

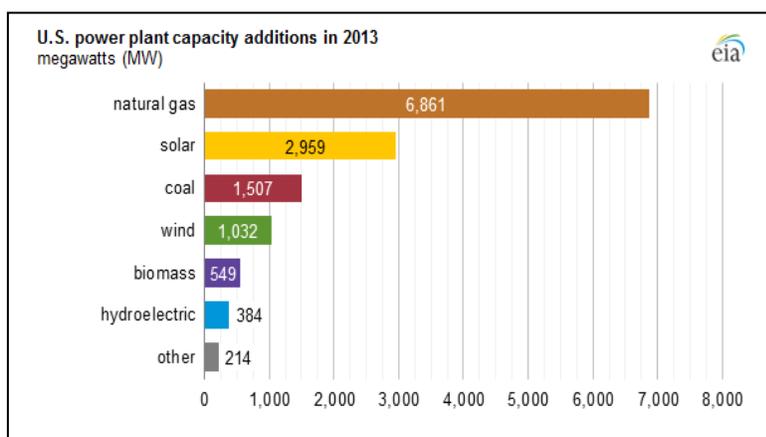
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 Representing the ISO-RTO Council
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DOE Quadrennial Energy Review

Gas Electric Interdependencies: Coordination Efforts, Regional Issues, and Remaining Challenges

The seven Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) operate the nation’s bulk electricity grid, administer wholesale electricity markets, and conduct system power planning. Two-thirds of all electric consumers in the United States are served by an ISO or RTO.

Natural gas has become the fuel of choice for new generation, accounting for the majority of capacity additions in the United States in recent years. In 2013, gas-fired power plants accounted for just over 50% of new capacity additions.



Currently, almost half of the total installed capacity in the ISO/RTO regions comes from natural-gas fired generation, with higher percentages regionally. The locations of these plants vary. In some regions, the majority of gas-fired generators are directly connected to interstate pipelines. While in other regions, the majority of gas-fired generators are located behind a gas local distribution company (LDC).

ISO/RTO	Total ICAP (GW)	Gas-Capable ICAP (GW)	% of Total	Interstate ICAP (GW)	% Interstate	Intrastate/LDC ICAP (GW)	% Intrastate/LDC
PJM	183	78.7	43%	40.0	51%	38.7	49%
MISO	177	69.0	39%	44.6	65%	24.4	35%
NYISO	38	21	55%	4.3	20%	16.7	80%
CAISO	54	37	69%	6	16%	31	84%
ISO-NE	35	18.6	53%	14.3	77%	4.3	23%
Total	487	224.3	46%	109.2	49%	115.1	51%

Source: Eastern Interconnection Planning Collaborative (EIPC), Gas Electric Study, Target 1 and CAISO
 Note that the final EIPC report may provide updated figures for regions involved in the study.

Challenges related to market timing differences

The gas and electric markets have different operating days and different scheduling times. In some ISO/RTO regions generators do not yet know their day-ahead electric schedule before the close of the day-ahead gas Timely Cycle. In addition, given the operating day difference, generators nominate gas over one gas operating day, but over two electric operating days. Schedules for the second electric day are not yet known when generators nominate gas.

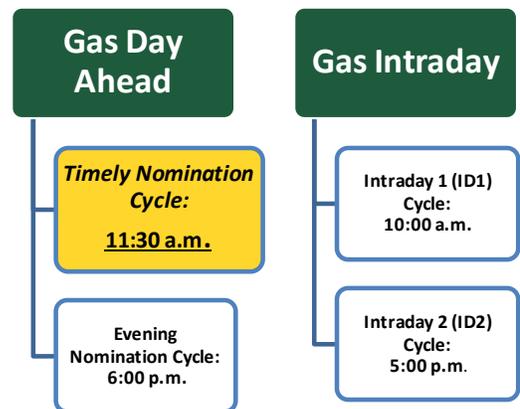
Operating Day Differences

Gas Day: 9 am – 9 am (Central Time)

Electric Day: 12 am – 12 am

Scheduling Differences

ISO/RTO	Bids Due (CT)	Day-Ahead Commitment Posted (CT)
California ISO	12:00 pm	3:00 pm
ISO-New England	9:00 am	12:30 pm
PJM	11:00 am	3:00 pm
MISO	10:00 am	2:00 pm
New York ISO	4:00 am	10:00 am
SPP	11:00 am	4:00 pm



Challenges related to gas scheduling

While the electric system is scheduled day-ahead, real-time electric system conditions can differ from day-ahead assumptions. Responding to unplanned outages in real-time, or adjusting to load forecast changes, for example, can require immediate system operator action to maintain electric system reliability.

Most generators in organized energy markets rely on secondary released capacity or interruptible transportation contracts, and often purchase gas through marketers. Even though gas can be nominated all days, gas markets are often less liquid during weekends, holidays, evening, and overnight hours. This means that it can sometimes be challenging for generators to purchase gas outside of normal business hours. In addition, relying on secondary or interruptible contracts means that generators may be at risk of not being able to transport gas on days when pipelines are constrained.

On non-peak gas days, there is often flexibility on the pipeline system to accommodate in-day nomination changes. Some pipelines even offer hourly nomination cycles, although most do not. However, during Operational Flow Orders (OFOs) flexibility on the pipeline system is limited. If during an OFO, pipelines or LDCs require ratable, hourly flows, this can further limit flexibility.

FERC Gas Electric Coordination

The Federal Energy Regulatory Commission (FERC) has taken a number of steps toward better coordinating the gas and electric industries.

- Technical conferences held in 2012 and 2013 examined issues related to scheduling and market timing differences, and communication and information-sharing.
- FERC Order 787: Permits ISO/RTOs and interstate pipelines to share non-public, operational information with each other for the purpose of promoting reliable service or operational planning on either system.
- FERC NOPR: Proposed modifying the Gas Operating Day (from 9am-9am CT to 4am-4am CT); Modifying the Timely Cycle nomination (from 11:30am CT to 1pm CT); and modifying the intra-day cycle times, as well as including additional intra-day cycles.

The FERC NOPR asked the electric and gas industries to work through the North American Energy Standards Board (NAESB) to reach consensus on any revisions to the proposed market timing changes. While a number of alternative proposals were considered, no consensus was reached during the NAESB Gas Electric Harmonization (GEH) Forum, since there was no agreement on the start of the gas operating day. However, given that there was some agreement on making changes to the day-ahead gas nomination cycle timing as well as the intraday scheduling cycles, the NAESB Board of Directors directed the development of standards to support these new scheduling times.

ISO/RTO Gas Electric Coordination

A number of efforts are underway to better coordinate gas and electric system operations. Since many of the interstate pipelines cross ISO/RTO regions, electric system operators are working together to create common communication procedures for sharing real-time operational information and coordinating planned outages. In addition, many ISO/RTOs are considering changes to their market designs and system planning processes, including making changes to their day-ahead scheduling times to better align with the proposed later (1 p.m. CT) Timely Cycle nomination.

The ISO/RTOs continue to support the 4 a.m. (CT) start to the gas operating day. The current start to the gas operating day requires generators to nominate gas over two electric days. Gas scheduled in the day-ahead Timely cycle covers the evening peak of one electric day, and the morning peak of a different electric day. Moving the gas operating day to an earlier time allows generators to nominate gas in the day-ahead Timely Cycle to cover the morning and evening peaks of the same electric day. This is especially helpful during extreme cold weather, when operating conditions on the gas pipeline can change drastically from one day to the next.

Gas Electric System Interface Study

The Eastern Interconnection Planning Collaborative is engaged in a study to assess gas and electric infrastructure adequacy. Planning authorities taking part in this study include: ISO New England, New York ISO (NYISO), PJM Interconnection (PJM), Ontario's Independent Electricity System Operator (IESO), the Midcontinent ISO (MISO) (including the MISO South/Entergy system), and the Tennessee Valley Authority (TVA).

This DOE-funded study has four targets:

Target 1: Develop a baseline assessment, including descriptions of the natural gas-electric system interfaces, interaction effects, and specific drivers of the pipeline/LDC planning process. (Complete)

- Reported that the natural gas infrastructure was not designed to meet the coincident gas requirements of the higher priority core gas loads associated with gas utility send out to residential, commercial and industrial (RCI) loads, and the lower priority non-core gas loads associated with gas-fired generators lacking primary firm transportation entitlements.

Target 2: Evaluate the capability of the natural gas systems to meet individual and aggregate core and non-core gas demand over a 5- and 10- year horizon (Preliminary Draft Available)

- Identified gas system infrastructure constraint points and evaluated infrastructure adequacy to meet generation on winter and summer peak days.

Target 3: Identify contingencies on the natural gas system that could adversely affect electric system reliability, and vice versa.

Target 4: Review the operational / planning issues affecting the availability of dual fuel capable generation, including fuel assurance objectives.