Item 7.2: System Operations Update

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Reliability and Markets Committee

ERCOT Public
October 16, 2023

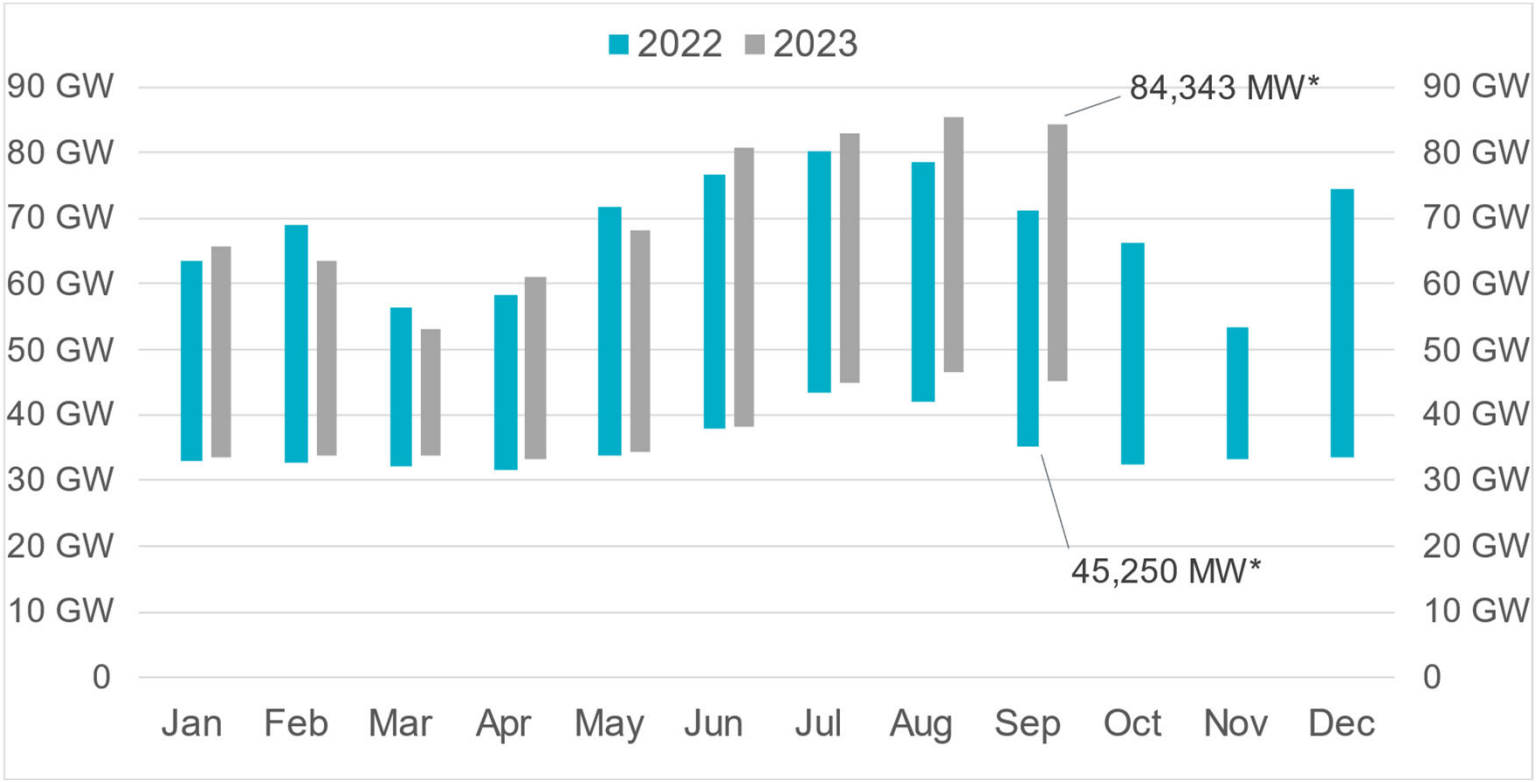
Overview

- **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 or Board; for discussion only

- **Key Takeaways**
  - All key operational metrics are trending well, and all Ancillary Services are generally performing well
  - Fall outage season is underway
  - Update on recent solar eclipse
  - ERCOT appropriately managed grid reliability during the September 6 scarcity event

Demand

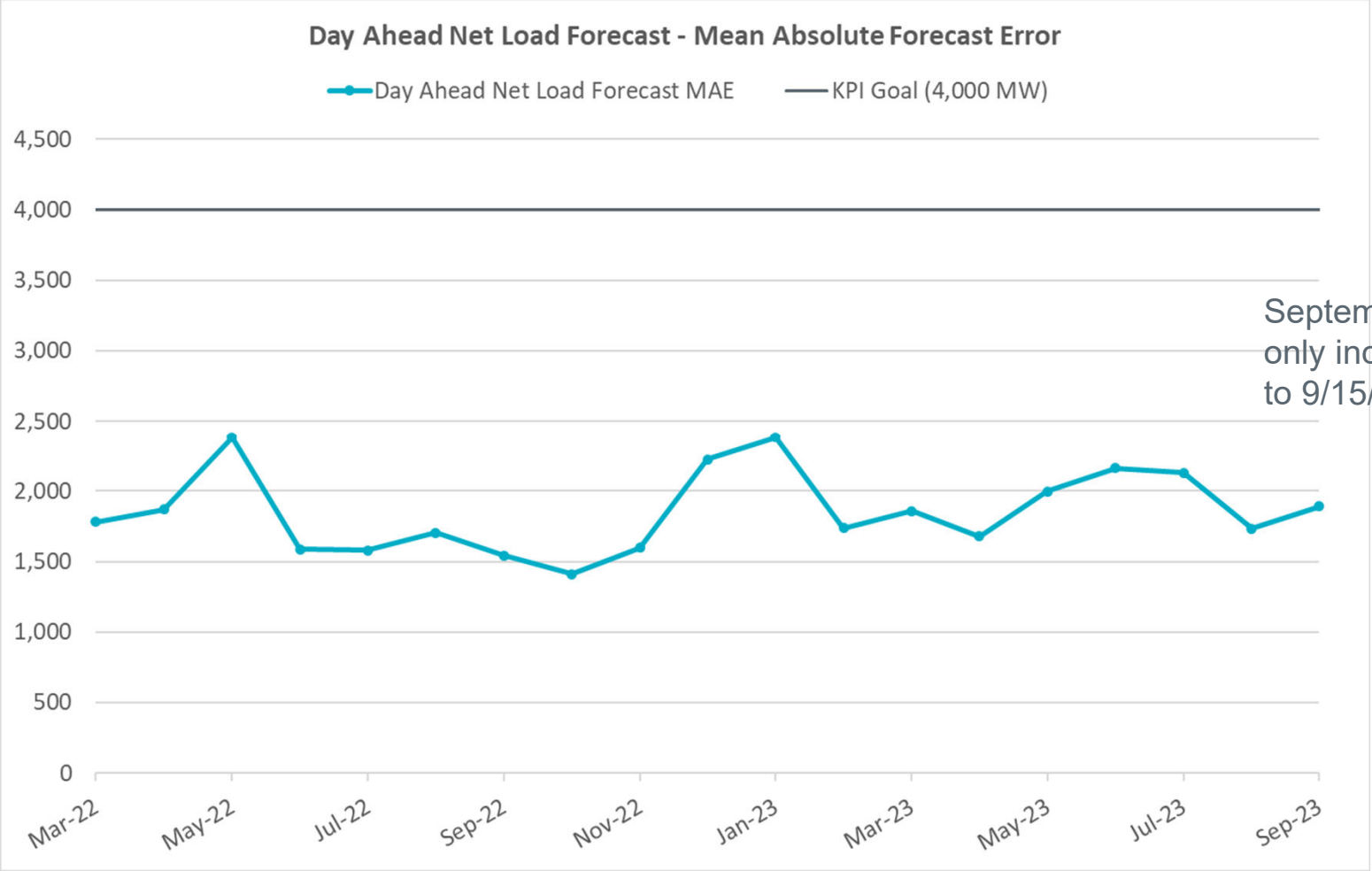


*Note that September 2023 data only includes days up to 9/15/2023.

*Data for latest two months are based on preliminary settlements.

Key Takeaway: ERCOT set a new all-time record of 85,464 MW* for the month of August on 8/10/2023; this was 2,525 MW more than the previous all-time record of 82,939 MW set on 7/31/2023. This is 6,959 MW more than the August 2022 monthly peak demand of 78,505 MW.

Forecast Performance

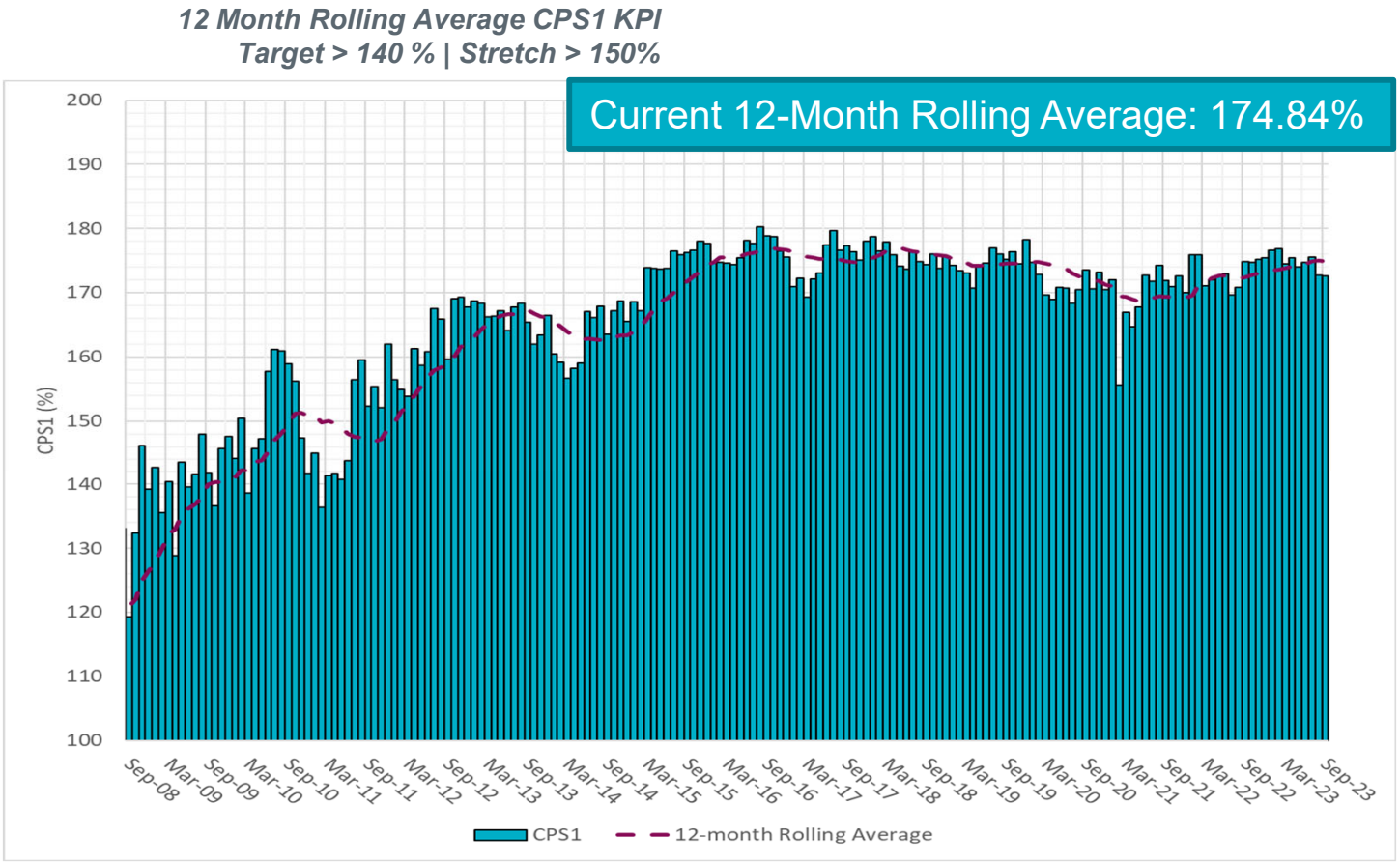


September 2023 data only includes days up to 9/15/2023.

Key Takeaway: Day Ahead Net Load Forecast Mean Absolute Forecast Error is a new Key Performance Indicator for 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%.

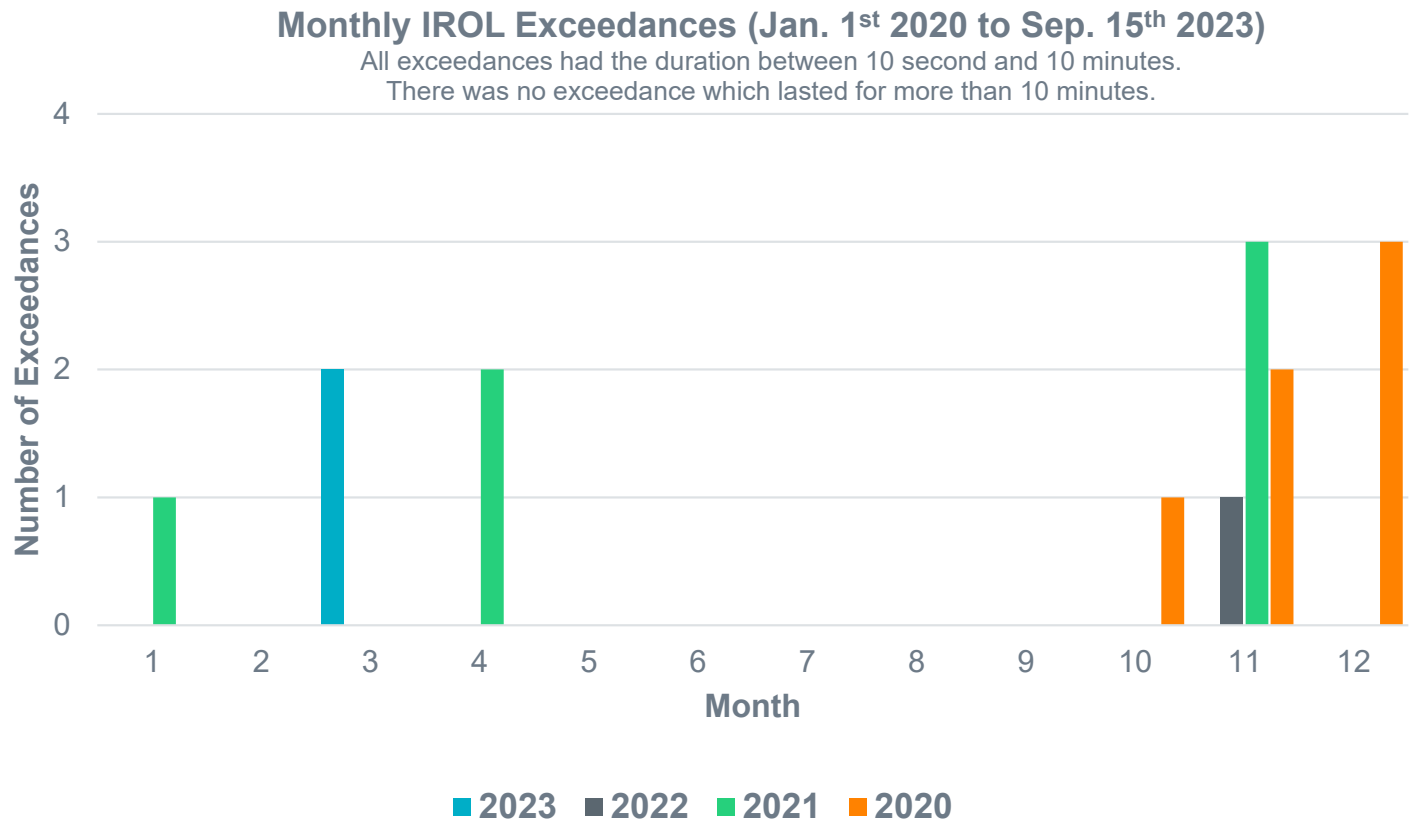


September 2023 data only includes days up to 9/15/2023.

Key Takeaway: Frequency control continues to perform extremely well.

Transmission Limit Control

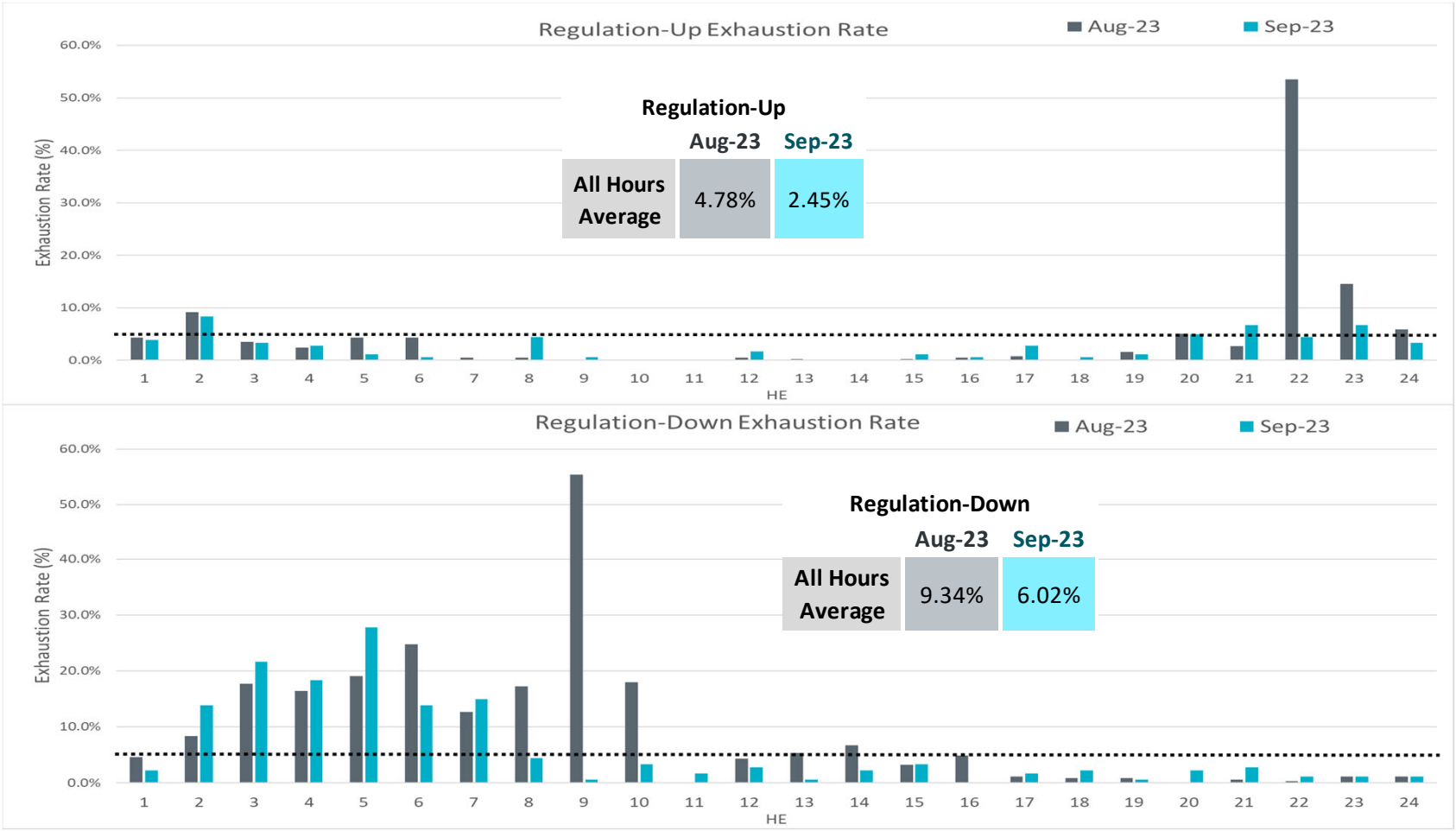
- The most-recent Interconnection Reliability Operating Limit (IROL) exceedance occurred in March 2023.



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

Ancillary Services Performance

Regulation Service Deployments from Aug – Sept 15, 2023



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

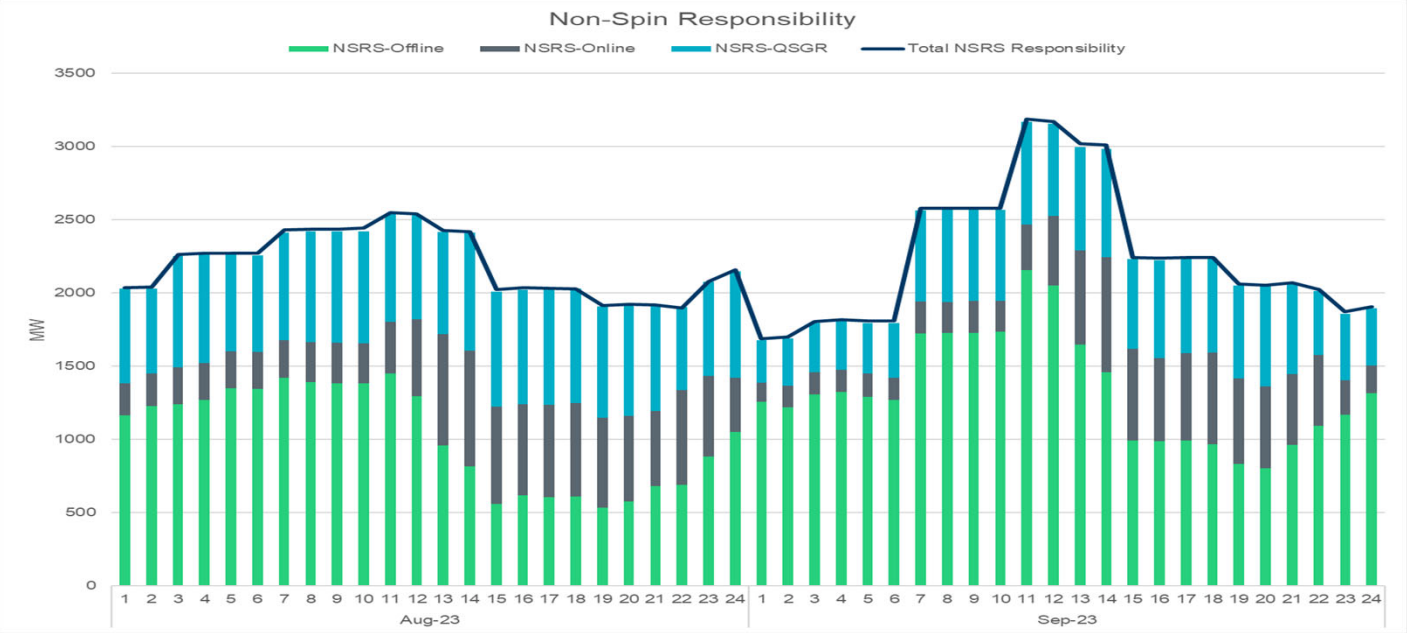
Key Takeaway: Average Regulation Up and Down exhaustion rates in Summer 2023 were similar to Summer 2022.

Non-Spinning Reserve Service (Non-Spin) Deployments from Aug 1 – Sept 15, 2023

Between Aug 1 and Sep 15, there were 18 events that resulted in deployment of offline Non-Spin. All deployments were to meet 30-minute projected net load and Non-Spin performed well in all deployments.

Deployment Start Time	Deployment Duration	Max Deployment (MW)
8/4/2023 17:04	3:39:22	123
8/7/2023 16:58	3:21:27	129.1
8/10/2023 15:29	4:53:33	116.9
8/11/2023 18:34	1:34:37	112
8/12/2023 18:57	1:16:18	244
8/13/2023 19:02	1:03:24	199.1
8/15/2023 19:37	1:05:37	1926
8/17/2023 14:41	6:16:58	2024
8/20/2023 19:14	2:03:02	267
8/24/2023 16:09	4:57:13	231.2
8/25/2023 17:57	3:04:42	158.2
8/29/2023 18:24	1:42:28	115.5
8/30/2023 18:02	2:47:59	170.7
8/31/2023 18:26	1:36:38	114
9/5/2023 17:14	3:44:23	72
9/6/2023 15:06	5:57:48	254.5
9/7/2023 18:17	1:47:43	122
9/8/2023 16:09	3:46:20	155

During this period, an average ~48% of Non-Spin was provided using online capacity and by Quick Start Generation Resources. This type of Non-Spin is always released to SCED to dispatch (with an offer floor of $75) and no operator action is involved in deploying this capacity.



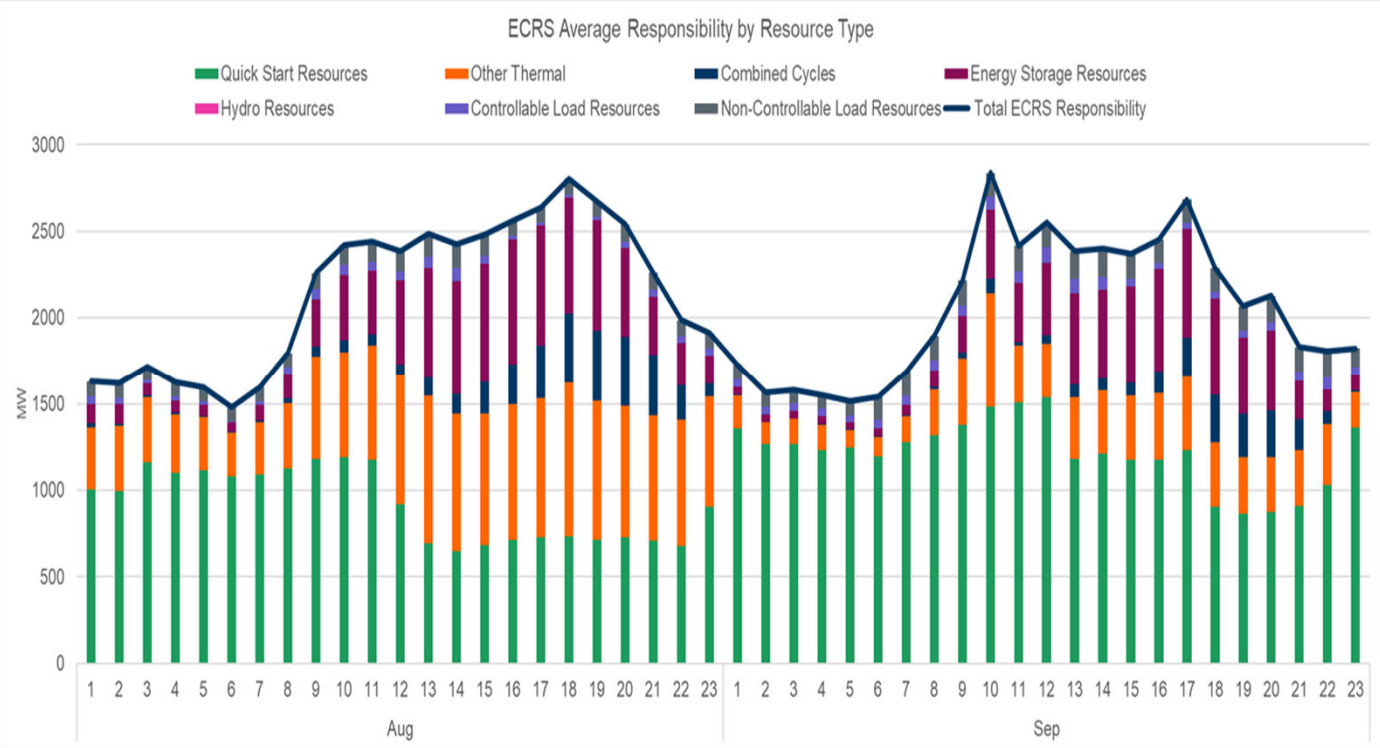
Key Takeaway: All recent Non-Spin deployments have been to meet 30-minute ramping needs. Non-Spin performed well in all deployments.

ERCOT Contingency Reserve Service (ECRS) Release from Aug 1 – Sept 15, 2023

Between Aug 1 and Sep 15, there have been 24 events that resulted in release of SCED dispatchable ECRS. Majority of events were to meet 10-minute projected net load.

Deployment Start Time	Deployment Duration	Maximum SCED Dispatchable MW Released	Reason
8/22/2023 1:27	0:07:44	674	Freq. below 59.91Hz
8/4/2023 17:03	1:10:48	800	Available capacity not sufficient for projected Net Load
8/4/2023 18:52	1:49:12	2472	
8/6/2023 19:46	0:39:20	1500	
8/7/2023 16:42	1:24:32	500	
8/7/2023 18:57	1:19:36	1500	
8/8/2023 19:31	0:56:16	1500	
8/10/2023 15:29	1:49:52	1500	
8/10/2023 17:20	2:58:32	1250	
8/11/2023 18:31	1:34:56	1750	
8/12/2023 19:37	0:34:40	500	
8/15/2023 19:25	1:05:44	500	
8/17/2023 14:41	6:04:40	2620	
8/20/2023 19:11	1:59:44	2000	
8/24/2023 15:55	4:45:48	2342	
8/25/2023 18:21	2:23:04	2579	
8/26/2023 19:38	1:07:56	500	
8/29/2023 19:26	0:35:08	700	
8/30/2023 18:27	2:13:32	2749	
9/5/2023 19:20	0:42:08	500	
9/6/2023 14:57	5:58:48	2600	
9/7/2023 18:34	1:29:04	1964	
9/8/2023 16:06	1:37:12	1000	
9/8/2023 18:56	0:36:00	750	

During this period, an average ~92.1 % of ECRS was provided by SCED dispatchable Resources.

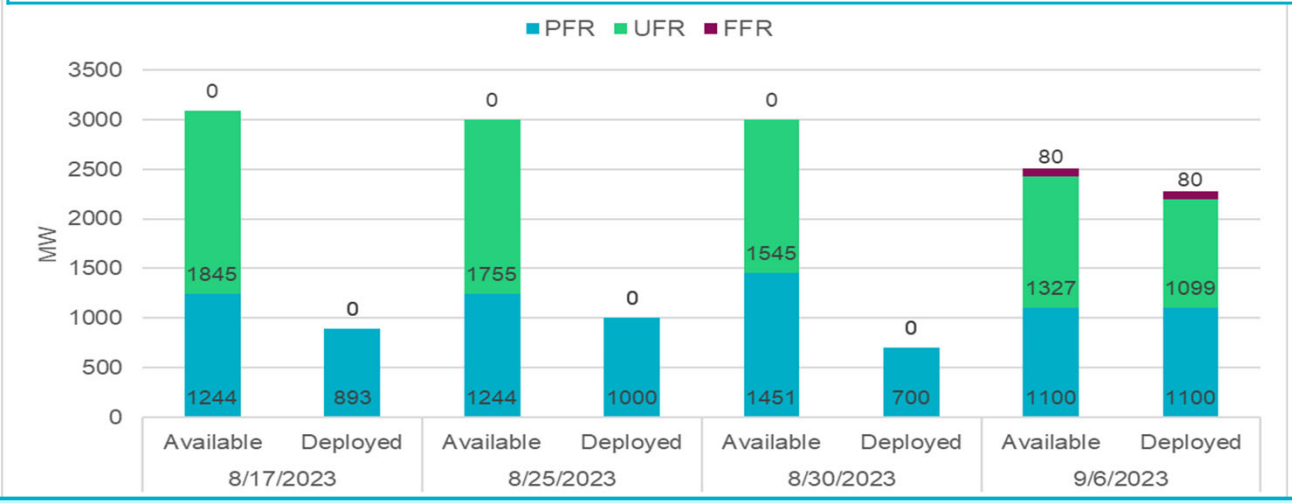


Key Takeaway: ECRS performed well during the 24 events that triggered in release of ECRS.

Responsive Reserve Service (RRS) Release from Aug 1 – Sept 15, 2023

Between Aug 1 and Sep there were 4 events where RRS was manually released. With 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.

Date and Time Released to SCED	Date and Time Recalled	Duration of Event	Maximum MWs Released	Reason
8/17/2023 19:09	8/17/2023 20:06	00:57:00	893	Capacity
8/25/2023 19:21	8/25/2023 20:11	00:50:00	1000	Capacity
8/30/2023 19:25	8/30/2023 20:24	00:59:00	700	Capacity
9/6/2023 18:59	9/6/2023 19:54	0:55:00	1100	Released for Capacity
9/6/2023 19:20	9/6/2023 19:35	0:15:00	80	Automatic Deployment of RRS-FFR on Frequency
9/6/2023 19:23	9/6/2023 20:17	0:54:00	1099	Manual Deployment of Load Resources



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

Key Takeaway: RRS performed well in the 4 events that triggered release of RRS. Note that additional analysis being conducted for the 9/6/2023 event.

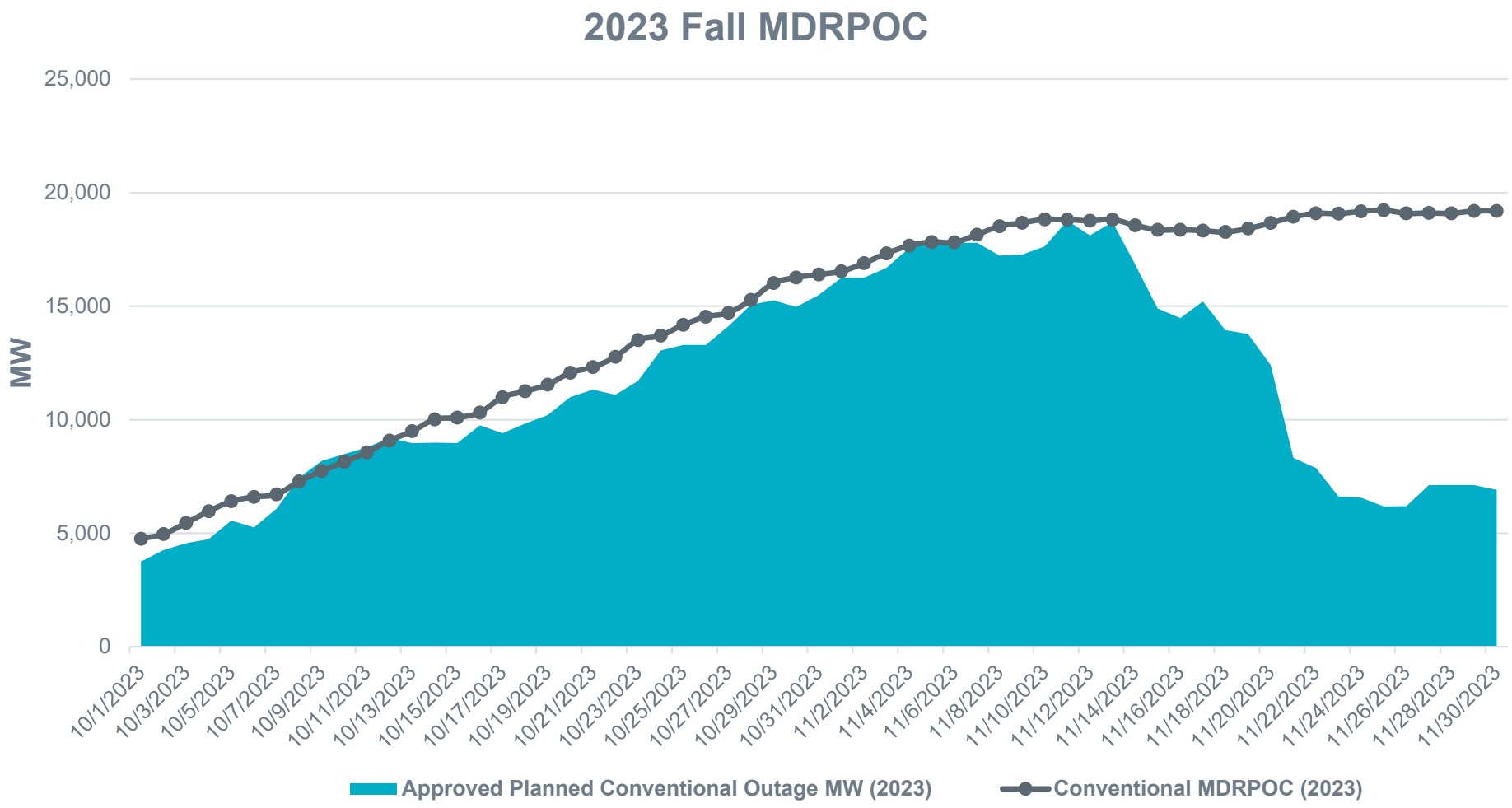
Hot Topics

Planned Fall Resource Outages

Solar Eclipse

September 6 EEA Event

Currently-Approved Planned Non-Renewable Resource Outages versus Maximum Daily Resource Planned Outage Capacity (MDRPOC)

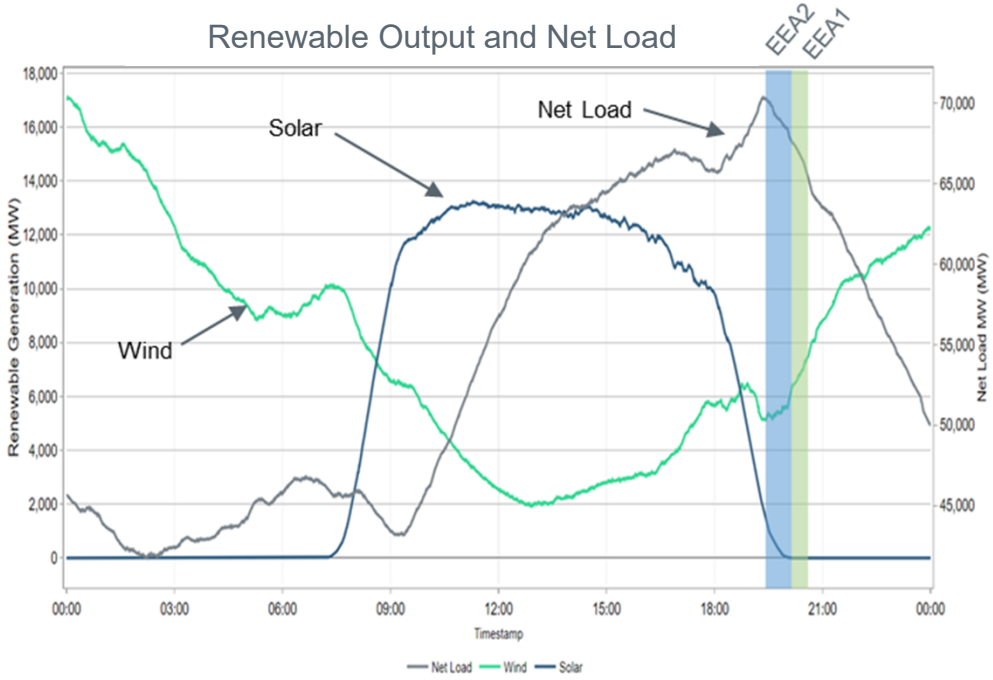


October 14th Solar Eclipse

- Verbal Update

September 6th – Emergency Operations

- Temperatures were high across Texas with 105 degrees in Dallas
- Reserves were tight during this period due to high demand, low wind in north and west, and earlier solar ramp compared to August
- ECRS and Non-spin reserves were used to serve load as early as 2:57pm
- As the sun set in the evening, reserves in north, west and central Texas declined

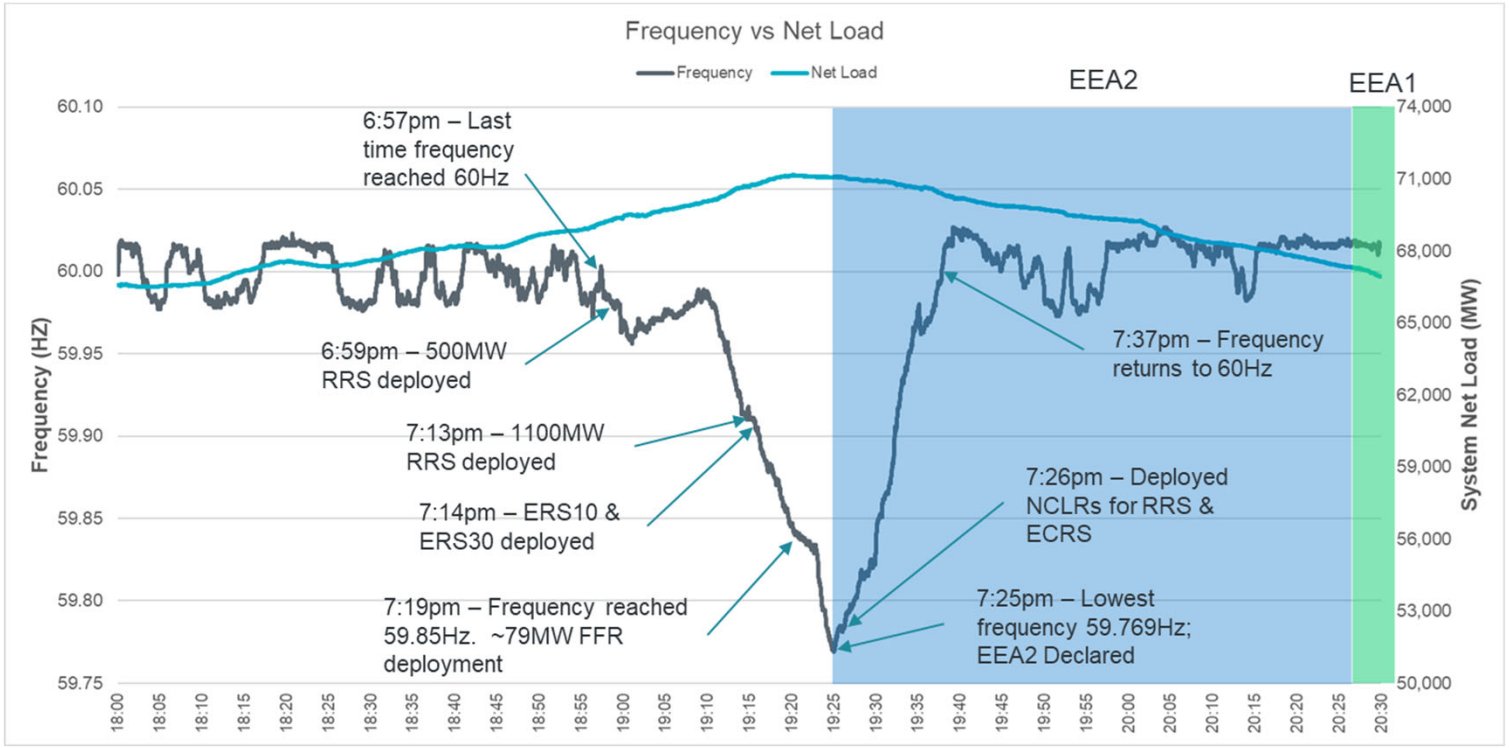


- At 6:59pm Responsive Reserve (RRS) was released to SCED
- Some additional generation in South Texas was available, but resulted in the overload of a high-risk transmission constraint from South Texas to rest of ERCOT
- ERCOT appropriately balanced the overload of the transmission constraint against the risk of going into EEA and began to manually curtail generation in South Texas to relieve the overload

Key Takeaway: High net load and the need to manage a high-risk transmission constraint led to a decline in frequency and the need to declare EEA2

September 6th – Emergency Operations

- At 7:10pm, even though Physical Responsive Capability (PRC) appeared to remain above 2000 MW, frequency began to decline, reaching a low of 59.769Hz by 7:25pm
- At 7:14pm, ERCOT gave a switching action instruction to reduce the overload and allow some of the curtailed generation to be restored
- During this low Frequency period an 80MW generator tripped offline
- At 7:25pm EEA2 was declared and Load Resources were deployed
- At 7:37pm system frequency was restored to 60Hz
- ERCOT moved to EEA1 at 8:27pm and to normal operations 8:37pm



September 6th – Emergency Operations

- Observations
  - With over 2000MW of PRC, frequency should not have dropped to this level
  - Primary Frequency Response from unloaded generation should have prevented the low frequency, if units were responding correctly and reporting correct data
  - Control room operators recognized that the reported PRC was suspect and acted based on the declining system frequency
  - EEA2 was declared to quickly access additional reserves by deploying Load Resources
  - Controlled outages were not implemented or required
- Follow-Up
  - ERCOT is investigating the causes of the inaccurate PRC reporting
  - Additional mitigations for the transmission constraint are under consideration

Key Takeaway:
Proper response from generators should have prevented the decline of frequency