Winter Storm Elliott
Natural Gas Fuel Supply Issues

Brian Fitzpatrick
Principal Fuel Supply Strategist
Operating Committee
April 13, 2023
Forced Outages/Derates by Fuel Type

SATURDAY, DEC. 24 AT 07:00:

46,124 MW

Fuel Types:
- Other
- Hydro
- Nuclear
- Oil
- Coal
- Gas

Note: Only even hours are shown for readability with the exception of Dec. 24, 2022 07:00 which was the hour with the largest amount of forced outages and derates

Dec. 23
2 a.m. | 10 a.m. | 6 p.m. | 2 a.m. | 10 a.m. | 6 p.m. | 2 a.m. | 10 a.m. | 6 p.m.

Dec. 24

Dec. 25

Uses March 1, 2023 GADS data
Forced MWh by Fuel Type and Cause

Fuel Types:
- Coal
- Gas
- Oil
- Nuclear
- Hydro
- Other

Uses March 1, 2023 GADS data
Gas – Forced Outages/Derates by Cause

Causes:
- Performance
- Secondary Fuel
- Emissions
- Boiler/HRSG
- Turbine
- Plant Equipment
- Freezing
- Gas Supply

Note: Only even hours are shown for readability with the exception of Dec. 24, 2022 07:00 which was the hour with the largest amount of forced outages and derates.
### Pipeline Operating Conditions

<table>
<thead>
<tr>
<th>Name</th>
<th>December</th>
<th>Pipeline Notice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelphia Gateway</td>
<td>14-21</td>
<td><strong>Restrictions on Non-Firm Contracts</strong> Customers with interruptible transportation contracts at higher risk of not being able to schedule adequate pipeline capacity</td>
</tr>
<tr>
<td>ANR</td>
<td>6-7</td>
<td><strong>Ratable Take Requirement</strong> Pipeline requiring customers to supply and burn gas at uniform hourly rates to avoid excessive pressure fluctuations</td>
</tr>
<tr>
<td>BHE EGTS</td>
<td>1-5</td>
<td><strong>Critical Day</strong> (Transport Deliveries/Storage Withdrawals) Pipeline requiring customers to stay within their transportation and storage contractual requirements</td>
</tr>
<tr>
<td>BHE Cove Point</td>
<td>2-3, 7</td>
<td><strong>Action Alert (Daily Balancing)</strong> Requires customers to ensure that their supply and demand is balanced at the end of each 24 hour gas day within the tolerances provided by the pipeline tariff provisions</td>
</tr>
<tr>
<td>Columbia Gas Transmission</td>
<td>1-2, 7</td>
<td><strong>Phases 1 and 2 Cold Weather Advisory</strong> Alerting customers of pending cold temperatures and tightening system conditions</td>
</tr>
<tr>
<td>Eastern Shore</td>
<td>4-7</td>
<td><strong>Phases 1 and 2 Cold Weather Extreme Conditions</strong> Requires customers to abide by their specific contract and rate provisions and to burn gas on a uniform hourly basis as their contracts direct. Interruptible contracts at greater risk of having service cut</td>
</tr>
<tr>
<td>East Tennessee Natural Gas</td>
<td>1-7</td>
<td><strong>Daily Balancing OFO</strong> Requires customers to ensure that their supply and demand is balanced at the end of each 24 hour gas day within the tolerances provided by the pipeline tariff provisions</td>
</tr>
<tr>
<td>Horizon</td>
<td>2</td>
<td><strong>Force Majeure</strong> Declared when there is an event outside of the pipeline's control occurs which may render service unavailable to certain customers regardless of contractual arrangements (ex. Loss of compressor station)</td>
</tr>
<tr>
<td>NGPL</td>
<td>1-2, 6</td>
<td><strong>Loss of Upstream Supply</strong> As a result of less gas coming into the pipeline due to upstream supply failures, pipelines provide notice that risk of downstream pressure loss and customer nomination cuts are increasing.</td>
</tr>
<tr>
<td>Northern Border</td>
<td>2-7</td>
<td><strong>Phase 1 Cold Weather Advisory</strong> Alerting customers of pending cold temperatures and tightening system conditions</td>
</tr>
<tr>
<td>Panhandle Eastern</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td>Tennessee Gas Pipeline</td>
<td>1-7</td>
<td></td>
</tr>
<tr>
<td>Texas Eastern</td>
<td>7-8</td>
<td></td>
</tr>
<tr>
<td>Texas Gas</td>
<td>7-8</td>
<td></td>
</tr>
<tr>
<td>Transco</td>
<td>7-9</td>
<td></td>
</tr>
<tr>
<td>Vector</td>
<td>7-9</td>
<td></td>
</tr>
</tbody>
</table>
Natural Gas Production

U.S. Dry Gas Production (Bcf/d)

Well Freeze Offs
~20%
Production Loss
Dec. 23 – 26, 2022
Gas Fuel Related Outages by Category by Percent of ICAP

Dec. 23, 2022
- Dual Fuel: 5.6%
- Gas Only/Firm Transport and Supply: 17.4%
- Gas Only/Non Firm: 27.3%

Dec. 24, 2022
- Dual Fuel: 6.9%
- Gas Only/Firm Transport and Supply: 26.4%
- Gas Only/Non Firm: 29.8%

Dec. 25, 2022
- Dual Fuel: 4.2%
- Gas Only/Firm Transport and Supply: 23.0%
- Gas Only/Non Firm: 29.8%

Dec. 26, 2022
- Dual Fuel: 4.3%
- Gas Only/Firm Transport and Supply: 14.2%
- Gas Only/Non Firm: 16.0%
Appendix
Gas Generation Outage MW Due to Supply Loss Firm vs Non Firm Contracts

Single Fuel – Firm - Gas Only Generation

- MW
- Outage MW
- Installed Capacity MW
- ICAP = 44,284 MW

<table>
<thead>
<tr>
<th>Date</th>
<th>Outage MW</th>
<th>Installed Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 23, 2022</td>
<td>4,773</td>
<td></td>
</tr>
<tr>
<td>Dec. 24, 2022</td>
<td>7,232</td>
<td></td>
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<tr>
<td>Dec. 25, 2023</td>
<td>6,302</td>
<td></td>
</tr>
<tr>
<td>Dec. 26, 2023</td>
<td>3,877</td>
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</tr>
</tbody>
</table>

Single Fuel – Non Firm - Gas Only Generation

- MW
- Outage MW
- Installed Capacity MW
- ICAP = 10,816 MW

<table>
<thead>
<tr>
<th>Date</th>
<th>Outage MW</th>
<th>Installed Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 23, 2022</td>
<td>2,951</td>
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<tr>
<td>Dec. 24, 2022</td>
<td>4,821</td>
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<td>Dec. 25, 2023</td>
<td>3,224</td>
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<tr>
<td>Dec. 26, 2023</td>
<td>1,730</td>
<td></td>
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</table>
Fuel Outage MW - Dual Fuel

ICAP = 24,738 MW

<table>
<thead>
<tr>
<th>Date</th>
<th>Outage MW</th>
<th>Installed Capacity MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 23, 2022</td>
<td>1,381</td>
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</tr>
<tr>
<td>Dec. 24, 2022</td>
<td>1,709</td>
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<tr>
<td>Dec. 25, 2023</td>
<td>1,041</td>
<td></td>
</tr>
<tr>
<td>Dec. 26, 2023</td>
<td>1,060</td>
<td></td>
</tr>
</tbody>
</table>
Facilitator:
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custsvc@pjm.com

Winter Storm Elliott – Gas Supply Issues
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