00	106.1
5/11/25 13:00	108.3
5/11/25 14:00	106.3

5/11/25 15:00	106.6
5/11/25 16:00	106.3
5/11/25 17:00	159.9
5/11/25 18:00	160.2
5/11/25 19:00	159.3
5/11/25 20:00	159.6
5/11/25 21:00	160.3
5/11/25 22:00	159.4
5/11/25 23:00	146.1
5/12/25 0:00	105.3
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5/12/25 2:00	105.4
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6/29/25 23:00	102.0
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6/30/25 3:00	103.2
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6/30/25 16:00	260.9
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7/1/25 17:00	456.0
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7/2/25 13:00	300.8

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7/8/25 11:00	105.7
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7/8/25 13:00	243.5
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7/8/25 17:00	449.1
7/8/25 18:00	424.2
7/8/25 19:00	437.7
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7/8/25 21:00	287.0
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7/8/25 23:00	102.4
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7/9/25 2:00	99.6
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7/9/25 10:00	101.4
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7/10/25 1:00	99.2
7/10/25 2:00	100.3
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7/10/25 5:00	105.3
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7/10/25 21:00	349.2
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7/10/25 23:00	228.3
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7/11/25 6:00	110.5
7/11/25 7:00	108.8
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7/11/25 12:00	163.8

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7/11/25 19:00	453.6
7/11/25 20:00	396.8
7/11/25 21:00	337.9
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7/11/25 23:00	122.5
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7/12/25 10:00	107.4
7/12/25 11:00	107.7
7/12/25 12:00	178.9
7/12/25 13:00	311.1
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7/12/25 19:00	375.6
7/12/25 20:00	349.9
7/12/25 21:00	349.5
7/12/25 22:00	349.6
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7/13/25 7:00	109.3

7/13/25 8:00	109.9
7/13/25 9:00	108.8
7/13/25 10:00	132.0
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7/15/25 9:00	105.8
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7/15/25 11:00	105.7
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7/15/25 13:00	172.7
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7/16/25 18:00	340.8
7/16/25 19:00	340.0
7/16/25 20:00	341.2
7/16/25 21:00	340.7

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7/16/25 23:00	202.5
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7/17/25 4:00	102.1
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7/17/25 15:00	464.5
7/17/25 16:00	464.2
7/17/25 17:00	463.0
7/17/25 18:00	460.9
7/17/25 19:00	458.4
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7/17/25 21:00	420.9
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7/17/25 23:00	310.3
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7/18/25 9:00	103.4
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7/18/25 15:00	459.6
7/18/25 16:00	437.6

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7/23/25 17:00	371.3
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7/23/25 19:00	370.4
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7/23/25 21:00	369.2
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7/24/25 1:00	109.2

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7/24/25 7:00	111.7
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7/24/25 18:00	466.8
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7/25/25 19:00	458.2
7/25/25 20:00	459.3

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7/29/25 17:00	457.9
7/29/25 18:00	457.3
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7/29/25 23:00	456.3
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7/31/25 23:00	399.5
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8/1/25 6:00	170.3
8/1/25 7:00	170.1
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8/2/25 4:00	170.1
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8/2/25 6:00	170.2
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8/2/25 18:00	459.1
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8/2/25 20:00	461.5
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8/14/25 12:00	468.7
8/14/25 13:00	468.0

8/14/25 14:00	466.7
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8/15/25 7:00	200.0
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8/15/25 9:00	200.5
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8/16/25 8:00	104.0

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8/16/25 12:00	300.9
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8/16/25 14:00	370.9
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8/16/25 19:00	471.3
8/16/25 20:00	471.4
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8/16/25 23:00	470.2
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8/19/25 21:00	472.2
8/19/25 22:00	472.1

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8/29/25 20:00	471.1
8/29/25 21:00	467.6
8/29/25 22:00	467.4
8/29/25 23:00	467.0
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9/10/25 9:00	106.3
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9/10/25 19:00	462.9
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10/3/25 17:00	464.7

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10/4/25 18:00	465.5
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11/22/25 21:00	460.0

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12/5/25 10:00	369.7

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12/6/25 4:00	104.2
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12/6/25 8:00	102.4
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12/6/25 18:00	465.0
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12/6/25 20:00	472.0
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12/6/25 22:00	349.5
12/6/25 23:00	350.0
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12/7/25 1:00	348.9
12/7/25 2:00	350.4
12/7/25 3:00	350.5
12/7/25 4:00	350.0
12/7/25 5:00	349.6

12/7/25 6:00	349.6
12/7/25 7:00	350.8
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12/7/25 14:00	469.4
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12/7/25 18:00	472.0
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12/8/25 6:00	165.4
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12/8/25 11:00	380.4
12/8/25 12:00	379.8
12/8/25 13:00	380.1
12/8/25 14:00	380.1
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12/8/25 16:00	380.0
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12/9/25 6:00	165.4
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12/9/25 9:00	380.5
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12/9/25 23:00	468.9
12/10/25 0:00	466.6
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12/12/25 14:00	200.4

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12/13/25 23:00	469.5
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12/16/25 4:00	120.1

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12/16/25 10:00	300.2
12/16/25 11:00	299.7
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12/30/25 12:00	240.8

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1/10/26 5:00	108.1
1/10/26 6:00	110.9

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1/10/26 17:00	242.2
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1/10/26 23:00	100.1
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1/11/26 3:00	100.3
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1/12/26 1:00	102.9

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1/16/26 3:00	106.0
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1/16/26 5:00	296.9
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1/17/26 22:00	200.4
1/17/26 23:00	125.7
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1/18/26 2:00	112.0
1/18/26 3:00	111.4
1/18/26 4:00	113.3
1/18/26 5:00	114.0
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1/18/26 9:00	201.2
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1/18/26 18:00	299.8
1/18/26 19:00	372.4
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1/19/26 21:00	390.1
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1/20/26 23:00	196.4
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1/21/26 3:00	108.3
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1/21/26 6:00	305.5
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1/21/26 10:00	379.4
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1/21/26 13:00	310.9
1/21/26 14:00	300.4
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1/21/26 16:00	299.8
1/21/26 17:00	330.5
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1/21/26 21:00	463.6
1/21/26 22:00	469.7
1/21/26 23:00	444.6
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1/22/26 4:00	180.8
1/22/26 5:00	214.4
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1/22/26 9:00	473.8
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1/22/26 14:00	400.1
1/22/26 15:00	399.0
1/22/26 16:00	400.7
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1/22/26 18:00	471.1
1/22/26 19:00	470.4

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1/22/26 21:00	457.9
1/22/26 22:00	257.1
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1/23/26 0:00	159.6
1/23/26 1:00	160.4
1/23/26 2:00	159.4
1/23/26 3:00	160.3
1/23/26 4:00	160.7
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1/23/26 8:00	179.6
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1/23/26 14:00	468.7
1/23/26 15:00	469.8
1/23/26 16:00	466.4
1/23/26 17:00	469.2
1/23/26 18:00	470.1
1/23/26 19:00	466.5
1/23/26 20:00	468.1
1/23/26 21:00	469.0
1/23/26 22:00	471.1
1/23/26 23:00	466.9
1/24/26 0:00	466.8
1/24/26 1:00	467.3
1/24/26 2:00	466.0
1/24/26 3:00	470.4
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1/24/26 5:00	409.1
1/24/26 6:00	420.1
1/24/26 7:00	472.5
1/24/26 8:00	471.5
1/24/26 9:00	474.3
1/24/26 10:00	471.6
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1/24/26 12:00	470.7
1/24/26 13:00	469.4
1/24/26 14:00	469.4

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1/24/26 18:00	471.7
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1/24/26 22:00	470.9
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1/25/26 7:00	199.9
1/25/26 8:00	200.1
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1/25/26 12:00	375.4
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1/25/26 15:00	466.6
1/25/26 16:00	464.1
1/25/26 17:00	460.8
1/25/26 18:00	464.2
1/25/26 19:00	463.6
1/25/26 20:00	466.0
1/25/26 21:00	466.6
1/25/26 22:00	461.8
1/25/26 23:00	461.1
1/26/26 0:00	460.9
1/26/26 1:00	460.8
1/26/26 2:00	461.7
1/26/26 3:00	462.4
1/26/26 4:00	463.1
1/26/26 5:00	465.4
1/26/26 6:00	467.9
1/26/26 7:00	464.3
1/26/26 8:00	463.2
1/26/26 9:00	464.3

1/26/26 10:00	465.4
1/26/26 11:00	467.2
1/26/26 12:00	469.6
1/26/26 13:00	472.0
1/26/26 14:00	472.7
1/26/26 15:00	467.3
1/26/26 16:00	470.7
1/26/26 17:00	472.4
1/26/26 18:00	472.6
1/26/26 19:00	471.8
1/26/26 20:00	473.1
1/26/26 21:00	470.5
1/26/26 22:00	471.8
1/26/26 23:00	473.1
1/27/26 0:00	468.2
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1/27/26 6:00	477.4
1/27/26 7:00	474.0
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1/27/26 13:00	458.7
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1/27/26 19:00	469.7
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1/27/26 21:00	471.2
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1/28/26 0:00	469.9
1/28/26 1:00	471.6
1/28/26 2:00	456.4
1/28/26 3:00	409.3
1/28/26 4:00	467.8

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1/28/26 6:00	469.7
1/28/26 7:00	469.6
1/28/26 8:00	470.0
1/28/26 9:00	472.9
1/28/26 10:00	470.6
1/28/26 11:00	468.6
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1/28/26 23:00	469.9
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1/29/26 1:00	470.9
1/29/26 2:00	470.7
1/29/26 3:00	472.4
1/29/26 4:00	470.4
1/29/26 5:00	470.5
1/29/26 6:00	472.3
1/29/26 7:00	470.0
1/29/26 8:00	471.2
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1/29/26 10:00	398.9
1/29/26 11:00	405.2
1/29/26 12:00	297.3
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1/29/26 14:00	188.9
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1/29/26 20:00	472.4
1/29/26 21:00	470.9
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1/29/26 23:00	469.7

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1/30/26 20:00	464.8
1/30/26 21:00	475.3
1/30/26 22:00	471.8
1/30/26 23:00	458.0
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1/31/26 4:00	214.6
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1/31/26 13:00	471.2
1/31/26 14:00	470.5
1/31/26 15:00	469.8
1/31/26 16:00	471.0
1/31/26 17:00	470.8
1/31/26 18:00	470.4

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1/31/26 22:00	472.6
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2/1/26 1:00	471.2
2/1/26 2:00	472.3
2/1/26 3:00	472.4
2/1/26 4:00	473.1
2/1/26 5:00	473.6
2/1/26 6:00	471.7
2/1/26 7:00	472.9
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2/1/26 9:00	471.6
2/1/26 10:00	470.1
2/1/26 11:00	471.5
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2/1/26 19:00	473.8
2/1/26 20:00	475.0
2/1/26 21:00	471.0
2/1/26 22:00	473.4
2/1/26 23:00	473.7
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2/2/26 1:00	472.8
2/2/26 2:00	473.7
2/2/26 3:00	473.7
2/2/26 4:00	472.3
2/2/26 5:00	474.9
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2/2/26 7:00	473.6
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2/2/26 9:00	474.9
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2/2/26 12:00	475.1
2/2/26 13:00	432.4

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2/2/26 22:00	474.1
2/2/26 23:00	471.4
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2/3/26 1:00	471.1
2/3/26 2:00	472.0
2/3/26 3:00	471.9
2/3/26 4:00	473.3
2/3/26 5:00	472.3
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3/24/26 4:00	104.6
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3/25/26 21:00	467.9
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3/25/26 23:00	360.1
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4/1/26 4:00	112.2
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4/1/26 22:00	341.1
4/1/26 23:00	224.4
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4/2/26 9:00	110.2
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4/2/26 16:00	119.2

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4/3/26 4:00	109.2
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4/3/26 6:00	105.0
4/3/26 7:00	103.9
4/3/26 8:00	104.6
4/3/26 9:00	107.1
4/3/26 10:00	102.8
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4/4/26 6:00	107.7
4/4/26 7:00	107.9
4/4/26 8:00	106.0
4/4/26 9:00	106.3
4/4/26 10:00	104.8
4/4/26 11:00	107.7

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4/5/26 7:00	252.6
4/5/26 8:00	249.1
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4/5/26 19:00	468.5
4/5/26 20:00	469.0
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4/5/26 23:00	369.8
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4/6/26 2:00	184.1
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4/6/26 6:00	145.7

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4/6/26 12:00	188.4
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4/16/26 4:00	106.1
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4/16/26 20:00	458.8
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4/17/26 2:00	104.3
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6/17/26 17:00	463.4
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6/19/26 5:00	110.4
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6/19/26 7:00	110.8
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6/22/26 6:00	104.6
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6/22/26 9:00	109.1
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6/22/26 19:00	462.8
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6/22/26 21:00	463.8
6/22/26 22:00	463.7
6/22/26 23:00	463.4
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6/23/26 21:00	466.4
6/23/26 22:00	468.5
6/23/26 23:00	466.2

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 66

DOE, AIR QUALITY AND ENVIRONMENTAL JUSTICE MEMORANDUM (2021)

Department of Energy
Washington, DC 20585

October 1, 2021

Enclosed is the final special environmental analysis (DOE/SEA-05) prepared by ICF, Incorporated (ICF) under direction of the Department of Energy (DOE) pursuant to the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4331 et seq., and DOE's implementing regulations, 10 CFR 1021.343(a).

On February 14, 2021, DOE issued an emergency order pursuant to section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the DOE Organization Act, 42 U.S.C. § 7151(b), DOE Order No. 2020-21-1, to the Electric Reliability Council of Texas (ERCOT) authorizing specific electric generating units located within the ERCOT area to operate at their maximum generation output levels under limited circumstances due to extreme weather conditions and to preserve the reliability of bulk electric power system (Order).

DOE issued the Order after determining that the emergency situation underlying ERCOT's request demanded immediate action consistent with DOE's NEPA regulations (10 CFR 1021.343(a)). As described in DOE's notice of emergency action (86 FR 18046; April 7, 2021), DOE reviewed the final data report received from ERCOT on March 31, 2021, and determined that a special environmental analysis would be the appropriate level of NEPA review. DOE has prepared special environmental analyses in other emergency situations that required immediate action. (See https://www.energy.gov/nepa/special-environmental-analyses). This special environmental analysis examines potential impacts resulting from issuance of the Order on air quality and environmental justice. DOE has independently reviewed the analysis provided by ICF and agrees with its conclusions. No further analysis will be conducted.

U.S. Department of Energy, Office of Electricity

Air Quality and Environmental Justice Analysis Memorandum, July 21, 2021

Introduction

During 5 days in February 2021 (February 15–19), the Electric Reliability Council of Texas (ERCOT) requested the Department of Energy (DOE) to authorize the emergency use of power generation under Section 202(c) of the Federal Power Act. This resulted in air emissions at times exceeding their permitted emissions levels for 28 power units located in East Texas, with most power units (20) located in Harris County. At the request of the DOE Office of Electricity (OE), ICF has examined whether these additional emissions from these power units covered by the Section 202(c) authorization may have led to an exceedance of the National Ambient Air Quality Standards (NAAQS). Further, ICF conducted an environmental justice analysis of the communities potentially affected by any additional emissions during this 5-day period.

We determined at the outset that for one power unit, ERCOT was unable to obtain any information on its air emissions. Therefore, our analyses included 27 units. Although the ERCOT Section 202(c) permit covered 27 power units, only 14 of the 27 power units were at unique locations.

1 Air Quality Analysis Approach

To assess whether emissions from the power units could potentially contribute to a NAAQS violation, ICF gathered the air quality monitoring data for stations in East Texas. The Texas Commission on Environmental Quality (TCEQ) maintains an extensive network of air monitoring stations throughout the state.[1] This hourly air monitoring and meteorological data, resultant wind speed and direction, outdoor temperature, standard deviation in wind direction, and solar radiation were downloaded from TCEQ. In addition, ERCOT provided the locations for each power generating unit. Using this collected data, ICF determined if any exceedances occurred during the emergency period (February 15–19, 2021) for air pollutants having short-term ambient air quality standards. This included 1- and 8-hour CO, 1-hour NO_2, 1-hour SO_2, and 24-hour PM^2 standards. No assessment was made for mercury or CO_2 emissions.

ERCOT provided DOE with hourly air emission rates for each unit above its permitted levels, along with the location of each power unit. This information was used to pair air quality monitoring stations with power units. We examined pairings using proximate radial distances of 10 km and 15 km. To determine if an air monitoring station was downwind of the power unit, we used each hour's wind direction to determine if the air monitoring station aligned in a downwind direction within a ±20-degree window.

To further strengthen conclusions, we compared the 5-day average temperature with historical average February temperatures using climatological data from Houston International Airport as an overall representative site. Lower than average temperatures are favorable for increased

[1] https://www.tceq.texas.gov/cgi-bin/compliance/monops/select_month.pl

[2] Although PM_{10} is the reported emission rate, we used the $PM_{2.5}$ standard, as nearly all (>97 percent by mass) of the power plant emissions have a mean mass diameter of less than 2.5 microns.

buoyancy from the exhaust stack, which means the plume will rise higher, favoring lower ground-level air concentrations. A similar analysis was performed for wind speeds but using the Houston Aldine site (EPA AIRS ID 48_201_0024). Here, higher wind speeds led to increased ventilation, which decreases residence time of air pollutants, leading to lower air pollutant concentrations.

Lastly, we discuss the concept of mixing height. The *mixing height* (or depth) is defined as the height above the Earth's surface through which vertical mixing occurs. The concept of a mixing layer is well-founded on theoretical principles. The mixing height acts as a lid on air pollutants, tending to prevent further vertical mixing of emissions higher into the atmosphere. Thus, we calculated the mixing heights during the 5-day emergency period and compared them to the average February mixing heights based on the Holzworth method (U.S. Environmental Protection Agency, 1972). Mixing heights can be determined from twice daily upper-air soundings performed at 6 a.m. and 6 p.m. The nearest upper-air station to Harris County is Lake Charles, Louisiana.

Review of ERCOT Emission Rates Against Total Emissions Rates During the Emergency Use Period

We reviewed the hourly emission rate data provided by ERCOT for each power unit. The dataset is intended to report the incremental emissions for each hour that exceeded the power units' maximum permitted emission rates. To compare these incremental emissions against the total emissions from each power unit, we downloaded the Continuous Emission Monitoring System (CEMS) from EPA's Air Markets Program Data (ampd.epa.gov/ampd). CEMS data reports the total emissions for each power unit on an hour-by-hour basis either as directly measured or as calculated from other measured parameters. The ERCOT data reported hourly emissions for SO_2, NO_X, CO, PM_{10}, and CO_2; however, CEMS does not report emissions for CO and PM_{10}, so the only pollutants that can be cross-referenced between the two datasets are SO_2, NO_X, and CO_2. However, SO_2 and CO_2 are rarely reported in the ERCOT-supplied data, likely because SO_2 emission rates are well below permitted levels even during the emergency period, and CO_2 emission rates are likely not specified in operating permit levels.

Because the ERCOT emission rates are in, we expected that in most cases the ERCOT incremental increase would only be a small fraction of the total CEMS rates and that the ERCOT rates could never be greater than CEMS rates because CEMS emissions are the total emissions from the power units. To see if our understanding is consistent with the reported data, we made a graphical presentation between the NO_X incremental emission rate versus the CEMS emissions rate for each hour in which ERCOT reported an emission rate over the 5-day emergency period.

1.1 Findings – Potential for NAAQS Exceedances

We discuss a series of analyses undertaken using available air quality and meteorological data to present a weight-of-evidence approach in trying to answer the principal question—*Could the power units' excess air emissions during this emergency period have caused an exceedance of the NAAQS?*

No one analysis can definitively answer this question, so we performed a series of analyses to provide a more defensible and robust conclusion and instill greater confidence in the answer.

1.1.1 Air Quality Monitoring Stations

A review of air quality monitoring stations in all air quality modeling regions in East Texas showed no violations of the NAAQS during the emergency period. However, many of the air quality monitoring stations failed to operate during the emergency period, presumably because of power outages. Tables 1a and 1b below show the daily percentage of missing air quality data during the emergency period for power units and air quality stations that we could pair using a 10-m radius. Only 14 of the 27 power units had unique locations, and of the 14 locations, only 10 had an air quality station within 10 km. The pollutant most widely monitored, as well as the pollutant most widely reported as having emissions exceeding permit levels, is NO_X. Of the 14 locations, seven had NO_2 monitors.[3] However, as highlighted in light blue and indicated with an asterisk (*), about half have missing data (likely as a result of power outages), particularly on the first 3 days of the emergency period. Other air pollutants have less air monitoring coverage but also show considerable missing data, particularly during the first 3 days of the emergency period.

The power unit codes shown in the rest of this report are defined in Appendix 1.

[3] Although the emitted pollutant is NO_X, the air quality standard is for NO_2. Typically, about 10 percent of the in-stack NO_X is in the form of NO_2, and the rest is emitted as NO. However, NO is converted to NO_2 in the atmosphere with a reaction rate on the order of minutes to hours, depending on available ozone and atmospheric mixing.

Table 1a. Ambient Air Quality Monitoring Stations (CO and NO_2) Within 10 km of the Power Generation Units

Power Unit Name	Pollutants of Interest Monitored				Data Coverage by Day CO					Data Coverage by Day NO_2				
	CO	NO_2	$PM_{2.5}$	SO_2	2/15	2/16	2/17	2/18	2/19	2/15	2/16	2/17	2/18	2/19
BOSQUE_CC1														
DDPEC_CC1	X	X	X	X	100%	21%*	0%*	50%	100%	100%	21%*	75%	100%	100%
FREC_CC2				X										
TXCTY_CC1				X										
CHAMON_CTG_0101		X								75%	0%*	17%*	100%	100%
CALHOUN_UNIT1														
THW_THWGT32		X								100%	92%	38%*	100%	100%
WAP4_WAP4														
GBY_GBYGT74		X	X							100%	96%	50%	100%	100%
PHR_CLCWA_5UNITS		X								8%*	88%	42%*	100%	96%
LH_LYN_30UNITS		X								75%	0%*	17%*	100%	100%
DSN_NEWP_10UNITS														
SOE_SEWP_10UNITS	X	X	X	X	100%	21%*	0%*	50%	100%	100%	21%*	75%	100%	100%
FEGC_UNIT1				X										

See Appendix 1 for definition of the unit codes.

Table 1b. Ambient Air Quality Monitoring Stations (PM25, SO_2) Within 10 km of the Power Generation Units

Power Unit Name	Pollutants of Interest Monitored				Data Coverage by Day $PM_{2.5}$					Data Coverage by Day SO_2				
	CO	NO_2	$PM_{2.5}$	SO_2	2/15	2/16	2/17	2/18	2/19	2/15	2/16	2/17	2/18	2/19
BOSQUE_CC1														
DDPEC_CC1	X	X	X	X	100%	17%*	71%	100%	83%	100%	21%*	67%	100%	100%
FREC_CC2				X						0%*	0%*	0%*	46%*	100%
TXCTY_CC1				X						100%	100%	100%	100%	100%
CHAMON_CTG_0101		X												
CALHOUN_UNIT1														
THW_THWGT32		X												
WAP4_WAP4														
GBY_GBYGT74		X	X		100%	92%	33%*	0%*	50%					
PHR_CLCWA_5UNITS		X												
LH_LYN_30UNITS		X												
DSN_NEWP_10UNITS														
SOE_SEWP_10UNITS	X	X	X	X	100%	17%*	71%	100%	83%	100%	21%*	67%	100%	100%
FEGC_UNIT1				X						0%	0%	0%	0%	25%

Increasing the search radius from 10 km to 15 km picked up two additional air quality monitoring stations; however, the influence from the power station at that distance is substantially diminished, particularly in urban environments, where other sources of emissions will affect the monitor.

Tables 2a and 2b show the three highest monitored concentrations for NO_2, $PM_{2.5}$, and SO_2 over the 5-day period.[4] The only pollutant within 50 percent of the air quality standard was $PM_{2.5}$, although the $PM_{2.5}$ standard is an average over 24 hours, whereas those for NO_2 and SO_2 are 1-hour standards. No exceedances of any air quality standard occurred at these stations, nor at any air quality monitoring stations in the region of study. The highest concentration, to any air quality standard, was for the 24-hour $PM_{2.5}$ standard at 56 percent.

The highest elevated $PM_{2.5}$ concentrations all occurred during the late evening hours (8 p.m.–11 p.m.) on February 19, 2021. Many sources contribute to $PM_{2.5}$ pollution, including buses, trucks, cars, and off-road sources (e.g., construction equipment, portable generators). In addition, meteorology and atmospheric chemistry play a significant role in determining the air concentration. However, it is not possible from this analysis to estimate the source contribution from the power units without additional air quality modeling analysis.

Table 2a. Top 3 Highest Air Concentrations Monitored Within 10 km of the Power Generation Units

Power Unit	NO_2 (ppb)			$PM_{2.5}$ (µg/m^3)			SO_2 (ppb)		
Unit Code	**First**	**Second**	**Third**	**First**	**Second**	**Third**	**First**	**Second**	**Third**
DDPEC_CC1	37	33	29	17	12	11	1	1	1
FREC_CC2							0	0	0
TXCTY_CC1							3	2	2
CHAMON_CTG_0101	31	30	29						
THW_THWGT32	37	37	36						
GBY_GBYGT74	40	36	35	20	14	14			
PHR_CLCWA_5UNITS	27	18	17						
LH_LYN_30UNITS	31	30	29						
SOE_SEWP_10UNITS	37	33	29	17	12	11	1	1	1
FEGC_UNIT1							0	0	0

Note: For NO_2 and SO_2 these are 1-hour averages; $PM_{2.5}$ is a daily average.

Table 2b. Top 3 Highest Air Concentrations (as Percentage of Air Quality Standard[a]) Monitored Within 10 km of the Power Generation Units

Power Unit	NO_2			$PM_{2.5}$			SO_2		
Unit Code	**First**	**Second**	**Third**	**First**	**Second**	**Third**	**First**	**Second**	**Third**
	37%	33%	29%	48%	34%	30%	1%	1%	1%
FREC_CC2							0%	0%	0%
TXCTY_CC1							3%	3%	3%
CHAMON_CTG_0101	31%	30%	29%						
THW_THWGT32	37%	37%	36%						
GBY_GBYGT74	40%	36%	35%	56%	40%	39%			
PHR_CLCWA_5UNITS	27%	18%	17%						

[4] CO is not shown because the values were <1 percent of the NAAQS.

Power Unit	NO_2			$PM_{2.5}$			SO_2		
Unit Code	**First**	**Second**	**Third**	**First**	**Second**	**Third**	**First**	**Second**	**Third**
LH_LYN_30UNITS	31%	30%	29%						
SOE_SEWP_10UNITS	37%	33%	29%	48%	34%	30%	1%	1%	1%
FEGC_UNIT1							0%	0%	0%

[a] The 1-hour NO_2 standard is 100 ppb, 1-hour SO_2 standard is 75 ppb, and 24-hour $PM_{2.5}$ standard is 35 µg/m3.

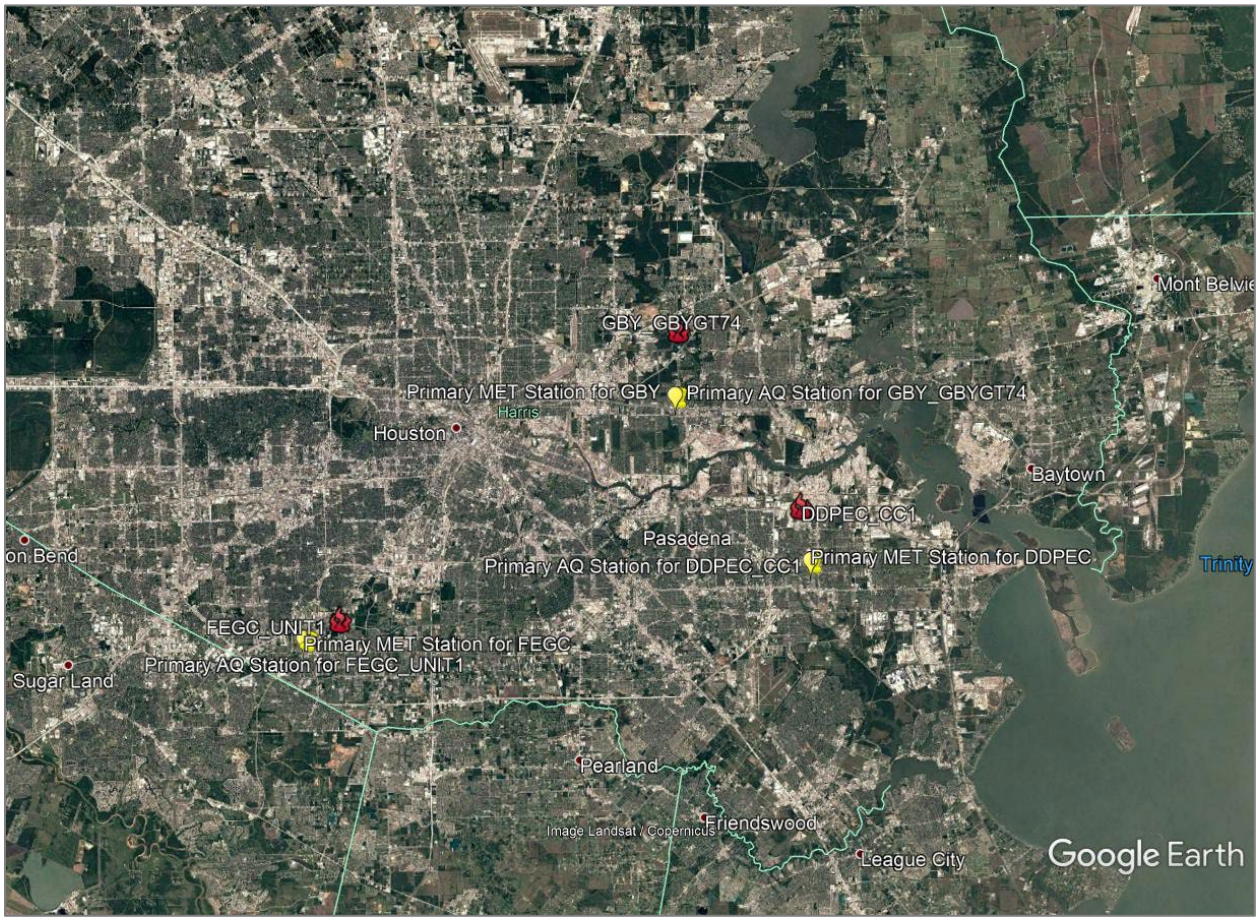
1.1.2 Downwind Air Quality Monitoring Sites

Besides being in close proximity to the power unit, an air quality monitoring station must also be oriented in the downwind direction of the power unit. Table 3 shows the percentage of time that the air quality monitoring station was downwind of the power unit. As shown, only one air quality monitoring site was downwind more than 50 percent of the hours. All other pairs of air quality monitoring stations and power units only had the correct alignment window 25 percent or less of the time. The air quality monitoring unit paired with the Deer Park Energy Center (DDPEC_CC1) power unit was downwind more than half the hours. This was the best pairing of any power unit and air quality station and shows good supporting evidence that the power units' excess emissions were unlikely to have caused an exceedance of the NAAQS (except on February 16, 2021, when the monitoring stations only had valid measurements for 20 percent of the hours that day). All other meteorological/air quality station pairs had too few hours to draw a conclusion. Figure 1 shows the locations of three of the power units relative to the air monitoring stations in Harris County.

Table 3. Power Unit Pairings With Nearby Meteorological Stations and Percentage of Time Downwind

Power Unit Code	Distance to MET Station (km)	AQ Station Direction – Lower Bound	AQ Station Direction – Upper Bound	% of MET Station Data Within +/-20 Degree Range of AQ Station Location
DDPEC	4.9	320°	360°	58%
FREC	10.3	320°	360°	25%
TXCTY	1.4	220°	260°	3%
CHAMON	8.6	0°	40°	6%
THW	17.5	220°	260°	<1%
GBY	5.6	345°	25°	25%
PHR	11.1	135°	175°	<1%
LH	1.2	100°	140°	10%
SOE	5.0	185°	225°	1%
FEGC	3.5	25°	65°	3%

Figure 1. Location of Three Power Units Operating in Harris County and the Paired Air Monitoring Station



1.1.3 Meteorological Conditions Conducive to High Concentrations

Wind Speed

As discussed, lower wind speeds result in poorer dispersive conditions that lead to higher air concentration levels. Average wind speeds for February, based on the 23-year average (1998–2020) from the Houston Aldine site (EPA Airs ID# 48-201-0024), is 6.2 mph. During the 5-day emergency-use period, the winds were slightly higher (14 percent) than the average wind speed of 7.0 mph. Thus, the slightly higher wind speeds are favorable to having lower air concentrations.

Temperature

As discussed, lower temperatures will lead to increased buoyancy, resulting in lower air concentrations. The climatological average air temperature for February at the Houston International Airport is 57.7°F. During the 5-day event, the average air temperature was 28.4°F, almost 30°F below average. These substantially colder temperatures are favorable to having lower ground-level air concentrations, assuming the plume rise from the power units is sufficiently high that these concentrations are not trapped in a shallow stable layer (i.e., temperature inversion) near the surface.

Mixing Heights

We determined mixing height by using the same method as the historical data from Lake Charles (the closest upper air station to Harris County). The February morning mean mixing height during the 5-day emergency event was 530 m, and the afternoon mixing height was 607 m. This compares with a climatological morning mixing height of 319 m in February and a climatological afternoon mixing height of 822 m. The higher mixing height observed during the event reduced the tendency for the trapping of air pollutants in a shallow layer near the Earth's surface, so air concentrations should be lower due to higher mixing height. The lower mixing heights observed during the event in the afternoon relative to the climatological average is the reverse of the morning, but the mean depth of the mixed layer is still higher than the morning period, so in general, concentrations are lower in the afternoon than the morning if emissions are the same.

1.1.4 Emission Rates: ERCOT versus CEMS

To better understand the emissions data, we graphically displayed the ratio of the ERCOT emission rates for NO_X to the CEMS NO_X emission rates for every hour using three representative emission profiles observed during our review of the ERCOT dataset. We report results for three representative types of findings. These are:

1. Peaking Plant, where the ERCOT is thought to be a large fraction of the CEMS data
2. Large amount of volatility in the ERCOT dataset
3. Does not make sense (ERCOT emission rate >> CEMS emission rate)

In no case should the ERCOT to CEMS ratio be greater than 1.

The three representative stations are:

1. Port Comfort Peaking Unit 2
2. Chamon Power Unit 1
3. Bosque CCP-GT-1

Figure 2 shows the ratio of the ERCOT NO_X emission rate to the CEMS NO_X emission rate for Port Comfort Peaking unit, with most hours reporting a ratio between 60 to 80 percent of the CEMS emission rate and with the unit off during most of February 18, 2021. A few anomalous hours occur where the ERCOT-to-CEMS ratio exceeds 1. Overall, this pattern appears to be a reasonable behavior.

Figure 2. Port Comfort Peaking Unit Hourly ERCOT/CEMS Emission Ratio During Emergency Period

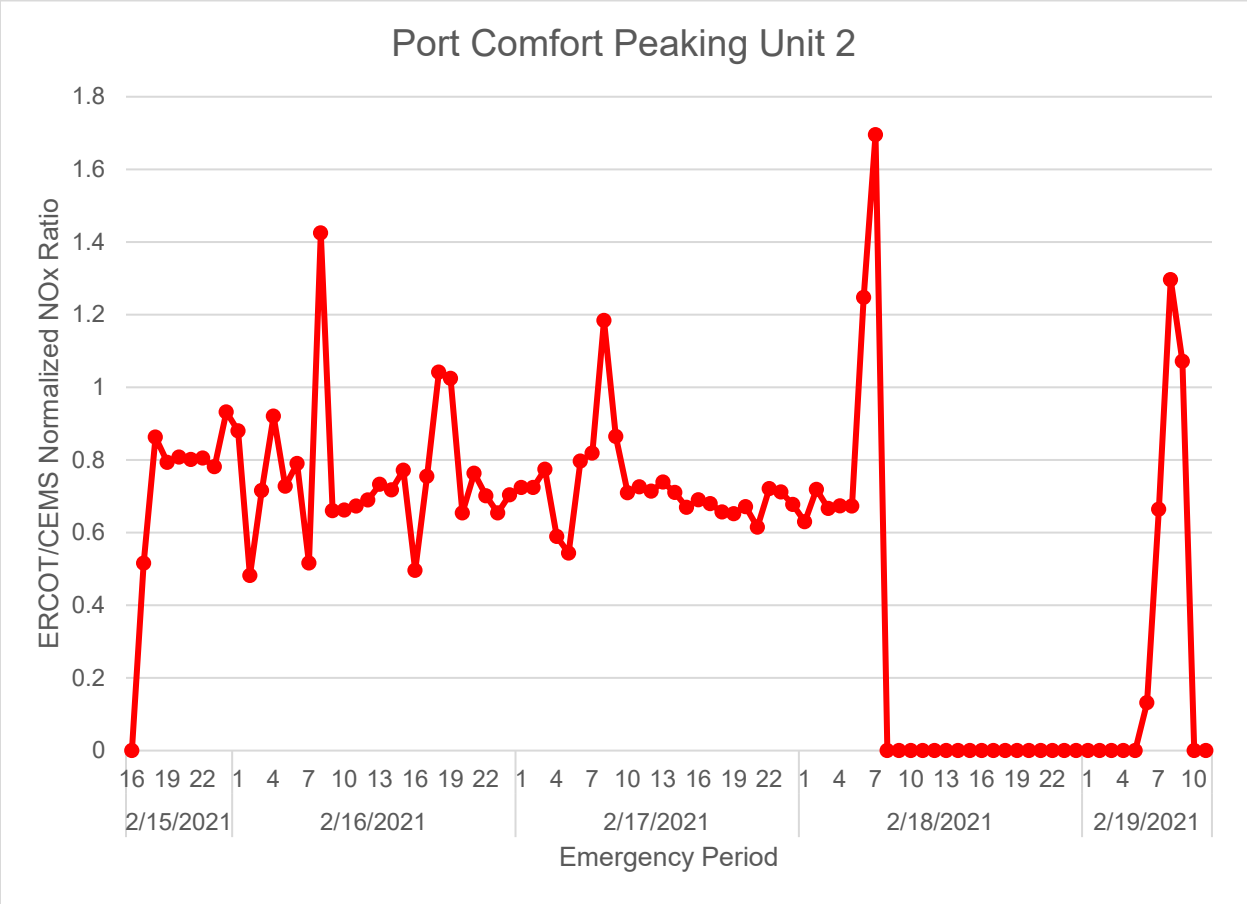


Figure 3 shows the ratio of the ERCOT NO_X emission rate to the CEMS NO_X emission rate for the Port Chamon unit, with most hours having a value of less than 100 percent. There are a few hours with a ratio excursion that well exceeds a ratio of 1. Overall, this pattern can likely be explained if further information can be obtained from the plant about the few hourly ratio excursions that were much greater than 1.

Figure 3. Chamon Unit 1 Hourly ERCOT/CEMS Emission Ratio During Emergency Period

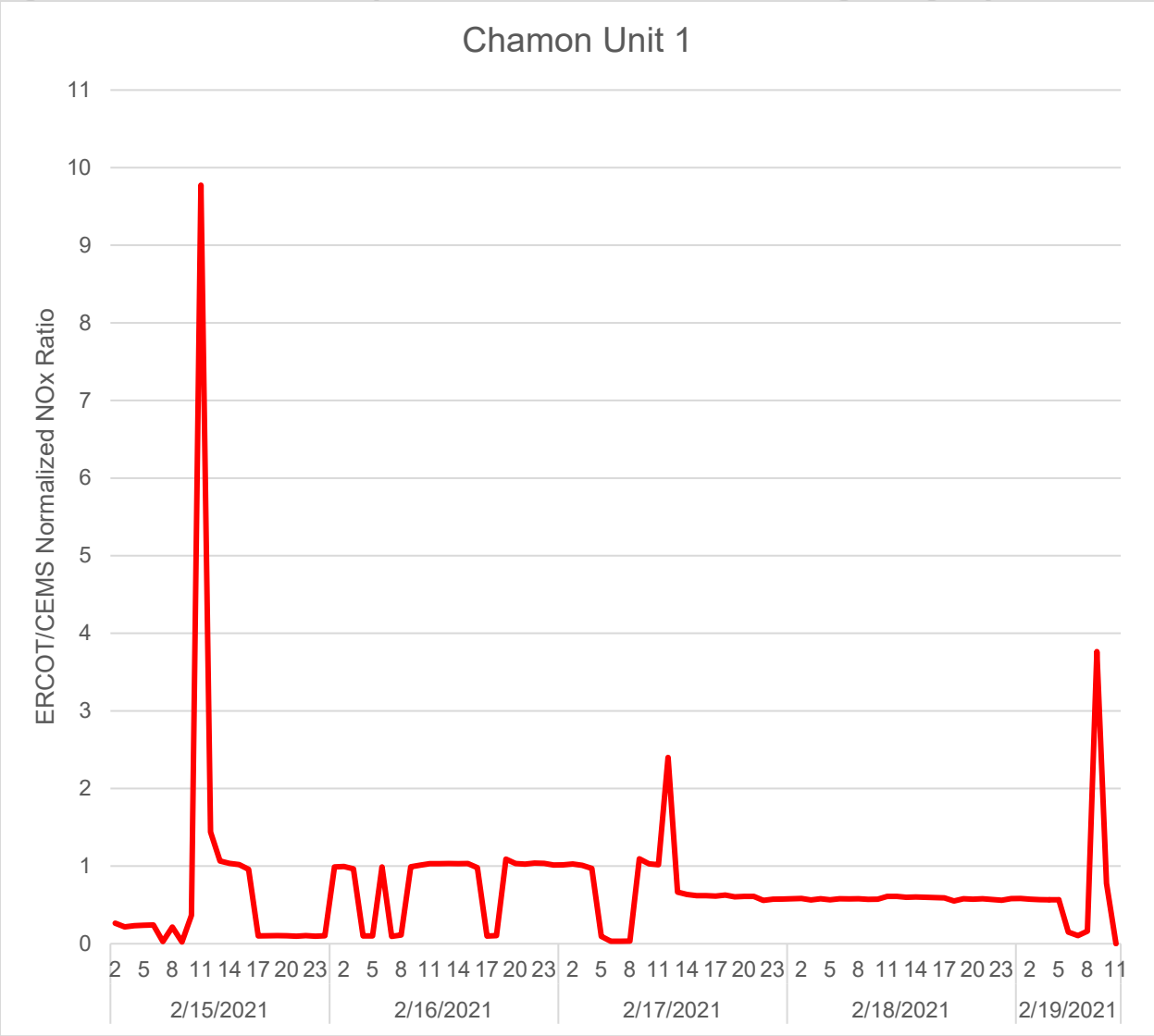
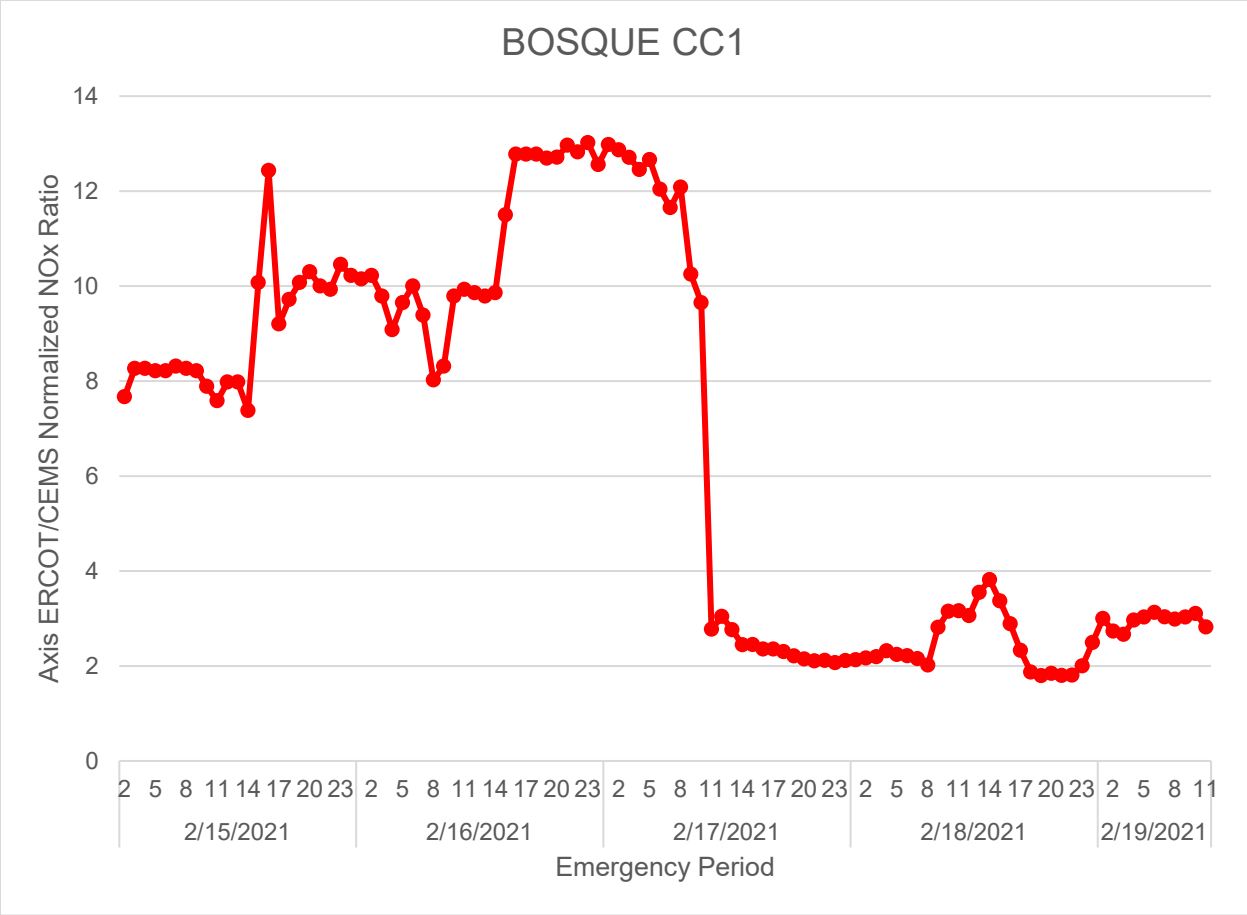


Figure 4 shows the ratio of the ERCOT NO_X emission rate to the CEMS NO_X emission rate for the BOSQUE unit, with all hours having a ratio in excess of 1, or less than 100 percent, but a few hours having a ratio excursion that well exceeds a ratio of 1. In fact, no ratio is less than 2, with a maximum of 13. Overall, these high values in comparison to the CEMS data are irregular. We suspect that incorrect values may have been reported by BOSQUE, as well as other units that exhibited similar behavior. However, further discussion with the plant is needed to clarify this finding.

Figure 4. BOSQUE Unit 1 Hourly ERCOT/CEMS Emission Ratio During Emergency Period



1.2 Conclusions – Air Quality Analysis

We reviewed ambient air quality monitoring data, meteorological data, and emission information for the power units that operated in exceedance of their permitted levels during the emergency use of power generation authorization under Section 202(c). We paired air quality monitoring stations with power units that were near each other. We found parings for 10 of the 14 unique power generation units, most often for NO_2. We found no exceedances of the NAAQS standards; however, many of the air quality stations were missing air quality measurements on February 16 and 17, 2021. The highest concentration, to any air quality standard, was for the 24-hour $PM_{2.5}$ standard at 56 percent of the exceedance threshold value. Further review of the air quality monitoring station and power unit data showed just one air quality monitoring station downwind of the power unit for the majority of hours during the emergency use period. A review and discussion of the meteorological conditions (e.g., wind speeds, temperature, mixing heights)

during the emergency period showed that the meteorology was conducive to better mixing and dispersion than average conditions in February. Reported incremental emissions did not compare favorably with the CEMS data available for NO_X.

Although no exceedances for the NAAQS occurred during the emergency use period, the large percentage of missing data, particularly on February 16 and 17, 2021, make it difficult to conclusively conclude that no violation of the NAAQS may have occurred. Furthermore, the limited number of downwind air quality monitors in close proximity to the power units makes it difficult to definitively conclude there were no air quality exceedances. However, based on the weight-of-evidence approach presented herein, it appears unlikely that the power units may have caused an exceedance of the NAAQS.

2 Environmental Justice Implications for the Affected Population

This section highlights the potential environmental justice (EJ) implications of the affected population in the region of interest. Our evaluation was based on data from U.S. Environmental Protection Agency's (EPA) EJSCREEN tool, available at ejscreen.epa.gov/mapper. EJSCREEN is a tool EPA has developed over the years to allow users to evaluate potential EJ impacts in different parts of the country using a GIS-based mapping platform. The tool allows users to combine demographic and environmental information on a user-selected area. The data used for these purposes in EJSCREEN are based on publicly available data sources, such as the American Community Survey from the Census Bureau for demographic data and various EPA data sources for environmental indicators. We used this screening tool for this analysis because it provides a method consistent with EPA's approach for defining EJ vulnerabilities for affected populations.

2.1 Analyzing Demographic Characteristics of Nearby Population

In order to identify the vulnerable population around these 14 unique power plants and 27 units that are likely to be impacted by any potential exceedances during the 5-day period, we extracted the demographic and environmental characteristics of those living with a pre-specified 5- and 10-km radius around each power plant. Note that we conducted this analysis at the plant level (as opposed to the unit level) because the unique location coordinates were available only at the plant level.

Figure 5 below overlays the 5-km circles around the individual power plants. Most of the plants are located around the Houston area, with a few farther away. Populations living around plants in the Houston area are likely to be more susceptible to potential EJ concerns. There is an overlap between the Lynchburg (LH) and Deer Park Energy Center (DDPEC) plant radii, as well as between the DDPEC and Southeast WPP (SOE) plant radii. Individuals in the intersections may experience EJ effects from both plants, and therefore may be more affected.

Figure 5. 5-km Radius Around Plants

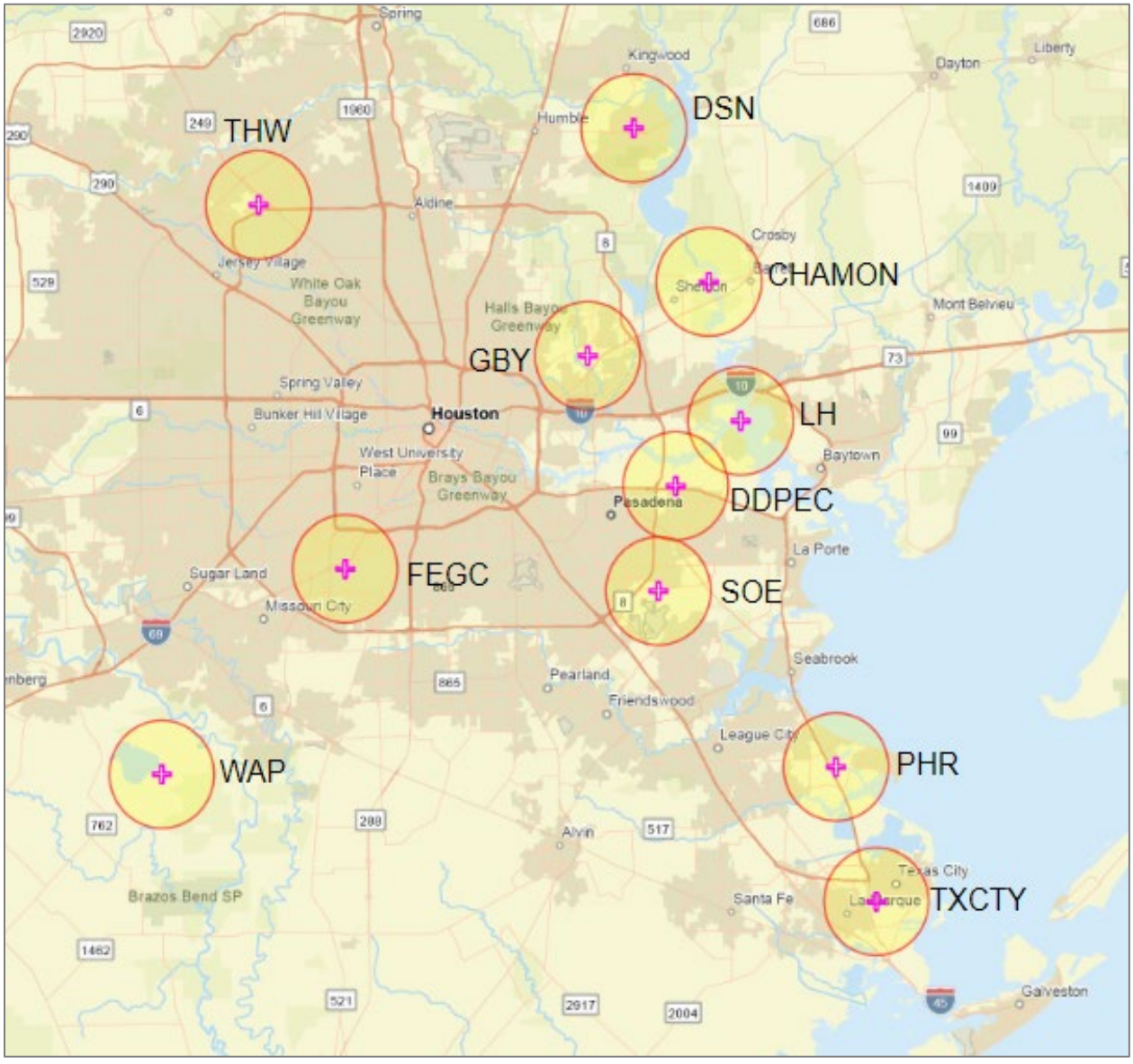
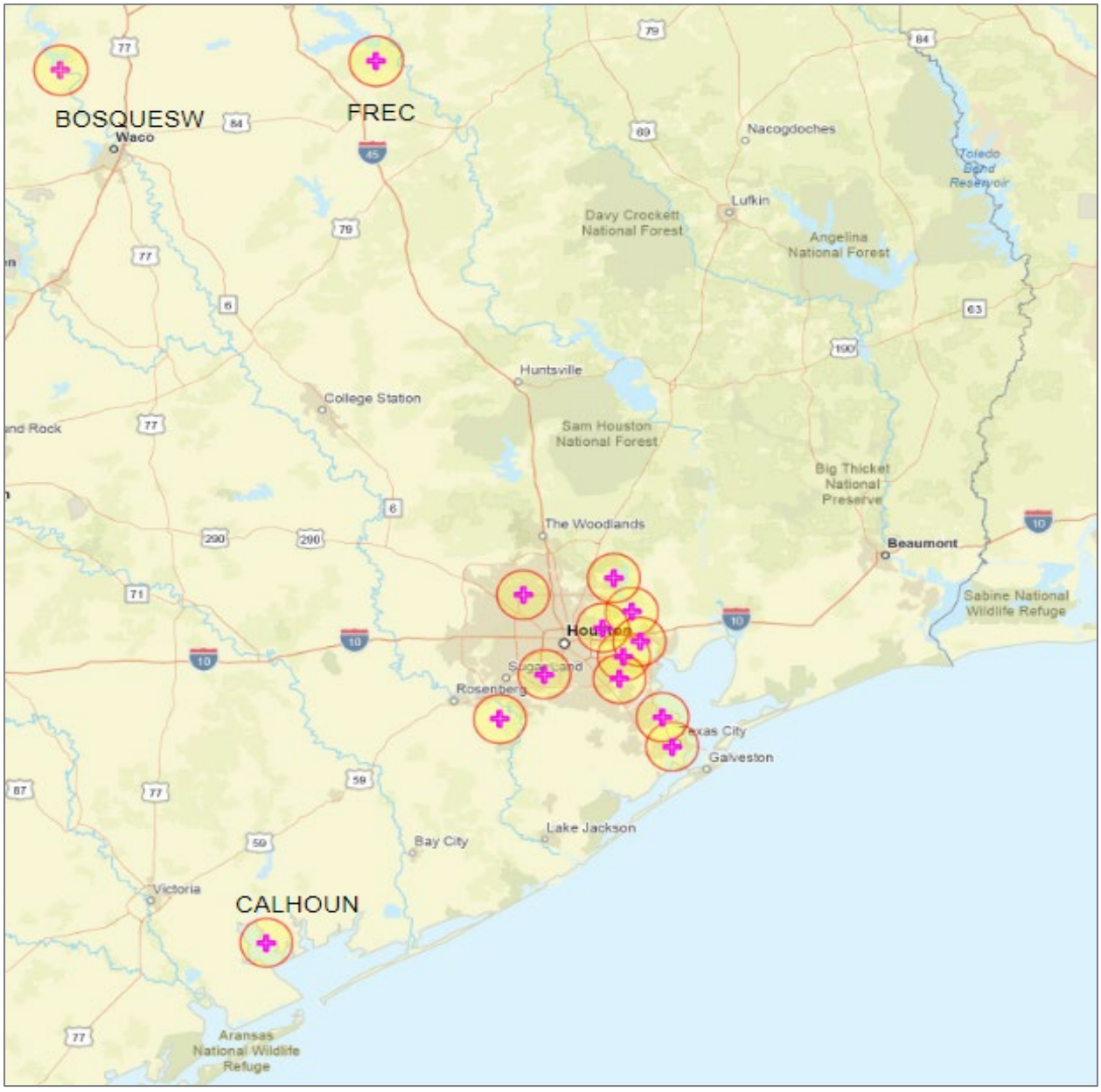


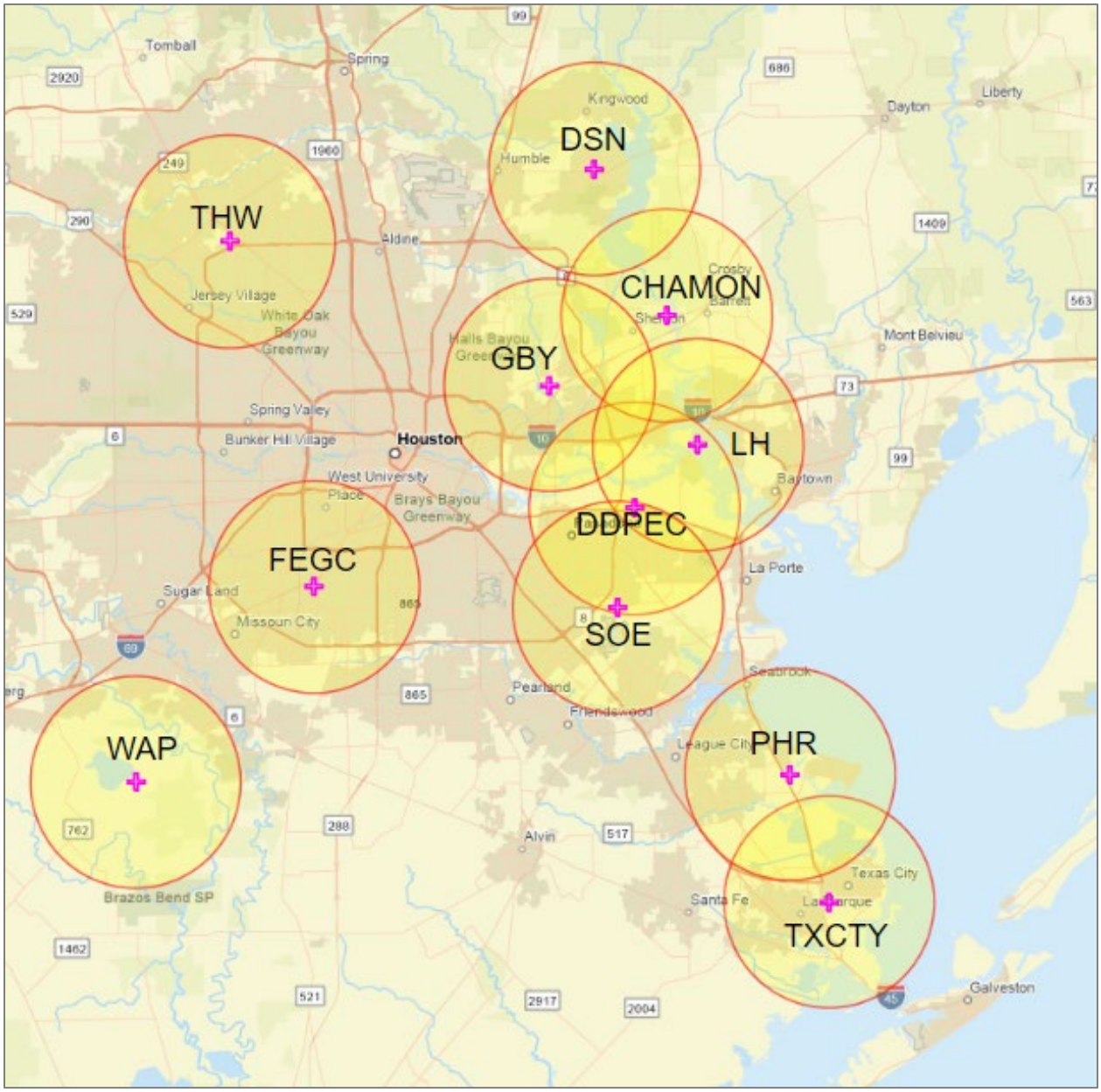
Figure 6 below overlays 10-km circles around the individual power plants. Using a 10-km radius around these plants captures a greater share of the potentially affected population and is consistent with the air quality analysis discussed above. It also creates more overlapping areas, which increases the EJ concerns for the people living in those areas. This is discussed in more detail below.

Figure 6. 10-km Radius Around Plants



Given the relative proximity of some of these plants, particularly those in the Houston area, several of the 10-km circles tended to have some overlapping areas among them, which suggests that some members of the population are likely to be affected by activities from multiple plants and are therefore exposed to higher EJ risks than others. In order to analyze those risks, Figure 7 below focuses on the plants around Houston to identify intersecting circles.

Figure 7. Intersecting Areas With 10-Km Radius Around the Plants



Using these custom boundaries, ICF extracted demographic and enviromental data from EJSCREEN to identify potential EJ vulnerabilities for the population living around these plants. Table 4 indicates the age ranges of populations in both the 5- and 10-km radii from the power plant indicated. As the table shows, there is a wide variablity of the exposure in the 5- and 10-km ranges around these plants. The total population exposed to any potential EJ concerns within a

5-km radius of these plants can range from about 50 people to over 100,000 people, with FREC being the lowest and FEGC being the highest. Similar patterns hold for the 10-km radii, except the range is from about 900 to over 500,000 people.

Table 4. Distribution of the Affected Population by Age

	5-Km Radius					10-Km Radius				
Power Plant	**Total Population**	**0 to 4**	**5 to 17**	**18 to 64**	**65+**	**Total Population**	**0 to 4**	**5 to 17**	**18 to 64**	**65+**
BOSQUE	**1,989**	5%	12%	55%	29%	**4,176**	4%	13%	55%	28%
CALHOUN	**751**	10%	17%	65%	8%	**11,735**	7%	17%	59%	17%
CHAMON	**10,469**	6%	20%	60%	15%	**90,052**	9%	21%	62%	8%
DDPEC	**53,680**	7%	21%	61%	10%	**276,938**	8%	22%	61%	9%
DSN	**67,599**	8%	22%	61%	9%	**201,458**	7%	21%	61%	11%
FEGC	**112,417**	7%	18%	63%	12%	**568,858**	8%	18%	64%	10%
FREC	**56**	4%	20%	61%	16%	**868**	5%	16%	65%	14%
GBY	**79,700**	9%	21%	62%	8%	**258,116**	8%	22%	61%	9%
LH	**12,839**	9%	21%	57%	14%	**128,113**	8%	22%	61%	10%
PHR	**18,722**	9%	19%	62%	10%	**93,580**	8%	19%	61%	12%
SOE	**56,345**	6%	18%	63%	13%	**394,451**	8%	20%	62%	10%
THW	**107,393**	7%	20%	63%	10%	**461,570**	7%	20%	63%	10%
TXCTY	**43,452**	8%	19%	59%	15%	**71,729**	7%	18%	60%	16%
WAP	**745**	8%	20%	61%	11%	**54,391**	7%	23%	61%	10%

The majority of the people living in these areas seem to fall into what is likely the least vulnerable from an age perspective for EJ concerns. As the table above shows, more than 50 percent of the population falls within the 18–64 age group. However, some of these plants do have a relatively large share of the population that can be considered to be more susceptible to EJ problems. For example, BOSQUE has the highest percentage of people age 65+ in a 5- and 10-km radius, but is among the lowest in total population. Also, four of these plants have roughly 30 percent of the population below the age of 18, with about 20 percent or so in the 5–17 age group and the remaining 10 percent or so in the 0–4 age group.

Table 5 shows the distribution of the population by household incomes in both the 5- and 10-km radii. Note that the income data presented below are for households and not in per capita terms, which is different from how the data are shown in the other demographic tables.

Many of these plants have a relatively large share (20–30 percent) of the households that have incomes less than $25,000 or close to the federal poverty line. Among them, GBY and TXCTY have the highest percentage (13 percent for the 10-km radius) of people with incomes below $15,000 for a household, which is likely to exacerbate potential EJ concerns for this region. Correspondingly, GBY and TXCTY have the lowest percentage of people with a household income above $50,000, falling between 40 and 50 percent for both radii. This indicates that the majority of people in these radii have household incomes below $50,000, and both of these power plants are among those with a larger surrounding population.

Table 5. Distribution of the Affected Households by Income

	5-Km Radius					10-Km Radius				
Power Plant	**Total Households**	**< $15,000**	**$15,000–$25,000**	**$25,000–$50,000**	**$50,000 +**	**Total Households**	**< $15,000**	**$15,000–$25,000**	**$25,000–$50,000**	**$50,000 +**
BOSQUE	**809**	10%	14%	23%	52%	**1,812**	11%	15%	22%	52%
CALHOUN	**285**	7%	7%	20%	65%	**4,137**	11%	8%	27%	53%
CHAMON	**3,418**	7%	8%	23%	62%	**28,248**	7%	7%	20%	66%
DDPEC	**16,779**	7%	9%	21%	63%	**85,473**	9%	10%	24%	56%
DSN	**22,212**	4%	4%	13%	78%	**67,417**	6%	5%	15%	74%
FEGC	**39,063**	11%	8%	21%	59%	**207,938**	12%	11%	22%	55%
FREC	**30**	10%	17%	17%	57%	**533**	10%	20%	19%	51%
GBY	**24,514**	11%	11%	30%	48%	**77,689**	13%	13%	30%	45%
LH	**4,234**	12%	10%	23%	55%	**39,892**	10%	9%	23%	59%
PHR	**6,527**	11%	12%	21%	56%	**34,256**	9%	8%	18%	64%
SOE	**19,748**	7%	7%	19%	68%	**130,051**	9%	8%	23%	60%
THW	**34,429**	7%	9%	25%	59%	**155,731**	8%	8%	24%	60%
TXCTY	**15,489**	15%	13%	30%	41%	**26,149**	13%	12%	27%	48%
WAP	**307**	2%	1%	9%	88%	**16,375**	3%	2%	8%	86%

The table below shows the breakdown of the population in these regions by race, in both the 5-km and 10-km radii. Race information is broken down to show populations that self-identify as Black, Hispanic, Other non-White (i.e., American Indian, non-Hispanic Asian, Pacific Islander, or another race), and White.

Not surprisingly, some of the regions with the lowest income distribution also have the largest minority populations. For example, the area around GBY, which had one of the largest shares of the low-income population, also has around 90 percent Black and Hispanic populations. TXCTY, which also had a high proportion of the low-income population around it, is about two-thirds Black and Hispanic. Among the others, the population around FEGC, THW, and LH is also high in non-White or minority populations.

Table 6. Distribution of Population by Race

	5-Km Radius					10-Km Radius				
Power Plant	**Total Population**	**Black**	**Hispanic**	**Other Non-white**	**White**	**Total Population**	**Black**	**Hispanic**	**Other Non-white**	**White**
BOSQUE	**1,989**	1%	7%	1%	91%	**4,176**	1%	7%	1%	90%
CALHOUN	**751**	5%	29%	9%	57%	**11,735**	4%	55%	7%	34%
CHAMON	**10,469**	21%	39%	3%	38%	**90,052**	18%	46%	4%	32%
DDPEC	**53,680**	2%	55%	2%	41%	**276,938**	4%	65%	2%	29%
DSN	**67,599**	17%	27%	6%	51%	**201,458**	15%	25%	5%	54%
FEGC	**112,417**	32%	39%	7%	22%	**568,858**	31%	35%	11%	23%
FREC	**56**	13%	7%	4%	77%	**868**	24%	7%	4%	65%
GBY	**79,700**	30%	59%	2%	9%	**258,116**	29%	61%	2%	9%
LH	**12,839**	7%	51%	3%	40%	**128,113**	14%	53%	4%	29%
PHR	**18,722**	4%	33%	7%	55%	**93,580**	9%	27%	5%	59%
SOE	**56,345**	3%	42%	10%	45%	**394,451**	6%	55%	7%	32%
THW	**107,393**	20%	40%	16%	24%	**461,570**	21%	39%	12%	29%
TXCTY	**43,452**	29%	32%	5%	34%	**71,729**	27%	29%	4%	40%
WAP	**745**	19%	22%	11%	48%	**54,391**	11%	13%	34%	41%

2.2 Combining Demographic Information With Environmental Indicators

In order to understand the EJ vulnerabilities of the population living around these power plants, we analyzed various pollutant indicators from EJSCREEN and used their estimated percentile rankings to compare the potential vulnerabilities across the various plants. The estimated percentile rankings, developed by EPA, combine the environmental indicator with the appropriate demographic data to account for the vulnerable groups in the calculation of the EJ indicator. In this context, EPA defines the vulnerable groups as the average of the count of minorities and low-income households. In terms of the individual percentile rankings, a low number signifies that this group is relatively better off than the rest of the state population, whereas a high ranking signifies a relatively worse off situation than the rest of the state. As an example, if a certain ranking is 80, it means that this place is at the 80th percentile, which implies that only 20 percent of the state population experiences pollution that is higher than those experienced by people in this region. Thus, as a general principal, percentile rankings that are on the high side generally imply the region in question is comparatively worse off than other places in the state.

Table 7 shows the relative rankings of the various populations around these plants that are exposed to the various environmental indicators of interest (see Table 7 notes for definitions of these pollutant indicators). We present the percentile rankings for both the 5- and 10-km radii around each power plant. Table 7 also presents a calculated average percentile ranking in order for us to easily compare across the various plants. Average percentile rankings greater than 50 percent are highlighted in light blue and indicated with an asterisk (*). Note that these averages are simple arithmetic means, which essentially puts equal weights on each environmental indicator, irrespective of their implications on human health. Thus, one could argue that these averages are not reflective of the individual pollutants' effect on the vulnerable populations. We included them here for easy comparison across the groups without any value judgement on the individual pollutants.

Table 7. Percentile Ranking of Various Environmental Indicators

	5-Km Radius					
Power Plant	**Particulate Matter ($PM_{2.5}$ in ug/m3)**	**NATA Diesel PM (ug/m3)**	**NATA Air Toxics Cancer Risk (risk per MM)**	**NATA Respiratory Hazard Index**	**Hazardous Waste Proximity (facility count/km distance)**	**Average Percentile Ranking**
BOSQUE	26	30	28	28	35	**29.4**
CALHOUN	40	38	40	40	50	**41.6**
CHAMON	57	59	69	62	60	**61.4***
DDPEC	52	62	64	54	85	**63.4***
DSN	16	16	12	15	25	**16.8**
FEGC	80	87	83	81	93	**84.8***
FREC	31	33	31	31	32	**31.6**
GBY	91	92	95	95	96	**93.8***
LH	62	67	84	68	95	**75.2***
PHR	41	40	40	40	49	**42**
SOE	44	51	50	46	66	**51.4***
THW	83	90	83	85	93	**86.8***
TXCTY	62	61	61	61	92	**67.4***
WAP	11	13	12	12	20	**13.6**
	10-Km Radius					
Power Plant	**Particulate Matter ($PM_{2.5}$ in ug/m3)**	**NATA Diesel PM (ug/m3)**	**NATA Air Toxics Cancer Risk (risk per MM)**	**NATA Respiratory Hazard Index**	**Hazardous Waste Proximity (facility count/km distance)**	**Average Percentile Ranking**
BOSQUE	22	27	23	23	33	**25.6**
CALHOUN	51	48	48	47	46	**48**
CHAMON	81	80	94	87	94	**87.2***
DDPEC	70	77	85	79	95	**81.2***
DSN	30	32	28	30	50	**34**
FEGC	77	86	80	78	87	**81.6***
FREC	48	44	48	48	42	**46**
GBY	89	91	95	94	97	**93.2***
LH	78	80	92	87	96	**86.6***
PHR	31	26	26	30	58	**34.2**
SOE	66	75	77	69	86	**74.6***
THW	78	86	79	80	87	**82***
TXCTY	56	56	56	56	87	**62.2***
WAP	50	54	49	49	48	**50**

Particulate Matter ($PM_{2.5}$ in ug/m3) – $PM_{2.5}$ levels in the air, measured in µg/m3 annual average.

NATA Diesel PM (ug/m3) – Diesel particulate matter level in the air, measured in µg/m3.

NATA Air Toxics Cancer Risk (risk per MM) – Lifetime cancer risk from inhalation of air toxics.

NATA Respiratory Hazard Index – Air toxics respiratory hazard index (the ratio of exposure concentration to health-based reference concentration).

Hazardous Waste Proximity (facility count/km distance) – The count of hazardous waste facilities (TSDFs and LQGs) within 5 km (or nearest beyond 5 km), each divided by the distance in kilometers.

In order to identify which of these regions may have a vulnerable population exposed to disproportionately higher environmental justice concerns than the rest of the state, we chose an arbitrary 50-percent threshold and highlighted in the tables above those regions that are above that threshold. The results imply that the vulnerable populations living in these regions are experiencing higher levels of EJ concerns than a majority of the rest of Texas. Unsurprisingly, among these regions around power plants that are of higher EJ concerns, the ones that we identified above as having the most vulnerable populations are the ones with the highest average ranking. This includes populations around power plants GBY, FEGC, and THW as the most at-risk, with an average percentile ranking of over 80. Following those are SOE, LH, and TXCTY, with rankings between 60 and 70. Some power plants seem to jump considerably, moving from the 5-km to the 10-km radii. These include CHAMON and DDPEC, where the rankings jump from the 60s to 80s when we move from the 5-km to 10-km radius. Thus, when we analyze the vulnerable population within a 10-km radius of these plants, the majority of these power plants (i.e., 8 out of 14) have a baseline EJ vulnerability, higher than the rest of the state, affecting the population living near these power plants.

2.3 Population in Close Proximity to Multiple Plants

As discussed previously (see Figure 7), several of these power plants, particularly those around the Houston area, have significant overlapping regions when we analyze the populations within a 10-km radius around these plants. Populations living in these “intersecting circles” are likely to face even higher EJ concerns, given that they may have been exposed to higher emissions from multiple power plants. Here we present data for these population groups in these intersecting circles and their potential for higher EJ concerns.

Table 8 below shows the age distribution of the population living in these intersecting regions with two or more 10-km radii. The intersecting radii are of different sizes, which is part of the reason for the differences in population between areas. Overall, the percentage of people in each intersecting region that are between ages 0 and 4 are comparable to those 65+, with the latter only a slightly higher percentage in most areas. In total, approximately 12 percent, or about 325,000 of the 2.6 million total population living within a 10-km radius of all power plants, live in these intersecting regions and are thus likely to face higher levels of baseline EJ concerns than those that live outside of these intersecting regions. Most of this population group lives in an area that has two plants within 10 km, but about 20 percent of them live in areas that are close to three or more power plants.

Table 8. Distribution of the Affected Population in the Intersecting Regions by Age

	10-Km Radius Intersections				
Power Plants	**Total Population**	**0 to 4**	**5 to 17**	**18 to 64**	**65+**
CHAMON & DSN	**14,817**	10%	19%	65%	5%
GBY & CHAMON	**21,330**	10%	21%	63%	6%
GBY & DDPEC	**22,002**	9%	23%	60%	8%
LH & CHAMON	**11,605**	7%	20%	61%	12%
LH & DDPEC	**6,337**	10%	20%	60%	10%
LH & GBY	**1,073**	3%	22%	66%	10%
PHR & TXCTY	**8,678**	7%	17%	61%	16%
SOE & DDPEC	**175,158**	8%	21%	61%	10%
DDPEC & LH & GBY	**28,277**	8%	25%	59%	8%
GBY & LH & CHAMON	**10,371**	8%	25%	62%	6%
LH & DDPEC & CHAMON	**3,495**	9%	24%	56%	10%
LH & DDPEC & SOE	**15,072**	5%	19%	65%	11%
DDPEC & LH & GBY & CHAMON	**7,275**	7%	25%	62%	5%

Table 9 shows the household income of populations living in intersections of two or more 10-km radii. Household incomes for the intersecting regions are comparable to the incomes of the 5- and 10-km radii. Two intersecting areas have a majority of households with incomes less than $50,000, which are the LH/DDPEC/CHAMON intersection and the GBY/DDPEC intersection. Alternatively, the highest percentage of households with incomes over $50,000 is 81 percent, in the intersection of CHAMON and DSN.

Table 9. Distribution of the Affected Population in the Intersecting Regions by Income

	10-Km Radius Intersections				
Power Plants	**Total Households**	**< $15,000**	**$15,000–$25,000**	**$25,000–$50,000**	**$50,000 +**
CHAMON & DSN	**4,652**	3%	4%	12%	81%
GBY & CHAMON	**6,424**	4%	5%	26%	65%
GBY & DDPEC	**6,320**	12%	15%	29%	44%
LH & CHAMON	**3,972**	9%	11%	24%	56%
LH & DDPEC	**1,989**	11%	12%	24%	54%
LH & GBY	**281**	2%	2%	20%	76%
PHR & TXCTY	**3,095**	13%	9%	25%	53%
SOE & DDPEC	**55,947**	10%	10%	24%	57%
DDPEC & LH & GBY	**7,730**	7%	12%	29%	52%
GBY & LH & CHAMON	**2,873**	6%	3%	20%	71%
LH & DDPEC & CHAMON	**959**	13%	20%	21%	46%
LH & DDPEC & SOE	**4,917**	2%	5%	17%	75%
DDPEC & LH & GBY & CHAMON	**2,081**	8%	5%	20%	67%

Table 10 below shows the racial composition of the population living in intersections of two or more 10-km substation radii. Most of these intersecting regions have a predominantly minority population, with the Hispanic population comprising the bulk. The intersection with the highest total population is also among the highest in percentage of non-Whites, SOE/DDPEC. With a population over 100,000 greater than the next largest population, 69 percent of the population is either Black, Hispanic, or another non-White race. Other areas with a high percentage of non-White races are GBY/LH/CHAMON, DDPEC/LH/GBY/CHAMON, and LH/GBY.

Table 10. Distribution of the Affected Population in the Intersecting Regions by Race

	Race of Population				
	10-Km Radius Intersections				
Power Plants	**Total Population**	**Black**	**Hispanic**	**Other Non-White**	**White**
CHAMON & DSN	**14,817**	21%	28%	5%	46%
GBY & CHAMON	**21,330**	24%	54%	6%	16%
GBY & DDPEC	**22,002**	4%	82%	1%	13%
LH & CHAMON	**11,605**	7%	47%	1%	44%
LH & DDPEC	**6,337**	0%	56%	1%	43%
LH & GBY	**1,073**	37%	44%	7%	12%
PHR & TXCTY	**8,678**	19%	28%	4%	48%
SOE & DDPEC	**175,158**	2%	64%	3%	31%
DDPEC & LH & GBY	**28,277**	11%	72%	1%	16%
GBY & LH & CHAMON	**10,371**	22%	66%	3%	9%
LH & DDPEC & CHAMON	**3,495**	0%	67%	2%	31%
LH & DDPEC & SOE	**15,072**	0%	29%	6%	65%
DDPEC & LH & GBY & CHAMON	**7,275**	25%	65%	2%	9%

Table 11 below shows the EJ indexes in intersections of two or more 10-km substation radii. As discussed above, the environmental indicator listed in the Table 11 incorporates the value of the pollutant within the radius, as well as the percentage of minority people and low-income people in the radius. The table also presents the “average” percentile ranking as a way to ordinally rank these intersecting circles. Average percentile rankings greater than 50 percent are highlighted in light blue and indicated with an asterisk (*).

Table 11. Environmental Justice Index in State Percentiles for People Living in the Intersecting Points of Two or More Substations in a 10-km Radius

	10-Km Radius Intersections					
Power Plants	**Particulate Matter (PM 2.5 in ug/m3)**	**NATA Diesel PM (ug/m3)**	**NATA Air Toxics Cancer Risk (risk per MM)**	**NATA Respiratory Hazard Index**	**Hazardous Waste Proximity (facility count/km distance)**	**Average Percentile Ranking**
CHAMON & DSN	42	44	43	43	41	**42.6**
GBY & CHAMON	94	93	97	96	94	**94.8***
GBY & DDPEC	78	85	89	94	98	**88.8***
LH & CHAMON	54	60	71	59	75	**63.8***
LH & DDPEC	64	69	90	72	97	**78.4***
LH & GBY	68	73	81	79	94	**79***
PHR & TXCTY	65	62	65	63	87	**68.4***
SOE & DDPEC	64	74	78	68	92	**75.2***
DDPEC & LH & GBY	88	89	97	96	99	**93.8***
GBY & LH & CHAMON	96	95	99	98	99	**97.4***
LH & DDPEC & CHAMON	78	80	97	84	98	**87.4***
LH & DDPEC & SOE	13	10	2	10	0	**7**
DDPEC & LH & GBY & CHAMON	95	93	99	97	99	**96.6***

Using the same 50 percent threshold, the table shows which of these intersecting circles have a value higher than 50 percent, which implies that the population living in these intersecting regions have a higher level of exposure to EJ concerns than a majority of the rest of the population in Texas. Only two intersections have an average state percentile under 50 percent, which are LH/DDPEC/SOE and CHAMON/DSN. Thus, almost 85 percent of the population living in these intersecting regions have higher exposure to EJ concerns than the rest of the state. Given that these population groups, consisting mostly of minority populations, live near multiple power plants (and presumably other stationary sources), it is not surprising that these groups are more vulnerable when it comes to environmental justice considerations compared to the rest of the state.

2.4 Conclusion – Environmental Justice Analysis

Using data from EPA's EJSCREEN, it appears that people of color and those with limited socioeconomic means in and around the Houston area are more vulnerable to environmental justice considerations compared to the rest of Texas. Given the paucity of data discussed in the air quality analysis above, we could not determine whether the EJ concerns for these groups were exacerbated during those 5 days in February 2021, when DOE authorized the emergency use of power generation under Section 202(c) of the Federal Power Act. However, analyzing the *baseline, business-as-usual* EJ concerns for the population around these power plants does indicate that a majority of the population living here are minority with limited socioeconomic opportunities and that they are also vulnerable to higher levels of pollution under those baseline conditions.

3 References

U.S. Environmental Protection Agency. 1972. *Mixing Heights, Wind Speeds, and Potential for the Urban Air Pollution Throughout the Contiguous Unites States*. Prepared by George Holzworth. Research Triangle Park, NC: Office of Air Program, AP-101.

Appendix – Generators

Generator Name	Fuel Type	Resource Owner Name	County	Unit Code
East Water Plant	Distillate Fuel Oil	NRG Energy Services	Harris	CL_EWP_30UNITS
Lynchburg Pump Station	Distillate Fuel Oil	NRG Energy Services	Harris	LH_LYN_30UNITS
Northeast Water Plant	Distillate Fuel Oil	NRG Energy Services	Harris	DSN_NEWP_10UNITS
Southeast Water Plant	Distillate Fuel Oil	NRG Energy Services	Harris	SOE_SEWP_10UNITS
Clear Lake City WWTP	Distillate Fuel Oil	NRG Energy Services	Harris	PHR_CLCWA_5UNITS
Texas City Power Plant	Natural Gas	Calpine Corporation	Galveston	TXCTY_CC1
Freestone Energy Center Block 1	Natural Gas	Calpine Corporation	Freestone	FREC_CC2
W. A. Parish G4	Natural Gas	NRG Energy Services	Fort Bend	WAP_WAP_G4
T. H. Wharton GT54	Natural Gas	NRG Energy Services	Harris	THW_THWGT54
T. H. Wharton GT56	Natural Gas	NRG Energy Services	Harris	THW_THWGT56
Deer Park Energy Center	Natural Gas	Calpine Corporation	Harris	DDPEC_CC1
Texas City Power Plant	Natural Gas	Calpine Corporation	Galveston	TXCTY_CC1
Freestone Energy Center Block 2	Natural Gas	Calpine Corporation	Bosque	FREC_CC2
Bosque Energy Center Block 1	Natural Gas	Calpine Corporation	Bosque	BOSQUESW_CC1
Bosque Energy Center Block 2	Natural Gas	Calpine Corporation	Bosque	BOSQUESW_CC2
Chamon CT1	Natural Gas	Chamon Power LLC	Harris	CHAMON_CTG_0101
Chamon CT2	Natural Gas	Port Comfort Power LLC	Harris	CHAMON_CTG_0301
Port Comfort CT1	Natural Gas	Chamon Power LLC	Calhoun	CALHOUN_UNIT1
Port Comfort CT2	Natural Gas	Port Comfort Power LLC	Calhoun	CALHOUN_UNIT2
Friendswood Energy Genco	Natural Gas	Friendswood Energy Genco LLC	Harris	FEGC_UNIT1

Source: “ERCOT_DOE_202(c)_Exhibit_A_2-17-2021_2100,” ERCOT.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Orlando Utilities Commission Regarding the Stanton Energy Center	Order No. 202-26-42

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

EXHIBIT 67

DOE, SPECIAL ENVIRONMENTAL ANALYSIS FOR ACTIONS TAKEN UNDER DOE EMERGENCY ORDERS RE OPERATION OF POTOMAC RIVER GENERATING STATION IN VA

DOE/SEA-04

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

November 2006

U.S. Department of Energy
Washington, D.C.

COVER SHEET

Responsible Agency:
U.S. Department of Energy (DOE)

Cooperating Agency:
U.S. Environmental Protection Agency

Title:
Special Environmental Analysis for Actions Taken under DOE Emergency Orders Regarding Operation of the Potomac River Generating Station in Alexandria, Virginia

Location:
Alexandria, VA, and Washington, DC

Contacts:

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Abstract:

On December 20, 2005, the Secretary of Energy issued an emergency order, DOE Order 202-05-03, requiring Mirant's Potomac River Generating Station in Alexandria, Virginia, to operate under limited circumstances. On September 28, 2006, the Secretary extended the Order, including all of its terms and conditions, DOE Order 202-06-2, until December 1, 2006. This SEA includes descriptions of the DOE emergency orders; assessments of the direct, indirect, and cumulative impacts resulting from the emergency orders; and descriptions of alternative actions for potential future decision-making that include mitigation. This SEA covers a period of about 24 months beginning in December 2005.

Public Comment:
Simultaneously with issuance of this SEA, the Secretary is issuing another temporary extension of the emergency order, including all of its terms and conditions, DOE Order 202-07-1, until February 1, 2007. DOE is placing the document on DOE's internet websites (http://www.oe.energy.gov/permitting/372.htm and http://www.eh.doe.gov/nepa/documentspub.html) and making it available at the public reading room at DOE headquarters. An announcement of the availability of the SEA is also being made in the *Federal Register*. Comments on this SEA are due on January 8, 2007, and will be considered in any future decision-making on this matter. Due to postal security procedures, comments sent through U.S. mail may be delayed, and DOE recommends that commentors use other means.

SUMMARY

On December 20, 2005, the Secretary of Energy issued an emergency order ("DOE Order" or "Order") to Mirant Potomac River, LLC (Mirant) pursuant to Section 202(c) of the Federal Power Act (FPA). The Order directed Mirant to operate its Potomac River Generating Station ("the Plant") in Alexandria, Virginia, in specific and limited circumstances in order to reduce the risk of a blackout in the Central Washington, D.C. area, while avoiding, to the extent possible, exceedances of the National Ambient Air Quality Standards (NAAQS) (text box). The Order was to expire on September 30, 2006, but DOE issued a temporary extension of the Order, until December 1, 2006, to allow for completion of this Special Environmental Analysis (SEA). This SEA assesses impacts resulting from the Orders and from potential future alternative actions DOE may take in this matter. DOE is accepting public comment on this SEA and will consider all comments submitted in any future decision-making.

National Ambient Air Quality Standards (NAAQS)

The Clean Air Act, which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set NAAQS for pollutants considered harmful to public health and the environment. EPA has set NAAQS for seven "criteria" pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead, carbon monoxide (CO), ozone, particulate matter less than or equal to 10 μm in aerodynamic diameter (PM_{10}), and particulate matter less than or equal to 2.5 μm in aerodynamic diameter ($PM_{2.5}$). Each NAAQS has a specific averaging time (e.g., 3-hour or 24-hour SO_2 standard) that represents the time period over which modeled air pollutant concentrations are analyzed for the purpose of determining attainment with the NAAQS. The NAAQS are implemented at the state level through State Implementation Plans (SIPs). SIPs use individual source emissions limitations to help attain and maintain the NAAQS.

In emergency situations, pursuant to 40 CFR 1506.11, the Council on Environmental Quality's (CEQ) National Environmental Policy Act of 1969 (NEPA) regulations call for agencies to consult with CEQ to determine what alternative arrangements the agency will take in lieu of preparing an environmental impact statement (EIS) that might otherwise be required for the relevant action. DOE is issuing this SEA in compliance with the "alternative arrangements" plan agreed upon with CEQ.

Background

The Plant is a 482-MW electricity generating facility located on the Potomac River in Alexandria, Virginia, about five miles (8 km) from the U.S. Capitol building (Figure S-1). The Plant consists of five generating units, each with its own exhaust stack. Because the Plant is located three miles (5 km) from the Ronald Reagan Washington National Airport and is within the flight path of the airplanes that fly in and out of that airport, it has stacks that are shorter than

normal for similar facilities. The Plant uses oil to pre-heat each of its units and then burns coal, which it receives via rail car, to generate electricity. The generated electricity is transmitted to the central business district of Washington, D.C., many Federal institutions, the Georgetown area, as well as other portions of Northwest D.C. and the D.C. Water and Sewer Authority's Blue Plains Wastewater Treatment Plant (collectively called the "Central D.C. area").

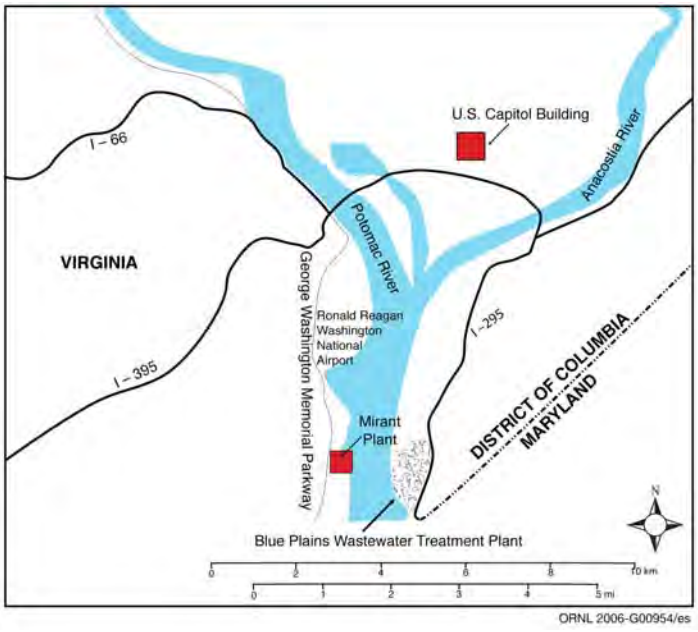


Figure S-1. The location of the Plant in relation to the central Washington, D.C. area.

The Plant site was relatively remote in 1949 when the Plant began operation. However, residential communities and commercial properties have grown up and around the Plant over the last 50 years, notably a condominium building, Marina Towers, built only 300 yards (270 m) from the Plant in the 1960s. Since 2001, residents of Marina Towers have complained about air quality impacts and associated health impacts of the Plant's operation. Since 2003, state and Federal environmental agencies have been working with Mirant to settle alleged violations of the Plant's operating permit limit for nitrogen oxide (NO_x) emissions. The alleged violations resulted in a judicial consent decree (EPA 2004) in September 2004 and an amended judicial consent decree in May 2006 (EPA 2006g). Part of the 2004 settlement required Mirant to perform a modeling analysis to predict the effect of "downwash"[1] from the Plant on ambient concentrations of several NAAQS pollutants. The study showed significant modeled exceedances of three NAAQS pollutants from downwash: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter finer than 10 μm in aerodynamic diameter (PM_{10}). As a result of the study, on August 19, 2005, the Virginia Department of Environmental Quality (VDEQ) issued a letter to Mirant requesting that Mirant "undertake such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station, including the potential reduction of levels of operation, or potential shutdown of the facility." On August 24, 2005, in response to VDEQ's August 19, 2005, letter, Mirant decided to shut down all five generating units at the Plant.

[1] The September 23, 2004, judicial consent decree (EPA 2004) defined downwash as "the effect that occurs when aerodynamic turbulence induced by nearby structures causes pollutants from an elevated source (such as a smokestack) to be mixed rapidly towards the ground resulting in higher ground-level concentrations of pollutants."

DOE Action

On August 24, 2005, the District of Columbia Public Service Commission (DCPSC) filed an Emergency Petition and Complaint ("Petition") with DOE pursuant to Section 202(c) of the FPA. The Petition requested the Secretary of Energy to find that an emergency existed under Section 202(c) of the FPA and to issue an order directing Mirant to continue operation of the Plant. Section 202(c) of the FPA authorizes DOE, upon determination that an emergency exists, to "require by order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest." The basis of the DCPSC's Petition was that the shutdown of the Plant had a drastic and potentially immediate effect on the reliability of the electricity supply of the Central D.C. area.

After receiving the Petition, DOE spent four months reviewing the facts to gather information on the shutdown of the Plant and its effect on the reliability of the Central D.C. electricity system. DOE met with private entities responsible for electricity transmission in the Central D.C. area and the regional electricity system to determine the role of the Plant in electricity reliability. DOE also met with officials from the Environmental Protection Agency (EPA) to understand the environmental situation posed by the Plant's operation, particularly with regard to the NAAQS. Meanwhile, on September 21, 2005, Mirant unilaterally restarted the Plant's unit 1 in an 8-8-8 capacity (that is, in any given 24-hour period, the unit ran for 8 hours at its maximum level, 8 hours at its minimum level, and did not run for 8 hours). Mirant also began experimental use of measures to control SO_2, specifically combustion of low-sulfur coal and injection of trona (a substance similar to baking soda) into flue gases.

During its investigation, DOE learned of the Plant's key role in providing electricity reliability to the Central D.C. area. The Plant is one of only three sources of electricity to the Central D.C. area. The other sources are two 230-kV transmission lines that deliver electricity from other regional generating sources. The Potomac Electric Power Company (Pepco) is in the process of installing two additional 230-kV transmission lines to the Central D.C. area that will provide a high level of electricity reliability to the area even in the absence of the Plant. These lines are currently expected to be placed in service in June 2007. Until then, if the Plant is not available to generate electricity and one of the two existing transmission lines goes out of service (either unexpectedly or for maintenance), the Central D.C. area would only be served by the remaining line. If the remaining line then failed, a blackout would occur, affecting many government agencies; a large number of residents and workers; and hospitals, police, and fire facilities. Since 2000, there have been 34 one-line planned outages, seven one-line unplanned outages, and two times where both lines failed simultaneously. Indeed, on December 15, 2005, during DOE's investigation, one of the 230-kV transmission lines failed unexpectedly, and the supply of electricity to the Central D.C. area depended solely on the remaining line until the morning of December 16, 2005.

After DOE's investigation, on December 20, 2005, the Secretary issued the Order stating:

> I find that in the circumstances presented here, an emergency exists that justifies the issuance of a section 202(c) order. My determination is not based on any single factor, but on the combination of all relevant facts and circumstances. In particular, I find that an emergency exists because of the reasonable possibility an outage will occur that would cause a blackout, the number and importance of facilities and operations in our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violates applicable reliability standards.

DOE's Order did not direct Mirant to simply generate full power at the Plant, even though continuous, unrestricted, operation of the Plant, at all times, was requested in the Petition and would have assured a high level of electricity reliability to the Central D.C. area. Instead, the Order sought to strike an appropriate balance between environmental concerns and electricity reliability by directing Mirant to operate the Plant, but only in certain circumstances and only to limited capacity. Specifically, the Order required Mirant to (1) operate the Plant to produce the amount of power necessary to meet demand in the Central D.C. area during a planned or unplanned outage of one of the 230-kV lines and (2) in situations where both 230-kV lines are functioning, keep as many generating units in operation and take all other measures to reduce the start-up time of units not in operation for the purpose of providing electricity reliability, without causing an exceedance of the NAAQS. The Order further required Mirant to utilize pollution control equipment and measures to the maximum extent possible to minimize the magnitude and duration of any exceedance of the NAAQS during a planned or unplanned transmission line outage. The Order also contemplated continued DOE cooperation with EPA and suggested that DOE would modify the Order at a later date if EPA decided to issue an order to Mirant.

On June 1, 2006, EPA issued an Administrative Compliance Order (ACO) to Mirant. The ACO directs Mirant to operate the Plant under conditions specified in the DOE Order during line outage situations, but requires Mirant to take all reasonable steps to limit SO_2, PM_{10}, and NO_x emissions and to optimize use of trona to minimize SO_2 emissions. In non-line outage situations (i.e., in the normal course of operation), the ACO authorizes Mirant to operate the Plant under "daily predictive modeling" after certain conditions are met. Under daily predictive modeling Mirant is to model a specific operating mode for the Plant based on predicted weather conditions for the following day and operate under that mode only where the daily modeling run demonstrates that the Plant will not cause or contribute to a modeled exceedance of the 3-hr and 24-hr SO_2 and PM_{10} NAAQS. The ACO also requires Mirant to maintain alarms that alert the Plant operators if monitored average concentrations reach 80% of the standards for SO_2, including the annual SO_2 standard. In addition, the ACO requires Mirant to install and operate six new SO_2 ambient monitoring stations in the vicinity where elevated pollutant concentrations have been predicted and to conduct actual monitoring of ambient SO_2 concentrations. On

June 2, 2006, DOE directed Mirant to operate under the ACO during non-line outage situations, for the purpose of providing electricity reliability, and to continue operation in accordance with the DOE Order in line-outage situations.

DOE believes that the Order and the ACO are the product of the best available balance between providing electricity reliability to the Central D.C. area and protecting the environment and human health in Alexandria, Virginia, until the additional 230-kV lines are in service. The Order and the ACO both contain provisions to prevent NAAQS exceedances in the normal course of operation of the Plant. The only time a possible exceedance of the NAAQS is contemplated is during line-outage situations. In addition, while unplanned transmission line outages cannot be predicted, planned transmission line outages are scheduled in 2006-2007 for periods of time when demand for electricity in the Central D.C. area (and hence emissions from the Plant) is at its lowest. The 2006 amended judicial consent decree, after it is implemented, will provide limitations on NO_x emissions from the Plant.

NEPA Process and this SEA

Major Federal actions significantly affecting the human environment generally call for DOE to prepare an EIS before taking the action to analyze impacts in compliance with NEPA. However, in emergency situations, pursuant to 40 CFR 1506.11, the CEQ's NEPA regulations provide that agencies consult with CEQ to determine what alternative arrangements the agency will take in lieu of preparing an EIS. Before issuing the Order, DOE consulted with CEQ pursuant to 40 CFR 1506.11. As part of its "alternative arrangements plan," DOE agreed to provide opportunity for public involvement, continue Agency consultation, and identify alternatives for mitigation (DOE 2006). In addition, as an alternative to an EIS, CEQ agreed to preparation of this SEA. This SEA does not include an impact assessment of alternative actions that DOE might have taken instead of issuing its Order on December 20, 2005. DOE will not issue a record of decision (ROD) based on this SEA.

In the January 20, 2006, *Federal Register* notice announcing the alternative arrangements (DOE 2006), DOE requested public comments on issues to be addressed in the SEA. Comments were provided by the following organizations: the Mount Vernon group and the Virginia Chapter of the Sierra Club; the Southern Environmental Law Center on behalf of itself and the American Lung Association of Virginia; the City of Alexandria; and the Institute for Public Representation on behalf of the Potomac Riverkeeper, Inc., the Patuxent Riverkeeper, and the Anacostia Riverkeeper at Earth Conservation Corps. Commentors on the notice expressed particular concern about the following issues that are within the scope of this SEA:

- impacts on health of increased particulate emissions, especially particulate matter smaller than 2.5 microns ($PM_{2.5}$), and of increased emissions of trace metals and hazardous air pollutants (especially arsenic, beryllium, lead, chromium, cadmium, nickel, and mercury);

- the potential for any increased emissions of SO_2 and NO_x to contribute to acid rain, nutrient loading to aquatic systems, and deposition of heavy metals, and the subsequent impacts on the aquatic resources of the Chesapeake Bay and several of its tributaries, specifically the Potomac, Anacostia, and Patuxent rivers;
- impacts of trona utilization; and
- potential mitigation measures, such as use of existing transmission lines along the railroad rights-of-way of the National Railroad Passenger Corporation ("AMTRAK") and CSX Corporation and notification of nearby residents about potential NO_x exceedances.

A commentor also expressed concern about possible adverse effects of trona utilization on Plant equipment. This concern is not addressed because it is not considered to be an environmental impact.

The aim of this SEA is to describe the impacts resulting from the Order and from potential future alternative actions DOE may take in this matter. Such potential future alternative actions include allowing the Order to expire; extending the Order until the expected June 2007 in-service date of the two additional 230-kV transmission lines (or until December 2007, to account for unlikely, but possible, delays in installation); or extending the Order in modified form to include measures to mitigate impacts. Because allowing the Order to expire would place the Central D.C. area at risk of a potential blackout, this SEA describes potential impacts associated with a blackout. Potential mitigation alternatives discussed in this SEA include measures to, among other things, reduce demand for electricity in the Central D.C. area, require storage of sufficient trona at the Plant, and expedite the installation of the additional 230-kV transmission lines.

In order to give the reader a contextual way to understand the assessed impacts attributable to the Order and from a potential extension of the Order until the two new 230-kV transmission lines are in service, DOE uses assessed impacts from two different earlier Plant operating modes as a basis for comparison: the "pre-shutdown" mode of operations and the "pre-Order" operating mode. The "pre-shutdown" operating mode is based on operations in the year preceding the August 24, 2005, shutdown. The "pre-Order" mode is based on operation of the Plant during its restart of unit 1 in the 8-8-8 operating mode (approximately September - December 2005).

DOE's assessment of the effects of Plant operations considered the following resource areas and impact topics:

- Effects of any increased *air emissions*;
- *Health* effects on Plant workers and the public of any increased air pollution;
- Effects on *water quality* due to atmospheric deposition of air pollutants from the Plant and changes in Plant water use and releases;
- *Ecological* effects due to acid deposition, changes in water quality, and changes in water use, including impacts to special status species;
- *Waste management* impacts, particularly impacts of trona utilization;

- *Transportation impacts* from increased shipping of coal and trona to the Plant and of wastes away from the Plant; and
- *Environmental justice* impacts.

It is important to understand the process DOE used to assess impacts from the Order and from a potential additional extension of the Order. Understanding DOE's approach for modeling air quality impacts is particularly important because (1) air quality is the most significant environmental concern associated with the Plant's operation and (2) many other impacts, including impacts to human health, are based on modeled estimates of air impacts. For its air analysis DOE used EPA's AERMOD model to assess modeled concentrations of SO_2 and PM_{10} as a result of the Order (split into two time periods: before the ACO and after the ACO) and a potential extension of the Order (until July 2007 and December 2007). DOE focused on modeling concentrations of SO_2 and PM_{10} because the original downwash study that prompted the shutdown of the Plant emphasized SO_2, PM_{10}, and NO_x (and the amended judicial consent decree between EPA and Mirant [EPA 2006g] deals with NO_x.) In modeling concentrations of SO_2 and PM_{10}, DOE used several simplifications and made a number of key assumptions that are essential to understand before interpreting the modeled results:

- *Assumptions in Modeling*
  - DOE's modeling of SO_2 and PM_{10} assumed weather conditions from 2001 because EPA had shown that 2001 resulted in predictions of more adverse air quality than any of the other years during the period from 2000 through 2004. Therefore, DOE's modeling results likely overestimate impacts.
  - DOE's assessment of impacts to the health of people living near the Plant is based on estimated exposures to $PM_{2.5}$. DOE used air dispersion modeling for PM_{10} to estimate exposures to $PM_{2.5}$. Therefore, to the extent that DOE's modeled air quality results overestimate impacts, the health results also likely overestimate impacts. In addition, DOE did not analyze factors such as health status or activity level that affect the likelihood of actual health impacts to specific individuals. Consequently, the results of DOE's health impact analysis represents an estimate of the impact to the population, rather than the likely impact to any specific individual.

- *Assumptions and Simplifications about Operations*
  - For the period from December 21, 2005, through March 31, 2006, DOE used hourly emissions data provided by Mirant to model SO_2 and PM_{10} emissions. (For the two days for which data were not provided, DOE assumed operations were identical to the preceding day.) To model the air quality impacts of operations during the period April 1 through May 31, 2006, DOE assumed that Mirant operated the Plant to the maximum level described in the operating plan supplements that Mirant provided to DOE.

- For operations during daily predictive modeling, DOE assumed that the Plant would generate the maximum allowed power by using a combination of increased trona injection and reduced power levels to assure that its operations would not contribute to an exceedance of the 24-hour-average NAAQS limit for SO_2 concentrations in the normal course of business (i.e., no line outage). DOE did not simulate predictive modeling for the 3-hour SO_2 standard because the computational effort required to calculate average concentrations for all possible 3-hour periods for each of the over 1,700 modeled locations near the Plant was judged to be excessively large for the information to be gained. Consequently, the SEA reports modest modeled exceedances of the 3-hour SO_2 standard that are not expected to actually occur. The SEA also reports exceedances of the annual standard because operating close to the 24-hour limit day after day raises the long-term average. However, because the ACO requires Mirant to monitor SO_2 concentrations and adjust operation of the Plant to meet SO_2 standards for all averaging periods, actual exceedances of the annual standard are not expected to occur.

Preliminary data from the six new SO_2 monitoring stations that Mirant installed during the summer of 2006, pursuant to the ACO, provides an initial look at actual impacts from the Plant under the ACO's daily predictive modeling. DOE's modeling results are not directly comparable to the monitored data because DOE's modeling used average emissions and historical weather data rather than current-year data. However, monitored data can be compared with the follow-up modeling that Mirant is conducting under the ACO, using actual concurrent emissions and weather data. For the period June 17, 2006, to September 17, 2006, the maximum monitored daily-average SO_2 concentration for the monitors ranged from 4 to 63 $\mu g/m^3$, whereas Mirant's follow-up modeling gave maximum daily-average SO_2 concentrations from 25 to 570 $\mu g/m^3$. Thus, monitored concentrations of SO_2 are much lower than Mirant's follow-up modeled concentrations. EPA will be evaluating the reasons for this large discrepancy between the actual monitored data and follow-up modeling throughout the course of the ACO. Should DOE extend the Order on December 1, 2006, DOE will make monitored data (as submitted by Mirant to EPA under the ACO) available on the website it maintains to provide information about this matter, http://www.oe.energy.gov/permitting/372.htm.

Table S.1 summarizes the assessed impacts of the Order, both before and after the initiation of daily predictive modeling. It also includes impacts of the temporary extension of the Order and a potential additional extension of the Order until December 2007, assuming a 6-month delay in the installation of the additional 230-kV lines. Finally, the table presents the assessed impacts associated with the "pre-shutdown" and "pre-Order" modes of operation of the Plant to give the reader a basis for comparison.

Table S.1 Summary of impacts of Plant operations (See text for details.)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
AIR QUALITY				
SO_2	Modeled maximum concentration values for SO_2 in ambient air exceed NAAQS limits for all averaging periods (i.e., 3-hour, 24-hour, and annual).	Modeling shows no exceedance of NAAQS limit for any averaging period.	For operations before the commencement of daily predictive modeling (i.e., before July 1, 2006), there are no modeled SO_2 or NO_x exceedances during non-line outage situations. For operations during line outages (21 days in January 2006) modeled maximum concentration values for SO_2 in ambient air exceed SO_2 NAAQS limits for all averaging periods. For operations after the commencement of daily predictive modeling (i.e., starting July 1, 2006), modeling shows no exceedances of 24-hour average SO_2 NAAQS limit because of requirements of predictive modeling. Modeling shows exceedances for other averaging periods, but because the ACO requires compliance with SO_2 NAAQS in non-line outage situations, actual exceedances are not expected.	For operations during non-line outage periods, modeling shows no exceedances of 24-hour average SO_2 NAAQS limit because of requirements of predictive modeling. Modeling shows exceedances for other averaging periods, but because the ACO requires compliance with SO_2 NAAQS in non-line outage situations, actual exceedances are not expected. For operations during line outages, modeled maximum concentration values for SO_2 in ambient air exceed SO_2 NAAQS limits for all averaging periods.

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
PM_{10}	Modeled maximum concentration values for PM_{10} in ambient air meet NAAQS annual standard but exceed limit for 24-hour averaging period. [2]	Modeled maximum concentration values for PM_{10} in ambient air meet NAAQS standards for both the annual and 24-hour averaging periods. [3]		
$PM_{2.5}$	Background concentrations measured by VDEQ while the Plant was operating at pre-shutdown levels are below the current NAAQS limit for 24-hour averaging period (65 $\mu g/m^3$) and are slightly below the current NAAQS annual limit (15 $\mu g/m^3$), but exceed the NAAQS limit for the 24-hour averaging period (35 $\mu g/m^3$) that will take effect in December 2006. As a result of the background contribution, estimated maximum concentration values in ambient air (including background) for all operating modes exceed the NAAQS annual limit and the December 2006 limit for the 24-hour averaging period, both at ground level and the top of Marina Towers. Adding estimated Plant contributions to background concentrations involves some double counting of Plant effects.			
	Estimated maximum concentration values in ambient air (including background) at ground level and the top of Marina Towers exceed current and future NAAQS limits for both 24-hour and annual averaging periods.	Estimated maximum concentration values in ambient air (including background) at ground level and the top of Marina Towers are lower than for pre-shutdown operations and meet the current NAAQS limit for the 24-hour averaging period, but exceed the annual and 24-hr limits that will take affect in December 2006.	Estimated maximum concentration values in ambient air (including background) at ground level are lower than for pre-shutdown operations but higher than for pre-Order operations and meet the current NAAQS limit for the 24-hour averaging period but exceed the annual and 24-hr limits that will take affect in December 2006. Estimated maximum concentration values at the top of Marina Towers are lower than for pre-shutdown operations, but exceed current and future NAAQS limits for both 24-hour and annual averaging periods.	

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
$PM_{2.5}$ (continued)	Plant contributions to ground-level $PM_{2.5}$: 38 $\mu g/m^3$ for 24-hr 5.7 $\mu g/m^3$ for annual	Plant contributions to ground-level $PM_{2.5}$: 9.2 $\mu g/m^3$ for 24-hr 2.0 $\mu g/m^3$ for annual	Plant contributions to ground-level $PM_{2.5}$: 25 $\mu g/m^3$ for 24-hr 2.4 $\mu g/m^3$ for annual	Plant contributions to ground-level $PM_{2.5}$: 23 $\mu g/m^3$ for 24-hr 4.0 $\mu g/m^3$ for annual
	Plant contributions to $PM_{2.5}$ at the top of Marina Towers: 76 $\mu g/m^3$ for 24-hr 7.8 $\mu g/m^3$ for annual	Plant contributions to $PM_{2.5}$ at the top of Marina Towers: 4.8 $\mu g/m^3$ for 24-hr 1.0 $\mu g/m^3$ for annual	Plant contributions to $PM_{2.5}$ at the top of Marina Towers: 41 $\mu g/m^3$ for 24-hr 3.9 $\mu g/m^3$ for annual	Plant contributions to $PM_{2.5}$ at the top of Marina Towers: 43 $\mu g/m^3$ for 24-hr 5.7 $\mu g/m^3$ for annual
Contributions to ozone pollution from NO_x	Operations estimated to emit 2,300 tons[3] of NO_x (which contributes to formation of ozone) over 285 days (rate of about 3,000 tons/yr)	Operations estimated to emit 640 tons of NO_x over 285 days (rate of about 820 tons/yr)	Operations estimated to emit 2,000 tons of NO_x over 285 days (rate of about 2,600 tons/yr)	Operations estimated to emit 3,700 tons of NO_x over 15 months (rate of about 3,000 tons/yr)
Mercury emissions	Operations estimated to emit mercury at a rate of 116 lb/yr or 91 lb over 285 days[3]	Operations estimated to emit 21 lb mercury over 285 days (rate of about 28 lb/yr)	Operations estimated to emit 79 lb mercury over 285 days (rate of about 101 lb/yr)	Operations estimated to emit mercury at a rate of 116 lb/yr or 146 lb over 15 months
Carbon monoxide and lead	Because ambient concentrations of carbon monoxide and lead are far below NAAQS limits and because coal plants are not important sources of either pollutant, DOE did not model Plant contributions to ambient levels for either pollutant.			
Contributions to global climate change	Operations estimated to release CO_2 (a greenhouse gas that contributes to global warming) at a rate of 2,000,000 tons/yr from coal use	Operations estimated to release CO_2 at a rate of 488,800 tons/yr from coal use	Operations estimated to release CO_2 at a rate of 1,766,500 tons/yr from coal and trona use	Operations estimated to release CO_2 at a rate of 2,007,500 tons/yr from coal and trona use

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
HUMAN HEALTH				
Premature mortality due to air pollution exposure	Expected incidence of premature mortality among the 144,000 adults in 36-mi^2 area[3] around the Plant of 3.8 per year	Expected incidence of premature mortality among the 144,000 adults in 36-mi^2 area around the Plant of 0.77 per year	Expected incidence of premature mortality among the 144,000 adults in 36-mi^2 area around the Plant of 1.3 over 285-day duration of the Order (annual rate of 1.7)	Expected incidence of premature mortality among the 144,000 adults in 36-mi^2 area around the Plant of 2.9 over 15-month duration of the potential extension (annual rate of 2.3)
WATER QUALITY				
Nitrogen loading to Chesapeake Bay	Operations deliver nitrogen to the Bay at an estimated rate of 170,000 lb/yr	Operations deliver nitrogen to the Bay at an estimated rate of 47,000 lb/yr	Operations deliver nitrogen to the Bay at an estimated rate of 150,000 lb/yr	Operations deliver nitrogen to the Bay at an estimated rate of 170,000 lb/yr
Acid deposition	Plant emissions of SO_2 and NO_x contribute to regional acid deposition.	SO_2 and NO_x emissions are 28% of pre-shutdown levels	NO_x emissions are 87% of pre-shutdown levels; SO_2 emissions are less than 45% of pre-shutdown levels	NO_x emissions are similar to pre-shutdown levels, but SO_2 emissions are 50% of pre-shutdown levels
	Negligible impacts to water quality in nearby watersheds, because these watersheds are well buffered against acid rain.			
Effects of changes in Plant water use and releases	Effects of many years of Plant operations are among the natural and human factors reflected in the existing water quality conditions of the Potomac River	Reduced water and thermal discharge rates, compared with pre-shutdown operations, could contribute to improved water quality in the Potomac River	Impacts intermediate between pre-Order and pre-shutdown operations	Impacts similar to pre-shutdown operations

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
ECOLOGICAL RESOURCES				
Acid deposition	Acid deposition resulting from Plant operations has negligible impacts on terrestrial and aquatic biological resources because (1) the soils in the nearby river and stream watersheds where emissions from the Plant are likely to fall are well buffered and (2) vegetation has actively grown near and next to the Plant even at "pre-shutdown" levels.			
Changes in water quality	Ecological changes to the Potomac River and Chesapeake Bay due to changes in nutrient loading induced by the Order or a potential extension of the Order would be minimal.			
	No effects from trona (no use of trona).	No effects from trona (assessment assumes no use of trona).	Selenium and arsenic leached from solid wastes produced with trona use could adversely affect biota in Mataponi Creek. Monitoring of collected landfill leachate and stormwater for selenium should identify the potential for problems before discharges occur, but the current discharge permit does not require monitoring for arsenic.	
Changes in water use	Effects of Plant operations under the Order or a potential extension of the Order through December 2007 would not have a major impact on aquatic biota, although the impacts from entrainment and impingement would be greater than for the "pre-Order" mode.			
Special status species	No adverse impacts to any special status species would be expected to result from Plant operations.			

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
WASTE MANAGEMENT				
Solid waste	With indefinite continuation of Plant operations in pre-shutdown mode, the Mirant Brandywine ash landfill would be able to receive fly ash until mid-2012.	With indefinite continuation of Plant operations in pre-Order mode, the Mirant Brandywine landfill would be able to receive fly ash until mid-2015.	With indefinite continuation of Plant operations at operating levels under the Order, including use of trona, the Mirant Brandywine ash landfill would be able to receive fly ash until early 2010.	
	Waste characteristics would be unchanged.	Waste characteristics would be unchanged (assessment assumes no use of trona).	Trona in Plant solid wastes may increase the leaching of selenium and arsenic from the landfill. Current monitoring requirements at the landfill include monitoring for selenium in collected leachate and stormwater before water is discharged to surface water, but do not include monitoring for arsenic. Groundwater monitoring does not include selenium or arsenic.	
TRANSPORTATION				
Impacts from road and rail traffic	Neither rail nor truck traffic associated with Plant operations have an important effect on local traffic near the Plant.			
	Transport of Plant fly ash to the Mirant Brandywine ash landfill contributes to existing traffic problems on Maryland Route 381, and increased traffic associated with operations under the Order, including the temporary extension of the Order and any potential extension of the Order increases this effect. The State Highway Administration is requiring that Mirant address problems at certain intersections along Maryland Route 381 that have been rated as having “failing” levels of service, and Maryland-National Capital Park and Planning Commission staff have recommended ways to address traffic impacts on North Keys Road.			

Table S.1 (Continued)

Resources and Topics	Pre-shutdown (prior to August 24, 2005)	Pre-Order (Sept. - Dec. 20, 2005)	Order (Dec. 20, 2005 - Oct. 1, 2006)	Temporary extension of Order (until Dec. 1, 2006) and potential extension until Dec. 2007 [1]
ENVIRONMENTAL JUSTICE				
Impacts to minority and low-income populations	Because of their proximity to the Plant, residents of block groups 1 and 2 (which are neither low-income nor minority populations) experience higher air pollution from Plant emissions than residents of block groups 3 (which is identified as a low-income population) and 4 (which is identified as a minority population). DOE has not identified any different or unique ways that these or other minority and low-income populations in the area could be exposed to Plant air pollutants or otherwise affected by the Order or its potential extension. Consequently, the minority and low-income populations in block groups 3 and 4 do not suffer "disproportionately high and adverse human health or environmental effects" related to air pollutant emissions from the Plant.			

[1] For several resources and topics, emissions and impacts are greater under an extension of the Order than under the Order because during the initial months of the Order the Plant operated at lower levels than result from daily predictive modeling.

[2] EPA's October 17, 2006, rule making on NAAQS for particulate matter (EPA 2006j) revoked the annual PM_{10} standard, effective December 18, 2006.

[3] To convert tons to metric tons, multiply by 0.91. To convert lbs to kg, multiply by 0.45. To convert square miles to square km, multiply by 2.60.

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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

DOE/SEA-04

U.S. Department of Energy
Washington, D.C.

November 2006

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ACRONYMS AND ABBREVIATIONS

µg	micrograms (i.e., millionths of a gram)
µm	micrometers (i.e., millionths of a meter)
ACO	Administrative Compliance Order
Btu	British thermal unit
C	Celsius
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
CT	census tract
D.C.	District of Columbia
DCPSC	District of Columbia Public Service Commission
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FR	*Federal Register*
ft	feet
ft^2	square feet
FWS	U.S. Fish and Wildlife Service
gal	gallons
ha	hectare
hr	hour
kg	kilogram
km	kilometer
km^2	square kilometer
kV	kilovolt
L	liter
lb	pound(s)
LLC	Limited Liability Company
LOS	level-of-service
m	meter
m^2	square meter
m^3	cubic meter
MBtu	million British thermal units
MES	Model Evaluation Study
mg	milligrams (i.e., thousandths of a gram)
mi	mile
mi^2	square mile
min	minute
MSL	mean sea level
MW	megawatts
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
Pb	lead
Pepco	Potomac Electric Power Company
PJM	PJM Interconnection, LLC
Plant	Mirant's Potomac River Generating Station (in Alexandria, Virginia)
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 µm
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 µm
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROD	*Record of Decision*
SEA	special environmental analysis
SIP	state implementation plan
SO_2	sulfur dioxide
TCLP	Toxicity Characteristic Leaching Procedure
U.S.	United States
U.S.C.	United States Code
VDEQ	Virginia Department of Environmental Quality
yd^3	cubic yard
yr	year

EXPONENTIAL NOTATION: Some values in the text and tables of this document are expressed in exponential notation. An exponent is the power to which the expression, or number, is raised. This form of notation is used to conserve space and to focus attention on comparisons of the order of magnitude of the numbers (see examples):

1×10^{4}	=	10,000
1×10^{2}	=	100
1×10^{0}	=	1
1×10^{-2}	=	0.01
1×10^{-3}	=	0.001

Metric Conversions Used in this Document:

Multiply	By	To Obtain
	Length	
inch (in.)	2.54	centimeters (cm)
feet (ft)	0.30	meters (m)
yards (yd)	0.91	meters (m)
miles (mi)	1.61	kilometers (km)
	Area	
acres (ac)	0.40	hectares (ha)
square feet (ft^2)	0.093	square meters (m^2)
square yards (yd^2)	0.84	square meters (m^2)
square miles (mi^2)	2.60	square kilometers (km^2)
	Volume	
gallons (gal)	3.79	liters (L)
cubic feet (ft^3)	0.028	cubic meters (m^3)
cubic yards (yd^3)	0.76	cubic meters (m^3)
	Weight	
ounces (oz)	28.4	grams (gm)
pounds (lb)	0.45	kilograms (kg)
short ton (ton)	0.91	metric ton (t)

1. PURPOSE AND NEED FOR THE DOE ACTION

1.1 Introduction

This special environmental analysis (SEA) focuses on the environmental impacts of operations at the coal-fired Potomac River Generating Station (the "Plant") in Alexandria, Virginia, as a result of a U.S. Department of Energy (DOE or "Department") emergency order (the "DOE Order" or "Order") (Appendix A) issued on December 20, 2005, pursuant to Section 202(c) of the Federal Power Act (FPA)[1]. The Plant is owned by Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant). (See text box.)

On August 24, 2005, Mirant shut down operation of the Plant to respond to concerns about the Plant's impacts on air quality. (See Section 1.3.3.) On August 24, 2005, DOE received an Emergency Petition and Complaint from the District of Columbia (D.C. or District) Public Service Commission (DCPSC 2005). That petition requested DOE to direct Mirant to continue operation of the Plant. The basis for the petition was that shutdown of the Plant reduced the reliability of the electrical supply (Section 1.3.1) to much of the central business district of the District of Columbia, many Federal institutions, the Georgetown area in D.C., other portions of Northwest D.C., and the D.C. Water and Sewer Authority's Blue Plains Wastewater Water Treatment Plant (collectively referred to herein as the "Central D.C. area"), placing these electrical customers at risk of a blackout (DCPSC 2005).

After receiving the petition from the D.C. Public Service Commission, DOE undertook an exhaustive review of the facts. (See Section 1.3.3 for a detailed history.) Based on this

Entities involved in delivering power in the Central D.C. area

Mirant owns and operates electrical power generating plants, including the Potomac River Generating Station in Alexandria, Virginia.

Potomac Electric Power Company (Pepco) owns and operates transmission lines and is responsible for supplying electricity to retail customers in D.C. and parts of Maryland.

PJM Interconnection, LLC (PJM) is the transmission organization responsible for coordinating the regional electric power grid and wholesale electricity market in D.C., Maryland, Virginia, Delaware, New Jersey, West Virginia, and parts of Indiana, Illinois, Kentucky, Michigan, Ohio, Pennsylvania, and Tennessee. PJM keeps the electricity supply and demand in balance by telling power producers how much power to generate.

[1] Section 202(c) of the FPA vests in the Secretary of Energy the authority to issue an order when "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 the fuel or water for generating facilities, or other causes..." [16 U.S.C. Section 824a(c)]

extensive evaluation, the Secretary of the Energy on December 20, 2005, issued Order 202-05-03 (the "DOE Order") directing Mirant to generate electricity at the coal-fired Plant under certain, limited circumstances.

DOE is issuing this SEA in compliance with the "alternative arrangements" plan agreed upon with the Council on Environmental Quality (CEQ) pursuant to 40 CFR 1506.11. This SEA covers a period of about 24 months beginning with the issuance of the Order. The time period for DOE's original Order ended at 12:01 am on October 1, 2006; on September 28, 2006, the Secretary of Energy extended the Order for two months, until 12:01 am on December 1, 2006. However, this SEA covers the full 24-month period at the end of which the Potomac Electric Power Company (Pepco) (text box) expects to have completed construction of new transmission lines that will provide additional electrical service to customers in the Central D.C. area.

1.2 Purpose and Need for Agency Action

The purpose and need for DOE's action was to respond to the emergency reliability situation that had been brought on by shutdown of operations at the Mirant Potomac River Generating Station.

1.3 Background

1.3.1 Electrical Reliability

The Plant has been operating since 1949. It is one of three sources that provide electricity to Central D.C. area customers. The other sources are two 230,000-volt (230-kV) transmission lines that deliver electricity from other regional generating sources. Two additional generating stations exist in close physical proximity to the Central D.C. area, but they are not connected by transmission lines that allow the electricity they produce to be delivered to that area. Thus, if the Plant is not available to generate electricity and one of the two transmission lines serving the Central D.C. area goes out of service, electricity would be supplied to that area by only the one remaining transmission line. Should the remaining line fail for any reason, a potentially extended blackout would occur in the Central D.C. area. If both lines are down and one of them could not be brought back into service immediately, it would take at least 28 hours to bring the Plant into full operation, during which time much of the Central D.C. area would be without electricity. Transmission line outages can be either planned in order to perform periodic maintenance or unexpected. The duration of an outage can be several days or weeks for maintenance or up to several weeks in the event of a major, unexpected equipment failure.

An important consideration in issuing the Order was the facilities and functions that would be adversely affected by an extended blackout. The Central D.C. area includes facilities of

all three branches of the U.S. government that are critically important to the Nation's national security, law enforcement, and regulatory functions. The Central D.C. area also includes hundreds of thousands of residents and workers and many public safety and protection facilities (e.g., hospitals, police and fire stations). Moreover, within 24 hours of a Central D.C. blackout the Blue Plains Wastewater Treatment Plant would begin to discharge untreated sewage into the Potomac River. Thus, an extended blackout would severely impact critical portions of the Nation's government with potentially adverse national effects. It would also result in hardship and potential physical risk to many people from loss of heat or cooling, elevator outages, medical equipment failure, and other causes.

In 2005 Pepco received permission from the D.C. Public Service Commission to construct two additional 230-kV lines that would supply electricity to the Central D.C. area and two new 69-kV lines that would supply electricity to the Blue Plains Wastewater Treatment Plant. The two 69-kV lines have since been constructed. Once the new 230-kV lines are completed, these lines will provide a high level of electricity reliability in the Central D.C. area, even in the absence of production from the Plant. However, it could be mid- to late-2007 before the new lines are installed and operating. Pepco's schedule for completing installation of the new transmission lines has the lines going into service in June 2007.

1.3.2 Environmental and Health Issues

Residents in the area of the Plant have been concerned about the environmental and health impacts of its air emissions for years (SPROL 2005). However, the D.C. Public Service Commission, Pepco, and PJM Interconnection, LLC (PJM) (text box) have contended that there were no actual monitored exceedances of the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act (CAA) during the Plant's operation in the period before Mirant shut it down on August 24, 2005, and that operation of the Plant at full power at any time during that period did not exceed the emissions limits contained in the Plant's operating permit (DOE Order 202-05-03).

1.3.3 Detailed History

This section describes the actions taken by DOE in relation to the DOE Order and to the Plant. Table 1.3-1, at the end of the section, provides a more complete chronology of the major actions and events related to the DOE Order and the Plant.

Mirant and the Virginia Department of Environmental Quality (VDEQ) entered into an Order by Consent on September 23, 2004. Under that order Mirant performed a dispersion modeling analysis to assess the effect of downwash[2] of air emissions from the Plant and to

[2] The September 23, 2004, judicial consent decree (EPA 2004) defined downwash as "the effect that occurs (continued...)

determine whether the Plant could cause or contribute to significant localized exceedances of the NAAQS (ENSR 2005). This study, known as the downwash study, used computer modeling to predict ambient concentrations of pollutants emitted by the Plant under certain weather and atmospheric conditions.

Mirant submitted the results of the downwash study to the VDEQ in August 2005. After reviewing the study, VDEQ sent Mirant a letter dated August 19, 2005, stating that the modeling results showed that under certain atmospheric conditions the Plant's operations could result in, cause, or substantially contribute to modeled violations of the NAAQS for sulfur dioxide (SO_2), oxides of nitrogen (NO_x), and particulate matter with an aerodynamic diameter less than or equal to 10 µm (PM_{10}).

In its August 19, 2005, letter the VDEQ requested "that Mirant *immediately* undertake such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station, including the potential reduction of levels of operation, or potential shutdown of the facility." (emphasis in original)

In response to the letter from the VDEQ, Mirant chose to shut down all five of the generating units at the Plant on August 24, 2005.

On August 24, 2005, the D.C. Public Service Commission filed an Emergency Petition and Complaint with DOE that requested DOE to issue an emergency order directing Mirant to continue operation of the Plant in order to prevent the risk of a blackout in the Central D.C. area (DCPSC 2005). The Commission also requested that the Federal Energy Regulatory Commission (FERC) issue a similar order under Sections 207 and 309 of the FPA.

Mirant then completed a refined computer modeling study using more realistic scenarios that indicated that the Plant could operate, in a limited fashion, within air quality standards. Thus, on September 21, 2005, Mirant restarted only Unit 1 at the Plant. From that date until the DOE Order was issued, Mirant operated that unit on an 8-8-8 basis – that is, in any given 24-hour period, the unit ran for up to eight hours at its maximum level, ran for eight hours at its minimum level, and did not run for eight hours. Mirant also experimented during this period with using trona (i.e., sodium sesquicarbonate, a naturally occurring substance similar to baking soda) or low-sulfur Colombian coal[3], alone or in combination, to control SO_2 emissions in order to determine if such changes would allow simultaneous operation of more than one unit without causing NAAQS exceedances.

---

[2] (...continued)
when aerodynamic turbulence induced by nearby structures causes pollutants from an elevated source (such as a smokestack) to be mixed rapidly towards the ground resulting in higher ground-level concentrations of pollutants."

[3] During its experiments with low-sulfur coal from Colombia, Mirant determined that the higher moisture content in this type of coal created multiple operational problems. For example, the Plant was unable to dry the coal sufficiently for the coal pulverizers to maintain adequate throughput rates, and the moisture resulted in reduced efficiency of both the combustion and the heat transfer processes. For these reasons after its initial test of Colombian coal, Mirant decided not to use it any further.

After receiving the Commission's petition, DOE conducted an independent examination of the electricity reliability situation in the Central D.C. area and analyzed the Plant's role in ensuring a reliable supply of electricity to that area (Kirby and Kueck 2005). DOE also consulted with Federal and state officials responsible for environmental compliance (e.g., EPA shared information with DOE regarding NAAQS modeled results and other environmental issues at the Plant) and private entities responsible for electricity transmission. DOE's investigation found that the Plant must be available to run when one of the 230-kV lines is out of service in order to maintain a minimally reliable electric power system, because outage of the remaining line could result in a blackout of the Central D.C. area. DOE's investigation also found that the Plant should be operated in such a way as to minimize the amount of time needed to bring it into full operation to be better able to meet electric reliability needs quickly whenever one of the two 230-kV transmission lines was unexpectedly removed from service.

After DOE's investigation, on December 20, 2005, the Secretary issued the Order stating:

> I find that in the circumstances presented here, an emergency exists that justifies the issuance of a section 202(c) order. My determination is not based on any single factor, but on the combination of all relevant facts and circumstances. In particular, I find that an emergency exists because of the reasonable possibility an outage will occur that would cause a blackout, the number and importance of facilities and operations in our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violates applicable reliability standards.

DOE's Order directed Mirant to generate electricity at the Plant under certain, limited circumstances and to do so in such a way as to minimize adverse environmental impacts. The Order required Mirant to (1) operate the Plant to produce the amount of power (up to its full capabilities) needed to meet demand in the Central D.C. area during any period in which one or both of the 230-kV lines serving the Central D.C. area were out of service and (2) in situations when both lines are functioning, keep as many generating units in operation and take all other measures to reduce the start-up time of units not in operation, without regard to cost and without causing or significantly contributing to any exceedance of the NAAQS, in order to provide electrical reliability to the Central D.C. area. The Order also required Mirant to submit a plan to DOE within ten days indicating how it would comply with the Order. (See Appendix A for the full text of the Order.)

On December 30, 2005, as required by the DOE Order, Mirant submitted a plan describing how it would comply with the Order. The plan outlined a proposed temporary phase and two options for a proposed intermediate phase: Option A and Option B. All proposals included the use of trona and/or low-sulfur coal to manage air emissions. Mirant stated in its compliance plan that "Option A results in no modeled NAAQS exceedances." Mirant also stated

that "Option B offers dramatically better reliability than Option A, but results in a marginal computer-modeled exceedance of the 24-hour NAAQS for [SO_2], although the 3-hour and annual NAAQS for SO_2 are met. Moreover, that exceedance was modeled to occur infrequently in the course of a year and only on the top floor balconies and the roof of the Marina Towers condominium..." After reviewing Mirant's compliance plan, DOE instructed Mirant on January 4, 2006, to "immediately take the necessary steps to implement Option A." Between January and May, the Department continued to weigh other options that were available to Mirant to comply with the DOE Order.

On June 1, 2006, Mirant entered into an Administrative Compliance Order (ACO) with EPA regarding operation of the Plant. (See Appendix B.) On June 2, 2006, DOE concluded that operation of the Plant under Option A did not provide an adequate level of electric reliability to the Central D.C. area and that operation of the Plant pursuant to the ACO was necessary to assure an adequate level of electric reliability to the Central D.C. area. Mirant has since that time operated the Plant in accord with those instructions from DOE. Since June 2, 2006, the operation of the Plant under the Order thus followed the scheme summarized in the following paragraphs. (See Section 4.1 for details.) The ACO will expire one year after it was issued, on June 1, 2007.

During "non-line outage situations" the operation of the Plant must follow the ACO, under which Mirant is to "keep as many units in operation," and "take all other measures to reduce start-up time of units not in operation, for the purpose of providing electricity reliability so long as such operations are in accordance with paragraph B of Part IV of the ACO." Among other things, paragraph B authorizes operation in accordance with "daily predictive modeling." Under daily predictive modeling, the Plant operators acquire the appropriate weather forecast for the next day and use that forecast, along with their planned operating parameters, as inputs to conduct a computer modeling run for the following day's planned operation. If the modeling results indicate that operating the Plant under those conditions would not cause a modeled NAAQS exceedance for 3-hr and 24-hr average SO_2 and PM_{10}, the operators may run the Plant on that day using those parameters. If the modeling results indicate that operation of the Plant would cause an exceedance of these NAAQS, the operators adjust their planned operating parameters until the modeling results indicate compliance with the NAAQS. The operators may then operate the Plant using those parameters. Thus, under this scenario the Plant can operate on any one day up to the maximum level allowed by the preceding day's weather forecast.

The ACO requires Mirant to maintain alarms that alert the Plant operators if monitored average concentrations reach 80% of the standards for SO_2, including the annual SO_2 standard. In addition, the ACO requires Mirant to install and operate six new SO_2 ambient monitoring stations in the vicinity where elevated pollutant concentrations have been predicted and to conduct actual monitoring of ambient SO_2 concentrations.

During "line outage situations," the ACO places environmental requirements on Mirant in addition to the requirements of the DOE Order. It requires Mirant to "take all reasonable steps to limit the emissions of PM_{10}, NO_x and SO_2 from each boiler, including operating only the number of units required to meet PJM's directive and optimizing its use of trona injection to

minimize SO_2 emissions." Further, the ACO requires that Mirant achieve "80% reduction of SO_2 emissions unless: 1) Mirant demonstrates ... that 80% reduction is not necessary to achieve compliance with the NAAQS; or 2) Mirant demonstrates that 80% reduction is not logistically feasible because of such factors as the quantity of available trona and the predicted duration of the outage." If Mirant demonstrates that 80% removal is not logistically feasible, it is required to submit a plan to EPA for optimizing its use of trona.

On September 28, 2006, DOE issued an extension of the Order, including all of its terms and conditions, until 12:01 am on December 1, 2006.

Table 1.3-1. Chronology of major actions and events related to the Plant

Date	Agencies and other companies	Mirant; Potomac River Generating Station
2004		
September 23	Effective date of Order by Consent between VDEQ and Mirant	
2005		
until August 20		Historical operations; ***Pre-shutdown mode for this SEA***
August 19		Mirant submitted emissions modeling study to VDEQ
August 19	VDEQ requested Mirant to immediately undertake actions to protect human health and environment around the Plant	
August 21		Output at Plant reduced to lowest feasible level from all five units
August 24		Operations at the Plant ceased
August 24	D.C. Public Service Commission filed emergency petition and complaint with DOE and FERC	
September 21		Unit 1 (one of the two load-following or cycling units) restarted on an 8-8-8 basis[3]
September 21 - November 11		Unit 1 operated on an 8-8-8 basis

[3] That is, in any given 24-hour period, the unit ran for up to eight hours at power levels up to its maximum level of 88 MW, ran for eight hours at its minimum level of 35 MW, and did not run for eight hours.

Table 1.3-1. Chronology of major actions and events related to the Plant

Date	Agencies and other companies	Mirant; Potomac River Generating Station
November 11 - November 23		Unit 1 operated on an 8-8-8 basis with trona testing
November 24 - December 14		Unit 1 operated on an 8-8-8 basis with Colombian coal testing, but without trona
December 15 - December 20		Unit 1 operated on an 8-8-8 basis with Colombian coal and trona testing; ***Pre-Order mode for this SEA***
December 20	DOE consulted with CEQ	
December 20	The Secretary of Energy issued emergency order requiring Mirant to operate the Plant to assure a reliable supply of electricity to central Washington, D.C.	
December 21- December 23		Plant operated as during December 15 - December 20 period
December 22	DOE consulted with CEQ	
December 24		No data available on Plant operations
December 25 - December 31		Unit 1 operated without using low sulfur coal or trona
December 30		Mirant submitted its compliance plan (also known as the Operating Plan) to DOE identifying two options, A and B
2006		
January 1		No data available on Plant operations
January 2 -3		Unit 1 operated without using low sulfur coal or trona
January 4	DOE instructed Mirant to implement proposed Option A in compliance plan	Plant began to operate under conditions in Option A in compliance plan; Plant continued to operate under Option A until June 2 except during transmission line outages (indicated below).

Table 1.3-1. Chronology of major actions and events related to the Plant

Date	Agencies and other companies	Mirant; Potomac River Generating Station
January 6	PJM specified that it was necessary for Mirant to operate the Plant to meet entire Central D.C. load during transmission line outages Pepco proposed for January 7 - 19 and 22 - 27 for maintenance.	
January 7 - 19		Plant operated to meet entire Central D.C. load during line maintenance.
January 13	DOE consulted with CEQ	
January 17	DOE consulted with CEQ	
January 20	DOE issued *Federal Register* notice describing its emergency action and requesting comments on scope of the SEA.	
January 21		A second trona unit became operational
January 21 - 28		Plant operated to meet entire Central D.C. load during line maintenance.
February 21	End of comment period on *Federal Register* notice	
March 6	Pepco receives permission from the D.C. Public Service Commission to construct two new 230-kV lines into the D.C. area and two new 69-kV lines to serve the Blue Plains Wastewater Treatment Plant	
March 20		Third trona unit became operational
March	U.S. Department of Health's Agency for Toxic Substances and Disease Registry began a review of the existing air quality and other environmental data related to the Plant, as requested by the Director of the Alexandria Health Department.	
May 31		All five trona units operational
June 1	EPA issued an ACO to Mirant	
June 2	DOE instructed Mirant to comply with the ACO with EPA	

Table 1.3-1. Chronology of major actions and events related to the Plant

Date	Agencies and other companies	Mirant; Potomac River Generating Station
June 20		Operation began in accordance with daily predictive modeling
July 15	Pepco places two newly constructed 69-kV lines into service at the Blue Plains Wastewater Treatment Plant	
September 28	The Secretary of Energy extended emergency order for two months	
October 1	DOE Order was scheduled to expire at 12:01 am	
November 27 - December 11	Pepco plans transmission line outage for repairs	Full Plant generation will be required to meet central D.C. predicted load because of Pepco line repairs.
December 1	Extension to DOE Order expires at 12:01 am	
2007		
February 19 - March 5	Pepco plans transmission line outage for upgrades	Full Plant generation will be required to meet Central D.C. predicted load because of Pepco line upgrades.
May 2 - 15	Pepco plans transmission line outage for upgrades	Full Plant generation will be required to meet Central D.C. predicted load because of Pepco line upgrades.
May 21 - June 15	Pepco plans transmission line outage for upgrades	Full Plant generation will be required to meet Central D.C. predicted load because of Pepco line upgrades.
June 1	The ACO expires.	
late June	Pepco plans to have two new 230-kV transmission lines in service	.
Fall		Mirant plans to take units out of service to reconfigure the exhaust stacks.

1.4 National Environmental Policy Act (NEPA) Process

Major Federal actions significantly affecting the human environment generally call for DOE to prepare an environmental impact statement (EIS) before taking the action to analyze

impacts in compliance with NEPA. However, in emergency situations, pursuant to 40 CFR 1506.11, the CEQ's NEPA regulations provide that agencies consult with CEQ to determine what alternative arrangements the agency will take in lieu of preparing an EIS. DOE consulted with CEQ on December 20, 2005, December 22, 2005, January 13, 2006, and January 17, 2006, on a plan for alternative NEPA arrangements. Under this plan (71 FR 3279, January 20, 2006) DOE agreed to:

- Prepare a SEA to examine the potential impacts resulting from issuance of the Order and describe further DOE decision-making regarding reasonable future alternatives;
- Provide opportunities for public involvement;
- Continue to consult with EPA and the VDEQ concerning information on emissions, modeling results, potential mitigation measures, and any changes in the operation of the Plant; and
- Identify in the SEA steps that could be taken to mitigate any impacts from the DOE Order.

Consistent with the consultations with CEQ, DOE has prepared this SEA.

1.5 Public Involvement

As described above, on January 20, 2006, DOE published a *Federal Register* notice (71 FR 3279) (Appendix C) in which DOE described the action it had taken under the Order and reported its discussions with CEQ and its agreement to issue an SEA as part of its alternative arrangements for NEPA compliance.

DOE also used that *Federal Register* notice to request public comments on the information in the notice, as well as on issues to be addressed in the SEA. The comment period closed on February 21, 2006. DOE received comments from the following organizations: the Mount Vernon group and the Virginia Chapter of the Sierra Club; the Southern Environmental Law Center on behalf of itself and the American Lung Association of Virginia ; the City of Alexandria; and the Institute for Public Representation on behalf of the Potomac Riverkeeper, Inc., the Patuxent Riverkeeper, and the Anacostia Riverkeeper at Earth Conservation Corps. These comments are posted on the DOE website described below. Commentors identified many of the same issues that DOE had determined should be covered in the SEA. Section 1.6 describes where these issues are addressed in this document.

DOE maintains a website containing information (under DOE Docket EO-05-01) about the D.C. Public Service Commission Petition, its proceedings, and the DOE Order itself: http://www.oe.energy.gov/permitting/372.htm. This website also provides links to correspondence related to the petition and the Order, as well as the *Federal Register* notice and the comments received on that notice.

1.6 Scope of the Analysis

Based on its own evaluation of potential impacts and the concerns expressed by commentors, DOE has analyzed the below effects of Plant operations under the Order in the indicated sections of this SEA. Cumulative effects are discussed as appropriate in each section as described at the beginning of Section 4.3.

- Effects of any increased *air emissions* (Section 4.3.1);
- *Health* effects on Plant workers and the public of any increased air pollution; commentors on the DOE *Federal Register* notice expressed particular concern about impacts of increased particulate emissions, especially particulate matter smaller than 2.5 microns ($PM_{2.5}$), and of increased emissions of trace metals and hazardous air pollutants (especially arsenic, beryllium, lead, chromium, cadmium, nickel, and mercury) (Section 4.3.2);
- *Water quality* (Section 4.3.3) and *ecological* (Section 4.3.4) effects due to changes in Plant water use and releases or any increased deposition of air pollutants on soil and terrestrial communities, water bodies, and watersheds; commentors on the DOE *Federal Register* notice expressed concern about the potential for any increased emissions of SO_2 and NO_x to contribute to acid rain, nutrient loading to aquatic systems, and deposition of heavy metals, and the subsequent impacts on the aquatic resources of the Chesapeake Bay and several of its tributaries, specifically the Potomac, Anacostia, and Patuxent rivers;
- *Waste management* impacts (Section 4.3.5), particularly impacts of trona utilization, which commentors on the DOE *Federal Register* notice identified as a concern;
- *Transportation impacts* from increased shipping of coal and trona to the Plant and of wastes away from the Plant (Section 4.3.6); and
- *Environmental justice* impacts (Section 4.3.7).

This SEA also describes alternatives for potential future decision-making that include mitigation measures should the Order be further extended. Among these are several measures suggested by commentors on DOE's *Federal Register* notice on the proposal to prepare this SEA and parties commenting on the Order itself.

Because of the limited nature of the action, certain types of impacts that are usually analyzed in NEPA documents are not addressed.

- Because there would be no construction outside the footprint of the existing facility, no impacts to *land use, soil structure, floodplains,* or *aesthetics* are expected.
- Because only very small amounts of construction and employment are associated with the changed operations at the Plant, no appreciable effects on *social* or *economic resources* are anticipated.

A commentor expressed concern about possible adverse effects of trona utilization on Plant equipment. This concern is not addressed because it is not considered to be an environmental impact.

2. DESCRIPTION OF THE MIRANT POTOMAC RIVER GENERATING STATION

The Plant, which has been operating since 1949, was acquired by Mirant Potomac, Inc in 2000. It is located in Alexandria, Virginia, on the western bank of the Potomac River near the District of Columbia, about 5 miles (8 km) south-southwest of the U.S. Capitol building. (See Figure 2-1.) It is almost directly across the river from the Blue Plains Wastewater Treatment Plant and near Ronald Reagan Washington National Airport. Two National Park Service sites, the George Washington Memorial Parkway, developed both as a memorial to George Washington and to preserve the natural scenery along the Potomac River (NPS undated), and the Mount Vernon Trail (Figure 3.4-1), run past the Mirant Plant.

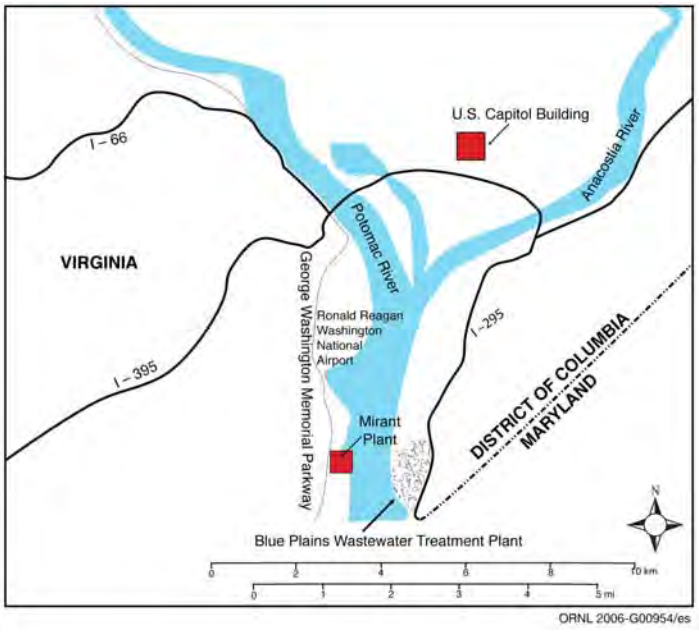


Figure 2-1. The location of the Plant in relation to the central Washington, D.C. area.

The site occupies approximately 28 acres (11 ha) and was relatively remote when the power plant was built. Alexandria has, however, grown up around it, and residential areas are now located immediately adjacent to the Plant. (See Figure 2-2.)

2.1 Site Layout

The footprint of the Mirant Plant is typical for a coal-fired electricity generation facility (see Figure 2.1-1), consisting of a large coal pile and a set of five steam generating boilers. The Plant has five stacks, each 161 ft (49 m) high (Mirant 2006a).

2.2 Plant Equipment and General Operation

The Plant consists of five steam boilers and associated generators with a net generating capacity of 482 megawatts (MW) of electricity for delivery to Central D.C. area customers. Units 1 and 2 are designed to be capable of load-following or cycling; that is, they are capable of changing power levels quickly as demand rises or falls. These units each have a generating capacity of 88 MW (with an operating range of 35 MW to 88 MW). Units 3, 4, and 5 are

designed for baseload operation; that is, they are intended to generate power at a steady rate for extended periods, typically 24 hours per day, and have historically been used more than Units 1 and 2 (Mirant 2006a). Units 3, 4, and 5 each have a generating capacity of 102 MW (with an operating range of 35 MW to 102 MW).

The facility uses oil to pre-heat units during startup and then burns coal. The Plant receives coal by rail car delivered by the CSX Railroad. (See Figure 2.1-1.) The rail cars are unloaded at a dedicated rail siding at the Plant. Typical plant operations involve unloading the rail cars and feeding some coal directly into the boiler building; additional coal is stored on-site in an outdoor coal pile with a capacity of 135,000 tons (122,000 metric tons). The coal storage yard occupies 4 acres (2 ha) and has an average coal-pile height of about 30 ft (9 m). Diesel-fueled bulldozers move the coal around the footprint of the coal pile, and a conveyor system transfers coal from the coal pile into the boiler building. The coal is pulverized in the boiler building and sized for injection into the five boilers. Steam is then piped from the boilers into the turbine building where the generators produce electricity.

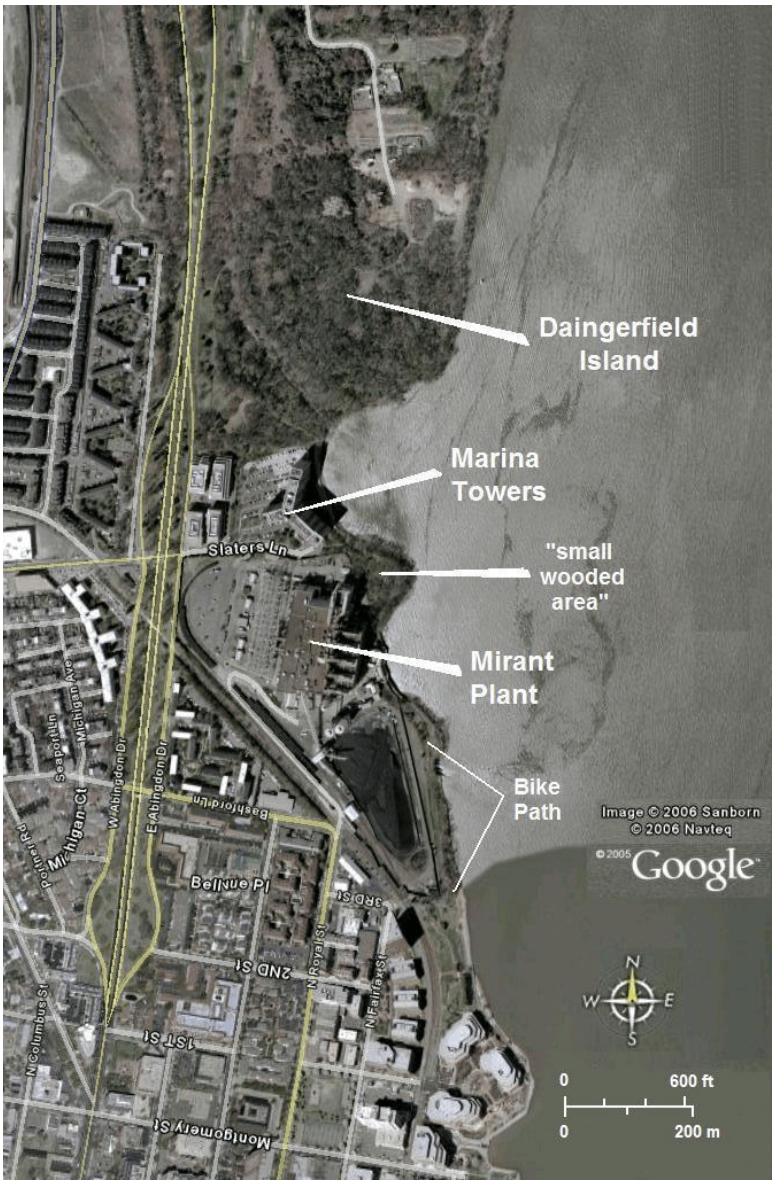


Figure 2-2. Aerial photo showing the Plant and surrounding residences.

Flue gases from each of the five boiler units exhaust to the atmosphere through separate, dedicated stacks. (See Figure 2.1-1.) Pollution abatement equipment at the Plant consists of hot- and cold-side electrostatic precipitators for each boiler unit. These precipitators remove solid particulate matter, called fly ash, from the exhaust gas streams. The fly ash collected by the precipitators is stored in a pair of on-site silos prior to being shipped by covered truck for off-site

disposal. Bottom ash from the boilers is collected and stored in a silo prior to being shipped off-site for beneficial use. (See Section 2.4.3)

The Plant also has trona injection units for each of the five boiler units. Each trona injection unit consists of 8 or 10 injection nozzles in the outlet duct from the boiler economizer to the hot-side precipitator inlet. Each injection unit is capable of injecting trona at a rate of up to 12,000 lb/hour (5,500 kg/hour), which Mirant's study determined to be sufficient to remove 80% of SO_2 from flue gas (Mirant 2006c). At maximum capacity the trona injection units on all five boilers can utilize a total of 25 tons (23 metric tons) of trona per hour to remove about 80% of SO_2 from flue gases. Trona is delivered to the site in 100-ton (91-metric ton) railcars shipped directly from the mine in Green River, Wyoming. Trona is fluidized and transferred pneumatically from the railcars to a 35-ton-capacity (32-metric ton-capacity) trona feed trailer adjacent to each boiler. Trona is transferred pneumatically to the boiler unit outlet duct where it is injected.

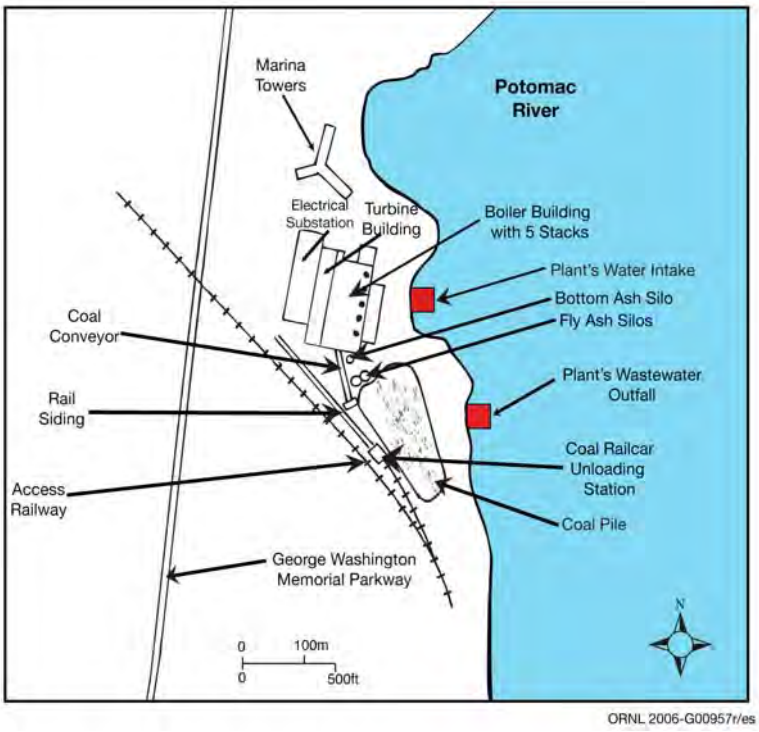


Figure 2.1-1. The site layout of Mirant's Potomac River Generating Station.

The Plant has a once-through cooling water system. Raw water is pumped from the Potomac River through a 1,250-ft^2 (116-m^2) rectangular intake area located on the river bottom along the shoreline, about 10 ft (3 m) below the water surface (Personal communications between D. Cramer, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 12, 2006, and between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006). The intake area is made up of 10 intake bays (two for each of the boiler units), each of which is 13.5 ft (4.1 m) long by 9 ft (3 m) wide and equipped with a 30,000-gal/min (about 100 m^3/min) pump (Personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006). Mirant installed new fine-mesh screens on the intakes in July and August 2005. One screen on an intake for Unit 1 is fitted with "fish buckets" for enhanced fish protection. All screens, with or without the enhanced system of fish recovery, facilitate the return of fish to the river south of the power plant intake. After removing debris and suspended solids, the Plant uses this water to cool condensers and auxiliary equipment associated with steam turbines (Mirant 2006b). Major water

treatment equipment includes a clarifier, settling pond, neutralization system, and an oil/water separator.

2.3 Resource Requirements

The Plant primarily uses three resources: coal, trona, and water. Each of these is discussed separately in this section.

In the period prior to August 24, 2005, the Plant typically used an average of about 2,280 tons (2,050 metric tons) of coal per day. Operation at full capacity could require up to 5,150 tons (4,670 metric tons) of coal daily. The Plant normally used central Appalachian coal with a heating value of about 12,000 Btu/lb, an ash content of about 14%, a sulfur content of 0.64% by weight, and a carbon content about 67% by weight.

Analyses of coal burned in 2003 indicates that the average mercury content was between 0.03 and 0.07 ppm (dry). DOE conservatively assumes that the coal consumed by Mirant contains 0.07 ppm mercury on average, or about 1.4 lb (0.6 kg) mercury per 1,000 tons (910 metric tons) of coal.

The coal data that Mirant provided to DOE did not include concentrations of toxic metals other than mercury. Table 2.3-1 presents some published data on concentrations of seven trace metals in other central Appalachian coals. These analyses provide an approximate indication of levels that may be present in the central Appalachian coal burned by the Plant.

Table 2.3-1. Ranges of values for trace metal concentrations in as-mined samples of Appalachian coals

Trace metal	Reported concentrations (mg/kg)
Arsenic	7 – 23
Cadmium	ND – 0.2
Lead	15 – 24
Selenium	ND – 2.9
Beryllium	1 – 2
Chromium	30 – 63
Nickel	18 – 34

ND = below quantitation limit
Source: Palmer et al. 1997.

Trona consumption is determined by the target for SO_2 removal. Theoretical calculations show that if trona reacted completely with SO_2 in the hot-side precipitator inlet gas, 2.354 parts by weight of trona would be required to react with each part by weight of SO_2 (e.g., 2.345 lb trona per lb of SO_2). However, testing by Mirant found that much larger quantities of trona must be used in order to achieve desired SO_2 removal rates. Addition of trona to the exhaust gas stream at five times the theoretically calculated rate was found to remove 80% of the SO_2 (Mirant 2006c). For typical coal burned at the Plant, removal of 80% of SO_2 would require 0.15 lb of trona per lb of coal burned (1 lb trona per 6.7 lb coal). Because Mirant does not operate the Plant to achieve 80% SO_2 removal most of the time, average trona consumption is about 1 lb for every 8.5 lb of coal consumed (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Water withdrawals from the Potomac River for cooling water and other in-plant uses are estimated to be about 1% higher than discharges (Personal communication between A. Wearmouth and D. Cramer, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 14, 2006). Therefore, based on discharges (Section 2.4.2), withdrawals are estimated to have averaged somewhat less than 350 million gal/day (1.3 million m^3/day) under pre-shutdown operating conditions (prior to August 24, 2005).

2.4 Waste and Effluents

2.4.1 Air Emissions

The VDEQ approved a Stationary Source Permit to Operate on September 18, 2000, and a Phase II Acid Rain Permit on February 28, 2003. The Stationary Source Permit limits NO_x (as NO_2) emissions to 0.38 lb/MBtu. The EPA judicial consent decree, as amended (EPA 2004, 2006g), requires Mirant to limit Plant total NO_x emissions during the May 1 to September 30 period each year to 1,600 tons (1,500 metric tons) through 2009, among other things. The Acid Rain Permit allocates annual allowances for air emissions of SO_2 during its effective period of January 1, 2003, through December 31, 2007. SO_2 allowances for individual generating units range from 2308 to 3036 tons/year and total 13,344 tons/year for all units combined; in addition, the permit authorizes Mirant to acquire SO_2 allowances from other sources. The Acid Rain permit also limits emissions of NO_x, but the limitation on NO_x is less restrictive than the limit in the Stationary Source Permit.

The coal burned at the Plant averages about 67% by weight carbon. On a day when the Plant consumed 2,280 tons (2,050 metric tons) of coal, as it typically did in the period prior to August 24, 2005, it released about 11 million lb (5,600 tons) of CO_2.

2.4.2 Water Effluents

Plant effluents, including cooling water, boiler blowdown, runoff from the coal pile and fly ash handling areas, and other storm water runoff, are discharged to the Potomac River under National Pollutant Discharge Elimination System (NPDES) permit DC0022004. This permit was last issued for a 5-year duration in 2000 and expired in 2005. Mirant applied for renewal in 2004 (Wearmouth 2004), and the existing permit remains in force while EPA considers the application for renewal (Capacasa 2005). According to the renewal application (Wearmouth 2004), under historical operating conditions discharge under this permit averaged almost 345 million gal/day (1.3 million m^3/day), of which all but about 0.4 million gal/day (1,500 m^3/day) was once-through cooling water.

Boiler blowdown and effluent from treatment (i.e., demineralization) of intake water are treated by sedimentation and neutralization. Before being mixed with other wastewaters, they are monitored (in accordance with permit requirements) for flow rate, pH, total suspended solids, and oil and grease to verify that concentration limits in the permit are met. Ash clarifier system wastewater and runoff from the coal pile and fly ash handling areas are treated by rapid mixing, flocculation, and precipitation. They are monitored for the same set of parameters prior to mixing with other wastewaters. Once-through cooling water and storm water runoff from uncontaminated areas are blended with the treated effluents and discharged without additional treatment. No chlorine or other chemicals are added to the cooling water or used in the Plant's other water processes.

The NPDES permit requires monitoring of flow rate and other parameters at several internal monitoring points and at outfalls. Mirant submits monthly reports with the monitoring data to EPA and the Washington, D.C. Department of Health (Mirant 2006b). The Plant's primary wastewater outfall is subject to permit limits on pH, total residual chlorine, thermal output, and temperature rise in the river. Heat discharge in cooling water is limited to 4,286 MBtu/hr. Temperature rise in the river is limited to 2.8°C above ambient temperature and a maximum temperature of 32.2°C beyond a 1,000-ft (300-m) radius of the discharge point when the ambient river temperature is less than 27.8°C and beyond a 1,600-ft (490-m) radius when the river temperature is warmer than 27.8°C. Mirant conducted temperature surveys in the river in 2001 that confirmed that heat discharge from the Plant does not cause exceedance of these temperature limits, so temperature monitoring in the river is not required (Mirant 2002, NPDES permit document, and personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 14, 2006).

Table 2.4-1 lists reported concentrations of selected contaminants in the Plant's cooling water intake and in effluent from the outfall that receives cooling water and treated wastewaters from demineralization, boiler blowdown, coal pile runoff, and fly ash handling. The table includes data for many parameters that are not listed in the Plant's NPDES permit. The near-neutral effluent has higher levels of biochemical oxygen demand, suspended solids, nitrate and nitrite, sulfate, aluminum, iron, manganese, copper, and fecal coliform bacteria than the intake

water, while loadings of chemical oxygen demand, total organic carbon, residual chlorine, phosphorus, and phenols are decreased in the effluent compared with the intake water.

Table 2.4-1. Water quality of Plant intake water and cooling water effluent

Contaminant	Intake Concentration (mg/L)	Effluent Concentration (mg/L, except as indicated)
Biochemical oxygen demand	9.6	14
Chemical oxygen demand	22	21
Total organic carbon	4.7	4.3
Total suspended solids	24	39
Fecal coliform bacteria	27	110
pH (pH units)	—	7.6
Chlorine, total residual	0.15	0.05
Fluoride	0.20	0.12
Nitrate-Nitrite as N	1.1	1.2
Nitrogen, total organic	ND	ND
Phosphorus	0.076	0.060
Sulfate	33	37
Aluminum	0.75	1.4
Iron	0.86	1.5
Manganese	0.11	0.13
Copper	ND	0.013
Zinc	0.023	0.023
Phenols, total	0.015	0.014

ND = Not detected
— = Not reported
Source: Wearmouth 2004; These values are from a single set of measurements and may not be representative.

2.4.3 Solid Wastes

The Plant's principal solid wastes are fly ash collected from exhaust gases and bottom ash from the boilers. (See Section 2.2.) Under pre-shutdown operating conditions prior to August 24, 2005, reported fly ash generation totaled about 14,200 tons/month (12,900 metric tons/month), equivalent to about 20% of coal consumption. Bottom ash generation equals about 25% of the fly ash generation (Personal communications between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006; and between D.

Cramer, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 12, 2006, and July 14, 2006).

Fly ash is sent by covered truck to the Brandywine Fly Ash Facility, a landfill located in southeastern Prince George's County, Maryland (Figure 2.4-1), that is owned and operated by Mirant Ash Management LLC and used solely for disposal of coal combustion ash. (See Section 3.5.) Plant fly ash is marketed for beneficial use, primarily for structural fill, but historically its utilization has been very limited (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006). The fly ash generated by the Plant under historical operating conditions is a pozzolanic material (that is, when mixed with water it "sets," like cement), but its unburned carbon content is too high to permit its use as a cement substitute (TFHRC undated). Bottom ash from the Plant is used or sold for purposes such as road fill.

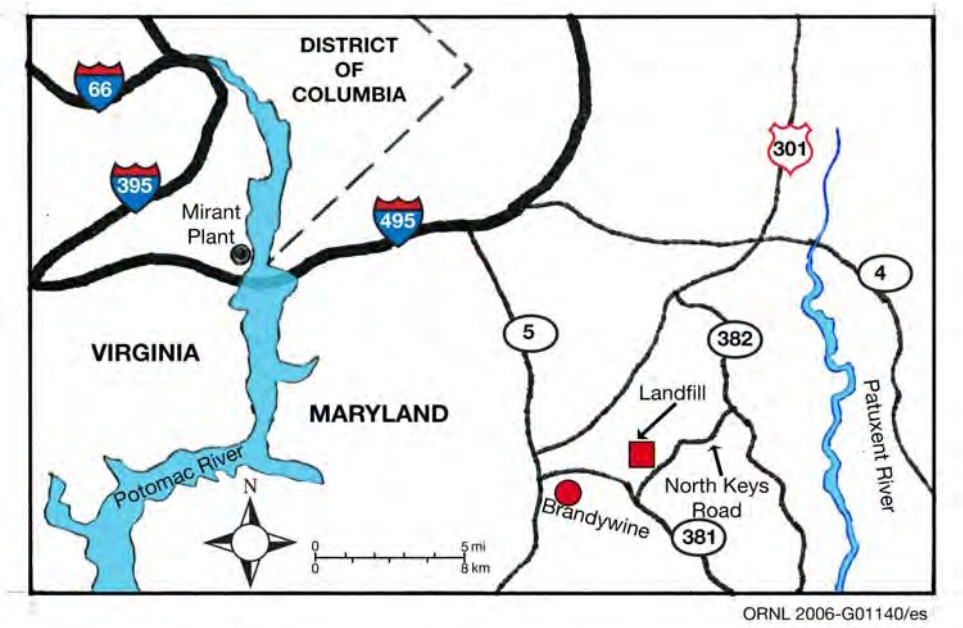


Figure 2.4-1. The location of and access routes to the Brandywine Fly Ash Facility used for disposal of solid wastes from the Plant.
Note: Mataponi Creek (not shown on the map) originates near Brandywine and flows east-northeast to the Patuxent River.

2.5 Changes to the Plant Since the DOE Order

Mirant has made several changes inside the existing Plant buildings since the DOE Order. The most important of these is the addition of trona injection units to all five boilers. Mirant has also made provision to withdraw trona from rail cars and transfer it to storage

containers inside the building. Several measures to control fugitive dust (for example, improved ash-loading systems for the two fly ash silos) were implemented during 2005 and 2006 in response to a 2004 EPA judicial consent decree (EPA 2004)that required Mirant to take actions to reduce fugitive particulate emissions. None of these changes included new construction or other disturbances at the Plant site.

Mirant is planning to merge the boiler exhaust gases from Units 1 and 2 and run the combined exhaust through the stack of Unit 1. Similarly Mirant is planning to merge the boiler exhaust gases from Units 3, 4, and 5 and run them through the stack of Unit 4. Mirant's modeling shows that combining the gas flows from the two units into one stack and from the three other units into another stack produces higher exit velocities and increases plume rise for all emissions into the atmosphere and, thus, lessens the potential for downwash impacts (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Merging unit exhaust gases requires new common ductwork to be installed connecting the individual unit exhaust fan discharges, and installation of new higher capacity fans. This common ductwork will be connected to the existing stack at the existing location at the base of the stack. This common ductwork will be installed inside the existing plant structure and will not be visible from the ground since it will be located in-between the existing precipitator and stacks. There will be no foundations required for this ductwork.

Mirant plans to implement the exhaust system changes during the fall of 2007 (Personal communication between Richard Killian, EPA Region 3, and L.N. McCold, Oak Ridge National Laboratory, October 16, 2006). Each Plant generating unit is expected to have an outage of 7 to 9 weeks in order to remove the existing equipment and install the new equipment.

3. AFFECTED ENVIRONMENT

This section describes the resources and environmental conditions that could be affected by the DOE action. The areal extent of this "affected environment" is not the same for all potentially affected resource areas. Also, because the purpose of this descriptive information is to lay the foundation for evaluating potential environmental impacts of the action, not all resources and geographic areas are described at the same level of detail.

For air quality the extent of the affected environment is very large because air emissions from the Plant are transported within a large region. However, because the potential effects of greatest interest, including the potential for exceedances of ambient air quality standards, are concentrated in a local area very near the Plant, the description and assessment in this document focus primarily on a 36-mi^2 (93-km^2) area within about 3 mi (5 km) of the Plant. Similarly, the area of primary interest for human health and environmental justice is this same 36-mi^2 (93-km^2) area.

For water resources and ecosystems the affected environment consists primarily of the resources directly affected by Plant operations, including the Potomac River, the Plant site, and neighboring lands. However, because atmospheric deposition of contaminants emitted from the Plant to the air contributes to cumulative impacts to water quality and ecosystems in a larger region, the Anacostia River, Patuxent River, Chesapeake Bay, and other land and water areas (including Potomac River tributaries and their watersheds) within about 20 miles (32 km) of the Plant are treated as part of the affected environment for water resources and ecosystems.

For waste management and transportation the affected environment includes the Plant site; the landfill used for disposal of Plant fly ash; the local roads and rail facilities used for access to the Plant and landfill; and resources in the immediate vicinity of these facilities that may be affected by their air, water, or noise emissions.

3.1 Climate and Air Quality

3.1.1 Climate

The Plant is in Alexandria, Virginia, which lies at the western edge of the mid-Atlantic Coastal Plain, about 50 mi (80 km) east of the Blue Ridge Mountains and 35 mi (56 km) west of the Chesapeake Bay, adjacent to the Potomac River. Elevations range from a few feet (about a meter) above sea level to about 400 ft (122 m).

Weather observations in the vicinity have been kept continuously since November 1870. Since June 1941, the official observations have been taken at Ronald Reagan Washington National Airport (National Airport), just north of the Plant.

National Airport is located at the center of a large urban complex. As a result, low temperatures there are higher than those in surrounding areas. In winter low temperatures at the airport are often 10-15°F (6-8°C) higher than in suburban locations. There is less difference between airport and suburban high temperatures. The normal summertime high temperatures range from 85-90°F (30-32°C), and the average winter lows range from 26-32°F (-3 to 0°C). Normal precipitation is distributed rather uniformly throughout the year, ranging, approximately, from 2.7 to 3.9 inches (6.9 to 9.9 cm) per month.

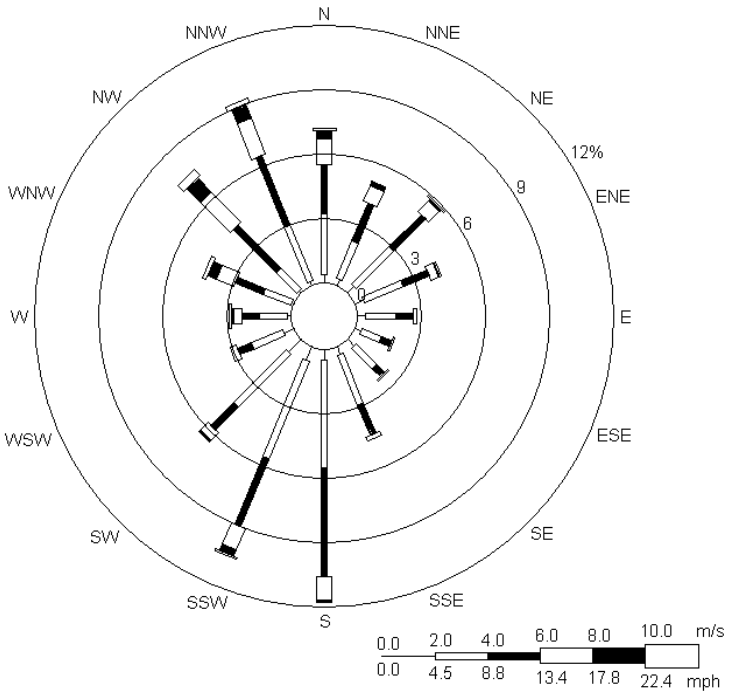


Figure 3.1-1. Wind rose for Ronald Reagan Washington National Airport, 2000-2004 weather data

Thunderstorms can occur at any time but are most frequent during the late spring and summer. The storms are often accompanied by downpours and gusty winds, but are not usually severe. Tornadoes, which occur infrequently, have resulted in significant damage. Severe hailstorms have occurred in the spring. Tropical storms can bring heavy rain, high winds, and flooding, but extensive damage from wind and tidal flooding is rare. Wind gusts of nearly 100 mi (160 km) per hour and rainfall over 7 inches (18 cm) have occurred during the passage of tropical storms.

Normal snowfall during the winter season is 15 inches (38 cm). The average date of the last freezing temperature in the spring is April 1, and the average date for the first freezing temperature in the fall is November 10.

Winds are most often from the south or south-southwest and from the north-northwest (Figure 3.1-1).

3.1.2 Air Quality

Criteria pollutants are defined as those for which National Ambient Air Quality Standards (NAAQS) exist (Table 3.1-1). These pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than or equal to 10 µm in aerodynamic diameter (designated PM_{10}), particulate matter less than or equal to 2.5 µm in aerodynamic diameter (designated $PM_{2.5}$), and sulfur dioxide (SO_2).

Table 3.1-1. National Ambient Air Quality Standards for criteria pollutants

Pollutant	Averaging period	Concentration
CO	8-hour [a]	9 ppm (10 mg/m^3)
	1-hour [a]	35 ppm (40 mg/m^3)
Lead	Maximum quarterly average	1.5 µg/m^3
NO_2	Annual arithmetic mean	0.053 ppm (100 µg/m^3)
O_3	4th highest 8-hour daily maximum [b]	0.08 ppm (157 µg/m^3)
PM_{10}	Annual arithmetic mean [c]	50 µg/m^3
	24-hour [c]	150 µg/m^3
$PM_{2.5}$	Annual arithmetic mean [d]	15 µg/m^3
	98th percentile 24-hour [d]	65 µg/m^3
SO_2	Annual arithmetic mean	80 µg/m^3 (0.03 ppm)
	24-hour [a]	365 µg/m^3 (0.14 ppm)
	3-hour [a]	1,300 µg/m^3 (0.50 ppm)

[a] Not to be exceeded more than once per year.

[b] The 8-hour standard is met when the 3-year average of the annual 4th highest daily maximum 8-hour O_3 concentration is less than or equal to 0.08 ppm.

[c] The annual PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50 µ/m^3 (3-year average); the 24-hour standard is attained when the expected number of days above 150 µ/m^3 is less than or equal to 1 per year. EPA's October 17, 2006, rule making on NAAQS for particulate matter (EPA 2006j) revoked the annual PM_{10} standard, effective December 18, 2006.

[d] The annual $PM_{2.5}$ standard is met when the annual average of the quarterly mean $PM_{2.5}$ concentrations is less than or equal to 15 µg/m^3, when averaged over 3 years. If spatial averaging is used, the annual averages from all monitors within the area may be averaged in the calculation of the 3-year mean. The 24-hour standard is met when the 98th percentile value, averaged over 3 years, is less than or equal to 65 µg/m^3. Under new standards published on October 17, 2006, and effective December 18, 2006 (EPA 2006j), the 24-hour standard will be 35 µg/m^3. The state of Virginia has until April 2008 to develop and submit to EPA for approval SIP provisions to implement, maintain, and enforce the new NAAQS for $PM_{2.5}$.

[e] Same as primary standard.

Source: 40 CFR Part 50.

The NAAQS are expressed as concentrations of pollutants in the ambient air; that is, in the outdoor air to which the general public has access [40 CFR 50.1(e)]. Primary NAAQS define levels of air quality that EPA deems necessary, with an adequate margin of safety, to protect human health. Secondary NAAQS are similarly designated to protect human welfare by safeguarding environmental resources (e.g., soils, water, plants, animals) and manufactured materials. States may modify NAAQS to make them more stringent or set standards for additional pollutants. Virginia has adopted the NAAQS as the state standards without modifications.

Attainment status for NAAQS is determined primarily by evaluating data from ambient air quality monitoring stations. The monitoring station nearest to the Plant (AIRS 51-510-0009) is located at the Alexandria Health Department, 517 North Saint Asaph Street, 0.6 mile (0.9 km) south. The station monitors CO, SO_2, NO_2, and O_3. The nearest $PM_{2.5}$ monitoring station (AIRS 51-013-0020) is located at Aurora Hills Visitors Center, 18th and Hays Streets, Arlington County, due west of Ronald Reagan Washington National Airport and 2.7 miles (4.4 km) north-northwest of the Plant. The nearest PM_{10} monitoring station (AIRS 51-059-0018) is located at Mount Vernon Fire Station, 2675 Sherwood Hall Lane, Mount Vernon, 5.7 miles (9.2 km)

south-southwest of the Plant. Because no lead monitoring stations are employed in Virginia, this section does not discuss lead.

Table 3.1-2 summarizes recent air quality data in the vicinity of the Mirant Plant.[4] The city of Alexandria and surrounding Arlington, Fairfax, Loudoun, and Prince William Counties are designated as NAAQS nonattainment areas for $PM_{2.5}$ and the 8-hour O_3 standard (VDEQ 2006a, 2006b).

Table 3.1-2. Ambient air quality in the vicinity of the Plant, 2004

Pollutant	Regulated parameter	Monitored concentration [a]	NAAQS limit
CO [b]	Second highest hour	2.9 ppm	35 ppm (40 mg/m^3)
	Second highest 8-hour average	2.0 ppm	9 ppm (10 mg/m^3)
NO_2 [b]	Annual average	0.024 ppm	0.053 ppm (100 µg/m^3)
O_3 [b]	4th highest 8-hour average	0.080 ppm	0.080 ppm (235 µg/m^3)
PM_{10} [c]	Annual arithmetic average	21 µg/m^3	50 µg/m^3
	Second highest 24-hour average [e]	44 µg/m^3	150 µg/m^3
$PM_{2.5}$ [d]	Annual average	14.4 µg/m^3	15 µg/m^3
	98th percentile 24-hour average	35.7 µg/m^3	65 µg/m^3
SO_2 [b]	Annual average	0.006 ppm	0.03 ppm (80 µg/m^3)
	2nd highest 24-hour average	0.021 ppm	0.14 ppm (365 µg/m^3)
	2nd highest 3-hour average	0.054 ppm	0.50 ppm (1,300 µg/m^3)

[a] *Source:* VDEQ 2005a (Just before publication of this document, Virginia released ambient air monitoring data for 2005 [VDEQ 2006c]. The updated background levels vary only slightly from the 2004 values reported and used here.)
[b] Measured at Alexandria Health Department (AIRS 51-510-0009).
[c] Measured at Mt. Vernon Fire Station (AIRS 51-059-0018).
[d] Measured at Aurora Hills Visitors Center (AIRS 51-013-0020).
[e] EPA's October 17, 2006, rule making on NAAQS for particulate matter (EPA 2006j) revoked the annual PM_{10} standard, effective December 18, 2006.

Contaminants other than the criteria pollutants are present in the atmosphere in varying amounts that depend on the magnitude and characteristics of the sources, the distance from each source, and the residence time of each pollutant in the atmosphere. In the ambient air many of these pollutants are present in extremely small concentrations, requiring expensive state-of the art equipment for detection and measurement. Hazardous air pollutants are regulated at emission sources based on the National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 61 and 63); measurements of existing ambient air concentrations for many such pollutants are, at best, sporadic.

[4] While additional air quality monitoring stations are located in Maryland and the District of Columbia, the monitoring station for each pollutant nearest the Plant is found in Virginia. (See Metropolitan Washington Council of Governments 2005 and VDEQ 2005a.)

3.2 Human Health

There is a well established association between exposure to outdoor air pollution and a broad variety of health effects, both acute and chronic. These health effects range from simple irritation such as burning eyes to premature death. The principal air pollutants generated by fossil fuel combustion that are associated with these health effects are PM, SO_2, and NO_x (WHO 2000). U.S. ambient air quality standards have been set at levels above background. For example, while the background concentration of SO_2 in the U.S. is about 1 $\mu g/m^3$, the NAAQS for annual-average SO_2 concentration is 80 $\mu g/m^3$. However, human health effects have been reported for concentrations below NAAQS levels for both PM and SO_2 (Dockery et al. 1993).

For the purposes of this SEA DOE has analyzed premature adult (age 30 and older) mortality as a useful indicator for health effects associated with air pollution because background mortality rates are readily obtainable, thereby strengthening the estimates, and the association between air pollution and mortality has well documented exposure response functions. The most recently available all-cause, all-age death rate for the area near the Plant is 7.5 deaths per year per 1000 population, as obtained from the Virginia Department of Health (2004). The most recent all-cause adult (age 30 and older) death rate in the region is 13 deaths per year per 1000 population.

3.3 Water Resources and Water Quality

Water resources potentially affected by Plant operations include the Potomac River and the Patuxent River, as well as the Chesapeake Bay, which is the destination for both of those rivers. The Potomac River supplies water to and receives effluent discharges from the Plant, and the watersheds of the Potomac and Patuxent Rivers include the land areas where air pollutants emitted from the Plant are most likely to be deposited. In addition, effluents from the landfill serving the Plant are discharged to Mataponi Creek, which is in the Patuxent River watershed. The Anacostia River and Rock Creek, which are tributaries to the Potomac located near the Plant, are also specifically discussed in this section.

3.3.1 Physical Setting and Hydrology

The Plant is situated in the Atlantic Coastal Plain physiographic province, in the watershed of Chesapeake Bay (Figures 3.3-1 and 3.3-2). Chesapeake Bay and its major tributaries, including the Potomac and Patuxent rivers, are “drowned river valleys.” That is, they are river valleys that were partially inundated by sea water when sea level rose following the end of the last Pleistocene glaciation. The Potomac, Patuxent, and other major streams in the region arise in upland areas and flow as fresh-water streams to the fall line near the edge of the

coastal plain. Below the fall line, the streams are considered to be estuaries, since their flow is modified by the influence of ocean tides. In the estuarine section of a stream, fresh water mixes with salt water in increasing proportions as the stream flows toward the sea. The effects of tides shelter the waters of these estuaries from the full effects of river currents, while river-valley geometry and stream flow shelter them from the full energy of ocean waves. Because they are sheltered from the flushing actions of both stream flow and ocean waves, water remains in these estuaries for a long time. Thus, pollutants discharged into an estuary remain there much longer than they would in an upland stream or in the open ocean. At the same time the sheltered waters of estuaries support exceptionally productive ecosystems. (See Section 3.4.)

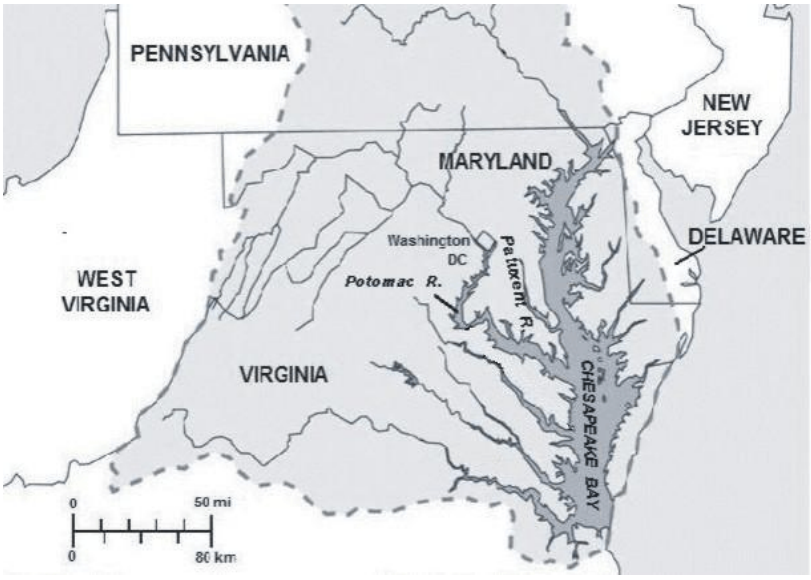


Figure 3.3-1. The Chesapeake Bay watershed includes the Patuxent and Potomac rivers.

3.3.1.1 Potomac River

The Plant is located next to the Potomac River, which flows from the Appalachian mountains to Chesapeake Bay, draining a 14,670-mi^2 (38,000-km^2) watershed in Maryland, Virginia, West Virginia, Pennsylvania, and the District of Columbia

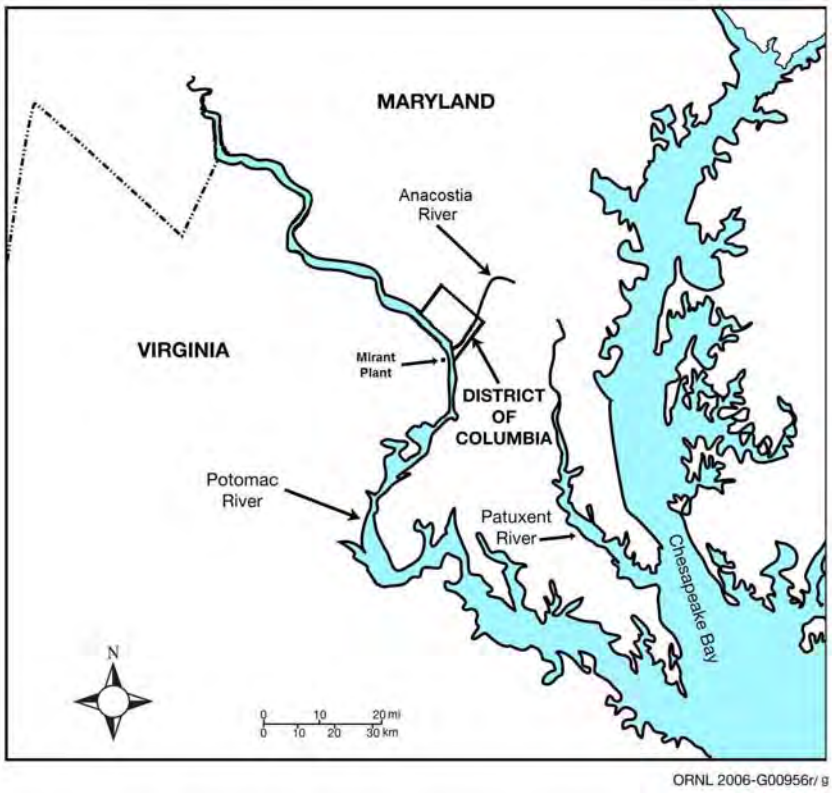


Figure 3.3-2. The Chesapeake Bay watershed near the Plant includes the Potomac, Patuxent, and Anacostia rivers.

(EPA 2000; Wilderness Society undated). The river is tidally influenced for about 110 miles (180 km) from the fall line at Little Falls, Maryland (located a short distance upstream from the District of Columbia border, about 11 miles [18 km] upstream from the Plant), to its mouth at Chesapeake Bay (EPA 2000).

While the entire tidally influenced reach of the river is an estuary, it is classified in three distinct hydrographic regimes: tidal river, transition zone, and mesohaline estuary. Adjacent to the Plant the Potomac is a tidal river with fresh water (salinity less than 500 mg/L) and a net seaward flow direction throughout the water column (EPA 2000). The transition zone begins approximately 38 miles (61 km) downstream from the fall line, about 27 miles (43 km) downstream from the Plant. The transition zone is about 22 miles (35 km) long and is characterized by variable salinity (from 500 to 10,000 mg/L) and significant mixing of fresh water with salt water from Chesapeake Bay. The lower 50 miles (80 km) of the river are classified as a mesohaline estuary with salinity varying from 5,000 to 18,000 mg/L (EPA 2000). Near the Plant the river channel has been extensively modified by past dredging and spoil disposal.

Average stream flow in the Potomac River at the fall line (above the zone of tidal influence) over the 50-year period 1931-1981 was 11,406 ft^3/sec (7.4 billion gal/day or 28 million m^3/day) (EPA 2000). Seasonally, flow is highest in the spring (February through May) and lowest in the late summer (July through September). September is the month with the lowest average flow, 4,126 ft^3/sec (2.7 billion gal/day or 10 million m^3/day). The long-term mean 7-day, 10-year low flow at the fall line is 628 ft^3/sec (406 million gal/day or 1.54 million m^3/day). The District of Columbia and some other area jurisdictions obtain public water supplies from the Potomac above the fall line.

3.3.1.2 Anacostia River

The Anacostia River is a tributary to the Potomac River that enters the Potomac approximately 4 miles (6 km) upstream from the Plant. The extensively urbanized Anacostia watershed encompasses 176 mi^2 (456 km^2) in Montgomery and Prince George's County, Maryland, and the District of Columbia. The Anacostia is a tidal river for its lower 8.4 miles (13.5 km). Flow in the tidal reach is described as sluggish; this reach has an average water residence time of 30 to 35 days. Average flow into the tidal reach from free-flowing tributaries and reaches is approximately 138 ft^3/sec (89 million gal/day or 338,000 m^3/day) (Anacostia Watershed Network 2006).

3.3.1.3 Rock Creek

Rock Creek (Figure 3.3-3) is a tributary to the Potomac River that enters the river several miles upstream from the Plant. Approximately 80% of its watershed is in Montgomery County, Maryland, with the remainder in Washington, D.C. (MDOE 2006). The nontidal portions of the

creek occur mainly within Maryland and cover about 60 mi^2 (155 km^2); the tidal portion is mainly within D.C.

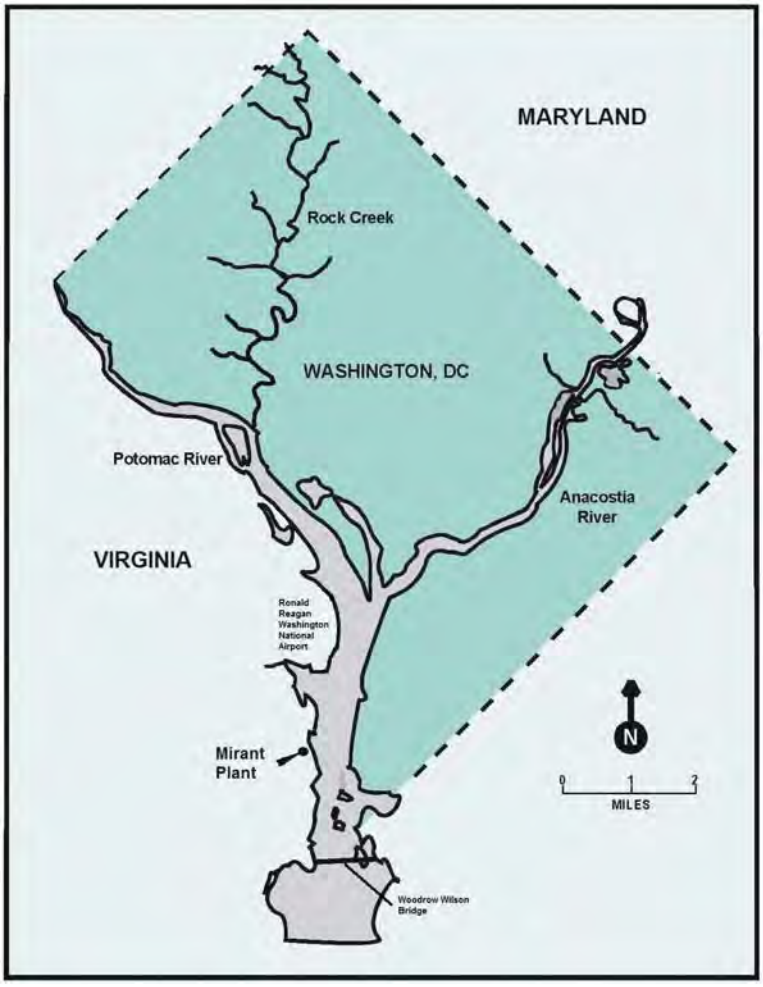


Figure 3.3-3. Location of features mentioned in the text.

3.3.1.4 Patuxent River

The Patuxent River watershed is immediately east of the Potomac River watershed in the Maryland counties of Anne Arundel, Calvert, Charles, Howard, Montgomery, Prince George's, and St. Mary's (Maryland DNR undated-a). The drainage divide between the Potomac and Patuxent watersheds is about 10 miles (16 km) east of the Plant. Only about 40% of the 849-mi^2 (220-km^2) Patuxent River watershed contributes to the river's flow above the fall line; the remainder of the watershed drains directly to the river's estuary, which has a water surface area of about 49 mi^2 (127 km^2) (Hagy and Kemp 2002). Total stream flow to the Patuxent estuary averages about 728 ft^3/sec (470 million gal/day or 1.78 million m^3/day) (Boynton and Swaney 1998). Fresh water residence time in the estuary typically varies between 50 and 80 days (Hagy and Kemp 2002).

Mataponi Creek, the Patuxent River tributary that receives discharges from the Mirant landfill (Section 3.5), originates in the upland near Brandywine, Maryland (Figure 2.4.1) and flows east-northeast toward the Patuxent River, entering the fresh water tidal reach of the river at a location about 9 miles (14 km) northeast of Brandywine. No stream flow or water quality data have been located for Mataponi Creek.

3.3.1.5 Chesapeake Bay

The Chesapeake Bay is the largest estuary in the United States, about 200 miles (320 km) in length, with a surface area of about 4,400 mi^2 (11,000 km^2) (including the estuarine reaches of its major tributaries) and a watershed of about 63,000 mi^2 (164,000 km^2), including the District

of Columbia and parts of the states of Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia (Figure 3.3-1). The Chesapeake Bay is the destination of all waters in the region. The Potomac and Patuxent rivers contribute about 15% and 1% of the stream flow into the Bay, respectively (Boynton and Swaney 1998). Average water depth in the Bay is about 22 ft (7 m).

3.3.2 Water Quality

Important water quality concerns for all potentially affected surface waters include the potential for excessive sedimentation and depletion of dissolved oxygen. Dissolved-oxygen depletion is attributable to excessive loadings of organic materials and nutrients. The long water residence times and poor flushing that are typical of estuaries increase the susceptibility of estuaries to pollution problems. Effects on aquatic ecosystems are the principal focus of concern regarding water quality in these waters, as discussed further in Section 3.4. Public water supplies are obtained from rivers and reservoirs above the fall line; tidal waters generally do not supply water for human consumption. Information about water quality conditions in specific surface water bodies is presented below.

3.3.2.1 Potomac River

Water quality in the tidally influenced sections of the Potomac River is controlled primarily by the mixing of fresh water from upland streams and salt water from Chesapeake Bay, resulting in variable salinity. In the vicinity of the Plant fresh water predominates over salt water, and total dissolved solids are less than 500 mg/L. Table 2.4-1 includes additional data on the quality of river water at the Plant's water intake.

Due to their volume, effluent discharges from the Plant and the Blue Plains Wastewater Treatment Plant have the potential to be important influences on Potomac River water quality near the Plant. Data on the quality of effluents from the Plant are provided in Table 2.4-1.

The Blue Plains Wastewater Treatment Plant, owned and operated by the District of Columbia Water and Sewer Authority, is directly across the Potomac River from the Plant. (See Figure 2-1.) This facility provides wastewater treatment services for the District of Columbia and portions of Montgomery and Prince George's Counties, Maryland, and Fairfax and Loudoun Counties, Virginia, with a combined population near 2.2 million. The Blue Plains treatment plant has a rated treatment capacity of 370 million gal/day (1.4 million m^3/day) and a peak wet-weather capacity of 1.076 billion gal/day (4.1 million m^3/day). Operation at the rated capacity delivers a water volume to the river equivalent to 5% of the average flow and more than 90% of the 7-day, 10-year low flow at the fall line. The Blue Plains facility is considered an advanced wastewater treatment facility, providing primary and secondary treatment followed by nitrification-denitrification, effluent filtration, chlorination-dechlorination, and post-treatment aeration (DC WASA 2006). Historically, wastewater effluents discharged at this site caused

severe water quality degradation in the Potomac estuary, including high bacteria levels and low levels of dissolved oxygen. Downstream water quality improved dramatically, however, following implementation of secondary and advanced treatment in the Blue Plains treatment plant (EPA 2000). The NPDES permit for the Blue Plains facility specifies stringent water quality limits for discharges, as indicated in Table 3.3-1.

Table 3.3-1. NPDES-permitted discharge limits for the Blue Plains Wastewater Treatment Plant

Contaminant		Maximum Concentration (mg/L, except as indicated)
Carbonaceous Biochemical Oxygen Demand		5.0
Total Suspended Solids		7.0
Phosphorus, total		0.18
Ammonia Nitrogen (NH_3-N)	May-October	1.0
	November-April	6.5
Dissolved Oxygen		5.0
Chlorine, total residual		0.02
pH (range of values, pH units)		6.0 to 8.5

Source: DC WASA 2006.

Principal water quality concerns for Potomac River tributary streams draining northern Virginia watersheds near the Plant include the effects of urbanization on aquatic habitats, high fecal coliform bacteria counts in some streams, and the need to protect the watersheds of water-supply reservoirs (Northern Virginia Regional Commission undated; Fairfax County Stormwater Planning Division 2001).

3.3.2.2 Anacostia River

Water quality conditions in the free-flowing tributaries of the Anacostia range from excellent to poor, but the tidal reach of the Anacostia River has very poor water quality. Principal water quality issues for the Anacostia watershed include sediment, trash and debris, toxic chemicals, combined sewer and stormwater overflows that discharge directly into the river, and other nonpoint-source pollution (Anacostia Watershed Network 2006). According to EPA (1997), urbanization has altered the Anacostia River and its tributary streams to the point that floods are ten times more frequent, summer flows are much lower, and stream water temperatures are 5 to 10° C higher than under natural conditions. Due to the long water residence time in the tidal reach of the river, this reach has been described as “a very efficient pollutant trap” (Galli et al. 2001). The tidal reach has chronically low dissolved oxygen levels that

threaten aquatic life and high bacterial levels that make it unsafe for swimming and other water contact activities.

Through a series of agreements, beginning in 1984, local, state, and Federal government agencies have committed to cooperative efforts aimed at restoring the river (Metropolitan Washington Council of Governments 1999). The parties have made progress in implementing measures that should improve water quality, including improving stormwater management, reducing combined sewer overflows and trash, changing land use management to protect sensitive headwater tributaries, and increasing riparian forest buffers; the current agreement calls for continued efforts (Anacostia Watershed Restoration Committee 2001).

3.3.2.3 Rock Creek

Because Rock Creek Park surrounds the entire length of Rock Creek in D.C. and Maryland parks surround most of its length upstream from the District, Rock Creek experiences fewer adverse water quality impacts from urbanization than does the Anacostia River. However, creek water quality is affected by sedimentation and other contaminants associated with urban stormwater runoff (EPA 1997).

3.3.2.4 Patuxent River

Upland streams in the Patuxent River watershed are well oxygenated (only 1% are reported to have dissolved oxygen levels below 5 mg/L), but stream bank instability and erosion reduce biotic habitat quality and contribute contamination to downstream areas (Maryland DNR undated-a). In the tidally influenced area of the main channel, salinity increases in the downstream direction, ranging from fresh to moderately saline. Nutrient loading is a water quality concern throughout the watershed, contributing to eutrophication and oxygen depletion in the lower estuary (Maryland DNR undated-c).

3.3.2.5 Chesapeake Bay

A principal focus of concern for Chesapeake Bay water quality is ecosystem health, which is threatened by excessive loading of nutrients (Section 3.4.2). The historic *Chesapeake Bay Agreement of 1983* established the Chesapeake Bay Program with the goal of restoring the Bay (CBP undated). Through this Agreement, which has been updated and revised several times, Pennsylvania, Maryland, Virginia, the District of Columbia, EPA, and the Chesapeake Bay Commission have committed to a coordinated set of goals and targets for restoration of the Bay ecosystem, including its water quality.

Excessive loading of nitrogen, a nutrient, has been identified as one major contributor to various ecological problems in Chesapeake Bay. (See Section 3.4.2.) Nitrogen occurs naturally in soil, animal waste, plant material, and the atmosphere. In addition to these natural sources,

sewage treatment plants, industries, vehicle exhaust, acid rain, and runoff from agricultural, residential, and urban areas contribute nitrogen to the Chesapeake Bay and its rivers. One of the specific goals set by the Chesapeake Bay Program to achieve the overall objectives of the Chesapeake Bay Agreement is to reduce annual nitrogen input to the Bay to no more than 175 million lb (79 million kg) by 2010. This value is 162 million lb (74 million kg) less than the estimated 1985 input of 337 million lb (153 million kg). Between 1985 and 2004 estimated total nitrogen input to the Bay was reduced by 67 million lb/yr (30 million kg/yr) (41% of the goal), with the biggest improvement coming from reductions in point-source loadings, such as from sewage treatment plants (CBP 2005). The majority of the future reductions in nitrogen loading to the Bay are expected to come from land-based measures such as reducing farm runoff into streams.

Another important source of nitrogen in the Bay is atmospheric deposition (both on land in the watershed and directly on water). Atmospheric sources are estimated to contribute about 91 million lb (41 million kg) of nitrogen to the Bay annually. In 1985 this represented 27% of the nitrogen entering the Bay; by 2000 the estimated fractional contribution from atmospheric deposition had increased to 32% due to reductions in inputs from other sources. About three-quarters of the atmospheric nitrogen that reaches the Bay is estimated to have been emitted in the form of NO_x (Blankenship 1997). In the seven-state region (i.e., Maryland, Virginia, Pennsylvania, New York, West Virginia, New Jersey, and Ohio) estimated to produce most of the air emissions that contribute nitrogen to the Bay, utilities are estimated to be responsible for 38% of the NO_x emissions, cars and trucks 35%, industries 6%, and other sources 21% (CBP 2000).

Much of the atmospheric nitrogen that is deposited on land within the Bay watershed is utilized in biological processes and retained in the ecosystem, so that it is not delivered to the Bay (CBP STAC 1996). Thus, delivery of atmospheric nitrogen to the Bay is estimated based on landscape characteristics, data from acid-deposition monitoring, and other data. Maps of estimated per-hectare delivery of nitrogen to the Bay from all parts of the watershed (Brakebill and Preston 2004) indicate that the total delivery of atmospheric nitrogen to the Bay (in all chemical forms) is about one-tenth to one-third of the atmospheric nitrogen estimated to be deposited to the land surface as NO_x.

Plans for achieving the 2010 nitrogen goal assume that input from atmospheric deposition will be reduced by 8 million lb/yr (3.6 million kg/yr) between 1985 and 2010 as a result of the implementation of new or proposed regulations aimed at achieving Clean Air Act mandates to reduce acid rain and ozone and to limit NO_x emissions from automobiles (Blankenship 1997, 2004). The Chesapeake Bay Program has not established any location-specific targets for reducing atmospheric nitrogen input, which can originate from sources outside the watershed as well as sources within the watershed.

3.3.2.6 Acid deposition

Acid deposition (often called acid rain), due to the dry or wet deposition of oxides of nitrogen and sulfur in the air, is a concern for water quality and ecosystems in the Appalachian mountains and northeastern United States. Acids derived from air emissions have the potential to dissolve, and thus mobilize, aluminum and other metals in soils and sediments, introducing toxic metals into surface waters.

Streams and lakes most susceptible to the impacts of acid deposition are those in watersheds where soils lack carbonate minerals and other alkaline constituents that can neutralize acids deposited from the atmosphere. Such watersheds are considered to be "poorly buffered." In the state of Maryland approximately 96% of the 636 mi^2 (1,650 km^2) portion of the Potomac River watershed surrounding the District of Columbia (including Maryland portions of the Anacostia watershed) and 98% of the Patuxent River watershed are classified as "well buffered" against acid rain (Maryland DNR undated-a and undated-b). Thus, in the watersheds most likely to receive atmospheric deposition of Plant emissions, surface waters are not particularly susceptible to adverse effects from acid deposition.

3.4 Ecological Resources

The Plant is located on the western bank of the Potomac River, in the Chesapeake Bay watershed (Figures 3.3-1 and 3.3-2). The region around it is a highly urbanized ecosystem that includes the District of Columbia. Development has transformed the ecological resources of the region, and they are greatly changed from early historical conditions (EPA 1997). The ecological condition has, however, improved from the highly degraded situation that was prevalent in the late 1950s and early 1960s, and the region continues to support terrestrial, aquatic, and wetland resources.

3.4.1 Terrestrial Resources

3.4.1.1 Vegetation

Since the turn of the 20th century, approximately 75% of the forest cover in the District of Columbia has been eliminated by human activities (EPA 1997). Regionally, tree cover declined more than 30% from 1972 to 1997 (American Forests 2002). In many places intentional plantings or invasions of exotic trees and other plants have displaced and substantially altered the native vegetation (EPA 1997). Agricultural and forest land cover are, however, still predominant in some parts of the region.

Daingerfield Island, which is administered by the National Park Service as part of the George Washington Memorial Parkway, lies about a quarter mile (less than a half kilometer) north of the Plant (Figure 3.4-1). No longer geographically an island, this flat 107-acre (43-ha), mostly wooded peninsula includes a large patch of forest on the eastern portion of the island with common suburban trees and understory plants (NPS 2002).

The National Park Service administers the land between the Potomac River and the Plant. This expanse includes a bike path that runs south from Daingerfield Island past the Plant and a small wooded area near the Plant at the edge of the Potomac River. (See Figure 2-2.) The vegetation in the small wooded area is similar to that on Daingerfield Island, common suburban tree and understory plant species.

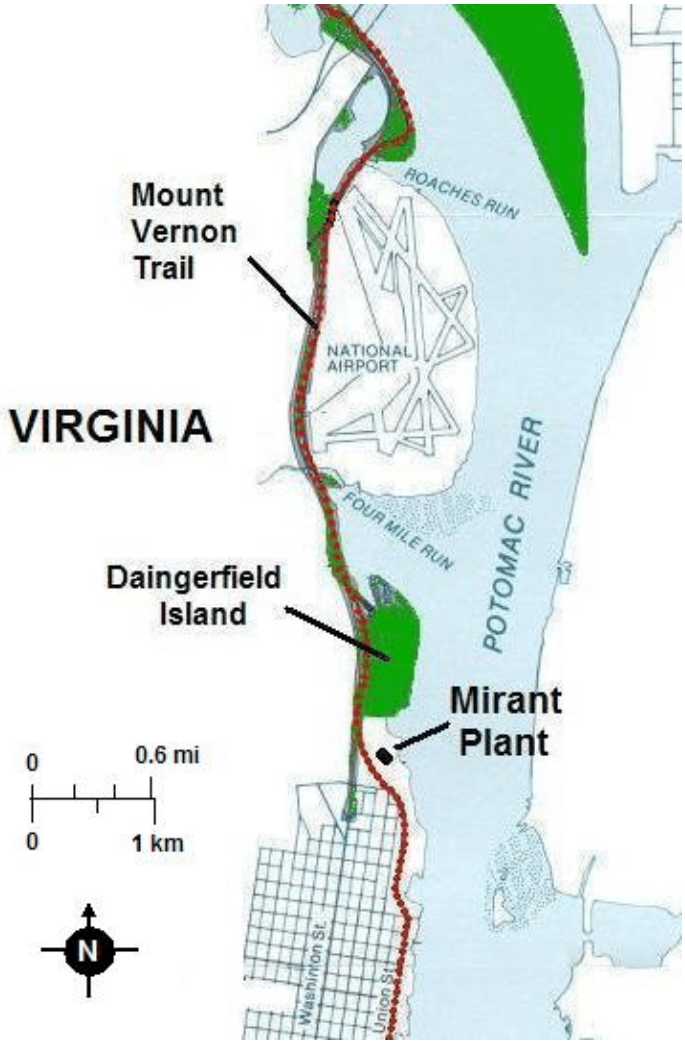


Figure 3.4-1. Location of National Park Service trail that passes the Plant.

3.4.1.2 Wildlife

Many of the animal species originally present in the D.C. region disappeared long ago (EPA 1997). Wildlife in the region is now dominated by opportunistic species characteristic of urbanized areas. Animals tolerant of human activities (e.g., opossums, raccoons, squirrels, black and Norway rats, house mice, stray cats and dogs) have increased in abundance due to the absence of larger predators and the abundant food offered by garbage. Bird species reflect a change from predominantly forest interior species to species representative of mixed land uses.

Wildlife on Daingerfield Island includes common urban species such as small mammals and birds (NPS 2002). Larger animals could possibly use the forest there for habitat. However, because the forest patch is separated from other forested areas by roadways, fields, and water bodies, the movement of large animals into the peninsular forest may be limited. The wooded

area near the Plant is also too small and too isolated by roadways, fields, and water bodies to provide habitat that could be easily used by larger animals.

3.4.1.3 The Mirant Plant site

The 28-acre (11-ha) Plant site is almost entirely covered by facilities related to coal storage and electric power generation. However, it also includes a 1,500 ft^2 (140 m^2) wildflower garden planted with woody and herbaceous vegetation for insects and pollinators.

Animals on the site include common urban wildlife species such as small mammals and birds. Artificial nesting structures for purple martins, eastern bluebirds, bats, and peregrine falcons are located within the small scattered areas of wildlife habitat.

3.4.2 Aquatic Resources

Aquatic ecosystems with the most potential to be affected by the Order include those in the Chesapeake Bay and some of its tributaries, particularly the Potomac, Anacostia, and Patuxent rivers and Rock Creek. (See Figures 3.3-2 and 3.3-3 and Section 3.3.) Coal-fired power plants can impact aquatic resources directly by the cooling water withdrawals and discharge of aqueous effluents and indirectly by the deposition of air pollutants (e.g., acid rain) into watersheds. The Plant withdraws cooling water from and discharges back to the Potomac River. The other rivers and the Chesapeake Bay are potentially affected indirectly by atmospheric deposition.

3.4.2.1 Potomac River

The estuarine portion of the Potomac River adjacent to the Plant supports aquatic communities that are recovering from past stresses. Historically the Potomac River supported dense stands of bay grasses along its entire length, but much of it was lost by the late 1930s (EPA 1997). A dense and wide patch of bay grasses has regrown and currently stretches from the Virginia Potomac shoreline at National Airport to the middle of the Potomac, extending past the southern tip and along the northern and eastern edges of Daingerfield Island that lies north of the Plant (NPS 2002). (See Figure 3.4-1.)

A large, tidally influenced river, the Potomac once possessed an exceptionally diverse and productive fish community, but species abundance and diversity are low compared to historic levels (EPA 1997). The Potomac River watershed supported large numbers of both resident, freshwater fish and anadromous fish (i.e., species that spend their adult lives in saltwater and spawn in freshwater), such as shad and river herring (*Alosa* sp.).

Even though the river has been degraded by the effects of human activities, a wide variety of fish species still occur in it. Many of these are exotic species (e.g., largemouth [*Micropterus salmoides*] and smallmouth bass [*Micropterus dolomieu*], walleye [*Sander*

vitreus]). Some native and exotic species present in the river (e.g., catfish [*Ictalurus punctatus*], crappie [*Pomoxis* sp.], sunfish [*Lepomis* sp.], largemouth and smallmouth bass, walleye) are important recreational species. The northern snakehead (*Channa argus*), a fish from Asia that has attracted public interest because it preys on other fish and can survive several days out of water, is believed to be established in the Potomac River and its tributaries (Fuller 2006). The estimated total fish abundance in the Potomac-Washington Metro Basin, which includes the Anacostia and Potomac rivers and a number of creeks, is 4.9 million fish (Maryland DNR undated-b).

An indication of the particular fish species that are affected by the Plant's cooling water withdrawals can be obtained from entrainment and impingement studies. Studies of aquatic organisms impinged (trapped) on the intake screens at the Plant during 2003-2004 provided information on the species that occur in that stretch of the Potomac (Personal communications between A. Wearmouth, Mirant Corporation, and M.S. Salk, Oak Ridge National Laboratory, July 24, and August 18, 2006). The main fish species found were white perch (*Morone americana*), gizzard shad (*Dorosoma cepedianum*), blueback herring (*Alosa aestivalis*), and channel catfish. Striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*), commercially important fishes, were found in low numbers. Earlier impingement studies also observed gizzard shad and white perch, many of which were juveniles, stunted, or already diseased prior to impingement (Pepco 1982).

The benthic macroinvertebrate community in the tidally influenced river near the Plant includes a mix of freshwater organisms that are tolerant of exposure to low salinity and estuarine organisms that are tolerant of fresh water (http://www.dnr.state.md.us). Benthic organisms are affected by oxygen depletion that occurs in the bottom waters during summer months. The freshwater tidal Potomac does not support shellfish of commercial value, but it does include large populations of Asiatic clams (*Corbicua fluminea*), an undesirable invasive species (EPA 1997).

3.4.2.2 Anacostia River

The Anacostia River estuary has some of the poorest water quality in the Chesapeake Bay system and is, thus, in a degraded ecological condition (EPA 1995). Many miles of stream habitats have been severely degraded by urbanization, which has profoundly altered the flow, shape, water quality, and ecology of streams in the watershed. Stressors of concern in the river are described in Section 3.3.2.2.

Urbanization has caused the loss of nearly 50 percent of the forest cover in the basin, including much of the stream-side or riparian vegetation and other wetlands. (See Section 3.4.3.)

As a large, tidally influenced freshwater river like the Potomac, the Anacostia also has the capacity to support many diadromous as well as resident fish species. Even though the river has been degraded by the effects of human activities, a wide variety of fish species still occurs in it. Numerous man-made fish barriers, however, block migration of fish.

The tidal reach of the river has chronically low dissolved oxygen levels that threaten aquatic life. (See Section 3.3.2.2.) The periodic lack of dissolved oxygen is the likely reason that substantial clam populations are absent from the river (EPA 1997). The macroinvertebrate communities in the river are severely degraded compared to those in the Potomac.

Implementation of the Anacostia Watershed Restoration Agreement (Section 3.3.2.2) has resulted in some improvement in aquatic habitat conditions (EPA 1997, Anacostia Watershed Restoration Committee 2004).

3.4.2.3 Rock Creek

As the largest stream in D.C., Rock Creek has historically supported substantial populations of recreationally important fish species and, through its direct connection to the Potomac River, large numbers of anadromous species (EPA 1995). The present anadromous fish populations and resident fish communities reflect the harmful effects of polluted runoff, barriers to fish movement, and over fishing. Nonnative fish species (e.g., largemouth bass, bluegill [*Lepomis macrochirus*], carp [*Cyprinus carpio carpio*]) now constitute a significant part of the fish community. Some species that were historically present in Rock Creek have apparently been extirpated from the watershed (e.g., white perch, trout-perch [*Percopsis omiscomaycus*]). In contrast, populations of anadromous alewife (*Alosa pseudoharengus*) and blueback herring appear to be healthy. Even though instream impediments to fish movement probably affect these species and prevent them from passing far upstream, schools of hundreds of individuals occur at several locations.

In contrast to the mainstem, fish communities in tributaries of Rock Creek are small or absent (EPA 1995). Episodic water quality problems (e.g., low flows, flooding, scouring during storm events) and polluted runoff are likely contributing factors.

Overall, the condition of the benthic macroinvertebrate communities in Rock Creek is poor. However, the creek contains several spring-dependent species of isopods, ostracods, and amphipods (EPA 1995), including one amphipod that is listed as an endangered species (Section 3.4.4.1).

3.4.2.4 Patuxent River

Stream quality for fish communities in the Patuxent River is poor in over 50% of the stream miles; only 18% are considered to be in good condition for fish (Maryland DNR undated-a). The Patuxent River watershed includes an estimated 1.1 million fish of 44 species in its wadeable streams. Four species in the basin are at risk of local extinction: American brook lamprey (*Lampetra appendix*), glassy darter (*Etheostoma vitreum*), stripeback darter (*Percina notogramma*), and warmouth (*Lepomis gulosus*). The wadeable tributary streams of the watershed serve as a nursery for the five gamefish species that are found there (i.e., largemouth

bass, smallmouth bass, chain pickerel [*Esox niger*], brown trout [*Salmo trutta trutta*], and rainbow trout [*Oncorhynchus mykiss*]), as most individuals are not of harvestable size.

3.4.2.5 Chesapeake Bay organisms

The sheltered waters of Chesapeake Bay, the largest estuary in the U.S., are exceptionally productive. The Bay is a complex ecosystem that provides homes, protection, and food for many species, including fish, shellfish, and turtles (CBP undated, Alliance for the Chesapeake Bay undated).

Bay grasses, a form of naturally submerged aquatic vegetation, are important to the Chesapeake Bay ecosystem (CBP undated). Bay grasses produce oxygen, supply food for many species (especially waterfowl), offer shelter and nursery habitat for fish and shellfish, reduce wave action and shoreline erosion, absorb excess nutrients (e.g, nitrogen, phosphorus), and trap sediments.

More than 300 species of fish, including 32 year-round species, live in the Bay and its tributaries or use its waters as they migrate along the Atlantic Coast (Alliance for the Chesapeake Bay undated). Migrating fish can, however, no longer reach many stream habitats due to the presence of dams, inadequate culverts, and other barriers to their passage (EPA 1997).

The Bay acts as a nursery for crabs, oysters, and many other species of shellfish (Alliance for the Chesapeake Bay undated). While many of these species, particularly blue crabs (*Callinectes sapidus*), are still commercially important, oyster (*Crassostrea virginica*) populations have declined to about one percent of historical levels.

3.4.2.6 Chesapeake Bay stresses

Hydrological changes, sedimentation, and pollutant loading have degraded aquatic habitats throughout Chesapeake Bay. The cooperative efforts and guidance of the Chesapeake Bay Program have led to improvements, including reduced levels of nutrients and sediments in the Bay and increased availability of dissolved oxygen for the Bay's aquatic biota, but they have not fully restored the health of the Bay (CBP undated). The biggest problems currently facing the Bay's ecosystem and making restoration difficult are excess nutrients, chemical contaminants, air pollution, and landscape changes. (See Section 3.3.2.5.)

Nutrient loading contributes to excessive algal growth, which in turn depletes dissolved oxygen and reduces water clarity. Harmful blooms of *Microcystis* and other cyanobacteria (blue-green algae) that are toxic to humans and other mammals can occur in the fresh-water and low-salinity portions of the Bay and in tributary estuaries (e.g., the Potomac River). In addition, suspended sediment loading and the presence of toxic substances in Bay sediments stress Bay biota.

3.4.3. Wetlands and Riparian Habitats

Wetlands act as water-storage basins and provide vital habitats for a rich diversity of wildlife, including threatened and endangered species (EPA 2006d). They also reduce flooding and storm damage, minimize erosion of uplands, improve water quality by filtering pollutants, and support tourism and the hunting and fishing industries.

Many of the wetlands in the region have been degraded and are of poor quality, but some continue to provide habitat for waterfowl, wildlife, fish, and shellfish (EPA 1995).

Much of the area (e.g., the District of Columbia) was initially built by filling in extensive areas of marshes and swamps along the Potomac and Anacostia rivers (EPA 1997). Such wetlands originally comprised about half the area within the boundaries of the city, totaling more than 9,600 acres (3,900 ha) in 1790. In the early 1990's only 845 acres (342 ha) of wetlands remained in the District, a decrease in area of more than 90% in 200 years.

Riparian, or stream side, vegetation is especially important to the integrity of the District of Columbia ecosystem because it buffers aquatic resources from developed areas and provides habitat for terrestrial species near water (EPA 1997). Contiguous riparian habitats also provide migration corridors for wildlife, a critical factor in urbanized environments. Because Rock Creek Park surrounds the entire length of Rock Creek in the District and Maryland parks surround most of its length beyond the District, the area along Rock Creek is the most important terrestrial and riparian resource in the city.

Within the Anacostia River watershed nearly 75 percent of the freshwater wetlands have been destroyed. Of the original 2,600 acres (1,100 ha) of emergent tidal wetlands in the watershed, less than 100 acres (40 ha) remained in the early 1990s (EPA 1995); by 2003 ongoing restoration efforts had increased the area of tidal wetlands to 123 acres (50 ha) (Anacostia Watershed Restoration Committee 2004). Parklands along the Anacostia River do not provide benefits similar to those along Rock Creek because they are not protected natural areas, but rather are reclaimed wetlands in the form of sparsely wooded lawns. They have the potential, however, to provide such benefits, especially if riparian restoration is coordinated with ongoing restoration of wetlands.

The Federal government maintains 80% of the property bordering the Potomac River, Anacostia River, and Rock Creek drainage basins in the District of Columbia, thus providing some protection to their riparian areas (EPA 1997).

3.4.4. Special Status Species

3.4.4.1 Federally listed species

The Plant’s NPDES permit names three species listed as threatened or endangered under the Federal Endangered Species Act (ESA) that could occur at locations in or near the District of Columbia, including the Potomac River drainage. These are the endangered Hay's Spring

amphipod (*Stygobromus hayi*) and shortnose sturgeon (*Acipenser brevirostrum*) and the threatened bald eagle (*Haliaeetus leucocephalus*).

The Hay's Spring amphipod is restricted to a small area in Rock Creek in D.C., a very specialized habitat, and the species is not found elsewhere (Personal communication between A. Moser, U.S. Fish and Wildlife Service, and M.S. Salk, Oak Ridge National Laboratory, June 19, 2006).

The shortnose sturgeon exists as 19 distinct populations that occupy and spawn in rivers and bays from Canada to Florida (Keeney 2002). The Potomac River is one of several tributaries in the Chesapeake Bay drainage that appear to have suitable habitat for it. The Shortnose Sturgeon Recovery Plan (NMFS 1998) reports that one shortnose sturgeon was captured in 1996 at the mouth of a small creek off the Potomac River about 50 miles (80 km) downstream from the Plant. Between 1996 and 2002 six sturgeon were captured many miles downstream from the Plant in the lower and middle tidal Potomac River (Keeney 2002). Two mature, egg-bearing females were captured in the river in September 2005 and March 2006, suggesting that a spawning population continues to exist in the river system (Appendix D). The female caught in September 2005 overwintered in a creek approximately 24 miles (39 km) downstream of the Plant. Population dynamics in the Potomac River have not been documented, but it is likely that they migrate past the Plant in the spring (March - June) while moving to and from the presumed spawning grounds near Little Falls, Maryland (about 11 miles [18 km] upstream from the Plant). It is unknown if the sturgeon occur in this region of the river during other times of the year. However, if appropriate forage items are present, they could live in the area in the summer and fall. The shortnose sturgeon has not been reported among the species impinged by the Plant (Personal communication between D. Knight, Mirant, and M.S. Salk, Oak Ridge National Laboratory, July 24, 2006).

While a pair of bald eagles lived for several years about two miles (3 km) south of the Plant near the Woodrow Wilson Bridge (WWBP 2006a) until the recent death of the female (WWBP 2006b), bald eagles are only rarely seen near the Plant (Personal communication between D. Knight, Mirant, and M.S. Salk, Oak Ridge National Laboratory, July 24, 2006). (See Figure 3.3-3.)

The Virginia Natural Heritage Resources information database indicates that no Federally listed threatened or endangered species occur in the city of Alexandria, but it names two Federal species of concern[5] that could occur there: the Northern Virginia well amphipod (*Stygobromus phreaticus*) and Torrey's mountain-mint (*Pycnanthemum torrei*) (VNHR 2006). The amphipod is found only in caves (NatureServe 2006). In Virginia Torrey's mountain-mint occurs in dry, rocky, upland, deciduous woods; along roadsides; and in thickets near streams (NatureServe 2006). There is no suitable habitat for either species on the Plant site.

[5] "Species of concern" means a species that might be in need of conservation action (FWS 2006). Such species receive no legal protection, and use of the term does not necessarily imply that a species will eventually be proposed for listing.

3.4.4.2 State-listed species

The Virginia Natural Heritage Resources information database indicates that the only state protected species that occurs in the city of Alexandria is the threatened wood turtle (*Glyptemys insculpta*) (VNHR 2006). Wood turtles live along permanent streams during much of each year, but in summer they may roam widely overland and can be found in a variety of terrestrial habitats adjacent to streams, often associated with the margins of woods (NatureServe 2006). There is no suitable habitat for the species on the Plant site.

3.5 Waste Management

Except for small quantities of fly ash that are used beneficially (Section 2.4.3), fly ash from the Plant is disposed of in the Brandywine Fly Ash Facility, a landfill owned and operated by Mirant Ash Management LLC and used solely for disposal of coal combustion ash. The landfill, located in southeastern Prince George's County, Maryland (east of the community of Brandywine) (Figure 2.4.1), is also used for disposal of fly ash from Mirant's Chalk Point Generating Plant on the Patuxent River estuary in southeastern Prince George's County.

The 178-acre (72-ha) site currently used for waste disposal is part of a larger area that was formerly surface-mined for gravel and that has been used for coal combustion ash disposal since 1971. Surrounding land uses include an active sand and gravel mining operation, agricultural fields, forest, a high-voltage electric transmission line, and other landfills. The landfill site has a low-permeability base of compacted native soil (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006) and is equipped with a leachate collection system. Ash is delivered to the landfill by dual-axle dump trucks and is placed and compacted in the landfill in 2-ft (0.6-m) layers. On weekdays during peak power-generation periods the landfill receives approximately 60 truckloads of ash from the two generating stations; average daily ash receipts are approximately 70% of peak daily receipts.

Stormwater runoff and leachate from the landfill drain to collection ponds where a sprinkler pump provides aeration, water quality is monitored, pH is adjusted, and solids settle out before the water is discharged to the upper reaches of Mataponi Creek (a tributary to the fresh water tidal river reach of the Patuxent River) and an unnamed tributary to the creek (Baxter 2006). Dust is controlled by periodically watering haul roads and the active disposal area, using water recycled from the collection ponds (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Landfill site plans limit the final height of the fill to a elevation of 260 ft (79 m) above mean sea level (MSL), or about 70 ft (21 m) above the original land surface grade (Personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006). Areas of the landfill that have reached their maximum

design height are capped with a 3-ft (1-meter) thickness of soil and seeded to establish a vegetative cover. In January 2005 the landfill was calculated to have a remaining capacity of 2.07 million yd^3 (1.58 million m^3), providing sufficient capacity for disposal of the two power plants' projected ash generation for about 7 years, or approximately through the middle of 2012 (GB&B Inc. 2005).

Disposal facilities for coal combustion ash are not subject to state solid waste regulation in Maryland (Personal communication between R. Daniel, Maryland Department of Environment Customer Service Center, and E.D. Smith, Oak Ridge National Laboratory, June 6, 2006), but local zoning requirements and state wastewater regulations apply. The Brandywine facility operates under a series of special exceptions from Prince George's County zoning restrictions. The most recent special exception for 12 years of continued operation was approved by Maryland-National Capital Park & Planning Commission, Prince George's County Planning Department in 1991 (Baxter 2006). In 2005 Mirant filed an application for a 15-year extension to this special exception (Baxter 2006); the application is currently pending.

Discharge of wastewater from the site, including storm water runoff, collected leachate, and truck wash water, is permitted under MDE Discharge Permit 02-DP-1389 (NPDES Permit MD0054836), issued by the Maryland Department of the Environment. The current 5-year discharge permit is effective September 1, 2005, to August 31, 2010. The permit limits discharge to a pH range of 6 to 9 pH units, total suspended solids of no more than 35 mg/L as a monthly average and 70 mg/L as a daily maximum, and total iron of no more than 3.5 mg/L as a monthly average and 7.0 mg/L as a daily maximum. Discharge monitoring requirements under the permit include monthly flow and monthly measurements for pH, total suspended solids, hardness, iron, copper, lead, selenium, and zinc. Six groundwater monitoring wells in the vicinity of the landfill are monitored quarterly for pH; total dissolved solids; chloride; sulfate; and dissolved aluminum, cadmium, manganese, copper, iron, lead, silver, and nickel. No surface or groundwater problems are currently identified at the site (Baxter 2006). There have been no regulatory violations since 1996 when a discharge from one of the wastewater ponds exceeded the permit limit for total suspended solids (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

3.6 Transportation Resources

The primary transportation activities associated with Plant operations are (1) trains traveling to and from the Plant to deliver coal and trona and (2) trucks traveling to and from the plant to remove ash. The following sections discuss the affected local environment for these rail and road operations.

3.6.1 Rail

Trains enter and exit the Plant to deliver coal and trona via a short rail spur from the CSX, Inc., main rail line located west of North Henry Street (Figure 3.6-1). The City of Alexandria allows the Plant to conduct rail operations during two daytime periods (11 a.m. to 12 p.m. and 1 p.m. to 3 p.m.) and one nighttime period (7 p.m. to 11 p.m.) from Monday through Saturday. (The Plant does not receive rail deliveries on Sundays.) Daytime rail operations involve removing empty rail cars from the Plant during each of the two daytime periods to avoid blocking vehicular traffic on the George Washington Parkway (Figure 3.6-1). Nighttime rail operations involve deliveries of coal and trona (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

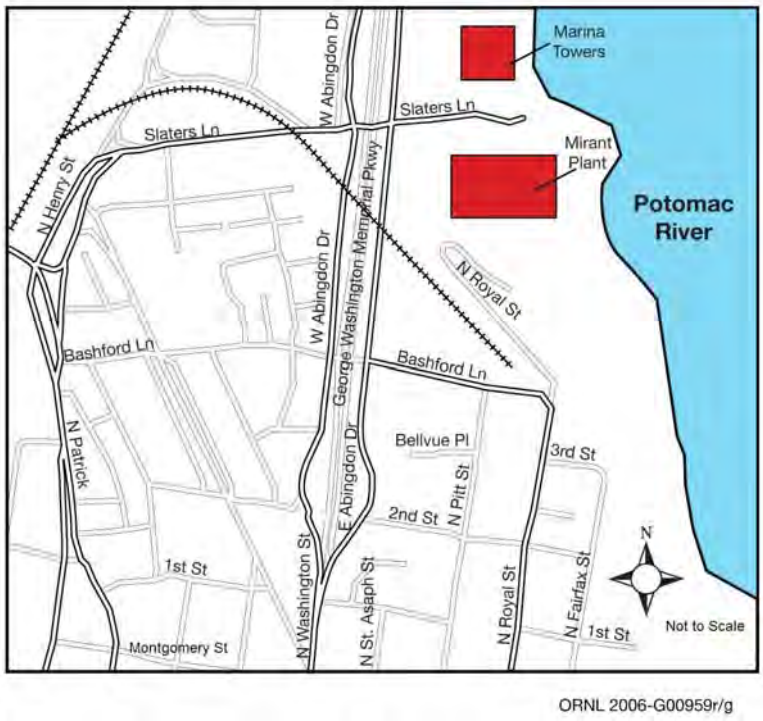


Figure 3.6-1. Access routes near the Mirant Plant.

3.6.2 Road

Trucks enter and exit the Plant to remove ash via a gated entrance located on North Royal Street (Figure 3.6-1). The trucks haul ash from the Plant to the Brandywine Fly Ash Facility in Prince George's County, Maryland (Figure 2.4-1).

From the Plant the trucks travel south on North Royal Street, then west on Montgomery Street (Figure 3.6-1). Neither the Virginia Department of Transportation nor the City of Alexandria maintains data on annual average daily traffic[6] or level-of-service (LOS)[7] for North Royal Street, but it is a local street with relatively little traffic and an existing level-of-service (LOS) at or near "A" (Personal communication between B. Garbacz, Transportation Engineer,

[6] The annual average daily traffic is "an estimate of typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year" (VDOT 2004).

[7] Level-of-service (LOS) is "a standard measurement used by transportation officials which reflects the relative ease of traffic flow on a scale of A to F, with free-flow being rated LOS-A and congested conditions rated as LOS-F" (FHWA 2006).

City of Alexandria, Virginia, and J.W. Saulsbury, Oak Ridge National Laboratory, May 26, 2006). On Montgomery Street annual average daily traffic is 3,800 vehicles (VDOT 2004).

Once the trucks reach the intersection of Montgomery Street and Henry Street (State Route 1) (Figure 3.6-1), they travel south on Henry Street to access Interstate 495 (I-495 or the Capital Beltway) (Figure 2.4-1). The trucks then travel east on I-495 North, crossing the Potomac River on the Woodrow Wilson Memorial Bridge, which serves as a major connector between Virginia and Maryland (Figure 3.3-3). On entering Maryland, trucks exit onto Maryland Route 5 and travel south. The trucks continue to travel south on Maryland Route 381 (Brandywine Road) to North Keys Road, on which the Brandywine facility is located. Table 3.6-1 lists the existing traffic volumes on each of these roads between Henry Street in Alexandria and the Brandywine facility in Maryland.

Table 3.6-1. Roads traveled by the ash removal trucks between Henry Street and the Brandywine Fly Ash Facility

Road	Segment	Annual Average Daily Traffic
Henry Street (Route 1)	Southbound to I-495 North (Capital Beltway)	22,000 to 25,000
I-495 North	Eastbound into Maryland via the Woodrow Wilson Memorial Bridge	154,000
I-495 North	Eastbound in Maryland to Maryland Route 5	142,925 to 174,800
Maryland Route 5	Southbound to Maryland Route 381	62,450 to 112,050
Maryland Route 381 (Brandywine Road)	Southbound to North Keys Road	4,850 to 12,150
North Keys Road	Southbound to the Brandywine Fly Ash Facility	No data available

Sources: VDOT 2004; MDOT 2005

The road network used to transport ash to the landfill is affected by ongoing construction activities associated with the Woodrow Wilson Bridge Project (WWBP 2006a). This project, which is scheduled for completion in December 2012, involves a series of roadway and interchange improvements along a 7.5-mile-long (12-km-long) segment of I-495 that extends from the Telegraph Road interchange in Virginia to the Route 210 interchange in Maryland. The project's centerpiece, widening and improving the Woodrow Wilson Memorial Bridge, is scheduled for completion in December 2008.

Access to the Brandywine Fly Ash Facility from North Keys Road is via a private road that is shared by an adjoining sand and gravel mining and wet processing facility. During peak winter and summer months total hauling operations at the Brandywine Fly Ash Facility consist of approximately 60 truckloads per day. This total includes trucks from the Plant and from Mirant’s Chalk Point Power Plant in Prince George’s County, Maryland. Typical weekday

haulage activity at the Brandywine facility is approximately 70 percent of the seasonal peaks (Baxter 2006).

There are some existing traffic problems on Maryland Route 381, which is used to access the Brandywine facility. Although the State of Maryland's accident records indicate that this road operates without any significant safety deficiencies, certain intersections along Maryland Route 381 function inadequately and have a low LOS based on existing traffic volumes (Baxter 2006).

In April 2005 Mirant filed with the Maryland-National Capital Park and Planning Commission an Application for Special Exception for a Sanitary Landfill (Fly Ash) (Baxter 2006). That application includes information about transporting ash to the Brandywine facility. Mirant's Application was reviewed by the Maryland Department of Transportation State Highway Administration and the Prince George's County Department of Public Works and Transportation. The Department of Public Works and Transportation conducted a traffic study for Mirant's Application in which it assumed that there would be "an increase in through traffic percent along key roadways in the study area." The traffic study examined impacts for seven intersections under three scenarios:

- existing traffic conditions,
- the addition of 13 background developments whose impact would affect some or all of the study intersections, and
- traffic volumes representing total background conditions combined with projected facility site trip generation (the 20-year build-out projection).

Analysis of this third scenario (which includes Mirant's Application, as well as 13 other "background" developments over a 20-year period) indicated impacts on the seven intersections as listed in Table 3.6-2. Ash hauling associated with pre-shutdown operations at the Plant was a minor contributor to these existing traffic problems.

The Department of Public Works and Transportation traffic study notes that the State Highway Administration has required Mirant to address the failing levels of service at these intersections along Maryland Route 381. In particular, the study notes that the intersection of Maryland Route 381 and U.S. Highway 301 "operates inadequately based on existing traffic volumes (LOS-E in the morning) and will worsen significantly with the inclusion of approved background developments." The study adds that pursuant to State Highway Administration's comments, Mirant "has offered no improvements that would ameliorate the inadequacies at that intersection" (Baxter 2006).

Table 3.6-2. Traffic impacts projected in Mirant's *Application for Special Exception* for the road intersections used to access the Brandywine Fly Ash Facility

Intersection	Level-of-Service during after-midnight and morning hours	Level-of-Service during afternoon and evening hours
North Keys Road/Gibbons Church Road (unsignalized)	B	A
Maryland 381/North Keys Road (unsignalized)	***F***	C
Maryland 381/U.S. 301 (signalized)	***F***	***F***
Maryland 381/Baden Westwood Road (unsignalized)	***F***	B
Maryland 381/Croom Road (unsignalized)	***F***	***F***
Link—Maryland 381 (U.S. 301–North Keys Road)	E	D
Link—Maryland 381 (Croom Road–North Keys Road)	C	C

Figures in ***boldface italics*** represent failing levels of service.
Source: Baxter 2006

3.7 Minority and Low-Income Populations

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs each Federal agency to identify and address the "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." The Council on Environmental Quality (CEQ) guidance on environmental justice (CEQ 1997) states that a "minority population" should be identified where either: "(a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis." The CEQ guidance defines "low-income" using statistical poverty thresholds from the Bureau of Census Current Population Reports, Series P-60 on Income and Poverty.

For this analysis DOE examined the 2000 U.S. Census data to identify any minority or low-income populations in census tract[8] (CT) 2018.01, in which the Plant is located (Figure 3.7-1), and the four block groups[9] within CT 2018.01. DOE focused on CT 2018.01 because its boundaries encompass the geographical distribution of the greatest air quality impacts from the

[8] The U.S. Census Bureau defines census tracts as small, relatively permanent statistical subdivisions of a county. Census tracts average about 4,000 inhabitants and are designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions. Census Tract 2018.01 has a total population of 4,727.

[9] The U.S. Census Bureau defines block groups as subdivisions of a census tract. Block groups are the smallest geographic unit for which the Census Bureau tabulates sample data.

Plant. To identify minority and low-income populations within CT 2018.01 and its block groups, DOE defined a "meaningfully greater" population as one that had a minority or low-income percentage at least 10 percentage points higher than the percentages for the city of Alexandria, the state of Virginia, or the United States (whichever is lower).[10] Thus, based on the data in Table 3.7-1, DOE identified minority populations as those that have a minority percentage of at least 39.8% (10 percentage points higher than the state of Virginia) and low-income populations as those that have a low-income percentage of at least 18.9% (10 percentage points higher than the city of Alexandria).

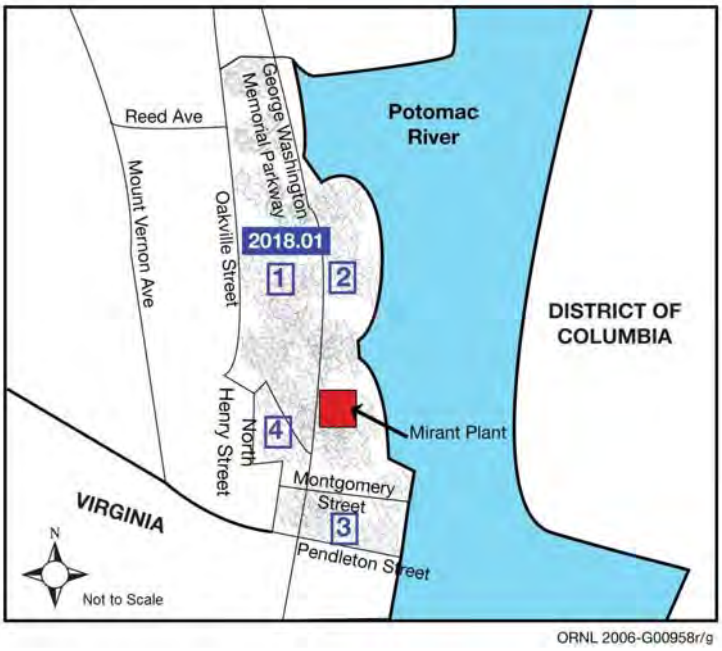


Figure 3.7-1. Block Groups 1-4 within Census Tract 2018.01.

As indicated in Table 3.7-1, the percentages of the total population in CT 2018.01 (population 4,727) that are classified as minority (27.2%) and low-income (11.1%) do not exceed DOE's threshold for identifying either minority or low-income populations. However, block group 3, which is located south of the Plant (Figure 3.7-1) and has a total population of 1,368, exceeds DOE's low-income threshold. Similarly, block group 4, which is located southwest of the Plant (Figure 3.7-1) and has a total population of 620, exceeds DOE's minority threshold. Therefore, block groups 3 and 4 of CT 2018.01 contain minority and low-income populations that meet the DOE thresholds, while block groups 1 and 2 (populations of 1,650 and 1,085, respectively) do not.

[10] The "10 percentage point" criterion is used here because it is large enough to indicate the presence of a minority or low-income population when compared to a large geographic area (i.e., the state or the nation), yet small enough to indicate minor differences in percentages among several census tracts or block groups in a small geographic area. Note that the use of a more conservative criterion, such as 5 percentage points, would not change which block groups are identified as minority or low-income populations.

Table 3.7-1. Minority and low-income data for census tract 2018.01 and its block groups (See Figure 3.7-1)

Location	Percent minority [a]	Percent low-income [b]
United States	30.9	12.4
State of Virginia	29.8	9.6
City of Alexandria	46.3 [‡]	8.9
Census tract 2018.01	27.2	11.1
Block group 1	18.9	5.0
Block group 2	6.3	9.5
Block group 3	37.8	23.3 [‡]
Block group 4	60.0 [‡]	3.4

[a] Includes all persons who identified themselves as not "white alone," plus those who identified themselves as both "white alone" and "Hispanic or Latino."
[b] Represents individuals below the poverty level as defined by the U.S. Census Bureau.
[‡] Minority or low-income population based on the DOE thresholds for percent minority or low-income.
Source: U.S. Census Bureau 2006.

4. PLANT OPERATIONS, ASSUMPTIONS, AND ENVIRONMENTAL CONSEQUENCES

This chapter begins by describing general Plant operations as authorized by the DOE Order. Next, this chapter describes the information and assumptions that DOE used to assess the impacts of the Plant under the DOE Order and a potential extension of the Order until the new 230-kV transmission lines are in service. Finally, this chapter assesses the impacts to air, human health, water, ecological resources, waste management, transportation resources, and minority and low-income populations as a result of the Order and a potential extension of the Order until the new 230-kV transmission lines are in service.

4.1 General Plant Operations as Authorized by the DOE Order

The DOE Order consists of 285 days, from December 20, 2005, to October 1, 2006. Just before the Secretary issued the Order, Mirant operated Unit 1 on an 8-8-8 basis (that is, in any given 24-hour period, it ran for eight hours at up to its maximum level of 88 MW, ran for up to eight hours at its minimum level of 35 MW, and did not run for at least eight hours), and began using trona and low sulfur Colombian coal, alone or in combination.

4.1.1 Operations as Authorized by the DOE Order until the Administrative Compliance Order (ACO)

At the time the Order was issued, Mirant had one operational trona injection unit that serviced only the Unit 1 boiler. A second trona unit became operational on January 22, 2006, and a third on March 20, 2006. Except during transmission line outages (Table 1.3-1), Mirant operated only boilers that had trona units. By April 28, 2006, Mirant had operational trona injection units installed on all five boiler units.

On January 4, 2006, DOE authorized Mirant to operate each of the two load-following or cycling units at the Plant (i.e., Units 1 and 2) up to 16 hours per day. Each unit was authorized to operate 8 hours at minimum load and up to an additional 8 hours at maximum load. In addition, DOE authorized Mirant to operate any one of the three baseload units continuously without constraint as to load or operating hours. According to Mirant's proposed operating plan, each baseload unit would operate for approximately two weeks before another baseload unit began a two-week operating period.

In January 2006, due to transmission line outages for maintenance, Mirant operated the Plant to meet the entire Central Washington, D.C., load for 21 days. No line outages have occurred since those in January. Between January and May, DOE continued to weigh other options that were available to Mirant to comply with the Order and consulted with EPA on options to increase electricity reliability while ensuring environmental protection.

4.1.2 Operation under the ACO

EPA issued its ACO to Mirant on June 1, 2006. On June 2, 2006, DOE directed Mirant to operate under the ACO during non-line outage situations, for the purpose of providing electricity reliability, and to continue operation in accordance with the DOE Order in line-outage situations.

4.1.2.1 Operations during non-line outage situations

Daily predictive modeling. Upon installation of three SO_2 monitors[11] the ACO directs Mirant, in non-line outage situations, to operate under daily predictive modeling. Under daily predictive modeling the Plant operators acquire the National Weather Service forecast for the next day for Ronald Reagan Washington National Airport and use that forecast along with their planned operating parameters as inputs to a computer modeling run for the following day using AERMOD Default[12]. If the modeling results indicate that operating the Plant under those conditions would not cause a modeled exceedance of the 3- and 24-hour average SO_2 and PM_{10} NAAQS limits, operators may run the Plant on that day using those parameters. If the results indicate that operation of the Plant would cause a modeled exceedance for these pollutants, the operators must adjust the planned operating parameters and rerun the model using the same weather forecast. The operators must continue to adjust their planned operating parameters and rerun the model until the results indicate no modeled exceedance of these pollutants. The operators then will operate the Plant the next day using those parameters. Thus, under this scenario the Plant can operate each day up to the maximum level allowed by the weather forecast for that day. The ACO only requires daily predictive modeling for PM_{10} when Mirant operates four or five units. Mirant is required to assume a PM_{10} emission rate of 0.055 lb/MBtu and to adjust operations to prevent a modeled exceedance for PM_{10}.

Other requirements of the ACO. In addition to daily predictive modeling, the ACO requires Mirant to install an audible alarm in the Plant's control room that will sound when the ambient concentration of SO_2 at any monitor reaches specified levels. When an alarm sounds, Mirant must make operational changes (e.g., increase use of trona, decrease operating level) and observe the effect of those changes on the level of SO_2 measured at the monitors. The ACO uses this alarm system to monitor the Plant's compliance with the annual SO_2 NAAQS limit. The

[11] Until June 20, 2006, when three newly installed SO_2 monitors were functioning, Mirant operated under the constraints detailed in Table 1 in the ACO. (See Appendix B.) These constraints included, for example, restrictions on number of hours of operation and SO_2 emission rate during each calendar day. For example, on days when Units 1 and 3 were operating, each unit was required to achieve a 24-hour average SO_2 emission rate no higher than 0.24 lb/MBtu and a 3-hour rolling rate no higher than 0.51 lb/MBtu, and Unit 1 was required to operate for no more than 8 hours per day above minimum power and spend at least 8 hours per day off.

[12] AERMOD Default means Version 04300 of the AERMOD computer model, currently approved for general use by EPA in accordance with 40 CFR Part 51, Appendix W, to predict NAAQS compliance. See the AERMOD text box in Section 4.3.1.

ACO also directs Mirant to undertake a "Model Evaluation Study" (MES) (text box) "to determine the best performing model for predicting the computer-modeled ambient air quality impacts" from Plant operations. To provide data for the MES and to support the alarms, Mirant installed six SO_2 monitors in locations identified in the ACO. (See Appendix B.) Lastly, the ACO puts a NO_x limitation on the Plant; at all times Mirant may not emit more than 3,700 tons (3,400 metric tons) of NO_x per year.

4.1.2.2 Operations during line outage situations

The ACO directs Mirant, in line-outage situations, to follow the DOE Order, but requires Mirant to "take all reasonable steps to limit the emissions of PM_{10}, NO_x and SO_2 from each boiler, including operating only the number of units required to meet PJM's directive and optimizing its use of trona injection to minimize SO_2 emissions." Further, the ACO requires that Mirant achieve "80% reduction of SO_2 emissions unless: 1) Mirant demonstrates ... that 80% reduction is not necessary to achieve compliance with the NAAQS; or 2) Mirant demonstrates that 80% reduction is not logistically feasible because of such factors as the quantity of available trona and the predicted duration of the outage." If Mirant demonstrates that 80% removal is not logistically feasible, it is required to submit a plan to EPA for optimizing its use of trona. However, as described in Section 4.3.1.1 and Section 5.3.1, DOE assumed 50% removal of SO_2 emissions in assessing impacts under the DOE Order and a potential extension of the Order.

Model Evaluation Study

The objective of the MES is to determine the best performing model for predicting the computer-modeled ambient air quality impacts from Plant operations. The MES proceeds by comparing the air quality impacts predicted by the AERMOD Default and those predicted by AERMOD EBD computer models to actual measured SO_2 concentrations in order to determine the better performing model. AERMOD Default is Version 04300 of AERMOD computer model, currently approved for general use by EPA. AERMOD EBD means the standard AERMOD computer model with modified direction-specific equivalent building dimensions derived from a wind tunnel study. Mirant submitted an MES protocol to EPA in July 2006 and submitted the results of the wind tunnel study to EPA in August 2006. If EPA and the VDEQ approve AERMOD EBD, Mirant must use it in its predictive modeling for the remainder of the MES period.

Mirant is to compare the actual data from the six monitors to the results of the two computer models. At the end of the study EPA and the VDEQ expect to determine which model is *best performing*. The best performing model will then be used to develop permanent emission limits for the Plant.

4.2 Assumptions and Data Used in SEA to Model Plant Operations

To the extent possible, DOE's assessment of the environmental impacts of Plant operations under the Order is based on actual operating data. However, the Plant has had several different modes of operation under the Order, and data are not available for all parameters.

Therefore, it was necessary to make some assumptions in order to assess the impacts of the Order and of the potential extension of the Order. This section describes operations under the Order and the assumptions that DOE used to estimate the environmental consequences.

4.2.1 Pre-Shutdown Operations

Before it shut down on August 25, 2005, the Plant operated its five units without SO_2 emissions controls. The Plant generated electricity at an annual average rate of 210 MW and burned about 837,000 tons (755,000 metric tons) of coal per year. Generation varied seasonally, with the highest generation occurring in the summer months when demand for air conditioning is high (Figure 4.2-1).

DOE used hourly, unit-by-unit electricity generation data, provided by Mirant, to model operations of the Plant. DOE used SO_2 emission factors it developed by analyzing detailed operation and emission data for the period December 20, 2005, through March 31, 2006. DOE assumed that the Plant emitted SO_2 at a rate of 1.05 lb/MBtu and that it emitted NO_2 at a rate of 0.35 lb/MBtu for Units 1 and 2 and 0.26 lb/MBtu for Units 3, 4, and 5.

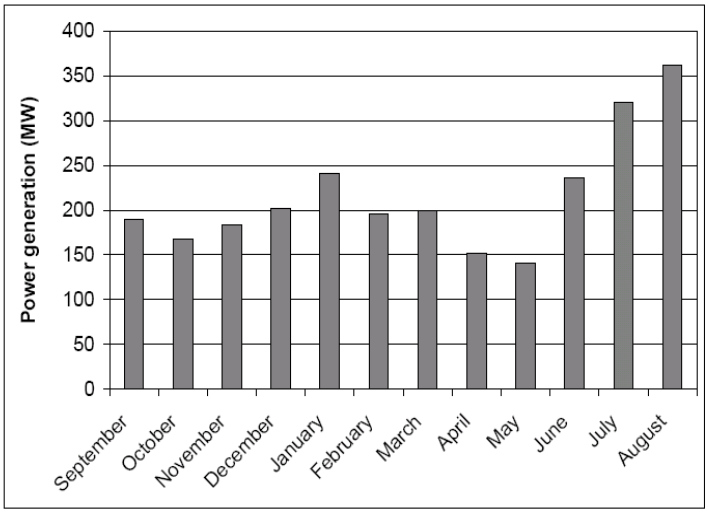


Figure 4.2-1. Monthly average power generation for September 2004 through August 2005.

4.2.2 Pre-Order Operations

Before the Secretary of Energy issued the Order, Mirant was operating Unit 1 in an 8-8-8 mode (in any given 24-hour period, the unit ran for up to eight hours at power levels up to its maximum level of 88 MW, ran for eight hours at its minimum level of 35 MW, and did not run for eight hours) and had begun using trona injection and low-sulfur coal in varying quantities. If the Order had not been issued, it is likely that Mirant would have continued to restart additional units at the Plant with the further installation of trona injection units. However, because it is impossible to know exactly what would have happened if the Order had not been issued, DOE is providing this "pre-Order" mode of operations as a basis for comparing impacts under the Order.[13]

[13] Because Mirant did not provide DOE with operations data for periods before December 20, 2005, and (continued...)

During the pre-Order mode, the Plant's Unit 1 operated for 16 hours per day with intermittent use of Colombian coal and/or trona injection. A typical day started at about 4 am with the unit being brought up to operating temperature by burning oil for about two hours. At about 6 am the unit was switched to coal and began generating electricity. The unit would reach a level close to its 88 MW capacity in about five hours, around 11 am. The unit would continue at that high power level through the afternoon and evening before making the transition to shut down status by about 10 pm. This is the 8-8-8 mode of operation.

During the pre-Order period Unit 1 consumed about 540 tons (490 metric tons) each day of coal with an average heat content of 12,000 Btu/lb and a heat rate of 12.9 million Btu per MWh (MBtu/MWh). On average, the unit emitted about 10,300 lb (4,700 kg) of SO_2 and about 4,300 lb (1,900 kg) of NO_x per day. SO_2 emission rates varied within the period due to trona injection and burning of coal with different sulfur contents. At this rate of coal consumption, one train containing 40 rail cars with 100 tons (91 metric tons) of coal per rail car could provide a week's worth of coal to the Plant. On a day when the Plant consumed 540 tons (490 metric tons) of coal that was on average 67% by weight carbon, it released about 1,300 tons (1,200 metric tons) of CO_2.

According to discharge monitoring reports that Mirant prepared for submission to EPA (Personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006), during December 2005 discharges to the Potomac River of cooling water and treated in-plant effluents averaged 94 million gal (356,000 m^3) per day. The reported maximum thermal discharge to the river was 969 MBtu per hour.

4.2.3 Operations under the Order and Potential Extension

Mirant provided DOE with hourly records of power plant operations for the period December 20, 2005, through March 31, 2006. These records include power production, stack gas parameters (e.g., flow rate, temperature, percent CO_2, opacity), pounds of NO_2 released per million Btu, pounds per hour of NO_2 released, pounds of SO_2 released per million Btu, and pounds per hour of SO_2 released. Table 4.2-1 is a summary of plant operations through March 31, 2006.

Mirant also supplied data on wastewater discharges for all months through June 2006 and data on total coal consumption and fly ash generation during the 3-month period March through May 2006.

The operating records described above allowed DOE to estimate plant operational parameters for each unit. DOE used those parameters to model plant operations during the Order and during a potential extension of the Order.

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[13] (...continued)
because Mirant continued its pre-Order (8-8-8 mode) operations through December 23, DOE used December 20 through 23 to represent pre-Order operations.

Table 4.2-1. Plant operation from December 21, 2005, through March 31, 2006

Dates	Operating mode
December 20- 23, 2005	Unit 1 operated with Colombian coal and trona testing
December 24, 2005	No data available
December 25 - 31, 2005	Unit 1 operated without using low sulfur coal or trona
January 1, 2006	No data available
January 2 - 6	Unit 1 operated without using low sulfur coal or trona
January 7 - 19	All five units operated as directed by PJM for a transmission line outage; only Unit 4 had trona injection
January 20	Only Unit 4 operated
January 21 - 28	All five units operated as directed by PJM for a transmission line outage; trona injection on Units 3 and 4
January 29 - February 15	Units 1 and 4 operated with trona injection
February 16 - 17	Only Unit 4 operated
February 18 - 21	Unit 3 and Unit 4 operated
February 22 - 25	Unit 1 and Unit 3 operated
February 26 - 27	Only Unit 3 operated
February 28 - March 8	Unit 2 and Unit 3 operated
March 9	Only Unit 4 operated
March 10 - 21	Unit 4 and Unit 5 operated
March 22	Only Unit 4 operated
March 23 - 31	Unit 3 and Unit 4 operated

Note: After January 28, only units employing trona injection were operated. Because Mirant found the Colombian coal unsuitable for use at the Plant, after the initial supply was consumed, Mirant used only trona injection to control SO_2 emissions.

For the purpose of evaluating impacts for which actual emissions data are not available, DOE assumed that impacts could be scaled to power production and coal use based on pre-August 2005 data (Section 4.2.1). During the year before shutting down in August 2005, the Plant generated power at an average rate of approximately 210 MW and consumed about 832,000 tons (755,000 metric tons) of coal.

Assumptions for operations from December 20, 2005, through June 30, 2006. For the period through March 31, DOE used hourly emissions data provided by Mirant to model air emissions. For the two days for which data were not provided, DOE assumed operations were identical to the preceding day. For this period DOE used historical weather data for the specific days of operation acquired from the National Weather Service.

Beginning with April, DOE made assumptions on operating modes based on information provided by Mirant. In operating plan supplements that Mirant supplied to DOE on January 13, 17, and 24 and February 6 and 16, 2006, Mirant described combinations of SO_2 emission rates and limits on hours of operation for all combinations of two units that its modeling determined would not cause any NAAQS exceedance. To model the air quality impacts of operations during the period April 1 through May 31, 2006, DOE assumed that Mirant operated the Plant to the maximum level described in those supplements.

Assumptions for operations from July 1 through September 30. On June 2, 2006, DOE directed Mirant to operate the Plant in compliance with the ACO. The ACO directed Mirant to operate the Plant within a set of constraints on operation hours and SO_2 emission rates enumerated in the ACO until Mirant met the requirements to operate in accordance with daily predictive modeling. For the purposes of this SEA DOE assumed that the Plant operated June 1 through June 30, 2006, in a manner that produced the maximum electrical power while being in compliance with the table of operational limits in the ACO.[14]

DOE assumed that after June 30 Mirant operated at the maximum level of power generation allowed under daily predictive modeling, as described in Section 4.1.2.1, and that, except during line-outage periods, this mode of operation continued through the duration of the Order and during a potential extension of the Order through 2007. The Plant generates electric power in response to demand, at levels requested by PJM. In order to estimate how much power might be generated during non-line outage situations when operating under daily predictive modeling, DOE used the record of the last year of historical operation (i.e., the year prior to August 24, 2005; Figure 4.2-1) to produce a scenario that represents levels of operations that might reasonably be expected if it were not for environmental constraints.

Assumptions for a potential extension of the Order.[15] DOE assumed that during non-line outage periods, the Plant would produce as much power as during the year before shutting down in August 2005, while complying with the ACO. Pepco has plans for several transmission line outages that would occur during a potential extension of DOE's Order before the two new 230-kV transmission lines are put into service. Outages are planned from November 27 through December 11, 2006; and February 19 through March 5, May 2 through 15, and May 21 through June 15, 2007. During outage periods DOE assumed that the Plant generated an amount

[14] Table 1 of the ACO specifies maximum operations levels and SO_2 emission rates for individual units and for combinations of two or three units. For operations under the ACO before daily predictive modeling commenced, DOE assumed that the Plant operated two units at all times.

[15] On September 28, 2006 Secretary Bodman issued a temporary extension of the Order until 12:01 a.m., December 1, 2006 to allow time to complete the SEA and consider public comments.

of power equal to the Central D.C. load during the corresponding dates in the year ending on August 31, 2005.[16]

Mirant is planning to take units out of service beginning in the fall of 2007 to reconfigure the exhaust stacks. DOE has not modeled these planned unit outages because they are not confirmed.

4.3 Environmental Consequences

Assessment of the environmental consequences of the Order is organized by environmental resource. Consideration of cumulative environmental impacts is incorporated into the individual resource-specific discussions, both implicitly (by considering impacts of the Order in the context of environmental conditions that exist because of past and ongoing actions) and explicitly (by considering the potential impacts of any additional ongoing and reasonably foreseeable future actions identified as having the potential to affect the resource).

4.3.1 Air Quality

Impacts to air quality would occur as the result of pollutants being emitted from the Plant's stacks during operations, as well as from activities at the Plant involving vehicle emissions and fugitive dust associated with the coal pile and the handling of ash. The pollutants of primary concern are SO_2 and particulate matter. Modeled concentrations of SO_2 and PM_{10} are discussed in Section 4.3.1.3. All other NAAQS pollutants, including $PM_{2.5}$, and hazardous air pollutants are discussed in Section 4.3.1.5. The emissions from the Plant were modeled for four periods: (1) Pre-shutdown operations, that is, the period before the Plant shutdown in August 2005; (2) Pre-Order operations (Section 4.2.2); (3) the period of the Order, including before

AERMOD

AERMOD is one of the approved models included in EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). It is composed of three parts: AERMAP, AERMET, and AERMOD. AERMOD is a steady-state plume air dispersion model that computes the air concentration of released pollutants at selected receptor points. During each hour modeled AERMOD considers the source characteristics (e.g., amount, temperature, stack exit velocity), atmospheric parameters (e.g., wind speed and direction, atmospheric stability), the relative locations of the source and receptor, and the effects of nearby buildings. The computed hourly concentrations are combined to produce the averaging periods (e.g., 24-hour averages) as requested by the user. AERMAP produces the required input data relative to the receptor grid, including elevation. AERMET processes surface and upper-air atmospheric data and produces the input files required by AERMOD.

[16] Because the Plant was not operating at normal historical levels in the period from August 21-31, 2005, DOE used operational levels for the first 11 days of August 2005 to represent the level that the Plant would likely have operated at if it had been generating power at historical levels during the last 11 days of the month.

the ACO allowed daily predictive modeling (December 20, 2005 through June 30, 2006) and after daily predictive modeling began (July 1 through September 30, 2006); and (4) the period beyond the Order (including the period of the temporary extension of the Order to December 1, 2006) until such time as the new transmission lines are placed into operation (October 1, 2006, through June 30, 2007, or, possibly, December 31, 2007).

4.3.1.1 Modeling methods and assumptions

DOE modeled hourly- and annual-average air concentrations of SO_2 and PM_{10} using the AERMOD system (EPA 2002). (See text box.) AERMOD was used to calculate concentrations for each of the more than 1,700 receptor locations provided by EPA, as shown in Figure 4.3.1-1. The modeled receptor locations include 50-meter intervals along the Plant's fence line. Beyond the fence line, the receptor grid forms a rectangular pattern with the innermost receptors spaced at 100-meter intervals out to a distance of 1,000 meters from the Plant (i.e., the innermost

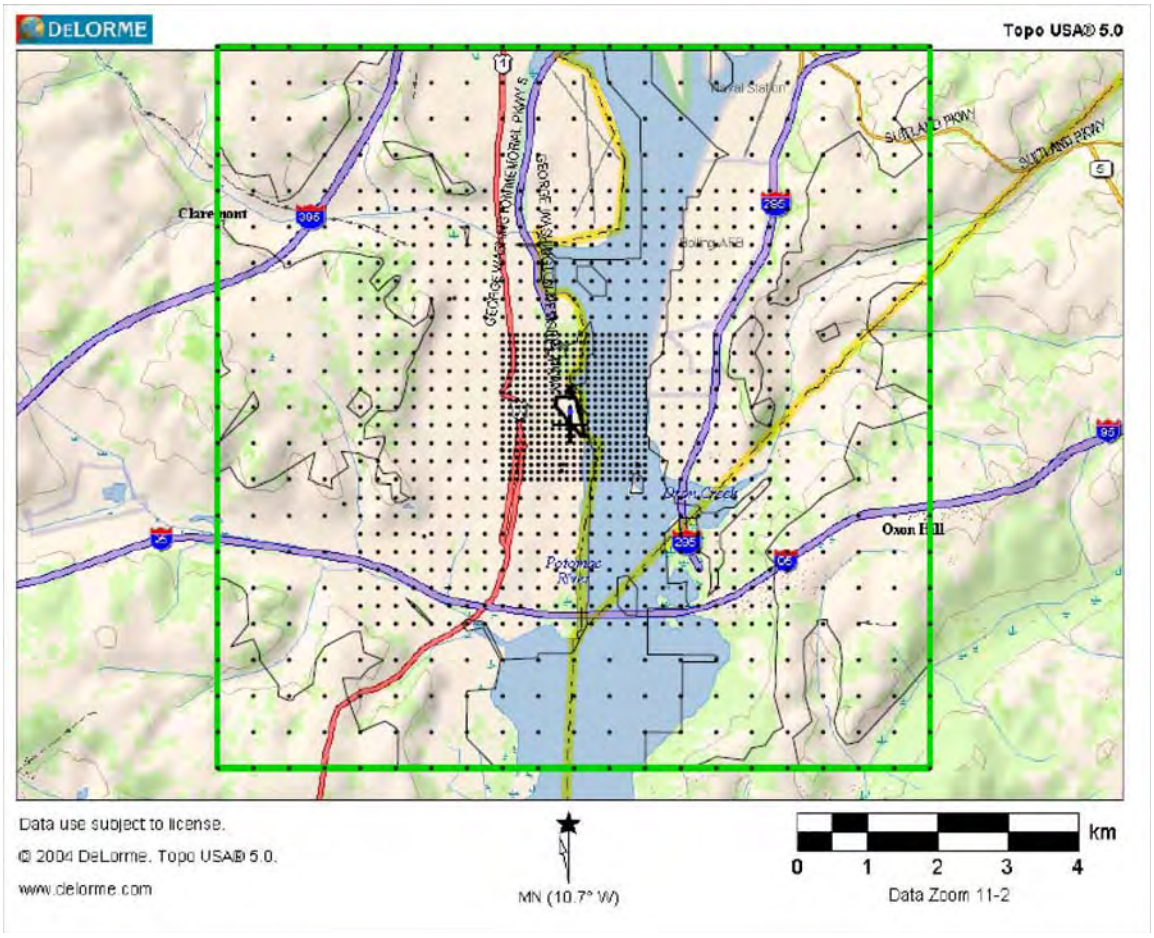


Figure 4.3.1-1. Map of receptor grid points for atmospheric dispersion modeling.

receptor grid forms a square 2,000 meters long on each side). A second set of receptors is located on the rectangular coordinates at 250-meter spacing for the distances between 1,000 and 3,000 meters of the Plant. Beyond 3,000 meters from the Plant, the receptor grid spacing is increased to 500-meter intervals. The receptor farthest from the Plant in an east-west direction (or in a north-south direction) is located 5,000 meters from the Plant. In addition to the grid of receptor locations, DOE modeled pollutant concentrations at several tall buildings in the vicinity of the Plant. DOE modeled 336 points around Marina Towers at the north end of the Plant, as well as points at multiple heights for six other nearby, tall buildings. The 336 points around Marina Towers are from 24 locations around the perimeter of the building and each of 24 floors of the building. Similarly, the multiple heights at the six other nearby buildings are the heights of each floor of the building.

AERMOD input data. For the period December 20, 2005, through March 31, 2006, DOE used actual unit-by-unit emissions (as provided by Mirant) and actual weather data obtained for Ronald Reagan Washington National Airport. These actual emissions and weather data were used in AERMOD to calculate local air pollution contributions of the Plant. For all other time periods DOE used estimated emissions and weather data from 2001 (as provided by EPA). Previous analyses by EPA had shown that 2001 resulted in predictions of more adverse air quality than the other years in the period 2000 through 2004.

For the period April 1 through May 31, 2006, DOE assumed that the Plant operated a different pair of units each week. Mirant reported to DOE that it had identified 10 two-unit operating modes (i.e., combinations of units that could operate for specified numbers of hours per day at specified SO_2 emission rates) that modeling by Mirant's contractor had demonstrated would not lead to exceedances of the 24-hour average SO_2 concentration at any location. For modeling purposes DOE assumed that the Plant practiced a ten-week rotation during which two of the five units were in operation during any given week. DOE assumed the following rotation of units: 1 and 2, 1 and 3, 1 and 4, 1 and 5, 2 and 3, 2 and 4, 2 and 5, 3 and 4, 3 and 5, and 4 and 5.

For the period April 1 through May 31, 2006, DOE assumed that the Plant operated a different pair of units each week. Mirant reported to DOE that it had identified 10 two-unit operating modes (i.e., combinations of units that could operate for specified numbers of hours per day at specified SO_2 emission rates) that modeling by Mirant's contractor had demonstrated would not lead to exceedances of the 24-hour average SO_2 concentration at any location. For modeling purposes DOE assumed that the Plant practiced a ten-week rotation during which two of the five units were in operation during any given week. DOE assumed the following rotation of units: 1 and 2, 1 and 3, 1 and 4, 1 and 5, 2 and 3, 2 and 4, 2 and 5, 3 and 4, 3 and 5, and 4 and 5.

For the month of June DOE assumed that two units at a time operated according to the schedule of allowed operations given in the ACO (Section 4.1.2). DOE assumed that the Plant used each of the 10 combinations of two units and operated each for three days.

DOE assumed that daily predictive modeling, as authorized by the ACO, was implemented beginning July 1, 2006. For operations under daily predictive modeling DOE assumed that, except during outages, each Plant unit generated power at the same level as it had during the year before Mirant terminated operations in August 2005[17] and that at all times Mirant injected enough trona to achieve 50% SO_2 removal (i.e., controlled to 0.525 lb/MBtu). DOE estimated 50% SO_2 removal to be an average or typical removal rate. At low power generation times and/or favorable wind conditions, very little SO_2 removal is needed to meet air quality standards. During high generation times and/or unfavorable wind conditions, higher rates of trona use (to remove up to 80% of SO_2) are necessary to meet air quality standards. DOE selected the assumption of 50% removal as a mid-range value.

During the transmission line outages planned by Pepco (Table 1.3-1), DOE assumed that all five units operated as necessary to meet the full load of Central D.C. as determined from past data.[18] DOE assumed that after a planned transmission outage the Plant resumed generating power at the level it had the year before operations were terminated on August 24, 2005.

The greatest modeled exceedances of the NAAQS SO_2 limits occur during line outage periods. Although removal of 80% of SO_2 from stack gases, which is technically feasible, would considerably reduce (but not eliminate) modeled exceedances, DOE's modeling of line outage periods assumes that the Plant removes 50% of SO_2 from stack gases. DOE has not modeled 80% removal because Mirant does not stockpile sufficient trona to maintain 80% SO_2 removal for an extended (typically, two-week) line outage.

Sulfur Dioxide. The SO_2 modeling proceeded by using AERMOD to calculate concentrations for each receptor grid point. To simulate the daily predictive modeling process of adjusting planned operations until modeled NAAQS compliance is achieved, DOE examined the 24-hour average concentration for each receptor grid point and for each day. For each day the predicted pollution concentration of each point in the receptor grid was reduced by the percentage that just brought the point with the highest concentration into compliance with the 24-hour SO_2 NAAQS limit.[19] DOE performed this procedure for every modeled day (except

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[17] Mirant provided unit-by-unit, hour-by-hour generation data for the period September 1, 2004, through August 31, 2005. DOE used this hourly power generation data to represent what the Plant would do if there were no environmental constraints. Plant operations were terminated on August 24, 2005. Because the data suggest that the Plant started reducing operations on August 21, generation data after August 20 were not considered representative of normal operation.

[18] During outages, DOE assumed that all five units operate at all times, each generating at least 30 MW (minimum capacity), for a total of at least 150 MW. When the load exceeded 150 MW but did not exceed 366 MW, DOE assumed that the two load-following or cycling units (Units 1 and 2) operated at minimum load (for a total of 60 MW) and the three baseload units (Units 3, 4, and 5) each operated at the same level to meet the remaining load. When the load exceeded 366 MW, DOE assumed that the baseload units each operated at capacity (102 MW), for a total of 306 MW, and the load-following or cycling units each operated at the same level to produce enough additional power to meet the demand until the load exceeded the capacity of the Plant (482 MW).

[19] Compliance with the 24-hour SO_2 limit was based on a concentration of 314 $\mu g/m^3$ (the NAAQS standard

(continued...)

during outages) before calculating 3-hour, 24-hour, and long-term average concentrations. Although the ACO also requires modifying planned operations if daily predictive modeling forecasts an exceedance of 3-hour average SO_2 limits, DOE did not simulate predictive modeling for the 3-hour standard because the computational effort required to calculate average concentrations for all possible 3-hour periods for each of the 1,747 modeled locations was judged to be excessively large for the information to be gained.

Particulate Matter. DOE's modeling considered both stack emissions and fugitive emissions from the Plant as sources of airborne particulate matter.

Based on particulate emissions testing by TRC Environmental Corporation (2006), DOE used a stack emission rate of 0.019 lb PM_{10} per MBtu when trona injection was employed and 0.035 lb/MBtu PM_{10} when it was not in use. For operations before the Order and during the January 2006 transmission line outage, DOE assumed the 0.035 lb/MBtu PM_{10} emission rate. For all other periods after the Order, DOE assumed the 0.019 lb/MBtu emission rate. DOE modeled stack emitted PM_{10} emissions using the same operational schedule as used for SO_2 modeling. However, DOE did not simulate the effects of daily predictive modeling on PM_{10} emissions because DOE found that with the 0.019 lb/MBtu emission rate, stack emissions never lead to exceedances of the NAAQS limit for PM_{10}.

DOE modeled fugitive PM_{10} emissions using fugitive dust parameters supplied to EPA by Mirant. Some fugitive emissions are related to wind; for example, wind blows dust off the coal pile. Most of the emissions are related to the handling of coal and ash, which are operations that increase as plant operations increase. Fugitive dust modeling parameters were not, however, increased or decreased as generating levels increased or decreased. The parameters are based on the assumption that four of the five units operate full time, but they do not account for the extra dust generated by disposal of trona waste.

4.3.1.2 Uncertainties in modeling

The modeling results need to be interpreted cautiously because of many uncertainties related to assumptions and modeling approaches. Overall, DOE's approach was conservative in that it tends to overestimate impacts. Specific sources of uncertainty include the following:

1. DOE chose to use 2001 weather data because, based on EPA experience using 2000 through 2004 weather data, the 2001 data were more likely than other years to yield modeled exceedances.

2. For periods after June 30, 2006, DOE assumed that Mirant used trona injection to reduce SO_2 emissions by 50%. The Plant may operate with less than 50% SO_2 removal when

[19] (...continued)
of 365 less the assumed background concentration of 51 µg/m^3).

modeling (based on predicted weather conditions) does not indicate an exceedance would result. Conversely, the Plant may remove more than 50% of SO_2 or reduce power generation rates when modeling indicates this is necessary to avoid exceedances of the NAAQS. The assumption of 50% SO_2 removal is likely to mean that DOE's modeling underestimates the period-average concentrations of SO_2. However, because of the way DOE has modeled daily predictive modeling, this should introduce little error in estimates of maximum short-term SO_2 concentrations.

3. DOE did not model all of the operational possibilities available to Mirant. When modeling indicates an exceedance, DOE's modeling assumes that Mirant reduces emissions to a level just below what would cause a modeled exceedance. (This is equivalent to assuming that the power generation from each boiler is reduced by the necessary percentage, or that additional trona is injected at each boiler to reduce SO_2 emissions by that percentage.) While it is mathematically possible to exactly meet the 314-µg/m^3 24-hour limit, DOE expects Mirant to keep SO_2 emissions somewhat below the levels that are computed to just meet the limit. Therefore, this DOE modeling approach tends to overestimate actual 24-hour averages.[20]

4. The ACO requires Mirant to achieve 80% SO_2 removal during line outage situations unless predictive modeling demonstrates that this level of SO_2 removal is not necessary or Mirant demonstrates that 80% removal is not "logistically feasible." Because Mirant does not have the capacity to stockpile sufficient trona for an extended line outage, DOE assumed 50% SO_2 removal during line outage situations.

5. DOE has used an estimate of fugitive PM_{10} emissions that is based on the assumption that four of the five boiler units are operating at all times. While some fugitive emissions are caused by wind-blown erosion (e.g., of the coal pile), most fugitive emissions result from coal and ash handling. Because the amount of coal and ash handling is related to the level of power generation, fugitive emissions are probably overestimated for periods when the Plant is producing relatively little power. On the other hand, because the fugitive emissions rates do not account for increased emissions due to trona waste generated by operations, the fugitive emissions may be underestimated during high power generation periods.

6. DOE's modeling of operations under daily predictive modeling does not account for the use of monitoring and alarms to prevent exceedances of SO_2 NAAQS. The ACO requires

[20] Although not required, Mirant is known to be targeting 200 µg/m^3 for a margin of predictive modeling to provide a margin of safety. (D. Lohman, EPA Region 3, personal communication with Seema Kakade, DOE, October 26, 2006.)

Mirant to monitor SO_2 at two locations on the top of Marina Towers and four other locations near the Plant. The ACO requires Mirant to maintain alarms that alert the Plant operators if monitored average concentrations reach 80% of the standards for SO_2. If one of the alarms sound, Mirant is required to modify operations to prevent an exceedance. (See Appendix B, Section IV, B, 5.) Because DOE's modeling does not account for use of monitoring to constrain operations, it overestimates the actual concentrations that will be observed during operations after this section of the ACO takes effect.

7. The highest modeled SO_2 concentrations occur at the rooftop at Marina Towers. Initial monitoring data collected by SO_2 monitors installed by Mirant for the MES do not show concentrations as high as calculated by Mirant's follow-up modeling, which is based on actual weather data. Because DOE believes it used the same AERMOD input parameters that Mirant used, these data suggest that the DOE application of AERMOD may overestimate maximum concentrations at Marina Towers. These data and the questions they raise are described in more detail in Section 4.3.1.4.

Despite the limitations, the results presented here are the best estimates available at this writing.

4.3.1.3 Modeling results for SO_2 and PM_{10} emissions

The EPA has established air quality standards for different averaging periods. An area is considered to be in attainment when the standards are not exceeded at any location in the area. For most pollutants compliance is determined by the second highest value or some other statistical characteristic per year.

The tables in this section present concentrations for three time averaging periods: 3-hour, 24-hour, and specific indicated time periods ranging from 21 to 387 days in length, which are presented as surrogates for the annual average. Although the standards typically determine compliance by the second highest value or another statistical characteristic, for simplicity DOE presents only the highest value for the specified averaging period. This maximum value is likely to be higher than the value used to determine compliance with the standard.

In all cases the value presented in the table is the modeled value for the receptor location that had the highest modeled value among the 1,747 modeled receptor locations. The 3-hour average refers to the highest average concentration for any three consecutive hours for any location. The 24-hour average is the highest average concentration for any calendar day (in the period) at any location. The maximum 3- and 24-hour averages represent relatively unusual occurrences. The annual or period average is more indicative of the usual air quality. Because most of the modeled periods are shorter than one year, the modeled period averages in the tables are not directly comparable to the annual air quality standards, but they do indicate how the period contributes to the annual average. For example, operations during a period with an average that exceeds the annual standard could contribute toward an exceedance of the annual

standard, while operations during a period with an average below the standard could contribute toward meeting the annual standard. Note that, because pollutants are not evenly distributed across the area, all values in the tables considerably overstate the expected concentration at all but a few of the 1,747 modeled locations.

Table 4.3.1-1 shows modeled SO_2 and PM_{10} concentrations for pre-shutdown operations, pre-Order operations, and operations under the Order through September 30, 2006. The first row of the table presents maximum background concentrations. These are the maximum values observed at nearby ambient air quality monitoring stations for the specified averaging periods (Table 3.1-2). The ACO specifies that these "background concentrations" must be added to modeled concentrations resulting from Plant operations in determining whether a "modeled exceedance" occurs. Other rows in the table present modeled concentrations resulting from Plant operations and summed values in which modeled concentrations are added to the maximum background concentrations. The summation approach specified in the ACO is conservative because it is very unlikely that maximum Plant-induced concentrations would occur at the same time as maximum background concentrations. The modeling results presented in the table are discussed in more detail in the following paragraphs.

Pre-shutdown operations. Until August 2005 the Plant operated in the historical manner; essentially, it produced power as economics would dictate. The Plant operated without controls on SO_2 emissions. Table 4.3.1-1 shows that modeling of pre-shutdown operations predicts significant exceedances of the NAAQS for SO_2 concentrations. The table also shows exceedance for the maximum 24-hour PM_{10} concentration. The maximum PM_{10} values reported here are dominated by fugitive dust emissions. Maximum modeled concentrations of PM_{10} from stack emissions are generally less than half of concentrations due to fugitive emissions.

Pre-Order operations. During the fall of 2005, the Plant operated in an 8-8-8 mode: 8 hours off, 8 hours at minimum power, and 8 hours at up to maximum power each day (Section 4.2.2). During this period the Plant was experimenting with trona injection and use of Colombian coal. However, Mirant had performed modeling that showed that no exceedance of the NAAQS SO_2 limit would occur under 8-8-8 operation even if no SO_2 control were employed. Consequently, during this period Mirant did not control SO_2 emissions to any set level. Table 4.3.1-1 shows the results of modeling pre-Order operations for an assumed full year. The table shows that pre-Order operations allow the Plant to meet SO_2 limits.

During 2005 and 2006, Mirant implemented several fugitive dust control measures (Section 2.5). Modeling of PM_{10} concentrations resulting from pre-Order operations used emissions factors that assume that some of these measures were in place. Table 4.3.1-1 shows that modeled PM_{10} concentrations for pre-Order operations are substantially lower than for pre-shutdown operations and meet the PM_{10} limits.

Table 4.3.1-1. Modeled maximum ambient SO_2 and PM_{10} concentrations ($\mu g/m^3$) for Plant operations among all receptor locations.

	SO_2			PM_{10}	
Operating Scenario and Period	**Maximum 3-hour average**	**Maximum 24-hour average**	**Maximum period average (for the specified period or 1 year)**	**Maximum 24-hour average**	**Maximum period average (for the specified period or 1 year)**
Maximum Background Concentration	238 [a]	51 [a]	16 [a]	45 [a]	21 [a]
Modeled Maximum Concentrations					
Pre-shutdown operations (Sep. 1, 2004 through Aug. 20, 2005)	5,156	2,967	299	150	25
Pre-Order operations (annual)	767	277	24	61	13
Dec. 20, 2005 through June 30, 2006					
Non-outage periods (172 days)	479	246	32	36	9
Outage periods (21 days)	3,484	1,888	389	43	13
July 1 through September 30, 2006	1,445	314	136	58	10
Modeled Maximum Concentrations with Maximum Background Concentrations Added					
Pre-shutdown operations (Sep. 1, 2004 through Aug. 20, 2005)	5,394	3,018	315	195	46
Pre-Order operations (annual)	1,005	328	40	106	34
Dec. 20, 2005 through June 30, 2006					
Non-outage periods (172 days)	717	295	48	81	30
Outage periods (21 days)	3,772	1,939	405	88	34
July 1 through September 30, 2006	1,683	365	152	103	31
NAAQS limit [b]	***1,300***	***365***	***80***	***150***	***50***

Note: Modeled values are the highest criteria pollutant concentration among all receptor locations. Pre-shutdown and pre-Order operations do not include higher levels of operations for line outages. Actual or planned line outage conditions are included in the operational periods of the Order. Annual values for modeled concentrations for periods less than one year are time-weighted averages. Whereas many NAAQS limits are specified as the second highest or other value, the modeled values presented in this table are the highest values.

[a] These are the highest values observed at nearby monitoring stations for the specified averaging periods. At most times ambient concentrations are lower than these values. Annual SO_2 concentration is the annual arithmetic mean for years 2001, 2002, and 2003 measured at 517 N. Saint Asaph Street, Alexandria City (ENSR Corporation 2005). Annual PM_{10} concentration is the 2004 arithmetic mean reported in VDEQ 2005, page 49, monitoring site L-46-B3. (Just before publication of this document, Virginia released ambient air monitoring data for 2005 [VDEQ 2006c]. The updated background levels vary only slightly from the 2004 values reported and used here.)

[b] NAAQS values from 40 CFR Part 50. See Section 3.1.2 and Table 3.1-1 for an explanation of NAAQS and the averaging periods that apply to each. EPA's October 17, 2006, rule making on NAAQS for particulate matter (EPA 2006j) revoked the annual PM_{10} standard, effective December 18, 2006.

Operations under the Order. Operations under the Order were addressed in two periods, December 20, 2005, through June 30, 2006, and July 1 through September 30, 2006. Operations under the Order were divided in this manner because DOE assumed that operations changed significantly when Mirant began operations under daily predictive modeling as permitted by the ACO. The following paragraphs discuss the effects of SO_2 and PM_{10} emissions for these two time periods.

December 20, 2005, through June 30, 2006. For the December through June period, maximum modeled SO_2 concentrations (Table 4.3.1-1) show exceedances of the SO_2 limits during the January line outages, when the highest modeled 3- and 24-hour SO_2 concentrations occurred. For most of the outage trona injection was available on only one unit; Mirant injected trona in two units simultaneously during the last week of the outage. For non-line outage periods through June 30, there were no modeled exceedances of the 3- or 24-hour limits, in part because the Plant operated at a relatively low average power. Table 4.3.1-1 shows no modeled exceedances of limits for PM_{10} during either line outage or non-line outage periods. The fugitive dust parameters used in modeling PM_{10} concentrations for this time period reflect the progressive implementation of fugitive dust control measures at the Plant.

July 1 through September 30, 2006. The commencement of *daily predictive modeling* on July 1, 2006, approximately coincided with the beginning of the season of highest power demand (Figure 4.2-1). Beginning July 1, 2006, modeled plant generation increased and modeled SO_2 exceedances occur for all averaging periods except the 24-hour average during non-outage periods. The ACO requires modifying planned operations if daily predictive modeling forecasts an exceedance of either 3- or 24-hour average SO_2 limits. DOE's modeling assumed that the Plant would scale back operations to meet the 24-hour SO_2 standard as required by the ACO (Section 4.1.2). However, as described in Section 4.3.1.1, DOE's model did not assume that the Plant would scale back operation to meet the 3-hour standard, even though it is required by the ACO, because it would have been excessively complex to model. In actuality, it is expected that the modeled maximum 3-hour average exceedances indicated by Table 4.3.1-1 for the July through September period would be prevented by daily predictive modeling. However, the model's prediction of exceedances when the 3-hour limit is not applied suggests that controlling operations for 24-hour averages is not enough to assure compliance with the 3-hour average SO_2 limit.

The modeled exceedance of the longer-period average SO_2 limit (Table 4.3.1-1) is a logical consequence of operations under daily predictive modeling, because daily predictive modeling allows the Plant to operate at the highest levels that do not cause exceedances of 24-hour SO_2 limit. Operating close to the 24-hour limit (314 g/m^3) day after day inevitably raises the long-term average to a higher level than for a plant that does not consistently operate close to the limit.

The exceedances indicated in the table are modeled exceedances, not actual exceedances. The ACO has provisions for preventing actual exceedances during non-outage periods. In particular, the ACO requires Mirant to monitor SO_2 concentrations near the top of Marina Towers (where the maximum modeled exceedances occur) for close approaches to NAAQS SO_2 limits. If a monitored concentration exceeds 80% of the limit for one of the averaging periods, an audible alarm will sound in the control room (Section 4.1.2.1) and the ACO requires Mirant to take corrective action, such as reducing power generation. Consequently, DOE anticipates that actual exceedances of the SO_2 limits will not occur during non-line outage periods.

As shown by Table 4.3.1-1, Plant operations under the ACO do not result in modeled exceedances of any of the NAAQS limits for PM_{10}.

Operations during a potential extension of the Order until new transmission lines are installed. Table 4.3.1-2 presents modeled maximum concentrations of SO_2 and PM_{10} due to Plant operations during a potential 9- or 15-month extension of the Order beyond September 30, 2006. This includes the period of the temporary 2-month extension of the Order from October 1 to December 1, 2006. Pepco's current schedule has the new transmission lines being installed and operational by the end of June 2007. Because there is a possibility that the transmission lines may not become operational on schedule, DOE has also examined a scenario for extension of the Order through December 2007.

As shown by Table 4.3.1-2, compliance with the ACO leads to meeting the NAAQS limits for 24-hour average SO_2 concentrations during non-line outage periods. As with operations under the initial term of the Order, DOE's model did not assume that the Plant would scale back operation to meet the 3-hour standard as required by the ACO. In actuality, it is expected that the modeled maximum 3-hour average exceedances indicated by Table 4.3.1-2 would be prevented by daily predictive modeling. The modeled exceedances of the NAAQS SO_2 limits for the annual average during non-line outage situations shown in Table 4.3.1-2 result from the assumption that the Plant operates close to the 24-hour limit on a continuing basis. Under the ACO Mirant would be required to modify Plant operations to avoid predicted exceedances of all SO_2 NAAQS averaging periods. Consequently, DOE anticipates that actual exceedances of the SO_2 limits would not occur during non-line outage periods.

As shown by Table 4.3.1-2, Plant operations under an extension of the Order would not result in modeled exceedances of any of the NAAQS limits for PM_{10}.

EPA has provided DOE with preliminary data on monitored air quality measurements taken by Mirant pursuant to the ACO. Mirant sent this information to EPA as part of its monthly reporting requirements under the ACO. EPA is currently reviewing and interpreting the data; however, as discussed in Section 4.3.1.4, the data suggest that actual air quality impacts from operation of the Plant under daily predictive modeling are lower than impacts predicted through DOE's modeling efforts.

4.3.1.4 Monitored SO_2 data

Pursuant to the requirements for performing the MES (Appendix B, Section VI), Mirant has installed six SO_2 monitoring stations near the Plant. Two are located on the roof of Marina Towers--one at the center of the building and one on the southeast wing. One station is located east of stack 5 on the west bank of the Potomac River. Another monitor is located southeast of the Plant along the fence line near the River. One monitor is located at Daingerfield Island about 800 m north of Marina Towers. One monitor is located on the roof of Harbor Terrace (Holiday Inn) southwest of the Plant. These monitoring sites were selected based on discussions among Mirant, DOE and EPA modeling and meteorological experts.

Initial results from the monitors show that actual monitored daily average (approximately the same as 24-hour average) values are much lower than shown by Mirant's follow-up modeling using actual hourly emissions and exhaust parameters and observed weather

Table 4.3.1-2. Modeled maximum ambient SO_2 and PM_{10} concentrations (µg/m^3) for Plant operations among all receptor locations for a potential extension of the Order.

	SO_2			PM_{10}	
Operating Scenario and Period	**Maximum 3-hour average**	**Maximum 24-hour average**	**Maximum period average (for the specified period or 1 year)**	**Maximum 24-hour average**	**Maximum period average (for the specified period or 1 year)**
Maximum Background Concentration	238 [a]	51 [a]	16 [a]	45 [a]	21 [a]
Modeled Maximum Concentrations					
Potential extension of the Order Oct. 1, 2006 – Jun. 30, 2007					
Non-outage periods (203 days)	1,236	314	101	61	12
Outage periods (70 days)	2,193	1,152	171	66	13
Potential extension of the Order Oct. 1, 2006 – Dec. 31, 2007					
Non-outage periods (387 days)	1,449	314	115	67	12
Outage periods (70 days)	2,193	1,152	171	66	13
Modeled Maximum Concentrations with Maximum Background Concentrations Added					
Potential extension of the Order Oct. 1, 2006 – Jun. 30, 2007					
Non-outage periods (203 days)	1,474	365	117	106	33
Outage periods (70 days)	2,431	1.203	187	111	34
Potential extension of the Order Oct. 1, 2006 – Dec. 31, 2007					
Non-outage periods (387 days)	1,687	365	131	112	33
Outage periods (70 days)	2,431	1,203	187	111	34
NAAQS limit [b]	***1,300***	***365***	***80***	***150***	***50***

Note: All periods include the period of the two-month temporary extension of the Order from October 1 to December 1, 2006. Modeled values are the highest criteria pollutant concentration among all receptor locations. Planned transmission line outages in preparation for the 230-kV lines are included in the periods. Annual values for modeled concentrations for periods other than one year are time-weighted averages. While, many NAAQS limits are specified as the second highest or other value, the values presented in this table are the highest values.

[a] These are the highest values observed at nearby monitoring stations for the specified averaging periods. At most times, ambient concentrations are lower than these values. Annual SO_2 concentration is the annual arithmetic mean for years 2001, 2002, and 2003 measured at 517 N. Saint Asaph Street, Alexandria City (ENSR Corporation 2005). Annual PM_{10} concentration is the 2004 arithmetic mean reported in VDEQ 2005, page 49, monitoring site L-46-B3. (Just before publication of this document, Virginia released ambient air monitoring data for 2005 [VDEQ 2006c]. The updated background levels vary only slightly from the 2004 values reported and used here.)

[b] NAAQS values from 40 CFR Part 50. See Section 3.1.2 and Table 3.1-1 for an explanation of NAAQS and the averaging periods that apply to each. EPA's October 17, 2006, rule making on NAAQS for particulate matter (EPA 2006j) revoked the annual PM_{10} standard, effective December 18, 2006.

conditions, matched hour for hour. Specifically, for the period June 17 through September 17, 2006, the maximum monitored daily-average concentration for the monitors ranged from 4 to 63 µg/m^3. For the same time period Mirant's follow-up modeling of actual operations using weather data recorded at Ronald Reagan Washington National Airport gave maximum daily-average concentrations that ranged from 25 to 570 µg/m^3. Aside from the specific operations and weather data, follow-up modeling used the same parameters to characterize the Plant as used for the analysis in the SEA and the 2005 downwash study (ENSR Corporation 2005).

The reasons for the discrepancy between monitored and maximum concentrations from follow-up modeling are not apparent. Mirant's technical consultant reports that when modeling uses effective building dimensions derived from a wind tunnel study, the resulting modeled maximum SO_2 concentrations are closer to the monitored concentrations (Personal communication between D. Shea, ENSR Corporation, Welsford, MA, and L.N. McCold, Oak Ridge National Laboratory, Oak Ridge, TN, October 3, 2006), but this modeling approach does not fully account for the discrepancy. An explanation suggested by Mirant's consultant is that AERMOD underestimates the buoyancy of multiple stack plumes when the wind is blowing parallel to the line of stacks. Another possible explanation is that the weather data from National Airport does not precisely match the weather at the Plant. Mirant's consultant reports that wind directions reported at National Airport are often slightly different from those detected at the Plant. Particularly near the Plant, small differences in wind direction can cause large differences in pollutant concentration at any specific point.

The discrepancy between monitoring data and modeled concentrations raises the possibility that the modeled maximum concentrations reported in Tables 4.3.1-1 and 4.3.1-2 of this SEA are unrealistically high for receptor points that are very close to the Plant. However, because DOE used forecasts rather than actual emissions and weather data, the results presented in this SEA are not directly comparable to either the monitoring data or to Mirant's follow-up modeling.

Because the MES may require as much as a year of monitoring data, EPA is not expected to reach a conclusion about the accuracy of the modeled concentrations before late 2007. In the meanwhile, the ACO requires that the Plant be operated to avoid predicted modeled exceedances.

4.3.1.5 Other air pollutants

Contributions to $PM_{2.5}$ pollution. For $PM_{2.5}$ the NAAQS specify a maximum annual average concentration of 15 µg/m^3 and a 98th-percentile 24-hour average concentration of 65 µg/m^3. Regulation of $PM_{2.5}$ is still developing. On October 17, 2006, EPA published new ambient air quality standards for $PM_{2.5}$ in the *Federal Register* (EPA 2006j). The new standards, which take effect December 18, 2006, retain the level of 15 µg/m^3 for the annual average and institute a 35 µg/m^3 24-hour average. State implementation plans (SIPs) for $PM_{2.5}$ are not due to EPA until 2008.

The $PM_{2.5}$ monitor nearest to the Plant is at Aurora Hills Visitor Center (Table 3.1-2), a short distance west of Ronald Reagan Washington National Airport. The 2004 annual average $PM_{2.5}$ concentration measured at Aurora Hills was 14.4 µg/m^3; the 98th-percentile 24-hour average concentration was 35.7 µg/m^3.[21] As noted in Section 3.1.2, the region in which the Plant exists is in nonattainment with the $PM_{2.5}$ standard.

[21] Just before publication of this document, Virginia released ambient air monitoring data for 2005 (VDEQ 2006c). The updated background levels vary only slightly from the 2004 values reported and used here.

There are two important sources of particulate matter associated with the Plant: stack emissions and fugitive dust. Because fugitive dust from the Plant is emitted near ground level, for locations near the Plant fugitive dust is the principal source of ground level $PM_{2.5}$ attributable to Plant operations. Because stack emissions are located far off the ground, they are the most important Plant-related source of particulate matter at nearby elevated receptor locations, specifically near the top of Marina Towers. Because both ground level and elevated concentrations are important, maximum values for each are presented here.[22]

DOE used estimates of PM_{10} concentrations (Section 4.3.1.3) as a basis for estimating $PM_{2.5}$ concentrations. EPA's AP-42 emission factor guidelines (Personal communication between D. Lohman, U.S. EPA, Region III, and L.N. McCold, Oak Ridge National Laboratory, August 28, 2006) applied to wind blown dust indicate that $PM_{2.5}$ is 15% of the PM_{10}. Based on this guidance, DOE assumed that 15% of fugitive PM_{10} was $PM_{2.5}$. The AP-42 factors for the $PM_{2.5}$ fraction of PM_{10} from electric generating units controlled by electrostatic precipitators range between 44% for dry bottom boilers and 76% for over-fire stokers (Personal communication between D. Lohman, U.S. EPA, Region III, and L.N. McCold, Oak Ridge National Laboratory, August 28, 2006). Based on this guidance, DOE conservatively assumed 76% of PM_{10} emitted from the Plant stacks was $PM_{2.5}$.

DOE's analysis considers only directly emitted particulate matter. In addition to $PM_{2.5}$ that is emitted directly as particulate matter, certain chemicals, especially SO_2 and NO_x, are emitted as gases, but form particulate matter after they are released. This source of $PM_{2.5}$ is not included in the air quality analysis because AERMOD does not incorporate a photochemical model that can account for nonlinear chemical reactions. In addition, such a model would require much more extensive atmospheric data than are readily available. However, because the background concentrations used in developing DOE's $PM_{2.5}$ estimates were measured while the Plant was operating at pre-shutdown levels, some, unknown but probably small, fraction of the background is due to Plant operations. Consequently, adding estimated Plant contributions to background concentrations involves some double counting of Plant effects. The discussion below presents estimates of $PM_{2.5}$ contributions first with and then without background concentrations.

Pre-shutdown operations. Pre-shutdown operations (one year) are estimated to have resulted in maximum 24-hour average concentrations of 74 $\mu g/m^3$ (38 $\mu g/m^3$ due to Plant operations alone; that is, without background) at ground level and 112 $\mu g/m^3$ (76 $\mu g/m^3$ due to Plant operations) at the top of Marina Towers. The annual average ground level $PM_{2.5}$ concentration was estimated to be 20 $\mu g/m^3$ (5.7 $\mu g/m^3$ due to Plant operations), and the average annual $PM_{2.5}$ concentration at the top of Marina Towers was estimated to be 22 $\mu g/m^3$ (7.8 $\mu g/m^3$ due to Plant operations).

Pre-Order operations. If pre-Order operations had continued for one year. the maximum estimated ground-level 24-hour-average $PM_{2.5}$ would have been 45 $\mu g/m^3$ (9.2 $\mu g/m^3$ due to

[22] Both stack and fugitive sources were included in estimating $PM_{2.5}$ concentrations for both ground-level and elevated receptors.

Plant operations), and the comparable concentration at the top of Marina Towers would have been 40 $\mu g/m^3$ (4.8 $\mu g/m^3$ due to Plant operations). The maximum estimated ground-level annual average $PM_{2.5}$ concentration would have been 16 $\mu g/m^3$ (2.0 $\mu g/m^3$ due to Plant operations), and the maximum annual average concentration at the top of Marina Towers would have been 15 $\mu g/m^3$ (1.0 $\mu g/m^3$ due to Plant operations).

Operations under the Order. For the duration of the Order, the estimated maximum 24-hour-average ground-level $PM_{2.5}$ concentration is 61 $\mu g/m^3$ (25 $\mu g/m^3$ due to Plant operations), and the maximum estimated ground-level 285-day-period-average $PM_{2.5}$ concentration is 38 $\mu g/m^3$ (2.4 $\mu g/m^3$ due to Plant operations). Because an important fugitive dust suppression measure was implemented in March 2006, the period before April contributed more to the 285-day-period average $PM_{2.5}$ concentration than operations after April, and the maximum estimated 24-hour-average $PM_{2.5}$ concentration occurred before April.

For the duration of the Order, the maximum 24-hour-average concentration at the top of Marina Towers is 76 $\mu g/m^3$ (41 $\mu g/m^3$ due to Plant operations), and the maximum 285-day-period-average concentration at the top of Marina Towers is 18 $\mu g/m^3$ (3.9 $\mu g/m^3$ due to Plant operations). Because of increased generation after the start of operations under daily predictive modeling, operations after June contributed more to the 285-day-period-average $PM_{2.5}$ concentrations than operations before July, and the maximum estimated 24-hour-average concentration occurred after June.

Potential extension of the Order. For a potential extension of the Order through December 2007 (including the period of the temporary extension until December 1, 2006), the estimated maximum 24-hour average ground-level concentration would be 58 $\mu g/m^3$ (23 $\mu g/m^3$ due to Plant operations), and the maximum estimated concentration on the top of Marina Towers would be 79 $\mu g/m^3$ (43 $\mu g/m^3$ due to Plant operations). The estimated maximum 24-hour average occurs during non-outage periods. The estimated maximum annual average ground-level $PM_{2.5}$ concentration would be 18 $\mu g/m^3$ (4.0 $\mu g/m^3$ due to Plant operations), and the estimated maximum concentration at the top of Marina Towers would be 20 $\mu g/m^3$ (5.7 $\mu g/m^3$ due to Plant operations).

Nitrogen oxide contributions to ozone (O_3) pollution. Alexandria and the surrounding area are in nonattainment for O_3. Ozone is formed in the atmosphere when sunlight interacts with NO_x and volatile hydrocarbons. In the eastern United States, natural volatile hydrocarbon molecules are abundant in the atmosphere. Consequently, the most effective method for limiting the formation of O_3 is limiting the abundance of NO_x in the atmosphere. NO_x is readily formed in high temperature combustion processes such as power plants and internal combustion engines.

The following data were used to estimate NO_x emissions. Hourly operations data for December 20, 2005, through March 31, 2006, indicate that average NO_x emission rate for Units 1 and 2 is about 0.35 lb/MBtu and the emission rate for Units 3, 4, and 5 averages 0.26 lb/MBtu. Assuming that each unit consumes the same average amount of coal, the average emission rate would be 0.296 lb per MBtu of coal consumed. At 12,000 Btu/lb of coal, Units 1 and 2 have NO_x

emission rates of 8.4 lb per ton of coal. When all units operate (using equal quantities of coal), the average NO_x emission rate is about 7.1 lb per ton of coal.

As a point of reference, the ACO requires that the Plant emit no more than 3,700 tons (3,400 metric tons) of NO_x per year.

Pre-shutdown operations consumed about 832,000 tons (755,000 metric tons) of coal per year and emitted 3,000 tons (2,700 metric tons) of NO_x per year. For comparison purposes, if pre-shutdown operations had continued for the 285-day duration of the Order, the Plant would have consumed about 650,000 tons (590,000 metric tons) of coal and emitted about 2,300 tons (2,100 metric tons) of NO_x. If pre-shutdown operations were to continue for a 15-month extension of the Order through December 2007 (including the period of the temporary extension until December 1, 2006), the Plant would consume about 1,040,000 tons (943,000 metric tons) of coal and emit about 3,700 tons (3,400 metric tons) of NO_x.

Pre-Order operations. For comparison purposes, if pre-Order operations (when only Unit 1 operated) had continued for the duration of the Order, the Plant would have consumed about 153,000 tons (140,000 metric tons) of coal and emitted about 640 tons (580 metric tons) of NO_x, a rate of about 820 tons (750 metric tons) per year. If pre-Order operations were to continue for an extension of the Order through December 2007 (including the period of the temporary extension until December 1, 2006), the Plant would emit about 1,030 tons (940 metric tons) of NO_x over the 15-month period.

For the 285-day term of *the Orde*r, the Plant is estimated to burn about 566,000 tons (504,000 metric tons) of coal and emit about 2,600 tons (2,300 metric tons) of NO_x, a rate of 2,600 tons (2,300 metric tons) per year.

For *potential extension of the Order* from October 1, 2006 through December 2007 (including the period of the two-month temporary extension until December 1, 2006), the Plant would consume about 1,040,000 tons (940,000 metric tons) of coal and emit about 3,700 tons (3,400 metric tons) of NO_x, a rate of about 3,000 tons (2,700 metric tons) per year.

Contributions to carbon monoxide (CO) and lead pollution. As shown by Table 3.1.2, monitored levels of CO are well below the standard. Because CO levels are so low and because coal-fired power plants are not significant sources of CO, DOE did not model contributions to ambient CO levels due to Plant operations. Because ambient lead concentrations have declined to such low levels since the elimination of leaded gasoline that lead concentrations are no longer monitored in Virginia, DOE did not model potential contributions due to Plant operations.

Contributions to hazardous air pollutants. *Mercury* emissions by coal fired power plants are believed to be a major contributor to atmospheric mercury contamination. In its elemental form mercury is easily vaporized. Mercury forms nonvolatile compounds with sulfur and chlorine that can be captured in precipitators and incorporated in fly ash, but DOE assumed that all mercury in the coal burned by the Plant is emitted to the atmosphere through the stacks. This assumption is not likely to lead to an overestimate of mercury emissions because chemical analyses of Plant fly ash did not detect mercury (Section 4.3.5).

Data provided by Mirant indicates that the mercury content of coal supplied to the Plant ranges from 0.03 to 0.07 ppm (0.06 to 0.14 lb mercury per thousand tons of coal). DOE's analysis conservatively uses the high end of this range, that is 0.14 lb per thousand tons of coal.

Pre-shutdown operations consumed about 832,000 tons (755,000 metric tons) of coal per year. At 0.14 lb of mercury per thousand tons of coal, pre-shutdown operations can be estimated to emit 116 lb/year (53 kg/year) of mercury. For the 285-day period of the Order, it would emit about 91 lb of mercury. For extension of pre-shutdown operations through a 15-month extension of the Order, operations would emit about 145 lb of mercury.

For *pre-Order operations*, the Plant would burn about 540 tons (490 metric tons) of coal per day. Pre-Order operations for the period of the Order would lead to consumption of about 153,000 tons (140,000 metric tons) of coal. At 0.14 lb mercury per thousand tons of coal, pre-Order operations would have caused emission of about 21 lb (10 kg) of mercury for the period of the Order. Pre-Order operations for a 15 month extension of the Order would involve consumption of about 245,000 tons (220,000 metric tons) of coal and emission of about 34 lb (16 kg) of mercury.

For the 285 days of *the Order*, DOE estimates Plant coal consumption at 566,000 tons (510,000 metric tons), resulting in emissions of about 79 lb (36 kg) of mercury. Thus, the Order is estimated to increase mercury emissions of the Plant by 58 lb (26 kg) over the 285-day term of the Order. By comparison, if *pre-shutdown operations* had continued for the same 285 days, the Plant would have consumed about 650,000 tons (590,000 metric tons) of coal and emitted about 91 lb (41 kg) of mercury.

For *potential extension of the Order* from October 2006 through December 2007 (including the period of the two-month temporary extension until December 1, 2006), the Plant would consume about 1,040,000 tons (943,000 metric tons) of coal and emit approximately 146 lb (66 kg) of mercury. By comparison, pre-Order operations of the Plant for the same period would involve burning about 245,000 tons (220,000 metric tons) of coal with emission of about 34 lb (16 kg) of mercury. Thus, extension of the Order for 15 months would result in an increase in mercury emissions, over pre-Order operations, of about 111 lb (50 kg) mercury.

Other metals typically present as trace constituents of coal are less volatile than mercury, so they are primarily incorporated into solid wastes (bottom ash and fly ash), with only small fractions emitted to the atmosphere. The coal data that Mirant provided to DOE did not include concentrations of toxic metals other than mercury. Table 2.3-1 summarizes some published data on concentrations of seven trace metals in Appalachian coals. These data provide an indication of levels that may be present in the central Appalachian coal burned by the Plant. DOE performed a mass balance analysis for five of these metals using data on fly ash from Table 4.3.5-2. The results suggest that much of the arsenic and cadmium in the original coal, and some of the lead, selenium, and chromium are captured in fly ash. Capture of selenium in fly ash increases greatly when trona is used in the Plant (Section 4.3.5). DOE does not have data on the composition of the Plant's bottom ash, which would be expected to contain the majority of some metals, particularly the least volatile, such as beryllium, chromium, and nickel. Metals not

captured in a solid phase are released to the atmosphere. DOE has not estimated the quantities of these metals released to the atmosphere.

4.3.1.6 General conformity requirement

Background. General conformity arises out of Section 176(c)(1) of the Clean Air Act (CAA) which provides that no Federal agency shall "engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to [an approved State implementation plan (SIP)]." Under the CAA conformity to an implementation plan means that such activities will not (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area [CAA §176(c)(1)(B)].

Before DOE issued its Order, VDEQ raised several concerns related to general conformity in its filing to FERC (VDEQ 2005b).[23] VDEQ claimed that resumption of Plant operations at the previous levels would "not be in conformity with the Virginia SIP's purpose of eliminating or reducing the severity and number of exceedances of the NAAQS." VDEQ's filing to FERC also claimed that resumption of Plant operations "at the previous levels, or any other level that would not be protective of human health or the environment, would clearly conflict with Mirant's regulatory obligation to comply with the [VDEQ] Director's request under 9 VAC 5-20-180(I), and therefore would not be in conformity with the SIP."

The Federal general conformity regulations implementing Section 176(c)(1) of the CAA are codified at 40 CFR Part 51, Subpart W, and 40 CFR Part 93, Subpart B. Pursuant to 40 CFR 51.851, Virginia has an EPA approved general conformity rule that complies with the CAA. Therefore, Virginia's general conformity rule applies here.

Under the general conformity rules, if the conformity rule applies to a Federal action, then the agency must determine whether the action "conforms" to a SIP. The conformity rule applies for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by the action would equal or exceed de minimis thresholds and where the action does not fit an exception (9 VAC 5-160-30). If the conformity rule applies, a Federal action is deemed to "conform" to a SIP if it is in compliance with all relevant requirements and milestones in the SIP and meets one of several requirements enumerated in the regulations, such as the emissions are specifically identified and accounted for in the SIP (40 CFR 93.158, 9 VAC 5-160-160).

The city of Alexandria and surrounding Arlington, Fairfax, Loudoun, and Prince William counties are in nonattainment for $PM_{2.5}$ and 8-hour ozone (the precursors for ozone are NO_x and volatile hydrocarbons) (EPA 2006f). Because the general conformity regulations only apply to

[23] As stated in DOE's Order (footnote 2), DOE considered all legal arguments made in FERC filings in its decision-making process.

Federal actions that exceed de minimis thresholds in designated "nonattainment" or "maintenance" areas, these are the only pollutants that are relevant here.

The Order conforms to the Virginia SIP. Because the Order does not cause or contribute to new emissions not already accounted for in the SIP or interfere with limits in the SIP, the Order conforms to the Virginia SIP. The Order does not allow the Plant to resume operations at levels it had been operating at under the Virginia SIP before the August 24, 2005, shutdown. Instead, the Order only allows the Plant to operate at pre-shutdown levels in limited transmission line outage circumstances, or when permitted by daily predictive modeling. In addition, for $PM_{2.5}$ the Order cannot interfere with $PM_{2.5}$ emissions not already accounted for in the SIP because Virginia does not currently have a SIP for $PM_{2.5}$.[24] Similarly, because the original study regarding the Plant's NO_x emissions (prompting the shutdown of the Plant on August 24, 2005), related to downwash rather than to NO_x as a precursor to ozone, the Order would not appear to affect Virginia's SIP for ozone (EPA 2006g).[25]

Furthermore, the Order alleviates the concerns related to conformity to the SIP raised by VDEQ in its filing to FERC. To the extent that the SIP accounts for full operation of the Plant without the use of trona and low-sulfur coal, the Order actually decreases emissions already accounted for in the SIP. Therefore, the Order helps Virginia achieve its "purpose of eliminating or reducing the severity and number of exceedances of the NAAQS" (VDEQ 2005b). The Order also does not present a conflict between resumption of Plant operations under the Order and Mirant's regulatory obligation to comply with the VDEQ Director's August 19, 2005, request. Indeed, the VDEQ Director's August 19, 2005, letter to Mirant suggested the "potential reduction of levels of operation" as a potential method of complying with the Director's request under 9 VAC 5-20-180(I) to "immediately undertake such action as is necessary to ensure protection of human health and the environment" (Personal communication between R.G. Burnley, VDEQ, and L.D. Johnson, Mirant Potomac River, LLC., August 19, 2005). Moreover, the DOE Order does not impinge upon VDEQ's ability to enforce concerns over pollutants emitted from the Plant. For example, during the period of the Order, VDEQ continued to work with EPA and Mirant on a long-standing settlement over NO_x that began in 2003 and resulted in an amended settlement on May 8, 2006 (EPA 2006g).

The function of the general conformity requirement is to ensure that Federal actions do not interfere with SIPs for meeting CAA standards and requirements. The integration of Federal actions and state air quality planning is intended to "protect the integrity of the SIP by helping ensure that SIP growth projections are not exceeded, emissions reduction progress targets are achieved, and air quality attainment and maintenance efforts are not undermined" (58 FR 63214,

[24] Although EPA has had a $PM_{2.5}$ NAAQS since 1997 (revised on October 17, 2006), $PM_{2.5}$ SIP's are not due for states with designated nonattainment areas for $PM_{2.5}$ until April 2008 (EPA 2006h, 2006i).

[25] Concerns over alleged violations of the 2003 Ozone Season NO_x emission limitations specified in Mirant's Stationary Source Permit have been resolved through a judicial consent decree between EPA, VDEQ, the State of Maryland, and Mirant (EPA 2004, 2006g).

63215; Nov. 30, 1993). In this case the Order not only conforms to the Virginia SIP by definition, but also achieves the overarching purpose of the general conformity principle.

The Order is exempt under the General Conformity regulations. Even if the Order does not conform to the Virginia SIP, the emissions generated from the Order fall within the "emergency" exceptions enumerated in the Virginia conformity regulations (9 VAC 5-160-30). A conformity determination is not required for "actions in response to emergencies or natural disasters such as hurricanes, earthquakes, etc., which are commenced on the order of hours or days after the emergency or disaster . . ." (40 CFR 93.153(d)2). "Emergency" is further defined in the Federal conformity regulations as:

> A situation where extremely quick action on the part of the Federal agencies involved is needed and where the timing of such Federal activities makes it impractical to meet the requirements of this subpart, such as natural disasters like hurricanes or earthquakes, civil disturbances such as terrorist acts and military mobilizations. (40 CFR 93.152)

An emergency clearly existed on December 20, 2005. In fact, the very nature of DOE's ability to issue the Order in the first place comes from the Department's *emergency* authority under Section 202(c) of the Federal Power Act. It took DOE three months to understand the reliability situation at hand and determine the potential environment, health, and safety risks associated with the Plant's shutdown. However, as soon as a line outage occurred (December 16, 2005) and the very real threat of a blackout in the Central D.C. area became apparent, DOE took quick action by issuing its Order. Therefore, DOE's action qualifies as an emergency exception to the general conformity regulations.

4.3.1.7 Global climate change

A major worldwide environmental issue is the likelihood of major changes in the global climate (e.g., global warming) as a consequence of increasing atmospheric concentrations of "greenhouse" gases (IPCC 2001). The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth's surface and be converted to heat energy (infrared radiation) that does not pass back through the atmosphere as easily as the solar radiation passes in. The result is that heat energy is "trapped" near the earth's surface.

Greenhouse gases include water vapor, CO_2, methane, nitrous oxide, O_3, and several chlorofluorocarbons. The greenhouse gases constitute a small percentage of the earth's atmosphere; however, their collective effect is to keep the temperature of the earth's surface about 60°F (33°C) warmer, on average, than it would be if no atmosphere existed. Water vapor, a natural component of the atmosphere, is the most abundant greenhouse gas. The second-most abundant greenhouse gas is CO_2, which has increased about 30% in concentration over the last century. Fossil fuel burning is the primary contributor to increasing concentrations of CO_2 (IPCC 2001). The increasing CO_2 concentrations likely have contributed to a corresponding increase in

globally averaged temperature in the lower atmosphere, which has increased by about 1–1.4°F (0.5-0.8°C) in the last hundred years (IPCC 2001).

Because CO_2 is relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of CO_2 emissions does not depend upon their source location on the earth. Instead, an increase in CO_2 emissions from a specific source is effective in contributing to global increases in CO_2 concentrations.

Carbon dioxide emissions from the Plant involve two components: CO_2 produced by the combustion of the carbon contained in the coal and CO_2 produced by chemical reactions as the trona removes SO_2 from the exhaust gases. These two components of Plant emissions are shown in Table 4.3.1-3 and are discussed in detail in the following paragraphs. Coal combustion is discussed first.

During four days in December 2005, when the Plant was running in pre-Order mode, the Plant burned 2,150 tons (1,950 metric tons) of coal. This coal produced 5,300 tons (4,800 metric tons) of CO_2. Operation of the Plant for a full year at the pre-Order level operations would be expected to produce about 480,000 tons (440,000 metric tons) of CO_2.

For the 285-day term of the Order (December 20, 2005, through September 30, 2006), the total amount of coal used by the Plant is estimated to be 566,000 tons (513,000 metric tons). This quantity of coal, when burned, would produce approximately 1.38 million tons (1.25 million metric tons) of CO_2. On an annualized basis operation of the Plant under the Order would be expected to produce at an annual rate of 1.76 million tons (1.60 million metric tons) of CO_2 per year.

During the one-year period immediately preceding the shutdown of the Plant in August 2005, the Plant generated power at an average rate of 210 MW, using an estimated 832,000 tons (755,000 metric tons) of coal. The combustion of this amount of coal produced approximately 2 million tons (1.8 million metric tons) of CO_2. These data can be used to represent the anticipated operation of the Plant during the two-month temporary extension until December 1, 2006, and through the duration of any additional extension of the Order (i.e., October 1, 2006, through December 31, 2007).

For all three cases above, the use of trona is assumed to result in 50% removal of SO_2 from the Plant's stack gases. To achieve this removal rate, trona needs to be fed at a 2.5 times higher than the rate theoretically calculated to be sufficient to react with all of the SO_2 in the stack gases. With the addition of heat CO_2 is released from trona in a calcining reaction. This results in approximately 0.009 lb of CO_2 being released from trona for each pound of coal burned. The resulting quantities of the CO_2 released from trona, as shown in Table 4.3.1-3, are a very small fraction of the CO_2 released by coal combustion.

To put the above numbers into perspective, global fossil combustion in the year 2003 resulted in emissions of approximately 28 billion tons (26 billion metric tons) of CO_2 (Marland et al. 2006).

Table 4.3.1-3. Annualized carbon dioxide emissions (tons/year) from the Mirant Plant during operational periods under analysis in this report

	Coal combustion	Trona utilization	Total from Plant
Pre-shutdown operations	2,000,000	0	2,000,000
Pre-Order operations	480,000	1,800	488,800
The Order (Dec. 20, 2005 – Sep. 30, 2006)	1,760,000	6,500	1,766,500
Potential extension of the Order (Oct. 1, 2006 – Dec. 19, 2007)[a]	2,000,000	7,500	2,007,500

Note: "Annualized" values were obtained by prorating the emissions during the actual period over a hypothetical 365-day period.
[a]Includes the period of the temporary extension of the Order until December 1, 2006.

4.3.2 Human Health

This section discusses the human health impacts of emissions from the Plant during two principal time periods: (1) the period of operations under the Order and (2) the duration of a potential extension of the Order. As a comparison, the health effects of the pre-Order mode of operation as well as the pre-shutdown operation of the Plant are also presented. The analysis in this section uses mathematical factors that relate a person's exposure to concentrations of airborne pollutants to premature mortality and other health effects.

Potential human health effects resulting from the Order are a serious concern to DOE. A wide range of human health effects are associated with ambient concentrations of particulate matter and SO_2 as well as other NAAQS primary and secondary pollutants. Numerous epidemiological studies have demonstrated that increases in pollution levels are associated with increases in illness rates, use of health services, and earlier death among exposed persons.[26]

Particle pollution, especially fine particle pollution (i.e., $PM_{2.5}$), contains microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing,
- decreased lung function,
- aggravated asthma,
- development of chronic bronchitis,
- irregular heartbeat,

[26] Some recent information about air pollution health effects may be found in the Criteria Documents prepared to support EPA periodic reviews of the NAAQS; http://www.epa.gov/ttn/naaqs/.

- nonfatal heart attacks, and
- premature death in people with heart or lung disease.

People with heart or lung diseases, children, and older adults are most likely to be affected by particle pollution exposure. However, even healthy people may experience temporary symptoms from exposure to elevated levels of particle pollution.

Peak levels of SO_2 in the air can cause temporary breathing difficulty for people with asthma who are active outdoors. Longer-term exposures to high levels of SO_2 gas and particles cause respiratory illness and aggravate existing heart disease. SO_2 reacts with other chemicals in the air to form tiny sulfate particles. When these are breathed, they gather in the lungs and are associated with increased respiratory symptoms and disease, difficulty in breathing, and premature death.

4.3.2.1 Analytical approach

For the purposes of this SEA, DOE has used two techniques to estimate premature mortality due to Plant operations and has used one technique to estimate the incidence of other health effects. DOE analyzed all-cause mortality as a useful indicator of health effects because background mortality rates are readily obtainable and the association between air pollution and premature mortality[27] has well-documented response functions. DOE used a concentration-response function for premature mortality from Pope et al. (2002) to estimate the expected fatalities and to estimate the risk of premature mortality to a hypothetical maximally exposed individual in the community near the Plant. DOE used an EPA scaling technique (EPA 2005) to estimate premature mortality and other health effects to a much broader population.

For the assessment of health effects to persons in the local area, DOE used estimated $PM_{2.5}$ and modeled SO_2 concentrations for a 36-mi^2 (93-km^2) receptor grid comprised of 1,747 receptor locations with the Plant near its center (Figure 4.3.1-1). This area contains approximately 240,581 people.[28]

In order to provide estimates of the adverse effects of various operating scenarios in this SEA, DOE has chosen all-cause mortality as the most useful single indicator of adverse health effects. Mortality is the most severe outcome in personal terms and also represents 90% or more of the associated cost in economic terms.

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[27] The studies on which this environmental analysis is based analyzed all-cause mortality for cohort studies, which capture both short-term and long-term effects. *All-cause mortality* means fatalities that occur for any reason. Scientists studying the effects of air pollution use all-cause mortality rather than fatalities that are clearly tied to air pollution because accurately determining the cause of death is often impossible in epidemiological studies.

[28] The population estimates are based on individual, rectangular cells with a dimension of 15 seconds of one degree on each side. The populations within all such cells within the grid are interpolated to the U.S. Census Bureau's 2005 estimates (Personal communication between P. Coleman, Oak Ridge National Laboratory, and A.L. Sjoreen, Oak Ridge National Laboratory, June 5, 2006).

DOE used the adult (age 30 and older) $PM_{2.5}$ concentration-response function (relative rate: 1.06 per 10 µg/m^3, 95% confidence interval: 1.02–1.11) from Pope et al. (2002).[29] The Pope et al. (2002) study finds one of the strongest associations between $PM_{2.5}$ exposure and premature mortality. Because SO_2 represents a significant proportion of the Plant's pollutant output, and SO_2 is known to convert to sulfate particles in ambient air, it is considered here as an addition to the estimated $PM_{2.5}$ concentrations.[30] DOE assumed that SO_2 converts to sulfate particles as an addition to the $PM_{2.5}$ loading at the rate of 7% per 24-hour period (Azad and Kitada 1998).

All cause premature mortality is calculated by multiplying the modeled pollutant concentration by the age specific population, the age specific all-cause death rate, and the concentration-response function to obtain the expected number of deaths. Sixty percent of the population in Virginia is aged 30 or older (Virginia Department of Health 2004). For the receptor grid DOE studied this yields an estimate of 144,000 persons 30 or older. For this age group, the annual, all-cause death rate is 13 per 1,000 (Virginia Department of Health 2004).

To estimate several other health effects from particulate matter resulting from plant operations, DOE used a scaling technique developed by EPA based on extensive air quality modeling (EPA 2005). The method involves interpolation among cases that were modeled in detail by EPA. DOE used parameters provided by EPA to estimate health effects incidence based on total emissions of SO_2, NO_x, and $PM_{2.5}$ from the Plant (Personal communication between B. Hubbell, EPA, and L.N. McCold, Oak Ridge National Laboratory, October 11, 2006). The potentially affected population on which these estimates are based is roughly the population of the eastern United States. While the risks to persons who live near the Plant are largest, the expected incidence includes the sum of very small risks to millions of people.

4.3.2.2 Results

DOE estimated the expected incidence of premature mortality among the 144,000 adult population (age 30 or older) in a 36-mi^2 (93-km^2) area centered on the Plant (Figure 4.3.1-1). The results of the analysis of health effects to the adult population are described by the following bullets:

- As a result of exposure to the combined effects of SO_2 and PM_{10}, the expected incidence of premature mortality among the 144,000 adults (30 and older) in a 36-mi^2 (93-km^2) area around the Plant from *pre-shutdown operations* is about 3.8 (confidence interval: 1.2 to 6.8) per year.

[29] EPA employs the Pope et al. $PM_{2.5}$-related mortality estimates as one component in cost/benefit analyses of various air pollution reduction strategies (EPA 2005). Information on EPA's studies and the methodology can be found in the Regulatory Impact Analysis for the Final Clean Air Interstate Rule (EPA-452/R-05-002, March 2005), which may be found at http://www.epa.gov/air/interstateairquality/pdfs/finaltech08.pdf.

[30] NO_x is also known to convert to $PM_{2.5}$ in the atmosphere. DOE did not include NO_x in the analysis of nearby health effects because NO_x is a relatively smaller part of Plant pollution emissions and converts to $PM_{2.5}$ less efficiently that SO_2.

- For *pre-Order operations,* the expected incidence of premature mortality among the exposed population of 144,000 adults (30 and older) would be 0.77 (confidence interval: 0.26 to 1.4) per year.
- For *operations under the Order* the expected incidence of premature mortality among the adult population of 144,000 is 1.3 (confidence interval: 0.44 to 2.4). The annual rate for operations under the Order is 1.7 (confidence interval: 0.58 to 3.1).
- For *potential extension of the Order* through June 2007 the expected incidence of premature mortality among the adult population of 144,000 would be 1.5 (confidence interval: 0.51 to 2.7) Extending it through December 2007 would raise the expected fatalities to 2.9 (confidence interval: 0.97 to 5.1). The annual rate for extension of the Order is 2.3 (confidence interval 0.78 to 4.1).

Statistical Terminology

The results of the health effects analysis are expressed in statistical terms.

Some results are expressed as the ***expected incidence*** of a specified health effect occurring in the exposed population. For instance, if pepper were thrown into the faces of 1,000 people in 100 groups of 10 people and 340 of the people sneezed, for the next randomly selected group of 10 people, the expected incidence of sneezing would be 3.4 people. In each group of 10, the number of people sneezing would be a whole number. Sometimes it would be three people, sometimes it would be four, and it could as small as zero or as a high as 10, but for this hypothetical example the long-term average would be 3.4. Expected incidence, in this case 3.4, is not a statement about what will occur, but a statement of what is likely to occur.

Other results are expressed as the ***probability*** that an individual who is exposed would experience the specified health effect. For the example above, the probability that any one random individual would sneeze would be 0.34 (=340/1000).

Another example shows how probability statements can be interpreted for groups and individuals. In 2003 approximately 25 per 100,000 (0.00025 or 0.025%) Americans 50 years of age or older, were diagnosed with stomach cancer. This can be reported as an expected incidence of 25 stomach cancers per 100,000 Americans age 50 or older. For an average American 50 or older, the probability per year of being diagnosed with stomach cancer is 0.00025.

The reader should understand that the estimates of expected fatalities above do not indicate the risk faced by any particular individual. Pollutants do not affect all sectors of the population to the same extent. The very young, the elderly, and those with preexisting health conditions tend to experience adverse health effects at pollutant levels that have little or no effect on the remainder of the population. Activity levels also affect the nature of the health effects; the more active the person, the more likely that PM or SO_2 will induce health effects. For instance, jogging while pollution levels are high is more likely to cause health effects in healthy people than would resting on a picnic bench or walking slowly. The reader should also bear in mind that among the modeled population of 144,000 adults, about 1,800 would die each year due to various causes.

Another useful indicator of the potential health effects of the Order is the risk to the "maximally exposed individual." The maximally exposed individual is a hypothetical person who spends all his time outdoors at the receptor point that has the highest average modeled concentration. Nobody stays at the same place all the time, so the maximally exposed individual establishes the upper limit on the health risk that anyone could experience. However, the response factor used to generate these estimates is for the average adult (30 or older). Persons who are more susceptible to air pollutants would have a higher risk and healthy people would have a smaller risk.

Confidence Intervals

A confidence interval is one expression of the uncertainty associated with a statistical estimate. To be clearly defined, the confidence interval needs to specify the confidence level associated with the interval. The confidence intervals reported in this SEA are for a 95% confidence level. For example, if the estimate of the probability of a health effect is 0.30, it means that the best estimate of the probability is 0.30. If the associated 95% confidence interval is 0.17 to 0.48, it means that while the estimate is not certain, we are 95% confident that the true probability of the health effect is no lower than 0.17 and no higher than 0.48.

A confidence interval is helpful in informing us of how much confidence we can have in a statistical estimate. For example, if the confidence interval above were 0.29 to 0.31, we would know that we could be very confident in the estimate of 0.30. Conversely, if the confidence interval were 0.01 to 0.99, we would know to have much less confidence that 0.30 was close to the true value.

- For *pre-shutdown operations* the hypothetical maximally exposed individual has a risk of premature mortality of 0.22% (confidence interval: 0.074 to 0.39%) for a year of operation.
- For *pre-Order operations* if they had continued for one year, the risk of premature fatality to the hypothetical maximally exposed individual would be 0.028% (confidence interval: 0.0094 to 0.050%)
- For *operations under the Order* the risk of premature mortality from SO_2 concentrations to the maximally exposed individual is 0.072% (confidence interval: 0.024 to 0.13%).
- For a *potential extension of the Order* through June 2007, the risk of premature mortality to a hypothetical maximally exposed individual would be 0.067% (confidence interval: 0.022% to 0.12%). If the Order were extended through December 2007, the hypothetical maximally exposed individual risk of premature mortality would be 0.13% (confidence interval: 0.045 to 0.24%).

There are important uncertainties that are relevant to both the maximally exposed individual and population analyses. First, there are uncertainties associated with the response factors as indicated by the 95% confidence intervals. (See text box.)

Another uncertainty is the health status of the affected persons. If the persons exposed to the highest concentrations are more healthy than average, the risks are lower. Conversely, if the people exposed to the highest concentrations are relatively unhealthy, the estimated premature fatality probability may be an underestimate. Further, there is uncertainty associated with the location of affected persons, e.g., people who may not be at home all day or workers who may be

outside much of the day, so their actual exposures may be lower or higher than assumed for this analysis. To reduce these uncertainties would require very detailed information about the health status and daily movements of a large number of people. Such detailed information is not available.

Another important uncertainty has to do with the air dispersion modeling. As discussed in Section 4.3.1, many assumptions and approximations were used in the air dispersion analysis. Where there was uncertainty, DOE selected assumptions that avoid underestimating the impacts of Plant operations. The net result of all these assumptions is most likely to overestimate maximum pollutant concentrations. In addition, Mirant has stated that the standard building dimensions used in AERMOD lead to overestimating the modeled downwash effect, with the result that modeled concentrations at Marina Towers are unrealistically high. EPA authorized Mirant to initiate the MES to help resolve this concern. Initial monitoring results for SO_2 monitors near the Plant tend to support Mirant's statement, but EPA has yet to reach a conclusion.

If the estimate of the downwash effect is too high, it would mean that the maximum exposures to stack emissions are overestimated and the risk to the hypothetical maximally exposed individual may be too high. However, overestimate of the risk to the hypothetical maximally exposed individual may not appreciably affect the risk to the population. The population health effect is the sum of the individual risks for the modeled population of 144,000 adults. Relatively few people live in the top floors of Marina Towers. Even if modeling with improved input parameters showed that pollutant concentrations at Marina Towers are lower than current estimates, the concentrations at points that are farther away and the exposures for most of the population would be little affected. Thus, the population risk is not expected to be much affected by more accurate modeled building dimensions.

EPA Scaling Technique. The EPA scaling technique is a simple method of making estimates of a variety of health effects. The health effects reported in Table 4.3.2-1 are those examined by EPA in its recent regulatory impact assessments for emission standards. The estimates of population health effects are higher than those that would result from the method above because the potentially affected population is much larger. The EPA scaling technique does not provide estimates of uncertainty or confidence intervals. However, the estimates of premature mortalities are based on Pope et al. (2002) cited above. Consequently, at least for the premature mortalities, it is reasonable to estimate that a 95% confidence interval would span at least 70% below to 80% above the expected incidences reported in Table 4.3.2-1 based on Pope's reported confidence intervals.

4.3.3 Water Quality

Two types of water quality impacts could result from Plant operations as a result of the Order. Plant operations could cause direct impacts to Potomac River water quality by changing the volume or characteristics of the effluent discharged from the Plant. Indirect impacts to regional water quality could result from changes in the emissions of air pollutants that are

Table 4.3.2-1. Expected incidence of short- and long-term health effects resulting from Mirant Plant operations for the population of the eastern United States

Health effect	Pre-shutdown (one year)	Pre-Order (285 days)	Order (285 days)	Order extension Oct. `06 – Jun. `07	Order extension Oct. `06 – Dec. `07
Premature mortality (adults, 30 and over)	37	5	14	12	23
Infant mortality (infants less than one year)	0.08	0.01	0.03	0.03	0.05
Chronic bronchitis (adults, 26 and over)	20	3	7	6	13
Non-fatal myocardial infarctions (adults, 18 and older)	50	7	18	16	31
Hospital admissions – Respiratory (adults, 20 and older)	13	2	5	4	8
Hospital admissions – Cardiovascular (adults, 20 and older)	11	2	4	3	7
Emergency room visits for asthma (18 and younger)	30	4	11	9	19
Acute bronchitis (children, 8-12)	46	7	17	14	29
Asthma exacerbations (asthmatic children, 6-18)	698	101	258	218	440
Lower respiratory symptoms (children, 7-14)	553	80	205	173	349
Upper respiratory symptoms (asthmatic children, 9-11)	423	61	157	132	267
Work loss days (adults, 18-65)	3,942	568	1,459	1,234	2,488
Minor restricted activity days (adults, age 18-65)	23,490	3,387	8,693	7,350	14,823

Source: DOE analysis of SO_2, NO_x, and $PM_{2.5}$ emissions from the Mirant Potomac River Generating Station, using EPA scaling technique (Personal communication between B. Hubbell, Health and Environmental Impacts Division, EPA, Research Triangle Park, North Carolina, and L.N. McCold, Oak Ridge National Laboratory, October 11, 2006).

subsequently deposited in surface waters or that are washed into surface waters after being deposited on the ground surface.

4.3.3.1 Direct impacts to the Potomac River

The operating changes associated with the pre-Order period or operations under the Order do not change the water quality characteristics of Plant intake water and effluents. Thus, the effect of the Plant on the pollutant load in the Potomac River (including suspended sediments, coliform bacteria, and metals) under different operating conditions can be assumed to be proportional to the volume of water used and discharged by the Plant. No chlorine was used in the Plant during pre-Order operations or under the Order; thus, Plant operations do not affect chlorine levels in the Potomac River.

Pre-shutdown operations. Under pre-shutdown operating conditions the Plant used Potomac River water and discharged effluents to the river as described in Section 2. The effects of many years of Plant operations are among the natural and human factors reflected in the existing water quality and ecological conditions in the river, as described in Sections 3.3.2.1 and

3.4.2.1. Table 2.4-1 presents data on the water quality of intake water and effluents associated with pre-shutdown operations.

Pre-Order operations. The Plant's water discharges to the Potomac River in December 2005 (assumed to be typical of pre-Order conditions) averaged 94 million gal/day (360,000 m^3/day), approximately 27% (on average) of the average pre-shutdown discharge volume (Section 2.4.2). Assuming that withdrawals from the river during any period are about 1% higher than monitored discharges (Section 2.3), withdrawals during this pre-Order period are estimated at less than 95 million gal/day (360,000 m^3/day). The reported maximum thermal discharge to the river in December 2005 was 969 Mbtu/hr. The much lower water and thermal discharge rates associated with pre-Order operations could contribute to improved river water quality relative to pre-shutdown operations, which could improve conditions for aquatic organisms (Section 4.3.4.2).

Operations under the Order and potential extensions of the Order. The Plant's water and thermal discharges to the river varied during the 285-day period of the Order. Operations during the line outage in January 2006 contributed to an average water discharge for the entire month of 266 million gal/day (1.0 million m^3/day), nearly three times the discharge recorded in the pre-Order period. Reported maximum thermal discharge to the river was 3,355 MBtu/hr, more than three times the December maximum. Operations in the period February through May 2006, a period of relatively low power demand (Figure 4.2-1) during which there were no line outages, resulted in an average discharge of 170 million gal/day (640,000 m^3/day), about 80% higher than pre-Order operations but only about half of the average for the pre-shutdown period. Maximum thermal discharges in this period ranged from 1,157 to 1,620 MBtu/hr. Average water discharge in June 2006 was 250 million gal/day (950,000 m^3/day). This value is 165% higher than discharge under pre-Order conditions, but is still 27% less than the average discharge under pre-shutdown operations before August 2005. Maximum thermal discharge in June 2006 was 2,406 MBtu/hr, which also is intermediate between pre-shutdown and pre-Order levels. The somewhat lower water and thermal discharge rates resulting from operations under the Order through June 2006 could contribute to improved river water quality relative to pre-shutdown operations, which could improve conditions for aquatic organisms (Section 4.3.4.2).

For operations under the Order following the commencement of daily predictive modeling in July 2006 (including the temporary extension of the Order to December 1, 2006, and any extension beyond that date), water and thermal discharges are assumed to be similar to those during pre-shutdown operations. Impacts are estimated to be the same as for pre-shutdown operations.

4.3.3.2 Indirect impacts to regional water quality

DOE identified and assessed two potential sources of indirect impact to regional water quality from deposition of Plant air pollutants: (1) nitrogen loading and (2) acid deposition.

Nitrogen loading. Deposition of nitrogen compounds emitted from the Plant contributes to nitrogen input to Chesapeake Bay and other waters in the region, thus contributing to the nutrient loading that degrades water quality (Section 3.3.2) and can impact aquatic organisms (Section 4.3.4).

Targets for reducing atmospheric nitrogen inputs have been set for the Chesapeake Bay as a whole (Section 3.3.2.5), but not for component watersheds. Therefore, DOE's assessment of the potential impacts of Plant operations on nitrogen loading to area surface waters focuses on Chesapeake Bay. Because nitrogen inputs due to pre-shutdown operations of the Plant are implicitly included in current Bay nutrient budgets, the reduced levels of operations associated with pre-Order conditions and the Order contribute toward the Chesapeake Bay Program's 8-million-lb (3.6-million-kg) target for reduction in atmospheric inputs of nitrogen (Section 3.3.2.5). In all cases the estimated reductions in nitrogen loading are small when compared with the total nitrogen input to the Bay.

Assumptions. DOE estimates (Section 4.3.1.5) that the Plant emitted 2,800 tons (2,500 metric tons) of NO_x per year under pre-shutdown operating conditions. In estimating the impacts of nitrogen emissions from the Plant on Chesapeake Bay water quality, DOE assumes that NO_x has the same nitrogen content as an equivalent mass of NO_2; the pre-shutdown NO_x emission is the equivalent of about 1.7 million lb/yr (770,000 kg/yr) of nitrogen.

To estimate the impact of the Plant on Chesapeake Bay nitrogen loading, DOE assumed that 10% of the nitrogen released from the Plant reaches the Bay, primarily due to being deposited directly on water or on impervious urban surfaces, while all other nitrogen emitted from the Plant is either consumed in terrestrial or aquatic ecosystems or deposited outside the Bay watershed (e.g., on the open Atlantic Ocean). (See Section 3.3.2.5.)

The above assumption is believed to be realistic, based on the following reasoning. Assuming that electric power plants such as the Plant are responsible for 38% of the atmospheric contribution of nitrogen to the Bay (consistent with their contribution to regional NO_x emissions, as discussed in Section 3.3.2.5), the total estimated electric-utility contribution to the Bay is about 35 million lb/yr (16 million kg/yr). The 170,000 lb/yr (77,000 kg/yr) of nitrogen estimated to reach the Bay as a result of Plant air emissions (10% of the total nitrogen emissions) are approximately 0.5% of this total electric-utility contribution. This 0.5% value is consistent with power-plant NO_x emissions inventories reported by EPA (2006b), which indicate that during several months in early 2005 the Plant accounted for about 0.5% of electric utility NO_x emissions in the seven-state region (i.e., Maryland, Virginia, Pennsylvania, New York, West Virginia, New Jersey, and Ohio) estimated to produce most of the air emissions that contribute nitrogen to the Bay.

Pre-shutdown operations. Based on the above assumptions and the Plant's estimated NO_x emissions under pre-shutdown operating conditions, pre-shutdown Plant operations contributed about 170,000 lb (77,000 kg) of nitrogen to the Bay annually, or about 0.2% of the total annual nitrogen input to the Bay that is attributed to atmospheric sources (Section 3.3.2.5).

Pre-Order operations. Based on the estimate of NO_x emissions presented in Section 4.3.1.5, pre-Order operations are estimated to emit nitrogen at an annual rate of about 470,000

lb/yr (220,000 kg/yr). For the 285-day duration of the Order (through October 1, 2006) operations at pre-Order levels would emit about 370,000 lb (170,000 kg) of nitrogen.

Assuming that 10% of the nitrogen from the Plant reaches the Bay, pre-Order operations, if extended for a full year, would contribute about 47,000 lb (22,000 kg) of nitrogen to the Bay annually. Compared with pre-shutdown operations, pre-Order operations would avoid an estimated 123,000 lb (55,000 kg) of annual nitrogen delivery to the Bay, thus potentially achieving about 1.5% of the Chesapeake Bay Program's targeted 8-million-lb (3.6-million-kg) reduction in atmospheric nitrogen input.

Operations under the Order. Based on the estimate of NO_x emissions presented in Section 4.3.1.5, operations under the Order emit nitrogen at a rate of about 1.5 million lb/yr (670,000 kg/yr). For the 285-day duration of the Order (through October 1, 2006) operations under the Order emit 1.2 million lb (530,000 kg) of nitrogen, delivering nitrogen to the Bay at an estimated rate of 150,000 lb (67,000 kg) per year. If sustained for a full year this level of operations would avoid about 20,000 lb (10,000 kg) of pre-shutdown nitrogen delivery to the Bay annually and would achieve about 0.2% of the Chesapeake Bay Program's goal for annual atmospheric nitrogen reductions.

Potential extension of the Order. DOE's analysis assumes that Plant operations after October 1, 2006, including operations during the temporary extension of the Order through December 1, 2006, and any subsequent extension of the Order, would utilize coal and emit NO_x at approximately the same rate as pre-shutdown operations, so there would be no reduction from pre-shutdown nitrogen delivery to the Bay and no contribution toward meeting the Chesapeake Bay Program's nitrogen-reduction goals.

Acid deposition. The Plant's air emissions of SO_2 and NO_x (Section 4.3.1) contribute to regional acid deposition. However, under all operating conditions acid-deposition impacts to water quality of streams in nearby watersheds, including the Anacostia, Patuxent, and nearby portions of the Potomac watershed, would be negligible because these watersheds are well buffered against acid rain (Section 3.3.2.6).

Pre-Order operations. Air emissions of SO_2 and NO_x under pre-Order conditions were about 28% of pre-shutdown emissions of these pollutants, proportionately reducing the Plant's contribution to regional acid deposition, relative to pre-shutdown operations.

Operations under the Order. Compared to pre-Order operations, operations under the Order increase the Plant's contribution to regional emissions of these air pollutants that produce acid deposition, but the Plant's contribution is smaller than under pre-shutdown operations. Over the 285-day duration of the Order, the Plant produced about 87% of the NO_x emissions that would have occurred for the same duration of pre-shutdown operations, but roughly three times the emissions estimated for pre-Order operations. SO_2 emissions also increased relative to pre-Order operations, but the use of trona caused emission of less than 45% of the SO_2 that would have been emitted from pre-shutdown operations.

Potential extension of the Order. Operations under the Order after October 1, 2006, including during the temporary extension of the Order to December 1, 2006, and any extension

beyond that date, are conservatively estimated to emit NO_x at the same annual rate as pre-shutdown operations, but use of trona is assumed to reduce SO_2 emissions by 50% compared with pre-shutdown operations. Thus, the Plant's overall contribution to regional acid deposition is smaller than under pre-shutdown operations.

4.3.4 Ecological Resources

Operation of coal-fired power plants can impact ecological resources through air, water, or solid waste releases that can result in acid deposition, nutrient enrichment (see section 4.3.3.2), or changes in water quality or quantity of the receiving bodies (Dvorak et al. 1978, EPA 2006c).

4.3.4.1 Acid deposition

Acid deposition can affect plant and animal species, both directly and indirectly (Schreiber 1995, Roth et al. 2005, EPA 2006a), but Plant emissions (discussed in Sections 3.3.2.6 and 4.3.3.2) are expected to have minimal impacts as described below.

Aquatic impacts. The ecological effects of acid rain are most clearly seen in aquatic environments (e.g., streams, lakes, marshes) located in watersheds where the soils have a limited buffering capacity (EPA 2006a). (See Section 3.3.2.6.) In areas where buffering capacity is low, acid rain can release aluminum, which is highly toxic to many species of aquatic organisms, from soil into lakes and streams. In general, lowering the pH of a water body can impair the ability of certain fish and other aquatic organisms to grow, reproduce, and survive.

Soils in the river and stream basins in the region where air emissions from the Plant are most likely to fall (e.g., Potomac, Anacostia, and Patuxent rivers; Rock Creek) are generally well buffered (CBWP-MANTA 2001, Roth et al. 2005, Shanks 2005; also see Sections 3.3.2.6 and 4.3.3.2). Mobilization of aluminum is, thus, unlikely to occur, and acid deposition will not greatly change the pH level of the streams. Therefore, acid deposition resulting from the DOE Order, including the temporary extension of the Order to December 1, 2006, and any extension beyond that date, would have minimal impacts on biological resources in regional waterways.

Terrestrial impacts. Increases in soil acidity can impair the ability of some species of trees to grow and resist disease, while dry deposition of acidic gases and particles can directly impact some terrestrial vegetation.

The effects of over 50 years of Plant operations are among the natural and human factors reflected in the existing ecological conditions near the Plant, as described in Section 3.4.1. Vegetation still actively grows nearby on Daingerfield Island and in the small wooded area next to the Plant (Figure 2-2). While the Order results in higher emissions of the air pollutants responsible for acid deposition than occurred during the pre-Order period (Sections 4.3.1 and 4.3.3.2), combined total estimates of emissions of these pollutants under the Order and any

extension of the Order, including the temporary extension, are still lower than during pre-shutdown operations, when vegetation was growing well near the Plant. Thus, the Order is unlikely to have negative impacts from acid deposition on vegetation or the wildlife that depends on it.

4.3.4.2 Impact of water quality changes

Nutrients. One of the main causes of aquatic habitat loss in the Chesapeake Bay watershed as a whole (CBP undated) is elevated loading of two nutrients: nitrogen and phosphorus. (See Section 3.3.) To the extent that the DOE Order changes loading of these two nutrients to surface waters compared to the pre-Order or pre-shutdown operating periods, there could be effects on habitats in the river for fish and submerged aquatic vegetation (Section 3.4.2.6), but the Plant's impact on nutrient loading would be small relative to the total.

As discussed in Section 4.3.3.2, nitrogen compounds are emitted from the Plant and augment the nitrogen input to Chesapeake Bay and other waters in the region, thus, contributing to the nutrient loading that impacts aquatic organisms and their habitat. During the first six months of operations under the DOE Order, the Plant's contribution to the nitrogen in the Bay increased over the pre-Order value, but was still lower than under pre-shutdown operating conditions. Operations under daily predictive modeling are estimated to contribute a similar amount of nitrogen as pre-shutdown operations. In all cases changes in the Plant's contribution of atmospheric nitrogen to the Bay are small (as discussed in Section 4.3.3.2), when compared with the total nitrogen input to the Bay.

Reported phosphorus levels in Plant water effluent (Table 2.4-1) were lower than those in the intake water, suggesting that Plant water use may reduce the phosphorus load and, thus, benefit aquatic systems. If the Plant reduces phosphorus concentration in effluent by 0.016 mg/L (Table 2.4-1), effluent discharge at the pre-shutdown rate of almost 345 million gal/day (1.3 million m^3/day) would remove about 48 kg/day of phosphorus. Reduced operating levels during pre-Order operations and the first six months of the DOE Order would have diminished the Plant's beneficial impact by removing proportionately less phosphorus than pre-shutdown operations or operations under daily predictive modeling. At any level of operations, however, any beneficial impact on phosphorus load resulting from Plant operations is small relative to the total daily input (from all sources) of phosphorus to the Potomac River, which has been estimated to be about 8,000 kg/day (Boynton and Swaney 1998), or the contribution of the nearby Blue Plains Wastewater Treatment Plant, which delivers 720 kg/day of phosphorus to the river when operating at its rated capacity of 370 million gal/day (1.4 million m^3/day) and discharging effluent with the phosphorus concentration of 0.18 mg/L allowed by its NPDES permit (Table 3.3-1).

Other contaminants. As discussed in Section 4.3.3.1, changes under the Order in the amount of water used and discharged by the Plant could cause proportional, but small, changes

in concentrations of other pollutants removed from or returned to the Potomac River that are unlikely to result in impacts to organisms or their habitats in the Potomac River.

Trona use. Use of trona may change the landfill effluent discharged to Mataponi Creek by increasing pH and concentrations of sodium sulfate, sodium chloride, selenium, arsenic, and dissolved metals. (See Section 4.3.5.) Modest increases in pH that result from carbonate leaching could be beneficial to aquatic life in the creek due to buffering of acidity. Sulfate compounds are neither toxins nor nutrients; thus, increased concentrations of sodium sulfate would not be expected to impact the creek's aquatic life. Any increase in sodium chloride would likely be indistinguishable from background.

Release of arsenic and selenium could, however, have adverse impacts on aquatic biota and other wildlife that consume these organisms, depending upon the levels at which they occur in the effluent. As noted in Section 4.3.5, monitoring of collected landfill leachate and stormwater, as required under the existing discharge permit, should identify the potential for any problems from selenium before discharges occur. Arsenic levels are not, however, currently monitored prior to water discharge, so there is a potential for arsenic to be released to the creek at concentrations that could be harmful to aquatic life.

Selenium can enter the food web from both sediments and surface water (EPA 2006e). In the food web it undergoes bioconcentration, bioaccumulation, and biomagnification as organisms that first take it in are eaten by others. Elevated levels cause growth reduction in green algae. In other aquatic organisms a number of adverse effects have been observed including loss of equilibrium and other neurological disorders, liver damage, reproductive failure, reduced growth, reduced movement rate, chromosomal aberrations, reduced hemoglobin and increased white blood cell count, and necrosis of the ovaries.

Arsenic can cause cancer and genetic mutations in aquatic organisms, with those effects including behavioral impairments, growth reduction, appetite loss, and metabolic failure (EPA 2006e). Aquatic bottom feeders are more susceptible to arsenic than other organisms.

4.3.4.3 Impacts of changes in water use

Once-through cooling water systems such as used by the Plant can impact aquatic species by impingement (when aquatic organisms become trapped on the intake screens), entrainment (when aquatic organisms are taken in and pass through the cooling water intake system), or thermal changes (Jensen 1981). Impingement and entrainment are often roughly proportional to the volume of water withdrawn, as well as the numbers and species of aquatic organisms in the water body. At the Plant the numbers and species of fish, crabs, and other aquatic organisms that are susceptible to impingement or entrainment at any one time depends on the season of the year, annual fluctuations in relative abundance, and the impact of restoration activities in the Chesapeake Bay watershed. Overall, the effect on species or their habitats of water use and changes in water use by the Plant in different operation modes is expected to be small. The

Plant's thermal discharge is permitted and has been shown to not form a barrier to movement or cause lethality of aquatic organisms.

Impingement. Mirant studied impingement at the Plant during 1981-1982 and 2003-2004 (Pepco 1982; Personal communications between A. Wearmouth, Mirant Corporation, and M.S. Salk, Oak Ridge National Laboratory, July 24, and August 18, 2006). Rates of cooling water withdrawal at the Plant were similar for both study periods (i.e., pre-shutdown conditions). For 1981-1982 the estimated impingement was 206,379 finfish[31] and 56,600 blue crabs; for 2003-2004 the annual estimates were 19,392 finfish and no blue crabs. In the 1981-1982 study over 90% of the fish were impinged in the winter and spring. The main fish species impinged in both studies were species that were either not used commercially (e.g, gizzard shad) or were too small to be of commercial value (e.g, white perch). Some fish exhibited disease conditions or appeared stunted, indicating that they were in poor health.

Although the 2003-2004 study is likely more representative of the fish community that is currently susceptible to impingement by the Plant, the large differences in the results of the two studies illustrate the potential magnitude of annual variation in potential impacts, so results of both studies were used as a basis for assessing impacts of the Order.

Impingement is assumed to be proportional to water intake for the Plant. At pre-Order operating levels the Plant withdraws about 27% of the amount of water it used during the pre-shutdown period. (See Section 4.3.3.1.) Thus, impingement under pre-Order conditions is estimated to amount to about 5,200–55,000 fish per year, based on the levels observed during the two studies at the Plant.

Under the Order before the commencement of daily predictive modeling (i.e., between January and June 2006), monthly Plant water use ranged from 42 to 77% of monthly use in the pre-shutdown period, averaging about twice the use during the pre-Order period. Assuming that 90% of annual impingement occurs during the winter and spring months of January through June, impingement during this time period is estimated at approximately 9,400–99,000 fish. At the high end of the range the number of fish impinged under the Order on an annual basis is equivalent to about 3% of the estimated 4.9 million fish in the Potomac-Washington Metro Basin (Maryland DNR undated-b).

Following the commencement of daily predictive modeling in July 2006, the Plant is assumed to withdraw water at pre-shutdown levels, resulting in annual impingement rates within the range indicated by the two studies (i.e., about 19,000–206,000 fish per year). However, because the 1981-1982 study indicated that less than 10% of annual impingement occurs during the summer months, operations under the Order during the period July through September 2006 are estimated to have impinged fewer than 1,900–21,000 fish. The temporary extension of the Order to December 1, 2006, and any extension beyond that date would result in cooling water

[31] The number of fish impinged is for the 56-week duration of the study. Thus, the annual rates would be slightly less.

withdrawal rates and annual impingement rates similar to pre-shutdown conditions (i.e., about 19,000–206,000 fish per year).

Not all impinged fish are killed; new intake screens, particularly the one with the fish buckets (Section 2.2), should lower impingement mortality. Fish or other organisms impinged on the water intake screens are washed off the screens and returned to the river on the south side of the cove area next to the Plant, south of the water intake area. (See Figure 2.1-1.)

Little impact is expected to the blue crab population as studies have indicated that initial and latent mortality from impingement is less than 10% (Pepco 1982). Also, blue crabs are found near the Plant only in years when the river is particularly salty (Personal communication between A. Wearmouth, Mirant Corporation, and M.S. Salk, Oak Ridge National Laboratory, August 17, 2006). A difference in the salt level in the river between the two impingement studies is the likely explanation for the difference in the observed number of impinged crabs.

Entrainment. Mirant studied entrainment of fish eggs and larvae at the Plant in 1981 and 2005. Preliminary results from the 2005 study are similar to those from the 1981 study reported below (Pepco 1983; Personal communication between A. Wearmouth, Mirant Corporation, and M.S. Salk, Oak Ridge National Laboratory, August 25, 2006).

Only organisms small enough to pass through the screens on the water intakes are drawn into the Plant where they are subjected to heat, fluid, and mechanical stresses (Cada et al. 1981). Entrainment of fish eggs and larvae is mainly an issue in the period during and soon after fish spawning, from early spring through mid-summer.

During the 1981 study, eggs and larvae of anadromous species (i.e., white perch and herring) were 99% of the total number entrained. Freshwater species (e.g., minnows [fish in the Cyprinidae family], tessellated darter [*Etheostoma olmstedi*]) were entrained in very low numbers, less than 1% of the total.

The major spawning area for both white perch and herring is about 9 miles (14 km) above the Plant at Little Falls. As they mature, the larvae float downriver, past the Plant, mostly in a dredged channel well offshore. The Plant draws cooling water primarily from shallow water near shore, which results in relatively low entrainment rates. Significant spawning of white perch and herrings also occurs in other portions of the Potomac River and its tributaries. Thus, while some fish spawn in the Washington, D.C. portion of the Potomac River, spawning there represents a small portion of the spawning of the Potomac River population. The best estimate of the percent entrainment varied from 1.6% for white perch yolk-sac larvae (an early larval stage) to 8.7% for herring larvae after yolk absorption (Pepco 1983).

Pre-Order operations. There would have been no entrainment of fish eggs and larvae during pre-Order conditions in December 2005 because of the absence of these organisms from the Potomac River at that time. On an annual basis, assuming that entrainment is proportional to water intake, pre-Order conditions would result in entrainment at about 27% of pre-shutdown rates.

Operations under the Order. Under the Order before the commencement of daily predictive modeling (i.e., during January through June 2006) entrainment is estimated to have

occurred at approximately twice the calculated pre-Order rates, but substantially less than pre-shutdown levels (about 55% of pre-shutdown rates). Following commencement of daily predictive modeling in July 2006, entrainment is estimated to have been similar to pre-shutdown conditions for the summer season (owing to similar cooling water withdrawal rates). The temporary extension of the Order to December 1, 2006, and any extension beyond that date would be expected to result in entrainment rates similar to those that occurred during the pre-shutdown time period.

Since entrainment was not a major issue when the Plant was operating at the pre-shutdown level before August 2005, entrainment resulting from operations under the Order or any extension of the Order would not have a major impact on fish populations.

Temperature changes. The Plant's NPDES permit (Section 2.4.2) limits temperature rise in the Potomac River from water discharge to 2.8°C above ambient temperature beyond a 1,000-ft (300-m) radius in order to prevent formation of a barrier to movement of aquatic life or lethality to passing organisms. Based on a 2001 study (Mirant 2002), the thermal plume from the Plant does not form a barrier to movements of aquatic life or cause lethality to passing organisms. The main path for movement of aquatic organisms is the river channel, which is unaffected by the warm water plume from the Plant (Mirant 2002). Thus, no blockage to aquatic life movement is expected from the thermal plume under any assessed operating conditions.

If pre-Order operating conditions continued throughout the year, slightly lower summer water temperatures would result. This could slightly reduce the potential for nuisance algal blooms (Section 3.4.2). Similar, but smaller, benefits could be expected in 2006 because Plant operations under the Order before the commencement of daily predictive modeling resulted in thermal input levels intermediate between pre-Order and pre-shutdown operations (Section 4.3.3.1). Following commencement of daily predictive modeling in July 2006 and throughout any extensions of the Order, however, thermal input to the river is assumed to be similar to pre-shutdown conditions.

If there were a sudden shutdown of the Plant during the winter under any operating conditions, fish that were acclimated to the warm discharge might suffer cold shock when they lose the warm water habitat.

4.3.4.4 Special status species

The NPDES permit stated that the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), the agencies responsible for implementing the Federal Endangered Species Act (ESA), had indicated that the Plant's wastewater discharges were not adversely affecting the three Federally listed species mentioned in the permit. (See Section 3.4.2.)

During consultation with Mirant before the start of sampling for an entrainment study, FWS concluded that taking of eggs of the shortnose sturgeon, an endangered species, in the sampling process was not an issue as there was no possibility of finding them (Personal

communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 14, 2006).

While bald eagles are occasionally seen near the Plant, the site provides no suitable nesting habitat for them (Personal communications between A. Wearmouth and D. Knight, Mirant Corporation, and M.S. Salk, Oak Ridge National Laboratory, July 24, and 25, 2006, respectively).

The Plant site does not provide any suitable habitat for any of the other special status species (i.e., the Hay's Spring amphipod, the Federal species of concern, and the Virginia state-listed species) discussed in Section 3.4.2. There have been no reported adverse impacts to any of these species due to the Plant while operating at the pre-shutdown level before August 24, 2005. Since Plant operating levels under the DOE Order are no higher than they were under pre-shutdown conditions, adverse impacts to any of the special status species would not be expected.

In order to comply with Section 7 of the ESA, DOE sent letters to FWS and NMFS as part of informal consultation. (See Chapter 6 and Appendix D.) The NMFS by letter dated October 3, 2006, concurred with DOE's determination that continued operation of the Plant under the Orders is not likely to adversely affect any listed species. The FWS by letter dated November 20, 2006, stated that only occasional transient individuals of Federally listed endangered or threatened species are known to exist within the project impact area. Both agencies concluded that no further consultation under Section 7 of the ESA is required.

4.3.5 Waste Management

Potential waste management impacts from the Order include (1) impacts to landfill capacity resulting from changes in the quantity of waste generated and (2) changes in environmental impacts of waste management resulting from changes in solid waste characteristics. Impacts related to solid waste transportation are discussed in Section 4.3.6.

4.3.5.1 Impacts on landfill capacity

Assumptions. In estimating the impacts of operations under the Order on remaining waste capacity in the Mirant Brandywine ash landfill used for disposal of fly ash from the Plant (Section 3.5), DOE made the following assumptions, derived from GB&B Inc. (2005):

- remaining disposal capacity at the beginning of 2005 was 2.07 million yd^3 (1.58 million m^3);
- ash placed in the landfill has an in-place density of 1.1 ton per yd^3 (760 kg per m^3); and
- throughout the period of analysis the Chalk Point Generating Plant would generate 206,000 tons (187,000 metric tons) of ash per year, of which 15% would be recycled and 85% would be placed in the Brandywine landfill.

Data and assumptions for pre-shutdown operations. Mirant's records indicate that the Plant sent 113,865 tons (103,297 metric tons) of ash to the landfill during the period January

through August 2005, prior to the events and actions addressed in this SEA (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006). This corresponds to an annual ash generation rate of 170,000 tons (150,000 metric tons) per year, which is somewhat higher than the rate (136,000 tons [124,000 metric tons] per year) used in the GB&B Inc. (2005) analysis.

Assumptions for pre-Order operations. Making the conservative assumption that, on average, pre-Order operations of the Plant during the last three months of 2005 generated fly ash at 20% of the rate recorded for the first eight months of the year, DOE estimated that under pre-Order operating conditions the plant would generate fly ash at a rate of 34,000 tons (31,000 metric tons) per year. (To simplify the assessment of waste management impacts, DOE assumed that under pre-Order operating conditions trona use did not affect the rate of ash generation. This assumption is conservative, in that it minimizes the estimated impacts of pre-Order operations, thus increasing the contrast between the impacts of pre-Order operations and operations under the Order.)

Data and assumptions for operations under the Order. Mirant's records indicate that the Plant sent 28,399 tons (25,763 metric tons) of ash to the Brandywine landfill during the 3-month period March through May 2006 (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006). In estimating the impacts of operations under the Order on landfill capacity, DOE assumed that fly ash was generated at the same average rate from February 2006 until the beginning of June, when the Plant began operating under the ACO. From that time forward the analysis conservatively assumes that under the Order the Plant operates, on average, at pre-shutdown levels, including the temporary extension of the Order to December 1, 2006, and any extension beyond that date.

Impacts. Using the data and assumptions summarized above, DOE estimated total Brandywine landfill waste disposal (from both power plants) during 2005 (prior to the Order) at 269,000 yd^3 (206,000 m^3), which is somewhat less than the historical annual disposal rate of 278,000 yd^3 (213,000 m^3) used in the GB&B Inc. (2005) analysis. This value then became the starting point for analysis of the effect of several different Plant operating modes on the remaining capacity and operating life of the landfill, summarized in Table 4.3.5-1.

Pre-shutdown operations. The 2005 analysis by GB&B Inc. projected that with continued operations at then-current (i.e., pre-shutdown) operating levels, the Brandywine ash landfill would be able to continue receiving ash from the Plant and Mirant's Chalk Point Generating Plant until the middle of 2012.

Pre-Order operations. Table 4.3.5-1 indicates that under pre-Order operating conditions, beginning with the date of the Order and continuing indefinitely, the landfill would be able to receive waste from both power plants for approximately the next 9 years, through the middle of 2015.

Operations under the Order and any extension. To indicate the potential range of impacts from operations under the Order and any extension (including the temporary extension through December 1, 2006), Table 4.3.5-1 presents estimates of disposed waste volume and remaining

Table 4.3.5-1. Impact of Plant operations on remaining operating life of the Brandywine ash landfill

Plant operating mode [a]	Disposal rate for Plant fly ash (yd^3/year) [b]	Estimated full-capacity date for landfill
Pre-shutdown operations [c]	119,000	mid-2012
Plant operates at pre-Order level [d]	31,000	mid-2015
Plant operates in accordance with the Order, without trona injection [e]	varies [e]	late 2011
Plant operates in accordance with the Order (as above), with trona injection [f]	310,000 [f]	early 2010

[a] Mirant's Chalk Point Generating Plant is assumed to operate under all scenarios, generating 159,000 yd^3 of in-place waste annually. If Chalk Point Generating Plant operated and the Mirant Potomac Plant did not, the estimated full-capacity date for the landfill would be the end of 2017 (GB&B 2005).
[b] To obtain the approximate equivalent numerical value in tons/year, multiply by 1.1.
[c] These values are from GB&B Inc. (2005).
[d] Pre-Order level of operations is conservatively estimated to be equivalent to approximately 20% of pre-shutdown operations.
[e] Due to line outage conditions in January 2006, operations in accordance with the Order during that month are assumed to have resulted in waste disposal at the pre-shutdown rate. Operations during February through May are assumed to have resulted in waste disposal at the annual rate of 103,000 yd^3/year recorded during March through May (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006). Beginning in June 2006, the Plant is assumed to operate at the pre-August 2005 level, without trona injection, resulting in waste disposal at annual rate of 155,000 yd^3/year.
[f] Beginning in June 2006, trona injection is assumed to double the quantity of waste requiring disposal.

landfill life for two different assumptions: (1) the Plant operates at pre-shutdown levels, but with no use of trona, after the beginning of June 2006 (since trona is used in operations under the Order, this assumption results in a lower-bound estimate of potential impacts from the Order) and (2) the Plant operates at pre-shutdown levels beginning in June 2006 and trona is injected at a rate which doubles the pre-shutdown rate of solids generation. Trona injection in the Plant can substantially increase ash production; at injection rates necessary to achieve maximum SO_2 removal, trona injection could double or triple the quantity of fly ash waste generated by the Plant (Mirant 2006c). Because trona injection is done only part of the time that the Plant operates and Mirant records of fly ash generation during the period March through May 2006 (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006) indicate that trona use during that period increased fly ash production by approximately 50% over the quantity expected based on coal utilization during the same period, the assumption that trona use doubles the rate of fly ash generation is expected to provide an upper bound on the potential impacts of trona use on landfill capacity. DOE's estimates of the potential impact of the Order on landfill operating life (Table 4.3.5-1) assume that operations

continue indefinitely at pre-shutdown levels, instead of ending when the Order or any extension to the Order expires.

The table indicates that with the level of Plant operations estimated under the Order, but without trona use after June 2006, the landfill's operating life would be about one-half year shorter than projected by GB&B (2005) for pre-shutdown conditions, but about 3.5 years shorter than under pre-Order operations. (Note that this analysis assumes that the ash-generation rate reported in the first 8 months of 2005 would continue, rather than the lower rate assumed by GB&B.) Use of trona would cut almost two additional years off the Brandywine landfill's life expectancy, causing it to reach capacity in a little more than three years.

The assumptions of this analysis are conservative, but the limited landfill life that is estimated to remain if trona injection continues at a high rate may not provide sufficient lead time for siting a new ash landfill. If the Brandywine landfill were to reach capacity before a new ash landfill were sited, Mirant could ship fly ash to a commercial sanitary landfill until a new landfill became available.

Because commercial landfill capacity in the region is very limited (Metropolitan Washington Council of Governments 2001, VDEQ 2002, Harrison 2004, MDOE 2005), ash might need to be transported long distances if it is required to be sent to a commercial landfill licensed for municipal solid waste. Several large privately owned Virginia landfills receive municipal solid waste from outside the local area (Metropolitan Washington Council of Governments 2001). The nearest of these landfills is in King George County, about 60 miles (100 km) by road from the Plant; others are in the Richmond area, more than 100 miles (160 km) from the Plant. If the state regulatory agency allows coal combustion ash disposal in landfills permitted for disposal of construction and demolition debris (in Maryland, these are called "rubble landfills" or "rubblefills"), there are private landfills closer to the Plant (in Lorton, Virginia, and in Prince George's and Baltimore counties in Maryland) that possibly could be used. It has been estimated that the Lorton landfill will reach capacity before 2011 (Harrison 2004), but the state of Maryland has received applications to site several additional commercial rubble landfills (MDOE 2005), giving some assurance that the region will continue to have disposal capacity for construction and demolition waste.

4.3.5.2 Effects of trona use on the environmental consequences of waste management

In addition to increasing the volume of solid waste requiring management, operation of the Plant with trona injection alters the chemistry and physical properties of the fly ash waste, potentially changing the environmental consequences of its management. (Quantities and characteristics of the Plant's bottom ash are not affected by the use of trona.)

Chemical characteristics of Plant fly ash. Reaction of trona (sodium sesquicarbonate; $Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$) with SO_2 in the exhaust gas results in the formation of solid sodium sulfate compounds (assumed to be Na_2SO_4), along with the release of gaseous CO_2. The resulting

sodium sulfate is incorporated into the fly ash captured in the Plant's precipitators, together with mineral ash derived from coal combustion and unreacted trona (which is assumed to be dehydrated in the exhaust gas stream, forming sodium carbonate). Because the trona feed rate is typically several times larger than the feed rate calculated to be necessary to react chemically with SO_2 in the air emissions, the fly ash captured in the precipitators contains several times more sodium carbonate than trona reaction products. Although trona use enhances particulate capture in precipitators (Mirant 2006c), thus adding to the volume of fly ash, the increase in Plant fly ash volume that results from trona injection is due almost entirely to incorporation of trona residue into the fly ash. The trona-ash waste stream also can be assumed to include minor amounts of (1) any trace elements found in the raw trona and (2) compounds formed when other gases in Plant emissions react with trona.

Table 4.3.5-2 presents results of chemical analyses of four samples of ash produced in October and November 2005, including two samples produced during Plant operations without trona injection and two samples produced during trona injection. Comparison of the two pairs of analyses illustrates that trona use converts the Plant's fly ash from a largely insoluble mineral ash (oxide percentages of silica and alumina total 84-86% in the pair of samples produced during operations without trona injection) into a mixture of mineral ash and water-soluble carbonates and salts (the high values for sodium and alkalinity in the second pair of samples in Table 4.3.5-2 identify the sodium carbonate component of the ashes produced during trona injection). Trona use increases ash pH (which already is high, indicating an alkaline material) but also greatly increases alkalinity, which is a quantitative measure of the amount of material available to react with acid. Sulfate, which is a very minor component of ash produced without trona injection (first pair of analyses), is a significant fraction of the ash produced with trona (second pair of analyses). With trona use measurements of loss on ignition (a test used to indicate the level of unburned carbon in a sample) increased from 5% and 12% to values of 20% and higher. Trona addition should not affect the amount of unburned carbon in fly ash, so the increased measured values of loss on ignition probably are attributable to volatilization of trona-related constituents. Chloride was not measured, but it is likely that some sodium chloride is included in the ash due to chemical reaction of trona with the small amounts of chlorine present in Plant emissions.

Selenium concentrations are increased approximately 10-fold in the ash produced when trona is used (second pair of selenium in Table 4.3.5-2) compared with ash produced by Plant operations without trona use (first pair of selenium results in Table 4.3.5-2). The source of the increased selenium in the trona ash has not been determined, but it is likely that selenium (a trace constituent in coal that can volatilize during coal combustion) in Plant exhaust gas reacts with sodium carbonate or trona and is incorporated into the fly ash as solid sodium selenate, Na_2SeO_3. This chemical reaction is used industrially when sodium carbonate (often referred to as "soda ash") is used in the commercial production of selenium metal to isolate selenium from various other compounds and convert it to the sodium selenate form (WebElements 2006). Although selenium might also be present as an impurity in the natural trona used in the Plant, it is not mentioned in published reports about this material (Dyni 1991, 1996).

Table 4.3.5-2. Concentrations of major constituents and trace elements in samples of Plant fly ash resulting from operations with and without trona injection.

Parameter (units)	Ashes produced without trona injection		Ashes produced during high-rate trona injection	
	Load following	Baseline	Low load	Full load
Silica (%)	56.4	59.3	33.2	38.6
Alumina (%)	27.4	26.6	15.4	17.5
Titania (%)	1.4	1.3	0.7	0.9
Iron (as % FeO)	5.6	5.3	3.1	3.4
Calcium (as % CaO)	1.4	1.3	0.8	1.1
Magnesium (as % MgO)	1.4	1.3	0.8	1.1
Potassium (as % KO)	3	2.5	1.3	1.7
Sodium (as % Na_2O)	0.34	0.32	39.2	28.3
Sulfate (as % SO_3)	0.22	0.17	3.4	5.7
pH (pH units)	10.2	10.2	11.1	11.0
Alkalinity (% $CaCO_3$ equivalent)	0.55	0.55	39.21	32.4
Lead (mg/kg)	15	15	8.7	10
Arsenic (mg/kg)	47	39	31	26
Barium (mg/kg)	680	660	310	360
Cadmium (mg/kg)	0.29	0.39	0.2	0.28
Chromium (mg/kg)	13	19	7.7	13
Selenium (mg/kg)	1.1	ND [a]	15	11

[a] ND = Not detectable

Source: Mirant (Personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006)

Measured concentrations of lead, arsenic, barium, and chromium are lower in ash produced during trona operations, probably indicating a dilution effect from the addition of trona components to the mineral ash. Cadmium concentrations are similar in both types of ash. Mercury and silver concentrations are not presented in Table 4.3.5-2 because these metals were below detection limits in all samples.

The ash samples were tested for leachability using the Toxicity Characteristic Leaching Procedure (TCLP) (Personal communication between A. Wearmouth, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 21, 2006). The TCLP simulates leaching in the acidic environment of a municipal solid waste landfill and is one of the tests specified under the Resource Conservation and Recovery Act (RCRA) for determining whether a solid waste is a hazardous waste. TCLP extracts were analyzed for lead, silver, arsenic, barium, cadmium,

chromium, selenium, and mercury. These test results do not affect the regulatory status of Plant ash because ash from the combustion of coal, including flue gas emission control waste (such as the trona component of Plant fly ash), is exempt from RCRA regulation as a hazardous waste (40 CFR 261.4).

Barium was the only metal detected in TCLP leachates from the two ash samples produced without trona injection, with concentrations of 0.28 and 0.43 mg/L. Leachates from the two ash samples obtained during trona use had somewhat higher concentrations of barium (0.63 and 0.93 mg/L), but all barium concentrations were below the primary drinking water standard of 1 mg/L, as well as the 100 mg/L threshold for identifying a waste material as a RCRA hazardous waste.

TCLP leachates from both of the ash samples produced during trona injection also contained detectable levels of arsenic and selenium. The measured arsenic concentrations of 1.4 and 1.1 mg/L exceed the primary drinking water standard of 0.05 mg/L, but not the 5 mg/L threshold for identifying a waste material as a hazardous waste. Measured selenium concentrations of 1.1 and 0.77 mg/L also exceed the primary drinking water standard, which is 0.01 mg/L, and the higher measurement exceeds the 1 mg/L threshold for identifying a waste material as a hazardous waste. (As discussed above, however, Plant ash is exempt from RCRA regulation as a hazardous waste.) Sodium selenate (the form in which selenium is likely to be present) is soluble in water, and the presence of sulfate is likely to increase the solubility of both arsenic and selenium.

Implications for waste management operations. Although ash produced during trona injection has reduced pozzolanic activity (Section 2.4.3), it still has significant pozzolanic properties that facilitate its management. Mirant personnel report that trona use does not adversely affect ash workability or its physical stability after placement in the Brandywine ash landfill (Personal communication between D. Cramer, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 12, 2006). Thus, there should be no adverse consequences for the emission of windblown dust or for successful stabilization and closure of completed portions of the landfill. Ash produced during trona injection has, however, been observed to be more corrosive than other ash wastes handled at the Brandywine ash landfill (presumably due to the sulfate component), increasing the need for equipment maintenance and possibly accelerating the need for equipment replacement (Personal communication between A. Wearmouth and D. Cramer, Mirant Corporation, and E.D. Smith, Oak Ridge National Laboratory, July 14, 2006).

Fly ash generated during trona use has pozzolanic activity that is too low for most structural uses (TFHRC undated) and contains substantial amounts of sulfate and other soluble constituents that would reduce its suitability for construction use. Therefore, it is unlikely that any Plant fly ash generated during trona use can be beneficially used as a construction material. However, Mirant might be able to find other beneficial uses for this material. For example, due to its high alkalinity, the ash generated during trona production might be a suitable fill material in settings where alkaline material is needed to neutralize acids, such as in waste-site restoration or coal mine reclamation.

Implications for impacts of the Brandywine ash landfill. Leaching of the fly ash produced during trona injection would increase the release of dissolved solids into the landfill leachate that eventually is discharged to Mataponi Creek.

Sodium sulfate, sodium carbonate, and sodium chloride, which are major chemical constituents of the ash produced during trona injection (see discussion above), are all soluble and could be readily released into the leachate. Leachate pH is likely to be higher due to the presence of large amounts of carbonate.

The TCLP test results indicate a potential for the waste produced during trona injection to release the trace constituents selenium and arsenic. The presence of soluble sulfate and carbonate in leachate might increase the solubility and mobility of these or other trace constituents in the fly ash. Because the TCLP test protocol uses acidic leaching conditions, the TCLP test results may not be good predictors of the potential for selenium and arsenic to leach in the alkaline conditions found in the fly ash landfill. Leach testing using "synthetic precipitation" or "synthetic groundwater" would be more reliable than the TCLP for predicting contaminant mobility in the environment of a fly ash landfill.

Modest increases in effluent pH could be beneficial due to buffering of acidity, but there is a possibility of generating a leachate with a pH higher than permitted for discharge. Release of arsenic and selenium to Mataponi Creek could result in adverse impacts to aquatic biota and other wildlife that consume these organisms (Section 4.3.4).

Increases in release of other dissolved solids are not expected to adversely affect creek water quality. Increased concentrations of sodium sulfate would not be expected to affect the creek's suitability for aquatic life, since sulfate compounds are neither toxins nor nutrients. Any increase in sodium chloride would likely be indistinguishable from background.

If landfill leachate or storm water had unacceptably high levels of pH, selenium, lead, iron, copper, or zinc, the monitoring required under the existing discharge permit for the landfill (Section 3.5) should identify the presence of these contaminants before the water was discharged, thus providing an opportunity to make arrangements to treat the water before discharges occur. Current discharge monitoring does not, however, provide for detection of arsenic, so surface water releases of arsenic could go undetected.

Similarly, the current groundwater monitoring program (Section 3.5) should provide for detection of unacceptably high levels of pH, chloride, sulfate, and several dissolved metals before any substantial migration occurred. However, groundwater is not monitored for either arsenic or selenium, so groundwater releases of these substances could go undetected. Because shallow groundwater in hydrologic settings similar to the landfill site flows primarily to nearby streams, any adverse impacts from undetected groundwater releases of selenium or arsenic would be experienced in Mataponi Creek and its tributaries.

4.3.6 Transportation Resources

The primary impacts to transportation associated with Plant operations are increases in rail and road traffic due to trains and trucks traveling to and from the Plant.

Impacts from traffic increases due to Plant operations are considered in the context of existing traffic conditions. Other ongoing and future actions in the area that generate traffic or affect the capacity of transportation facilities also contribute to cumulative transportation impacts, including increased traffic and noise. Actions that could combine with Plant operations to create cumulative impacts include the 13 background developments that have been identified (Baxter 2006) as increasing automobile and truck traffic in the vicinity of the Brandywine landfill facility and contributing to the exacerbation of existing road traffic problems, especially on Maryland Route 381. (See Section 3.6.2.) The Woodrow Wilson Bridge Project (Section 3.6.2) is the only highway construction and maintenance project in the Virginia or Maryland Department of Transportation databases (VDOT 2006, MDOT 2006) that is likely to contribute to the cumulative impacts of Plant operations. Truck traffic from the Plant that crosses the bridge going to and from the Brandywine facility would combine with the increased traffic, delays, and noise generated by the Woodrow Wilson Bridge Project to contribute to cumulative impacts on transportation.

The following sections discuss transportation impacts for each of the Plant operating scenarios.

4.3.6.1 Pre-shutdown operations

Rail. Under pre-shutdown operations the Plant used about 2,280 tons (2,052 metric tons) of coal per day. Assuming the use of 100-ton (91-metric ton) rail cars, the Plant required about 23 rail car loads of coal per day. This demand could be met with five coal deliveries to the Plant each week using a 40-car train. Because the Plant has its own rail spur and train yard, five 40-car trains per week did not have major impacts on rail traffic or service on the CSX, Inc. main line.

Also, pre-shutdown operations did not have a major impact in terms of wait times for vehicular traffic at the on-grade rail crossing on the George Washington Parkway. Typical daytime rail operations (20-car trains) stopped traffic on the Parkway for ten periods of about 2 minutes each week, while typical nighttime operations (40-car trains) stopped traffic on the Parkway for five periods of about 4 minutes each week (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Road. Under pre-shutdown operations the Plant generated about 470 tons (430 metric tons) of ash per day. Assuming the use of 24-ton (22-metric ton) dump trucks, ash removal required about 28 round trips each weekday from the Plant to the Brandywine facility. These trips had a minor impact in terms of traffic on the local streets used to access the Plant, as the streets have relatively little traffic and operate at a level-of-service at or near “A” (Personal communication between B. Garbacz, Transportation Engineer, City of Alexandria, Virginia, and J.W. Saulsbury, Oak Ridge National Laboratory, May 26, 2006). Similarly, the 28 truck trips attributable to pre-shutdown Plant operations were not a major part of the traffic volume on the major roads between Henry Street and Maryland Route 381 (Table 3.6-1). However,

pre-shutdown operations did contribute to the existing traffic problems on Maryland Route 381 (see Section 3.6.2).

4.3.6.2 Pre-Order operations

Rail. Under pre-Order operations the Plant used about 540 tons (490 metric tons) of coal per day. Assuming the use of 100-ton (91-metric ton) rail cars, the Plant required about 5.5 rail car loads of coal per day. This total demand could be met with one coal delivery to the Plant each week using a 40-car train. Because the Plant has its own rail spur and train yard, one 40-car train per week did not have major impacts on rail traffic or service on the CSX, Inc. main line.

Also, pre-Order operations did not have a major impact in terms of wait times for vehicular traffic at the on-grade rail crossing on the George Washington Parkway. Typical daytime rail operations (20-car trains) stopped traffic on the Parkway for two periods of about 2 minutes each week, while typical nighttime operations (40-car trains) stopped traffic on the Parkway for one period of about 4 minutes each week (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Road. Under pre-Order operations, the Plant is estimated to have generated about 95 tons (86 metric tons) of ash per day. Assuming the use of 24-ton (22-metric ton) dump trucks, ash removal required about five or six round trips each weekday from the Plant to the Brandywine facility. These trips had a negligible impact in terms of traffic on the local streets used to access the Plant, since the streets have relatively little traffic and operate at an level-of-service at or near "A" (Personal communication between B. Garbacz, Transportation Engineer, City of Alexandria, Virginia, and J.W. Saulsbury, Oak Ridge National Laboratory, May 26, 2006). Similarly, the addition of five or six truck trips to the existing traffic volume on the major roads between Henry Street and Maryland Route 381 (Table 3.6-1) represented only a small impact. However, pre-Order operations did contribute to a small extent to the existing traffic problems on Maryland Route 381. (See Section 3.6.2.)

4.3.6.3 Operations under the DOE Order, temporary extension, and potential additional extensions

Rail. Under the Order before the commencement of daily predictive modeling (between December 20, 2005, and June 30, 2006), the Plant is assumed to have used an average of about 1,990 tons (1810 metric tons) of coal per day. Assuming the use of 100-ton (91-metric ton) rail cars, the Plant required about 20 rail car loads of coal per day. In addition, the use of trona required delivery by two rail cars per day. This total demand (about 22 rail cars per day) could be met with four coal/trona deliveries to the Plant each week using a 40-car train. Because the Plant has its own rail spur and train yard, two 40-car trains per week did not have major impacts on rail traffic or service on the CSX, Inc. main line.

Also, operations between December 20, 2005, and June 30, 2006, did not have a major impact in terms of wait times for vehicular traffic at the on-grade rail crossing on the George Washington Parkway. Typical daytime rail operations (20-car trains) stopped traffic on the Parkway for eight periods of about 2 minutes each day, while typical nighttime operations (40-car trains) stopped traffic on the Parkway for four periods of about 4 minutes each night (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Following commencement of daily predictive modeling (on July 1, 2006), including the temporary extension of the Order to December 1, 2006, and any extension beyond that date, the Plant is assumed to operate at a level similar to pre-shutdown operations, but with the addition of trona. Thus, the Plant uses an average of about 2,280 tons (2,050 metric tons) of coal per day. Assuming the use of 100-ton (91-metric ton) rail cars, the Plant requires about 23 rail car loads of coal per day. In addition, the use of trona requires delivery by two rail cars per day. This total demand (about 25 rail cars per day) could be met with five coal/trona deliveries to the Plant each week using a 40-car train. Because the Plant has its own rail spur and train yard, five 40-car trains per week do not have major impacts on rail traffic or service on the CSX, Inc. main line.

Also, following commencement of daily predictive modeling, the Plant is assumed to not have a major impact in terms of wait times for vehicular traffic at the on-grade rail crossing on the George Washington Parkway. Typical daytime rail operations (20-car trains) stop traffic on the Parkway for ten periods of about 2 minutes each week, while typical nighttime operations (40-car trains) stop traffic on the Parkway for five periods of about 4 minutes each week (Personal communication between D. Cramer, Mirant Corporation, and L.N. McCold, Oak Ridge National Laboratory, July 7, 2006).

Road. Under the Order before the commencement of daily predictive modeling (between December 20, 2005, and June 30, 2006), the Plant is estimated to have generated about 16 to 28 round trips each weekday (using 24-ton trucks) transporting ash from the Plant to the Brandywine facility. These trips had a negligible impact in terms of traffic on the local streets used to access the Plant, as the streets have relatively little traffic and operate at a level-of-service at or near “A” (Personal communication between B. Garbacz, Transportation Engineer, City of Alexandria, Virginia, and J.W. Saulsbury, Oak Ridge National Laboratory, May 26, 2006). Similarly, the addition of 16 to 28 truck trips to the existing traffic volume on the major roads between Henry Street and Maryland Route 381 (Table 3.6-1) represented only a small impact. However, the increase in traffic associated with operations between December 20, 2005, and June 30, 2006, contributed to the existing traffic problems on Maryland Route 381. (See the discussion in Section 3.6.2.)

Following commencement of daily predictive modeling (on July 1, 2006), including the temporary extension of the Order to December 1, 2006, and any extension beyond that date, the Plant is assumed to operate at a level similar to pre-shutdown operations, but with the addition of trona. Because the use of trona can approximately double the amount of ash produced, the Plant generates up to twice as much coal fly ash per day as under pre-shutdown operations (Section

4.3.6.1), requiring up to 56 round trips each weekday from the Plant to the Brandywine facility. Mirant is currently approved to deliver a total of 100 truckloads of ash to the Brandywine facility each weekday from the Potomac River Generating Plant and the Chalk Point Generating Plant combined (Baxter 2006).

Although the estimated level of truck traffic each weekday after July 1, 2006 (56 round trips), exceeds truck traffic under pre-shutdown operations (28 round trips), pre-Order operations (6 round trips), and operations between December 20, 2005, and June 30, 2006 (14 to 16 round trips), it does not appear to have a major impact in terms of traffic on the local streets used to access the Plant, since the streets have relatively little traffic and operate at a level of service at or near "A" (Personal communication between B. Garbacz, Transportation Engineer, City of Alexandria, Virginia, and J.W. Saulsbury, Oak Ridge National Laboratory, May 26, 2006). Similarly, the addition of about 56 truck trips to the existing traffic volume on the major roads between Henry Street and Maryland Route 381 (Table 3.6 1) represents a relatively minor impact in terms of traffic. The increase in traffic associated with operations after commencement of daily predictive modeling is, however, estimated to make a relatively large contribution to the existing traffic problems on Maryland Route 381. (See the discussion in Section 3.6.2.)

4.3.7 Environmental Justice

As discussed in Section 4.3.1, the elevated levels of air pollution from Plant operation that occur under certain conditions are highest very close to the Plant. Because of their proximity to the Plant, under all operating conditions residents of block groups 1 and 2 (Figure 3.7-1) experience higher exposures to air pollution from Plant emissions than residents of block groups 3 and 4. All of the gridded locations where maximum modeled ambient air concentrations occur (as reported in Tables 4.3.1-1 and 4.3.1-2) are located within block groups 1 and 2.

Thus, the populations with the highest exposure to impacts from the Plant are the non-minority and non-low-income populations in block groups 1 and 2. Consequently, the minority and low-income populations in block groups 3 and 4 (Section 3.7) do not experience "disproportionately high and adverse human health or environmental effects" related to air pollutant emissions from the Plant. In addition, DOE has not identified any different or unique ways that these or other minority and low-income populations in the area could be exposed to Plant air pollutants or otherwise affected by the Order or its potential extension. Thus, neither the Order nor any extension to the Order have "disproportionately high and adverse human health or environmental effects ... on minority and low-income populations" as discussed in Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.

As discussed in Section 4.3.1, the elevated levels of air pollution from Plant operation that occur under certain conditions are highest close to the Plant. Thus, because of their proximity to the Plant, under all operating conditions residents of block groups 1 and 2 experience higher air pollution from Plant emissions than residents of block groups 3 and 4. Consequently, the minority and low-income populations in block groups 3 and 4 do not

experience “disproportionately high and adverse human health or environmental effects” related to air pollutant emissions from the Plant. In addition, these populations do not have different or unique ways of being affected by the Order or its potential extension.

5. ALTERNATIVES FOR FUTURE DECISION-MAKING

The DOE Order, as extended, expires on December 1, 2006. Before December 1, 2006, DOE will decide whether to allow the Order to expire, extend the Order, or take some other action, such as extending the Order with mitigation measures.

5.1 Allow the Order to Expire

As stated in the Order, Pepco's new 230-kV transmission lines are expected to provide a high level of electric reliability to the Central D.C. area even in the absence of production from the Plant. However, these new lines are not expected to be complete until the summer of 2007. DOE cannot speculate how Mirant would operate if DOE did not extend the Order; however, allowing the Order to expire would likely place the Central D.C. area in risk of a potential blackout.

It is difficult to specify the risk of death or health injury associated with blackouts because of the lack of statistical studies on such risk. However, blackouts can cause, and historically have caused, significant health and environmental impacts.

Blackouts create multiple public health problems that can lead to new or exacerbated injury or death. During hot weather blackouts can result in increased deaths, due to loss of air-conditioning or cooling ventilation. For example, 232 deaths were reported in the Midwest in the summer of 1999 during an extreme heat wave that also included a series of power disturbances; the majority of the deaths were attributable to elderly individuals without access to air-conditioning (Palecki and Changnon 1999). Blackouts can also cause significant problems for people with existing illnesses. During the Midwest/Northeast blackout of August 2003 paramedics from Passaic Beth Israel hospital had to respond to four times the usual number of calls, many involving respiratory ailments for patients whose batteries on home respirators had expired and for electronic breathing aids that went dead (WNBC 2003a).

Blackouts can also cause impacts to drinking water supplies and water bodies. The Midwest/Northeast blackout of August 2003 cut water service to 1.5 million people in Cleveland and caused officials in Detroit to warn residents to boil their water until the supply could be tested for potential bacteria (Water Quality and Health Council 2004). Because electricity powers pumps that push water through a city's water system, blackouts can cause the pressure in water pipes to drop, leaving the system open to bacteria entering the water supply. In addition, the discharge of sewage from treatment plants that run on electricity can cause environmental damage to water bodies. As recently as May 19, 2006, a 3-hr power failure at the Blue Plains Wastewater Treatment Plant in Washington, D.C. resulted in 17 million gallons (64,000 m^3) of raw untreated sewage being spilled into the Potomac River (Cohn 2006).

Blackouts also cause injury and death from fires (e.g. due to burning of candles), use of unvented portable emergency generators, accidents, and criminal activity. In the July 1977

blackout in New York City fires killed three, and one store owner shot and killed an armed looter (TIME 1977). Hundreds were also injured during widespread looting and other criminal activity in the July 1977 blackout. In a July 2006 blackout in Missouri that affected 150,000 people, a utility worker died after touching downed power lines, and another man died from burns while he tried to fix a generator he was using in his home (Associated Press 2006). In addition, during the Midwest/Northeast blackout of 2003 two people succumbed to carbon monoxide fumes from a gas generator aboard the boat they had been sleeping in overnight (WNBC 2003b).

5.2 Extend the Order as Currently Written

Impacts associated with extending the Order until either June 30, 2007, or December 31, 2007 (assuming a delay in installation of the new transmission lines), are assessed in Chapter 4. Extension of the Order until either date would result in increased impacts as compared to the Plant's "pre-Order" operating mode, but not the Plant's "pre-shutdown" operating mode. As presented in Chapter 4, impacts resulting from SO_2 emissions would be lower than under the pre-shutdown mode, while impacts resulting from trona use would be higher than under the pre-shutdown mode, and levels of other impacts would be similar to those from pre-shutdown operations.

5.3 Extend the Order with Mitigation Measures

Impacts of Plant operation under an extension of the Order could be mitigated by various alternatives including: (1) requiring Mirant to improve Plant operations and pollution control measures, (2) requiring Mirant to reduce exposure to pollutants to workers and nearby residents, (3) managing the demand for electricity in the Central D.C. area, (4) using alternative sources for generating electricity, and (5) expediting the installation of additional transmission lines.

5.3.1 Improve Plant Operations and Pollution Control Measures

- Require Mirant to store enough trona at or near the Plant to achieve 80% removal of SO_2 emissions for the full duration of any planned line outages. Mirant's experiments with trona indicate that this level of sulfur removal can be achieved. While Mirant has installed trona units on all five boilers, Mirant does not maintain sufficient trona on site or nearby to reduce emissions by 80% under high power operations for the duration of planned line outages.

    - Requiring Mirant to store sufficient trona at the Plant could help to ensure the logistical feasibility of achieving 80% removal of SO_2 emissions during a planned line outage, pursuant to the ACO. This could result in decreased modeled emissions

and any associated health effects. The quantity of trona available to Mirant may be limited, however, or it may take more time to increase current storage space at or near the Plant than required to install the two new transmission lines. DOE can consider working with EPA to monitor the ability of Mirant to gain and store enough trona for the Plant to achieve 80% SO_2 removal.

- Require that during non-outage situations Mirant operate the Plant at the minimum level of power generation that would maintain all units in a state in which they would be available to produce full power within a few hours of a line outage. Based on information provided by Mirant, minimum operation would require each baseload unit to operate 20 hours per day at minimum power (about 30 MW) and 4 hours at maximum power (about 105 MW). Similarly, the load-following or cycling units would need to operate 8 hours per day at minimum power (30 MW) and 4 hours at maximum power (88 MW).

    - This would reduce overall operation of the Plant and, therefore, reduce emissions and any associated health effects. DOE considered this operating mode before issuing the Order, but determined that it is not feasible because the baseload units at the Plant are designed for operation at high power levels and cannot sustain low levels of operation for a long period of time without damage.

- Require Mirant to increase the height of the Plant's exhaust stacks in order to create conditions conducive to better dispersion of emitted pollutants.

    - Taller stacks would reduce modeled air quality impacts of plant operations. The taller stacks would be visible at a greater distance and may also result in adverse visual impacts for neighbors of the Plant. Issues related to stack height increase are under the jurisdiction of the Federal Aviation Administration (FAA), which has granted Mirant permission to raise the stacks by 50 ft (15 m).

5.3.2 Reduce Exposure to Pollution

- Require Mirant to notify nearby residents when they would be potentially affected by a modeled NAAQS exceedance.

    - DOE is not able to estimate what people would do with such information and whether any decrease in health effects would occur. However, DOE can consider requiring Mirant to post daily when residents would be potentially affected by a modeled NAAQS exceedance during a line outage.

- DOE will post Mirant's monthly reports to EPA (as required by the ACO), as they become available to DOE, on DOE's website containing information related to the Plant. Such monthly reports would notify nearby residents of the results of monitored data, thereby allowing nearby residents to assess the likelihood of future exposure to an actual NAAQS exceedance.

- Pepco is filing monthly progress reports on the status of Pepco's new transmission lines and corresponding planned outages with FERC (FERC docket number EL05-145-000). Nearby residents can access Pepco's monthly reports through FERC's elibrary system at http//www.ferc.gov/docs-filing/elibrary.asp (search for FERC docket number EL-05-145-*).

  In addition, pursuant to the December 20, 2005, Order, Pepco is required to give advance notice of any planned outage and the estimated duration of any such outage to DOE. DOE will post any advance notice received from Pepco on DOE's website containing information related to the Plant (http://www.oe.energy.gov/permitting/372.htm).

  Therefore, nearby residents should be aware of planned line outage situations when the Plant is directed to produce power (up to full capacity) as directed by PJM.

- Require Mirant to provide the people who live in areas that would be affected by modeled exceedances of NAAQS during planned line outage situations the reasonable cost of moving to alternate locations until the threat of an exceedance is over if such people so choose.

  - Implementing this would involve several practical difficulties, such as determining the number of people who would be affected by a modeled exceedance, and whether relocation would be an appropriate response.

  - DOE believes that this many not be an appropriate use of its authority under Section 202(c) of the Federal Power Act (FPA) under these circumstances.

- Require Mirant to monitor outdoor levels of PM on the Plant site and provide suitable breathing protection for those working in high PM areas.

  - DOE can consider consulting with EPA about the need for PM monitoring. Determining the need for or type of suitable breathing protection is too speculative at this time.

5.3.3 Manage the Demand for Electricity in the Central D.C. Area

- Require the D.C. Public Service Commission (DCPSC) to develop a plan for reducing electrical demand in the Central D.C. area.

    - Reducing electrical demand in the Central D.C. area would reduce the need for operation of the Plant. However, the DCPSC and Pepco do not currently have a formal plan to reduce electrical demand in this area. Developing a plan would require rulemaking procedures, and implementing the plan would require infrastructure changes that may well take more time than required to install the new transmission lines. However, DOE has had several discussions with DCPSC encouraging DCPSC's efforts to reduce electrical demand in the Central D.C. area. DCPSC has informed DOE that:

        - DCPSC has given approval to Pepco to install "smart meters" in 2,250 homes as part of an effort to investigate how demand can be reduced in peak and other critical times.

        - DCPSC is currently in discussions with fellow state public service commissions in the Mid-Atlantic area and with PJM on how to improve demand response and related distributed energy resources.

        - A DCPSC commissioner is currently chairing the Mid-Atlantic Distributed Resources Initiative (http//www.energetics.com/madri/). DOE is currently providing technical advisory services and funding for facilitation efforts for this Initiative.

    - DOE can continue to encourage DCPSC to pursue demand-response initiatives in the Central D.C. area as in previous Orders.

- Order the development of specific, emergency load reduction programs to compensate for an unexpected loss of electricity generation or transmission capacity. For example, DOE could require emergency load shedding or load cycling for Federal and/or D.C. government buildings and/or other facilities during electrical emergencies.

    - Emergency load shedding or load cycling would reduce the need for operation of the Plant. DOE's Federal Energy Management Program is pursuing opportunities for energy management within the Federal government, both within and outside of emergency situations. Most recently, DOE and the General Services Administration held a workshop on April 26, 2006, on potential demand-response opportunities that

was attended by the majority of Federal electricity customers. The workshop educated Federal electricity customers on the reliability problems in the Central D.C. area and offered DOE technical assistance for demand-response initiatives.

5.3.4 Use Alternative Sources for Generating Electricity

- Require installation of temporary or back-up electricity generating equipment at specific facilities or government agencies to eliminate the need for the Mirant Plant.

    - Installation of temporary or back-up electricity generating equipment would not likely generate enough power to eliminate the need for the Plant. Alternative sources of electricity sufficient to eliminate the need for one or more units at the Plant could not be brought on line before the additional 230-kV power lines have been brought into service.

- Encourage Federal agencies in the Central D.C. area to operate on alternative sources of electricity, to reduce their peak electricity demand, or to develop a generating capability. For example, heating plants operated by the General Service Administration could be modified to cogenerate both heat and electricity, and essential government facilities could become capable of independently generating their own electricity in emergencies.

    - Alternative sources of electricity could reduce the need for the Plant and were discussed at DOE's April 2006 workshop described above. However, alternative sources of electricity sufficient to replace the Plant or eliminate the need for one or more units at the Plant could not be brought on line before the additional 230-kV power lines have been brought into service.

5.3.5 Expedite the Installation of Additional Transmission Lines or Encourage the Use of Other Existing Lines

- Expedite the installation of the two 230-kV transmission lines that Pepco is currently working on.

    - DOE has evaluated Pepco's construction schedule to make sure it is as efficient as possible. DOE can continue to monitor the construction and outage schedule to ensure, as much as possible, that the construction process remains on schedule and that any planned outages are essential. Pepco notified DOE on September 7, 2006, that the expected installation date of the new 230-kV lines is now June 21, 2007, instead of July 1, 2007.

- DOE can provide assistance to Pepco in expediting the installation of the new 230-kV lines that is requested by Pepco and that is practical and feasible. For example, at Pepco's request DOE met with Pepco representatives in March 2006 to discuss ways that DOE could help with the NEPA process for Pepco's proposed route for the new 69-kV lines to the Blue Plains Wastewater Treatment Plant (which partially fall on National Park Service land). The new 69-kV lines became operational on July 15, 2006.

- Encourage Pepco to construct additional new transmission lines, for example, from other plants in close proximity to the Central D.C. area, namely the Benning Road or Buzzard Point plants, to supply the power currently provided by the Plant.

    - Pepco already uses the power from these sources for other customers. Obtaining additional rights-of-way to construct new transmission lines would not be feasible in the time period required to solve the immediate reliability issues in the Central D.C. area.

- Encourage the use of additional transmission lines along existing corridors. Existing transmission lines enter the D.C. area from the north and south along, for example, railroad rights-of-way of the National Railroad Passenger Corporation ("AMTRAK") and CSX Corporation.

    - As described in Pepco's April 13, 2006, filing to DOE, although use of the existing transmission lines on the AMTRAK and CSX rights-of-way would reduce the need for the Plant in the Central D.C. area, the lines are already being used by Pepco. Adding additional lines along the same corridor would take more time than required to install the new 230-kV transmission lines already planned and under development.

- Encourage the use of currently existing, but inactive, transmission lines, such as the 69-kV circuits between Buzzard Point and the Plant.

    - As described in Pepco's April 13, 2006, filing to DOE, Pepco refurbished three 69-kV circuits between Buzzard Point and the Plant in 2004 to provide emergency back-up service, which would be used to restart the Plant and help the restoration process for any blackout of the Central D.C. area. These circuits cannot be energized under normal operating conditions because they are of small capacity and would overload quickly upon the failure of one of the existing 230-kV transmission circuits or the Plant; thus, their use would not provide an increase in reliability.

6. REGULATORY CONSULTATION AND COMPLIANCE

Under Section 7 of the Endangered Species Act (ESA) Federal agencies must consult with the Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) regarding actions that they may undertake that could adversely affect species and habitats protected under the Act. In order to comply with this requirement, DOE sent letters to FWS and NMFS as part of informal consultation describing the species that were likely to occur near the Plant and requesting concurrence from FWS and NMFS that the operation of the Mirant Potomac River Generating Station under the terms of the DOE Orders would not adversely impact Federally listed or proposed threatened or endangered species or designated or proposed critical habit. (See Appendix D.)

The responses from FWS and NMFS, also included in Appendix D, are discussed in Section 4.3.4.4.

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APPENDIX A

DOE Emergency Orders

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United States of America
Department of Energy

District of Columbia Public Service Commission) Docket No. EO-05-01

Order No. 202-05-3

I. Summary

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, a shortage of facilities for the transmission of electric energy and other causes, and that issuance of this order will meet the emergency and serve the public interest. Therefore, Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), are hereby ordered to generate electricity at their Potomac River Generating Station (the "Plant") pursuant to the terms of this order.

II. Procedural History

On August 19, 2005, Mirant submitted to the Virginia Department of Environmental Quality (DEQ) a computerized emissions modeling study Mirant had conducted of its Plant that indicated that emissions from the Plant caused or contributed to significant localized exceedances of the National Ambient Air Quality Standards (NAAQS).[1] Also on August 19, 2005, DEQ issued a letter to Mirant which requested "that Mirant *immediately* undertake such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station, including the potential reduction of levels of operation, or potential shut down of the facility." (emphasis in original). The letter asked Mirant to provide DEQ with a summary of the actions taken and the progress toward eliminating NAAQS exceedances by August 24, 2005. At midnight on August 21, 2005, Mirant reduced production of all units at the Plant to their minimum load, and at midnight on August 24, 2005, Mirant shut down all five of the generating units at the Plant.

On August 24, 2005, the District of Columbia Public Service Commission (DCPSC) filed an *Emergency Petition and Complaint* with both the United States Department of Energy (DOE or Department) and the Federal Energy Regulatory Commission (FERC or Commission) pursuant to the FPA. The DCPSC requested the Secretary of Energy to find that an emergency exists under section 202(c) of the FPA and to issue an order directing Mirant to continue

[1] The Clean Air Act, 42 U.S.C. § 7401 *et seq.*, authorizes the United States Environmental Protection Agency (EPA) to establish NAAQS, 42 U.S.C. §§ 7408-7409, and states that it is the responsibility of the states and local governments for assuring that they are attained, 42 U.S.C. §§ 7401(a)(3) and 7416.

operation of the Plant. The basis for the petition was that the shutdown of the Plant "...will have a drastic and potentially immediate effect on the electric reliability in the greater Washington, D.C., area and could expose hundreds of thousands of consumers, agencies of the Federal Government and critical federal infrastructure to curtailments of electric service, load shedding and, potentially, blackouts." The DCPSC requested that the Commission issue a similar order under sections 207 and 309 of the FPA. Numerous parties filed interventions and comments in response to DCPSC's emergency petition, as well as subsequent comments and responses.[2] Further, both FERC and DOE issued information requests to Mirant, the Potomac Electric Power Company (PEPCO), the company responsible for supplying electricity to retail customers in the District of Columbia, and PJM Interconnection, LLC (PJM), the grid operator responsible for the administration of the bulk power grid and electricity market in the region.[3] In addition to the DCPSC petition proceedings, DOE has hosted and participated in numerous conference calls and meetings to gather information on the shutdown of the Plant and its effect on the reliability of D.C.'s electricity system.[4]

III. Background

The coal-fired Mirant Plant, which began operation in 1949, is located in Alexandria, Virginia, and is capable of producing 482 megawatts of electricity primarily for delivery to Washington, D.C. The Plant consists of five generating units, two of which are cycling units that range in output from 35 MW to 88 MW, and three of which are baseload units that range in output from 35 MW to 102 MW. It is one of only three sources of electricity that serve the central business district of the District of Columbia, many federal institutions, the Georgetown area in D.C., as well as other portions of Northwest, D.C., and the District of Columbia Water and Sewer Authority's Blue Plains Advanced Water Treatment Plant, the largest wastewater

[2] Several of these filings were only made in the FERC docket and not in DOE's docket. Even though a number of filers did not submit their comments in the DOE docket, the Department has, in the interest of rendering an appropriate and fully informed determination, reviewed all the filings in the FERC docket for any pertinent facts that will assist the Department in making its decision. Also, to the extent the filings contained analysis or legal arguments pertaining to the Department's 202(c) authority, they have been considered in the Department's decision making process.

[3] The data submitted contained Critical Energy Infrastructure Information and was submitted in both confidential and redacted versions, as defined in FERC's rules at 18 C.F.R. § 388.13. All information contained in this order is from public filings in the DOE and FERC dockets.

[4] The Administrative Procedure Act's prohibitions on ex parte communications in an adjudicatory proceeding, 5 U.S.C. § 557(d)(1), do not apply to DOE's 202(c) proceedings, because section 202(c) explicitly authorizes the Department to issue a 202(c) order "either upon its own motion or upon complaint, with or without notice, hearing, or report. . ." 16 U.S.C. § 824a(c).

treatment plant in the world.[5] The other two sources are two 230 kV lines that deliver electricity from other generating sources in the regional electric grid operated by PJM. Although there are other generating units in close physical proximity to the Central D.C. area, (e.g., the Benning Road and Buzzard Point generating facilities, which are dual-fueled oil and natural gas generating power plants, owned by PEPCO) there are no transmission lines that would allow delivery of power from these other units to reach the Central D.C. area. With regard to the sources of power that serve the Central D.C. area, PEPCO owns and operates the transmission lines, and PJM determines electricity demand.

Although Mirant shut down all of the Plant's generating units on August 24, 2005, it has since restarted unit number one which, the Department understands, is currently operating. Mirant is operating the unit on an 8/8/8 basis --- that is, in any given twenty-four hour period, the unit runs for eight hours at its maximum level of 88 MW, eight hours at its minimum level of 35 MW, and has eight hours when it does not run. DOE has been informed that both EPA and DEQ acknowledge that the operation of this unit in this manner does not result in any NAAQS exceedances. In addition, DOE understands that Mirant is taking other steps to increase production at the Plant in a manner which will be acceptable to DEQ and EPA.

PEPCO has applied to the DCPSC to construct two new 230 kV lines that would supply electricity to the Central D.C. area. In the same application, PEPCO has proposed building two new 69kV lines to supply the Blue Plains wastewater treatment plant. PEPCO proposes having the two 69 kV lines installed by the summer 2006 peak season, and the two 230 kV lines installed in 18 to 24 months. The two existing 230 kV lines that supply the Central D.C. area would need to be temporarily taken out of service sequentially in order to connect the new lines to the Central D.C. area. Once completed, these lines apparently would provide a high level of electric reliability in the Central D.C. area, even in the absence of production from the Plant.

IV. Discussion

A. Reliability Issues

The Department has conducted an independent analysis of the electricity reliability situation in the Central D.C. area and has analyzed the Plant's role in ensuring a sufficiently reliable supply of electricity to that area. DOE's analysis was conducted by the Department's Oak Ridge National Laboratory. Under North American Electric Reliability Council standards, at a minimum, the power system must carry at least enough contingency reserves of electricity to cover the most severe single contingency. The standards require that an area's system always be operated with sufficient reserves to compensate for the sudden failure of the area's most important single generator or transmission line.

[5] For purposes of this order, the area supplied with electricity by these three sources will be referred to as the "Central D.C. area," and the retail customers in this area will be referred to as the "Central D.C. area customers."

Based on the fact that the Central D.C. area has only three sources of supply, the Plant and the two 230 kV transmission lines, the Department's analysis concludes that in order to maintain a minimally reliable electric power system, the Plant must be available to run when one of the 230 kV lines is out of service, because if the remaining line failed there would be no other source of electricity to serve the Central D.C. area load. In addition, the analysis concludes that if one of the 230 kV lines failed unexpectedly, enough generation must be started as rapidly as possible so as to be able to serve all of the Central D.C. area load as a contingency reserve in the event the other line were to fail. The analysis also indicates that the Plant should be operated in such a way as to minimize the amount of time needed to bring it into production.

PEPCO has asserted that:

> Absent the generating capacity of the Plant, if the two 230 kV transmission circuits into the [Central D.C. area] fail, there will be a blackout in much of the District of Columbia until the circuits are repaired or the Plant's generators are restarted and can operate at a level that matches load. All electric customers in Georgetown, Foggy Bottom and major portions of downtown Washington will be affected. The affected customers will also include Blue Plains wastewater treatment plant. It is PEPCO's understanding that within 24 hours of the loss of electric supply, Blue Plains will have no option but to release untreated sewage directly into the Potomac River, which would result in a significant adverse impact to human health, aquatic wildlife and other environmental resources. Affected customers will also include numerous hospitals, schools, universities, commercial buildings, and residential customers. Importantly, numerous federal facilities will lose power, including those critical to the security, safety, and welfare of the whole country, such as the FBI, the Justice Department, the State Department, the Federal Emergency Management Agency, the Department of the Interior, and the Department of Energy to name but a few.[6]

No commenter has disputed these statements by PEPCO, and they have been generally corroborated by DOE's own independent analysis; therefore, DOE will accept them as correct statements of fact. Further, the 230 kV lines do go out of service on occasion; since 2000, there have been 34 one-line outages for maintenance, and seven occasions where one of the lines has tripped unexpectedly. DOE has been informed that, prior to 2000, there were two occasions when both of the lines failed simultaneously.

B. Environmental Issues

Some commenters have asserted that the renewed operation of the Plant would result in NAAQS exceedances and a violation of the Clean Air Act, and that DOE could not issue a 202(c) order which would contravene the Clean Air Act (42 U.S.C. §§ 7401-7626). In response to this assertion, DCPSC, PEPCO and PJM contend that there were no actual monitored

[6] *See* Potomac Electric Power Company's Leave to Answer and Answer to Comments, FERC Docket No. EL05-145-000 at pages 2 & 3 (September 9, 2005).

exceedances of the NAAQS at the Plant during operation, and that operation of the plant at full power does not exceed the emissions limits contained in the Plant's operating permit and therefore the operation of the Plant pursuant to a DOE order would not violate the Clean Air Act. EPA has shared information with DOE regarding NAAQS modeled results and other environmental issues at the Plant. In response to the environmental concerns raised, this order seeks to minimize, to the extent reasonable, any adverse environmental impacts. Should EPA issue a compliance order directed to operation of the Plant, DOE will consider whether and how this order should conformed to such order.

Another assertion raised is that DOE cannot issue an order without complying with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.* Responders to that assertion stated that NEPA review requirements do not apply because any order would merely require the Plant to operate in the manner and at the level it has historically operated, and thus is not a "major federal action" triggering NEPA. In addition, responders assert that "...the emergency nature of the relief sought in this case permits the [the Secretary] to act without conducting a NEPA analysis, even if it were required."[7] DOE has determined that the emergency circumstances here make it necessary to take action without performing a NEPA analysis. Indeed, in order for an order under FPA section 202(c) to be issued at all, the Secretary of Energy must determine that an emergency exists, and I have made that determination here. DOE has consulted with CEQ about alternative arrangements pursuant to 40 C.F.R. § 1506.11.

C. Other Issues

Commenters opposed to the issuance of a FPA section 202(c) order cited *Richmond Power & Light v. FERC*, 574 F. 2d 610 (D.C. Cir. 1978) as imposing a limit on the Secretary's authority to make an emergency finding under section 202(c). In *Richmond*, the New England Power Pool (NEPOOL) petitioned the Federal Power Commission (the Secretary's predecessor in exercising section 202(c) authority) for an order pursuant to FPA section 202(c) to have utilities east of the Mississippi River with excess electric generating capacity supply NEPOOL with that excess capacity. The request was based on fears of an oil shortage due to the 1973 Arab oil embargo. The Commission responded by holding a conference and a series of meetings which resulted in an agreement among the purchasing, transmitting and supplying utilities and participating state regulatory commissions. As a result of the agreement, NEPOOL moved to withdraw its petition, which the Commission allowed. Richmond Power & Light Company challenged the decision to allow the withdrawal and the court found that the Commission did not abuse its discretion in declining to issue an order under section 202(c), but rather settling on the temporary-voluntary agreement program reached by the interested parties. Instead of limiting its

[7] District of Columbia Public Service Commission Answer to Motion of the Virginia Department of Environmental Quality at page 24 (October 26, 2005), FERC Docket No. EL05-145-000. *See also* Answer of Potomac Electric Power Company and PJM Interconnection, LLC at page 18, (October13, 2005), FERC Docket No. EL01-145-000.

reach, *Richmond* underscores the discretionary nature of the Secretary's authority under section 202(c).[8]

Another case asserted to limit the Secretary's authority to issue an order under section 202(c) was *National Fuel Gas Supply v. FERC*, 909 F2d 1519 (D.C. Cir. 1990). In that case, National Fuel applied under section 7 of the Natural Gas Act (NGA), 15 U.S.C. § 717 *et seq.*, for a certificate of public convenience and necessity to allow it to make interruptible sales of natural gas. The Commission imposed a condition that National Fuel accept a blanket transportation certificate to provide open access transportation. The court ruled that the Commission was improperly using a NGA section 7 certificate condition in place of an individual or generic proceeding under section 5 of the NGA. The Department does not see the relevance of *National Fuel* here. I am using section 202(c) of the FPA for precisely the type of situation contemplated by section 202(c) of the FPA.

V. Decision

Section 202(c) of the FPA vests in the Secretary of Energy the authority to issue an order when "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 the fuel or water for generating facilities, or other causes...." 16 U.S.C. § 824a(c). DOE's regulations acknowledge that "[e]xtended periods of insufficient power supply as a result of inadequate planning or the failure to construct necessary facilities can result in an emergency as contemplated by these regulations." 10 C.F.R. § 205.371.

I find that in the circumstances presented here, an emergency exists that justifies the issuance of a section 202(c) order. My determination is not based on any single factor, but on the combination of all relevant facts and circumstances. In particular, I find that an emergency exists because of the reasonable possibility an outage will occur that would cause a blackout, the number and importance of facilities and operations in our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violates applicable reliability standards.

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[8] The facts in *Richmond* and in the current situation are very different. *Richmond* dealt with a wide regional or even national energy shortage situation, while we are considering electricity reliability in a discrete geographic area. The facts here more closely resemble those considered by the Federal Power Commission in *City of Cleveland, Ohio v. Cleveland Electric Illuminating Company*, 47 FPC 747 (1972). In that case, the City of Cleveland petitioned the Commission pursuant to section 202(c) to order an interconnection with Cleveland Electric Illuminating Company to provide services during shortages caused by outages of the City of Cleveland's generating facilities, or delays getting generation on line. The Commission found that the City of Cleveland had an emergency due to periodic shortages of generating facilities caused by outages and ordered the establishment of a 69kV temporary emergency interconnection between the electric systems of the City and Cleveland Electric Illuminating. Similarly, here DOE is ordering the Plant to provide electricity in certain limited situations.

More specifically, if the Mirant plant is not available to generate electricity and one of the two transmission lines serving the Central D.C. area goes out of service, the Central D.C. area would be served by only one transmission line. Should that remaining line fail for any reason, a blackout would occur in the Central D.C. area, potentially for an extended period of time. In fact, if one or both of the transmission lines could not be brought back into service immediately and the only source of energy for the Central D.C. area was the Mirant Plant, in the absence of today's order it would take several hours at a minimum to bring the Plant into full operation.

The outage of one of these two lines is not merely a theortetical possibility. On Friday, December 16, 2005, PJM informed DOE that on the previous night, "one of the two circuits critical to providing service to the District tripped. Continued [electric] service to certain load within the District was at that time entirely dependent on the remaining circuit." As a result, PJM requested dispatch of a second generating unit at the Plant, but Mirant refused to do so. PJM informed DOE that "service was not interrupted because load was low and the remaining circuit performed without incident." Fortunately, full service to the line that had tripped was restored by the morning of December 16. Nonetheless, there can be no assurance that the Central D.C. area will be so lucky next time, either with respect to the timing of the event, the operation of the second transmission line, or the ability to bring the first transmission line back into service.

Furthermore, it is periodically necessary for an outage to occur on one of the transmission lines because of the need to perform maintenance. In fact, maintenance is scheduled on one of the lines in the next few weeks. Thus, as occurred on the night of December 15, 2005 and as will certainly occur again in the future, if the Mirant Plant is not made operational Central D.C. will find itself relying solely on one transmission line. The duration of an outage can range from up to several days (for maintenance) or even longer (up to weeks) if the outage of a line is due to a major equipment failure. Throughout such a period, if the Plant is not fully operational a blackout in Central D.C. is only one step away, i.e., if an event should occur that causes the second line to fail. Such a blackout could last for hours or days.

I recognize that, if past experience is any guide, the simultaneous failure or outage of both transmission lines serving the Central D.C. area is not a high probability. While this event has occurred in the past, it has not happened often. Moreover, the recent tripping of one circuit does not in itself dictate the existence of an emergency justifying issuance of a 202(c) order.

The facilities and functions that would be adversely affected by an extended blackout in this instance, however, is an important consideration. The Central D.C. area includes offices, facilities and operations involved in all three branches of government, and that are critically important to the Nation's national security, law enforcement and regulatory functions. The Central D.C. area also includes hundreds of thousands of residents and workers, and all manner of public safety and protection facilities, including hospitals, police, and fire facilities. Moreover, DOE has been informed that within 24 hours of a blackout in the Central D.C. area, untreated sewage from the Blue Plains Wastewater Treatment plant would be discharged into the Potomac River.

Finally, it is noteworthy that a blackout in the Central D.C. area not only would affect critically important facilities and operations, it could last for an extended period. Depending on the reason for the outage of the transmission lines, the lack of service on those lines accompanied by the lack of generation by the Plant could result in a large portion of the District of Columbia being without electricity for a period that could last hours or days. At the very least, if the two transmission lines were made unavailable with no advance notice and the only source of electricity for the Central D.C. area was the Mirant plant, in the absence of today's order DOE understands it would take at least 28 hours, and likely longer, to bring the Plant into full operation, during which time all or a substantial part of the Central D.C. area would be without electric power The results would be hardship and physical risk to hundreds of thousands of persons from loss of heat, elevator outages, medical equipment failure and numerous other causes. In addition, critical portions of the nation's government would also be severely impacted, with resulting adverse effects on a national scale.

Of course, the fact that the Department did not act immediately on the DCPCS petition does not argue against my finding that an emergency currently exists. After the petition was filed, DOE took several weeks to gather the relevant information, consider the facts, talk with environmental regulatory authorities, and develop an order that balanced the appropriate considerations. As explained in the text of this order, the current facts fully justify my finding that an emergency exists and that this order will meet that emergency. There certainly is nothing in the Federal Power Act that requires me to wait until a blackout actually has occurred, lives are put in jeopardy, and a significant disruption of National government functions already has happened before exercising my section 202(c) authority.

Accordingly, and based on all of the facts and circumstances, I find that an emergency exists justifying the issuance of this order under Federal Power Act section 202(c).

After finding the existence of an emergency, DOE has the authority, "either upon its own motion or upon complaint, with or without notice, hearing, or report, to order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest." 16 U.S.C. § 824a(c). The statute gives the Secretary of Energy broad discretion to fashion the terms of an order that will, in the Secretary's judgment, "best meet the emergency and serve the public interest." Based on the circumstances described above in this order, I hereby direct Mirant to generate electricity at the Plant pursuant to the terms of this order.

While I am issuing this order to help ensure a reliable supply of electric energy to the Central D.C. area, I am cognizant of the concerns that have been expressed concerning the potential adverse environmental consequences of operating the Plant, and of the national interest in attainment of the NAAQS that have been established under the Clean Air Act. Ordering action that may result in even local exceedances of the NAAQS is not a step to be taken lightly. However, it would not be reasonable for the Department of Energy to stand by and take no positive action on the DCPSC petition, even though the Central D.C. area is in danger of an extended blackout and the Department and private parties have available to them the legal and operational tools to prevent such a blackout from occurring. In this order, I have sought to harmonize those interests to the extent reasonable and feasible by ordering Mirant to operate in a

manner that provides reasonable electric reliability, but that also minimizes any adverse environmental consequences from operation of the Plant.

DOE expects that the DCPSC, having sought an emergency order, will take such actions as are within its authority to provide adequate and reliable electric service for the Central D.C. area including, for example, expediting approval of PEPCO transmission system upgrades and instituting demand response programs.[9] Indeed, DOE views this order not as a permanent solution to the Central D.C. area's reliability issues, but rather as a bridge between the current untenable situation and a more permanent solution that must be crafted by appropriate parties, including the DCPCS, FERC, environmental regulatory authorities, and relevant private sector parties. This permanent solution may include the installation of the new transmission lines discussed above, the installation of new pollution control equipment at the Mirant Plant, or other means.

As explained above, in the event that one of the two transmission lines that serve the Central D.C. area is out of service (due either to a necessary planned outage or to unforeseen events) and sufficient electricity from the Mirant power plant were not available, then the Central D.C. area would experience an immediate blackout should the one remaining source of electricity fail. This situation must be avoided, and ordering paragraph A of this order ensures that this situation will be avoided. When an outage is planned, Mirant is to be given advance notice and is required to supply necessary generation throughout the period of the outage.[10] In the event of an unexpected outage, Mirant must provide such generation as soon as possible. In the very unlikely eventuality of both transmission lines failing at the same time, Mirant is required to provide sufficient generation to supply the electrical demands of the affected area as soon as possible.

It is essential to determine the level of operation and other steps that will enable Mirant to rapidly respond to an unplanned transmission line outage. Some commenters have urged the Department to order the Plant to run continuously, even if doing so causes ongoing exceedances of the NAAQS. This would assure a high level of reliability of the electricity supply, but of course would not be tailored to particular circumstances in which operation of the Plant would be most necessary to provide needed reliability for the Central D.C. area and might also cause local air quality concerns. Other commenters have urged the Department to do nothing.

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[9] Demand response programs prompt electricity customers to reduce demand, especially during periods of short supply.

[10] In making certain portions of this order effective only upon notice to Mirant by PEPCO of a planned or unplanned outage of one or both of the 230 kV lines, it is similar to the FPA section 202(c) orders issued during the 2000/2001 California energy crisis. In those, DOE ordered certain entities to generate, deliver, interchange and transmit electricity to the California Independent System Operator (California ISO), but the entities were not required to deliver energy or services unless the California ISO had filed with DOE a certificate that it had been unable to acquire adequate supplies of electricity in the market. *See* Order pursuant to Section 202(c) of the Federal Power Act (December 14, 2000); Order Pursuant to Section 202(c) of the Federal Power Act (January 11, 2001).

The Department is not prepared to order actions that could cause more localized NAAQS exceedances than are necessary in order to assure adequate electric reliability for the Central D.C. area. At the same time, the Department should address the risks that delays in responding to an unplanned transmission line outage would present if measures are available to mitigate that risk. In my judgment, the appropriate balance is struck by (1) requiring Mirant to keep as many units in operation, and take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electrical reliability, as feasible (as further defined in the ordering paragraphs below). Thus, Mirant must take actions to reduce the time it takes to respond to an unplanned outage. This will serve to reduce the risk of a blackout but not at the price of unnecessary exceedances of health-based NAAQS. As Mirant improves its environmental performance, in cooperation with environmental regulators, its ability to react to an unforeseen outage also will improve. Environmental regulators and Mirant can work together, with the Department, to reduce, and perhaps eliminate, any conflict between environmental goals and electric reliability.

This order is effective immediately and will terminate at 12:01 a.m. October 1, 2006. This order may be modified or extended at any time upon order of the Secretary of Energy.

VI. Ordering Paragraphs

For the reasons set forth above, pursuant to section 202(c) of the Federal Power Act, it is hereby ordered that:

A. During any period in which one or both of the 230kV lines serving the Central D.C. area is out of service, whether planned or unplanned, Mirant will operate the Potomac River Generating Plant to produce the amount of power (up to its full capacity) needed to meet demand in the Central D.C. area as specified by PJM for the duration of the outage.

> In the event of a planned outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand.
>
> In the event of an unplanned 230 kV line outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand as soon as possible.

When producing electricity pursuant to this paragraph, Mirant shall utilize pollution control equipment and measures to the maximum extent possible to minimize the magnitude and duration of any exceedance of the NAAQS.

B. Mirant shall keep as many units in operation, and shall take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electricity reliability, as "feasible." For purposes of this paragraph, "feasible" means as determined by the Department of Energy, after consideration of the plan submitted by Mirant pursuant to paragraph D of this order and after consultation with the Environmental Protection Agency, without regard to cost and without causing or significantly contributing to any exceedance of the NAAQS.

C. Notice

In instances of scheduled outages of one of the 230kV lines, PEPCO will give advance notice of the planned outage and the estimated duration of such outage to Mirant, PJM, DOE, FERC, EPA, and DEQ. The notice must be sufficiently in advance of the outage to allow Mirant to bring the required amount of generation needed for reliability purposes on line by the time the outage is scheduled. PEPCO will ensure that only those planned outages needed to maintain or enhance the reliability of the 230 kV lines (or to install new lines) are scheduled and that such outages are scheduled to minimize the environmental effects of the operation of the Plant.

PEPCO will notify DOE, PJM, FERC, EPA, and DEQ of any unplanned outage of one or both of the 230 kV lines as soon as possible, but in no event later than two hours after informing Mirant.

In the event of either a planned or unplanned outage, PJM will specify the amount of electricity that Mirant must provide in order to meet demand.

D. Mirant shall submit a plan to DOE, within 10 days of the date of this order, detailing the steps it will take to ensure compliance with this order. This compliance plan shall include, at minimum, information regarding adequate staffing, materials, and supplies; emissions controls; and length of time necessary to start-up the Plant's generating units in the event of an unplanned or planned outage. DOE will review the compliance plan and order additional requirements if necessary.

E. Pursuant to the terms of FPA section 202(c) and DOE regulations at 10 C.F.R. § 205.376, Mirant and its customers should agree to mutually satisfactory terms for any costs incurred by Mirant under this order. If no agreement can be reached, just and reasonable terms shall be established by a supplemental order.

F. DOE expects that the DCPSC will take all reasonable actions to augment electrical reliability and to reduce electricity demand in the Central D.C. area.

G. DOE will periodically reexamine the need for this order with particular emphasis on: (1) Mirant's progress, working with environmental regulators, in reducing emissions and/or the impact of emissions; and (2) whether the DCPSC is taking all reasonable actions available to it to support electricity reliability in the Central D.C. area.

H. Pursuant to section 313 of the Federal Power Act (16 U.S.C. § 8251), any person, State, municipality, or State commission that is a party to this proceeding and is aggrieved by this order may apply for a rehearing within thirty days. Requests for rehearing may be submitted by mail, facsimile, or electronic mail to the following: (1) mail should be directed to Lawrence Mansueti of the Permitting, Siting, and Analysis Division of the Office of Electricity Delivery and Energy Reliability at the United States Department of Energy, Routing Symbol OE-20, 1000

Independence Avenue, S.W., Washington, D.C. 20585; (2) facsimiles may be submitted to 202-586-5860; (3) e-mail may be submitted to Lawrence.Mansueti@hq.doe.gov.

Issued in Washington, D.C. at _____ this 20th day of December, 2005.

Samuel W. Bodman
Secretary of Energy

Department of Energy

Washington, DC 20585

District of Columbia Public Service Commission

Docket No. EO-05-01

Order No. 202-06-2

On December 20, 2005, in Order No. 202-05-3, I determined that an emergency existed in the Central District of Columbia area due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, a shortage of facilities for the transmission of electric energy and other causes, and that issuance of the order would serve to alleviate the emergency and serve the public interest. Therefore, pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. 824a(c), and section 301(b) of the Department of Energy (DOE) Organization Act, 42 U.S.C. 7151(b), and for the reasons set forth in Order No. 202-05-3, I ordered Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC, to generate electricity at its Potomac River Generating Station (the Plant) pursuant to the terms of the order.

In Order No. 202-05-3, I noted that the Plant is one of only three sources of electricity that serve the central business district of Washington, D.C., many federal institutions, and the Georgetown area, as well as other portions of Northwest D.C., and the District of Columbia Water and Sewer Authority's Blue Plains Advanced Wastewater Treatment Plant. The order further noted that:

> PEPCO has applied to the [District of Columbia Public Service Commission] to construct two new 230 kV lines that would supply electricity to the Central D.C. area. In the same application, PEPCO has proposed building two new 69kV lines to supply the Blue Plains wastewater treatment plant. PEPCO proposes having the two 69 kV lines installed by the summer 2006 peak season, and the two 230 kV lines installed in 18 to 24 months. The two existing 230 kV lines that supply the Central D.C. area would need to be temporarily taken out of service sequentially in order to connect the new lines to the Central D.C. area. Once completed, these lines apparently would provide a high level of electric reliability in the Central D.C. area, even in the absence of production from the Plant.

The two 69 kV lines to the Blue Plains wastewater treatment plant have been completed. The two new 230 kV lines have been approved by the relevant regulatory authorities and are scheduled to be completed and in operation by mid-summer 2007.

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On January 18, 2006, DOE issued a notice of the emergency order (published in the Federal Register on January 20, 2006, 71 FR 3279) in which DOE stated that it would prepare a Special Environmental Analysis (SEA) pursuant to the Council on Environmental Quality's Regulations Implementing the Procedural Requirements of the National Environmental Policy Act. The SEA would examine the potential impacts of the operation of the Plant pursuant to Order No. 202-05-3. DOE said it would make the SEA publicly available and would consider information contained in the SEA, and public comments on the SEA, in any future decision making regarding the operation of the Plant. The SEA has not yet been issued, but DOE expects it to be completed shortly.

Because the reliability problems identified in Order No. 202-05-3 continue in the absence of the completion of the two new 230 kV lines, but the SEA has not been completed, I am issuing a short-term extension of the emergency order pending completion and consideration of the SEA and DOE's review of comments thereon.

The Department reiterates its expectation that the DC Public Service Commission pursue demand response initiatives and actively promote conservation as additional means of enhancing reliability in the central D.C. area.

On February 17, 2006, I issued Order No. 202-06-1, which granted certain requests for rehearing of Order No. 202-05-3 for the limited purpose of further consideration. The rehearing requests continue under consideration and no action is being taken on those requests by the issuance of this order.

Based on the above, I find that the circumstances which led to my previous determination that an emergency existed still continue, and therefore I hereby extend Order No. 202-05-3 and all the terms and conditions thereof until 12:01 a.m., December 1, 2006.

Issued in Washington D.C. at 6:00 PM this 28 day of September, 2006.

Samuel W. Bodman
Secretary of Energy

APPENDIX B

EPA's Administrative Compliance Order for the Mirant Potomac River Generation Station

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

In the Matter of:

Mirant Potomac River LLC
Potomac River Generating Station
Alexandria, Virginia

Docket No. CAA-03-2006-0163DA

ADMINISTRATIVE COMPLIANCE ORDER BY CONSENT

I. STATUTORY AUTHORITY

This Order is issued pursuant to Section 113(a)(1) of the Clean Air Act (the "Act"), 42 U.S.C. § 7413(a)(1). Under Section 113(a)(1) of the Act, the Administrator of the United States Environmental Protection Agency ("EPA" or "the Agency") has the authority to issue Orders requiring persons to comply with the requirements of an applicable State Implementation Plan ("SIP") or permit issued by a state. The Administrator has delegated his authority to issue such Orders within the geographical jurisdiction of EPA Region III to the Regional Administrator of EPA Region III, who has re-delegated this authority to the Director of the Air Protection Division of Region III. The geographical jurisdiction of EPA Region III includes the Commonwealth of Virginia.

This Order is issued to Mirant Potomac River, LLC ("Mirant") for its Potomac River Generating Station in Alexandria, Virginia.

II. FINDINGS OF FACT

1. Mirant owns and operates an electricity generating station known as the Potomac River Generating Station ("PRGS") in Alexandria, Virginia.

2. Mirant is a Limited Liability Company organized in the State of Delaware on August 2, 2000.

3. Pursuant to the Order By Consent entered into by Mirant and the Virginia Department of Environmental Quality ("VaDEQ"), effective September 23, 2004, Mirant performed a

Dispersion Modeling Analysis to assess the effect of Downwash (the "downwash study") of emissions from the PRGS. The downwash study used computer modeling to predict ambient concentrations of pollutants emitted by the PRGS under certain weather and atmospheric conditions.

4. Mirant provided the results of the downwash study to VaDEQ in August 2005. By letter dated August 19, 2005, VaDEQ informed Mirant that the downwash study demonstrated that emissions from the PRGS result in, cause or substantially contribute to, modeled violations of the primary National Ambient Air Quality Standards ("NAAQS") for sulfur dioxide ("S02"), nitrogen dioxide ("NO2"), and PM10 under certain atmospheric conditions.

5. VaDEQ's August 19th letter also requested that Mirant immediately undertake "such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station." VaDEQ cited 9 VAC 5-20-180(I) as the authority for this action.

6. The provision of the Virginia State Implementation Plan ("SIP") cited by VaDEQ, 9 VAC 5-20-180(I), has been approved and incorporated into the Virginia SIP at 40 C.F.R. § 52.2420(c), and is therefore federally-enforceable.

7. Mirant shut down all five Units of the PRGS at midnight on August 24, 2005.

8. On August 24, 2005, the District of Columbia Public Service Commission ("DCPSC") filed an "Emergency Petition and Complaint" with the United States Department of Energy ("DOE") and the Federal Energy Regulatory Commission ("FERC"), respectively, pursuant to the Federal Power Act ("FPA"), 16 U.S.C. § 824a(c), 824f and 825h, and Section 301(b) of the DOE Organization Act, 42 U.S.C. § 7151(b). The Emergency Petition requested that DOE find that an emergency exists under Section 202(c) of the FPA and issue an order requiring Mirant to continue operation of the PRGS.

9. Following additional modeling and assessment of the downwash study, Mirant re-started Unit 1 of the PRGS on September 21, 2005. Additional modeling conducted by Mirant indicated that operation of only Unit 1 would not cause any modeled NAAQS exceedances.

10. On December 20th, 2005, the Secretary of Energy issued Order No. 202-05-3 ("DOE Order") finding that an emergency did exist and ordering Mirant to, among other things, submit a plan to DOE detailing the steps to be taken to ensure Mirant's compliance with the DOE Order.

11. On December 30, 2005, Mirant submitted to DOE the Operating Plan setting forth the steps that Mirant would take to ensure compliance with the DOE Order.

12. By letter dated January 4, 2006, DOE required that Mirant "immediately take the necessary steps to implement Option A of the intermediate phase proposed in the [Operating Plan]." The DOE letter also noted that implementation of Option A was an interim measure.

13. In accordance with DOE's directive to maximize electric generation while not causing or contributing to a NAAQS violation, Mirant supplemented the original Operating Plan with additional operating configurations and modeling. The supplements contemplated that Mirant would use trona injection and a blend of low sulfur coal to manage SO2 emissions. Mirant stated that these supplemental operating scenarios result in no modeled NAAQS exceedances.

14. By letter dated December 22, 2005, EPA issued a Notice to Mirant and the VaDEQ, alleging that Mirant did not immediately undertake the necessary action to protect human health and the environment required by VaDEQ's August 19, 2005 letter, and that Mirant was therefore in violation of 9 VAC 5-20-180(I) and the federally-enforceable Virginia SIP for the period of time in which it failed to immediately shut down all the PRGS Units.

15. Following issuance of the Notice, EPA met with Mirant on several occasions to discuss settlement of EPA's possible enforcement action for the violation alleged in the Notice under Section 113 of the CAA. These discussions, along with discussions with DOE and VaDEQ, have resulted in this Order.

16. In its evaluation of potential PRGS operating scenarios, DOE has determined that the levels of PRGS operation allowed under the terms and conditions of Part IV of this Order are necessary to assure an acceptable level of electric reliability to the District of Columbia under the circumstances.

17. EPA will require use of the AERMOD model with a 24 hour background SO2 concentration of 51 micrograms per cubic meter ("ug/m3") when evaluating the PRGS's effects on the SO2 NAAQS. In Mirant's December 30, 2005 Operating Plan and subsequent submissions to DOE and EPA, Mirant has used varying background concentrations for SO2 in determining the maximum predicted impact of various operating scenarios at the PRGS. EPA has determined that Mirant's use of these varying background concentrations was technically defensible but that additional conservatism will be required in this Order. In an effort to build additional conservatism into Mirant's operating scenarios to ensure protection of the NAAQS, EPA has instructed Mirant to use a background concentration of 51ug/m3 to add to the AERMOD 24 hour SO2 modeled pollutant concentrations to determine the maximum predicted impacts for all operational scenarios considered during and incorporated into this Order.

18. EPA has determined through modeling and analysis that there is a strong correlation between the days, hours, and locations of predicted highest 24-hour concentrations of

SO2 and predicted highest 24-hour concentrations of PM10; that the predicted highest concentrations of SO2 are higher, relative to the SO2 NAAQS, than the predicted highest concentrations of PM10 relative to the PM10 NAAQS; and that measures taken to reduce SO2 emissions from the PRGS facility, such as reduced levels of operation and/or increased levels of trona usage, will also reduce emissions of PM10.

III. CONCLUSIONS OF LAW

19. Mirant is a "person" within the meaning of Section 302(e) of the CAA, 42 U.S.C. § 7602(e), and within the meaning of Section 113(a) of the CAA, 42 U.S.C. § 7413(a), because it is a corporation.

20. EPA concludes that Mirant violated 9 VAC 5-20-180(I) by failing to immediately shut down the boilers at the PRGS upon receipt of the letter from VaDEQ, and that such failure is also a violation of Section 113(a) of the CAA, 42 U.S.C. § 7413(a).

21. Mirant has had an opportunity to confer with the Administrator or his designee regarding this alleged violation and the terms of this Order. Mirant denies that any violation occurred, but agrees to the entry of this Order.

22. EPA has determined that the following schedule and plan for compliance is reasonable, taking into account the seriousness of the modeled NAAQS exceedances and the concerns of DOE regarding electric reliability in the Central D.C. area, and that this schedule is expeditious given the length of time it will take Mirant to take more permanent measures as well as the time it will take for additional electric transmission lines to be put into service to alleviate the emergency as determined by DOE.

IV. ORDER

Based upon the forgoing, under Section 113(a)(4) of the Act, 42 U.S.C. § 7413(a)(4), IT IS DETERMINED AND ORDERED that:

A. Definitions - For the purpose of this Order, the following terms shall have the meanings defined below:

3-Hour Rolling SO2 and 24-Hour Calendar Day SO2 Emission Rate. For the purpose of calculating the specified rate in Table 1 for a specified time period, the actual SO2 emission rate is determined by dividing the sum of the total pounds of actual SO2 emissions from the boiler stack of that unit, as determined by hourly CEMS data, as certified by 40 CFR Part 75, by the sum of the total heat input in million Btus from that coal-fired boiler unit.

For any 3 hour rolling period when there are fewer than 2 hours of actual emissions from a coal-fired boiler unit, an emission rate for that 3 hour period that would have to comply with the Table 1 emission rates does not need to be calculated for that unit.

For any calendar day when there are fewer than 3 hours of actual emissions from a coal-fired boiler unit, a 24 hour emission rate to comply with Table 1 need not be calculated for that unit.

On any day when a unit runs between 3 and 18 hours, the complying 24 hour emissions rate for Table 1 shall be calculated as follows:

If a unit operates between 3 hours and 10 hours, the SO2 limit for that unit equals the 3 hour rate in Table 1 minus 1/3 of the difference between the 3 hr and 24 hr rate for that unit configuration;

If a unit operates 10 hours or more up to 18 hours, the SO2 limit for that unit equals the 3 hour rate in Table 1 minus 2/3 of the difference between the 3 hr and 24 hr rate for that unit configuration.

If a unit operates 18 hours or more, the 24 hour rate in Table 1 shall apply.

Nothing in this paragraph is intended to allow greater operation of a unit than what is specified in Table 1 where this Order requires operation in accordance with Table 1. In addition, where this Order requires operation in accordance with Table 1 and that configuration calls for unit(s) to operate between 3 and 18 hours, then the Table 1 emission rates shall apply without the above adjustments.

AERMOD Default means Version 04300 of the AERMOD computer model, currently approved for general use by EPA.

AERMOD EBD means the AERMOD computer model with modified direction-specific building dimensions derived from the Wind Tunnel Study.

Alternative Operating Scenario means a method of operating the Potomac River Generating Station during the Model Evaluation Study, which has been approved by EPA and reviewed by VaDEQ.

DOE means the United States Department of Energy

DOE Order means Order No. 202-05-3, issued by the Department of Energy on December 20, 2005 in Docket No. EO-05-01 in response to an Emergency Petition and Complaint filed by the District of Columbia Public Service Commission.

EPA means the United States Environmental Protection Agency, Region III.

Line Outage Situation means that one or both 230 kV transmission lines, serving the Central D.C. area are out of service due to a planned or unplanned outage.

Mirant means Mirant Potomac River, LLC.

Modeled NAAQS Exceedance means a modeled 3-hour average sulfur dioxide concentration which, when a background concentration of 238.4 micrograms per cubic meter is added, exceeds 1,300 micrograms per cubic meter; or a modeled 24-hour average sulfur dioxide concentration which, when a background concentration of 51 micrograms per cubic meter is added, exceeds 365 micrograms per cubic meter; or, a modeled 24 hour PM10 concentration which, when a background concentration of 45 micrograms per cubic meter is added, exceeds 150 micrograms per cubic meter.

Model Evaluation Study or MES means a study proposed by Mirant and approved by EPA and reviewed by VaDEQ to compare multiple computer model predicted ambient air impacts to actual measured ambient air concentrations for the purpose of determining the best performing computer model in evaluating the effects of the emissions resulting from the operation of the PRGS.

Monitoring Plan means a plan proposed by Mirant and approved by EPA and reviewed by VaDEQ as part of the MES for the installation and use of ambient air monitors in the vicinity of the PRGS to monitor ambient air quality impacts of the PRGS.

Monitors means the ambient air monitors installed in accordance with the Monitoring Plan.

NAAQS means the National Ambient Air Quality Standards.

Non-Line Outage Situation means all periods of time that do not qualify as a Line Outage Situation.

Operating Parameters means the hourly average MW load of each unit for each hour of that day at the PRGS, the hourly average SO2 emission rate expressed in lb/MMBtu for each unit for each hour of that day, and the emission rate of PM10 expressed in lb/MMBtu.

Operating Plan means the December 30, 2005 Operating Plan submitted to DOE by Mirant to respond to the requirement for a compliance plan under the DOE Order.

Predictive Modeling means the daily use of an approved AERMOD computer model run in accordance with 40 C.F.R. Part 51, Appendix W, with forecasted weather conditions and planned Operating Parameters for the following day to predict modeled NAAQS compliance on a day-ahead basis.

PJM means the regional transmission organization for the region where the PRGS is located.

PRGS means the coal-fired electric generating station owned by Mirant and located in Alexandria, VA, comprised of three baseload generating units (Units 3, 4, 5) of approximately 102 MW each and two cycling units (Units 1 and 2) of approximately 88 MW each.

VaDEQ means the Virginia Department of Environmental Quality.

Wind Tunnel Study means a study proposed by Mirant using a physical model, as outlined in CPP Wind's Wind Tunnel Model Evaluation protocol, dated January 17, 2006, reviewed by EPA and VaDEQ, and conducted in accordance with EPA Guidance, to evaluate the accuracy of AERMOD Default's assumptions with respect to the direction-specific effective building dimensions when applied to the PRGS.

B. **Operation During Non-Line Outage Situations**

1. Mirant shall implement and comply with all of the single-unit, two-unit, and three-unit configuration constraints listed in Table 1 below until such time as Mirant is authorized by EPA and DOE to begin an alternative operating scenario as described below. Mirant shall operate each unit within the applicable hours-of-operation and SO2 emission rate restrictions listed in the table each calendar day. Generally, unit transitions and unit startups will occur within (+/-) four hours of midnight. The following procedures will be followed when there is a transition between operating scenarios:

a. When transitioning between two units, the unit that is coming offline will cease burning coal before the starting unit begins burning coal. Number 2 oil will be burned during the warm-up phase of the starting unit and during the shutdown phase of the unit coming offline. The number of boilers burning coal will not exceed at any time the constraints applicable to the Unit Configurations listed in Table 1.

b. When a change in operating Unit Configuration occurs, Mirant shall, for the balance of the calendar day, meet the more stringent of the 3-hour SO2 and/or 24-hour SO2 rate caps and hours of operation applicable to:

(i.) the Unit Configuration being ceased, and
(ii.) the Unit Configuration being commenced.

TABLE 1

Unit Configuration	24 Hr Calendar Day SO2 Rate - Lb/MBtu	3-Hr Rolling SO2 Rate - lb/MBtu	Operating Constraints
Unit 1	1.20	1.20	8 hrs max / 8 min / 8 off, 14,800 lb/day
Unit 1	0.84	1.14	None
Unit 2	0.41	0.73	None
Unit 3	0.31	0.66	None
Unit 4	0.36	0.70	None
Unit 5	0.61	0.90	None
Units 1 & 2	0.29	0.50	Both Units: 100% Load 24 hrs/day
Units 1 & 3	0.24	0.51	#1 @ 8 max / 8 min / 8 off, none on #3
Units 2 & 3	0.23	0.40	#2 @ 8 max / 8 min / 8 off, none on #3
Units 1 & 4	0.30	0.54	#1 @ 8 max / 8 min / 8 off, none on #4
Units 2 & 4	0.25	0.44	#2 @ 8 max / 8 min / 8 off, none on #4
Units 1 & 5	0.43	0.60	#1 @ 8 max / 8 min / 8 off, none on #5
Units 2 & 5	0.35	0.55	#2 @ 8 max / 8 min / 8 off, none on #5
Units 3 & 4	0.23	0.43	#3 @ 6 max / 18 min; #4 @ 7 max /17 min
Units 3 & 5	0.24	0.43	Both units @ 12 hr max / 12 hr min
Units 4 & 5	0.27	0.51	Both units @ 12 hr max / 12 hr min
Units 1, 2 & 3	0.21	0.36	#1&2 @ 5 max / 4 min / 15 off, none on #3
Units 1, 2, &4	0.24	0.35	#1&2 @ 6 max / 5 min / 13 off, none on #4
Units 1, 2, &5	0.27	0.42	#1&2 @ 8 max / 8 min / 8 off, none on #5

2. Schedule for Installation of Trona Injection at All Boiler Units

a. In accordance with the schedule set forth in Mirant's Operating Plan of December 30, 2005, Mirant shall ensure that Trona injection units are installed and operated as follows:

(1). March 20, 2006 - In addition to the two portable, rental Trona units, Mirant shall have a third operational Trona injection unit, whether an engineered unit or a rental unit. Mirant shall operate all three Trona units whenever three or more boilers are operating.

(2). April 28, 2006 - Mirant shall have installed and be operating three engineered Trona injection units, and shall operate each unit whenever the boiler to which it is attached is operating. Mirant shall operate the rental Trona units on boilers not equipped with operating engineered units.

(3). May 31, 2006 - Mirant shall have installed and be operating

all five engineered Trona injection units, and shall operate each unit whenever the boiler to which it is attached is operating.

3. **Model Evaluation Study**

a. Mirant shall undertake a Model Evaluation Study to determine the best performing model for predicting the computer-modeled ambient air quality impacts from the PRGS's operations. Prior to beginning the MES, Mirant must submit to EPA for approval an MES protocol, and simultaneously send a copy to VaDEQ. Mirant may begin operating the PRGS in a manner that does not cause or contribute to Modeled NAAQS Exceedances by using Predictive Modeling as described in subsection 4 below, after completing the following tasks:

(1). EPA approval of the MES protocol;
(2). installation and operation of at least 3 SO2 monitors in accordance with the approved monitoring plan;
(3). execution of this Order by EPA; and
(4). authorization by DOE for Mirant to operate in accordance with this Order.

b. Upon commencement of daily predictive modeling performed in conjunction with the MES, the SO_2 emission rate limitations and other unit operating restrictions set forth in Table 1 shall no longer apply unless otherwise indicated. The Table 1 restrictions apply if Mirant ceases to operate the PRGS in accordance with the MES.

4. **Operations in Accordance with Daily Predictive Modeling**

a. By 10 AM each morning, Mirant shall collect actual weather predictions from the National Weather Service for the Reagan National Airport and use them along with planned Operating Parameters as inputs to conduct a computer modeling run for the following day using AERMOD Default. If the modeling confirms that Mirant's planned operations for the following day will not cause or contribute to a Modeled NAAQS Exceedance, Mirant may operate on the day modeled in accordance with the modeled Operating Parameters. If the Predictive Modeling indicates that the planned Operating Parameters will result in one or more Modeled NAAQS Exceedances, Mirant shall not run under those operating parameters but shall continue to adjust its planned operations and conduct additional modeling runs using the adjusted Operating Parameters to confirm that the adjusted operations will not cause or contribute to a Modeled NAAQS Exceedance for the day modeled.

b. During Line Outage Situations, Predictive Modeling must continue to be performed but the PRGS shall be operated under the Line Outage Situation provision in accordance with the DOE Order and this Order.

c. If the Predictive Modeling indicates that the predicted weather conditions and planned Operating Parameters do not result in a Modeled NAAQS Exceedance,

Mirant is authorized to operate using the planned Operating Parameters and shall not be in violation of this Order; or 9 VAC 5-20-180(I), as incorporated into the Virginia SIP at 40 C.F.R. 52.2420(c); nor shall such operation be deemed to give a right for a cause of action for any alleged violation of the NAAQS as a result of Mirant causing or contributing to any modeled or monitored exceedance of the NAAQS. This release shall only apply to alleged exceedances or violations occurring during the lifetime of the Order or the duration of the MES if the requirements of this Order have been incorporated into a state operating permit; shall only apply to laws in existence on the effective date of the Order; and shall not prevent Virginia from issuing an order under 9 VAC 5-20-180(I) or EPA from taking action under Section 303 of the Clean Air Act.

5. **Operation During Certain Periods of Elevated SO2 Impacts After MES Approval**

a. As a precaution, after the installation of at least three monitors, Mirant shall institute additional measures that will apply whenever ambient concentrations of SO2 are elevated, as defined below. Specifically, Mirant shall:

(1). Install a monitor alert system in the Potomac River Control Room that registers an audible alarm if in any one hour the average measured ambient concentration of SO2 at any monitor is equal to or greater than 80% of the 3 hour SO2 National Ambient Air Quality Standard, measured as 400 parts per billion (1,040 $\mu g/m^3$).

(a). During the hour following the sounding of the alarm, Mirant shall make operational adjustments, which may include increasing Trona injection and/or decreasing operation and shall observe the effect of these adjustments on the average, measured ambient concentration of SO2.

(b). If, at the end of the second hour, the average measured ambient concentration of SO2 is not equal to or less than 1,040 $\mu g/m^3$, Mirant shall adjust its operations to conform to the scenarios described in Table 1 until the rolling 3 hour average is less than 1,040 $\mu g/m^3$.

(2). Mirant shall also configure the audible alarm to sound if, in any 12 hour period, any monitor measures an average, ambient concentration of SO2 equal to or greater than 80% of the 24 hour SO2 National Ambient Air Quality Standard, measured as 112 parts per billion (292 $\mu g/m^3$).

(a). During the following 6 hours, Mirant shall make operational adjustments, which may include increasing Trona injection and/or decreasing operation and shall observe the effect of these adjustments on the measured ambient concentration of SO2.

(b). If, at the end of the 6 hour period, the average, measured ambient concentration of SO2 is not equal to or less than 292 $\mu g/m^3$, Mirant shall adjust its operations to conform to the scenarios described in Table 1 for the balance of the calendar day.

(3). Mirant shall also configure the audible alarm to sound if, after the first 6 months of operation, any monitor measures an average, ambient concentration of SO2 equal to or greater than 80% of the annual average NAAQS, measured as 64 $\mu g/m^3$.

(a). During the following 3 months, Mirant shall monitor the 7 month, 8 month and 9 month averages.

(b). If, at the end of 9 months, the average, measured ambient concentration of SO2 is not equal to or less than 64 $\mu g/m^3$, Mirant shall adjust its operations so that the annual, measured ambient concentration of SO2 does not exceed 80 $\mu g/m^3$.

(4). If the audible alarm sounds more than 5 times in a calendar month, Mirant shall, on a one-time basis, adjust the alarm to 75% of the applicable NAAQS.

6. **PM10 Predictive Modeling**

Whenever Mirant operates 4 or more units, it shall abide by an emission rate of 0.055 lbs/MM Btu and shall first conduct Predictive Modeling using this rate to determine whether operation of the units causes or contributes to a Modeled NAAQS Exceedance. If the Predictive Modeling indicates that the planned Operating Parameters will result in a Modeled NAAQS Exceedance for PM10, Mirant shall adjust its planned operating scenario and re-run the Predictive Modeling with an emission rate of 0.055 lbs/MM Btu until such time as Mirant confirms through Predictive Modeling that the adjusted operations will not cause or contribute to a Modeled NAAQS Exceedance for PM10.

7. **AERMOD EBD - Physical Changes Requiring Model Changes**

If Mirant elects to refine the AERMOD Default model by performing a Wind Tunnel Study, Mirant will submit a Wind Tunnel Study evaluation protocol for review by EPA and VaDEQ and approval by EPA. The protocol will describe the technical features of the proposed Wind Tunnel Study and the theoretical basis for demonstrating that the data generated should be used to develop a site-specific set of assumptions, including equivalent building dimensions, to be applied to AERMOD Default.

The results of the Wind Tunnel Study shall be submitted to EPA for approval and may result in site-specific equivalent building dimensions to be used in lieu of the assumptions in the AERMOD Default model. The results must be submitted to EPA no later than 90 days following entry of this AO. Upon approval of AERMOD EBD by EPA and VaDEQ, Mirant shall operate for the balance of the MES study period applying AERMOD EBD in its Predictive Modeling.

As the Model Evaluation Study progresses, Mirant may make other changes at the PRGS, including physical changes such as changes to the stacks. In that event, inputs utilized during the Predictive Modeling and in the models evaluated at the conclusion of the Model Evaluation Study (and the model used to develop emission limits for the PRGS) may, after EPA

approval, be adjusted to correspond to these changes. However, the MES study period must be conducted for a minimum of six months following any physical change in order to obtain monitoring data upon which to evaluate the models.

8. Monitoring and Comparison Modeling During the Model Evaluation Study

In accordance with the MES Protocol, as attached, Mirant shall install and operate a total of six (6) ambient SO2 monitors in the preferred locations or alternate locations as described below:

a. Preferred locations

(1). Two monitors on the roof of Marina Towers, with one located on the Southeast wing and one at the center of the building;

(2). One monitor east of the PRGS, approximately due east of Stack 5 on the west bank of the Potomac River;

(3). One monitor southeast of the PRGS, along the facility fenceline, near the River;

(4). One monitor approximately 800 meters north of Marina Towers; and

(5). One monitor on the roof of a building in the Harbor Terrace complex three

EPA will work with Mirant to assist in obtaining permission needed to install monitors in these preferred locations.

b. Alternate Locations: If EPA determines that notwithstanding Mirant's good faith and reasonable efforts to obtain permission to install monitors in the preferred locations, it is impractical to install some or all of the monitors in the preferred locations in a timely manner because the owner of the preferred monitor location declines to host the SO2 monitor(s) or the preferred location is unavailable or impractical for any other reason, EPA will authorize installation of monitors at some or all of the five alternative SO2 monitor locations set forth in the MES Protocol, as summarized below:

(1) Southwest of the PRGS on the rooftop of Braddock Place;
(2) Approximately 600 meters South-Southeast of the stack locations, at ground level along the Potomac River;
(3) Approximately 300 meters Southwest of the PRGS at ground level;
(4) Approximately 600 meters South-Southwest of the PRGS at ground level; and

(5) Approximately 100 meters SW of the plant at ground level.

c. Deadline for ambient monitor installation: Mirant shall have all six monitors installed and operating within 60 days of the execution of this Order. EPA may, at its own discretion, extend the deadline, and/or change locations, for installation and/or operation of one or all of the monitors and in the event that EPA determines that one of the preferred locations is impractical and authorizes use of an alternate location, Mirant shall have an additional 30 days in which to install that monitor.

d. Operation, Maintenance, and Quality Assurance/Quality Control ("QA/QC") of monitors - It shall be the responsibility of Mirant to ensure that the monitors are operated, maintained, and subject to the appropriate QA/QC provisions set forth at Appendix A to 40 C.F.R. Part 58.

e. Follow-up modeling: The data generated by the monitors shall be used at the end of the study to conduct a model evaluation. Until such time as all the ambient air monitors are installed in accordance with the Monitoring Plan and begin measuring and recording ambient air data, Mirant shall perform "follow up" computer modeling using actual weather conditions and Operating Parameters, and shall report the results to EPA and VaDEQ on a monthly basis, as described below. This "follow-up" modeling will be performed on the Monday following the previous week of operation.

9. **Determination of Best Performing Model at Conclusion of Model Evaluation Study**

At the conclusion of the MES, the performance of the applicable models will be evaluated in accordance with the document "Protocol for Determining the Best Performing Model." EPA-454/R-92-025, Sept. 1992, Comparing Computer Model-Predicted Air Concentrations to Actual Ambient Air Concentrations Measured by the Monitors. The information yielded by the comparison of model predictions to measured ambient concentrations will result in a determination by EPA and VaDEQ as to which model is best-performing. Thereafter, the best-performing model shall be used to conduct computer modeling to develop permanent emission limits at the PRGS.

10. **Reporting**

a. Throughout the period of the MES, Mirant shall deliver to EPA and VaDEQ monthly: (1) the modeled input files and results of the daily Predictive Modeling for the preceding month, including the hourly average heat input in MMBtu for each unit and the exit velocity (or exhaust volume) for each unit; (2) verification that the planned Operating Parameters utilized for Predictive Modeling in the preceding month were not exceeded, or if exceeded, documentation describing that exceedance; (3) the inputs and results of "follow-up" modeling for the preceding month (or portion thereof during which all Monitors were not in place), including the hourly average heat input in MMBtu for each unit and the exit velocity (or

exhaust volume) for each unit, but only until commencement of operation of all Monitors, and; (4) after installation of the Monitors, the data generated by the Monitors.

b. If at any time the "follow-up" modeling demonstrates a modeled exceedance of the NAAQS or the Monitors demonstrate an actual exceedance of the NAAQS, Mirant shall report such modeled or monitored exceedance to EPA and VaDEQ within 3 days of the modeled or monitored exceedance for a determination as to whether corrective action is required.

C. **Operation During Line Outage Situations**

1. During a Line Outage Situation, Mirant shall operate the PRGS to produce the amount of power needed to meet the load demand in the Central D.C. area, as specified by PJM and in accordance with the DOE Order. During such operations, Mirant shall take all reasonable steps to limit the emissions of PM10, NOX and SO2 from each boiler, including operating only the number of units necessary to meet PJM's directive and optimizing its use of Trona injection to minimize SO2 emissions. During a Line Outage Situation, Mirant shall achieve 80% reduction of SO2 emissions unless: 1) Mirant demonstrates, through predictive modeling or otherwise, that 80% reduction is not necessary to achieve compliance with the NAAQS; or 2) Mirant demonstrates that 80% reduction is not logistically feasible because of factors such as the quantity of available Trona and predicted duration of the outage. In the event that Mirant demonstrates that 80% reduction is not logistically feasible, it shall submit a plan to EPA for optimizing its use of Trona injection so as to maximize SO2 reduction and the plan shall propose control measures and removal efficiencies to be achieved during the Line Outage Situation. If Mirant has 30 days notice in advance of the Line Outage Situation, it shall submit the plan to EPA for approval 15 days before commencement of the Line Outage. If Mirant has less than 30 days advance notice of the Line Outage Situation, Mirant shall submit the plan to EPA for approval as promptly as reasonably possible under the circumstances. It is understood and acknowledged that the plan to be followed for an unscheduled Line Outage Situation will depend upon the specific circumstances at the time of the unscheduled Line Outage Situation. Nothing here shall diminish Mirant's obligation to produce the amount of power needed to meet the load demand in the Central D.C. area, as specified by PJM, and in accordance with DOE's Order.

2. Malfunctions of emission control devices, such as Trona injection, shall not be deemed a failure to limit the emissions during a line outage, provided that Mirant has made reasonable efforts to avoid the malfunction and to promptly correct the malfunction. All emissions during a Line Outage Situation count toward any other permit, statutory, or regulatory limits for the PRGS. Upon Mirant's request, EPA (after consultation with DOE) will provide contemporaneous written confirmation of the existence of a Line Outage Situation. If Mirant operates the PRGS in accordance with dispatch directions from PJM and the relevant terms of this Order during a Line Outage Situation, Mirant shall not be in violation of this Order; or 9 VAC 5-20-180(I), as incorporated into the Virginia SIP at 40 C.F.R. 52.2420(c); nor shall such operation be deemed to give a right for a cause of action for any alleged violation of the

NAAQS as a result of Mirant causing or contributing to any modeled or monitored exceedance of the NAAQS. This release shall only apply to alleged exceedances or violations occurring during the lifetime of the Order or the duration of the MES if the requirements of this Order have been incorporated into a state operating permit; shall only apply to laws in existence on the effective date of the Order; and shall not prevent Virginia from issuing an order under 9 VAC 5-20-180(l) or EPA from taking action under Section 303 of the Clean Air Act.

D. General Provisions

1. At all times, Mirant shall not emit more than 3700 tons of NOx per year and shall limit the emission rate of PM10 to 0.055 lbs/MMBtu.

2. Mirant's actions shall be consistent with all provisions of federal and state law, including but not limited to, the Clean Air Act, all federal regulations promulgated under the Clean Air Act, and any other applicable laws, including the Virginia State Implementation Plan.

E. Permitting Requirements

Within the 12 month period following entry of this Order, Mirant must cooperate with VaDEQ in the development of operating permit emission limits protective of all NAAQS. Mirant agrees that the obligations of this Order, to the extent they have not been completed, may become obligations in the operating permit issued by VaDEQ. Mirant further agrees that during the implementation of this Order, it will prepare and submit to EPA and VaDEQ an analysis of the applicability of NSR/PSD to the PRGS due to the installation of Trona injection and any additional fugitive emissions resulting from that installation.

V. PARTIES BOUND

This Order shall apply to and be binding upon Mirant, its agents, successors, and assigns and upon all persons, contractors and consultants acting under or for Mirant, or persons acting in concert with Mirant who have actual knowledge of this Order or any combination thereof with respect to matters addressed in this Order. No change in ownership or corporate or partnership status will in any way alter Mirant's responsibilities under this Order.

In the event of any change in ownership or control of the PRGS, Mirant shall notify the EPA in writing at least thirty (30) days in advance of such change and shall provide a copy of this Order to the transferee-in-interest of the PRGS, prior to any agreement for transfer.

VI. RESPONSES TO ORDER

Information required to be submitted to EPA under this Order must be sent to:

Chief, Air Enforcement Branch
Air Protection Division,

U.S. Environmental Protection Agency, Region 3
1650 Arch St.
Philadelphia, PA 19103

And

Douglas J. Snyder
Assistant Regional Counsel
Office of Regional Counsel (3RC10)
U.S. Environmental Protection Agency, Region 3
1650 Arch St.
Philadelphia, PA 19103

VII. EFFECT OF COMPLIANCE ORDER

As set forth in Section 113(a)(4) of the Act, 42 U.S.C. § 7413(a)(4), nothing in this Administrative Compliance Order by Consent shall prevent EPA from assessing any penalties, or otherwise affect or limit the United States' authority to enforce other provisions of the Act, or affect any person's obligations to comply with any Section of the Act or with any term or condition of any permit or applicable implementation plan promulgated or approved under the Act. Further, nothing in this Order shall limit or otherwise preclude the United States from taking criminal or additional civil judicial or administrative enforcement action against Mirant or any third parties with regard to the PRGS pursuant to any other federal or state law, regulation or permit condition, or for Mirant's failure to comply with any requirements of this Order. Nothing herein shall be construed to limit the authority of the EPA to undertake action against any person, including Mirant, in response to any condition that EPA determines may present an imminent and substantial endangerment to the public health, public welfare or the environment. EPA reserves any rights and remedies available to it to enforce the provisions of this Order, the Act and its implementing provisions, and of any other federal laws or regulations for which it has jurisdiction following the entry of this Order.

For the purposes of this proceeding only, Mirant hereby expressly waives its right to any appeal of this Order which it may have under Section 307(b) of the CAA, 42 U.S.C. § 7607(b), and waives the right to challenge the terms of this Order in any action taken to enforce this Order pursuant to Section 113(b) of the CAA, 42 U.S.C. § 7413(b).

VIII. ENFORCEMENT

Failure to comply with this Order may result in a judicial or administrative action for appropriate relief, including civil penalties, as provided in Section 113 of the Act, 42 U.S.C. § 7413. EPA retains full authority to enforce the requirements of the Clean Air Act, 42 U.S.C. §§ 7401-7642, and nothing in this Order shall be construed to limit that authority except as otherwise provided herein.

IX. CERTIFICATION OF REPORTS

Any notice, report, certification, data presentation, or other document submitted by Mirant under or pursuant to this Order, which discusses, describes, demonstrates, or supports any finding or makes any representation concerning Mirant's compliance or non-compliance with any requirement(s) of this Order, shall be certified by a responsible corporate official of Mirant. The term "responsible corporate official" means (a) the Chairman or Chief Operating Officer of Mirant, or (b) Vice President of Operations for PRGS.

23. The certification required by the preceding paragraph of this Order shall be in the following form:

> Except as provided below, I certify that the information contained in or accompanying this (type of submission) is true, accurate, and complete. As to (the/those) portion(s) of this (type of submission) for which I cannot personally verify (its/their) accuracy, I certify under the penalty of law that this (type of submission) and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.
>
> Signature:_____
> Name(print):_____

X. EFFECTIVE DATE AND OPPORTUNITY FOR CONFERENCE

24. By signing this Order, Mirant agrees that it has had an opportunity to confer on the terms of this Order with EPA and thereby waives its opportunity pursuant to Section 113(a)(4) to confer further with EPA concerning the violation(s) alleged in the above Order before the Order takes effect. Therefore, this Order shall be effective upon Mirant's receipt of a copy of the Order signed by the Director of the Air Protection Division, Region 3, or her designee. This Order shall expire one year after execution of the Order, in accordance with Section 113(a)(4) of the CAA, unless it is terminated sooner by EPA.

XI. FAILURE TO PERFORM

25. In the event of an inability or anticipated inability on the part of Mirant to perform any of the actions or work required by this Order in the time and manner required herein, Mirant shall notify EPA orally within twenty-four (24) hours of such event (or, if the event occurs on a Friday

or Saturday, Sunday, or legal holiday, no later than the following business day) and in writing as soon as possible, but in no event more than three (3) days after such event. Such notice shall set forth the reason(s) for, and the expected duration of, the inability to perform; the actions taken and to be taken by Mirant to avoid and mitigate the impact of such inability to perform; and the proposed schedule for completing such actions. Such notification shall not relieve Mirant of any obligation of this Order. Mirant shall take all reasonable actions to prevent and minimize any delay.

XII. BUSINESS CONFIDENTIALITY

26. Mirant is entitled to assert a claim of business confidentiality covering all or part of any requested information, in the manner described in 40 C.F.R. § 2.203(b), unless such information is "emission data" as defined in 40 C.F.R. § 2.301(a)(2). Information subject to a claim of business confidentiality will be made available to the public only in accordance with the procedures set forth in 40 C.F.R. Part 2, Subpart B. Unless a confidentiality claim is asserted at the time requested information is provided, EPA may make this information available to the public without further notice to you.

XIII. COPIES OF ADMINISTRATIVE COMPLIANCE ORDER BY CONSENT

A copy of this Order will be sent to James Sydnor, Virginia Department of Environmental Quality.

Dated: June 1, 2006

Judith Katz, Director
Air Protection Division
U.S. Environmental Protection Agency
Region III

The undersigned represents that he or she is a duly authorized representative of Mirant Potomac River, LLC for the purpose of signing this Order, and that Mirant agrees to the terms of this Order.

Dated: June 1, 2006

Robert Driscoll
Chief Operating Officer

APPENDIX C

Federal Register Notice of Emergency Action and Correspondence with the Council on Environmental Quality

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ACTION: Notice of public meeting agenda.

DATE AND TIME: Thursday, February 2, 2006, 10 a.m.–1 p.m.

PLACE: Hyatt Regency (Valley Forge Room), 400 New Jersey Avenue, NW., Washington, DC 20001. (Metro Stop: Union Station).

AGENDA: The Commission will receive the following reports: Title II Requirements Payments Update; and updates on other administrative matters. The Commission will receive presentations on the following topics: Implementation of the EAC Voting System Certification Program.

This meeting will be open to the public.

FOR FURTHER INFORMATION CONTACT: Bryan Whitener. Telephone: (202) 566–3100.

Ray Martinez III,

Vice-Chairman, U.S. Election Assistance Commission.

[FR Doc. 06–607 Filed 1–18–06; 3:32 pm]

BILLING CODE 6820–KF–M

DEPARTMENT OF ENERGY

Emergency Order To Resume Limited Operation at the Potomac River Generating Station, Alexandria, VA, in Response to Electricity Reliability Concerns in Washington, DC

AGENCY: Department of Energy.

ACTION: Notice of emergency action.

SUMMARY: Pursuant to 10 CFR 1021.343, the U.S. Department of Energy is issuing this Notice to document emergency actions that it has taken, and to set forth the steps it intends to take in the future, to comply with the National Environmental Policy Act (NEPA) in the matter described in this Notice.

On August 24, 2005, Mirant Corporation, and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), ceased operations at its Potomac River Generating Station (the ''Plant'') in Alexandria, Virginia, after modeling that it conducted indicated that the Plant's operations were causing exceedances of the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act. On the same day, the District of Columbia Public Service Commission (DCPSC) filed with the U.S. Department of Energy (DOE or ''Department''), a petition for an emergency order pursuant to section 202(c) of the Federal Power Act (FPA), asserting that the Plant's closure reduced the reliability of the electrical supply to much of the central business district of the District of Columbia, many federal institutions, the Georgetown area in DC, as well as other portions of Northwest DC, and the District of Columbia Water and Sewer Authority's Blue Plains Advanced Water Treatment Plant (collectively referred to herein as the ''Central DC area''), placing these electrical customers in risk of a blackout.

After an exhaustive review of the facts, and consultation with Federal and state officials responsible for environmental compliance and the private entities responsible for electricity transmission, the Secretary of the Department of Energy on December 20, 2005, issued an emergency order (the ''Order'') directing the Plant's owner, Mirant, to generate electricity at the coal-fired Plant under certain, limited circumstances. The section below on ''Further Information'' includes information on how to obtain paper and electronic copies of the Order.

In emergency situations such as this one, the Council on Environmental Quality (CEQ) Regulations Implementing the Procedural Requirements of NEPA at 40 CFR 1506.11 provide that a federal agency may take an action with significant environmental impacts without observing the provisions of the NEPA regulations associated with preparing an Environmental Impact Statement (EIS). Instead, the agency should consult with CEQ to determine what alternative arrangements the agency will take in lieu of preparing a normal NEPA EIS. DOE has consulted with CEQ about alternative arrangements it will take in this matter and is publishing this notice to inform the public of those arrangements pursuant to DOE's NEPA regulations at 10 CFR 1021.343.

Consistent with its consultation with CEQ, DOE will implement the following alternative arrangements: (1) Prepare a Special Environmental Analysis (SEA) that will examine the potential impacts from issuance of the order, and identify potential mitigation measures; (2) provide opportunities for public involvement by disseminating information related to the environmental effects of Mirant's operations and by accepting public comment on this notice, the compliance plan Mirant submitted to DOE, and the SEA; (3) continue consultations with appropriate agencies with regard to relevant environmental issues; and (4) identify in the SEA any steps that DOE believes can be taken to mitigate the impacts from its Order.

DATES: Comments on this notice and on issues to be addressed in the SEA should be submitted to DOE on or before February 21, 2006.

ADDRESSES: Comments should be addressed to: Lawrence Mansueti, Permitting, Siting, and Analysis Division, Office of Electricity Delivery and Energy Reliability (OE–20), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–0119; telephone: 202–586–2588; fax: 202–586–5860; *Lawrence.Mansueti@hq.doe.gov.*

FOR FURTHER INFORMATION CONTACT: For further information on this Notice, to obtain paper copies of the Order and compliance plan, to submit comments on the compliance plan, or for information on the emergency activities related to the Plant, contact Mr. Mansueti at the above address. In addition, all publicly available documents, including the Order and compliance plan, are available on DOE's Web site for this matter at *http://www.electricity.doe.gov/about/dcpsc_docket.cfm* or via hyperlinks from that Web site (referred to herein as the ''Mirant matter Web site''). Copies of the SEA will also be available on the DOE NEPA Web site at *http://www.eh.doe.gov/nepa/.*

For information on the DOE NEPA process, please contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH–42), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–0119; telephone: 202–586–4600; fax: 202–586–7031; or leave a toll-free message at: 1–800–472–2756.

SUPPLEMENTARY INFORMATION:

Procedural Background

On August 19, 2005, Mirant submitted to the Virginia Department of Environmental Quality (DEQ) a computerized emissions modeling study Mirant had conducted of its Plant that indicated that emissions from the Plant caused or contributed to significant localized exceedances of the NAAQS. Also on August 19, 2005, DEQ issued a letter to Mirant which requested ''that Mirant *immediately* undertake such action as is necessary to ensure protection of human health and the environment, in the area surrounding the Potomac River Generating Station, including the potential reduction of levels of operation, or potential shut down of the facility.'' (emphasis in original). On August 24, 2005, Mirant shut down all five of the generating units at the Plant, and on the same day, the District of Columbia Public Service

Commission (DCPSC) filed an Emergency Petition and Complaint with DOE and the Federal Energy Regulatory Commission (FERC) pursuant to the Federal Power Act (FPA). The DCPSC requested the Secretary of Energy to find that an emergency existed under section 202(c) of the FPA and to issue an order directing Mirant to continue operation of the Plant. The basis for the petition was that the shutdown of the Plant ''* * * will have a drastic and potentially immediate effect on the electric reliability in the greater Washington, DC, area and could expose hundreds of thousands of consumers, agencies of the Federal Government and critical federal infrastructure to curtailments of electric service, load shedding and, potentially, blackouts.'' On September 20, 2005, Mirant restarted its unit number one on an 8/8/8 basis—that is, in any given 24-hour period, the unit runs for eight hours at its maximum level of 88 MW, eight hours at its minimum level of 35 MW, and has eight hours when it does not run. DOE has been informed that both the U.S. Environmental Protection Agency (EPA) and DEQ acknowledge that the operation of this unit in this manner does not result in any modeled NAAQS exceedances.

Electricity Reliability

The coal-fired Mirant Plant consists of five generating units, two of which are cycling units that range in output from 35 MW to 88 MW, and three of which are baseload units that range in output from 35 MW to 102 MW. The Plant is one of only three sources of electricity to the Central DC area. The other two sources are two 230,000-volt (230 kV) transmission lines that deliver electricity from other generating sources in the regional electric grid operated by PJM Interconnection (PJM). Although there are other generating units in close physical proximity to the Central DC area, there are no transmission lines that would allow delivery of power from these other units to reach the Central DC area. Under North American Electric Reliability Council (NERC) standards, at a minimum, the power system must carry at least enough contingency reserves of electricity to cover the most severe single contingency. The standards require that an area's system always be operated with sufficient reserves to compensate for the sudden failure of the area's most important single generator or transmission line. Based on the fact that the Central DC area has only three sources of supply, the Plant and the two 230 kV transmission lines, in order to maintain a minimally reliable electric power system, the Plant must be available to run when one of the 230 kV lines is out of service, because if the remaining line failed there would be no other source of electricity to serve the Central DC area load.

The outage of one of these two lines is not merely a theoretical possibility. Since 2000, there have been 34 one-line outages for maintenance, and seven occasions where one of the lines has failed unexpectedly. DOE has been informed that, prior to 2000, there were two occasions when both of the lines failed simultaneously. Moreover, just days before issuance of the Order, PJM informed DOE on December 16, 2005, that on the previous night, ''one of the two circuits critical to providing service to the District tripped. Continued [electric] service to certain load within the District was at that time entirely dependent on the remaining circuit.'' Fortunately, full service to the line that failed was restored by the morning of December 16, 2005. Nonetheless, there can be no assurance that the Central DC area would be so lucky next time. In addition, the Potomac Electric Power Company (PEPCO) informed DOE that it needed to perform maintenance on the lines in January of 2006.

The Order

On December 20, 2005, DOE found that in the circumstances presented, an emergency existed within the meaning of section 202(c) of the FPA because of the reasonable possibility an outage would occur that would cause a blackout, the number and importance of facilities and operations in our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violated applicable reliability standards. PEPCO has applied to the DCPSC to construct two additional 230 kV lines that would supply electricity to the Central DC area and in the same application, proposed building two new 69kV lines to supply the Blue Plains wastewater treatment plant. Once completed, these lines will likely provide a high level of electricity reliability in the Central DC area, even in the absence of production from the Plant. However, it will likely take 18–24 months to construct the new lines.

Based on this finding, on December 20, 2005, DOE issued an Order requiring Mirant to, among other things, (1) operate the Plant to produce the amount of power (up to its full capabilities) needed to meet demand in the Central DC area during any period in which one or both of the 230kV lines serving the Central DC area is out of service as specified by PJM for the duration of the outage, and (2) keep as many generating units in operation and take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electricity reliability, as feasible, as determined by DOE after consideration of the plan submitted by Mirant pursuant to the Order and after consultation with EPA, without regard to cost, and without causing or significantly contributing to any exceedance of the NAAQS. A blackout in the Central DC area would have drastic impacts on the environment, as well as for the employees and citizens of the Central DC area, affecting hundreds of thousands of residents and workers, as well as public safety and protection facilities, including hospitals, police, and fire facilities. In addition, DOE has been informed that within 24 hours of a blackout in the Central DC area, untreated sewage from the Blue Plains Wastewater Treatment plant would be discharged into the Potomac River.

The time period for DOE's Order extends through October 1, 2006.

Mirant's Compliance Plan

Pursuant to DOE's Order, Mirant submitted a compliance plan (referred to as the Operating Plan by Mirant) on December 30, 2005. The plan outlines a proposed temporary phase, and two options for a proposed intermediate phase, Option A and Option B. All proposals include the use of ''trona'' (sodium sesquicarbonate, a naturally occurring substance similar to baking soda) and/or lower sulfur coal to manage air emissions. On January 4, 2006, DOE authorized Mirant to ''immediately take the necessary steps to implement Option A of the intermediate phase proposed in the implementation plan,'' stating that ''Mirant represents that implementation of this option will produce no NAAQS exceedences.'' DOE will work with EPA to verify the accuracy of that representation. DOE is still in the process of reviewing the other proposals described in Mirant's compliance plan in consultation with EPA.

NEPA Compliance Actions

Pursuant to CEQ regulations at 40 CFR 1506.11, DOE consulted with CEQ on December 20, 2005, December 22, 2005, January 13, 2006, and January 17, 2006, about formulating a plan for alternative arrangements. Under the agreed upon alternative arrangements plan, which will expire October 1, 2006, unless extended, DOE will:

1. *Prepare a Special Environmental Analysis (SEA).* The SEA will examine potential impacts resulting from issuance of the Order, and describe further DOE decisionmaking regarding reasonable future alternatives and potential further mitigation actions DOE may take in this matter. The analysis will present reasonably foreseeable impacts from possible changes in operations of the Plant over the time until two additional transmission lines planned by PEPCO are installed. DOE intends to issue its SEA no later than August 2006 and will make it available to the public on the DOE NEPA and Mirant matter Web sites as well as announce its availability in the **Federal Register**. DOE will consider information contained in the SEA, and public input received on the SEA, in any future decisionmaking in this matter.

2. *Provide Opportunities for Public Involvement.* DOE is currently accepting public comments on the compliance plan that DOE required Mirant to submit under the DOE Order. DOE also invites public comments on this Notice, as well as on issues to be addressed in the SEA. DOE will consider public input in determining appropriate mitigation measures and any additional actions DOE may take as DOE adaptively manages implementation of the Order. DOE will post on the Mirant matter Web site publicly available information (not exempt from disclosure under the Freedom of Information Act) regarding the environmental effects of ongoing or alternative operations of the Plant (*e.g.*, reasonably available ambient air quality data and results of air quality modeling), that the Department receives from Mirant, EPA, and DEQ.

3. *Continue Agency Consultations.* DOE will continue to consult with EPA and DEQ concerning information on emissions, modeling results, potential mitigation measures, and any changes to the operation of the Plant. EPA will act as a ''cooperating agency'' (see 40 CFR 1501.6 and 1508.5) for purposes of providing reasonably available public information regarding the environmental effects of operations of the Plant to be disseminated via DOE's Mirant matter Web site and evaluated in the SEA.

4. *Identify Mitigation.* DOE will identify in its SEA any steps that it believes can be taken to mitigate the impacts from its Order. DOE will continue to track the impacts of its Order and public input and provide for appropriate mitigation where practicable. DOE will publish on its Web sites, as noted above, its discussion of which mitigation measures are adopted for any future decision, and if not, why they are not adopted.

DOE may modify, in consultation with CEQ, the foregoing alternative arrangements as conditions warrant and will notify the public in the **Federal Register** if it does so.

Issued in Washington, DC, on January 18, 2006.

John Spitaleri Shaw,

Assistant Secretary for Environment, Safety and Health.

[FR Doc. 06–570 Filed 1–19–06; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Project No. 12481–002]

AMG Energy, LLC; Notice of Surrender of Preliminary Permit

January 12, 2006.

Take notice that AMG Energy, LLC, permittee for the proposed Selden Dam Project, has requested that its preliminary permit be terminated. The permit was issued on April 20, 2004, and would have expired on March 31, 2007.[1] The project would have been located on the Black Warrior River in Greene and Hale Counties, Alabama.

The permittee filed the request on December 7, 2005, and the preliminary permit for Project No. 12481 shall remain in effect through the thirtieth day after issuance of this notice unless that day is a Saturday, Sunday, part-day holiday that affects the Commission, or legal holiday as described in section 18 CFR 385.2007, in which case the effective date is the first business day following that day. New applications involving this project site, to the extent provided for under 18 CFR Part 4, may be filed on the next business day.

Magalie R. Salas,

Secretary.

[FR Doc. E6–598 Filed 1–19–06; 8:45 am]

BILLING CODE 6717–01–P

[1] 107 FERC ¶ 62,053.

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Project No. 12485–002]

AMG Energy, LLC; Notice of Surrender of Preliminary Permit

January 12, 2006.

Take notice that AMG Energy, LLC, permittee for the proposed Claiborne Hydroelectric Project, has requested that its preliminary permit be terminated. The permit was issued on June 28, 2004, and would have expired on May 31, 2007.[1] The project would have been located on the Alabama River in Monroe County, Alabama.

The permittee filed the request on December 7, 2005, and the preliminary permit for Project No. 12485 shall remain in effect through the thirtieth day after issuance of this notice unless that day is a Saturday, Sunday, part-day holiday that affects the Commission, or legal holiday as described in section 18 CFR 385.2007, in which case the effective date is the first business day following that day. New applications involving this project site, to the extent provided for under 18 CFR part 4, may be filed on the next business day.

Magalie R. Salas,

Secretary.

[FR Doc. E6–599 Filed 1–19–06; 8:45 am]

BILLING CODE 6717–01–P

[1] 107 FERC ¶ 62,287.

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. RP03–36–015]

Dauphin Island Gathering Partners; Notice of Negotiated Rate

January 13, 2006.

Take notice that on January 9, 2006, Dauphin Island Gathering Partners (Dauphin Island) tendered for filing as part of its FERC Gas Tariff, First Revised Volume No. 1, the revised tariff sheets listed below to become effective February 9, 2006.

Twenty-Fourth Revised Sheet No. 9.
Nineteenth Revised Sheet No. 10.
Seventh Revised Sheet No. 359.
Third Revised Sheet No. 427.

Dauphin Island states that these tariff sheets reflect changes to its statement of negotiated rates and nonconforming transportation and reserve commitment agreement tariff sheets.

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Department of Energy
Washington, DC 20585

January 18, 2006

Ms. Dinah Bear, General Counsel
Council on Environmental Quality
Executive Office of the President
722 Jackson Place, NW
Washington, DC 20503

Dear Ms. Bear:

The purpose of this letter is to document the Department of Energy's (DOE) consultations with the Council on Environmental Quality (CEQ) regarding compliance with the National Environmental Policy Act (NEPA) analyses and documentation requirements associated with the issuance of an emergency order under section 202(c) of the Federal Power Act (the Order) as a result of the shutdown of the Potomac River Generating Station (the Plant) in Alexandria, Virginia, on August 24, 2005. We thank you and others at CEQ for consulting with DOE on this matter on December 20 and 22, 2005, and January 13 and 17, 2006.

As you are aware, DOE issued its Order on December 20, 2005, requiring the owners of the Plant, Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), to generate electricity in certain limited circumstances. Due to the emergency nature of this matter, DOE issued the Order, despite potentially significant environmental impacts, without observing all of the normal provisions of the CEQ Regulations for Implementing the Procedural Requirements of the National Environmental Policy (NEPA) [40 CFR Parts 1500-1508]. Therefore, DOE is pursuing alternative arrangements to comply with NEPA, as provided in Section 1506.11 of the CEQ regulations. As a result of our discussions with CEQ, we propose the following alternative arrangements, which will expire October 1, 2006, unless extended:

1. Issuance of a *Federal Register* Notice, in accordance with DOE's NEPA regulations at 10 CFR 1021.343. The enclosed draft *Federal Register* Notice documents the emergency action that DOE has taken and actions it intends to pursue in the near term to address the electricity reliability emergency in the District of Columbia. The Notice provides background on Plant operations, outlines the Order DOE issued on December 20, 2005, and acknowledges potential environmental impacts from the Order. The Notice also describes DOE's continuing public involvement and preparation of a Special Environmental Analysis, as discussed below.

2. Prepare a Special Environmental Analysis (SEA). The SEA will examine potential impacts resulting from issuance of the Order, and describe further DOE decisionmaking regarding reasonable future alternatives and potential further

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mitigation actions DOE may take in this matter. The analysis will present reasonably foreseeable impacts from possible changes in operations of the Plant over the time until two additional transmission lines planned by Potomac Electric Power Company are installed. DOE intends to issue its SEA no later than August 2006 and will make it available to the public on the NEPA and Mirant matter websites as discussed in the enclosed Notice as well as announce its availability in the *Federal Register*. DOE will consider information contained in the SEA, and public input received on the SEA, in any future decisionmaking in this matter.

3. Provide Opportunities for Public Involvement. DOE is currently accepting public comments on the compliance plan that DOE required Mirant to submit under the DOE Order. DOE also invites public comments on this Notice as well as on issues to be addressed in the SEA. DOE will consider public input in determining appropriate mitigation measures and any additional actions DOE may take as DOE adaptively manages implementation of the Order. DOE will post on DOE's Mirant matter website publicly available information (not exempt from disclosure under the Freedom of Information Act) regarding the environmental effects of ongoing or alternative operations of the Plant (e.g., reasonably available ambient air quality data and results of air quality modeling) that the Department receives from Mirant, the Environmental Protection Agency (EPA), and the Virginia Department of Environmental Quality (DEQ).

4. Continue Agency Consultations. DOE will continue to consult with EPA and DEQ concerning information on emissions, modeling results, potential mitigation measures, and any changes to the operation of the Plant. EPA will act as a "cooperating agency" for purposes of providing reasonably available public information regarding the environmental effects of operations of the Plant to be disseminated via DOE's Mirant matter website and evaluated in the SEA.

5. Identify Mitigation. DOE will identify in its SEA any steps that it believes can be taken to mitigate the impacts from its Order. DOE will continue to track the impacts of its Order and public input and provide for appropriate mitigation where practicable. DOE will publish on its websites as noted above its discussion of which mitigation measures are adopted for any future decision, and if not, why they are not adopted.

We welcome any further suggestions you may have regarding our efforts to comply with NEPA under these emergency circumstances. Thank you for your assistance.

Sincerely,

John Spitaleri Shaw
Assistant Secretary for
Environment, Safety and Health

Enclosure

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
WASHINGTON, D.C. 20503

January 18, 2006

John Spitaleri Shaw
Assistant Secretary for
Environment, Safety and Health
Department of Energy
Washington, DC 20585

Dear Mr. Shaw:

This letter is in response to your January 18, 2006 letter documenting the Department of Energy's (DOE) request, under 40 C.F.R. 1506.11 and 10 CFR 1021.343, that the Council on Environmental Quality (CEQ) provide alternative arrangements for National Environmental Policy Act (NEPA) compliance. Consultation with CEQ is necessary to provide for a NEPA process that addresses the environmental effects of proposals for DOE action needed to maintain a minimally reliable electric power system for the central area of the District of Columbia (DC).

Your letter accurately reflects DOE's consultations with CEQ prior to and following issuance of its December 20, 2005 Order, which requires owners of the Potomac River Generating Station to generate electricity as necessary to address the current limitations of the electricity transmission system that serves central DC. The alternative arrangements proposed in your January 18, 2006 letter are limited to the immediate actions necessary to reduce electricity supply risks to acceptable levels, provide for local involvement and informed decision-making, and otherwise comply with NEPA in a manner appropriate to the nature and scope of the emergency described in the associated Federal Register notice.

Your proposal of alternative arrangements for NEPA compliance is accepted by CEQ. Thank you for your diligent coordination with CEQ. We plan to follow the implementation of these alternative arrangements closely and will remain available for consultation with DOE in this matter at any time.

Sincerely,

Dinah Bear
General Counsel

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APPENDIX D

Consultation Letters with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service

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August 17, 2006

U.S. Fish and Wildlife Service
Threatened and Endangered Species Branch
Chesapeake Bay Office
177 Admiral Cochrane Drive
Annapolis, MD 21401
ATTN: Mary Ratnaswamy

RE: Informal Consultation under Section 7 of the Endangered Species Act (ESA) for Operation of the Potomac River Generating Station in Alexandria, Virginia, Pursuant to DOE Order.

Dear Ms. Ratnaswamy:

This letter is intended to serve as informal consultation under section 7 of the ESA. In this regard, the Department of Energy (DOE) requests that you indicate if there are any additional protected species and habitat (beyond those described below) that should be considered for this ongoing action. If there are not any additional species or habitats and if you agree that the Plant would not impact any species when operating under the DOE Order, we request your concurrence that the operation of the Plant under the terms of the DOE Order would not adversely impact Federally listed or proposed threatened or endangeredspecies or designated or proposed critical habitat and that the consultation requirements of section 7 of the ESA have been satisfied.

Background: On August 24, 2005, Mirant Corporation, and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), ceased operations at its Potomac River Generating Station (the "Plant") in Alexandria, Virginia, after modeling that it conducted indicated that the Plant's operations were causing exceedances of the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act.

Also on August 24, 2005, the District of Columbia (D.C.) Public Service Commission filed an *Emergency Petition and Complaint* with DOE pursuant to section 202(c) of the Federal Power Act.

On December 20, 2005, after an exhaustive review of the facts and consultation with Federal and state officials responsible for environmental compliance and the private entities responsible for operation of the region's electrical grid, the Secretary of Energy issued an emergency order (the "Order") directing Mirant to generate electricity at the coal-fired Plant under certain, limited circumstances. On June 1, 2006, Mirant entered into an Administrative Consent Order (ACO) with the Environmental Protection Agency (EPA) regarding the operation of the Plant. On June 2, 2006, DOE instructed Mirant to comply with the ACO and operate as required under it.

After consultations with the Council on Environmental Quality (CEQ), DOE's Office of Electricity Delivery and Energy Reliability decided to prepare a special environmental analysis (SEA) under the emergencies provision of CEQ's National Environmental Policy Act (NEPA) Implementing Regulations (40 CFR 1506.11) and the emergency circumstances provision of DOE's own NEPA implementing regulations [10 CFR 1021.343(a)]. The SEA will document the assessment of the impacts associated with the emergency activities under DOE Order 202-05-03. The time period for DOE's Order extends to October 1, 2006; however, the SEA also addresses the 15-month period from October 1, 2006, through December 31, 2007, at which time new transmission lines are expected to be available to provide a high level of electric reliability to customers in the Central D.C. area, even in the absence of production from the Plant.

The Plant: The Potomac River Generating Station began operation in 1949 and is capable of producing 482 megawatts of electric power. The Plant site encompasses 28 acres (11 has) near D.C. and Reagan National Airport on the western bank of the Potomac River (Figure 1). Most of the property is used for power generation, coal storage, office buildings, and parking areas. The site was relatively remote when the power plant was built, but Alexandria has grown up around it. The Plant is beneath the flight path of Reagan National Airport.

EPA issued a National Pollutant Discharge Elimination System (NPDES) permit to the Plant on April 20, 2000, authorizing discharges into the Potomac River. The Virginia Department of Environmental Quality approved a Stationary Source Permit to Operate on September 18, 2000, and a Phase II Acid Rain Permit on February 23, 2003.

Coal combustion ash from the Plant is sent to the Brandywine Fly Ash Facility, which is located in southeastern Prince George's County, Maryland (Figure 2). Water from this landfill discharges into the upper reaches of Mataponi Creek.

Action at the Plant under DOE's Order: The DOE Order resulted in no new disturbances from construction at the Plant site. The provisions of DOE's Order and subsequent instructions to Mirant have, however, caused changes in the level of operation at the Plant. These changes have reduced the operating level of the Plant to below that at which it was historically operating before August 24, 2005, but increased the operating level above that at which it was operating between August 24 and December 20, 2005. To reduce sulfur dioxide (SO_2) emissions, Mirant has been using a compound known as "trona" (sodium sesquicarbonate, a naturally occurring substance similar to baking soda) and/or lower sulfur coal. Thus, even if the Plant were operating at the same level as before August 24, 2005, its emissions of SO_2 would be lower.

Threatened and Endangered (T&E) Species Impacts: Because the Plant site is heavily industrialized and surrounded by development in the City of Alexandria, no Federally listed or proposed threatened or endangered species are known or likely to occur on the Plant site. Also, there is no known designated or proposed critical habitat in the area of the action.

Of the permits issued for the Plant or landfill, only the NPDES permit for the Plant mentions T&E species. That permit states that two species listed by the U.S. Fish and Wildlife Service (FWS) under the ESA occur or may occur at locations near the Plant. These are the endangered Hay's Spring amphipod *(Stygobromus hayi)* and the threatened bald eagle *(Haliaeetus leucocephalus).*

The Plant's NPDES permit states, "The FWS and NMFS indicate that at the present time [i.e., April 20, 2000] there is no evidence that the ongoing wastewater discharges covered by this permit are adversely affecting these Federally listed species." Furthermore, "(w)astewater discharges, construction, or any other activity that adversely affects a Federally listed endangered or threatened species are [sic] not authorized under the terms of this permit."

The Hay's Spring amphipod occurs only in a small area in Rock Creek in D.C. The bald eagle is unlikely to occur near the Plant as the area around it is developed and provides no suitable habitat. There has been no known impact to these species due to the Plant's operation prior to the DOE Order. Thus, since there has been no impact to Federally listed threatened or endangered species when the Plant was operating at the higher historical level before August 24, 2005, adverse impacts to such species from the lower level of operation at the Plant under DOE's Order would not be expected.

Since the DOE Order is scheduled to expire on October 1, 2006, receipt of your reply and/or concurrence before that date will allow DOE to consider your comments in determining what, if any, future actions to take in this matter.

If you need additional information or wish to discuss this matter further, please contact me at (202) 586-5935.

Sincerely,

Anthony J. Como
Director, Permitting and Siting
Office of Electricity Delivery and
Energy Reliability
U.S. Department of Energy

Enclosures (2)

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August 17, 2006

Northeast Regional Office
National Marine Fisheries Service
Protected Resource Division
One Blackburn Drive
Gloucester, MA 01930
Attn: Julie Crocker

RE: **Informal Consultation under Section 7 of the Endangered Species Act (ESA) for Operation of the Potomac River Generating Station in Alexandria, Virginia, Pursuant to DOE Order.**

Dear Ms. Crocker:

This letter is intended to serve as informal consultation under section 7 of the ESA. In this regard, the Department of Energy (DOE) requests that you indicate if there are any additional protected species and habitat (beyond those described below) that should be considered for this ongoing action. If there are not any additional species or habitats and if you agree that the Plant would not impact any species when operating under the DOE Order, we request your concurrence that the operation of the Plant under the terms of the DOE Order would not adversely impact Federally listed or proposed threatened or endangered species or designated or proposed critical habitat and that the consultation requirements of section 7 of the ESA have been satisfied.

Background: On August 24, 2005, Mirant Corporation, and its wholly owned subsidiary, Mirant Potomac River, LLC (collectively referred to herein as Mirant), ceased operations at its Potomac River Generating Station (the "Plant") in Alexandria, Virginia, after modeling that it conducted indicated that the Plant's operations were causing exceedances of the National Ambient Air Quality Standards (NAAQS) of the Clean Air Act.

Also on August 24, 2005, the District of Columbia (D.C.) Public Service Commission filed an *Emergency Petition and Complaint* with DOE pursuant to section 202(c) of the Federal Power Act.

On December 20, 2005, after an exhaustive review of the facts and consultation with Federal and state officials responsible for environmental compliance and the private entities responsible for operation of the region's electrical grid, the Secretary of Energy issued an emergency order (the "Order") directing Mirant to generate electricity at the coal-fired Plant under certain, limited circumstances. On June 1, 2006, Mirant entered into an Administrative Consent Order (ACO) with the Environmental Protection Agency (EPA) regarding the operation of the Plant. On June 2, 2006, DOE instructed Mirant to comply with the ACO and operate as required under it.

After consultations with the Council on Environmental Quality (CEQ), DOE's Office of Electricity Delivery and Energy Reliability decided to prepare a special environmental analysis (SEA) under the emergencies provision of CEQ's National Environmental Policy Act (NEPA) Implementing Regulations (40 CFR 1506.11) and the emergency circumstances provision of DOE's own NEPA implementing regulations [10 CFR 1021.343(a)]. The SEA will document the assessment of the impacts associated with the emergency activities under DOE Order 202-05-03. The time period for DOE's Order extends to October 1, 2006; however, the SEA also addresses the 15-month period from October 1, 2006, through December 31, 2007, at which time new transmission lines are expected to be available to provide a high level of electric reliability to customers in the Central D.C. area, even in the absence of production from the Plant.

The Plant: The Potomac River Generating Station began operation in 1949 and is capable of producing 482 megawatts of electric power. The Plant site encompasses 28 acres (11 ha) near the D.C. and Reagan National Airport on the western bank of the Potomac River (Figure 1). Most of the property is used for power generation, coal storage, office buildings, and parking areas. The site was relatively remote when the power plant was built, but Alexandria has grown up around it. The Plant is beneath the flight path of Reagan National Airport.

EPA issued a National Pollutant Discharge Elimination System (NPDES) permit to the Plant on April 20, 2000, authorizing discharges into the Potomac River. The Virginia Department of Environmental Quality approved a Stationary Source Permit to Operate on September 18, 2000, and a Phase II Acid Rain Permit on February 23, 2003.

Coal combustion ash from the Plant is sent to the Brandywine Fly Ash Facility, which is located in southeastern Prince George's County, Maryland (Figure 2). Water from this landfill discharges into the upper reaches of Mataponi Creek.

Action at the Plant under DOE's Order: The DOE Order resulted in no new disturbances from construction at the Plant site. The provisions of DOE's Order and subsequent instructions have, however, caused changes in the level of operation at the Plant. These changes have reduced the operating level of the Plant to below that at which it was historically operating before August 24, 2005, but increased the operating level above that at which it was operating between August 24 and December 20, 2005. To reduce sulfur dioxide (SO_2) emissions, Mirant has been using a compound known as "trona" (sodium sesquicarbonate, a naturally occurring substance similar to baking soda) and/or lower sulfur coal. Thus, even if the Plant were operating at the same level as before August 24, 2005, its emissions of SO_2 would be lower.

Threatened and Endangered (T&E) Species Impacts: Because the Plant site is heavily industrialized and surrounded by development in the City of Alexandria, no Federally listed or proposed threatened or endangered species are known or likely to occur on the Plant site. Also, there is no known designated or proposed critical habitat in the area of the action.

Of the permits issued for the Plant or landfill, only the NPDES permit for the Plant mentions T&E species. That permit states that one species listed by the National Marine Fisheries Service (NMFS) under the ESA, the endangered shortnose sturgeon *(Acipenser brevirostrum)*, occurs or may occur at locations near the Plant.

The Plant's NPDES permit states, "The FWS and NMFS indicate that at the present time [i.e., April 20, 2000] there is no evidence that the ongoing wastewater discharges covered by this permit are adversely affecting these Federally listed species." Furthermore, "(w)astewater discharges, construction, or any other activity that adversely affects a Federally listed endangered or threatened species are [sic] not authorized under the terms of this permit."

The Shortnose Sturgeon Recovery Plan reports that one shortnose sturgeon was captured in 1996 at the mouth of Potomac Creek off the Potomac River downstream from the Plant. However, there are no other recent reports of it occurring in the Potomac River; therefore, there has been no known impact to this species due to the Plant's operation prior to the DOE Order. Since there has been no known impact to Federally listed threatened or endangered species when the Plant was operating at the higher historical level before August 24, 2005, adverse impacts to such species from the lower level of operation at the Plant under DOE's Order would not be expected.

Since the DOE Order is scheduled to expire on October 1, 2006, receipt of your reply and/or concurrence before that date will allow DOE to consider your comments in determining what, if any, future actions to take in this matter.

If you need additional information or wish to discuss this matter further, please contact me at (202) 586-5935.

Sincerely,

Anthony J. Como
Director, Permitting and Siting
Office of Electricity Delivery and
Energy Reliability
U.S. Department of Energy

Enclosures (2)

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

OCT - 3 2006

Anthony J. Como, Director
Permitting and Siting
Office of Electricity Delivery and Energy Reliability
US Department of Energy
Washington, DC 20585

Dear Mr. Como,

This is in response to your letter dated August 17, 2006 requesting consultation pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, regarding the operation of Mirant's Potomac River Generating Station in Alexandria, Virginia.

The Potomac River Generating Station is a coal fired plant located on the western bank of the Potomac River. The Plant began operation in 1949. On August 24, 2005, Mirant ceased operations at its Plant after modeling indicated that the Plant's operations were causing exceedences of the National Ambient Air Quality Standards of the Clean Air Act. On December 20, 2005, the Secretary of Energy issued an emergency order directing Mirant to generate electricity at the Plant under certain circumstances. On June 1, 2006, Mirant entered into an Administrative Consent Order (ACO) with the US Environmental Protection Agency (EPA) regarding the operation of the Plant. The DOE requires the Plant to operate at lower levels and to reduce sulfur dioxide emissions by using a compound known as "trona" (sodium sesquicarbonate) and/or lower sulfur coal. On June 2, 2006, the Department of Energy (DOE) instructed Mirant to comply with the ACO and operate as required under it. Operation of the Plant is necessary to ensure an uninterrupted supply of electricity to the District of Columbia. DOE has indicated that its order to comply with the ACO is scheduled to expire on October 1, 2006. The operation of the Plant from October 1, 2006 through summer 2007 under the terms of the DOE Order is the subject of this consultation. The DOE has made the determination that the operation of the Plant under the Order is not likely to adversely affect any species listed under the jurisdiction of NOAA's National Marine Fisheries Service (NMFS) and has requested that NMFS concur with this determination.

As noted in your letter, the only species listed under the jurisdiction of NMFS that may be present in the vicinity of the proposed project is the endangered shortnose sturgeon (*Acipenser brevirostrum).* During the 1996-2005 time period, the incidental capture of seventy-two different shortnose sturgeon in the Chesapeake Bay and its tributaries had been reported via the US Fish and Wildlife Service Atlantic sturgeon reward program. This number includes six shortnose sturgeon captured incidentally in fishing gear in the Potomac River. Additionally, researchers conducting a survey for shortnose sturgeon in the river captured one mature egg bearing female

in September 2005 and an additional mature egg bearing female in the same location in March 2006. Both fish have been outfitted with sonic tags and are being actively tracked by researchers. The female caught in September overwintered in the Potomac River near Mattawoman Creek. One of the females was documented at the presumed spawning grounds near Little Falls in the spring of 2006. The occurrence of pre-spawning females in the Potomac River suggests that a spawning population of shortnose sturgeon continues to exist in this river system. The Plant is located approximately 24 miles upstream of the suspected overwintering area. Population dynamics of shortnose sturgeon in the Potomac River have not been documented. However, based on patterns in other river systems, shortnose sturgeon likely migrate past the Plant while moving to and from the spawning grounds near Little Falls in the spring (March – June). It is unknown if shortnose sturgeon would occur in this region of the river during other times of the year. If appropriate forage items are present, shortnose sturgeon could also occur in the area in the summer and fall while foraging.

The continuation of operations from October 1, 2006 through summer 2007, would not result in any new construction or in-water disturbances at the plant. The only aspect of the Plant's continued operation that has the potential to impact shortnose sturgeon is the discharge of waste water from the Plant to the Potomac River. These discharges are authorized under a NPDES permit issued by the EPA. NMFS has previously consulted with the EPA on the NPDES permit for the Plant and determined that the discharges are not likely to adversely affect shortnose sturgeon. While the past operation of the plant has resulted in air quality impairments, there is no information available that indicates that the operation of the plant has had an adverse effect on water quality in the Potomac River. No other impacts from the operation of the Plant under the DOE order are likely. As such, NMFS concurs with DOE's determination that the continued operation of the Plant through summer 2007 is not likely to adversely affect any species listed under NMFS jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Should project plans change or new information become available that changes the basis for this determination, or a new species be listed or critical habitat designated, consultation should be reinitiated. Should you have any questions about this correspondence please contact Julie Crocker at (978) 281-9300 ext. 6530.

Sincerely,

Patricia A. Kurkul
Regional Administrator

Cc: Scida, F/NER3
Nichols, F/NER4
Williams, GCNE

File Code: Sec 7 DOE Mirant Potomac Generating Station
PCTS I/NER/2006/04102

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401
410/573-4575

November 20, 2006

RE: Informal Consultation under Section 7 of the Endangered Species Act (ESA) for Operation of the Potomac River generating Station in Alexandria, Va.

Dear Mr. Como,

This responds to your letter, received November 20, 2006, requesting information on the presence of species which are federally listed or proposed for listing as endangered or threatened in the above referenced project area. We have reviewed the information you enclosed and are providing comments in accordance with section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Except for occasional transient individuals, no proposed or federally listed endangered or threatened species are known to exist within the project impact area. Therefore, no Biological Assessment or further section 7 consultation with the U.S. Fish and Wildlife Service is required. Should project plans change, or should additional information on the distribution of listed or proposed species become available, this determination may be reconsidered.

This response relates only to federally protected threatened or endangered species under our jurisdiction. Limited information is currently available regarding the distribution of other rare species in the District of Columbia. However, the Nature Conservancy and National Park Service (NPS) have initiated an inventory of rare species within the District. For further information on such rare species, you should contact Mary Pfaffko of the National Park Service at (202)-535-1739.

An additional concern of the Service is wetlands protection. Federal and state partners of the Chesapeake Bay Program have adopted an interim goal of no overall net loss of the Basin's remaining wetlands, and the long term goal of increasing the quality and quantity of the Basin's wetlands resource base. Because of this policy and the functions and values wetlands perform, the Service recommends avoiding wetland impacts. All wetlands within the project area should be identified, and if alterations of wetlands is proposed, the U.S. Army Corps of Engineers, Baltimore District, should be contacted for permit requirements. They can be reached at (410) 962-3670.

We appreciate the opportunity to provide information relative to fish and wildlife issues, and

thank you for your interests in these resources. If you have any questions or need further assistance, please contact Devin Ray at (410) 573-4531.

Sincerely,

Mary Ratnaswamy

Mary J. Ratnaswamy, Ph.D.
Program Supervisor, Threatened and Endangered Species

APPENDIX E

Organizational Conflict of Interest Statement

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NEPA DISCLOSURE STATEMENT FOR PREPARATION OF A
SPECIAL ENVIRONMENTAL ANALYSIS FOR ACTIONS TAKEN UNDER DOE ORDER 202-05-3 REGARDING OPERATION OF THE POTOMAC RIVER GENERATING STATION IN ALEXANDRIA, VIRGINIA

CEQ Regulations at 40 CFR 1506.5(c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981, guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)." 46 FR 18026-10838 at 10831.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: [check either (a) or (b) to assure consideration of your proposal].

(a) __X__ Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

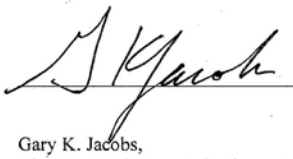
Financial or Other Interests

1.

2.

3.

Certified by:



Signature

Gary K. Jacobs,
Director, Environmental Sciences Division
Printed Name and Title

Oak Ridge National Laboratory,
Managed for the U.S. Department of Energy
by UT-Battelle, LLC
Company

11-1-06
Date

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APPENDIX F

Glossary

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GLOSSARY

Anadromous - species that spend their adult lives in saltwater and spawn in freshwater.

Ash - the mineral content of a product remaining after complete combustion.

Baseload - generating units that produce power at a steady rate for extended periods.

Biochemical oxygen demand - a standard quantitative measure of water pollution. It is the amount of oxygen consumed in the biological oxidation (by bacteria or other microorganisms) of organic material in a unit volume of waste water, as measured over a five-day period. Biochemical oxygen demand sometimes is divided into two components: carbonaceous oxygen demand and nitrogenous oxygen demand. Carbonaceous biochemical oxygen demand is the result of the breakdown of organic molecules such as cellulose and sugars, while nitrogenous oxygen demand is the result of the breakdown of proteins.

Biocide - a substance (e.g., chlorine) that is toxic or lethal to many organisms and is used to treat water.

Blowdown - the portion of steam or water removed from a boiler at regular intervals to prevent excessive accumulation of dissolved and suspended materials.

Bottom ash - combustion residue composed of large particles that settle to the bottom of a combustor from where they can be physically removed.

Calcining - the effects of heating a substance to a high temperature (below the melting or fusing point) at which point loss of moisture, reduction or oxidation, or the decomposition of carbonates and other compounds occurs.

Candidate species - plants and animals native to the United States for which the Fish and Wildlife Service or the National Marine Fisheries Service has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because other species have a higher priority for listing. The Services determine the relative listing priority of candidate taxa in accordance with general listing priority guidelines published in the *Federal Register*. (See endangered species and threatened species.)

Cooling water - water that is heated as a result of being used to cool steam and condense it to water.

Cyanobacteria - blue-green algae.

Diadromous - fish spending part of their lives in both fresh and salt water.

Downwash (building) - the downward movement of an elevated plume toward the area of low pressure created on the lee side of a structure in the wake around which the air flows.

Electrostatic precipitator - a device that removes particles from a stream of exhaust gas. It imparts an electrical charge to the particles, which causes them to adhere to metal plates that can be rapped to cause the particles to fall into a hopper for disposal.

Endangered species - plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR 424). (See threatened species.) The lists of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23(a) (marine organisms). The state of Virginia also lists species as endangered under its Endangered Species Act.

Entrainment - incorporation of any life stage of fish and shellfish with water flow entering and passing through a cooling water intake structure and into an industrial, municipal or electric utility power plant cooling water system.

Estuary - region of interaction between rivers and near-shore ocean waters, where tidal action and river flow mix fresh and salt water. Such areas include bays, mouths of rivers, salt marshes, and lagoons. These brackish water ecosystems shelter and feed marine life, birds, and wildlife. (See wetlands.)

Fall line - the boundary zone where the upland piedmont region meets the coastal plain. Waterfalls and rapids occur where rivers and streams cross the fall line.

Finfish - a fish with fins (which is most fish), in contrast to shellfish, crayfish, and jellyfish (which are not fish).

Fly ash - combustion residue composed of fine particles (e.g., soot) that are entrained with the draft leaving the combustor.

Fresh water - water with a low concentration of salts (typically less than 1,000 parts per million of dissolved solids).

Hazardous waste - a category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.

Impingement - the entrapment of any life stage of fish and shellfish on the outer part of an intake structure or against a screening device during intake water withdrawal.

Leachate - solution or product obtained by leaching, in which a substance is dissolved by the action of a percolating liquid.

Load following - power generating units that are capable of changing power levels quickly as demand rises or falls. They are also known as cycling units.

pH - a measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7. Acid solutions have pH values lower than 7, and basic (i.e., alkaline) solutions have pH values higher than 7.

Plume (atmospheric) - a visible or measurable, elongated pattern of emissions spreading downwind from a source through the atmosphere.

Pozzolanic - material that when mixed with water "sets," like cement.

Riparian - areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands.

Saline - describes water with high concentrations of salts (typically more than 10,000 parts per million dissolved solids), making it unsuitable for use.

Stratosphere - the portion of the atmosphere 10 to 25 mi (16 to 40 km) above the earth's surface.

Threatened species - any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR 424). (See endangered species.) The lists of threatened species can be found at 50 CFR 17.11 (wildlife), 17.12 (plants), and 227.4 (marine organisms). The state of Virginia also lists species as threatened under its Endangered Species Act.

Tidal river - a river segment with fresh water (salinity less than 500 mg/L) and a net seaward flow direction throughout the water column.

Transmission (electric) - movement of electrical power from the source where it is produced to end users.

Trona - a naturally occurring chemical compound, sodium sesquicarbonate, similar to baking soda.

Troposphere - the layer of the atmosphere closest to the earth's surface.

Watershed - the region draining into a river, river system, or other body of water.

Wetlands - areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

Wind rose - a graph in which the frequency of wind blowing from each direction is plotted as a bar that extends from the center of the diagram. Wind speeds are denoted by bar widths and shading; the frequency of wind speed within each wind direction is depicted according to the length of that section of the bar.