Gas and Electric Coordination: Is It Needed? If So, For What End?

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What is the Problem?

Trends in expanded gas use and reliance

Natural Gas Flows into New England, Algonquin Pipeline

... supply constraints create “stressed” market conditions in summer as well as winter months

Source: EIA

As gas-fired generation displaces other resources ...

Dollars per MMBtu

Algonquin Citygates
Tennessee Dracut
Reliability Concerns Vary Across Regions

Reliance on gas-fired generation varies across regions, as will need to support variable (renewable) resources

What is the Problem?

Actual system performance

- Incidents and “close calls” in many regions (e.g., ISO-NE, Southwest/ERCOT, Northwest)
- Performance of gas-fired generation under stressed market/system conditions
- High demand (relative to gas infrastructure) limiting supplies and creating high/volatile daily/hourly prices
- Supply disruptions (Gulf hurricanes, Southwest, Sable Island), pipeline contingencies
- Operational problems from deviations between flows and schedules
- Resource performance under cold weather

Are we adequately measuring reliability indicators in a systematic fashion?

- Leading indicators?
  - Modeled LOLE
  - Gas pipeline restrictions, curtailments and pressure drops
  - Generator failure to follow dispatch requests
What are the Potential Solutions?

Areas for market and system modifications under discussion:

- Communications between gas and electric system operators
- Coordination and enhancement of gas and electric market operation
- Performance (deliverability) obligations in electricity markets
- Enhanced services from pipelines
- Planning and resource procurement
Areas for potential market coordination or enhancement

- Sequence of electric and gas market scheduling/commitment/clearing (price v. quantity risk)
- Overlap of gas and electric days (gas day ends/begins during AM ramp)
- Ability to update market offers (for intraday gas price changes)

Potential impacts on reliability

- Align generator real-time incentives to deliver with their (day ahead) offers (particularly when dispatch differs from day-ahead markets)
  - Because of stale offers, real-time electric prices may not reflect real-time fuel costs
  - Difference in fuel costs/availability across gas days (pre-10amCT, post 10amCT)
- Provide generators with best opportunity to procure fuel supplies to meet day-ahead commitments (given the sequential nature of current gas nomination process)
- Improve to system operator assessment of likely unit performance
- Provide greater opportunity to commit long lead-time (non-gas) units
Example: Timing of Commitment Relative to Gas Market Nomination

**RTO/ISO Markets**

- **ISO NE**
  - **Initial Offers**
  - **Initial Commitment (Binding)**
  - **Final Commitment After Evening Gas Nomination**
  - **Initial Offers**
  - **Reoffers**
  - **Final Commitment Before Evening Gas Nomination**

- **ISO NE (Proposal Under Consideration)**

- **NYISO**
  - **Initial Offers Due**
  - **Initial Offers**
  - **Initial Offer / Reoffers**
  - **Reoffers**
  - **Final Commitments**

**Gas Pipeline**

- **Gas Nominations Due**
- **Schedules Announced**
- **Evening**

**Timely (Initial)**
Market Coordination and Enhancement (continued)

Example: Timing of Gas Day Relative to Electric System AM Ramp

Average System Demand - 2010 to 2011
Performance obligations in electricity markets

Electricity market reliability products with performance obligations

- Operating reserves markets
- Capacity markets
- Fast-ramping markets (to back variable resources)?

Requirements

- Technology-based ("command and control")
- Performance-based ("market based")

Technical options for more reliable performance have a range of costs, performance and ancillary benefits

- Dual fuel capability
- Storage, including LNG storage
- Firm or no-notice gas service (supported by more pipeline capacity?)
- Demand resources
Elements of performance-based obligations

- Measuring performance
  - Costs of monitoring are low and measurement certainty is high
  - Cost of imposing penalties is low (excepting litigated violations)
  - When to monitor performance? All periods v. “risky” periods (e.g., fuel scarcity, reserve deficiencies)

- Penalty/reward structure
  - Basis for penalty can be (1) costs to load or (2) cost recovery
  - Costs to load can reflect
    - Actual costs to load (value of lost load, change in system costs)
    - Expected costs to load (value of expected lost load, expected change in system costs)
Advantages of performance-based approach:

- Allows market to determine the least-cost means of achieving performance
  - Most cost-effective option may vary with type of generation facility, existing technologies/arrangements

<table>
<thead>
<tr>
<th>ISO-NE Dual Fuel Capability of Gas-Fired Fleet, MW (Estimate)</th>
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<tbody>
<tr>
<td>Dual Fuel Capable</td>
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<tr>
<td>Under- or Unutilized Dual Fuel Capability</td>
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<tr>
<td>No Dual Fuel Capability</td>
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- Maintains incentives for “soft” operational performance as well as “hard” investment (dual fuel capability, firm gas service, etc.)
- Avoids need to choose among widely varying technology performance (e.g., numbers of days of backup fuel; storage refill times; risks of backup contingencies)
- Eliminates need to audit?
  - Is there a need to audit capability if structure of penalties/rewards creates sufficient incentives? What would be the performance specification or technical specifications for compliance?
Enhanced Services from Pipelines

Opportunities for expanded pipeline services

- Pipelines currently provide flexibility to generators under normal operating conditions but impose constraints when capacity is limited (e.g., operational flow orders)

- Electric system operations necessitate intra-day flexibility
  - Variable flow over the course of the day
  - Unanticipated changes in flow (to meet dispatch changes, especially with greater variable resources)

- Value/price of this flexibility is generally not reflected in current rates/services offered (except through imbalance penalties)

- Is there scope for increased efficiencies in use of pipeline capacity (line pack) during tight conditions, including better allocation of supplies across generation units?

Enhanced pipeline services requires demand from generators to incur their additional costs
Do the combination of market coordination/enhancements and performance incentives adequately address market failures leading to reliability concerns?

Are there other market failures not addressed by these changes?

- Investment in pipelines capacity to meet electric sector needs given system benefits (i.e., lower production costs across the year)?

Would planning (with resource procurement) fill these gaps?
Other Information


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