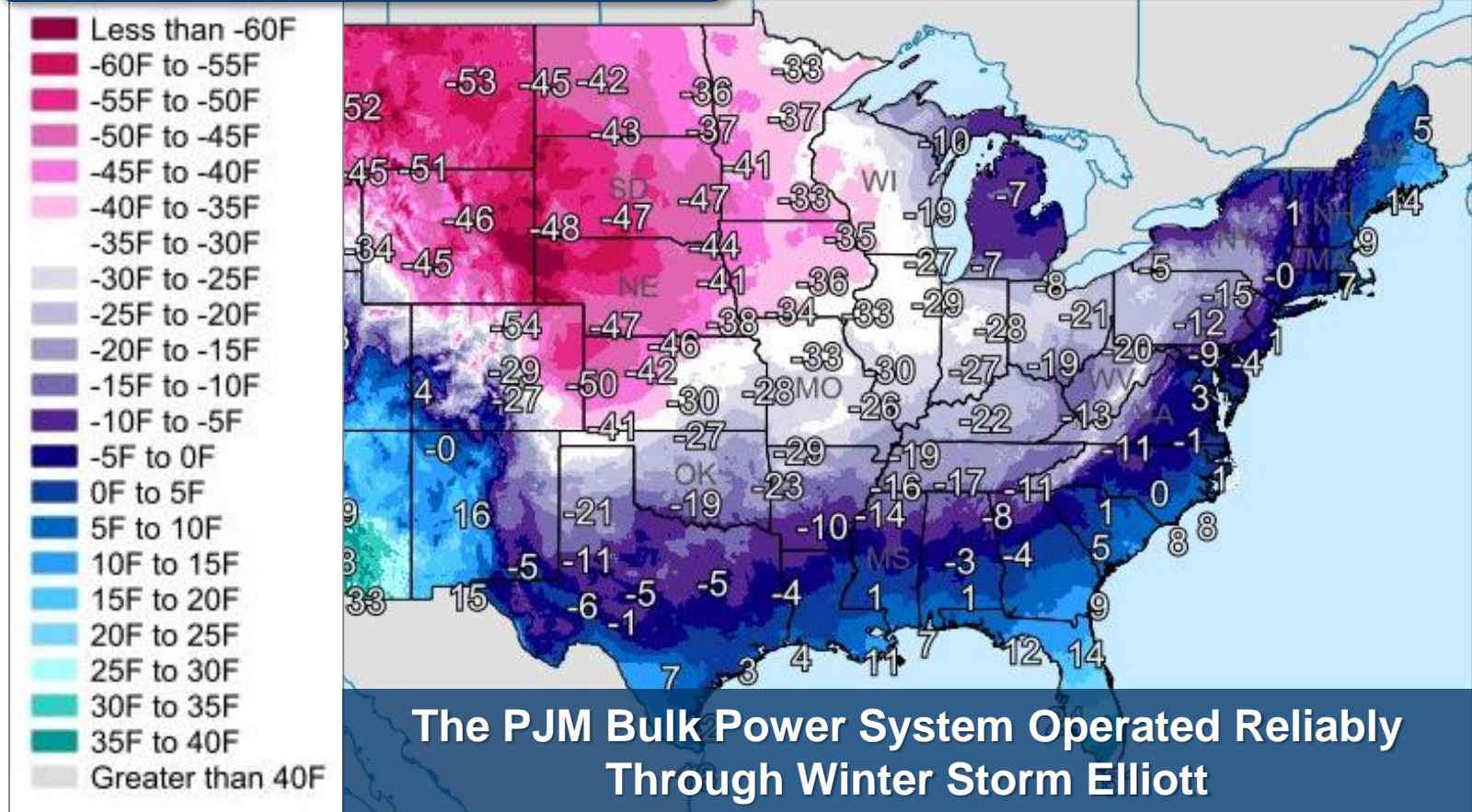




# Winter Storm Elliott Presentation to NAESB Gas/Electric Harmonization Forum Meeting

Craig Glazer  
Vice President-Federal Government  
Policy  
PJM Interconnection  
January 12, 2023

**Coldest Wind Chill**  
 Valid Ending Saturday December 24th, 2022 at 12 PM CST



Source: NOAA

Temperatures across the RTO plummeted beginning on Dec. 23 and lasted into the morning of Dec. 25 with record lows in some areas as well as record drops in some regions.

Source: NOAA and the National Weather Service; Graphic created on Dec. 21, 2022.

Winter readiness assessments: data collection on fuel inventory, supply and delivery characteristics, emissions limitations, and minimum operating temperatures

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Meetings with federal and state regulators and neighboring systems to review winter preparations; weekly operational review meetings with major natural gas pipeline operators

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PJM's [Cold Weather Preparation Guideline and Checklist](#) for generation owners includes everything from increasing staffing for weather emergencies to performing required maintenance activities.

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April 2023 NERC winterization standard implementation is important. PJM feedback to NERC and FERC: [New reliability standards need to be stronger and implemented sooner.](#)



## Dec. 20, 2022

### Cold Weather Advisory for Western Region From Dec. 23–26 (Later Expanded to Entire RTO)

- Prepare to take freeze-protection actions, such as erecting temporary windbreaks or shelters, positioning heaters, verifying heat trace systems, or draining equipment prone to freezing.
- Review weather forecasts, determine any forecasted operational changes, and notify PJM of any changes.
- Members are to update PJM with operation limitations associated with cold weather preparedness. Operating limitations include: generator capability and availability, fuel supply and inventory concerns, fuel switching capabilities, environmental constraints, generating unit minimums.

## Dec. 21, 2022

### Cold Weather Alert Issued for the Western Region for Dec. 23

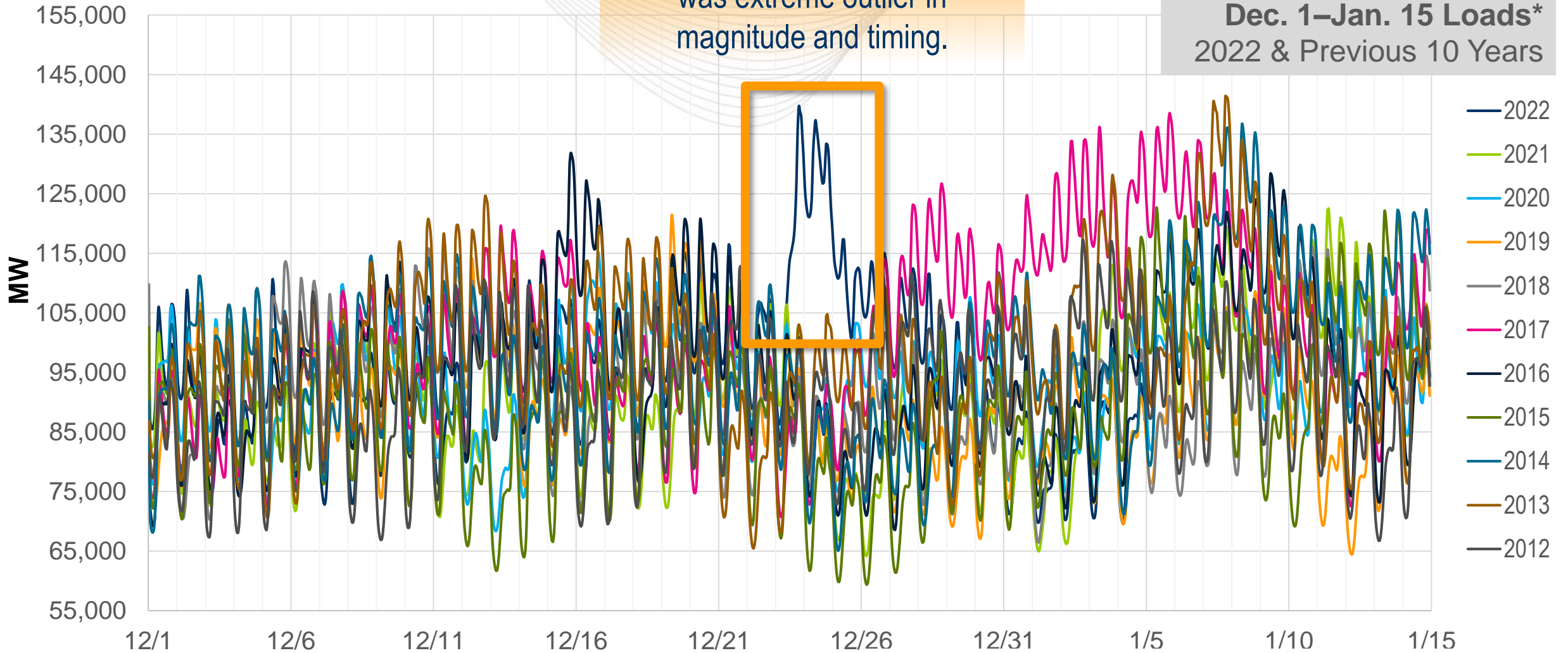
- Generation dispatchers review fuel supply/delivery schedules in anticipation of greater-than-normal operation of units.
- Generation dispatchers monitor and report projected fuel limitations to PJM dispatcher and update the unit Max Run field in Markets Gateway if less than 24 hours of run time remaining.
- Generation dispatchers contact PJM Dispatch if it is anticipated that spot market gas is unavailable, resulting in unavailability of bid-in generation.

## Dec. 23, 2022

### Second Cold Weather Alert Issued for the Entire RTO for Christmas Eve, Dec. 24

**2022 holiday weekend load was extreme outlier in magnitude and timing.**

**Dec. 1–Jan. 15 Loads\***  
2022 & Previous 10 Years

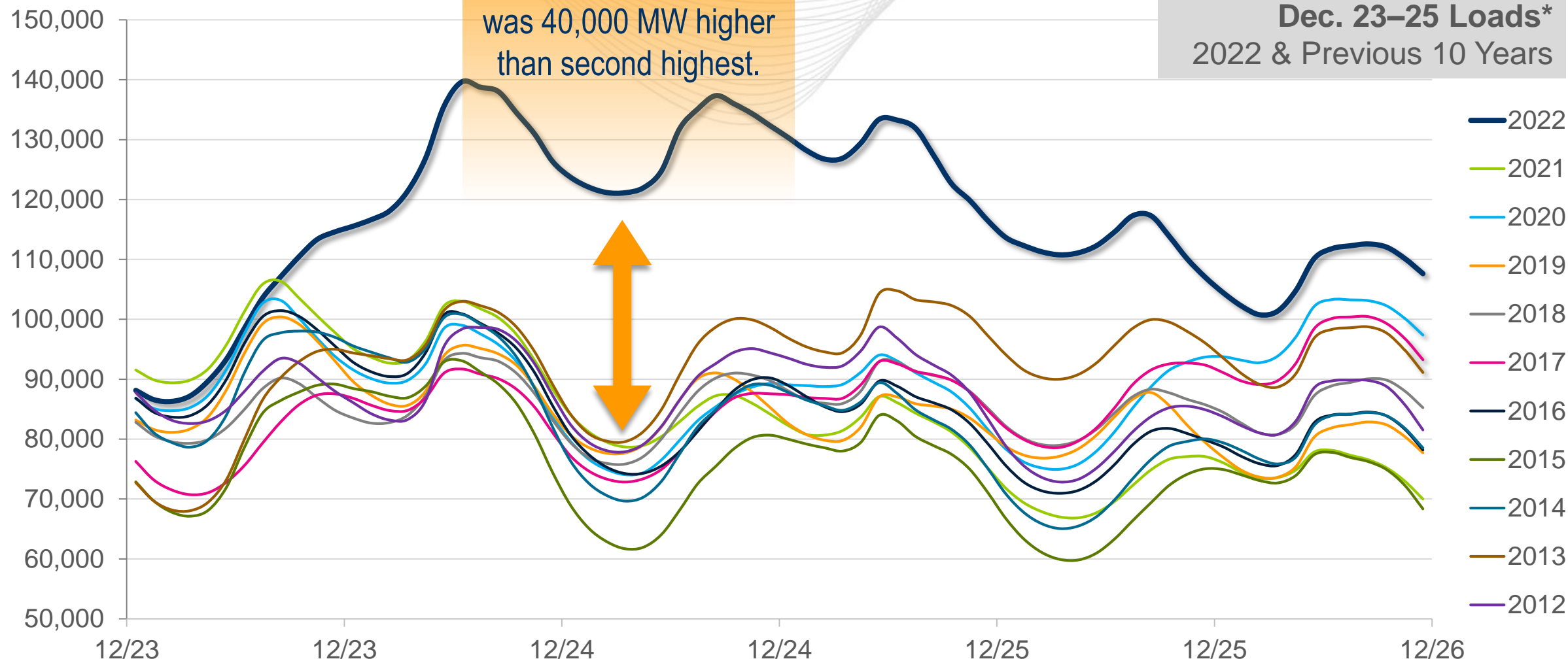


\*Note: Load values include the estimated demand response (DR) added back.

# Load Stayed Unusually High Overnight (Preliminary Data)

**Christmas Eve valley**  
was 40,000 MW higher  
than second highest.

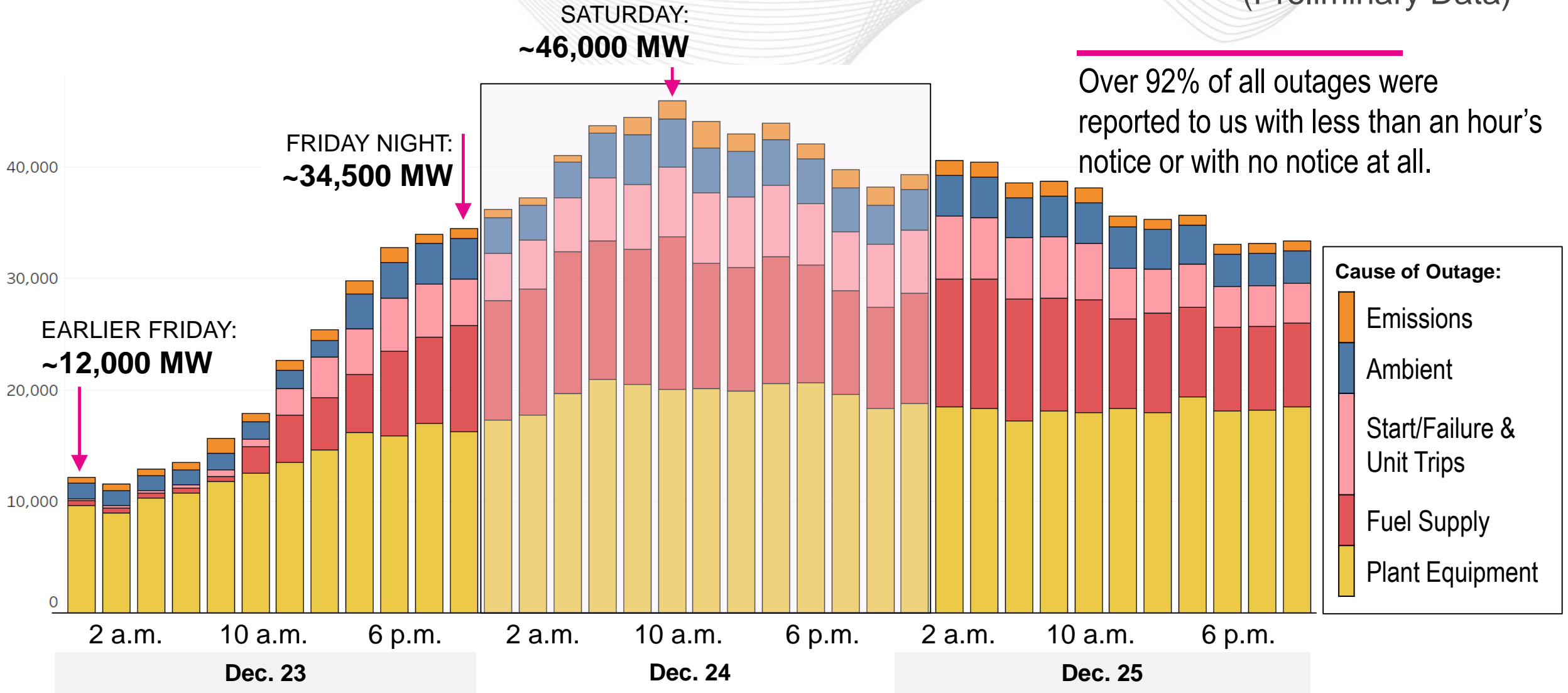
**Dec. 23–25 Loads\***  
2022 & Previous 10 Years



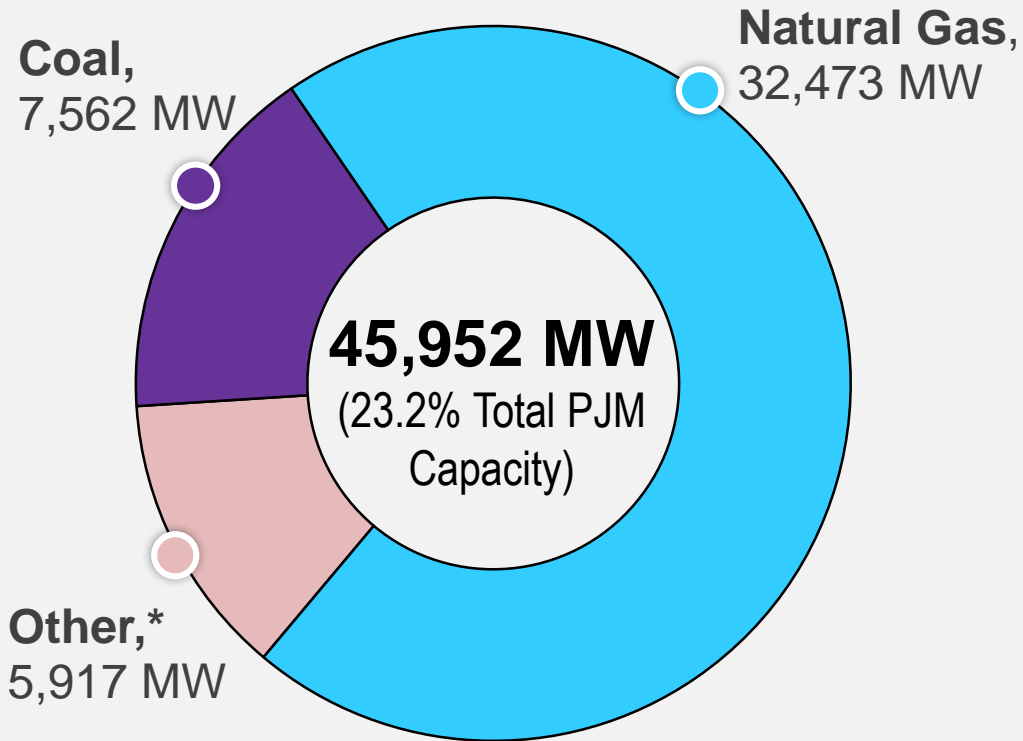
\*Note: Load values include the estimated demand response (DR) added back.



# As We Called Reserves, a Significant Portion of Fleet Failed To Perform (Preliminary Data)

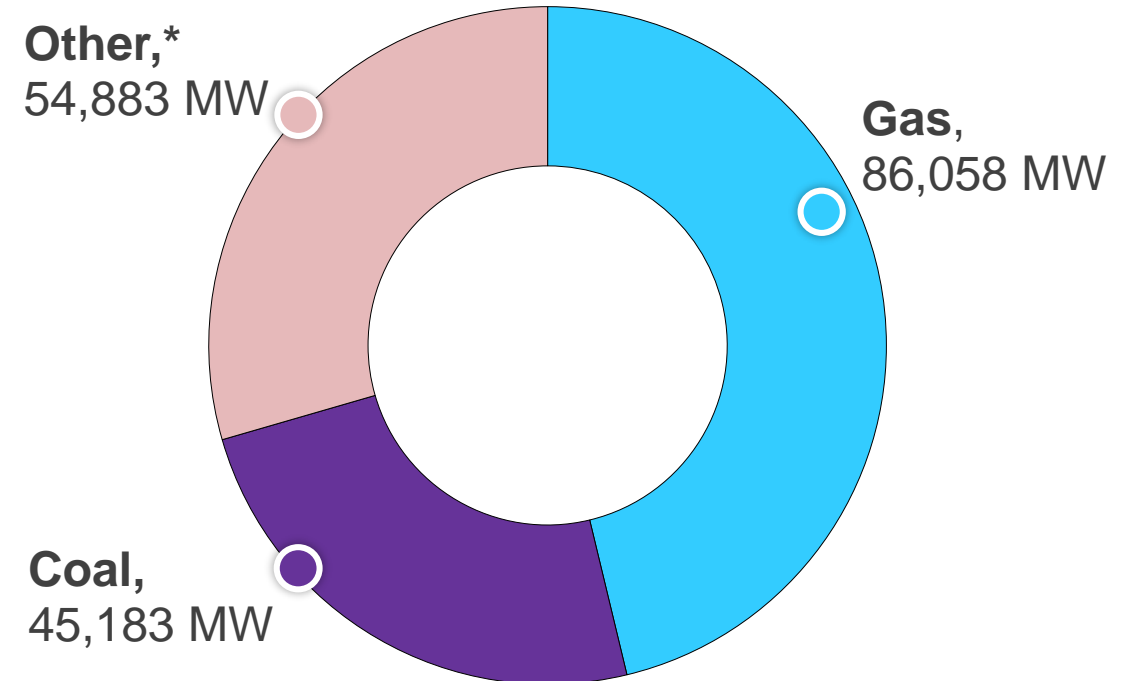


## TOTAL FORCED OUTAGES – DEC. 24, 2022



\*Other = nuclear, oil, wind, solar, etc.

## GENERATOR UCAP 2022/2023 DELIVERY YEAR



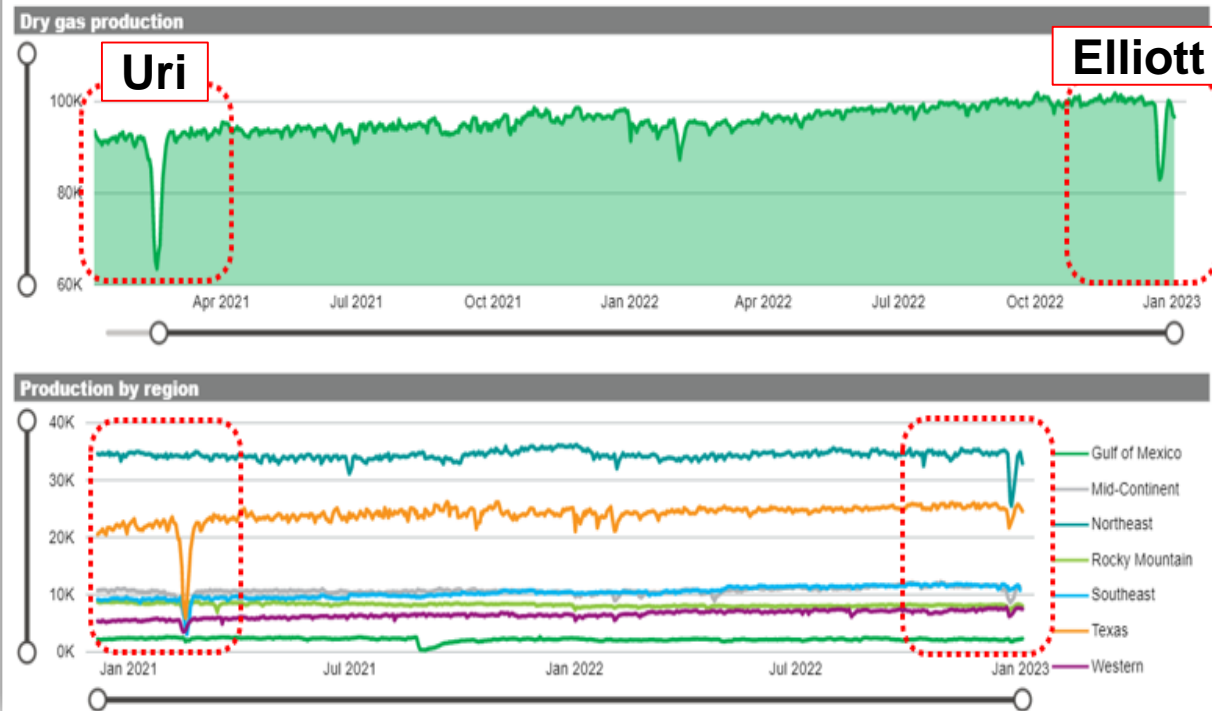
**PJM's Total Fleet Capacity – 186 GW**



# Natural Gas Production Declines Uri (February 2021) vs. Elliott (December 2022)

Jan. 1, 2021, through Jan. 2, 2023

Natural gas market history fundamentals for US Lower-48



Northeast: Marcellus and Utica Shale; Data Source: S&P Global

## Uri (February 2021)

- 30% nationwide production decline
- All production loss in Texas and Southwest
- No production loss in Appalachia

## Elliott (December 2022)

- 20% nationwide production decline
- Largest percentage of total decline in Appalachia (Marcellus and Utica), which saw a nearly 30% drop in daily production
- Production has returned to near pre-event levels.

# Emergency Procedures

(Preliminary Data)

- **Cold Weather Alert issued** from 07:00 on 12/23 through 23:00 on 12/25 for Western Region.
- **Cold Weather Advisory** extended to 07:00 on 12/23 through 23:00 on 12/26 for Western Region.

- **12/23 17:30–22:15** – Pre-Emergency Load Mgmt. Reduction Action – RTO 30-minute response product
- **12/23 17:30–23:00** – Maximum Generation Emergency Action, Issues EEA2
- **12/23 17:45–21:30** – Emergency Load Mgmt. Reduction Action and a NERC level EEA2
- **12/23 18:00–22:15** – Pre-Emergency Load Mgmt. Reduction Action, 60-minute response product
- **12/23 23:00** – Max. Generation Emergency Alert/Load Mgmt. Alert for 12/24

PAI Trigger

- **12/24 04:25–22:00** – Max. Generation Emergency Action
- **12/24 04:52–18:34** – Voltage Reduction Alert issued for RTO
- **12/24 05:16–21:08** – Emergency Energy Request
- **12/24 07:15–18:15** – Voltage Reduction Warning and Reduction of NCPL
- **17:45** – *DOE issues Emergency Order under Section 202 (c) of Federal Power Act*
- **12/24 22:30** – PJM downgrades EEA2 to EEA1.

PAI Trigger

Dec. 20

**Cold Weather Advisory** from 07:00 on 12/23 through 23:00 on 12/25 for Western Region.  
*PJM expands Cold Weather Advisory to the entire RTO on 12/22.*

Dec. 21

- **Cold Weather Alert issued** from 00:00 on 12/24 through 23:59 on 12/25 for the RTO.
- **12/23 10:14–10:25** – Synch. Reserve Event
- **12/23 16:17–18:09** – Synch. Reserve Event

Dec. 23

- **12/24 00:04–00:30** – 100% Synchronized Reserve Event initiated for the PJM RTO region.
- **12/24 02:23–03:24** – 100% Synchronized Reserve Event initiated for the PJM RTO region.
- *PJM Issues Call for Conservation effective 04:00 on 12/24 through 10:00 on 12/25.*
- **12/24 04:20–20:30** – Emergency Load Mgmt. Reduction Action and a NERC level EEA2 issued – All load mgmt.
- **12/24 04:23–05:51** – 100% Synchronized Reserve Event initiated for the PJM RTO region.

PAI Trigger

Dec. 24

Dec. 25

- **12/25 08:55** – Cold Weather Alert issued from 07:00 on 12/26 through 23:00 on 12/26 for Western Region
- **12/25 22:00** – EEA1 ends

PJM's ***rough estimate*** of non-performance charges for Dec. 23 and Dec. 24 is in the \$1 billion to \$2 billion range.

*This estimate is provided as an initial reference point only and can change materially.*

It includes preliminary excusals for MW scheduled down due to economic dispatch. It is subject to further change (*increase or decrease*) based on:

- Changes to the final balancing ratio
- Approval of retroactive replacement transactions
- Further review of actual resource performance data
- Further review of excusals due to economic dispatch
- Inclusion of excusals for:
  - Approved planned or maintenance outages
  - MW scheduled down due to manual dispatch

**Note:** FRR entities could have elected physical penalty in lieu of financial prior to DY.