

# Operational Flexibility Metrics

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- In 2023, PJM staff proposed a set of metrics to quantize the *operational flexibility* of the current supply mix
  - *Baseline the state of PJM to assess changes resulting from the energy transition to renewable-dominated dispatch & pricing*
  - Backwards-looking measurements, not forecast
- Informational updates posted to [MC Webinar](#) (+ Graphs data)

## Dispatch

- Monthly Maximum Net Load Ramp
- Maximum Daily Difference Between Gross Load and Net Load

## Supply Mix

- Hourly Maximum Percent of Metered Load Served by Renewables

## Pricing

- Monthly Percent of Negative Pricing Interval-Busses

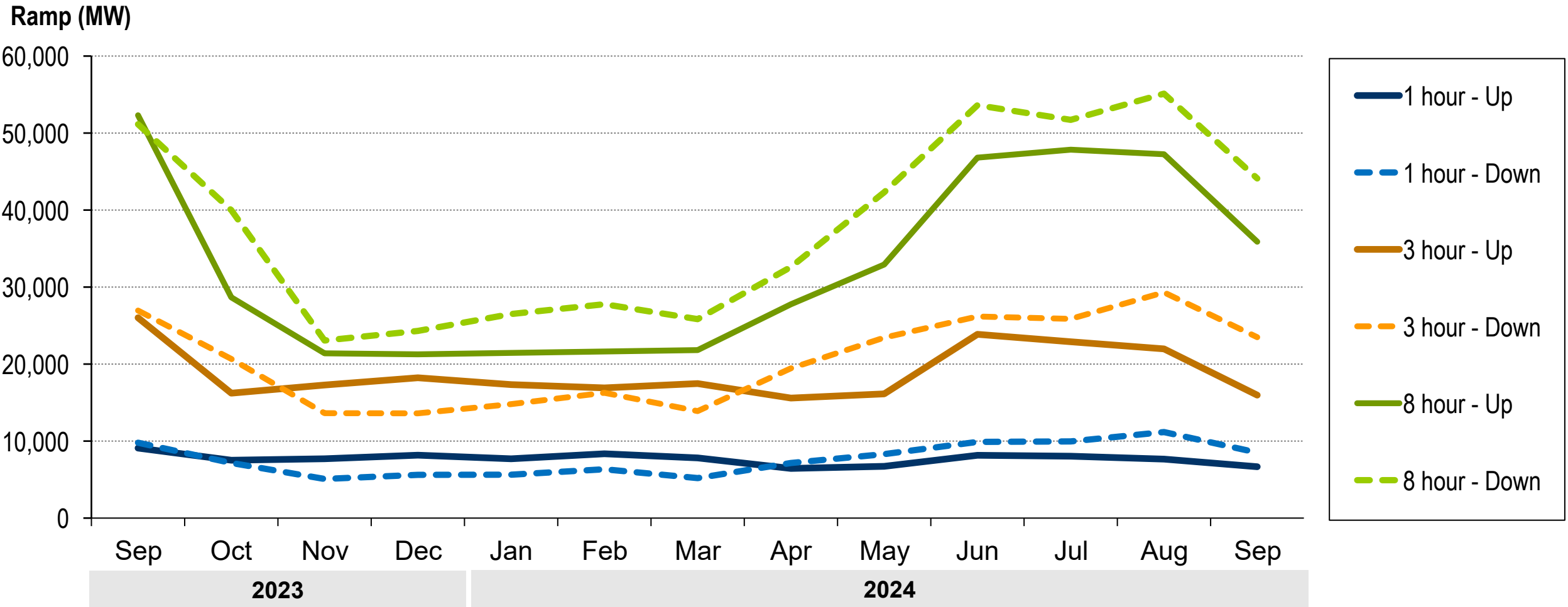
## Scheduling

- Hourly Scheduling Reserve
- Hourly Cycling Reserve

- 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

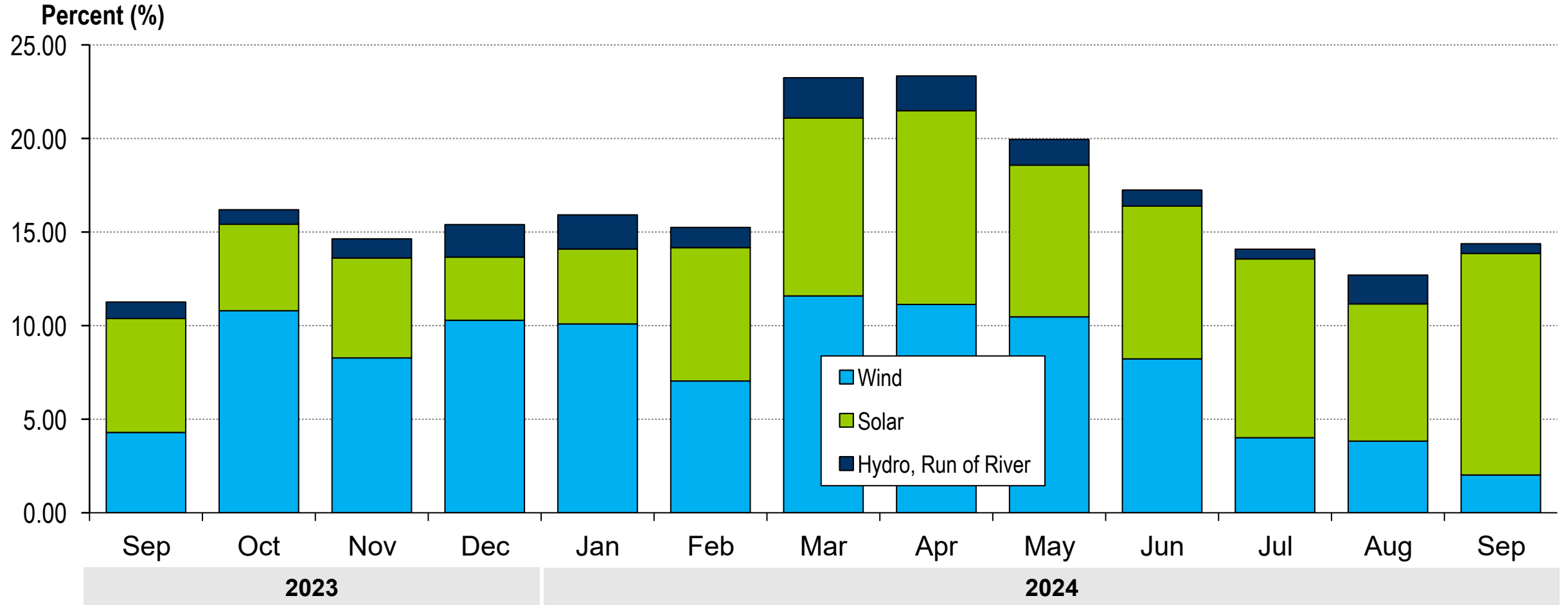


- This metric shows the hourly maximum percent of metered load served by the total of three different renewables in PJM for each month: wind (FTM), solar (FTM) and hydro, run of river.
- Metered Load = Total Electric Distribution Company demand, calculated from real-time telemetry

(FTM = Front-of-the-meter)



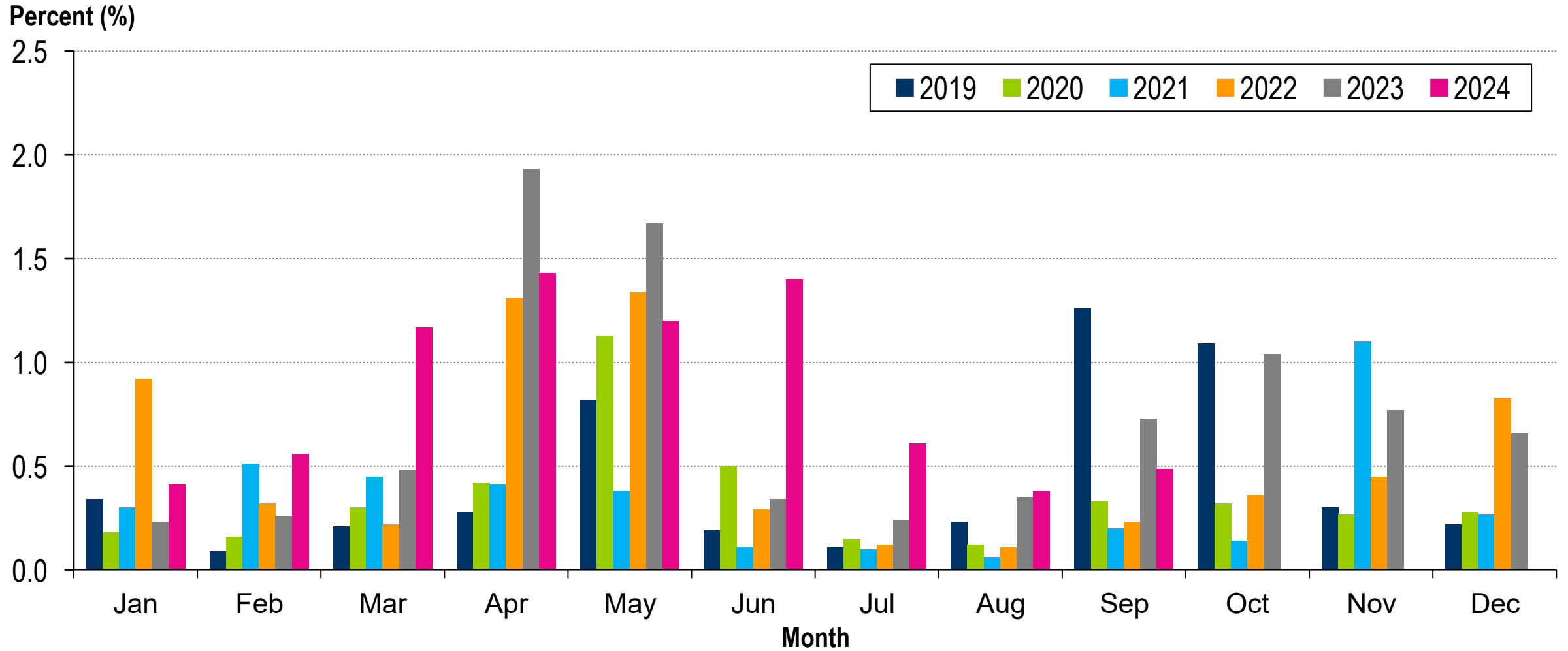
## 2) Hourly Maximum Percent of Metered Load Served by Renewables



- 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.

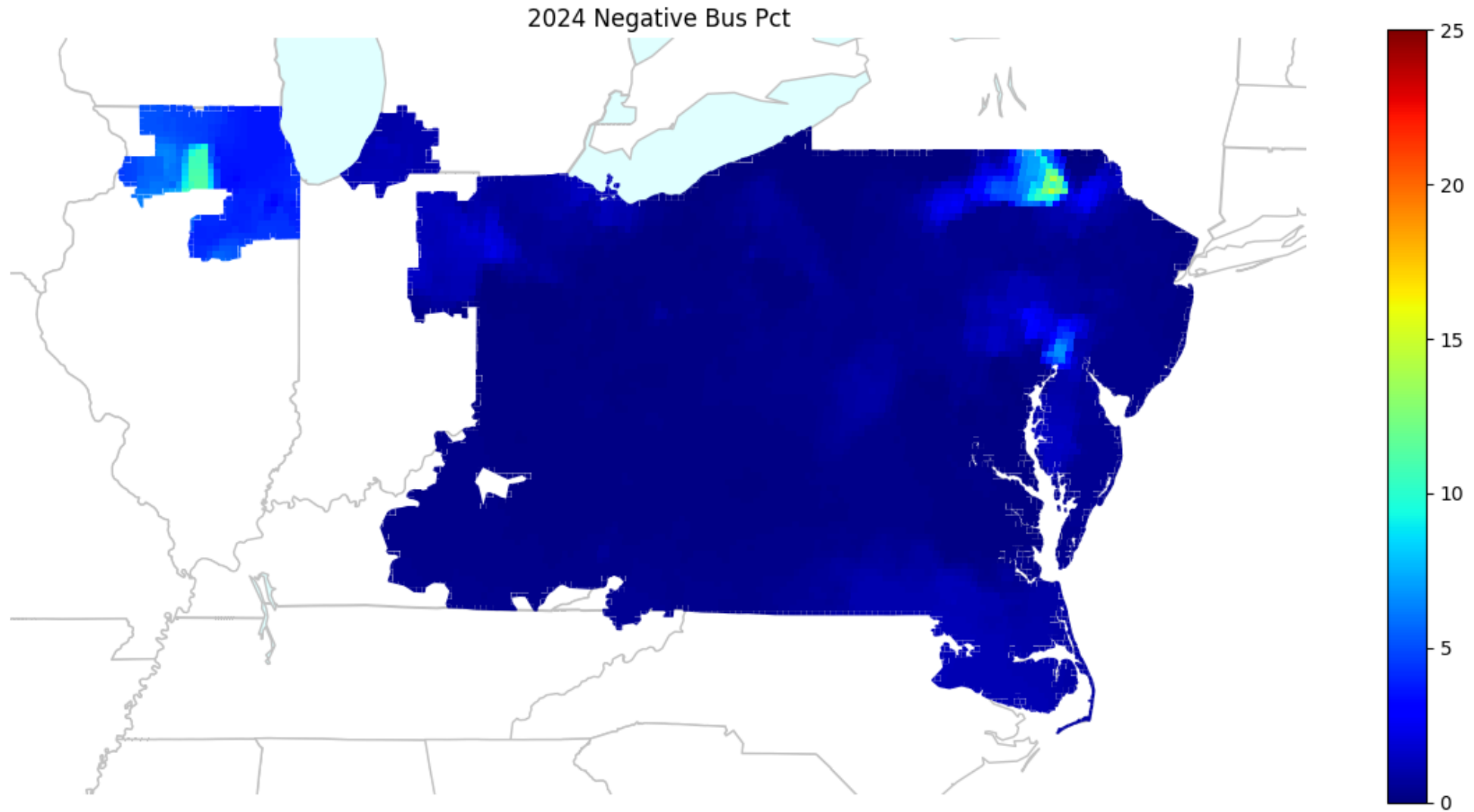


# 3a) Monthly Percent of Negative Pricing Interval-Busses



- This metric shows the percentage of bus-intervals year-to-date (YTD) (through September 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

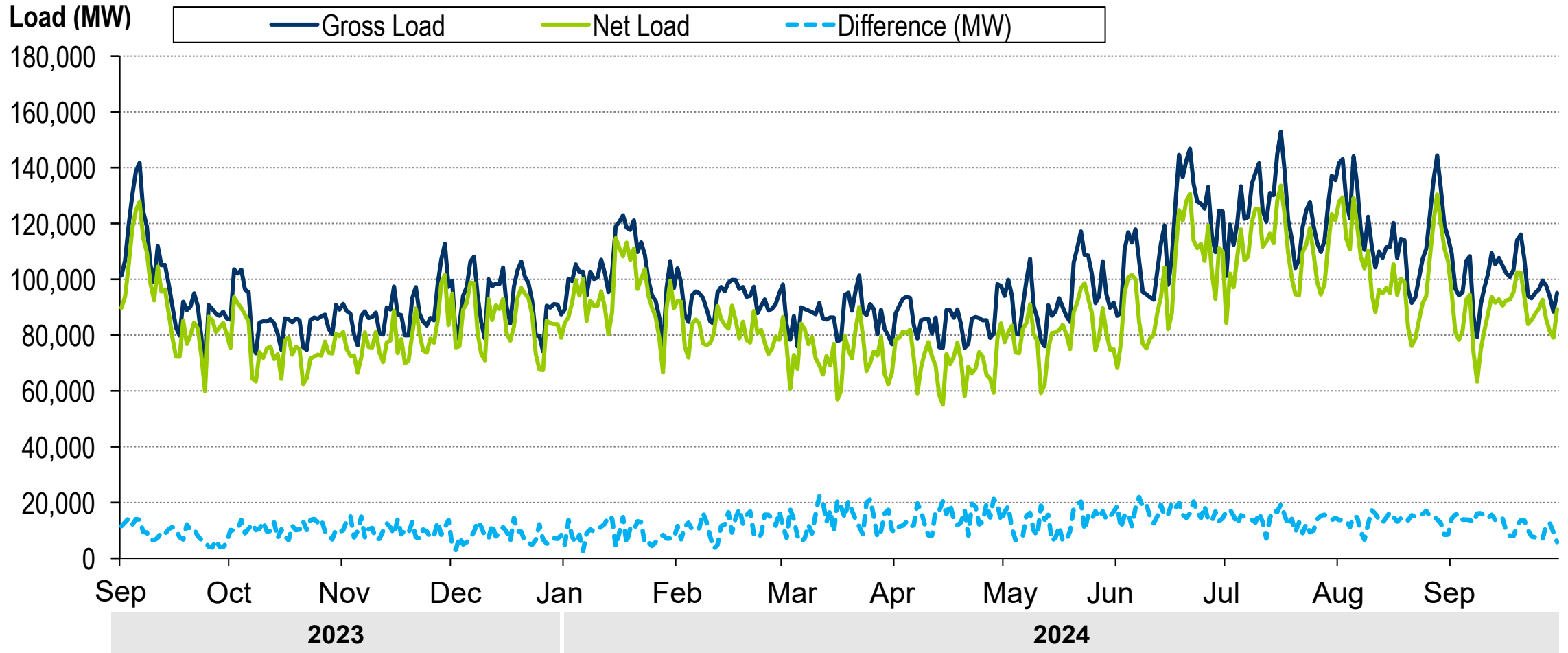
# 3b) YTD Percent of Negative Pricing Interval-Busses by Location



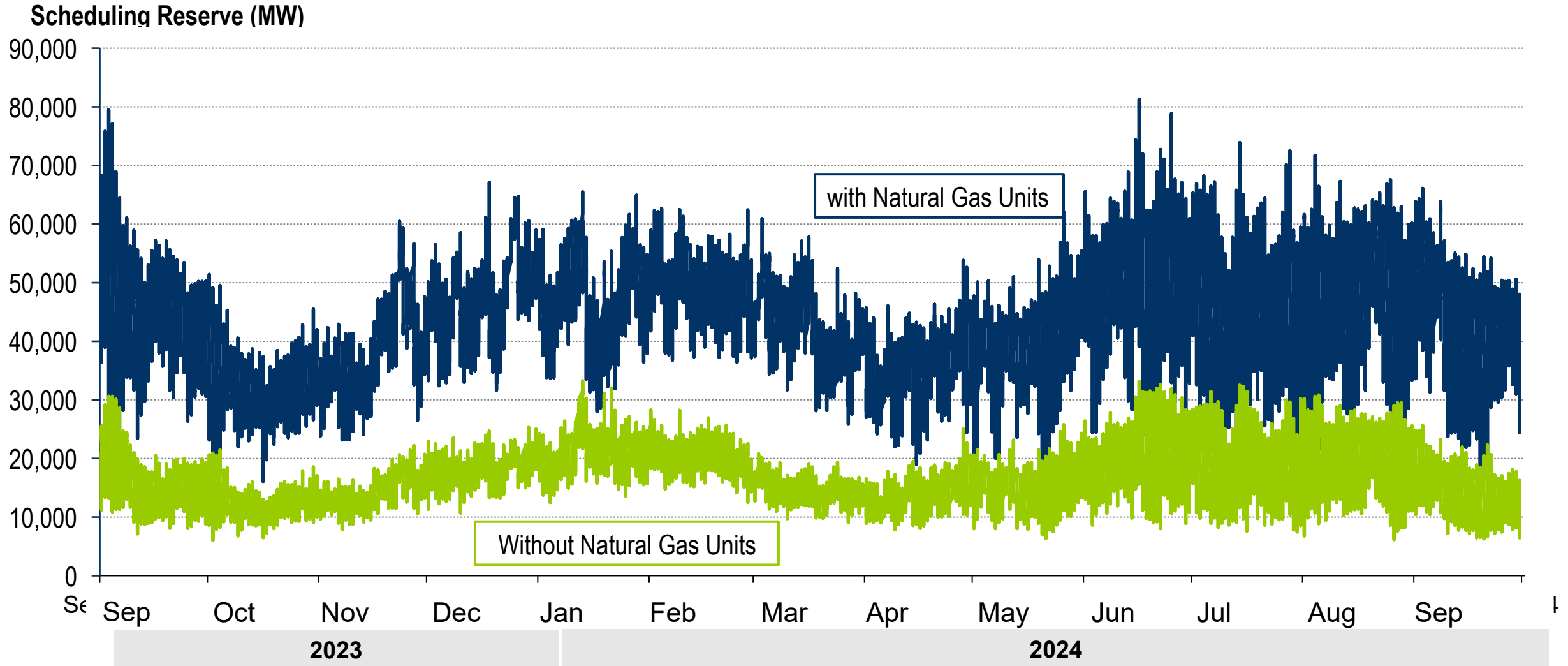
- This metric shows the gross load and net load during the hour of each day with the largest difference between the two.
  - Metered Load = Total Electric Distribution Company demand, calculated from real-time telemetry
  - Gross Load = Metered Load + BTM Solar
  - Net Load = Gross Load – FTM & BTM Solar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



# 4) Maximum Daily Difference Between Gross Load and Net Load



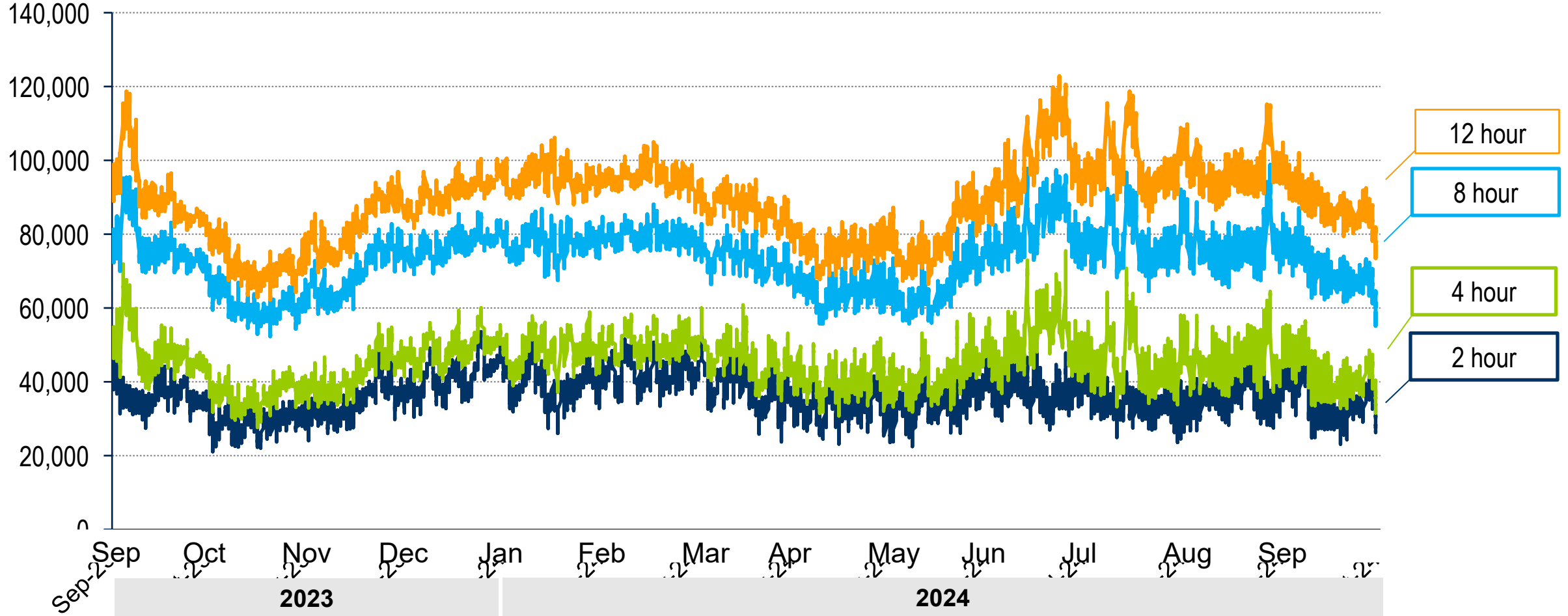
- This metric shows the offline/unscheduled generation that is capable of being scheduled and coming online in a future interval.
- For each hourly interval, it shows the calculated potential generator scheduling reserve available in a 2-hour-forward horizon.
- Measured at the RTO level
- The metric 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)



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