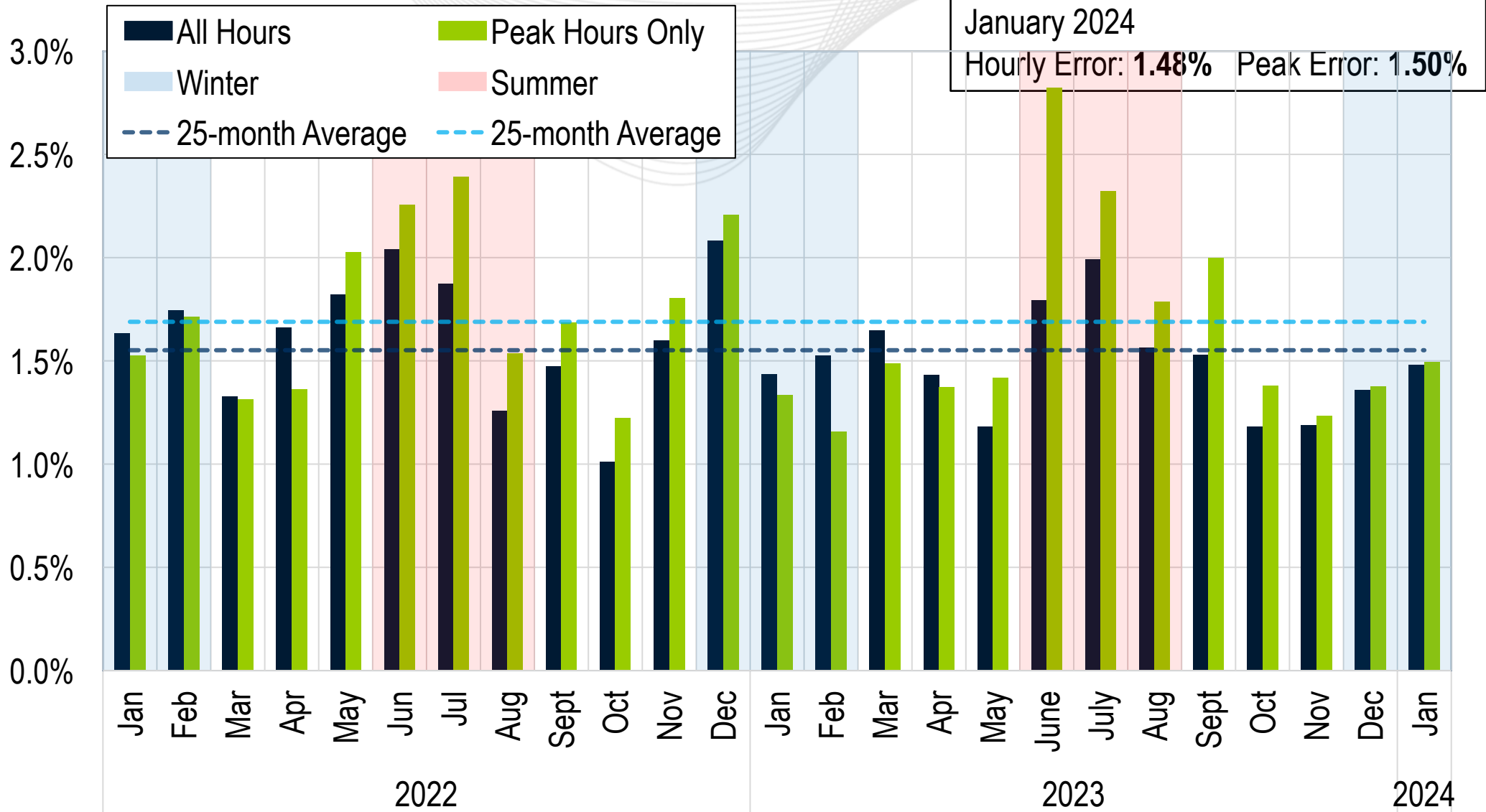




System Operations Report

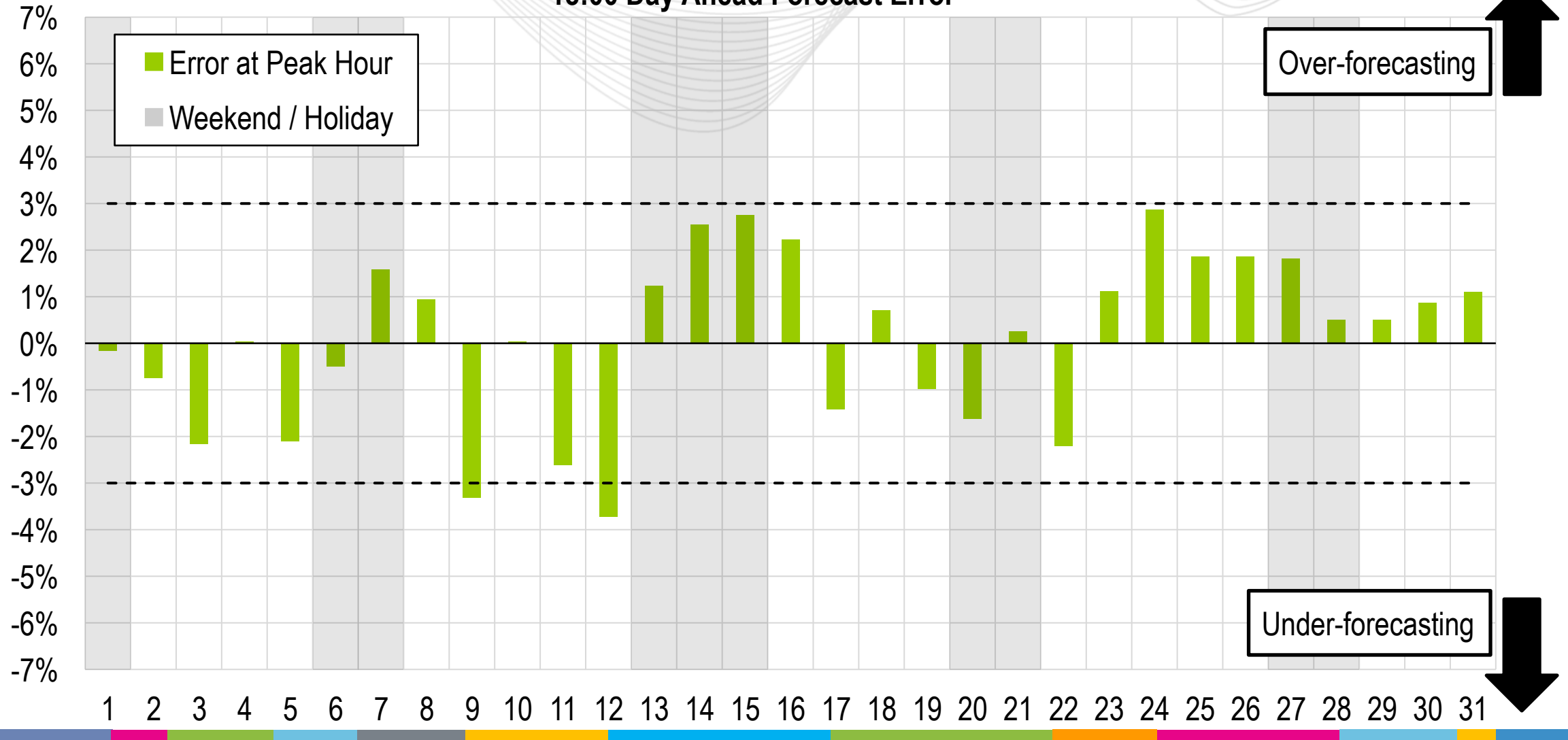
Hong Chen
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Mc Webinar
February 20, 2024

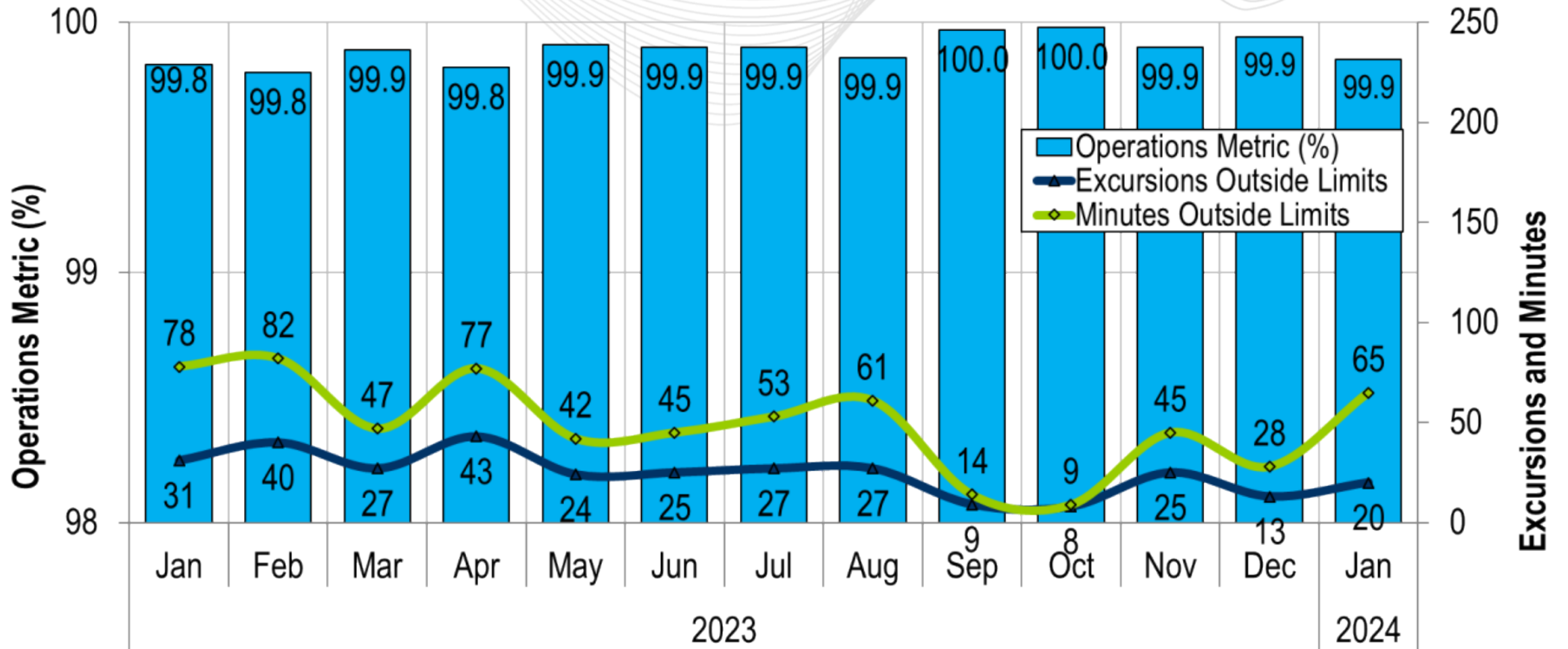
Average Load Forecast Error



Daily Peak Forecast Error (January)

18:00 Day Ahead Forecast Error

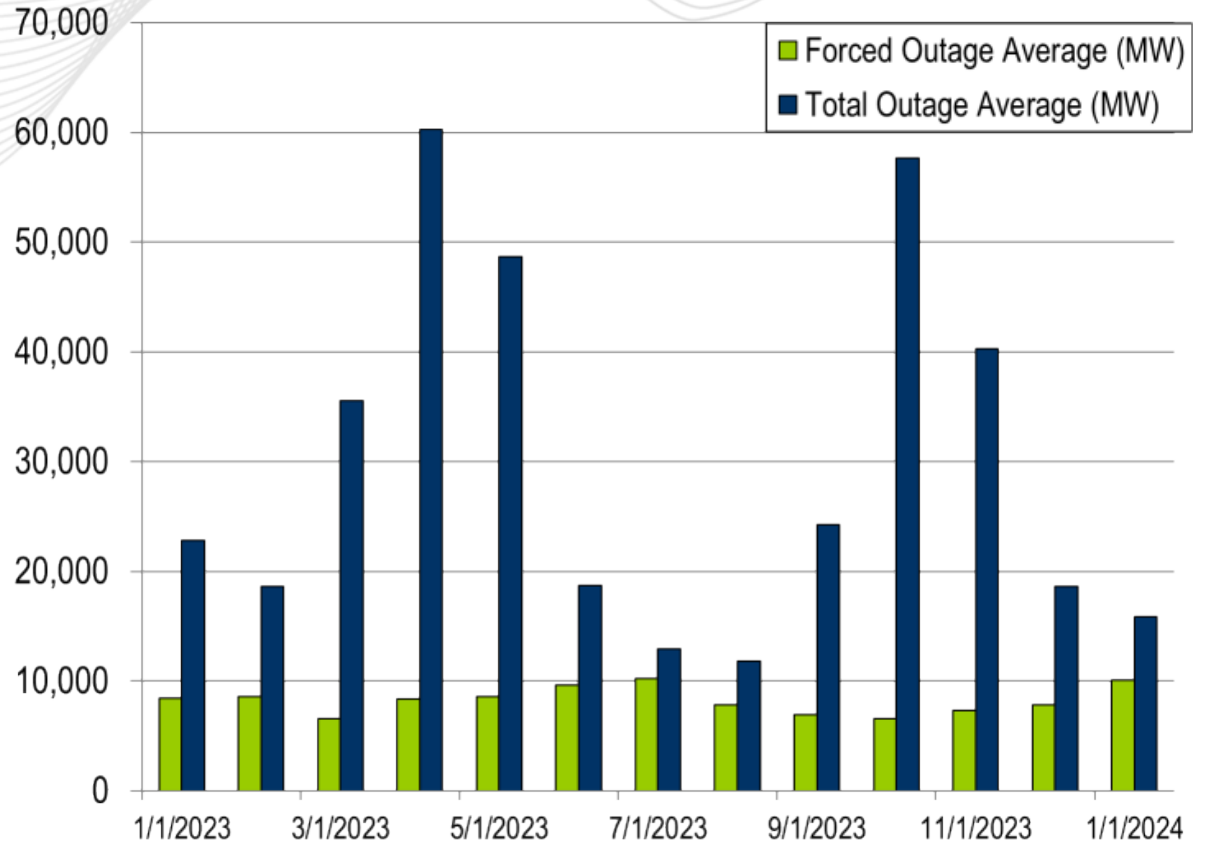
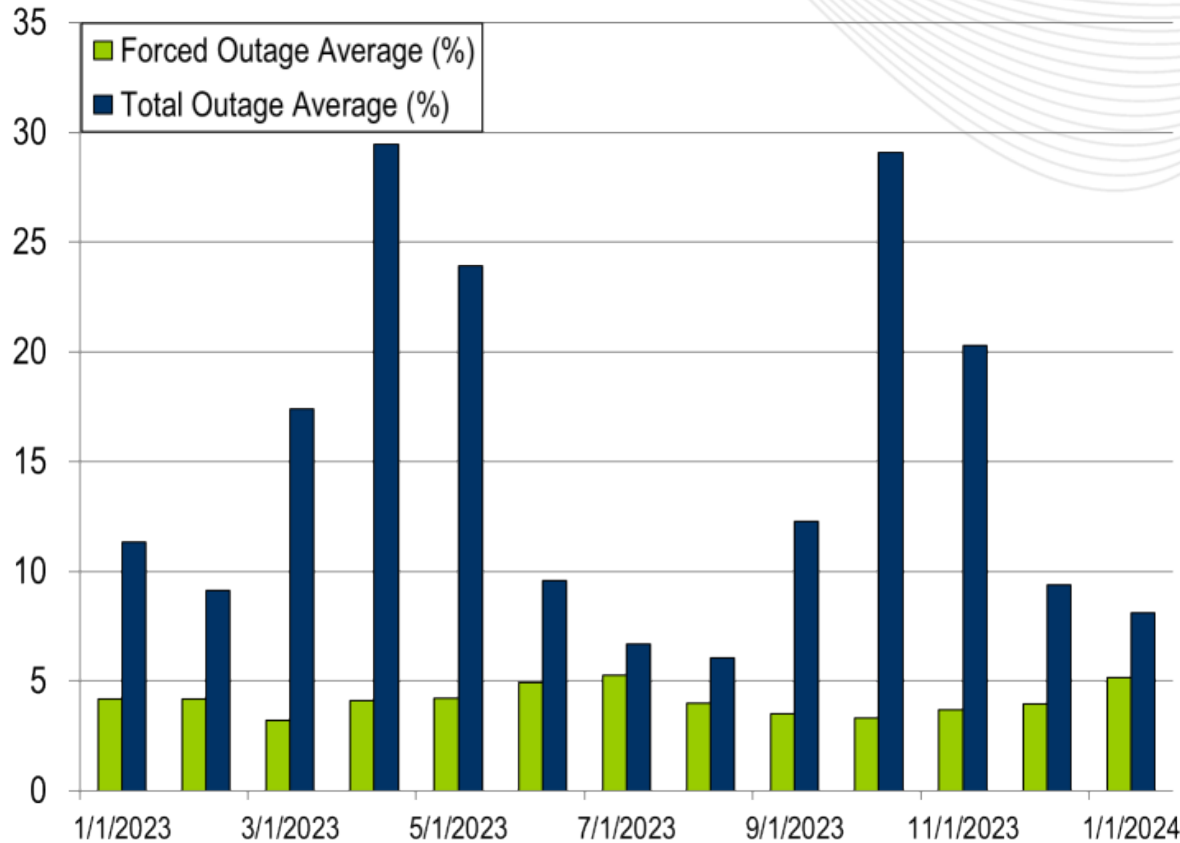




PJM's BAAL performance has exceeded the goal of 99% for each month in 2023 and 2024.

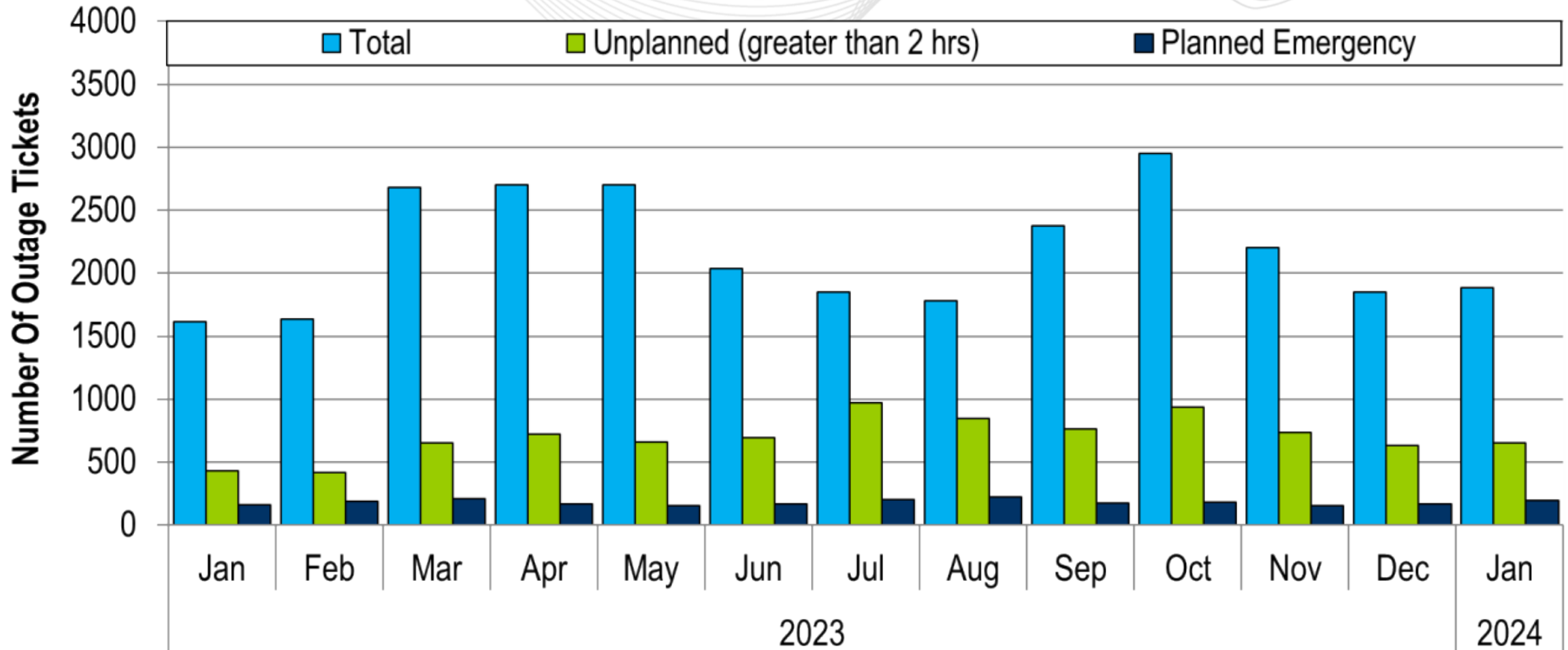
- 1 Shared Reserve event
- 3 Spin Events
- The following Emergency Procedures occurred:
 - 1 Conservative Operations Alert
 - 2 Cold Weather Alerts
 - 22 Post Contingency Local Load Relief Warnings (PCLLRWs)

- 9 Shortage Cases Approved
- The approved Shortage Cases occurred on:
 - 01/20/2024:
 - 3 Shortage Cases for the 17:40, 17:45, and 17:55 intervals
 - Factors: Load, interchange, and transfer interface binding hard
 - 01/21/2024:
 - 1 Shortage Case for the 17:50 interval
 - Factors: Load, interchange, and transfer interface binding hard
 - 01/22/2024:
 - 3 Shortage Cases for the 06:50, 06:55, and 06:59 intervals
 - Factors: Load, interchange, and transfer interface binding hard
 - 01/29/2024:
 - 2 Shortage Cases for the 12:10 and 12:15 intervals
 - Factors: Unit loss and interchange



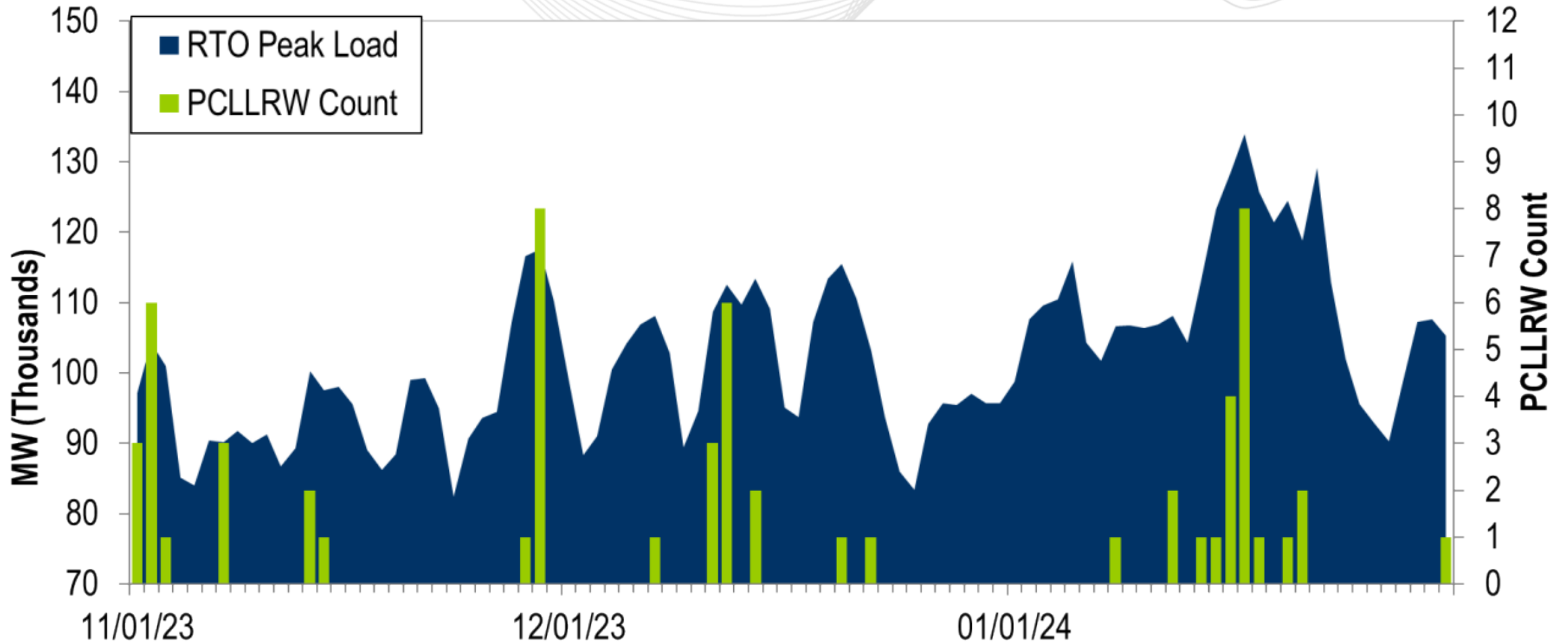
The 13-month average forced outage rate is 4.14% or 8,235 MW.
 The 13-month average total outage rate is 14.82% or 29,702 MW.

2022-2023 Planned Emergency, Unplanned, and Total Outages by Ticket



Note: "Unplanned Outages" include tripped facilities. One tripping event may involve multiple facilities.

PCLLRW Count Vs. Peak Load – Daily Values For 3 Months



| Event | 1 | | | 2 | | | 3 | | |
|--|----------|------|-------|----------|-----|-------|----------|-----|-------|
| Date | 01/13/24 | | | 01/25/24 | | | 01/29/24 | | |
| Start Time | 01:59:39 | | | 12:39:20 | | | 12:03:07 | | |
| End Time | 02:04:54 | | | 12:47:57 | | | 12:12:01 | | |
| Duration | 00:05:15 | | | 00:08:37 | | | 00:08:54 | | |
| Region | RTO | | | RTO | | | RTO | | |
| Resource Type | Gen | DR | Total | Gen | DR | Total | Gen | DR | Total |
| Assigned (MW) | 2456 | 80 | 2536 | 2173 | 668 | 2841 | 2085 | 579 | 2664 |
| Estimated Expected Response of Assigned Resources (MW) | 1289 | 42 | 1331 | 1872 | 576 | 2448 | 1855 | 515 | 2371 |
| Actual Response of Assigned Resources (MW) | 396 | 65 | 461 | 1102 | 541 | 1643 | 1433 | 507 | 1940 |
| Output Increase of Resources without Assignment (MW) | 2125 | 0 | 2125 | 605 | 0 | 605 | 1607 | 0 | 1607 |
| Percent Response To Estimated Expected Response (%) | 31% | 154% | 35% | 59% | 94% | 67% | 77% | 98% | 82% |
| Penalty (MW) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

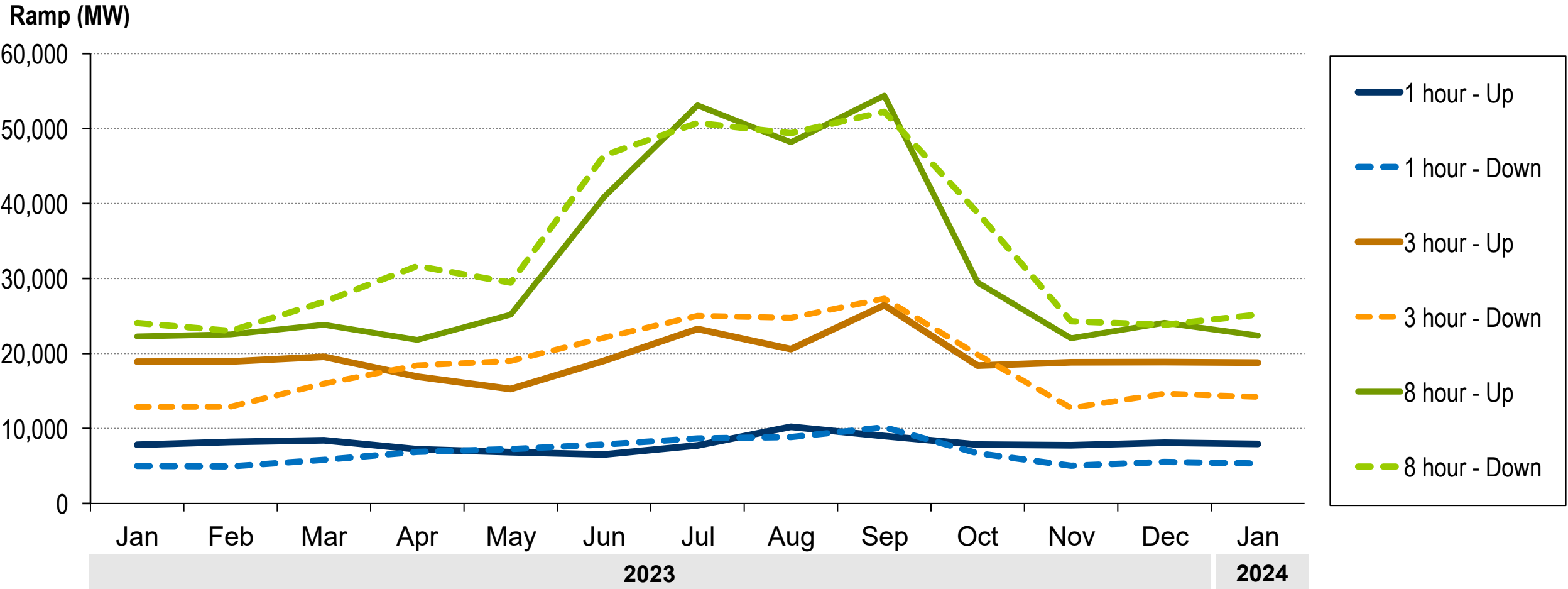
Operational Flexibility Metrics

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February 20, 2024

- This metric shows the monthly maximum net load ramps for various time frames (1, 3 and 8 hours) for both ramp up and ramp down.
- Metered Load = Total Electric Distribution Company demand, calculated from real-time telemetry
- Gross Load = Metered Load + BTM Solar
- Net Load = Gross Load – FTM & BTM Solar – FTM Wind

(BTM = Behind-the-meter, FTM = Front-of-the-meter)

1) Monthly Maximum Net Load Ramp

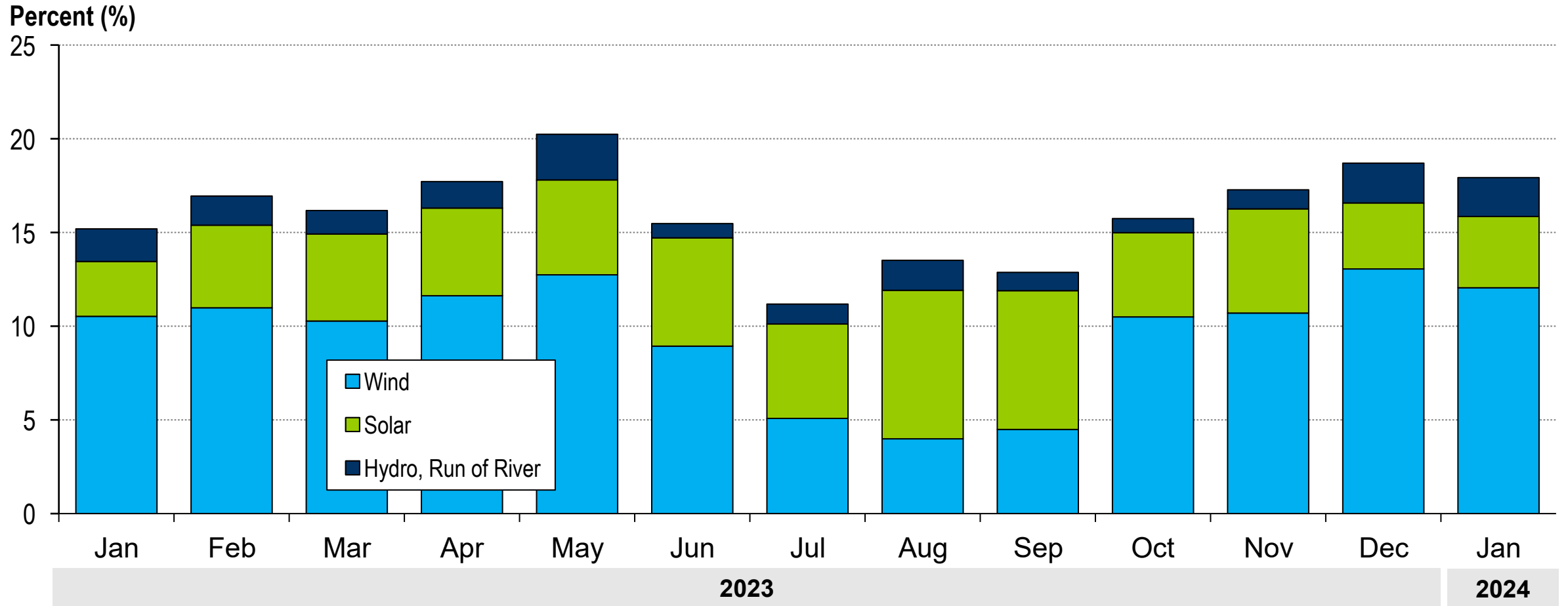


- This metric shows the hourly maximum percent of metered load served by the total of three different renewables in PJM for each month: wind (FTM), solar (FTM) and hydro, run of river.
- Metered Load = Total Electric Distribution Company demand, calculated from real-time telemetry

(FTM = Front-of-the-meter)

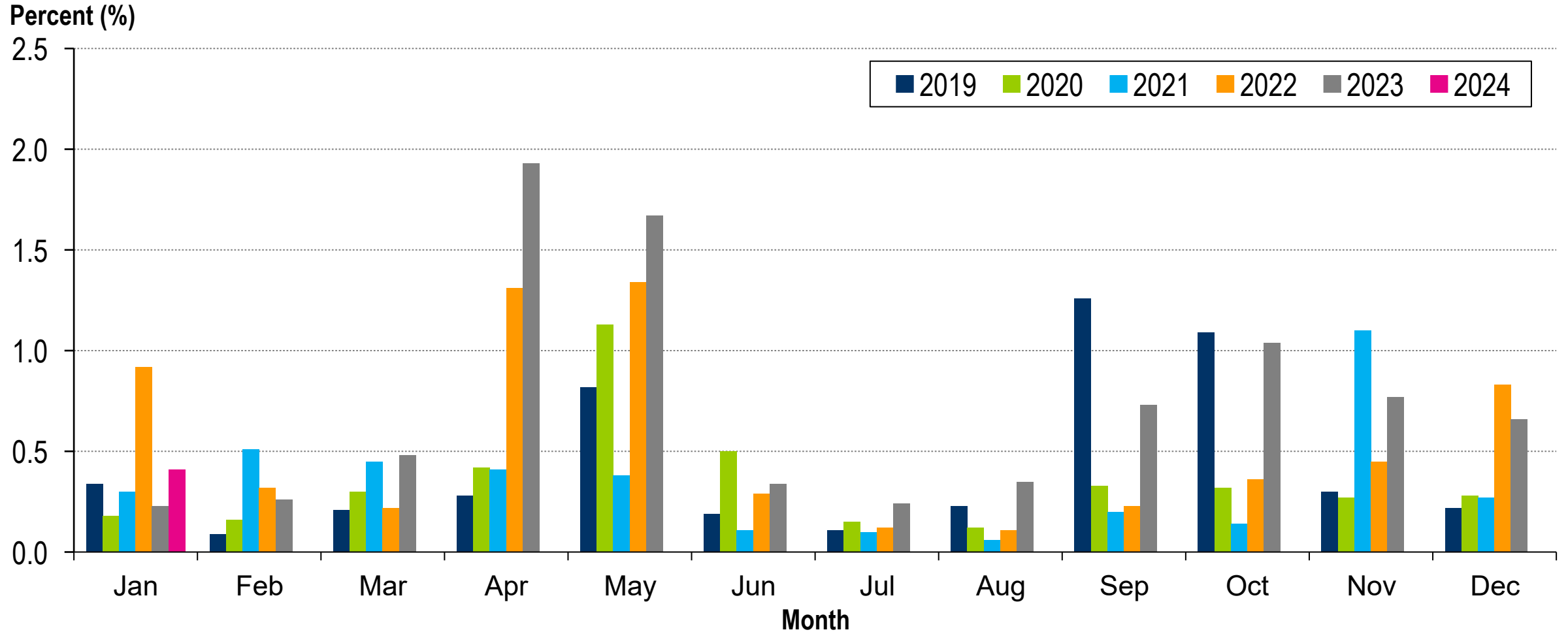


2) Hourly Maximum Percent of Metered Load Served by Renewables



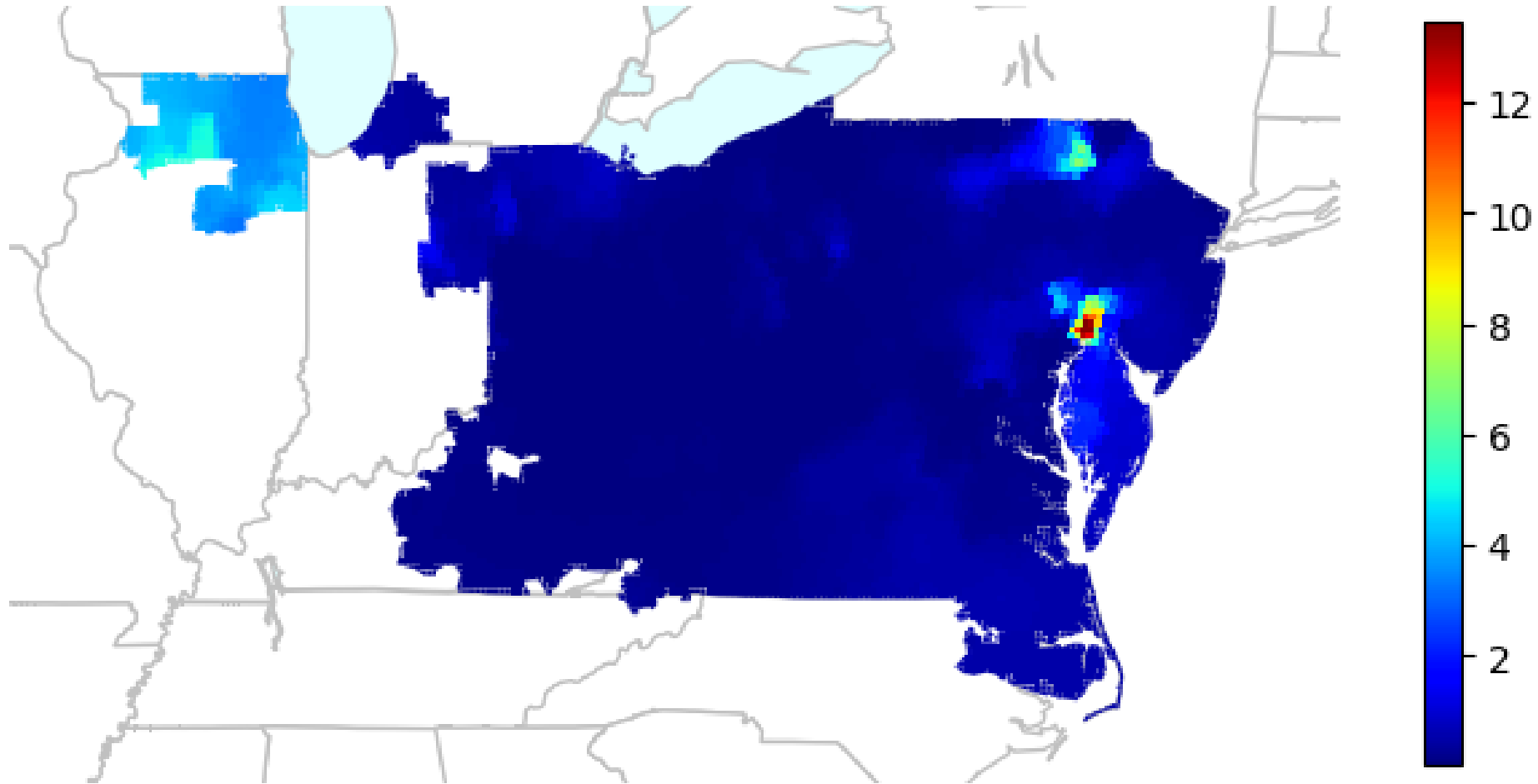
- This metric shows the percentage of bus-intervals across a month having a negative real-time total LMP. A qualified bus may be a generator, load, or other type of pricing node as defined by PJM Settlements.

3a) Monthly Percent of Negative Pricing Interval-Busses



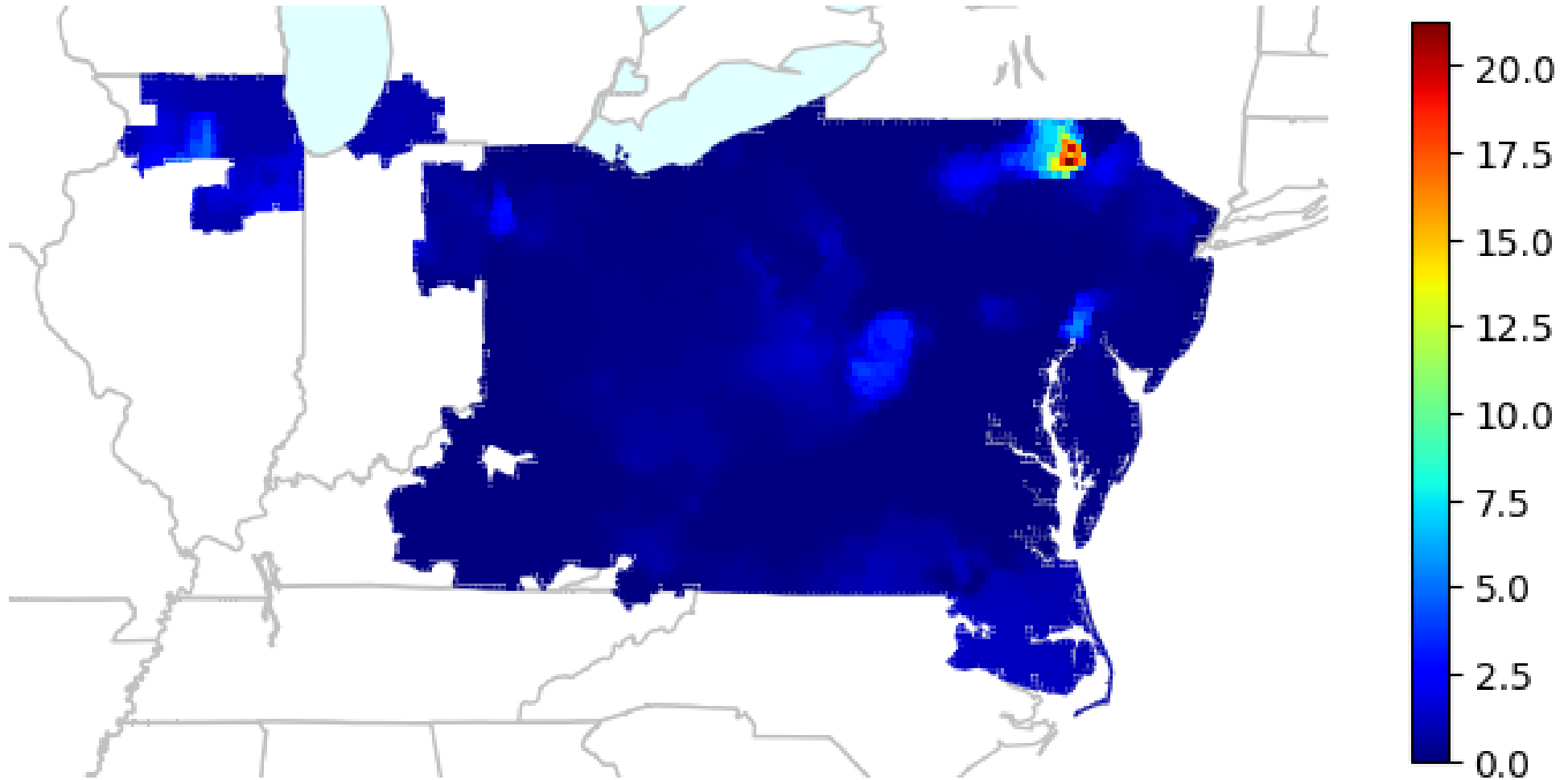
- This metric shows the percentage of bus-intervals year-to-date (YTD) (2023 and 2024 through January 2024) having a negative real-time total LMP by location. A qualified bus may be a generator, load, or other type of pricing node as defined by PJM Settlements.
- Mapped to DIMA station longitude and latitude
- Rasterized to five square mile blocks

2023 Annual % Negative Bus-Intervals



3b) YTD Percent of Negative Pricing Interval-Busses by Location

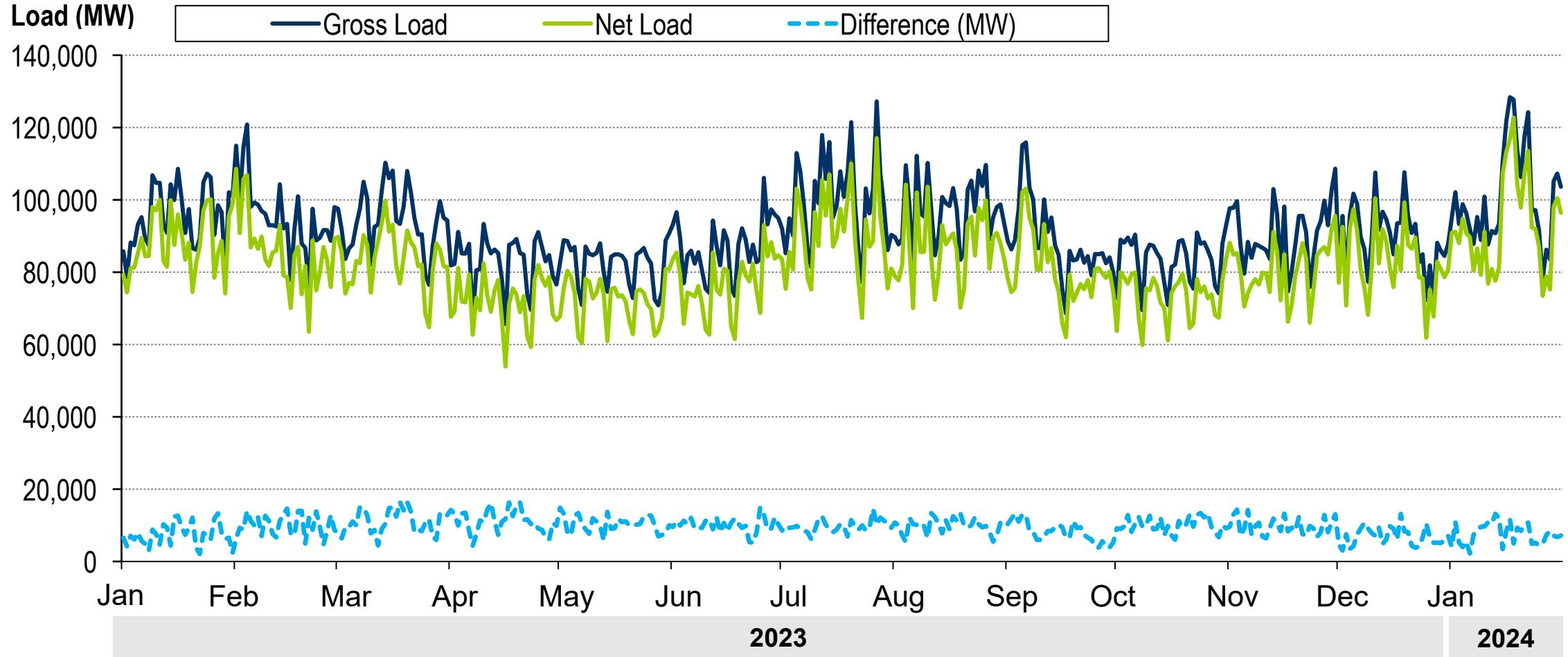
2024 YTD % Negative Bus-Intervals



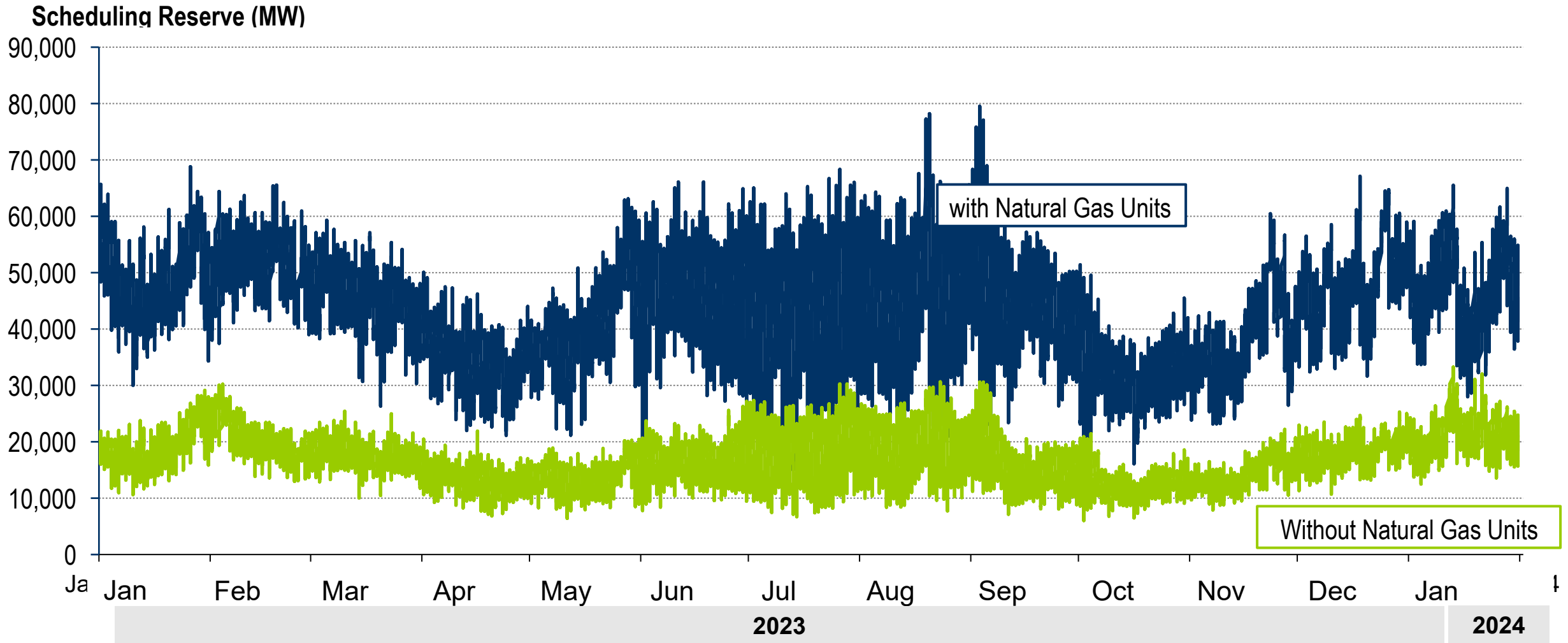
- This metric shows the gross load and net load during the hour of each day with the largest difference between the two.
 - Metered Load = Total Electric Distribution Company demand, calculated from real-time telemetry
 - Gross Load = Metered Load + BTM Solar
 - Net Load = Gross Load – FTM & BTM Solar – FTM Wind
- (BTM = Behind-the-meter, FTM = Front-of-the-meter)



4) Maximum Daily Difference Between Gross Load and Net Load

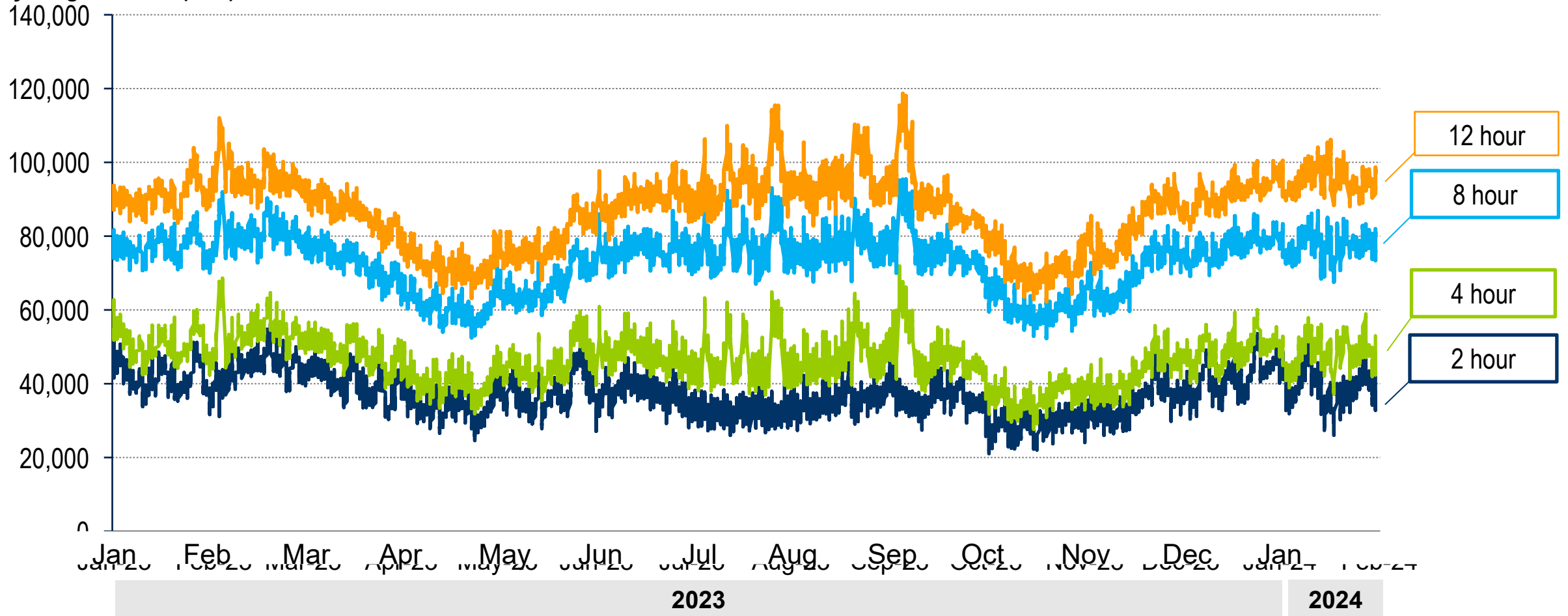


- This metric shows the offline/unscheduled generation that is capable of being scheduled and coming online in a future interval.
- For each hourly interval, it shows the calculated potential generator scheduling reserve available in a 2-hour-forward horizon.
- Measured at the RTO level
- The metric includes the following unit types: Coal, Hydro, Hydro Pumped Storage, Landfill, Natural Gas, Oil, Waste



- This metric shows the amount of currently online generation that can shut down and return in a forward horizon
 - Complement to scheduling reserve
- For each hourly interval, it shows the calculated potential generator cycling reserve available in 2-hour, 4-hour, 8-hour and 12-hour-forward horizons (values are inclusive and not additive, i.e. 2-hour values are included in the 4-hour, 8-hour and 12-hour values).
- Measured at the RTO level
- The metric includes the following unit types: Coal, Hydro, Hydro Pumped Storage, Landfill, Natural Gas, Oil, Waste

Cycling Reserve (MW)



System Operations Report

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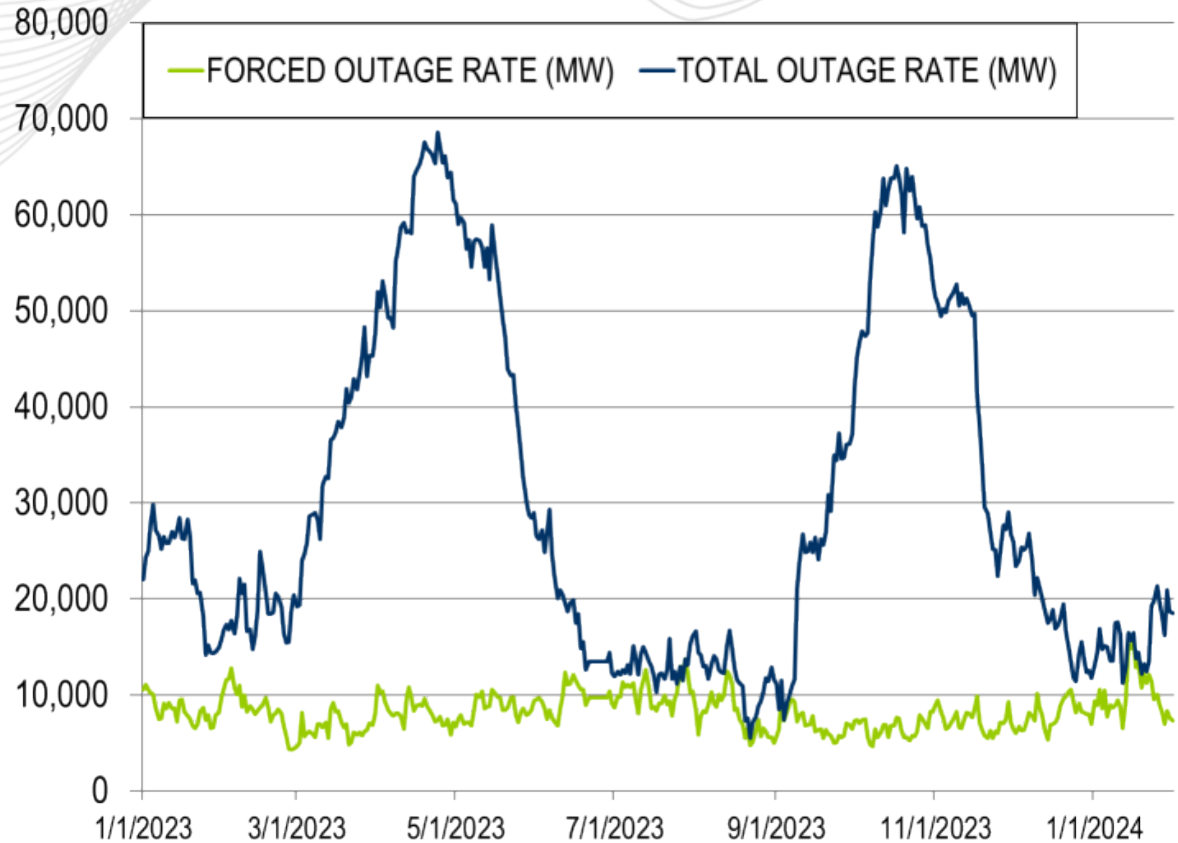
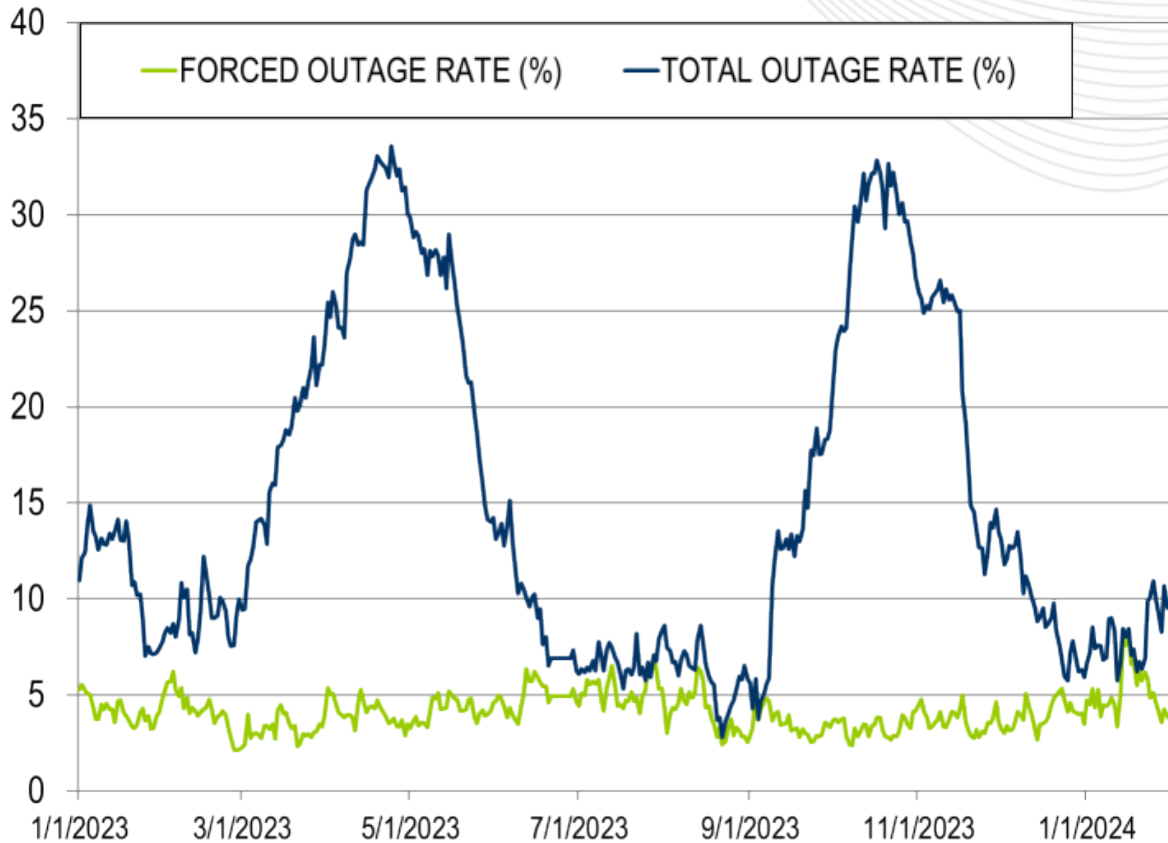
(866) 400 – 8980

custsvc@pjm.com

Appendix

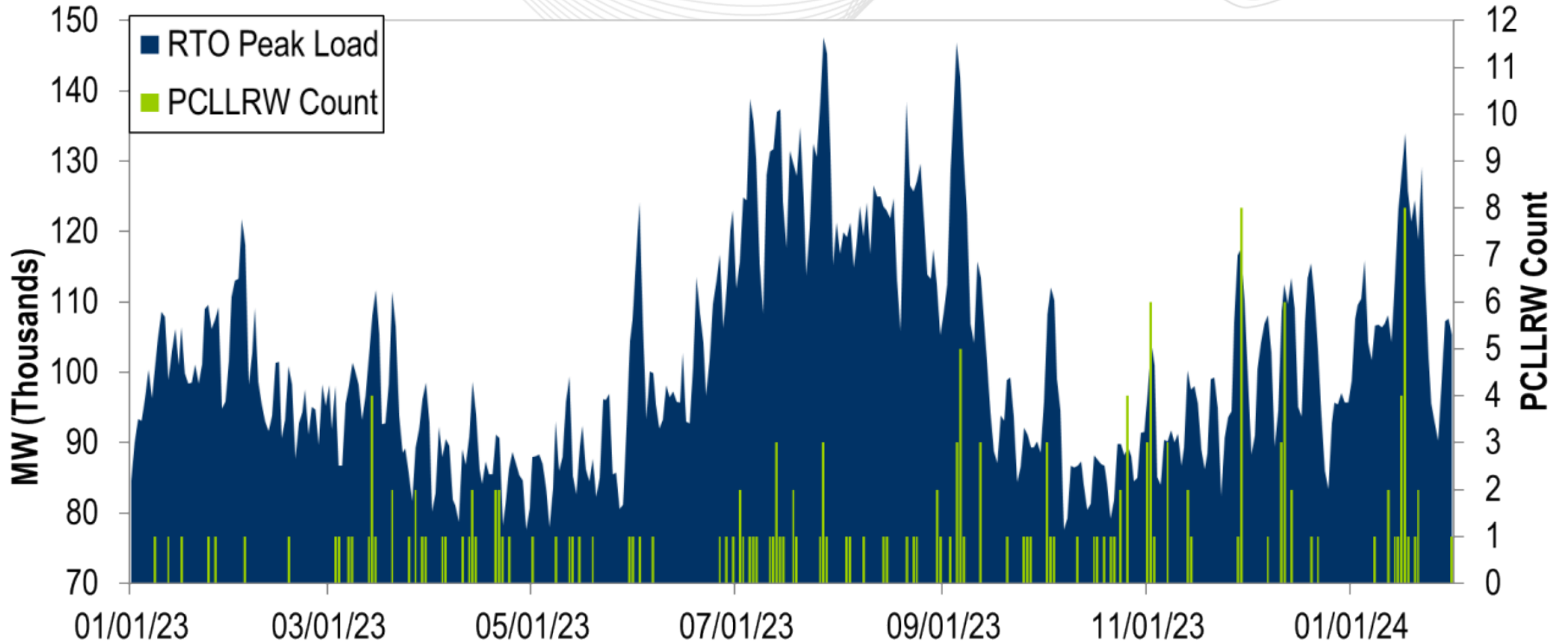
Goal Measurement: Balancing Authority ACE Limit (BAAL)

- The purpose of the new BAAL standard is to maintain interconnection frequency within a predefined frequency profile under all conditions (normal and abnormal), to prevent frequency-related instability, unplanned tripping of load or generation, or uncontrolled separation or cascading outages that adversely impact the reliability of the interconnection. NERC requires each balancing authority demonstrate real-time monitoring of ACE and interconnection frequency against associated limits and shall balance its resources and demands in real time so that its Reporting ACE does not exceed the BAAL ($BAAL_{LOW}$ or $BAAL_{HIGH}$) for a continuous time period greater than 30 minutes for each event.
- PJM directly measures the total number of BAAL excursions in minutes compared to the total number of minutes within a month. PJM has set a target value for this performance goal at 99% on a daily and monthly basis. In addition, current NERC rules limit the recovery period to no more than 30 minutes for a single event.



The 13-month average forced outage rate is 4.14% or 8,235 MW.
 The 13-month average total outage rate is 14.82% or 29,702 MW.

PCLLRW Count Vs. Peak Load – Daily Values For 13 Months



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POWER GRID**
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