Item 8.2: System Operations Update

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Reliability and Markets Committee Meeting

ERCOT Public
February 27, 2023

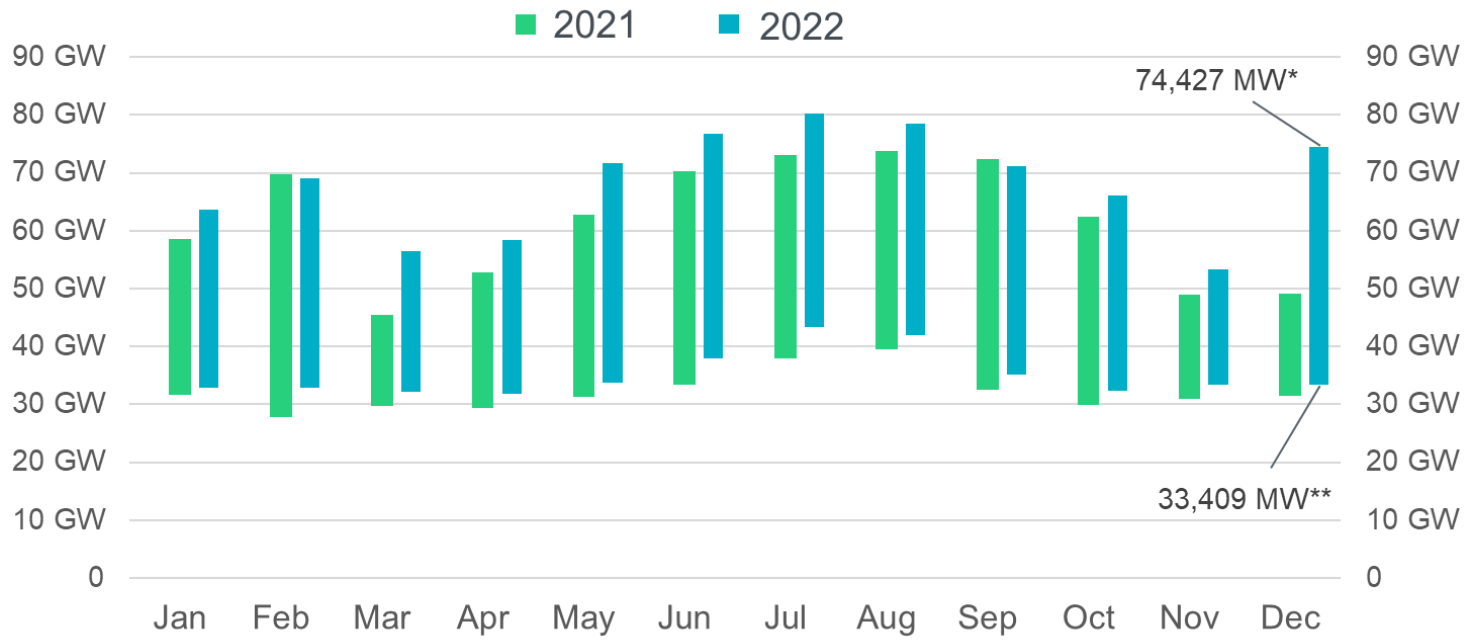
System Operations Update: Overview

- **Purpose**
  - Provide an update on key operational metrics to the R&M Committee
  - Provide information on recent Ancillary Services performance
  - Provide information on recent hot topics

- **Voting Items / Requests**
  - No action is requested of the R&M Committee or Board; for discussion only

- **Key Takeaways**
  - ERCOT set a new all-time winter peak record of 74,427 MW on 12/23/2022
  - All key operational metrics are trending well
  - All Ancillary Services are performing well; feedback requested on whether the metrics contained on the slide meet the request
  - There were no significant issues for the ERCOT Grid during Winter Storm Mara
  - Voltage ride-through trips at Inverter-Based Resources (IBRs) are an ongoing issue. Voltage ride-through reductions at large loads is an emerging issue

Demand



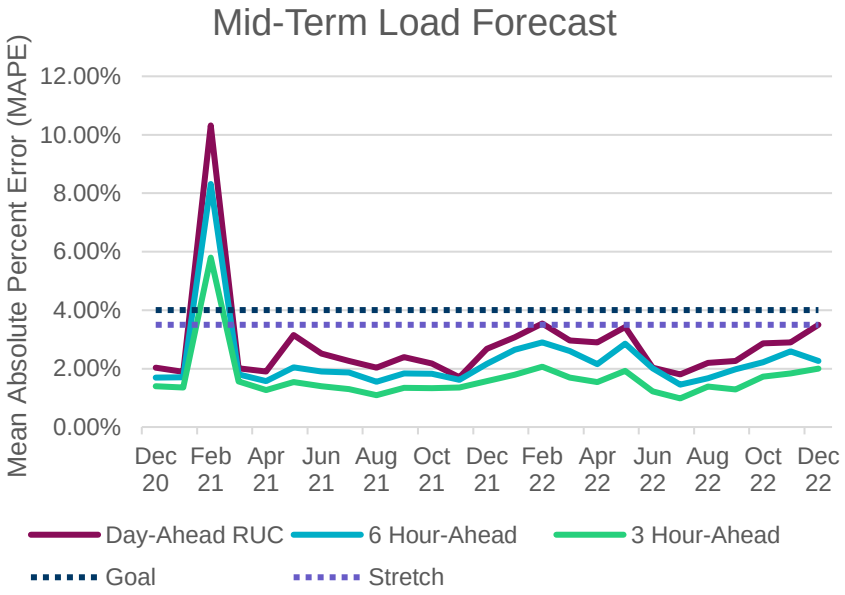
*Based on the maximum net system hourly value from January release of Demand and Energy 2022 report.

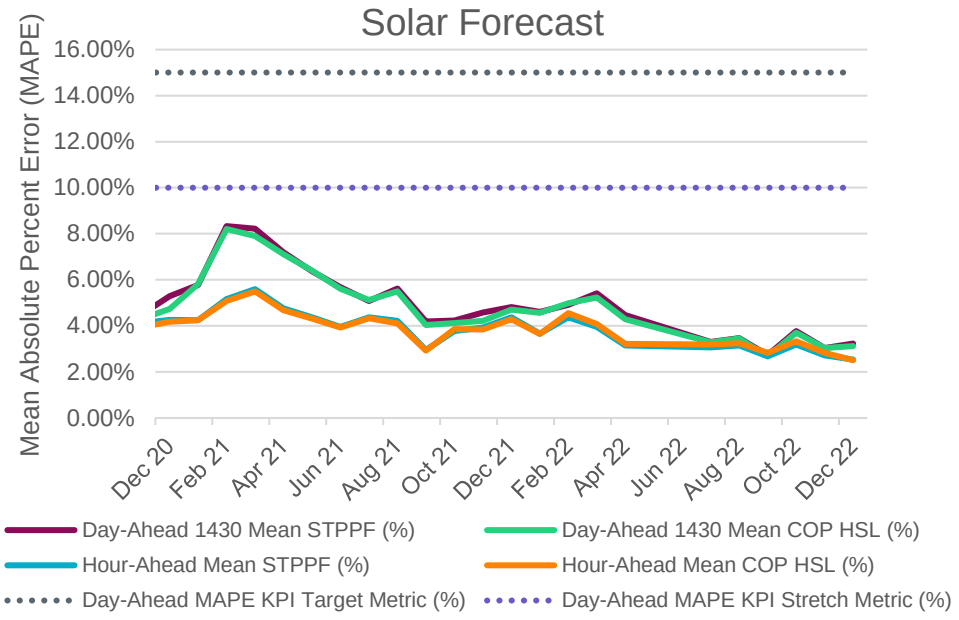
**Based on the minimum net system 15-minute interval value from January release of Demand and Energy 2022 report.

Data for latest two months are based on preliminary settlements.

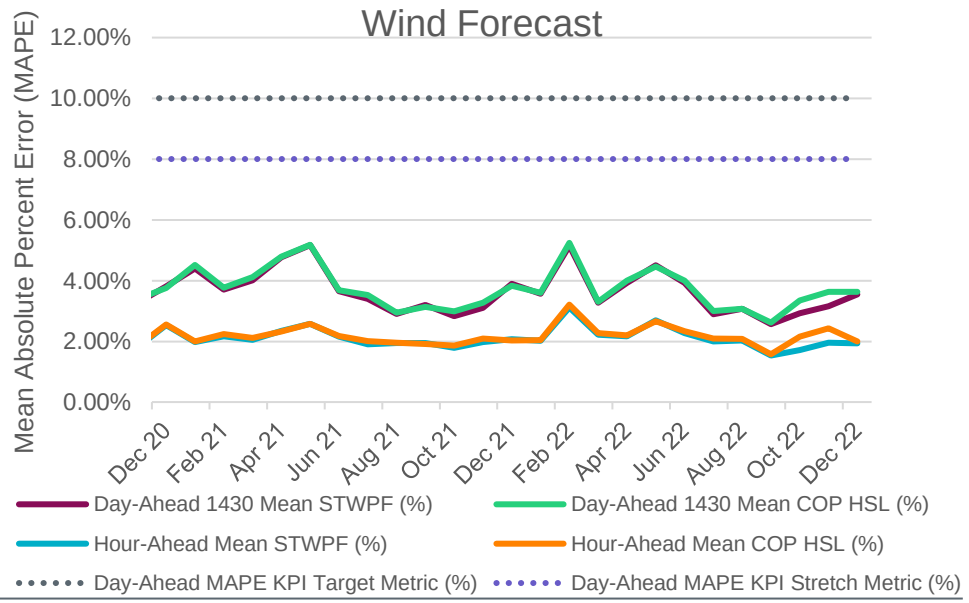
Key Takeaway: ERCOT set a new all-time winter peak record of 74,427 MW on 12/23/2022; this is 4,615 MW more than the previous winter record of 69,812 MW set on 2/14/2021.

Forecast Performance



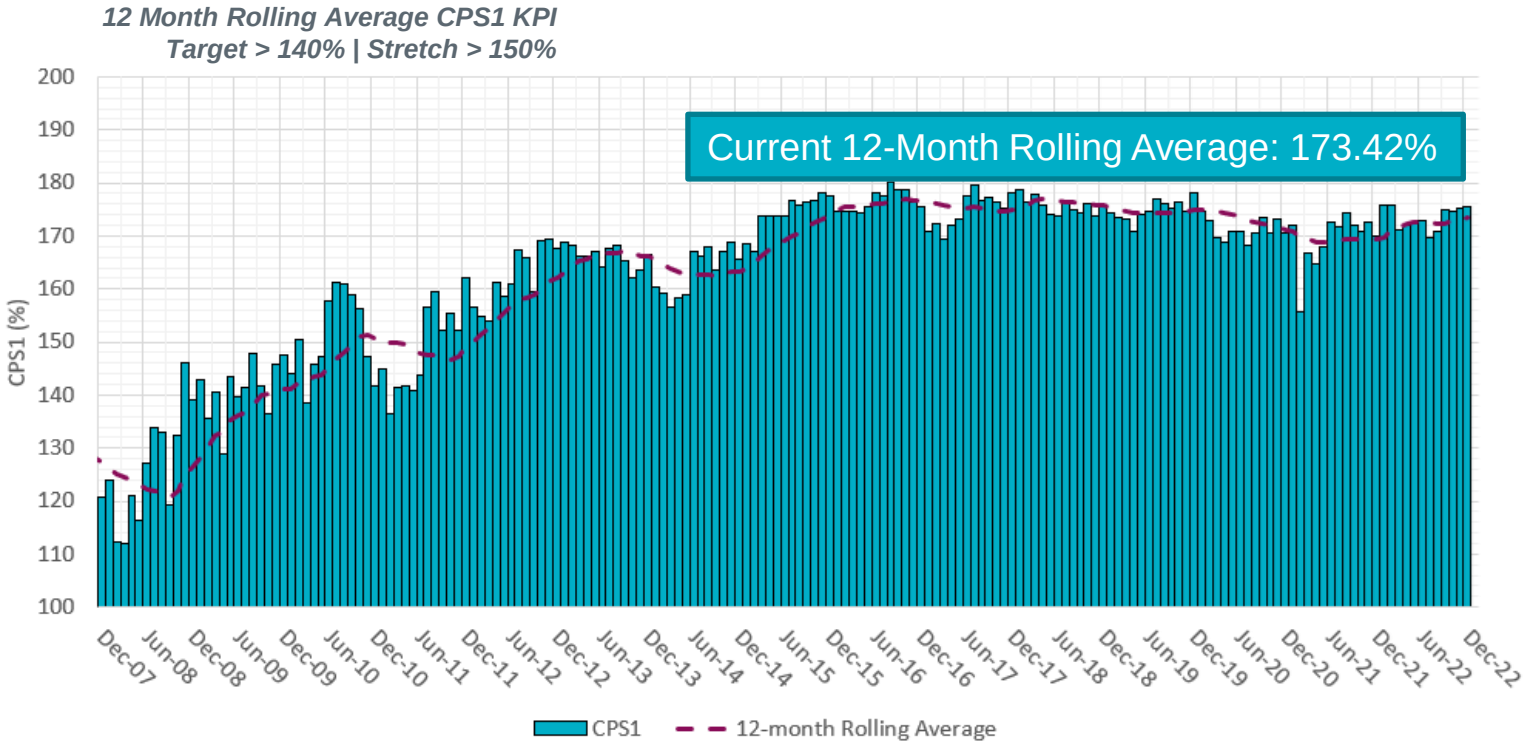


Key Takeaway: Load, solar, and wind forecast performance has met targets.



Frequency Control

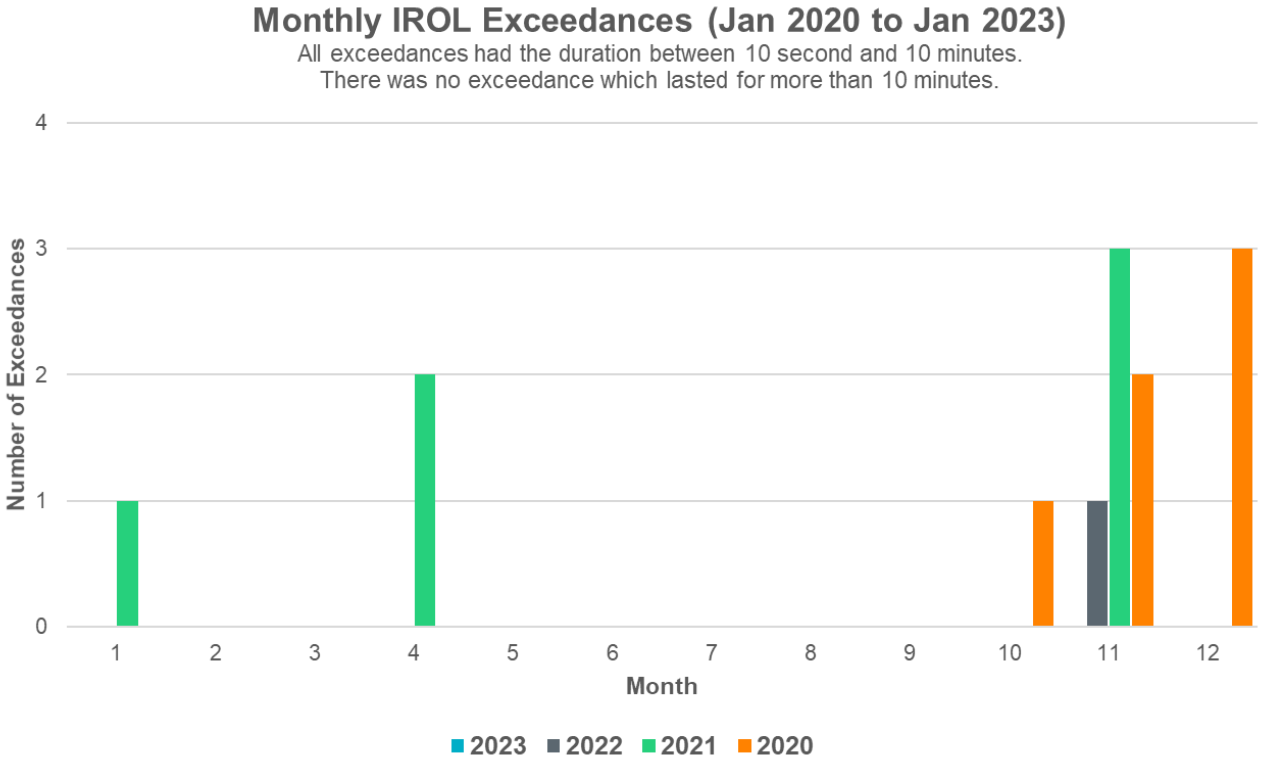
- Control Performance Standard 1 (CPS-1) is a measure of the frequency control on a power system, pursuant to NERC Standard BAL-001. The 12-month rolling-average of this measure is required to stay above 100%.



Key Takeaway: Frequency control has been performing extremely well.

Transmission Limit Control

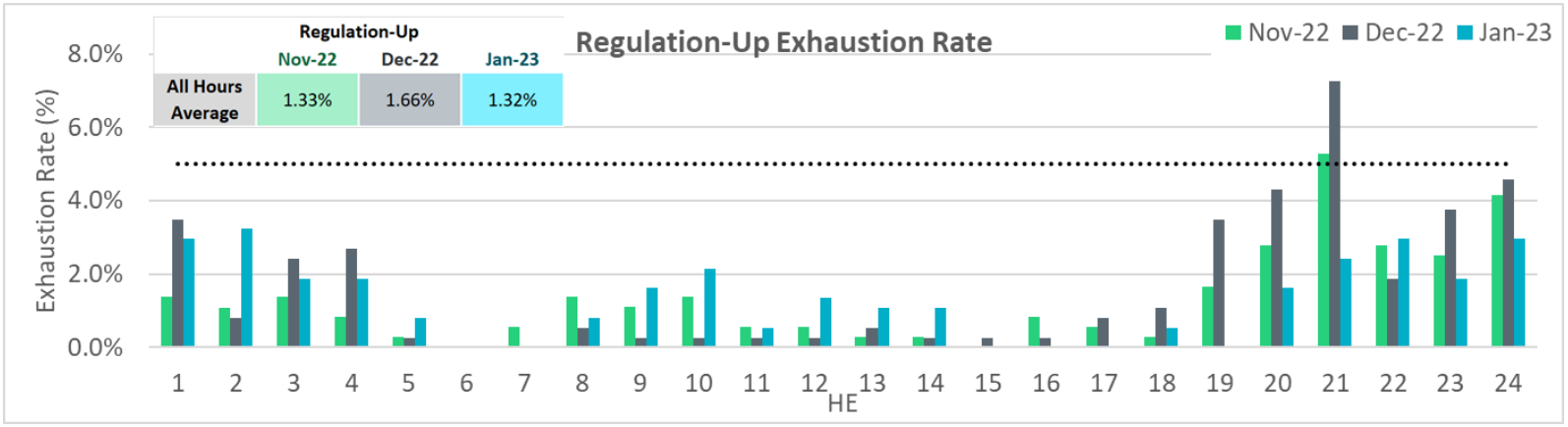
- The most-recent Interconnection Reliability Operating Limit (IROL) exceedance occurred in November 2022.

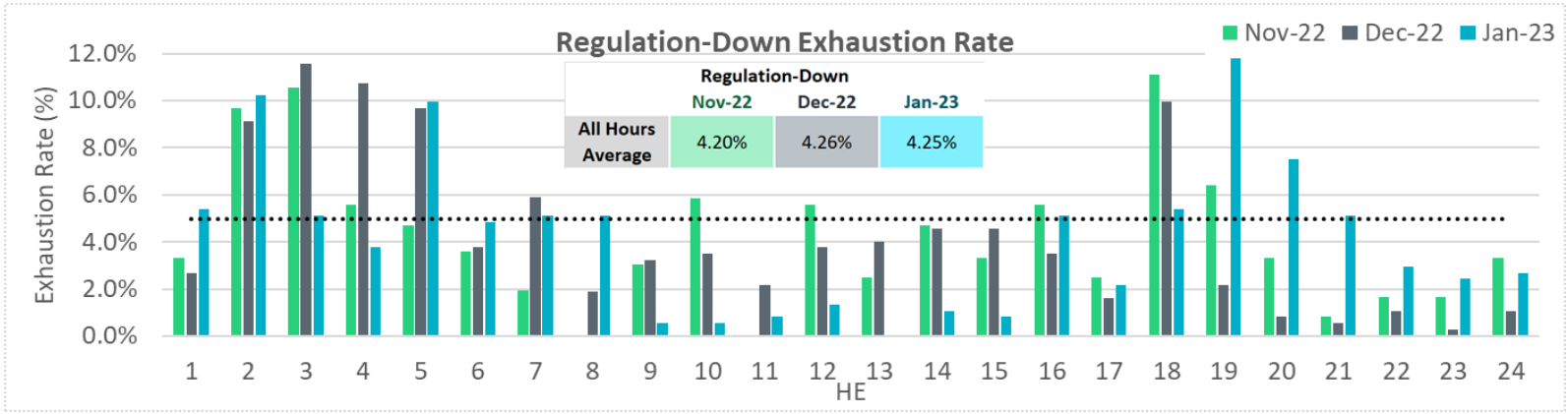


Key Takeaway: ERCOT has not experienced significant reliability risks associated with exceeding IROLs.

Requested Topic:
Ancillary Services Performance

Regulation Service Deployments between Nov 2022 and Jan 2023





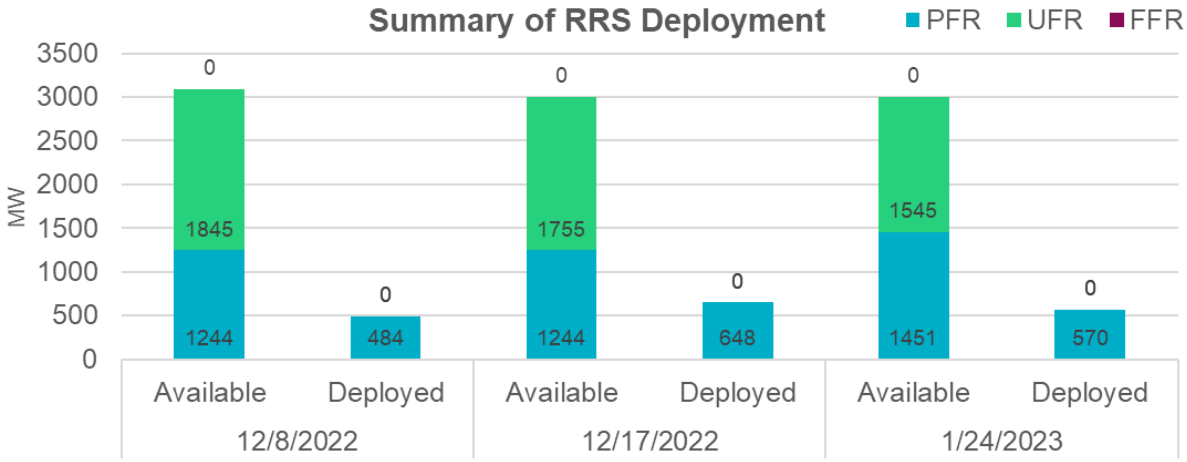
Exhaustion Rate = % of 5 min intervals when all available Reg is less than 5 MW

Key Takeaway: Regulation Up and Down exhaustion rates in Nov 2022, Dec 2022 and Jan 2023 were under the target of 5%.

Responsive Reserve Service (RRS) Deployments between Nov 2022 and Jan 2023

- Between Nov 2022 and Jan 2023, there were 3 events that resulted in deployment of RRS. In all cases the ERCOT grid recovered from the event within the targets established by NERC BAL-002 standard.

Date and Time Released to SCED	Date and Time Recalled	Duration of Event	Maximum MWs Released	Reason
12/08/2022 3:39:52	12/08/2022 3:43:24	00:03:32	484 (PFR)	Unit Trip (~595 MW)
12/17/2022 18:54:04	12/17/2022 18:59:00	00:04:56	648 (PFR)	Unit Trip (~552 MW)
01/24/2023 14:27:19	01/24/2023 14:31:42	00:04:23	570 (PFR)	Unit Trip (~713 MW)

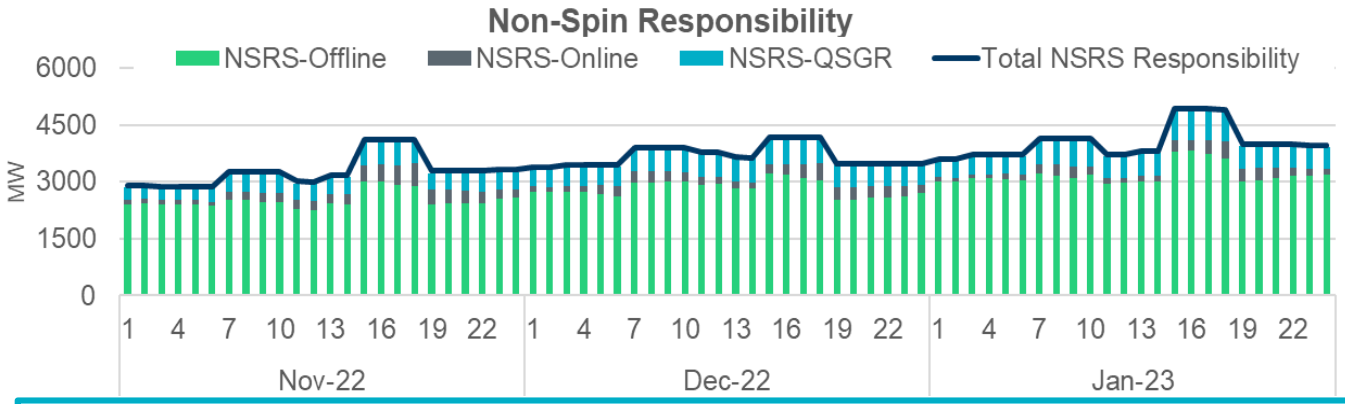


Types of RRS:
PFR = Primary Frequency Response;
UFR = Load Resources with Under-Frequency Relays;
FFR = Fast Frequency Response

Key Takeaway: RRS performed well in all three deployments between Nov 2022 and Jan 2023.

Non-Spinning Reserve Service (Non-Spin) Deployments between Nov 2022 and Jan 2023

Deployment Start Time	Deployment End Time	Deployment Duration	Max Deployment (MW)	Reason
11/26/2022 16:45	11/26/2022 18:12	1:27:00	3988	Available Headroom not sufficient for projected 30-minutes net load ramp
12/13/2022 17:40	12/13/2022 19:30	1:50:00	2965	
12/14/2022 18:43	12/14/2022 19:01	0:18:00	485	
12/16/2022 17:42	12/16/2022 19:17	1:35:00	967	
12/23/2022 6:52	12/23/2022 10:01	3:09:00	3222	
1/3/2023 17:21	1/3/2023 18:30	1:09:00	1135	
1/6/2023 16:53	1/6/2023 18:15	1:22:00	1215	
1/9/2023 17:26	1/9/2023 17:56	0:30:00	514	
1/17/2023 5:46	1/17/2023 7:25	1:39:00	468	



Between Nov 2022 and Jan 2023, there were 9 events that resulted in deployment of off-line Non-Spin.

- Note that, between Nov 2022 and Jan 2023, an average ~21% 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.

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

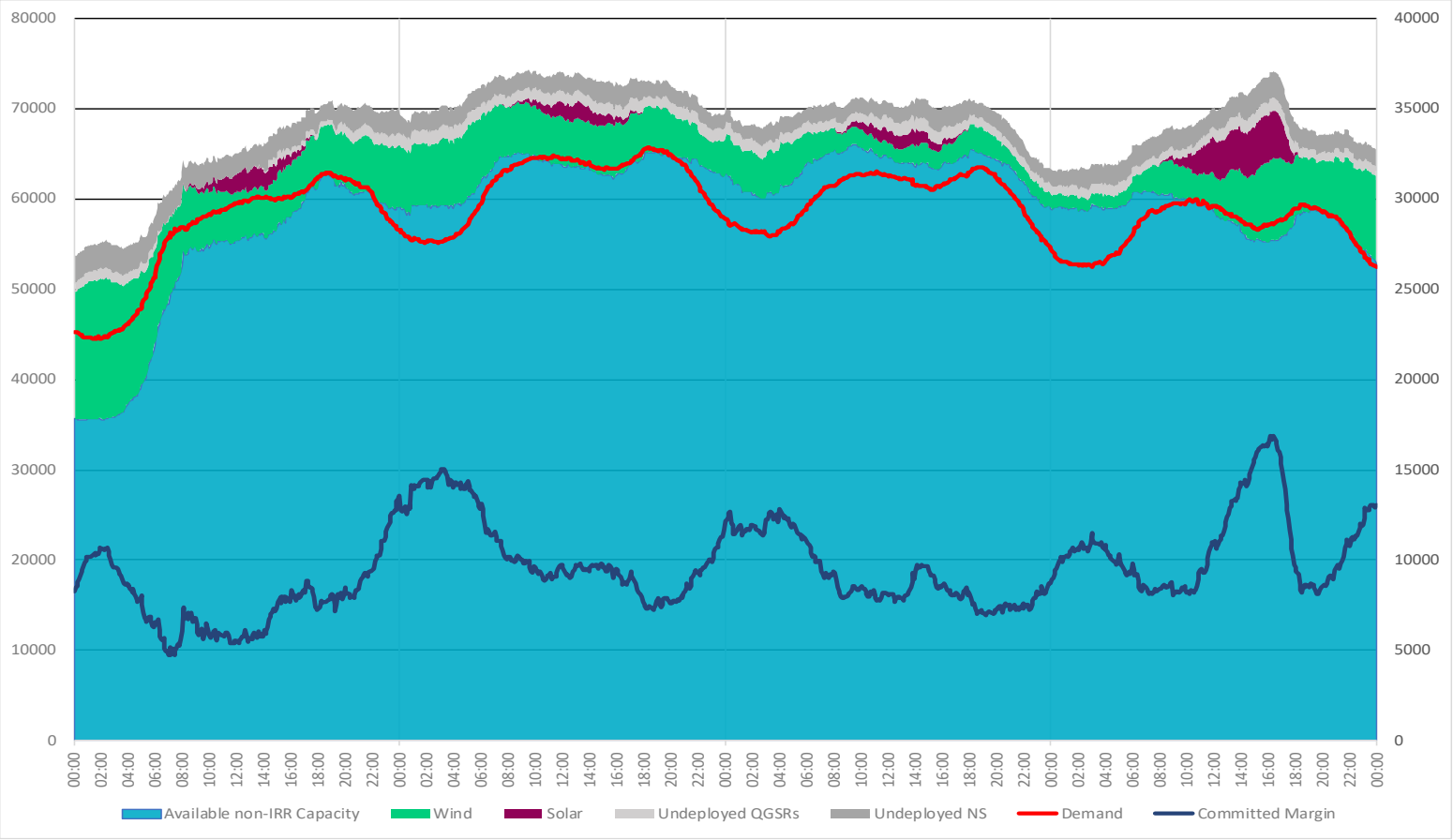
Special Topics:
Winter Storm Mara
And
Inverter-Based Resource (IBR) and Large Flexible Load (LFL) Data Center Events

Cold Weather Operations – Jan 30 to Feb 2, 2023
Winter Storm Mara

- Issued a Watch for potential freezing precipitation for the Panhandle, North, West, and Central areas of the ERCOT Region beginning Monday, January 30 until Friday, February 3 at 12:00.
- Icing on wind turbine blades affected approximately 14 GW of installed capacity at the maximum; impact of this icing on wind output was much lower than this amount due to calm conditions.
- Some gas generators in North Texas had fuel restrictions and ERCOT committed 0.8 GW of Firm Fuel Supply Service, which instructs gas generators to switch to stored fuel.
- Freezing rain and icing caused a significant number of distribution line outages.
- A few icing-related transmission outages occurred, including several in the eastern Hill Country which resulted in the need for a temporary localized loadshed in the Leander area on Thursday, February 2.

Key Takeaway: There were no significant reliability issues for the ERCOT Grid during this icing event.

Supply vs. Demand – Jan 30 to Feb 2, 2023



Key Takeaway: There were sufficient generation capacity and reserves to serve demand during Winter Storm Mara.

IBR and LFL Lack of Ride-through Events

- NERC has issued reports on two ERCOT Region events (5/9/21 and 6/4/22) in which a number of Inverter-Based Resources (IBRs) across West Texas did not ride through a fault in the Odessa area
  - There have been at least two additional, smaller events of this type (10/22/22 and 1/23/23)
- ERCOT has been working with generation owners and equipment manufacturers to implement mitigation measures for these events.
- ERCOT has proposed new market rules (NOGRR 245) to implement portions of IEEE Standard 2800-2022 that are expected to further mitigate these issues.
  - This NOGRR is in the stakeholder review process
- There have also been several events recently where certain large data center loads have not ridden through faults (10/12/22,10/31/22,12/7/22,1/23/23).
  - ERCOT is investigating these events to identify solutions to mitigate this emerging reliability issue.

Key Takeaway: There have been several system events where IBRs and/or Large Loads have tripped. ERCOT is working on several mitigation activities and will provide a comprehensive presentation on the events and mitigation activities at the next R&M meeting.