



Item 10.2: System Operations Update

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ERCOT Public

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Overview

- **Purpose**
 - Provide an update on key operational metrics to the R&M Committee
 - Provide information on recent Ancillary Services performance
 - Provide information on hot topics
- **Voting Items / Requests**
 - No action is requested of the R&M Committee; for discussion only

- **Key Takeaway(s)**
 - As part of holistic review of Ancillary Services in the PUC's Ancillary Service Study, ERCOT made several recommendations.
 - ERCOT will be filling revision requests soon to require Advanced Grid Support on future ESRs.
 - All key operational metrics are trending well, and all Ancillary Services are performing well.

Recommendations for PUC AS Study

PUC Ancillary Service Study

Background:

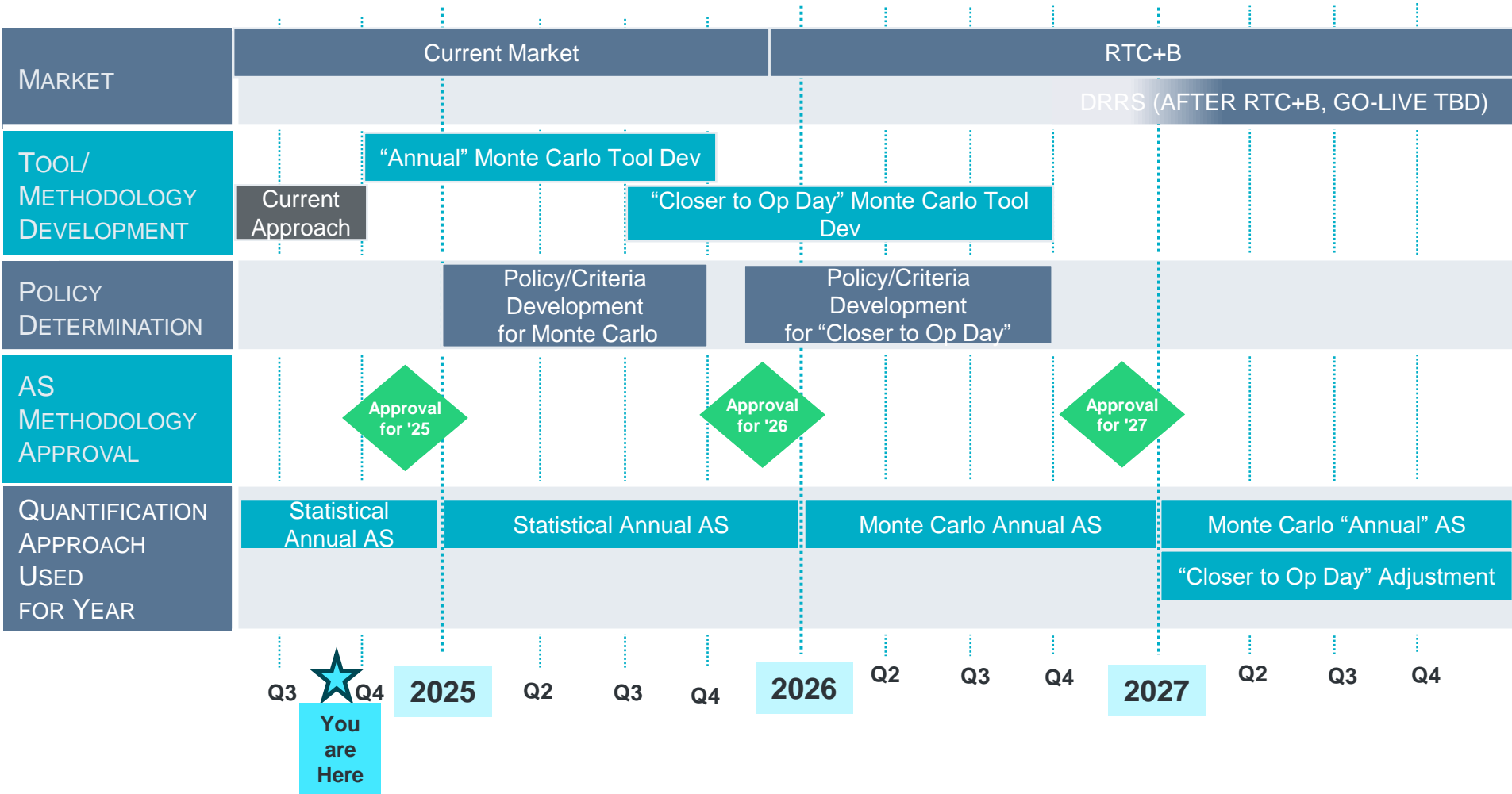
- Senate Bill 3 from the 87th Texas Legislative session requires the PUC to review Ancillary Services (AS)
- The PUC asked ERCOT and the IMM to conduct a holistic AS review
- Recent Timeline:
 - ERCOT-IMM-PUC workshop on August 28
 - ERCOT and IMM sent recommendations to PUC Staff in early September
 - Draft report filed by PUC Staff at the end of September
 - PUC workshop in late October
 - PUC recommendations submitted to the Legislature in January 2025

Key Takeaway: At the request of the PUC, ERCOT performed a holistic review of Ancillary Services.

Summary of ERCOT's AS Study Recommendations

- ERCOT finds that the existing AS products and the forthcoming DRRS are sufficient for meeting the ERCOT System's Real-Time, operational reliability needs.
 - ERCOT does not recommend additional AS products at this time.
- ERCOT recommends to continue using current mechanisms that best quantify the risks and meet applicable NERC reliability standard requirements for **Regulation**, **RRS**, and the frequency-response portion of **ECRS**.
- ERCOT recommends exploring the following two potential improvements:
 1. Revamp the methodology used to calculate non-frequency recovery related **ECRS** and **Non-Spin** quantities to use a Monte Carlo analysis framework for quantifying reliability risks that these reserves are required to cover; and
 2. Examine the benefits of determining some portion of AS quantities closer to the operating day based on days-ahead forecast conditions rather than strictly through an annual calculation.
- Lastly, ERCOT recommends continuing to monitor the impact of resource mix on system inertia and impact of large load growth on frequency control. While additional AS products are not known to be needed now, there may be a need to consider new AS and/or Regulation Service methodology changes, depending on how the system evolves in the future.

AS Methodology Evolution Road Map

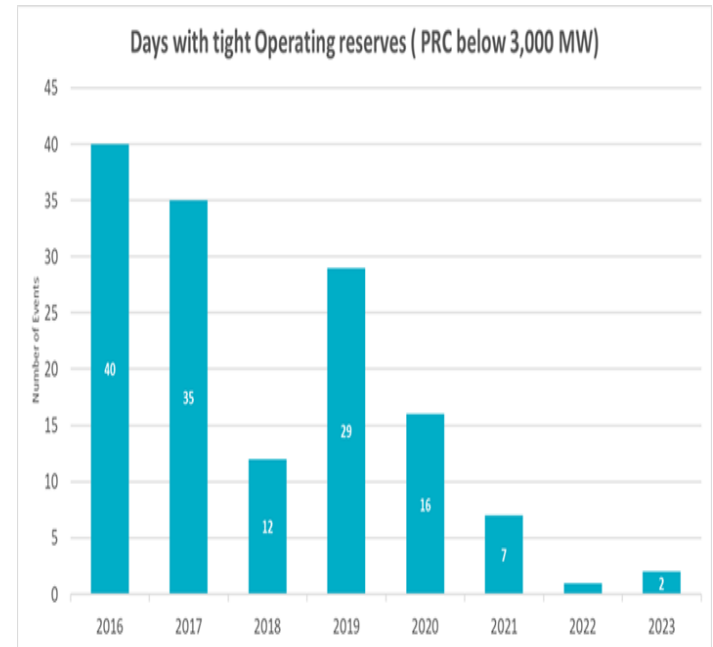
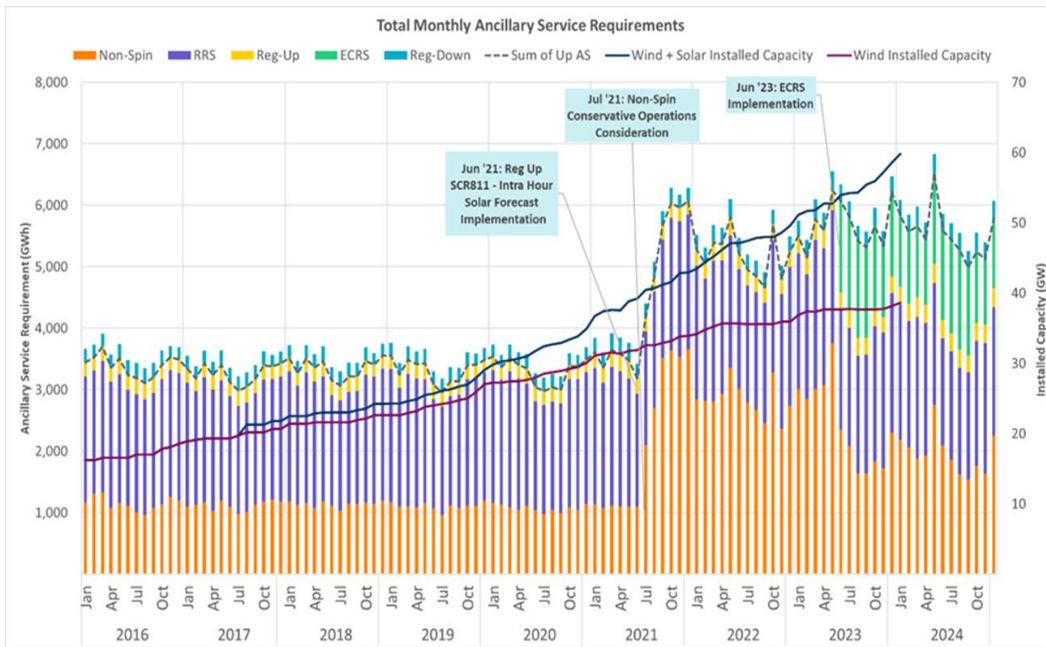


Response to the IMM's Analysis and Recommendations

- ERCOT notes that much of the reduction in AS quantities that the IMM's analysis proposes is NOT due to better analytics, but due to modifying previous policy decisions in a way that drives lower AS quantities. ***Modifying these decisions under ERCOT's current AS Methodology would significantly lower the quantities as well.***
- Those policy decisions are:
 - **Expect Periodic Emergency Operations:** The fundamental criterion the IMM is using for determining AS quantities is avoiding load-shed, whereas ERCOT intentionally increased AS quantities since 2021 using a criterion of avoiding Watches when Resources are available.
 - **Increase the use of RUC Rather Than Procuring AS:** The IMM is recommending that Non-Spin should only be used to cover risks in a one-hour timeframe, whereas the current AS methodology covers risks that have a six-hour lead time. Further, the IMM proposes that RUC can be used to cover risks that have a longer lead time.
 - **Rely on Non-Obligated Resources for Reliability Services:** The IMM recommends taking advantage of headroom from all Resources that are committed including those that don't have any obligation to be available. Historically, ERCOT has set AS quantities based on an estimation of the risks. This approach guarantees that Resources with the right operational characteristics will be available to cover these risks and does not rely on past actions/behavior from Market Participants which may not continue.

Key Takeaway: The significant reduction in AS quantities in the IMM's analysis is due to assumed changes in policy that should be carefully considered and expressly determined.

Background on these Policy Decisions



- Following multiple days of high net load forecast errors and/or high generator forced outages in spring and early summer of 2021, ERCOT began operating with higher real-time reserves.
- The intention of this change in operating posture was to operate to a higher reliability threshold. Specifically, the goal was to have enough reserves to *not only to avoid the need for **loadshed*** but also **to decrease the likelihood of the need for Emergency Operations** due to insufficient reserve capacity.
- Initially, this change was accomplished by committing additional generation through the Reliability Unit Commitment (RUC) process.
- Market Participant feedback led ERCOT to seek the additional reserves through increased procurement of AS quantities in July 2021 and other changes in AS Methodology beginning January 2022. Effectively, since 2022, AS Methodology uses avoiding the need for Emergency Operations (Watches, EEA) as its event/criteria for determining AS quantities.

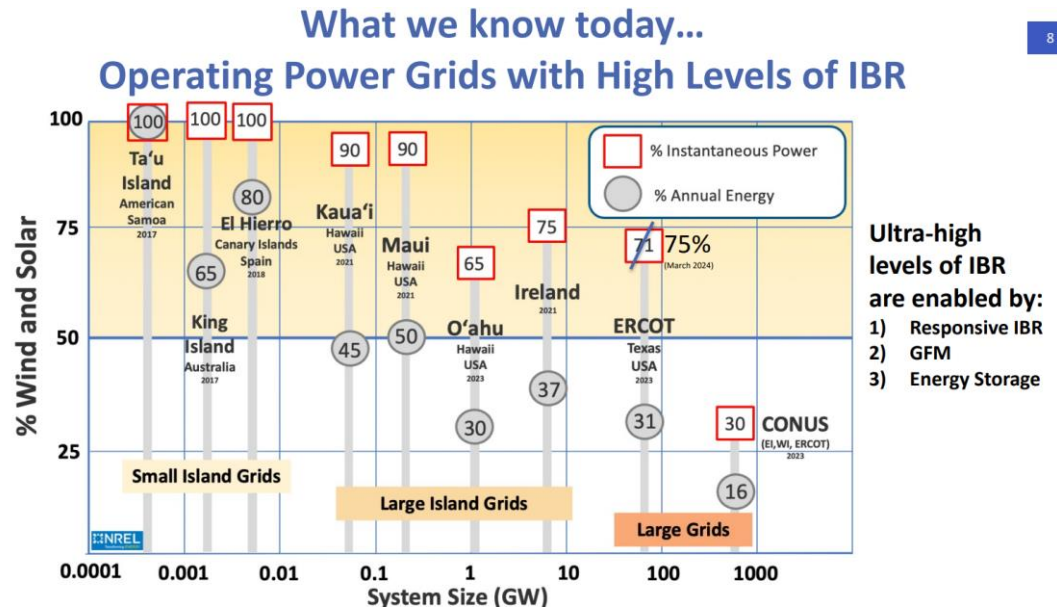


Advanced Grid Support (Grid-Forming Inverters)

Background

- ERCOT is one of largest grids in the world (largest in US) with a high penetration of inverter-based resources (75% in 2024).
- These currently-installed IBRs in ERCOT do not contribute to system strength; that has resulted in various types of stability issues on the grid
- ERCOT has implemented numerous mitigations to address these issues, including:

- Stability limits on power transfers through the use of Generic Transmission Limits (GTCs)
- Synchronous Condensers
- IBR ride-through requirements (NOGRR 245)



Capabilities and Trends

- Energy Storage Resources (ESRs) are available today that [CAN](#) provide system strength (aka “advanced grid support” (AGS) or “grid-forming inverters”)
 - Major OEMs for ESRs have commercially available products
 - Implementing these capabilities generally only require software/control setting
 - Minimal impact to hardware or commercial operations
- Globally, power grids with high penetration of IBRs are adopting grid forming technology to support grid security and resilience. (e.g., Australia, UK, Hawaii, Finland, Germany,...)
- NERC issued two white papers to highlight the need of AGS-ESR and encourage system operators adopt the technology
- ERCOT has worked with Electranix to develop performance requirements and model testing for AGS-ESRs

Proposed requirements and expectations

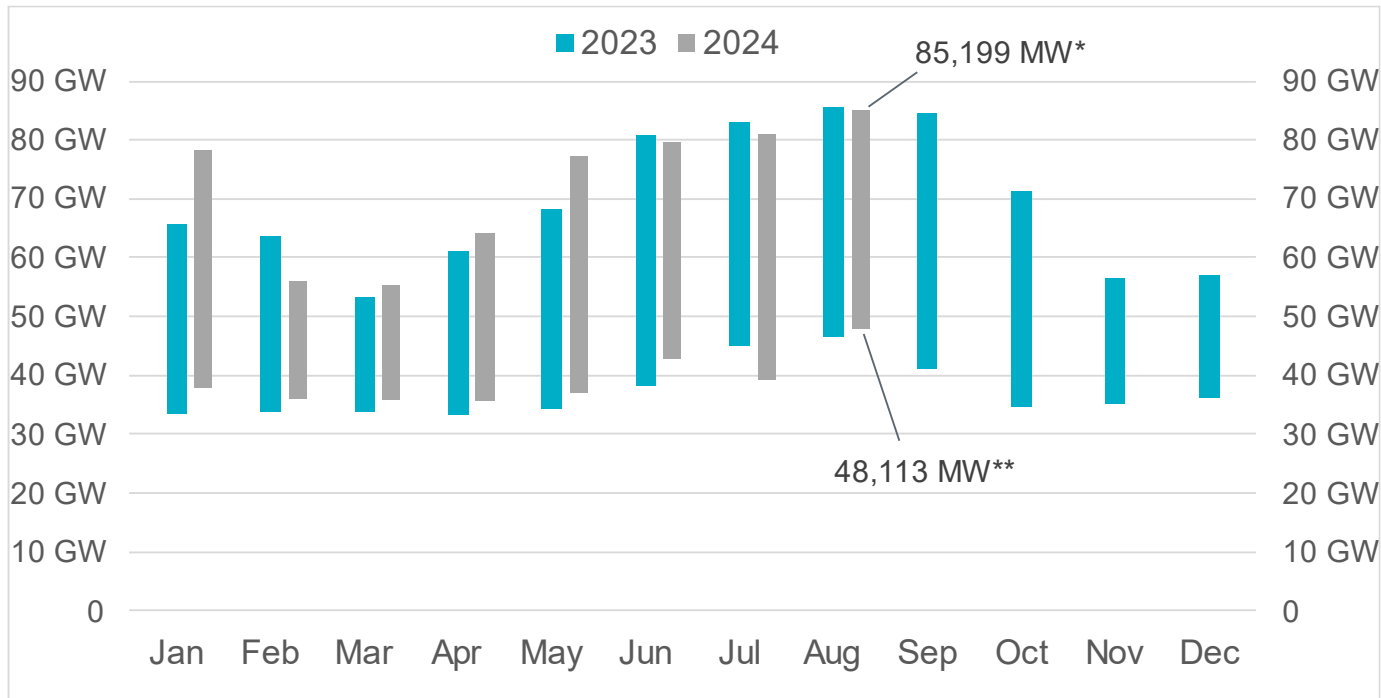
- Implementing AGS on ESRs would have major benefits to the grid stability and resilience
 - Could improve system voltage/frequency response and reduce event severity
 - Could potentially increase limit by 5~10% for some existing major stability constraints like WESTEX and Panhandle GTCs, and potentially eliminate need for other GTCs, if ESRs in those areas are capable of advanced grid support
- In October, ERCOT will be filing NOGRR/PGRR to require this capability on future ESRs
 - No requirement for existing ESRs, but there may be commercial reasons for ESRs in constrained areas to decide to implement voluntarily
 - Not proposing requirement for wind and solar IBRs since no current commercial availability and would require curtailment to provide
- Proposed AGS-ESR requirements and expectations:
 - Voluntary for the existing ESRs and mandatory for new ESRs
 - Requirements based on simulation of capability through interconnection studies and then modifications only through processes described in the Planning Guide Section 5.5 Generator Commissioning and Continuing Operations



Appendix

Operational Metrics and AS Performance

Demand



*Based on the maximum net system hourly value from August release of Demand and Energy 2024 report.

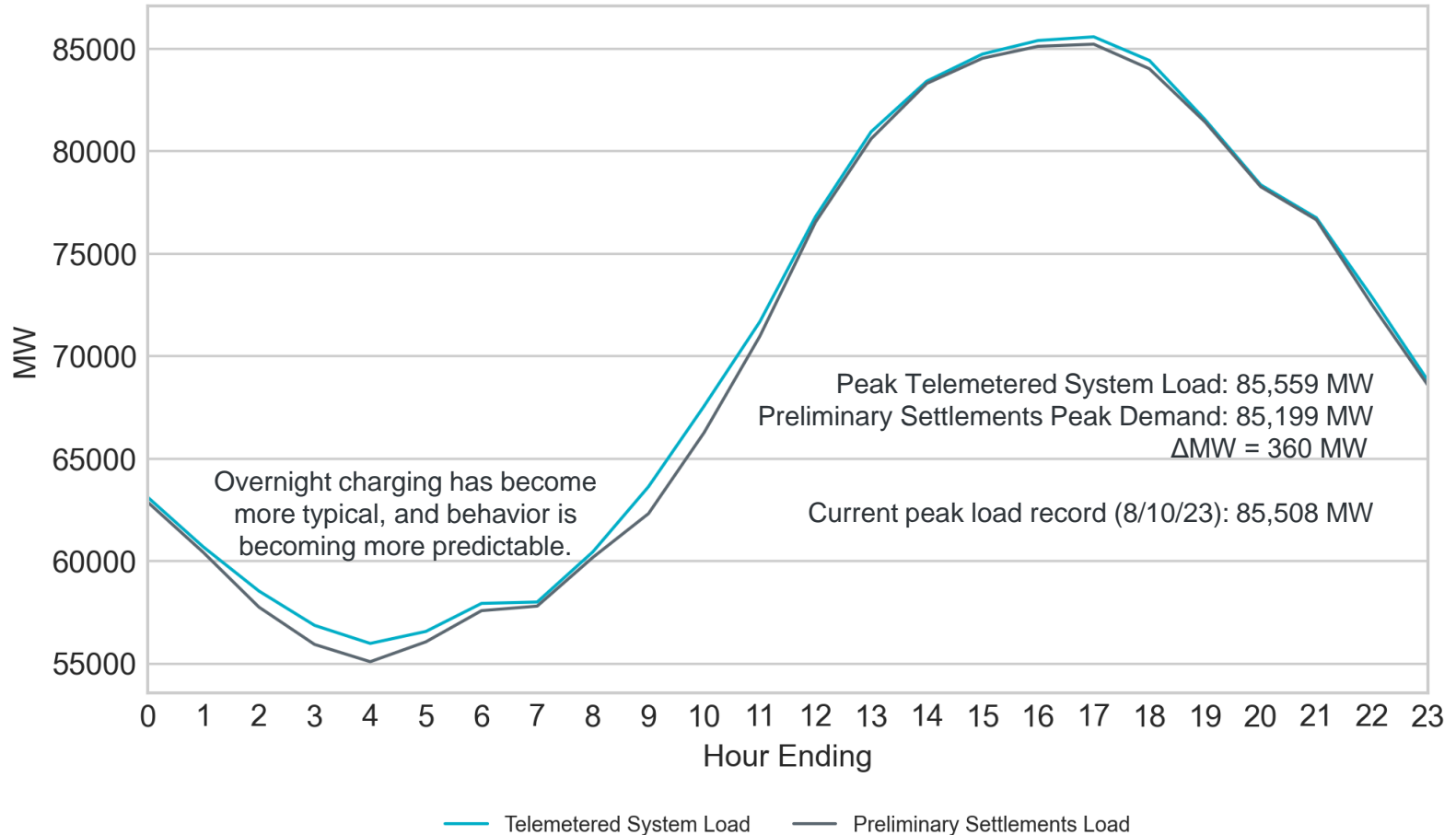
**Based on the minimum net system 15-minute interval value from August release of Demand and Energy 2024 report.

Data for latest two months are based on preliminary settlements.

Key Takeaway: ERCOT's maximum peak demand for the month of August was 85,199 MW*; this is 309 MW less than the August 2023 demand of 85,508 MW. Demand does not include Wholesale Storage Load (ESR charging), and therefore, ERCOT did not set a new all-time demand record this summer.

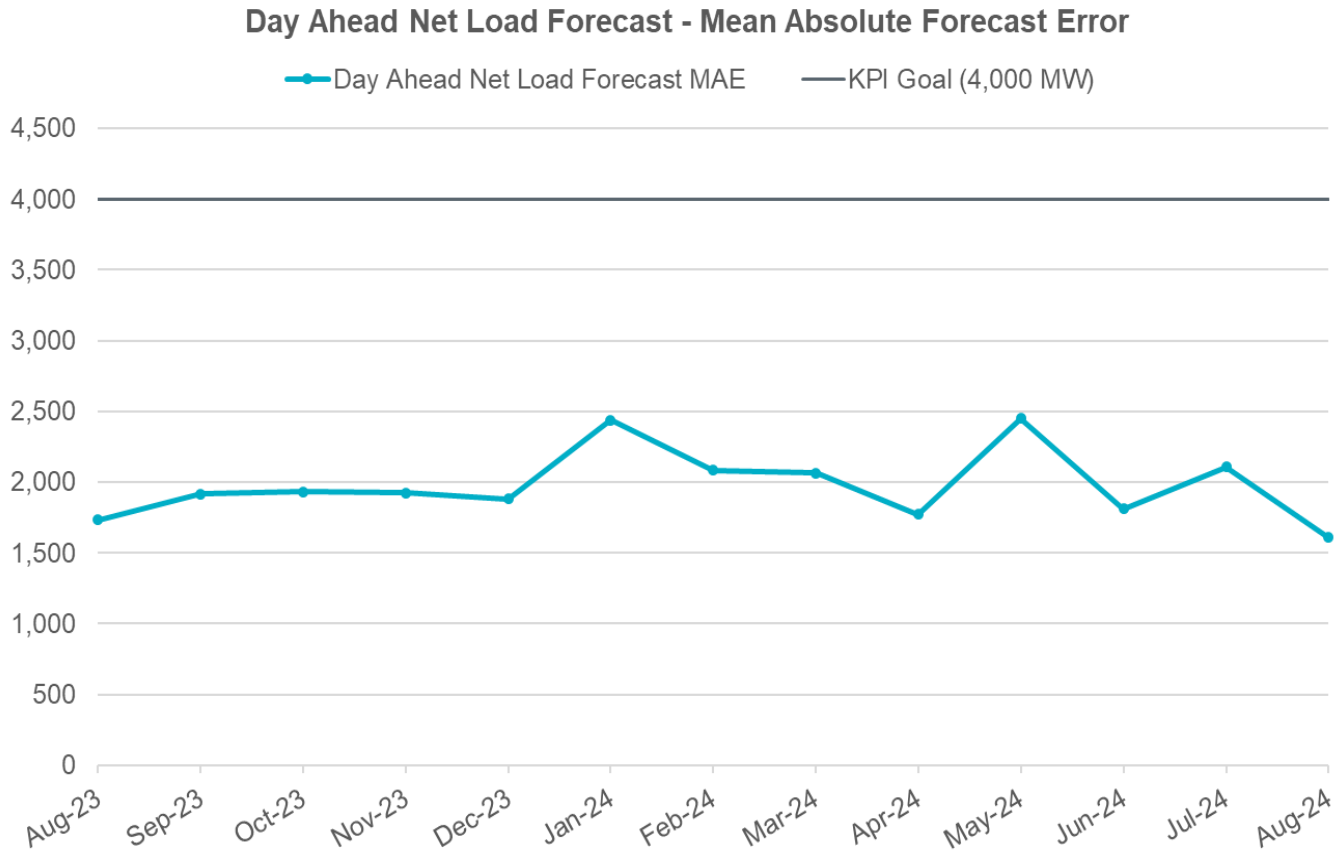
Summer 2024 Peak Demand

Telemetered Load & Settlements Load for Summer Peak (8/20/24)



Key Takeaway: The peak 2024 summer demand occurred on 8/20/24. The Telemetered System Load was higher than the all-time peak demand record (8/10/23), however preliminary settlements load does not include Wholesale Storage Load (WSL).

Forecast Performance

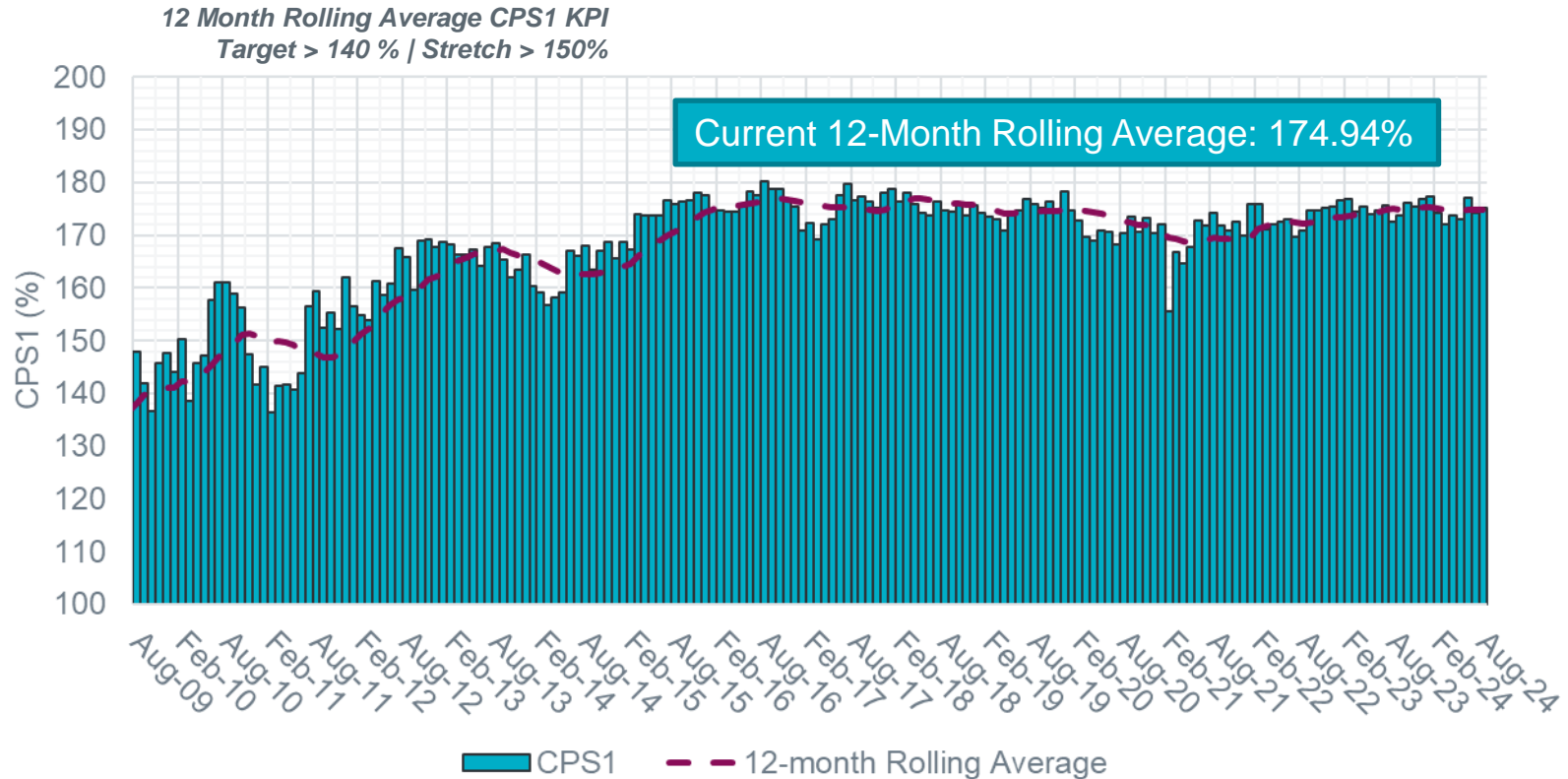


Key Takeaway: Day Ahead Net Load Forecast Mean Absolute Forecast Error is a new Key Performance Indicator from 2023. This metric has met the target and has been trending well.



Frequency Control

- Control Performance Standard 1 (CPS-1) is a measure of the frequency control on a power system, pursuant to NERC Standard BAL-001. The 12-month rolling-average of this measure is required to stay above 100%.



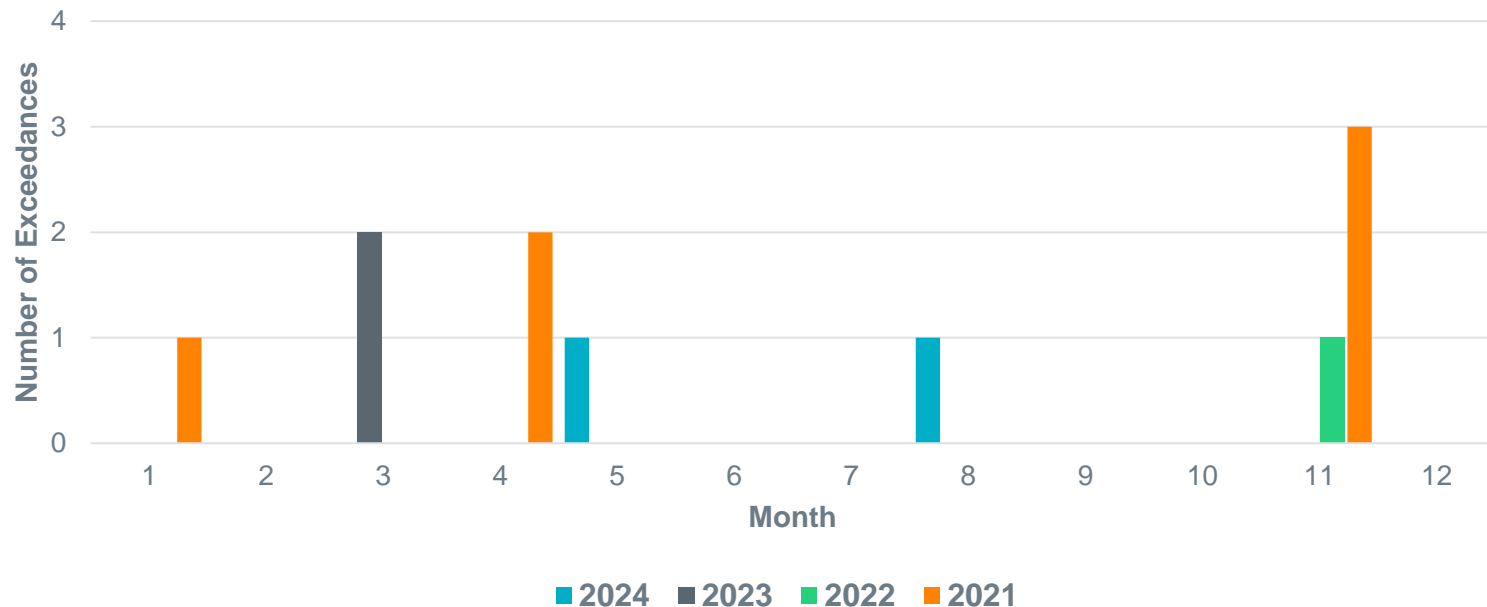
Key Takeaway: Frequency control has been performing extremely well.

Transmission Limit Control

- The most-recent Interconnection Reliability Operating Limit (IROL) exceedance occurred in August 2024.

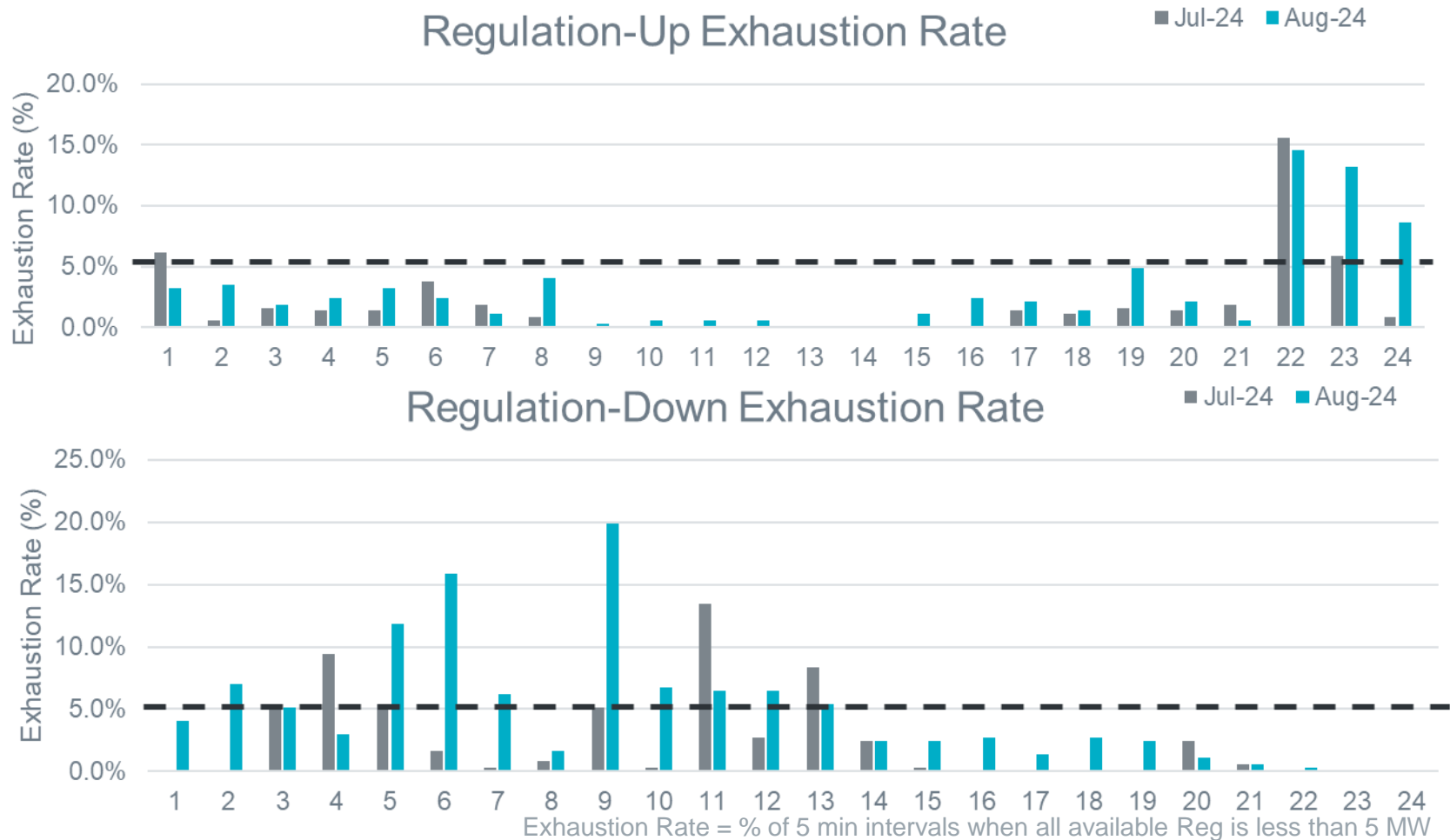
Monthly IROL Exceedances (Jan 2021 to August 2024)

All exceedances had the duration between 10 second and 10 minutes.
There were no exceedances which lasted for more than 10 minutes.



Key Takeaway: E_PASP IROL exceeded on August 14, 2024 for approximately 1 minute. This was primarily due to a generator trip in the Houston area and a change in wind generation pattern in the south.

Regulation Service Deployments for Jul-Aug 2024



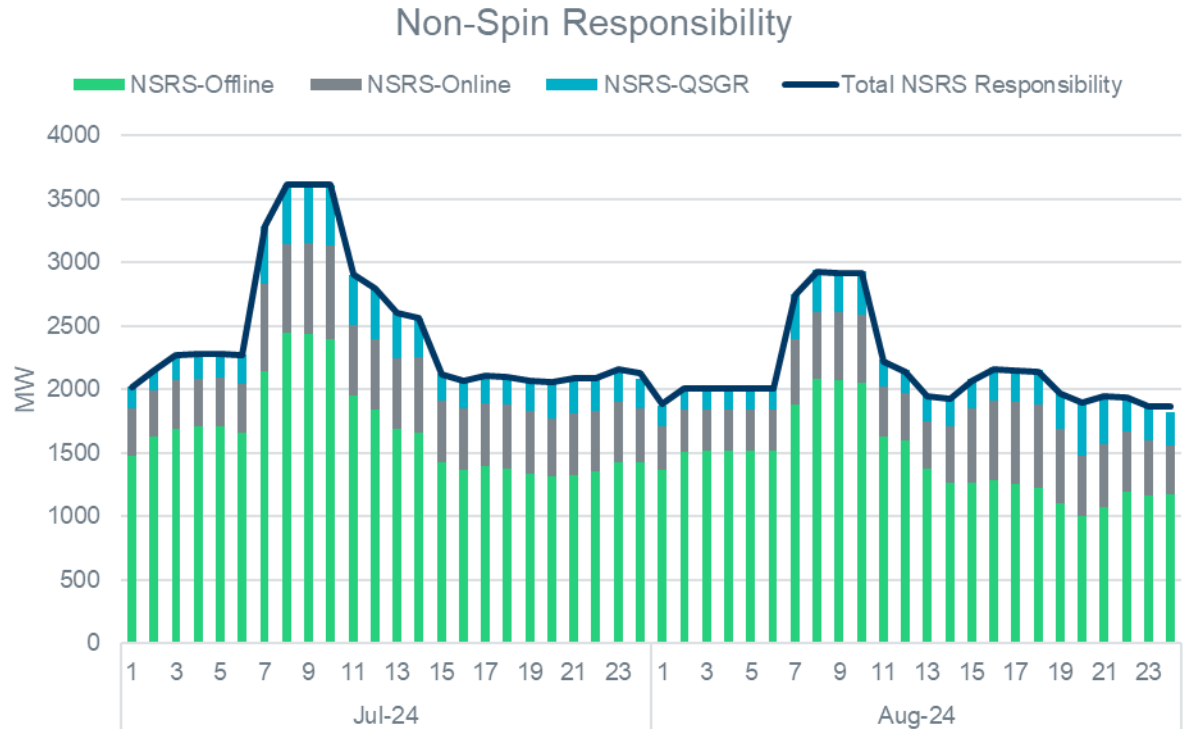
Key Takeaway: Average Regulation Up and Down exhaustion rates were similar in 2023.

Non-Spinning Reserve Service (Non-Spin) Deployments for Jul-Aug 2024

From July to August 2024, there were 4 events that resulted in deployment of offline Non-Spin.

During this time, an average of ~33% of Non-Spin was provided using online capacity and by Quick Start Generation Resources. This type of Non-Spin is always available to SCED to dispatch (with an offer floor of \$75) and no operator action is needed to deploy this capacity.

Deployment Start Time	Deployment Duration	Max Deployment (MW)
7/15/2024 19:32	01:22:12	588.0
8/7/2024 19:14	01:01:20	153.7
8/18/2024 18:52	01:32:48	380.2
8/20/2024 18:36	02:33:50	598.4



Key Takeaway: All recent Non-Spin deployments were to meet 30-minute ramping needs. Non-Spin performed well in all deployments.

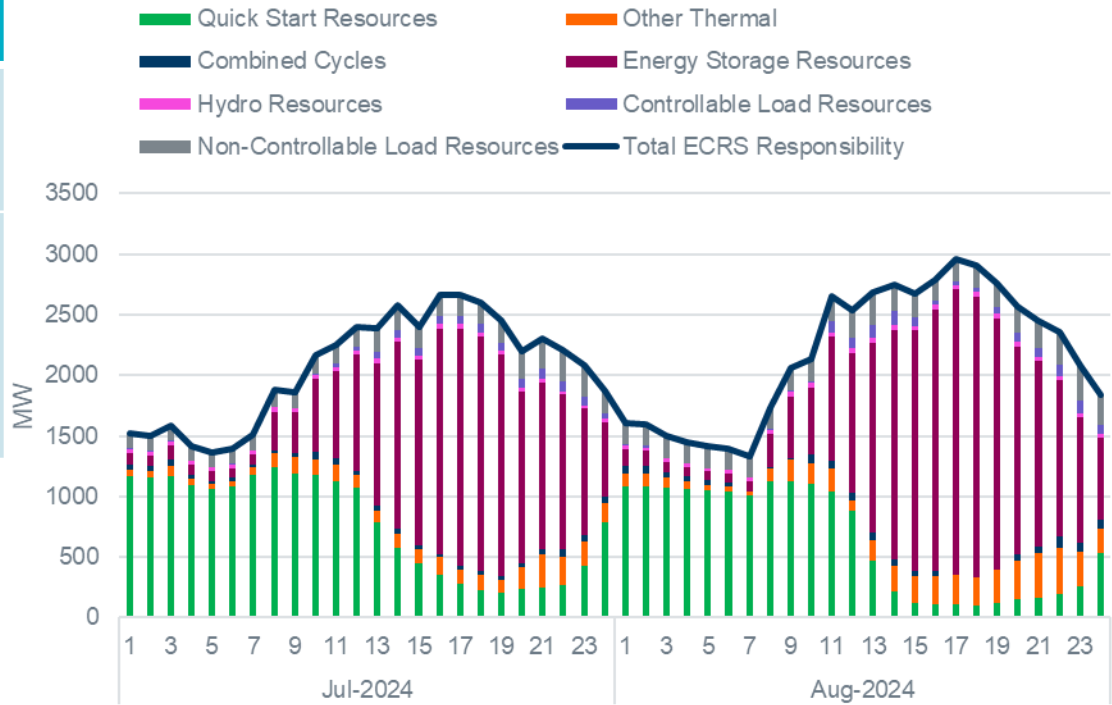


ERCOT Contingency Reserve Service (ECRS) Release for Jul-Aug 2024

From July to August 2024, there were 4 events that resulted in release of SCED dispatchable ECRS. Two releases were for frequency trigger while two releases were to meet 10-minute projected net load.

Deployment Start Time	Deployment Duration	Maximum SCED Dispatchable MW Released	Reason
7/18/2024 15:55	0:04:05	662.8	Frequency below 59.91Hz
7/24/2024 7:02	0:05:36	883.6	
8/20/2024 19:26	1:02:38	2413.1	Available capacity not sufficient for projected Net Load
8/20/2024 20:30	0:14:55	1500.0	

ECRS Average Responsibility by Resource Type



Key Takeaway: ECRS performed well in all deployments and helped recover from the events that triggered deployment.



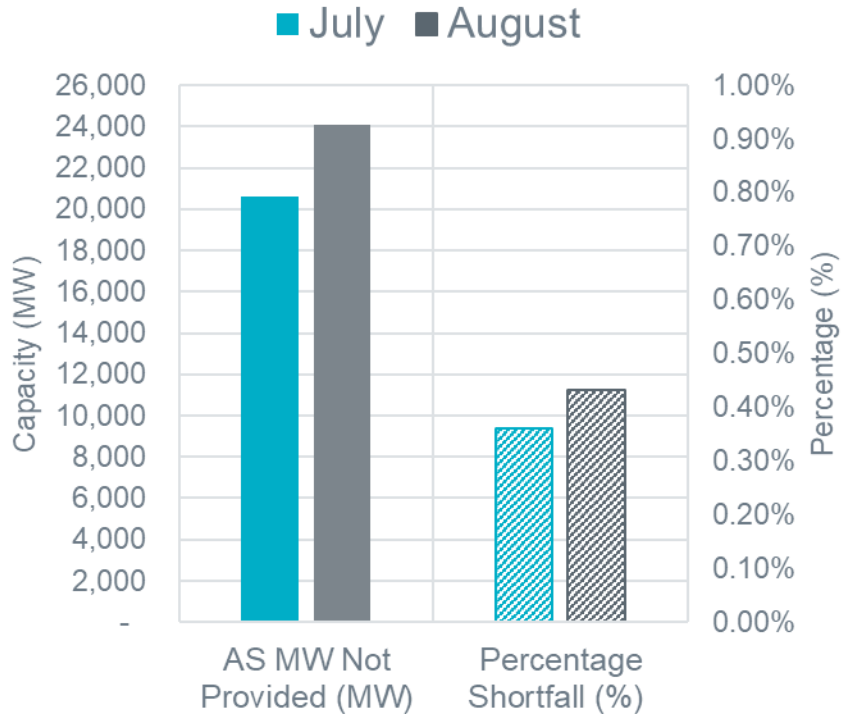
Responsive Reserve Service (RRS) Released for Jul-Aug 2024

- From July to August 2024, there was no manual release of RRS
- With the implementation of ECRS, RRS capacity autonomously deploys when frequency exceeds the frequency dead-band. RRS may be manually released to SCED during scarcity events when additional capacity is needed.

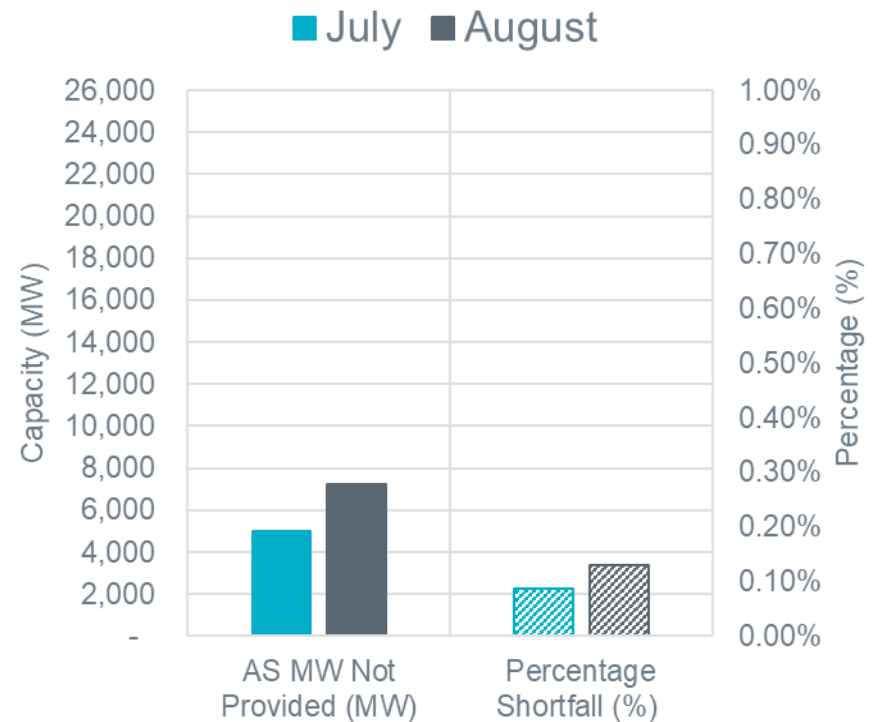
Key Takeaway: No Manual RRS Release from Jul-Aug 2024.

AS MW Shortfall Analysis

Total AS Capacity Shortfall (per Protocol Section 6.7.3)



Additional AS Capacity Shortfall if SOC from ESR's assigned AS is considered



Key Takeaway: A (small) portion of the procured AS is not being assigned to resources (regardless of technology type) by QSEs and is not available in Real Time. The magnitude of AS capacity unavailable in Real Time increases further if SOC from ESRs that are assigned AS is considered.



***Capacity data (MW) is plotted on primary y-axis and percentage shortfall (%) is plotted with a pattern format on secondary y-axis. Percentages in both graphs are based on total AS procured.