



Item 9.2: System Operations Update **REVISED ***

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Reliability and Markets Committee

ERCOT Public

February 3, 2025

* Updated Slide 2 and added Slides 3-8

Overview

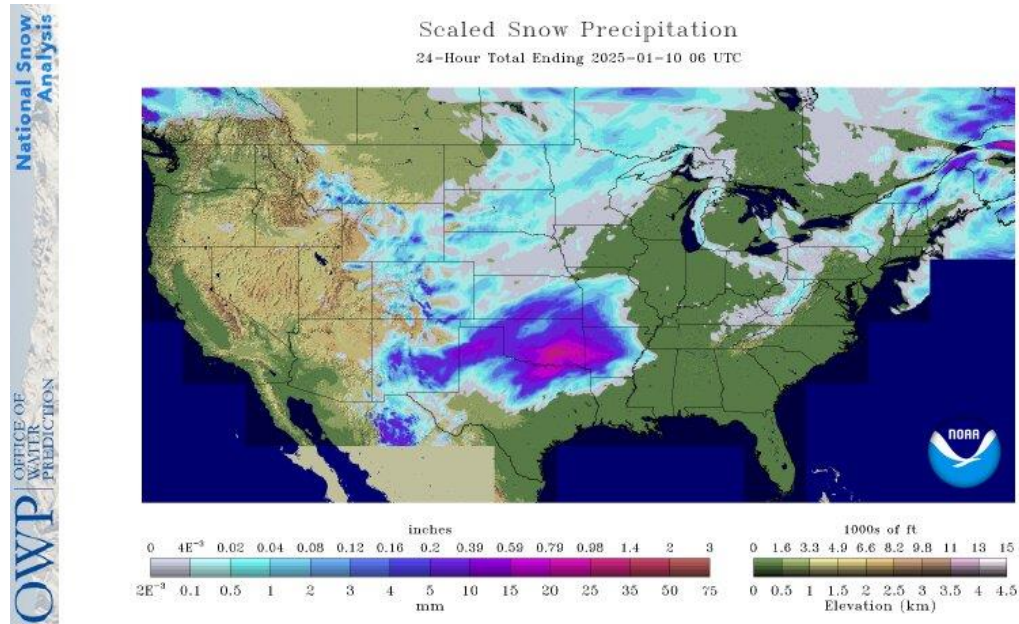
- **Purpose**
 - Provide an update on key operational metrics to the R&M Committee
 - Provide information on recent Ancillary Services performance
 - Provide information on hot topics
- **Voting Items / Requests**
 - No action is requested of the R&M Committee; for discussion only

- **Key Takeaways**
 - Winter Storm Cora reached the ERCOT region on January 9, 2025, and did not cause any ERCOT system reliability issues.
 - Winter Storm Enzo reached the ERCOT region on January 20, 2025, and resulted in transmission outages in southeast Texas, but no ERCOT system reliability issues.
 - ERCOT has proposed NOGRR272, PGRR121 to require grid-forming energy storage resources (ESRs) to provide advanced grid support (AGS).
 - All key operational metrics are trending well, and all Ancillary Services are performing well.

January 2025 Winter Storms Review

Winter Storm Cora: January 9 and 10

- Primarily a winter precipitation event in north Texas
- Online reserves remained high throughout event
- Estimated maximum wind capacity derations due to cold weather and icing: 4,323 MW
- No associated transmission outages

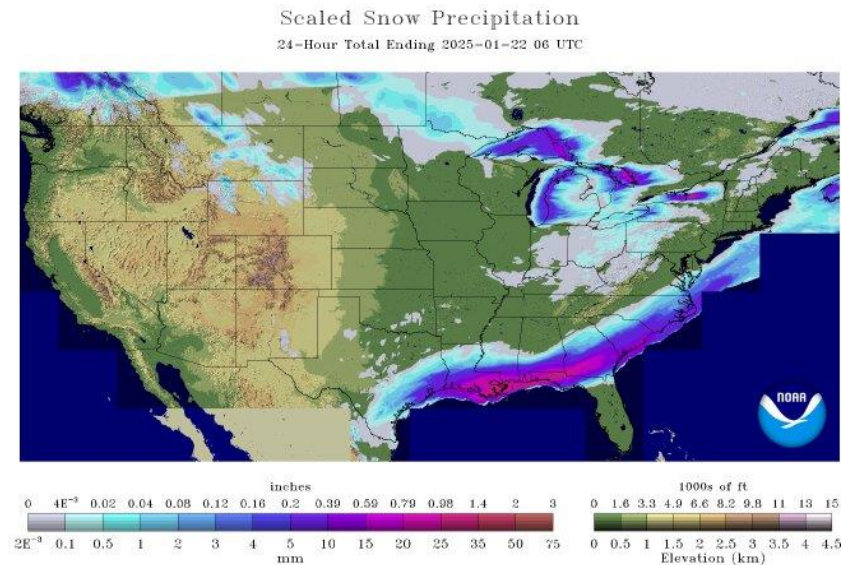


Key Takeaway: Winter Storm Cora did not cause any impacts to ERCOT system reliability.

Winter Storm Enzo: January 20-22

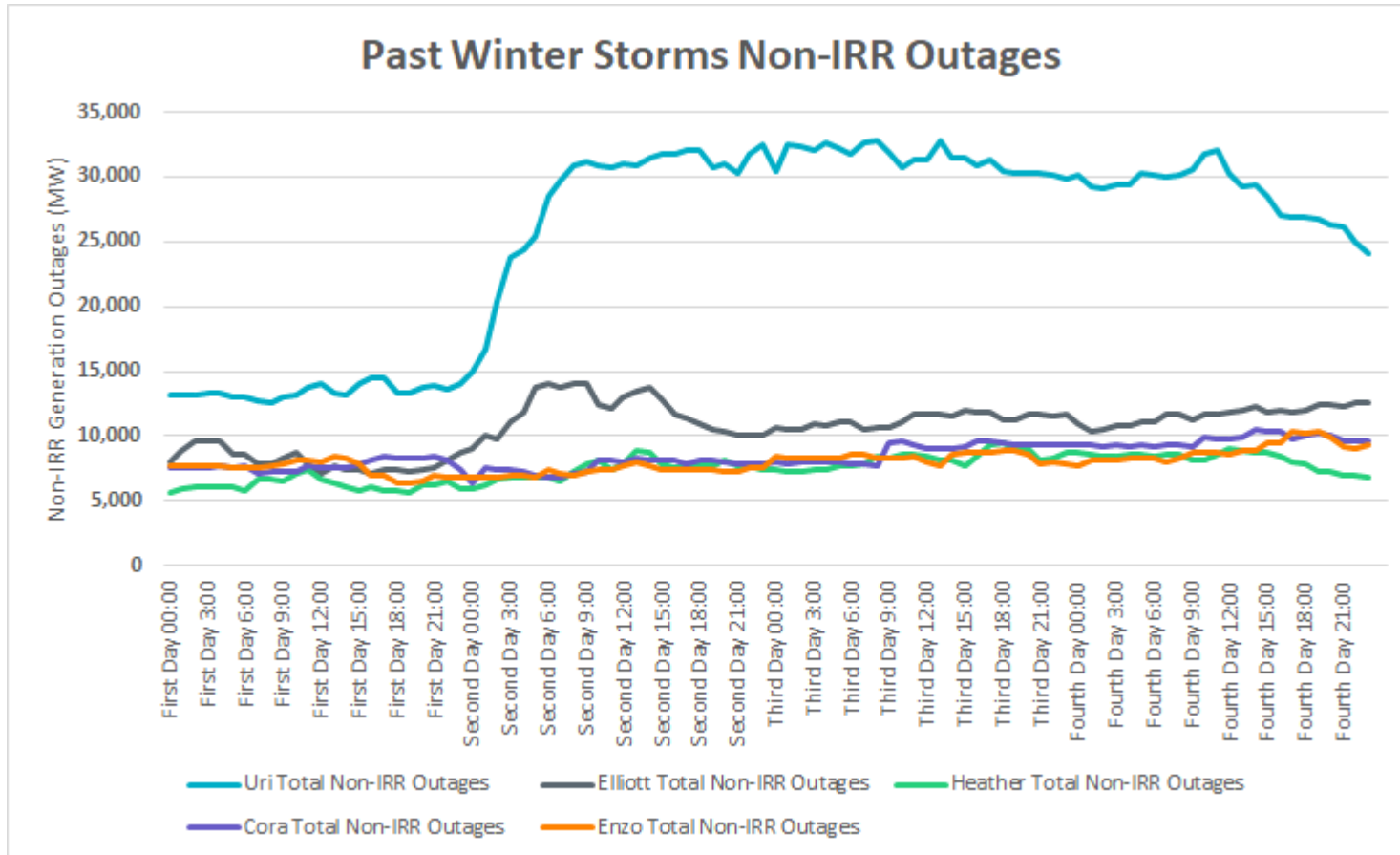
- Primarily a winter precipitation event in southeast Texas
- Online reserves remained high throughout event
- Some transmission outages occurred on the morning of Jan. 21st, generally east of I-35 and south of I-10 (total, not concurrent):
 - 138 kV: 20 transmission outages
 - 69 kV: 9 transmission outages
- Almost all outages were restored to service by the end of the day.
- Estimated maximum wind derations due to cold weather and icing: 3,152 MW

National Snow Analysis
OWP OFFICE OF WATER PREDICTION



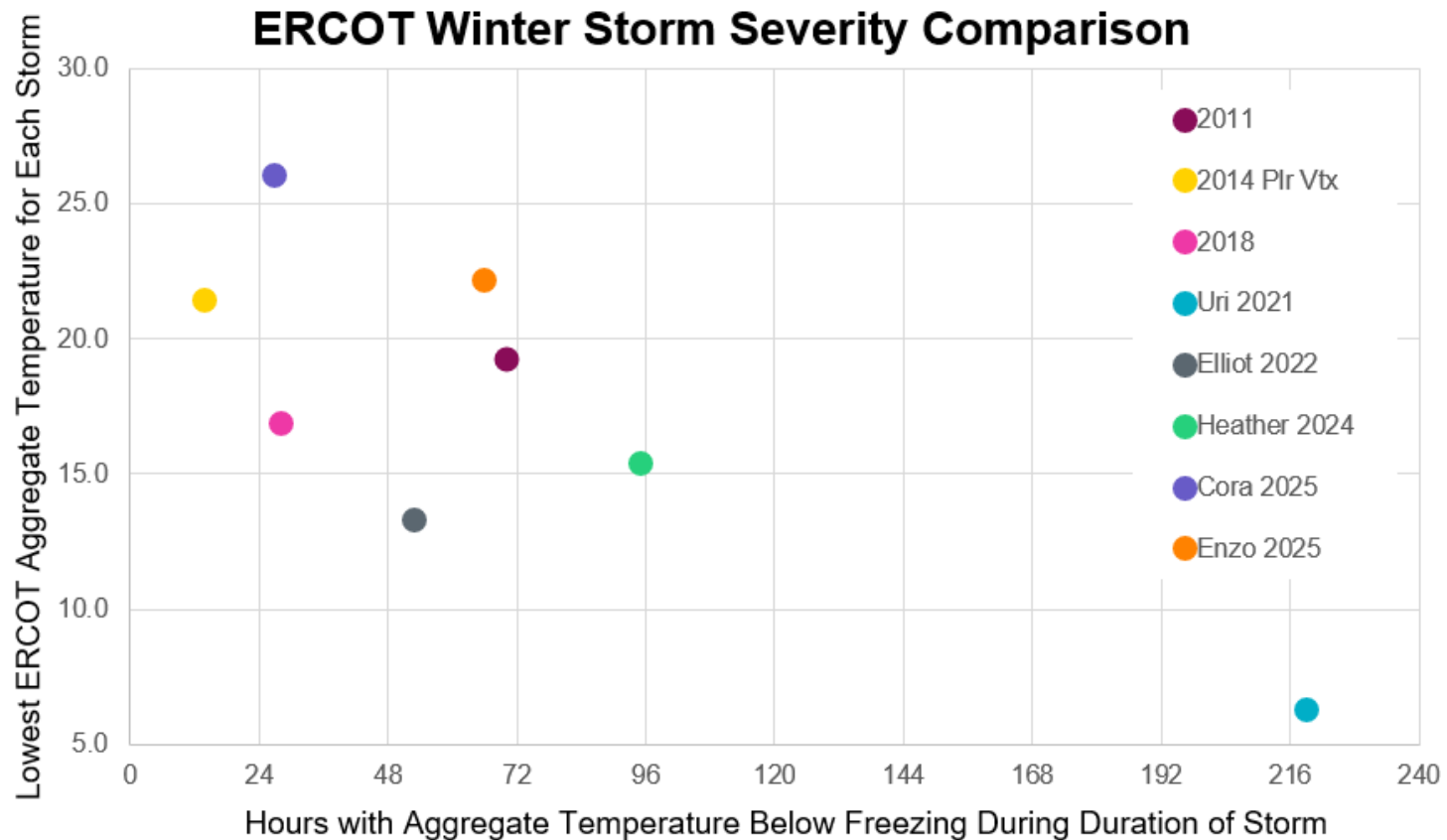
Key Takeaway: Winter Storm Enzo resulted in transmission outages in southeast Texas with no impacts to ERCOT system reliability.

Historical Non-IRR Outage Data from Previous Winter Storms



Key Takeaway: Non-IRR outages stayed at a consistent level across the past three winter storms.

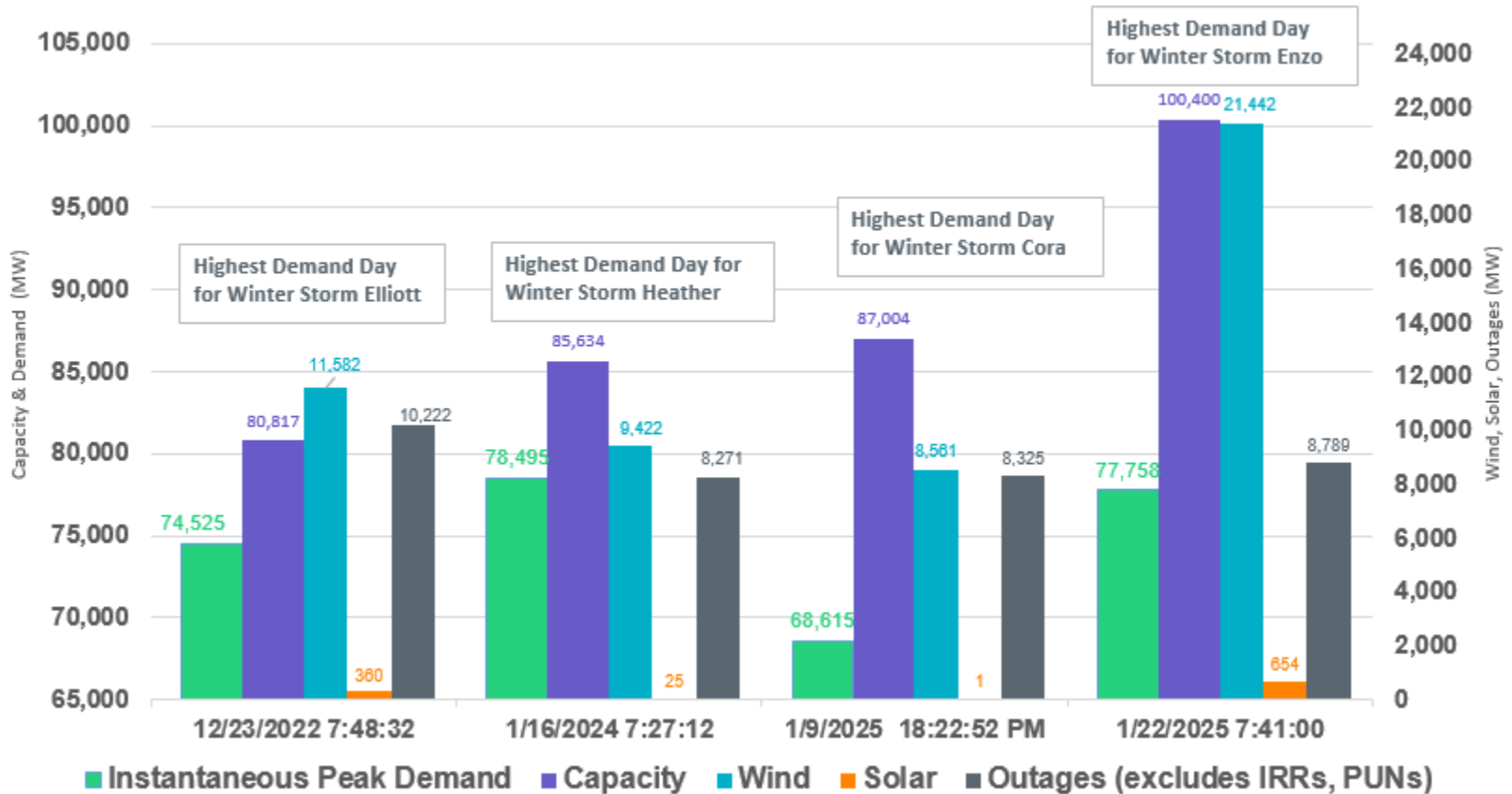
Comparison of January 2025 Storms to Past Winter Storms



Key Takeaway: Winter Storm Cora and Enzo were less severe than recent historical winter storms.

System Analysis at Various Winter Peaks

Past Winter Storms: System Analysis at Peak Demand



Key Takeaway: ERCOT's maximum unofficial instantaneous peak demand during Winter Storm Enzo was 77,758 MW, which was not a new winter peak (which was recorded during Winter Storm Heather) and there was relatively high wind output at that time.



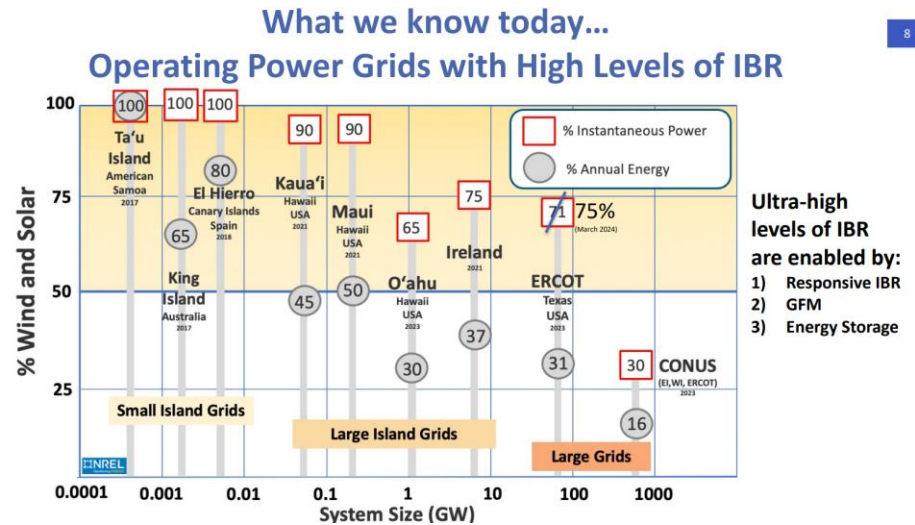
Advanced Grid Support Update

Advanced Grid Support

- ERCOT is one of the largest interconnection grids in the world with a high penetration of inverter-based resources (IBRs). (75% in 2024)
- As IBRs become increasingly prevalent in the ERCOT grid, the absence of online synchronous generation underscores the necessity to ensure reliable grid operation.

- Various efforts have been made to improve grid reliability

- Implement Generic Transmission Constraints (GTCs)
- [Synchronous condensers project](#) endorsed in Dec 2023
- [PGRR109](#) model review process effective in May 2024
- [NOGRR245](#) enhancing operating requirements approved in Oct 2024



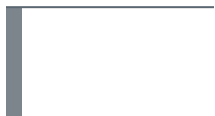
- Grid-forming (GFM) inverters with energy storage have the capability to improve grid stability, reliability, and resilience.

- [Emerging Technology - Intro to Grid Forming Inverters](#), Technology and Security Committee in June 2024



Advanced Grid Support

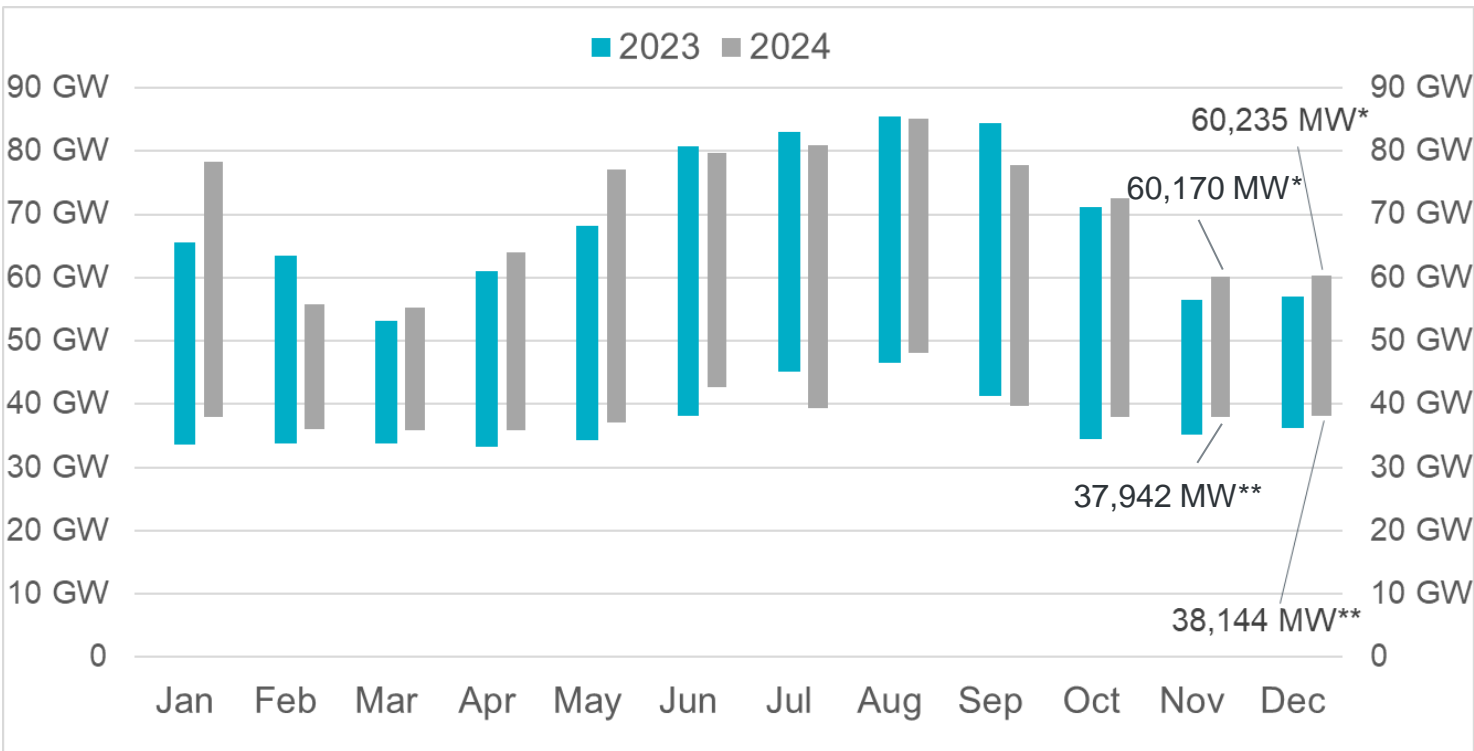
- ERCOT has proposed [NOGRR272](#), [PGRR121](#) in October 2024, requiring grid-forming energy storage resources (ESRs) to provide advanced grid support (AGS)
 - Voluntary for the existing ESRs and mandatory for new ESRs
 - Commercially available
 - Generally, only require software changes
 - Minimum impact to hardware or commercial operations
- The expected reliability benefits to the ERCOT grid
 - Reduce grid stability constraints, which will better utilize transmission grid to serve the demand
 - Improve grid dynamic performance, which will reduce the risk of generation or load losses during disturbances
 - Improve grid resilience, which will reduce the risk of delayed generation interconnection



Appendix

Operational Metrics and Ancillary Services Performance

Demand



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

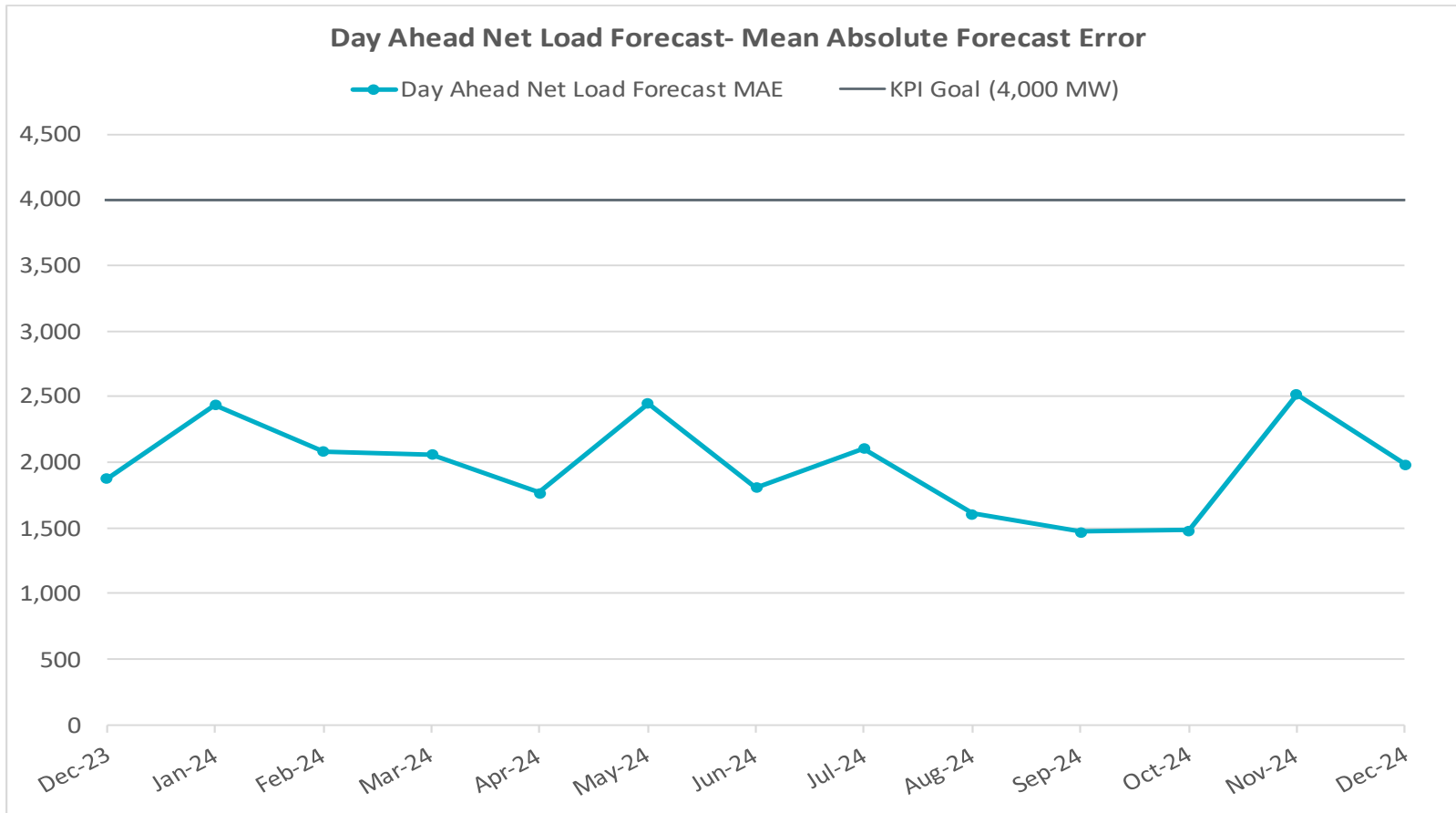
**Based on the minimum net system 15-minute interval value from January release of Demand and Energy 2024 report.

Data for latest two months are based on preliminary settlements.

Key Takeaway: ERCOT set a new record of 60,170 MW* for the month of November on 11/04/2024; This is 3,635 MW more than the November 2023 demand of 56,535 MW.



Forecast Performance

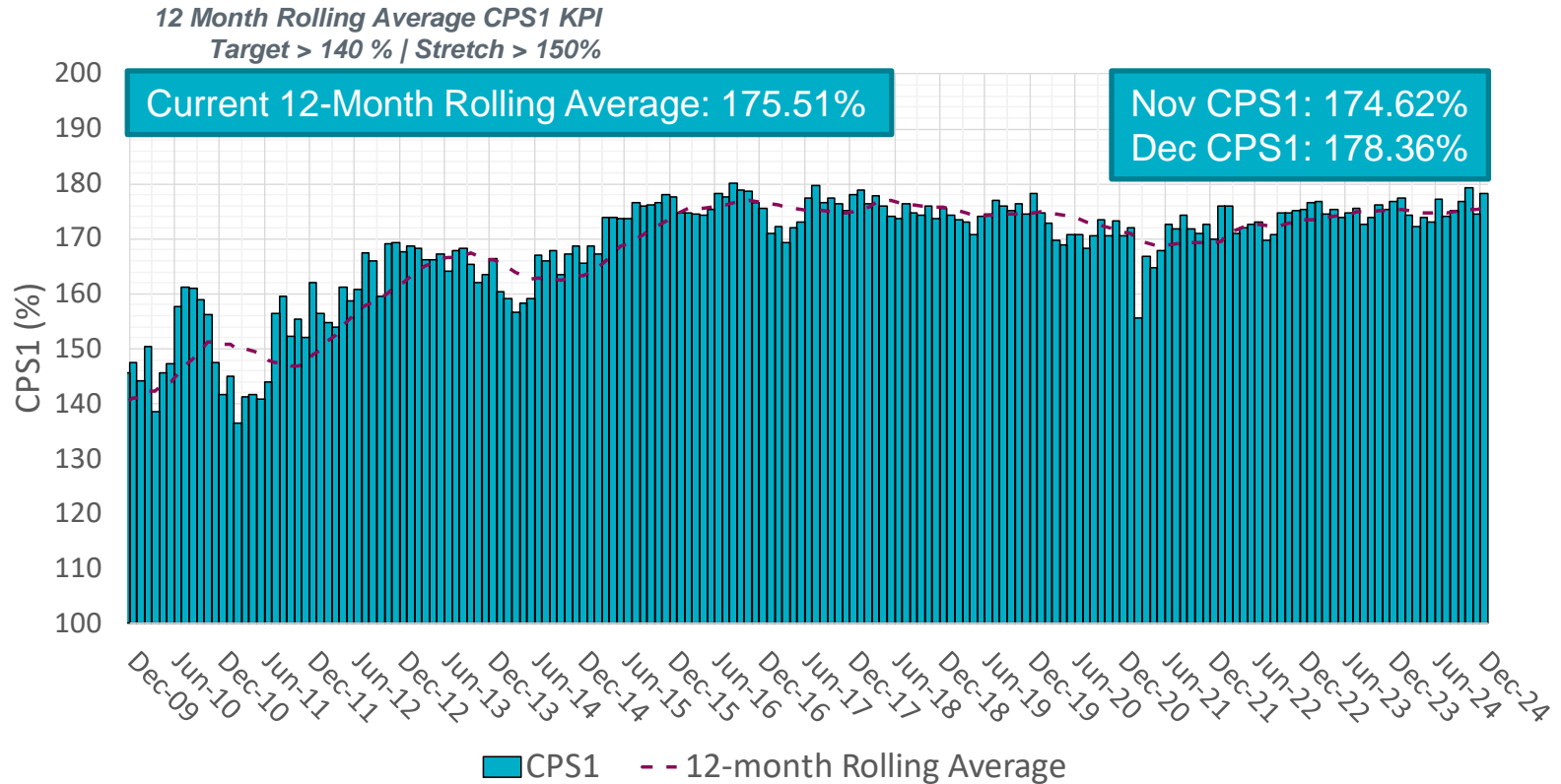


Key Takeaway: Day Ahead Net Load Forecast Mean Absolute Forecast Error is a new Key Performance Indicator from 2023. This metric has met the target and has been trending well.



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%.



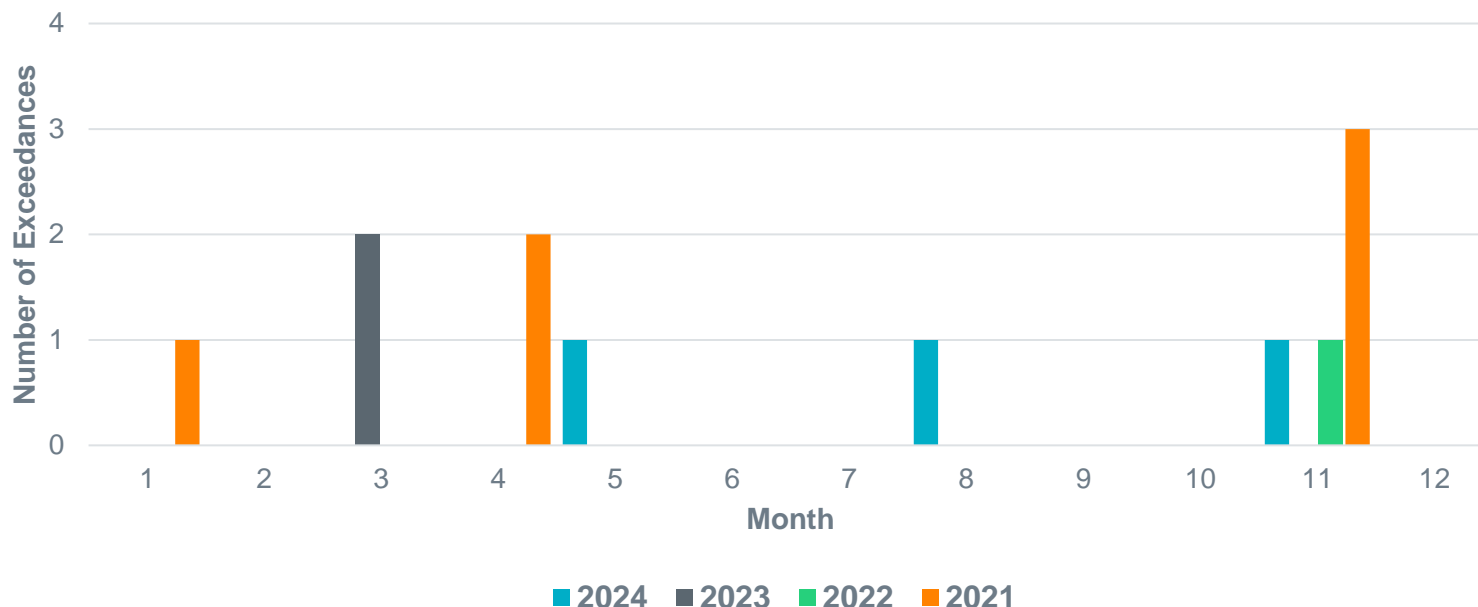
Key Takeaway: Frequency control has been performing extremely well.

Transmission Limit Control

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

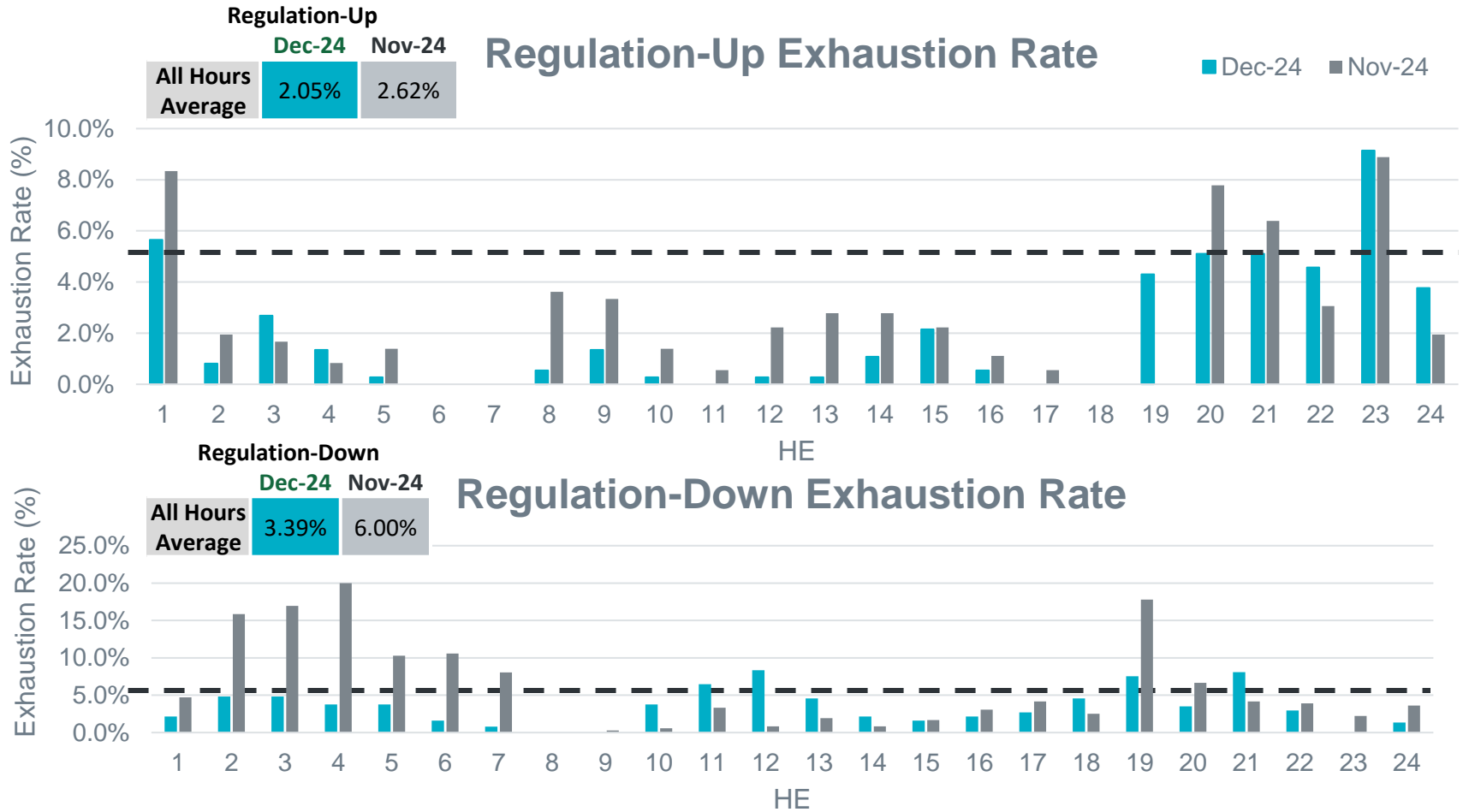
Monthly IROL Exceedances (Jan 2021 to December 2024)

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_PATA IROL exceeded on November 17, 2024, for approximately 5 minutes.

Regulation Service Deployments for Nov-Dec 2024



Exhaustion Rate = % of 5 min intervals when all available Reg is less than 5 MW

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

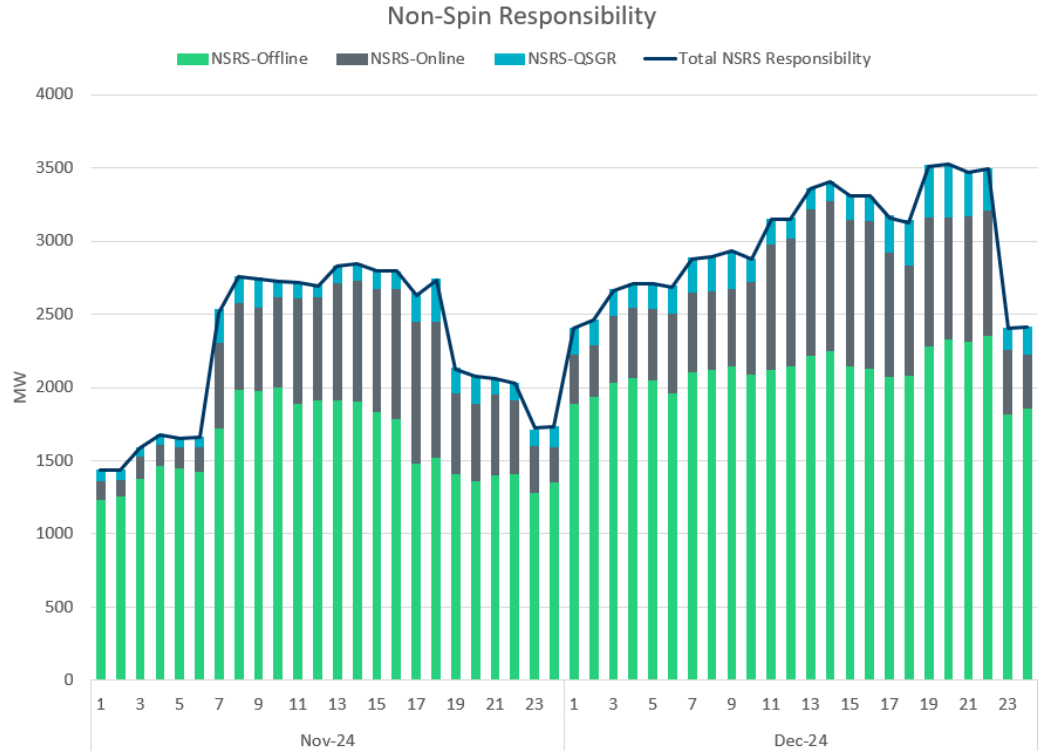


Non-Spinning Reserve Service (Non-Spin) Deployments for Nov-Dec 2024

From November to December 2024, there were 8 events that resulted in deployment of offline Non-Spin.

During this time, an average of ~28% 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)
11/3/2024 17:15	00:44:33	1350.8
11/5/2024 17:10	01:00:38	695.69
11/9/2024 17:05	01:05:11	1183.3
11/10/2024 16:21	04:59:01	778.05
11/11/2024 16:11	02:11:26	770.26
11/14/2024 16:38	01:44:27	1475.1
11/17/2024 15:09	03:12:58	1312
11/21/2024 16:29	02:05:14	582.7



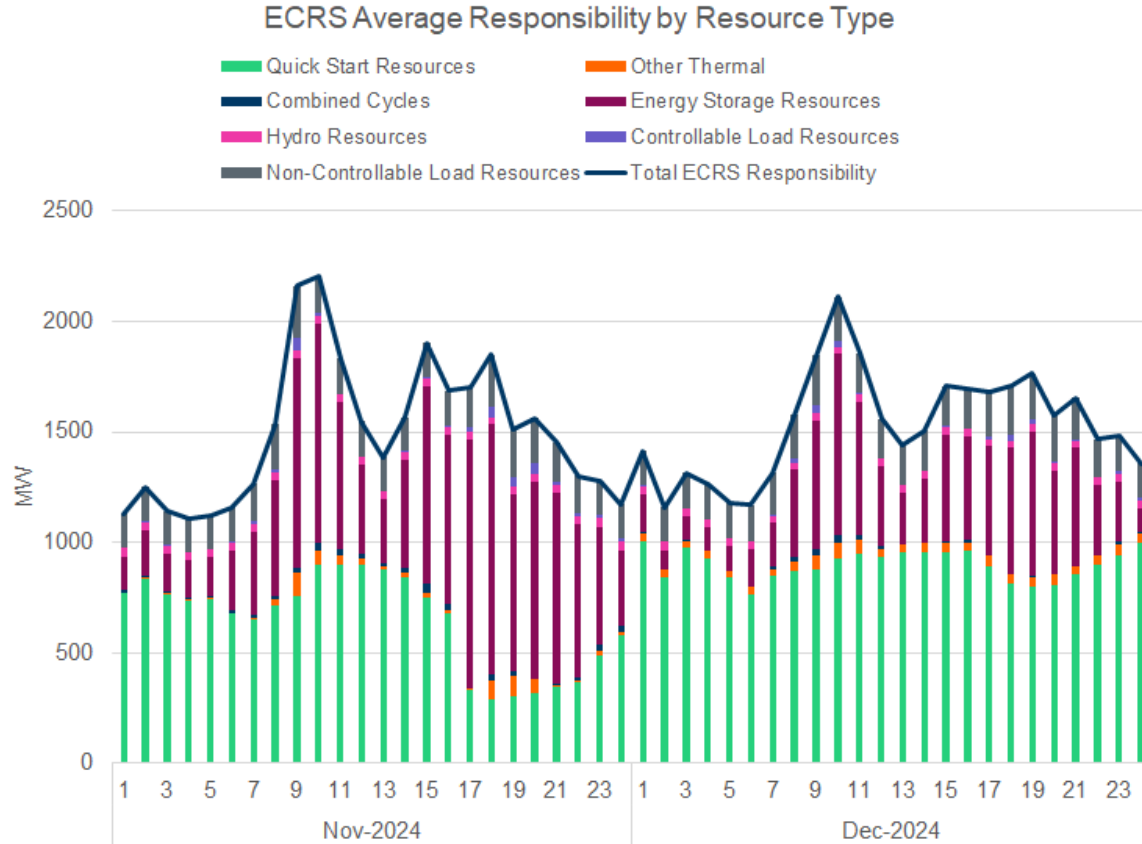
Key Takeaway: All recent Non-Spin deployments were to meet 30-minute ramping needs. Non-Spin performed well in all deployments.



ERCOT Contingency Reserve Service (ECRS) Release for Nov-Dec 2024

From November to December 2024, there were 3 events that resulted in the release of SCED dispatchable ECRS.

Deployment Start Time	Deployment Duration	Maximum SCED Dispatchable MW Released	Reason
11/10/2024 17:09	2:42:46	1372	Insufficient Capacity for projected netload ramp
11/17/2024 12:58	0:03:03	475.8	Unit Trip
11/17/2024 15:12	2:14:27	1000	Release due to SCED UnderGen



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



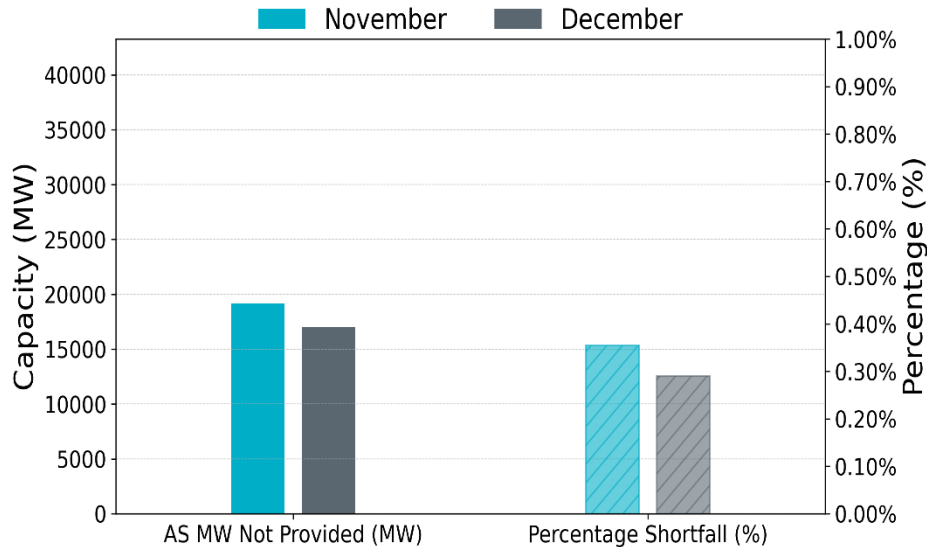
Responsive Reserve Service (RRS) Released for Nov-Dec 2024

- From November to December 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.

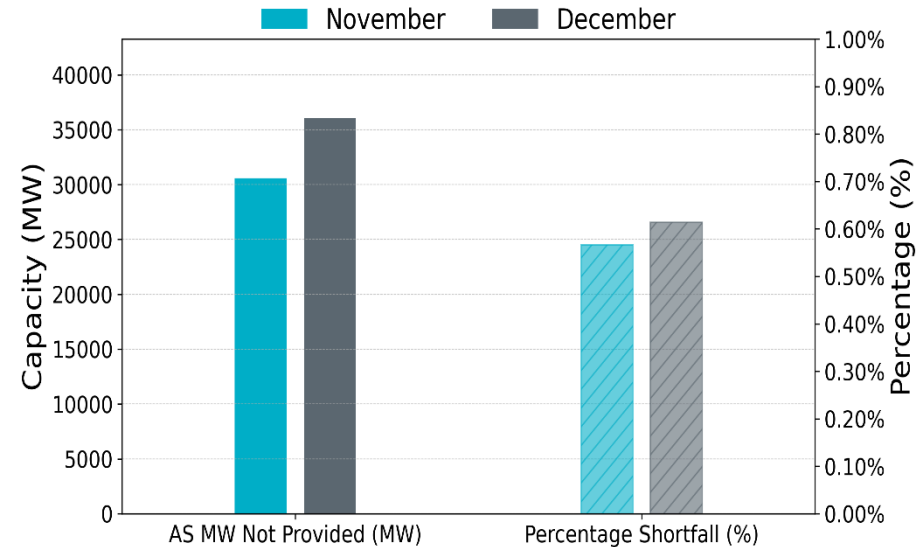
Key Takeaway: There was no manual RRS release from Nov-Dec 2024.

Ancillary Services 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. Worth noting, the AS Capacity Shortfall from ESRs due to SOC during the evening hours of November 10th were the largest observed since the implementation of NPRR1186.

