



Winter Storm Elliott Report Stakeholder Session

Workshop - MRC
July 24, 2023

The **purpose** of this report is to:



- Centralize information regarding the actions/events leading up to and including Winter Storm Elliott.
- Perform a deep dive review of those events to find out what went well and what did not.
- Share our recommendations for the areas where we've identified the opportunity to improve.
- Set a work plan for future enhancements based on the experiences and learnings from Winter Storm Elliott, the event analysis and subsequent stakeholder interaction.

PJM's goals for the session today are:

1

Provide an overview of the narrative of each section, as well as discuss the key recommendations.

2

Engage in a forward-looking, collaborative, discussion on how to use the recommendations from Winter Storm Elliott to make our processes, rules, systems, etc., better for the future.

3

Input for future consideration of observations or recommendations that were not identified.

There are currently active settlement discussions regarding the Performance Assessment Interval outcomes from Winter Storm Elliott.

We do not intend for this session to get into the specifics of the issues that motivated those complaints.

If we are trending in that direction, PJM will communicate that and ask to redirect discussion.

Our goal is for this session to be forward-looking, positive and collaborative.



Learning Teams and HP&OE Program

Glen Boyle
Sr. Manager – Performance
Compliance

HP&OE Program Goals:

- Reduce the frequency and impact of human error.
- Share and learn from internal and external events.
- Analyze events to identify corrective actions to prevent and reduce impacts of adverse events.



PJM's Sharing and Learning Culture Focuses on the Following:

- WHAT happened and WHY the event occurred, NOT WHO failed to do something
- Sharing and learning, NOT blaming others or pointing fingers
- Successes and what behaviors led to positive outcomes

7 Learning Team Sessions



Learning Teams are an analysis tool used to bring people together to better understand an event with the focus on learning and identifying successes and improvements.

SMEs participated spanning multiple divisions across PJM

40 Hours of Learning Team sessions attended by multiple team members

Consistent and Structured Methodology followed for each session



30 recommendations

Internal tool and process changes

Learning Team Topics



Capacity Performance / PAI / Energy Market

Generation Performance and Gas Pipelines

Load Forecasting

Generation Scheduling

Timing and Criteria for Emergency Procedures

Cost Offer Verification Process

Regulation Market



Advance Preparations & Operating Day

Paul McGlynn
Executive Director – System
Operations



Advance Preparations



- PJM Winter Operations Seasonal Study (a.k.a. the OATF)
- Generation Resource Operational Exercise

- Generation Resource Cold Weather Preparation Checklist
- Transmission Outage Deferrals
- Cold Weather Advisory

- Pre-Winter Emergency Procedures Drill
- Reliability Analysis Used in the Capacity Market
- PJM Winter Readiness Meeting



**Load Forecast
Planning Process**



**Emergency
Procedures Issued &
Actions Taken in
Advance of
Operating Day**



**Coordination With
Adjacent Systems**

**Coordination
With Natural Gas
Industry**



**Day-Ahead Market and
Reliability Assessment
Commitment (i.e., RAC)
Results**



Resource Performance

- Enhancements to the generator Cold Weather Checklist and Cold Weather Operating Limit reporting

Process Improvement



Procedures

- Operating Reserves – Evaluate triggers for increasing operating reserves based on risks imposed by extreme or unusual weather, renewable resource uncertainty and resource performance uncertainty.
- Reinforce and clarify expectations for Cold Weather Advisories and Cold Weather Alerts.

Process Improvement



Training and Awareness Improvement



Load Forecasting

Evaluate opportunities for improvements to extreme weather load forecast process and methodology.

Process
Improvement





Operating Day

Time-based review of key events
and actions taken throughout Dec. 23 to Dec. 26

<p>Load and generation performance</p>	<p>Deploying reserves Potential Disturbance Control Standard Compliance Issue</p>	<p>Neighbor status</p>
<p>Capacity Emergency Procedures Implemented Pre-emergency and emergency demand response Maximum Emergency Generation Action</p>		<p>DOE emergency order under Section 202(c) of the FPA</p>

Load Forecast vs Actual

Emergency Generation and Demand Response Performance

Interchange and Coordination With Neighbors

Generation Performance

- Forced outages / derates by cause by fuel type

- Cold weather operating limit analysis

Generation Parameters

Gas Availability Issues

Non-Retail Behind-the Meter Generation Performance

Resource Performance

- Curtailment Service Provider load reduction estimates
- Review opportunities to improve synchronized reserve response.

Process Improvement 

Operational Change 

Unit Status and Unit Parameters

- Training for staff involved in updating PLS and price schedules focusing on time to start parameters
- Review and update the Temporary Exception and Real-Time Value processes for cold weather advisories, alerts, conservative operation and pipeline OFO to ensure accurate offer information from generation resources.

Training and Awareness Improvement 

Process Improvement 

Gas Electric Coordination

Several recommendations to address challenges with differences in electric and gas days

- Evaluate multi-day commitment processes to provide greater certainty of fuel supply during critical operating periods with a focus on weekends.

Process Improvement



- Work with states to discuss opportunities to increase prioritization of gas for usage in electric power production.

Operational Change



- Evaluate including fuel-specific information in the capacity accreditation model (dual fuel, firm/non-firm gas, onsite fuel requirements etc.).

Market Construct Process Change or Addition





Market Results

Phil D'Antonio
Director, Energy Market Operations
– Market Services

Purpose: Review of the two-settlement market mechanism and the energy and reserve market pricing approaches. It presents both the Day-Ahead and Real-Time Market results for Dec. 23 and Dec. 24, including the ancillary services. This section also presents the analysis of Performance Assessment events.

TOPICS ADDRESSED:

Market Overview	Day-Ahead Market Results	Real-Time Market Results
Market Settlements Statistics	PAIs and Settlement Info	Background for Market Processes <i>Provided in the appendix</i>

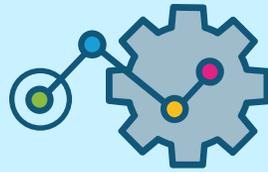
The Day-Ahead Market section includes:

Day-ahead load and prices:	Provided for Dec. 23 & 24	Provides a general observation of potential exposure to Real-Time pricing for loads and generation	High-level offer capping summary	
Virtual transactions:	General observations:	- Increment Offers	- Decrement Offers	- Up-to-Congestion Bids
Day-ahead reserves:	Pricing and values procured			

The Real-Time Markets section includes:

Congestion impacts	Real-time loads and prices	Day-ahead / Real-time price comparison	Interchange prices
Ancillary Services <ul style="list-style-type: none">- Regulation- Reserves	Synchronized Reserve Events and Reserve Performance		Cost Offer Verification

REVIEW



**Uplift
impacts**



Settlements results
Comparison to the Polar Vortex
Settlement results

Reserve Performance

- PJM has identified an opportunity for PJM, in conjunction with stakeholders, to evaluate Synchronized Reserve commitment and performance.

Operational Change



Reserve Pricing and Penalties

- There is also an identified opportunity to discuss alignment of market incentives with operational decisions.

Market Construct Process
Change or Addition



PJM will initiate discussion with Stakeholders during the July 26 MRC.



PAI

Lisa Morelli
Director, Market Settlements –
Finance

Largest event in the history of capacity performance by several multiples, resulting in non-performance charges of \$1.8 billion

Significant Underperformance

On average, resources with shortfalls provided 27% of their expected MW.

Breakdown by Resource Type:

- 99.8% generation
- 0.2% DR & PRD
- 0% Energy Efficiency

Significant Overperformance

- 70% of bonus performance came from capacity resources.
- 30% came from resources without capacity commitments and net imports.

Breakdown by Resource Type:

- 80% generation
- 10% net imports
- 5% DR & PRD
- 5% Energy Efficiency

The PAI section includes:

Balancing Ratio

Performance Shortfall

- Initial shortfall
- Excusals
- Generation shortfall distribution by fuel type
- Netting for Demand Response & Price Responsive Demand
- Non-Performance Charges
- Fixed Resource Requirement treatment

Bonus Performance

- Breakdown of Bonus MW by CP / Energy Only, Resource Type, Generation Fuel Type
- Bonus Performance Rates and Credits

Demand Response & Price Responsive Demand Performance

Settlement Timelines and Results

CIFP

<ul style="list-style-type: none"> • Evaluate opportunities to align the incentives from the capacity market via PAIs with real-time operating conditions, particularly with regard to PAI triggers. 	<p>Market Construct Process Change or Addition</p> 
<ul style="list-style-type: none"> • Evaluate if and how exports should be accounted for in the balancing ratio. 	<p>Process Improvement</p> 
<ul style="list-style-type: none"> • Reevaluate what happens in the scenario that a resource has not submitted a valid offer. 	<p>Market Construct Process Change or Addition</p> 
<ul style="list-style-type: none"> • Explore opportunities to refine and simplify excusal rules to reduce manual and case-by-case review processes. 	<p>Training and awareness improvement</p> 
<ul style="list-style-type: none"> • Review the M&V 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>Market Construct Process Change or Addition</p> 
<ul style="list-style-type: none"> • Explore opportunities for further education on PAIs, such as providing periodic training sessions. 	<p>Training and awareness improvement</p> 

Outreach/Communications

Tim Burdis

Sr. Manager – State Policy Solutions

Susan Buehler

Chief Communications Officer



State Government Communications

Tim Burdis

Sr. Manager – State Policy Solutions

Objectives of PJM's State Government Emergency Procedures

Inform for
Situational
Awareness

Establish
Accessibility

Instill Public
Confidence

Allow for
Mobilization of Public
Preparations

**Inform Public for
Cooperation**

Since last call for conservation, **state government communication channels have advanced.**

- Can more directly reach end-use customers

State government can play a role in helping PJM to **amplify its conservation message.**

Opportunity to formalize the advancement of message with state partners



State Emergency Procedures Reform – 2023

CALL FOR CONSERVATION PROCESS ENHANCEMENTS

	Q2	Q3	Q4	2024
Public Notification Language				
Update public plea draft language	X			
Take language through M13 / Stakeholder Process & state feedback		X		
SGP Processes				
Finalize state call for conservation list	X			
Investigate, assess and conduct any work associated with state other conservation alert mediums		X		
Establish process to annually update new call for conservation list	X			
Add call for conservation process engagement to summer and/or winter system ops drills		X		



Communications

Susan Buehler
Chief Communications Officer

PJM prepares for all crises with drills.

Tools used in outreach:

- Send Word Now
- PJM Now
- Emails to and conference calls with Transmission Owner communicators

Used Media, Press Releases and Social Media Sites



pjm News

FOR IMMEDIATE RELEASE

Contact: PJM News, at PJMNews@pjm.com or toll free at [866-PJM-NEWS \(866-756-6397\)](tel:866-639-7397)

PJM ASKS CONSUMERS TO CONSERVE ELECTRICITY

Cold Weather Continues to Push Electricity Use Higher

(Valley Forge, PA – Dec. 23, 2022) – PJM Interconnection, the electricity grid operator for 65 million people in 13 states and the District of Columbia, has requested the public in its region to conserve electricity. The call for conservation was prompted by continuing frigid weather.

The request is being made throughout PJM.

PJM Intercon... @pjmint... · Dec 24, 2022

Update from PJM Senior Vice President of Operations Mike Bryson.

Videos Impressions: 300,000

27 84 69

PJM Interconnection Retweeted

NJ Board of Public Util... @ · Dec 24, 2022

Our regional grid operator is asking the public to conserve electricity through 10:00AM on December 25, 2022 as frigid temps continue. What you can do:

- Set thermostats lower, if health permits
- Postpone use of major appliances
- Turn off non-essential lights & appliances

Worked With Utility Partners

Social media impressions: 600,000

Stakeholder Call for Conservation Amplification: ~ 1 million



Call for Conservation

- Evaluate opportunities to enhance Public Notification Language in Attachment A of Manual 13 regarding Call for Conservation to better direct the appeal to all customers, not just residential. Establish a process for annual review of state alert contacts, and explore additional opportunities to further amplify PJM's message through state communication channels, up to and including Emergency Alert Systems.

Operational
Change



Outreach

- Operations, Corporate Communications and SGP will seek ways to enhance communications, specifically looking at timeliness, relevance and clarity of information provided along with curating and updating of appropriate contacts for each audience and channel for messaging.

Training and
awareness
improvement



Drills & Exercises

- Operations, Corporate Communications and SGP will also strengthen their periodic drilling with states, Transmission Owners and other members by: 1) Finding opportunities to include states in PJM crisis exercises; 2) Providing education on PJM emergency procedures and Call for Conservation during summer and winter operations drills; 3) Following up with parties not represented at drills to make sure they are aware and contacts are up to date.

Process
Improvement



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Winter Storm Elliott Report



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