The Reliability Landscape: A Look Forward

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Reliability Papers and Studies
The PJM fleet has adequate resources and enough essential reliability services, but we need our generators to perform when called upon.

Generation retirements may outpace new entry with a simultaneous likelihood of load increasing, thereby creating resource adequacy concerns.

We will continue to need some amount of thermal generation to provide certain essential reliability services until a replacement technology is deployable at scale.
Our Reliability Concerns

The Immediate Concern
Support Resource Performance

The Near-Term Concern
Ensure Resource Adequacy

Energy Transition in PJM:
Resource Retirements, Replacements & Risks
Feb. 24, 2023

The Upcoming Concern
Maintain & Attract Essential Reliability Services

Energy Transition in PJM:
Frameworks for Analysis
Dec. 15, 2021
Initial Actions To Support Reliability

- CIFP/RASTF Priorities
- Reserve Certainty
- Load Following/Dispatchability
- Short-Term Forecasting

Proactive Planning:
- LTRTP
- Resilience
- Interregional

- LDA Modeling
- RMR Improvements
- Policy Reliability Safety Measures
- Continued Queue Improvements

- Energy Assurance
- Gas/Electric Coordination

*Elliott Placeholder*
Initial Actions To Support Reliability – Breakdown

**Support Excellence in Grid Performance**
- CIFP/RASTF Priorities
- Reserve Certainty
- Load Following/Dispatchability
- Short-Term Forecasting
- Gas/Electric Coordination
- Proactive Planning: LTRTP
- Proactive Planning: Resilience
- *Elliott Placeholder*

**Ensure Resource Adequacy**
- CIFP/RASTF Priorities
- LDA Modeling
- Gas/Electric Coordination
- RMR Improvements
- Policy Reliability Safety Measures
- Continued Queue Improvements
- Proactive Planning: LTRTP
- Proactive Planning: Interregional
- *Elliott Placeholder*

**Maintain and Attract Essential Reliability Services**
- CIFP/RASTF Priorities
- Reserve Certainty
- Energy Assurance
- Gas/Electric Coordination
- RMR Improvements
- Policy Reliability Safety Measures
- Proactive Planning: LTRTP
- *Elliott Placeholder*
Discussion

Reserve Certainty | Reliability Backstop | IMM Perspective

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Vice President, Market Design & Economics

Joe Bowring
President, Monitoring Analytics
Interconnection Progression Forecast & Long-Term Transmission Reforms

Ken Seiler
Vice President, Planning
## Interconnection Request Data as of March 20, 2023

<table>
<thead>
<tr>
<th>Phase</th>
<th>Number of Projects</th>
<th>Nameplate (GW)</th>
<th>Capacity (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully Executed Agreements</td>
<td>540</td>
<td>38.1</td>
<td>25.1</td>
</tr>
<tr>
<td>Out for Execution</td>
<td>45</td>
<td>5.7</td>
<td>2.2</td>
</tr>
<tr>
<td>AD2 and Prior (Pre-Transition)</td>
<td>None − All Complete or Out for Execution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE1 − AG1 (Fast Track and TC #1)</td>
<td>824</td>
<td>94.3</td>
<td>54.1</td>
</tr>
<tr>
<td>AG2 − AH1 (TC #2)</td>
<td>1,204</td>
<td>100.9</td>
<td>68.7</td>
</tr>
<tr>
<td>AH2 &amp; Beyond (New Process Cycle #1)</td>
<td>997</td>
<td>62.4</td>
<td>66.9</td>
</tr>
<tr>
<td><strong>Total for All Phases</strong></td>
<td><strong>3,610</strong></td>
<td><strong>301.4</strong></td>
<td><strong>217.0</strong></td>
</tr>
</tbody>
</table>
Study Projections

GW

- High ISAs
- Medium ISAs
- Low ISAs
- Cumulative Studies

- 2023: 45 GW
- 2024: 51 GW
- 2025: 61 GW
- 2026: 85 GW

- High ISAs: 68 GW
- Medium ISAs: 95 GW
- Low ISAs: 82 GW
- Cumulative Studies: 96 GW

- High ISAs: 96 GW
- Medium ISAs: 133 GW
- Low ISAs: 99 GW
- Cumulative Studies: 156 GW

- High ISAs: 156 GW
- Medium ISAs: 184 GW
- Low ISAs: 117 GW
- Cumulative Studies: 257 GW
Several stakeholders expressed interest in pursuing a parallel process to the queue for deactivating resource owners to transfer their CIRs to replacement resources.

- Problem Statement/Issue Charge (PS/IC) to be presented at the May Planning Committee.
- Process would allow these requests to be studied on an expedited basis in advance of all queued projects.
- Opportunity to expedite a narrow set of projects with limited transmission impacts to bring more generation on line.
Note: Please note that other, more accelerated transition options were offered during the course of the IPRTF but were rejected by stakeholders.
External Variables Affecting Build-Out:

<table>
<thead>
<tr>
<th>Local Opposition</th>
<th>Cost of Capital</th>
<th>Supply Chain Issues</th>
<th>Siting &amp; Permitting</th>
<th>Market Signals</th>
</tr>
</thead>
</table>

Transition Risks:
- Outside processes impacting interconnections (ELCC TRR)
- Customer requests and complaints
- New stakeholder processes

Note: Transitional Resource Request (TRR)
OBJECTIVE:
The long-term planning framework will develop plausible future changing resource mix and load growth scenarios that identify needs that may require long-lead transmission solutions and/or result in more robust or expandable short-term transmission solutions.

| Formed a new Scenario Analysis & Special Studies Department | Lead long-term planning studies/scenarios/sensitivities/benefits | Developing a long-term planning framework and will engage in stakeholder discussion in Q3 2023 |

Note:
• Early 2022, PJM facilitated Long-Term Planning Reform Workshops resulting in the Enhanced 15-Year Long-Term Planning (Master Plan) White Paper (enhanced-long-term-planning-discussion-document.ashx (pjm.com))
• Basis for PJM’s response to the LTRTP Notice of Proposed Rulemaking Docket No. RM21-17