Item 7: Review of Winter Storm Elliott

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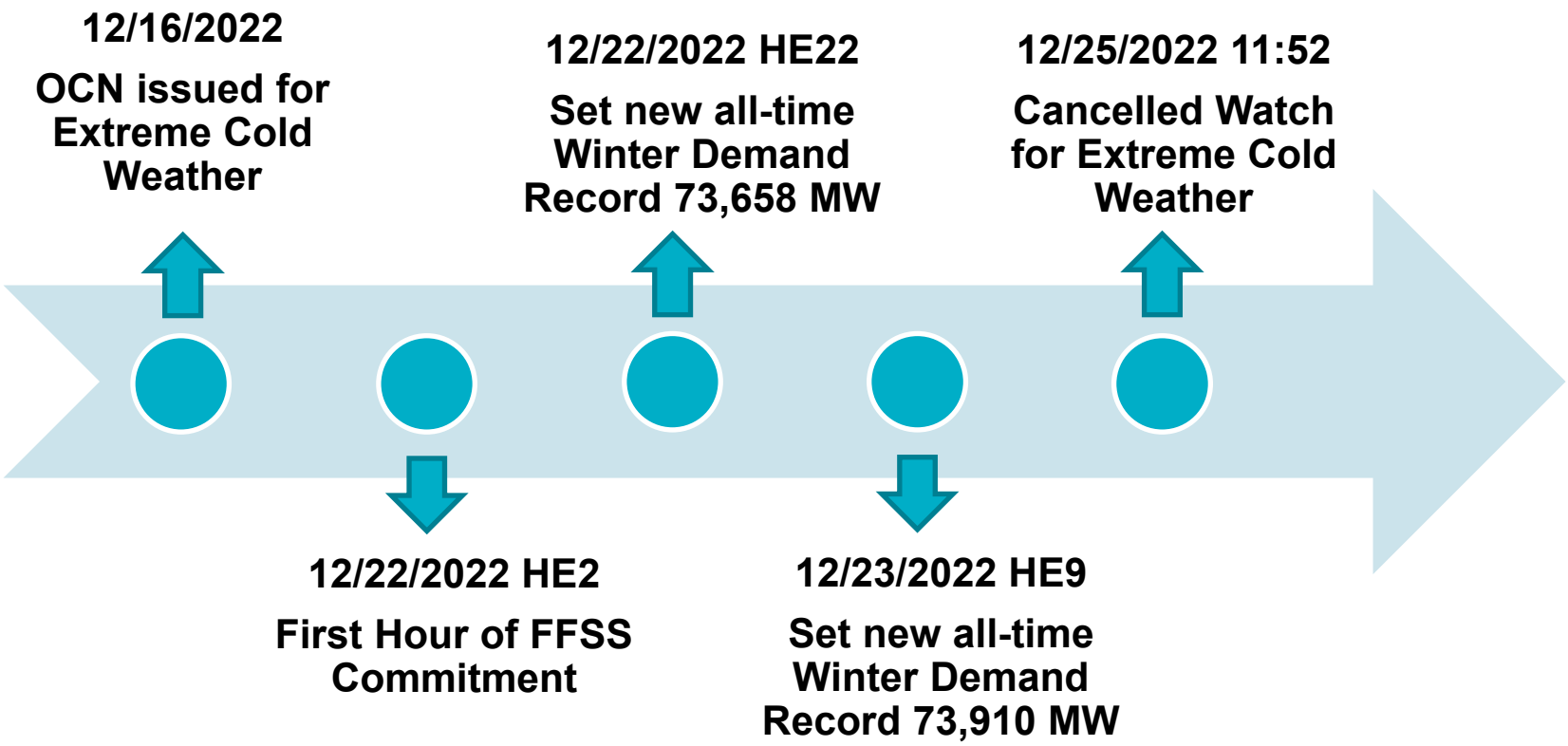
Board of Directors Meeting

ERCOT Public
February 28, 2023

Overview

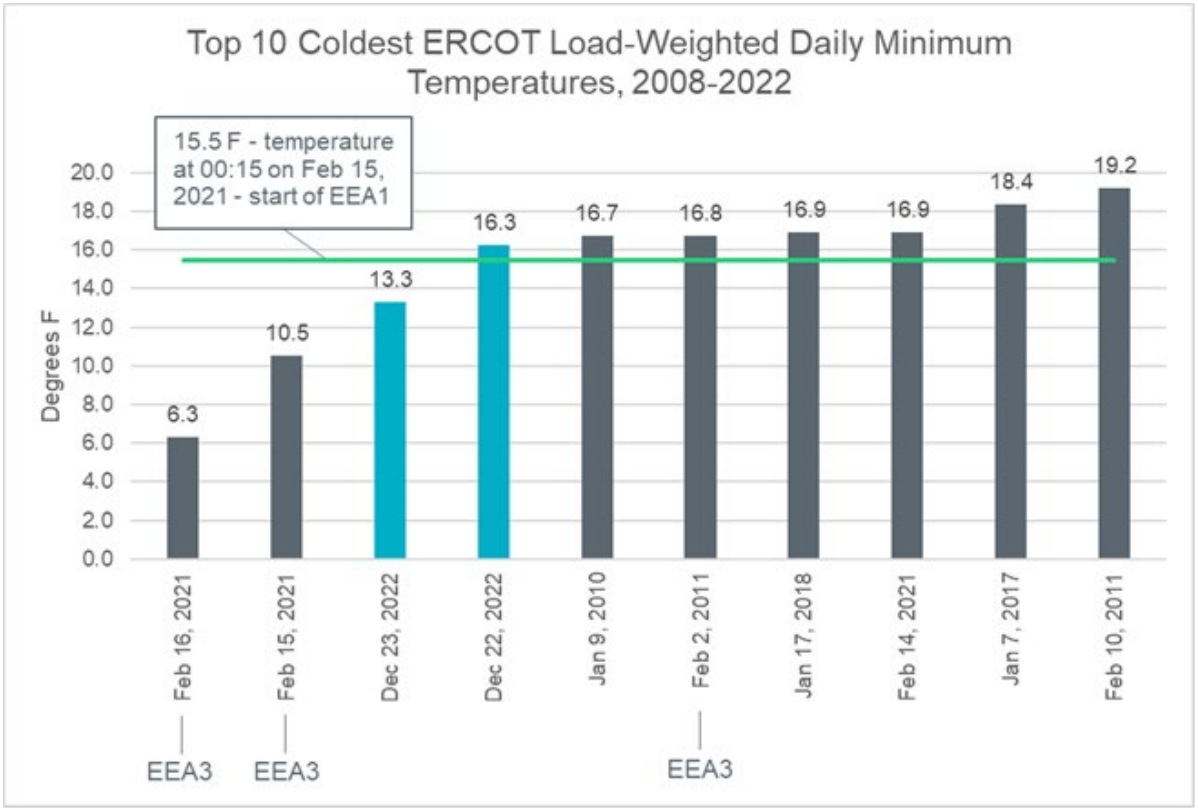
- **Purpose**
  - Provide the Board with an overview of operations during Winter Storm Elliott
- **Voting Items / Requests**
  - No action is requested of the Board; for discussion only
- **Key Takeaways**
  - ERCOT set new winter demand records, and resource performance coupled with conservative operations supported reliable execution throughout event.
  - ERCOT identified load forecast lessons learned and initiated improvements.

Operational Highlights



Key Takeaway: Two consecutive winter demand records were set, and resource performance coupled with conservative operations supported reliable execution throughout event.

Weather

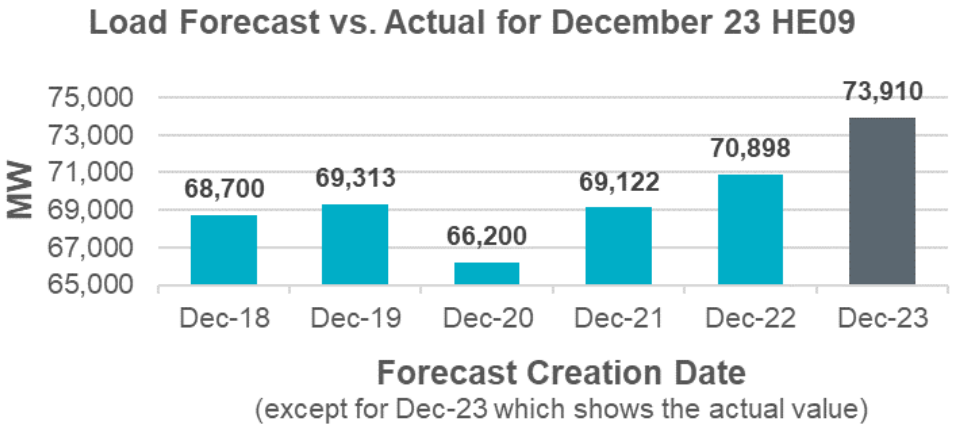


- Minimum daily temperatures don't tell the whole story, but are one indicator of severity
- Winds were also very strong

Key Takeaway: In the last 15 years, only two days of Winter Storm Uri had minimum temperatures colder across ERCOT than Winter Storm Elliott

Load Forecast

- Load Forecasts were too low going into event
  - Cold weather intrusion was deeper and quicker than the national weather models were forecasting
  - Load forecasting models overplayed the reduction in demand due to the holiday
  - Lack of historic load data without loadshed for temperatures this cold for the load forecast models to reference
- ERCOT has identified lessons learned and initiated improvements
- Many other system operators across the eastern US had similar forecast errors
- The under-forecast had no impact on reliability because we intentionally prepared for higher demand than what the forecast models were projecting



Key Takeaway: ERCOT identified load forecast lessons learned and initiated improvements.*

* See load forecast presentation from the February 2023 Operations Working Group meeting for more details: https://www.ercot.com/files/docs/2023/02/15/MTLF%20Winter%20Storm%20Elliot%20OWG.pptx

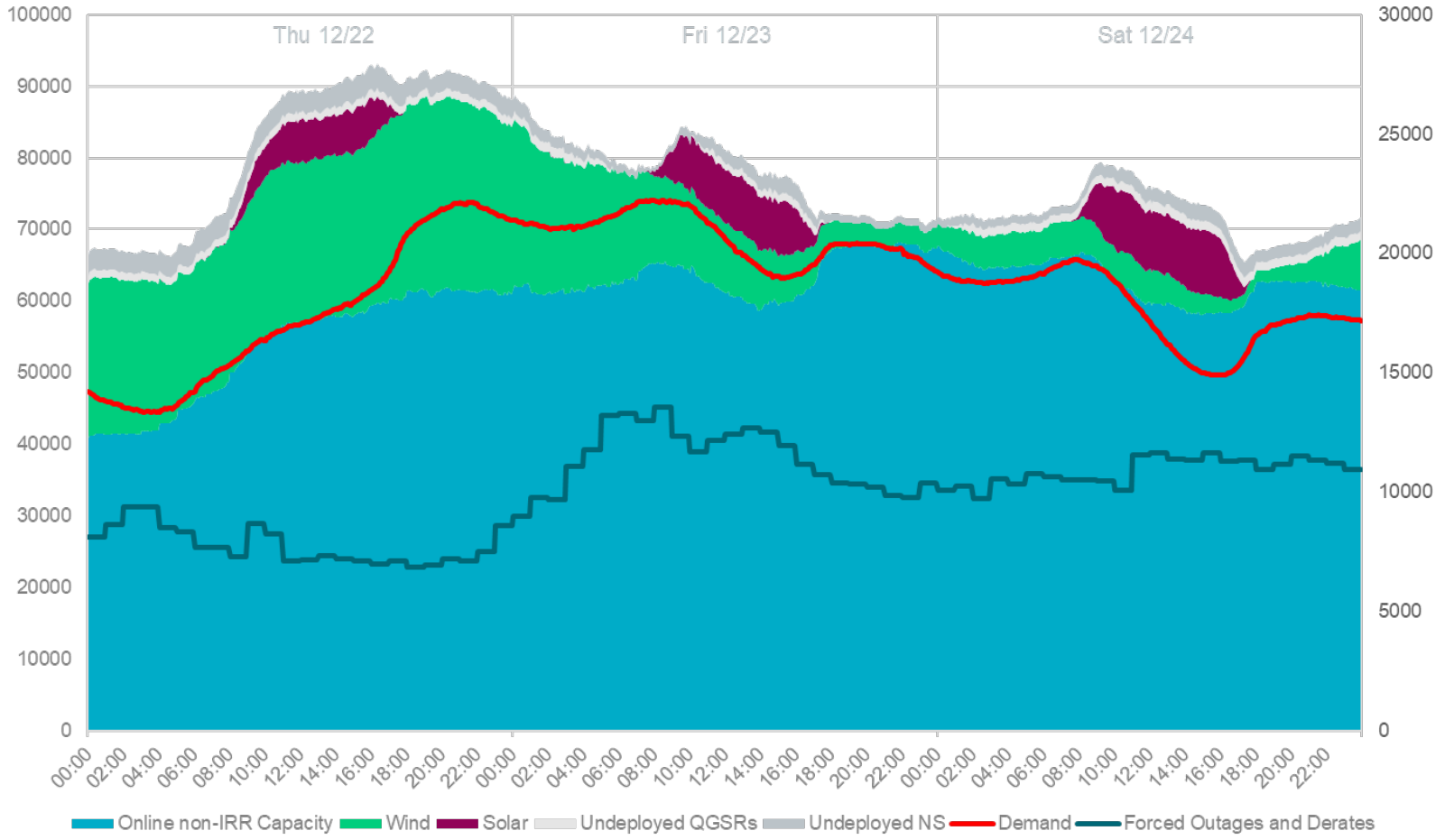
Wind and Solar Forecast

- On Thursday 12/22, ERCOT used the most conservative solar forecast and switched to the most conservative wind forecast in the afternoon, in advance of the cold weather and high load
- High winds on Thursday 12/22 followed by a down ramp and low winds on 12/23-12/24 was predicted before the cold front arrived

	Wind forecast (Dec. 22-25, 2022)	Wind forecast (Dec. 2022)	Solar forecast (Dec. 22-25, 2022)	Solar forecast (Dec. 2022)
Day-ahead Forecast Performance (MAPE)	5.07%	3.60%	2.72%	3.23%
1-hour-ahead Forecast Performance (MAPE)	2.83%	1.90%	2.55%	2.53%

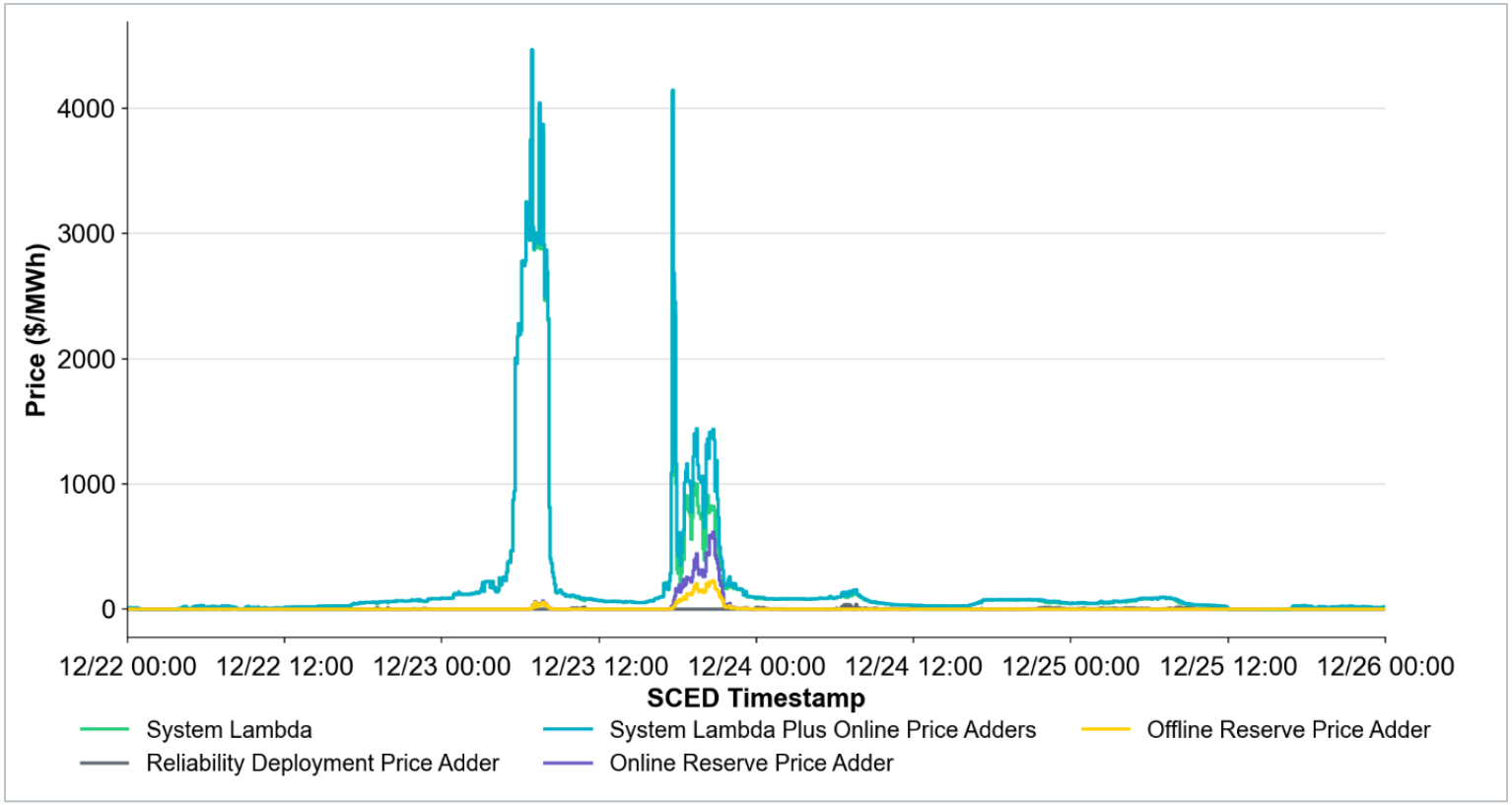
Key Takeaway: The wind and solar forecasts performed well during Winter Storm Elliott.

Supply vs. Demand 12/22-12/24



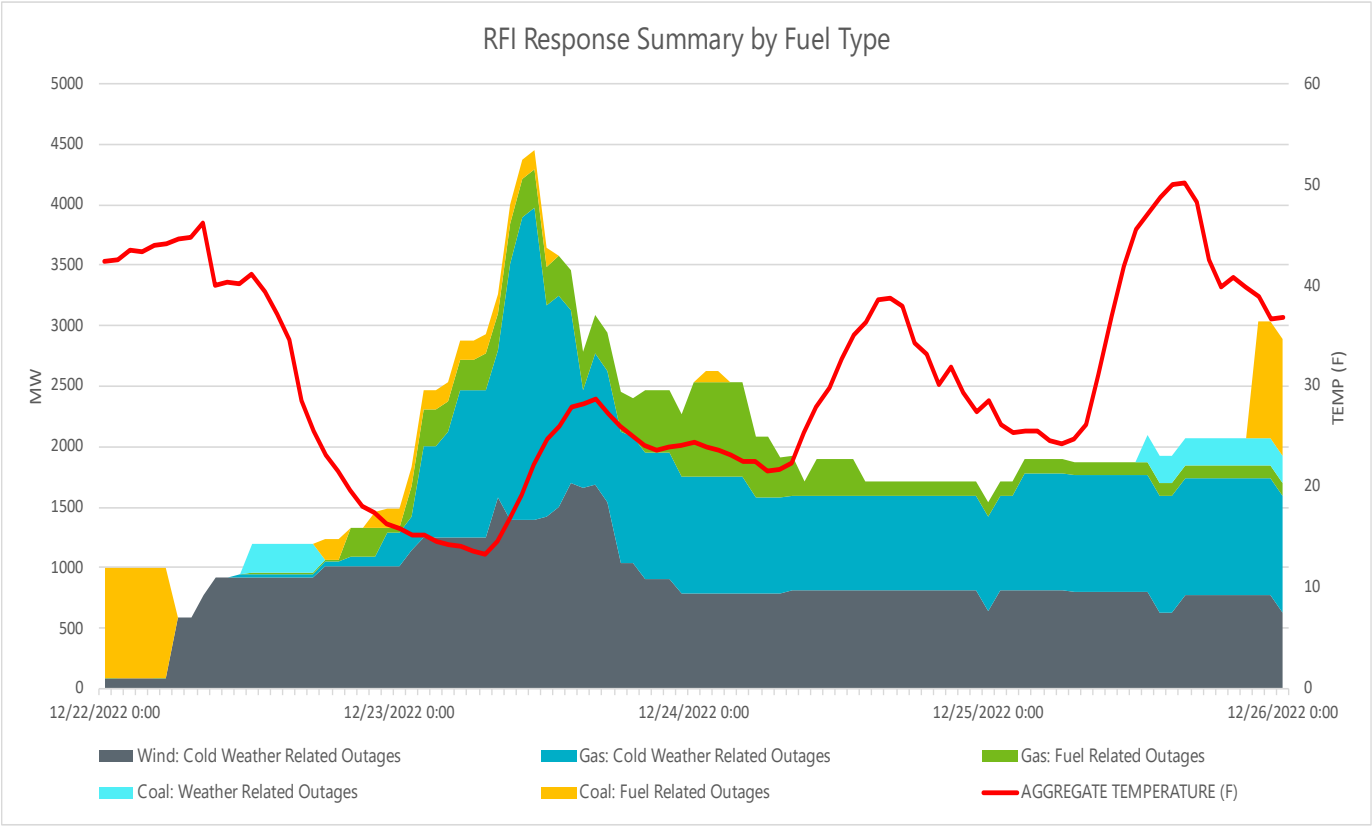
Key Takeaway: ERCOT had adequate generation throughout Winter Storm Elliott.

Real-time Pricing



Key Takeaway: Wholesale prices in real-time were elevated during the morning and evening of December 23.

Forced Generation Outages by Fuel Type – RFI Response Summary

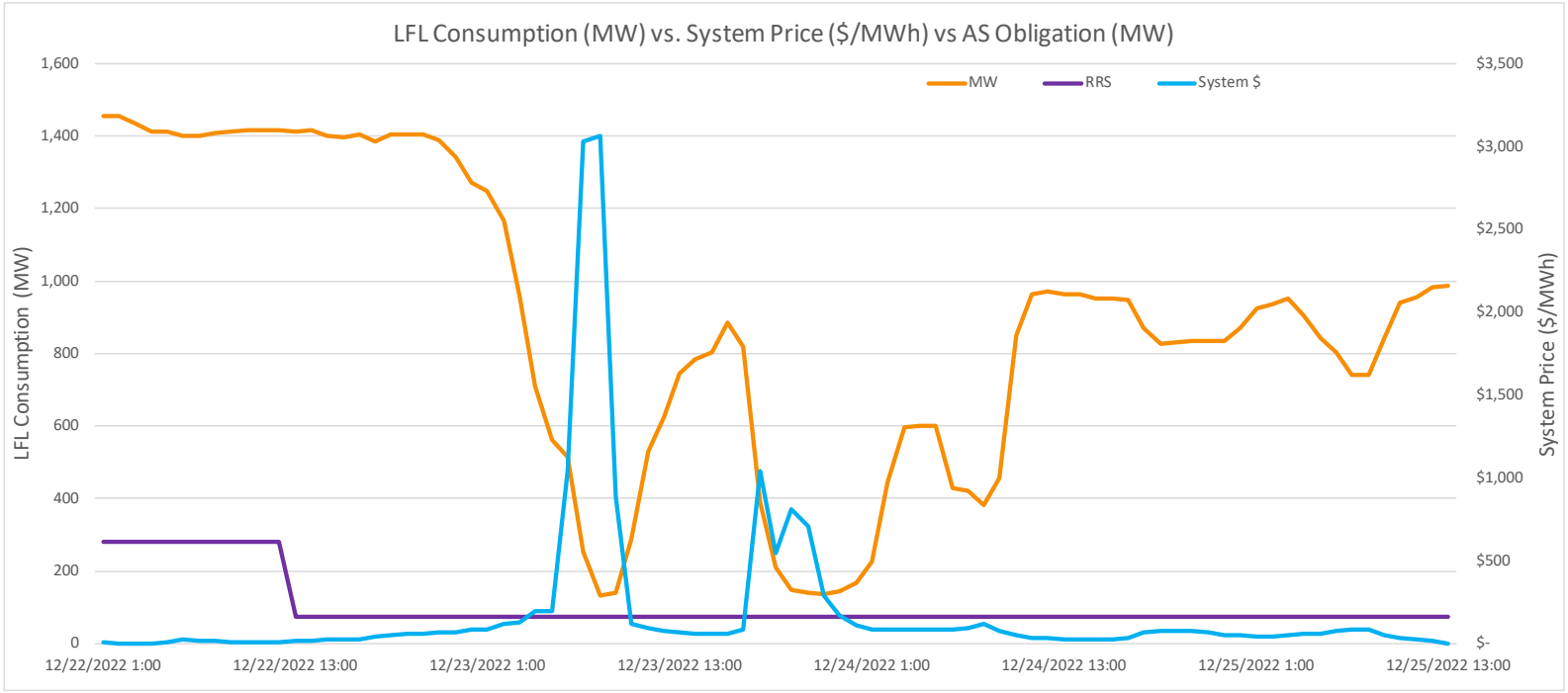


- The outages shown are the subset of all outages that occurred during the cold weather period that were attributed to either weather or fuel related issues
- Wind outages shown are nameplate capacity on outage, not lost output which was less

Key Takeaway: Weather-related outages were not insignificant, illustrating value of the PUC's additional Phase 2 weatherization standards that will be effective next winter. ERCOT is investigating root causes of these outages.

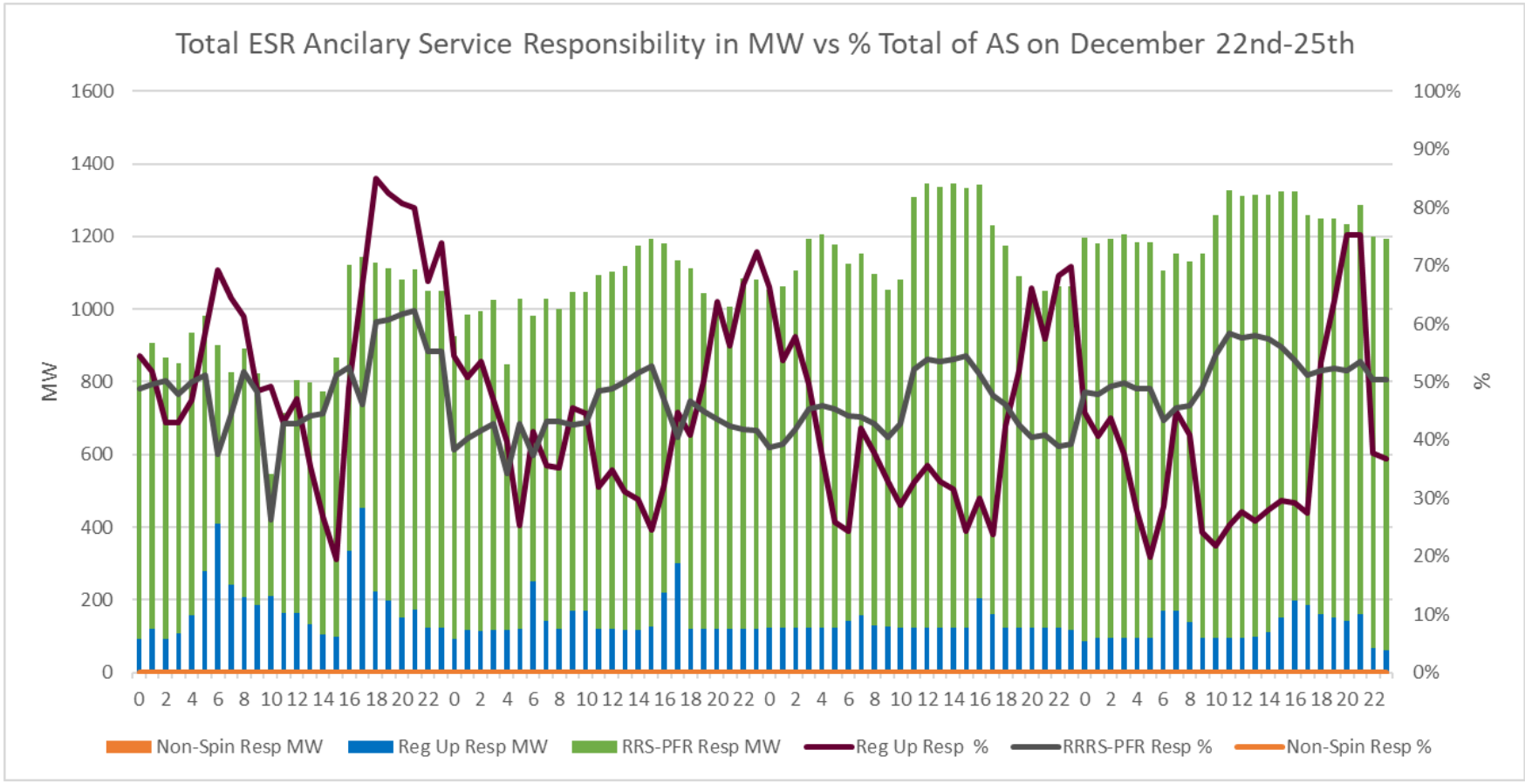
System-Wide Large Flexible Loads (LFL) Consumption

- A significant portion of the load associated with known LFLs curtailed during the event in response to market prices.
- At its peak, the response from LFLs totaled ~1,400 MW with an additional 75 MW carrying Responsive Reserve (RRS).



Key Takeaway: LFLs curtailed in response to market prices.

Energy Storage Resource (ESR)



Key Takeaway: Energy Storage Resources carried a meaningful amount of Ancillary Services during the cold weather.

Natural Gas Limitations

- Typical gas restrictions on units in North Texas and several Operational Flow Orders (OFOs) issued to prevent gas flowing beyond contract maximums
  - Resulted in some natural gas curtailments and reduction of Generation Resource capacity
- Firm Fuel Supply Service (FFSS) used to maintain unit availability with natural gas curtailments
  - ERCOT requested the deployed FFSS units to refuel in preparation for future events

Operating Day	Number of Resource Deployed	Total FFSS Deployed in MW (Based on FFSS Awards)
12/22/22	4	758
12/23/22	8	949
12/24/22	8	949
12/25/22	2	39

Key Takeaway: Natural gas generators experienced gas restrictions typical during cold weather. The new FFSS was beneficial in replacing the otherwise unavailable capacity.

TCEQ Enforcement Discretion and DOE Order

- ERCOT made requests to the Texas Commission on Environmental Quality (TCEQ) and Department of Energy (DOE) to maximize generation and avoid an Emergency Condition

- TCEQ Requests
  - 12/21/22: ERCOT requested and TCEQ granted emission enforcement discretion
  - 12/25/22: TCEQ enforcement discretion ended at noon

- DOE Requests
  - 12/23/22: ERCOT requested and DOE issued 202(c) order to allow generation emission exceedances
  - DOE Order was not used since ERCOT did not declare an Emergency Condition

Key Takeaway: ERCOT requested emission waivers to ensure maximum generation availability during the cold weather.

Questions?