

## Winter Storm Elliott Recommendations – Progress Summary

### Overview

Coming out of Winter Storm Elliott in December 2022, PJM and its stakeholders committed in 2023 to analyze the challenges the storm presented and identify opportunities for improvement across PJM's Operations, Markets and Planning. In July 2023, PJM published [Winter Storm Elliott Event Analysis and Recommendation Report](#) (WSE Report) (PDF), which included 30 separate recommendations to address in the near, mid and long term.

The recommendations from the WSE Report were adopted as action items for PJM and stakeholders. The actions completed in advance of the 2023–2024 winter are focused on improving generator communication, information sharing, scheduling and performance. The following are some of the actions PJM has implemented in 2023:

- Improved generator operational and seasonal reporting requirements
- Evaluated short-term forecasting processes to analyze and prepare for extreme weather events
- Enhanced communication protocols with generation owners before and during cold weather events so that required preparations and actions are received, understood and acknowledged
- Received FERC approval to allow generators to update their Day-Ahead Market operating parameters in real time, providing PJM operators with greater situational awareness of generators' capabilities

Other findings from the report informed the market-related proposals developed through the Critical Issue Fast Path – Resource Adequacy Group, which are pending FERC approval.

The review process performed to develop the recommendations was driven by the Human Performance and Operating Experience (HP&OE) program at PJM. The HP&OE program promotes excellence in human performance through behaviors that support reliable grid operations, fair and efficient energy markets, and infrastructure planning.

To conduct the review and event analysis, PJM employed the Learning Teams analysis tool. Learning Teams are utilized in the industry as a collaborative event analysis best practice because it focuses on bringing people together to better understand an event with a focus on learning and identifying successes and improvements.

From the Learning Team sessions, successes and opportunities for improvement were identified that led to recommendations for future analysis of enhancements to rules and procedures. The recommendations from PJM's Learning Team's sessions on Winter Storm Elliott were utilized to develop the recommendations in the WSE Report. The recommendations are tracked and managed through the HP&OE program until they are completed.

PJM held a [stakeholder workshop](#) in July and consolidated the 30 recommendations from the WSE Report into 22 “work areas.” In the table below, PJM has listed each work area, along with a brief summary of the improvements to be made in that specific work area and the actions taken to date.

Work areas are categorized as Complete or In Progress, including areas that have a mixture of completed and in-progress items. Some of the items marked as In Progress will be completed through this winter; any others not completed this winter are scheduled for completion in the course of 2024. Status updates on these items will be provided periodically throughout 2024.

A progress summary of Winter Storm Elliott recommendations as of Dec. 20, 2023 follows:

<b>Legend for Status</b>	<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;">Complete</span>	<span style="background-color: #ADD8E6; border: 1px solid black; padding: 2px;">In Progress</span>
--------------------------	---	--

As of Dec. 20, 2023

Work Area	Summary of Improvements	STATUS	
<b>Resource Performance</b>	Enhance the generator cold weather checklist and cold weather operating limit reporting.	▲	

**ACTIONS:**

- Cold weather preparedness checklist updated with additional NERC and industry best practices reflected in PJM Manual 14D: Generator Operational Requirements.
- Expanded cold weather preparations presentations for stakeholders to include more resources on training, using PJM's online tools and cold weather emergency procedures.
- Participated with ReliabilityFirst in visits to generators to assess winter readiness status, plans and best practices.
- Analyzed cold weather data requests.

<b>Resource Performance</b>	Improve Curtailment Service Provider load reduction estimates.	▲	
-----------------------------	--	---	--

**ACTIONS:**

- Reviewed load reduction estimates and provided updates at the Distributed Resources Subcommittee.
- Provided notice to CSPs that they must improve their estimation processes or be in violation of PJM manual requirements.
- Reached out individually to CSPs to emphasize their obligation to provide reasonably accurate estimates.

<b>Resource Performance</b>	Review opportunities to improve synchronized reserve response.	▲	
-----------------------------	--	---	--

**ACTIONS:**

- Reserve Certainty Senior Task Force Issue Charge approved.
- Provided required just-in-time training for Market Operations Centers.
- Provided "Synchronized Reserve Event Performance Generator Outreach" to PJM's Operating Committee.

<b>Unit Status and Unit Parameters</b>	Conduct training for staff involved in updating parameter limited schedules and price schedules, focusing on time-to-start parameters.	▲	
--	--	---	--

**ACTIONS:**

- Education provided by IMM on reflecting [fuel supply limitations](#) (PDF) in parameters at Electric Gas Coordination Senior Task Force.
- Internal training completed for PJM dispatchers.

<b>Unit Status and Unit Parameters</b>	Review and update the Temporary Exception and Real-Time Value processes for cold weather advisories, alerts, conservative operation and pipeline operational flow order to ensure accurate offer information from generation resources.	▲	
--	---	---	--

**ACTIONS:**

- Daily reports sent to internal SMEs, gas-electric coordination team and Dispatch leadership on temporary and real-time exceptions to confirm pipeline restrictions are reflected in parameters.
- FERC compliance filing made Dec. 11, 2023, allowing market sellers to submit temporary exceptions during operating day.
- Markets Gateway enhanced to allow temporary exceptions to be provided in real time.

Legend for Status	<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;">Complete</span>	<span style="background-color: #ADD8E6; border: 1px solid black; padding: 2px;">In Progress</span>
-------------------	---	--

As of Dec. 20, 2023

Work Area	Summary of Improvements	STATUS	
<b>CIFP</b>	Evaluate opportunities to align the incentives from the capacity market via Performance Assessment Intervals (PAIs) with real-time operating conditions, particularly with regard to PAI triggers.	▲	
<p><b>ACTIONS:</b></p> <ul style="list-style-type: none"> <li>• PAI trigger changes approved by FERC with an effective date of July 30, 2023, focusing performance assessments on times of greatest reliability risk.</li> <li>• Changes reviewed with the MIC and OC.</li> <li>• Transparency/visibility education for potential future PAIs provided at a special MRC session on Dec. 11, 2023.</li> </ul>			
<b>CIFP</b>	Evaluate if and how exports should be accounted for in the balancing ratio.	▲	
<p><b>ACTIONS:</b></p> <p>Considered and discussed as part of Resource Adequacy Senior Task Force and Critical Issue Fast Path (CIFP) stakeholder processes. Ultimately, PJM did not propose to change how exports are accounted for in the balancing ratio.</p>			
<b>CIFP</b>	Explore opportunities to refine and simplify excusal rules to reduce manual and case-by-case review processes.	▲	
<p><b>ACTIONS:</b></p> <p>Proposed and filed clarifications and adjustments with FERC to excusal rules which, in combination with tightened PAI triggers, are expected to reduce the need for manual reviews and/or clarify determination of such reviews. PJM expects a FERC order on this piece of the package by Feb. 6, 2024. If accepted, this would be effective and implemented starting on June 1, 2025.</p>			
<b>CIFP</b>	Review the measurement and verification calculations of Energy Efficiency and Demand Resources for PAIs to assess if the determination of actual performance and bonus accurately reflects the reliability benefit provided.	▲	
<p><b>ACTIONS:</b></p> <p>Measurement and verification of Energy Efficiency and Demand Response resources not directly considered as part of CIFP process. However, they would be impacted by other changes in PJM’s filed proposal, including a change that limits the pool of resources assessed during PAIs to only committed capacity.</p>			
<b>CIFP</b>	Explore opportunities for further education on PAIs, such as providing periodic training sessions.	▲	
<p><b>ACTIONS:</b></p> <p>First education session for stakeholders on new PAI triggers held Dec. 11, 2023, with the training scheduled to be updated and provided annually ahead of winter operations.</p>			
<b>Call for Conservation</b>	Evaluate opportunities to enhance Public Notification Language in Attachment A of Manual 13 regarding a Call for Conservation.	▲	
<p><b>ACTIONS:</b></p> <ul style="list-style-type: none"> <li>• Updated language in PJM Manual 13: Emergency Operations, Attachment A: Public Notification Statements, which was endorsed by the OC.</li> <li>• Updated State Emergency Procedure Manual.</li> <li>• Developed email templates, graphics and explanations related to emergency procedures to communicate with and educate key state stakeholders.</li> </ul>			

<b>Legend for Status</b>	<span style="background-color: #92d050; border: 1px solid black; padding: 2px;">Complete</span>	<span style="background-color: #00a0e3; border: 1px solid black; padding: 2px;">In Progress</span>
--------------------------	---	--

As of Dec. 20, 2023

Work Area	Summary of Improvements	STATUS	
<b>Outreach</b>	Seek ways to enhance communications, specifically looking at timeliness, relevance and clarity of information, along with curating and updating appropriate contacts for each audience.	▲	
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Developed materials and graphics to communicate emergency procedures to external audiences, including an extensive definitions and simple explanations document and a new guide posted on PJM.com, "<a href="#">PJM's Emergency Procedures and Messages</a>."</li> <li>State contact lists updated for 2023–2024 and process to maintain list documented in the internal State Emergency Procedure manual.</li> </ul>			
<b>Drills and Exercise</b>	Strengthen stakeholder participation in periodic Operations drills as well as Corporate Communications and State Government Policy drilling with states, Transmission Owners and other members.	▲	
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Expanded state participation in Grid Ex VII to include activity roles and in-person participation.</li> <li>PJM State &amp; Government Policy Team executed first annual team tabletop drill including states.</li> <li>Held first annual state agency emergency procedures training session.</li> <li>Provided education on PJM Emergency Procedures to Transmission Owner communications departments as part of summer and winter operations drills.</li> </ul>			
<b>Procedures</b>	Reinforce and clarify expectations for Cold Weather Advisories and Cold Weather Alerts.	▲	
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Expanded audience of SOS calls to include generation and enhanced expectations of generators in these calls.</li> <li>Enhanced proactive reach out ahead of implementing emergency procedures.</li> <li>Evaluate improvements to all-call scripts to emphasize required member actions.</li> </ul>			
<b>Procedures</b>	Evaluate triggers for increasing operating reserves based on risks imposed by extreme or unusual weather, renewable resource uncertainty and resource performance uncertainty.		
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Operating Reserve triggers have been reviewed and adjusted to help mitigate risks.</li> <li>PJM staff reviewed risks associated with load profiles and temperature impact on generation stations that would require more reserves due to increased probability of units not performing. Factors such as gas pipeline restrictions and OFOs have been considered to determine additional reserves.</li> </ul>		▲	
<ul style="list-style-type: none"> <li>Developing trigger for potential generation loss at extreme operating temperatures.</li> <li>Evaluate load-based risk profiles to increase Day-Ahead Scheduling Reserves.</li> </ul>			▲
<b>Load Forecasting</b>	Evaluate opportunities to improve extreme weather load forecast processes and methodology.		
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Evaluated and enhanced load forecast staffing.</li> <li>Developed internal processes for identifying and adjusting for risk of load forecast error driven by extreme weather.</li> <li>Developed partnership with PJM System Planning to leverage Planning model (longer history and different methodology) in parallel with the Operations model as an additional source/input.</li> </ul>		▲	
<ul style="list-style-type: none"> <li>Conducted an independent evaluation of PJM's short-term forecast processes with recommendations in progress.</li> <li>Extending weather forecast from seven days out to 15 days out and integrating data into existing visualization.</li> </ul>			▲

Legend for Status	<span style="background-color: #90EE90; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Complete	<span style="background-color: #ADD8E6; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> In Progress
-------------------	--	---

As of Dec. 20, 2023

Work Area	Summary of Improvements	STATUS	
<b>Gas Electric Coordination</b>	Evaluate multiday commitment processes to provide greater certainty of fuel supply during critical operating periods with a focus on weekends.		
<b>ACTIONS :</b> Multiple-day RAC tool under development (long-term deliverable).			▲
<b>Gas Electric Coordination</b>	Work with states to discuss opportunities to increase prioritization of gas for usage in electric power production.		
<b>ACTIONS :</b> Initiated conversations with OPSI in tandem with the release of the Winter Storm Elliott Event Analysis and Recommendations Report in July and at the OPSI Annual Meeting in October. Mike Bryson, Sr. Vice President – Operations, will discuss this in 2024 with regulators on a national platform with his recent appointment to NARUC’s new Gas-Electric Alignment for Reliability initiative (GEAR).			▲
<b>Gas Electric Coordination</b>	Evaluate including fuel-specific information in the capacity accreditation model (dual fuel, firm/non-firm gas, on-site fuel requirements etc.).		
<b>ACTIONS :</b> <ul style="list-style-type: none"> <li>Proposed capacity market enhancements to increase reliability of capacity resources filed with FERC on Oct. 13, 2023. PJM expects FERC to act on or before Jan. 29, 2024.</li> </ul>		▲	
<ul style="list-style-type: none"> <li>Efforts around capacity accreditation for firm-fuel units require further data (future efforts).</li> </ul>			▲
<b>Reserve Performance</b>	In conjunction with stakeholders, evaluate Synchronized Reserve commitment and performance.		
<b>ACTIONS :</b> Efforts underway in the Reserve Certainty Senior Task Force (RCSTF) as part of its immediate work plan. Stakeholder approval of packages intended for 2024.			▲
<b>Reserve Pricing and Penalties</b>	Evaluate and discuss alignment of market incentives with operational decisions.		
<b>ACTIONS :</b> Efforts underway in the RCSTF as part of its immediate work plan. Stakeholder approval of packages for immediate Key Work Activities under the Issue Charge are targeted for 2024.			▲
<b>CIFP</b>	Reevaluate what happens in the scenario that a resource has not submitted a valid offer.		
<b>ACTIONS :</b> Proposed and filed with FERC changes that included an update to the PJM Manuals allowing resources that do not submit price/MW offers into the market to still be eligible for bonus payments for their actual performance during an event. If approved, this update would be made in M-11.			▲