



MISO September 15 Maximum Generation Event Overview

October 11, 2018

Purpose & Key Takeaways



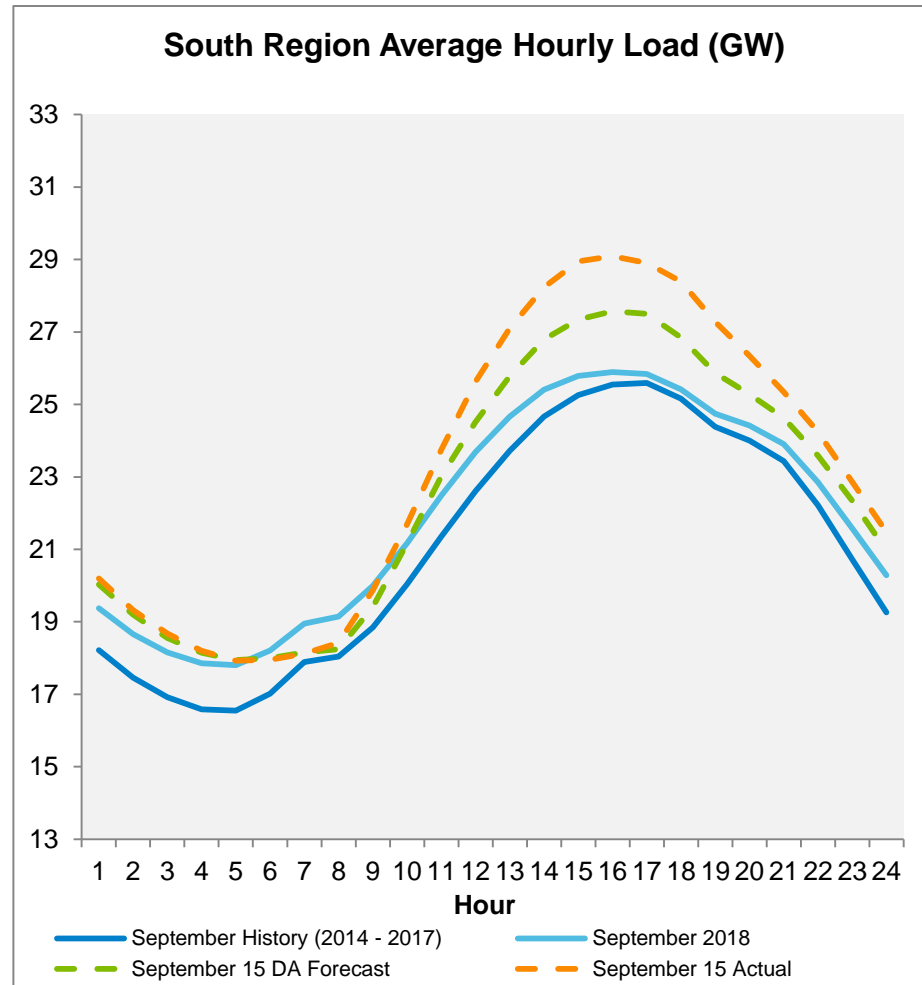
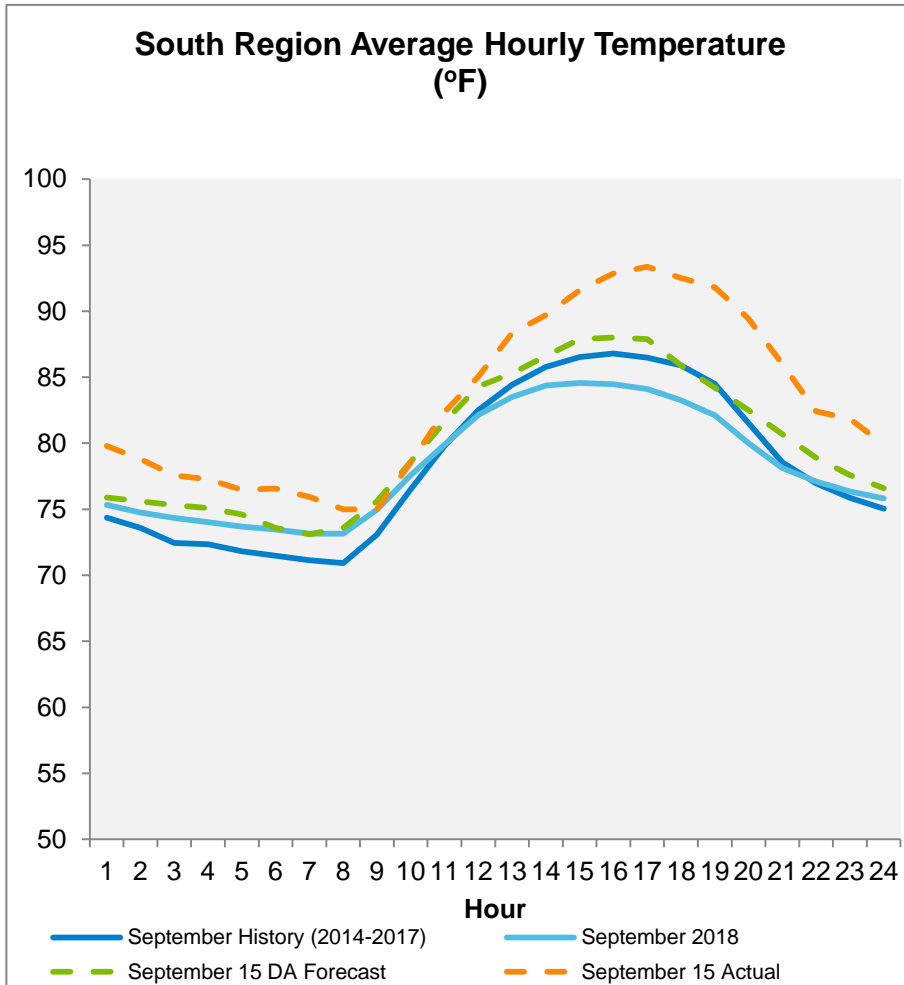
Purpose:

Summarize operations during the September 15 South Region Maximum Generation Event

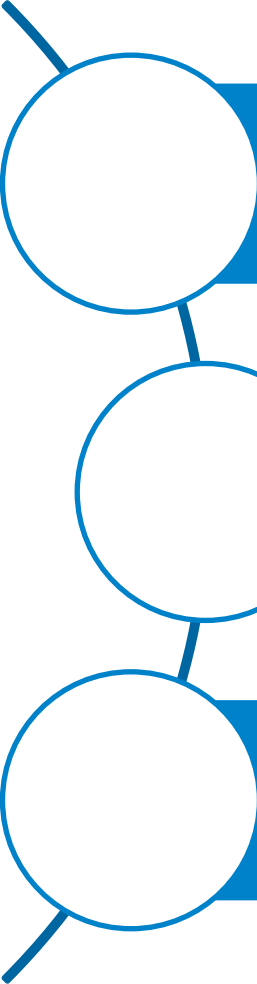
Key Takeaways:

- MISO and Members reliably managed operations through rapidly increasing load, underestimated temperature forecasts, and loss of generation
- MISO declared a Maximum Generation Event Step 2c/d to meet South Region load obligations and maintain reliability
- Lessons learned from January 17 allowed for a smoother execution of emergency purchases, public appeals, and increased awareness around the contractual Regional Dispatch Transfer constraint

Forecasted temperatures and cloud cover for the weekend did not materialize. Rapidly increasing temperatures not anticipated by MISO's weather vendors challenged load forecasting.



The top load forecasting error for the MISO footprint was observed on September 15, 2018.



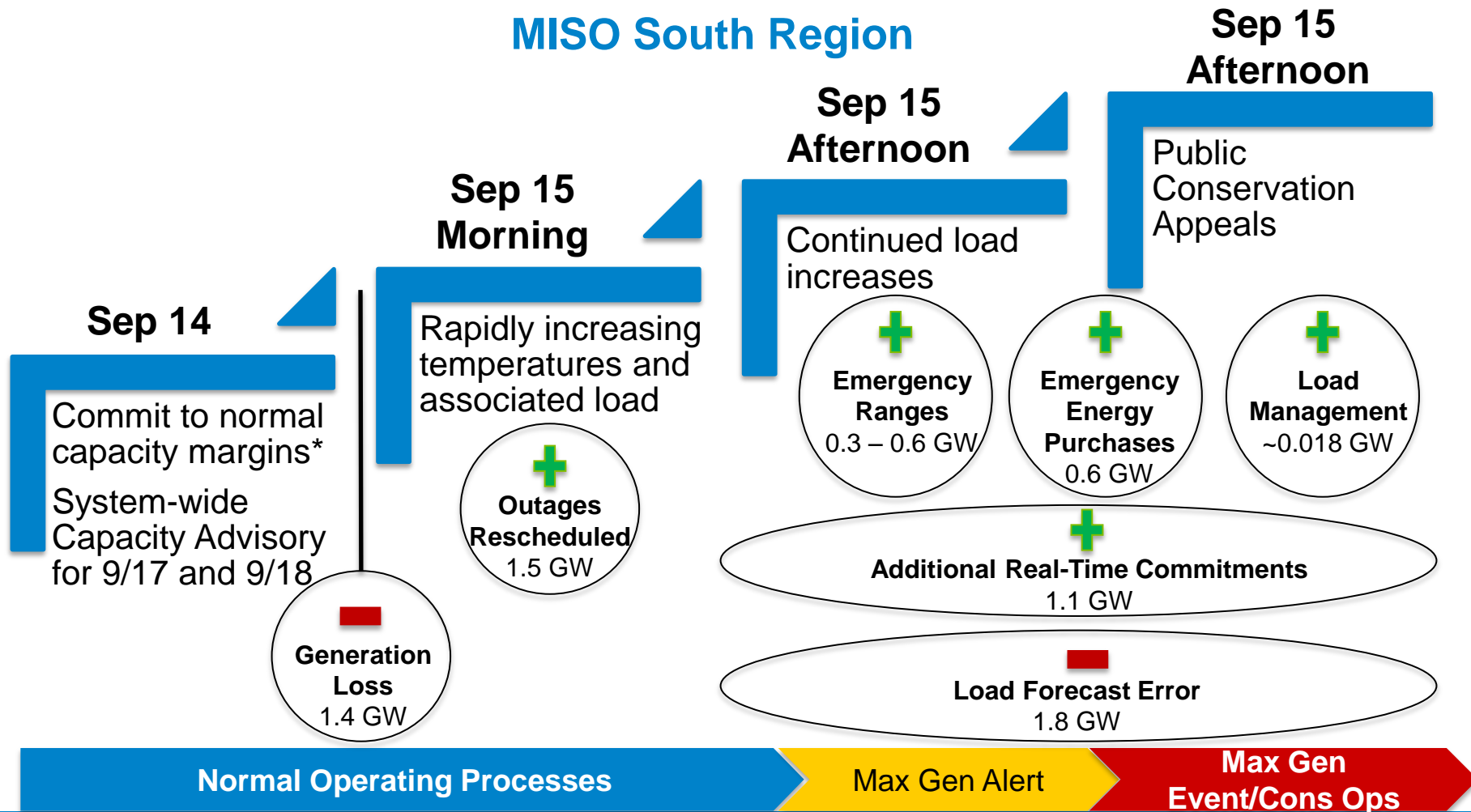
The system-wide 24 Hour Ahead Load Forecast was 7.6 GW lower than actual. This is the highest under-forecast amount to date!

The temperature forecast error for the afternoon periods ranged 3-5 degrees across the entire MISO footprint

Since 2011, MISO has had 8 other Emergency Operation Events. Of those, forecasting error was a significant contributing factor once, September 22, 2017

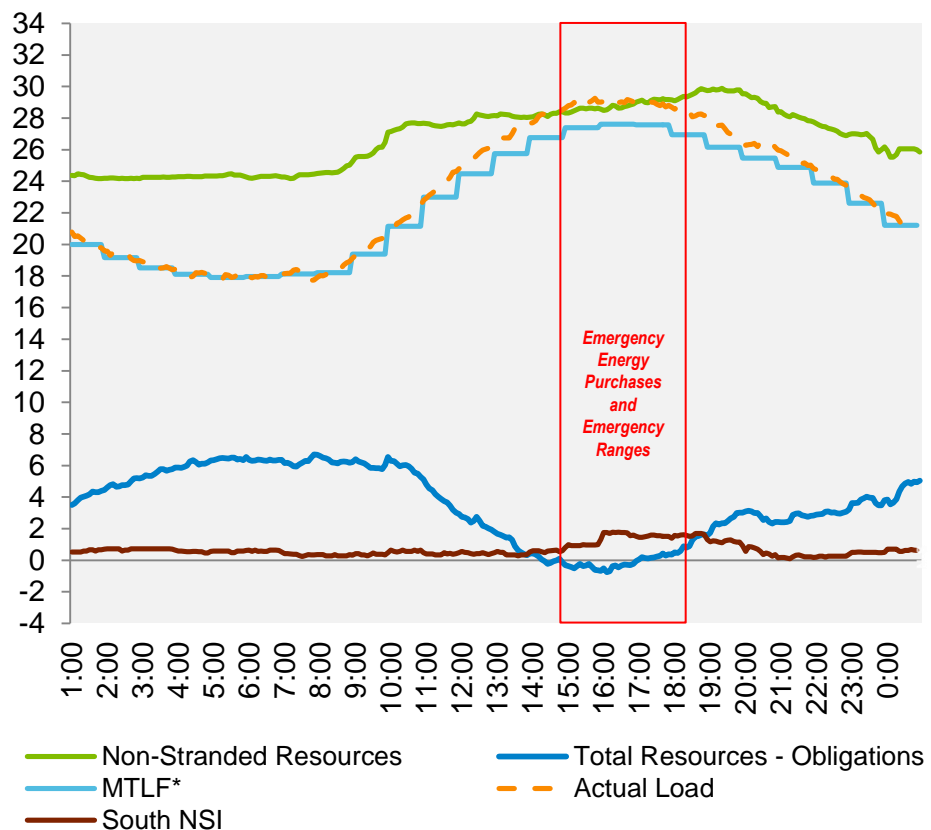
MISO committed available resources and took actions to mitigate capacity concerns by delaying planned outages and bringing additional generation online.

MISO South Region



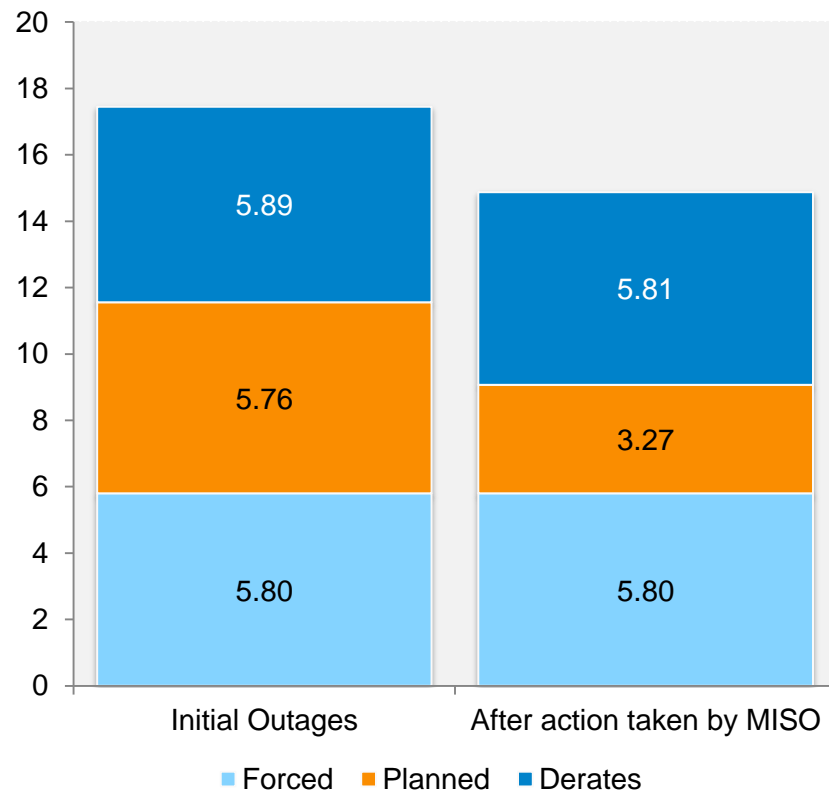
Tight operating conditions existed throughout the MISO footprint. MISO worked with members to monitor and respond to changing system conditions throughout the day.

**South Region
Load and Capacity (GW) – September 15**



*MTLF based on generated load forecast, LBA entered data, and control room discussions

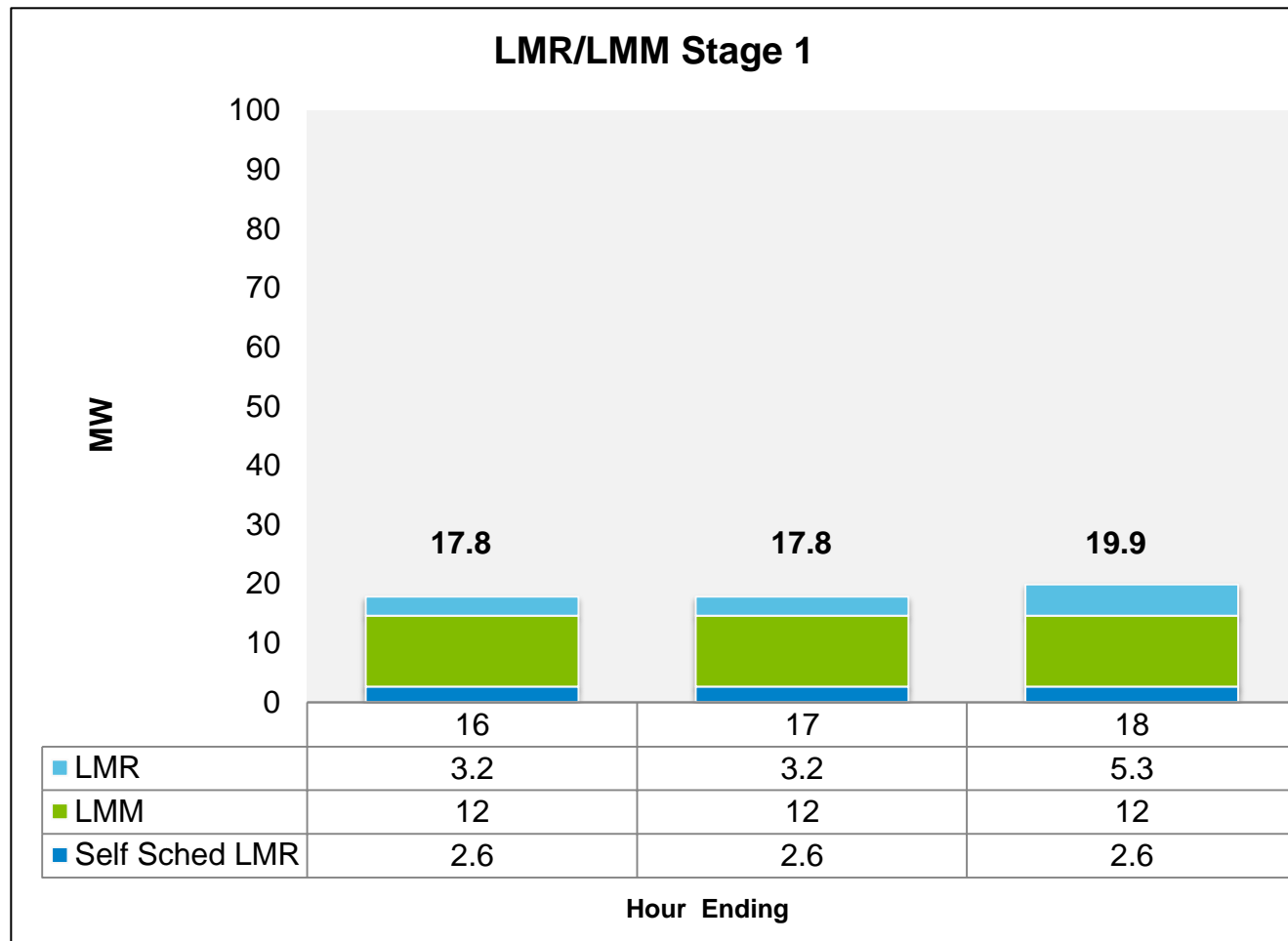
South Region Generation Outages and Derates (GW) – September 15



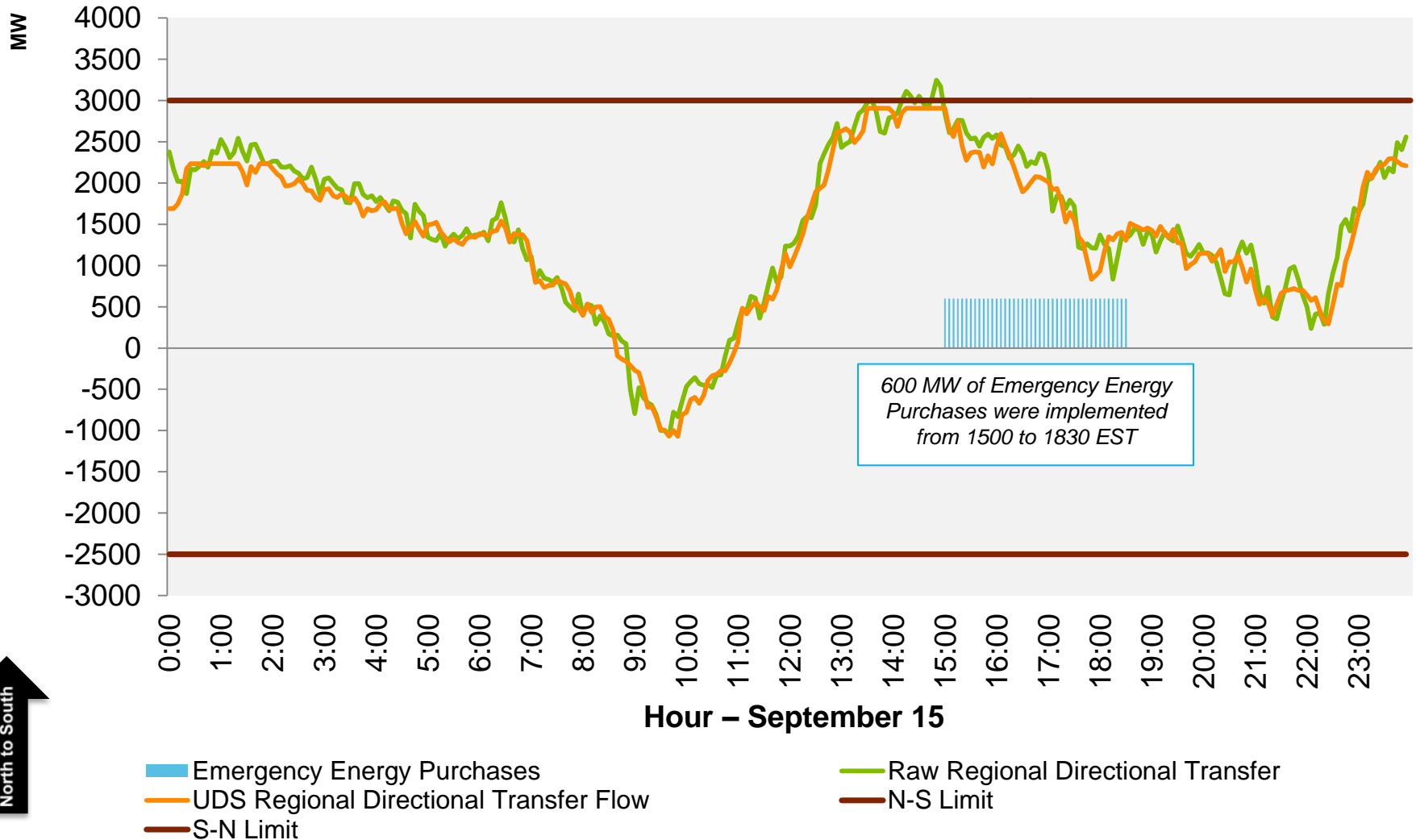
The outage chart reflects the data as it resided in the CROW Outage system on 09/21/2018

Load management was implemented to address shortage conditions. Seasonal requirements and long notification times can limit the availability of Load Modifying Resources.

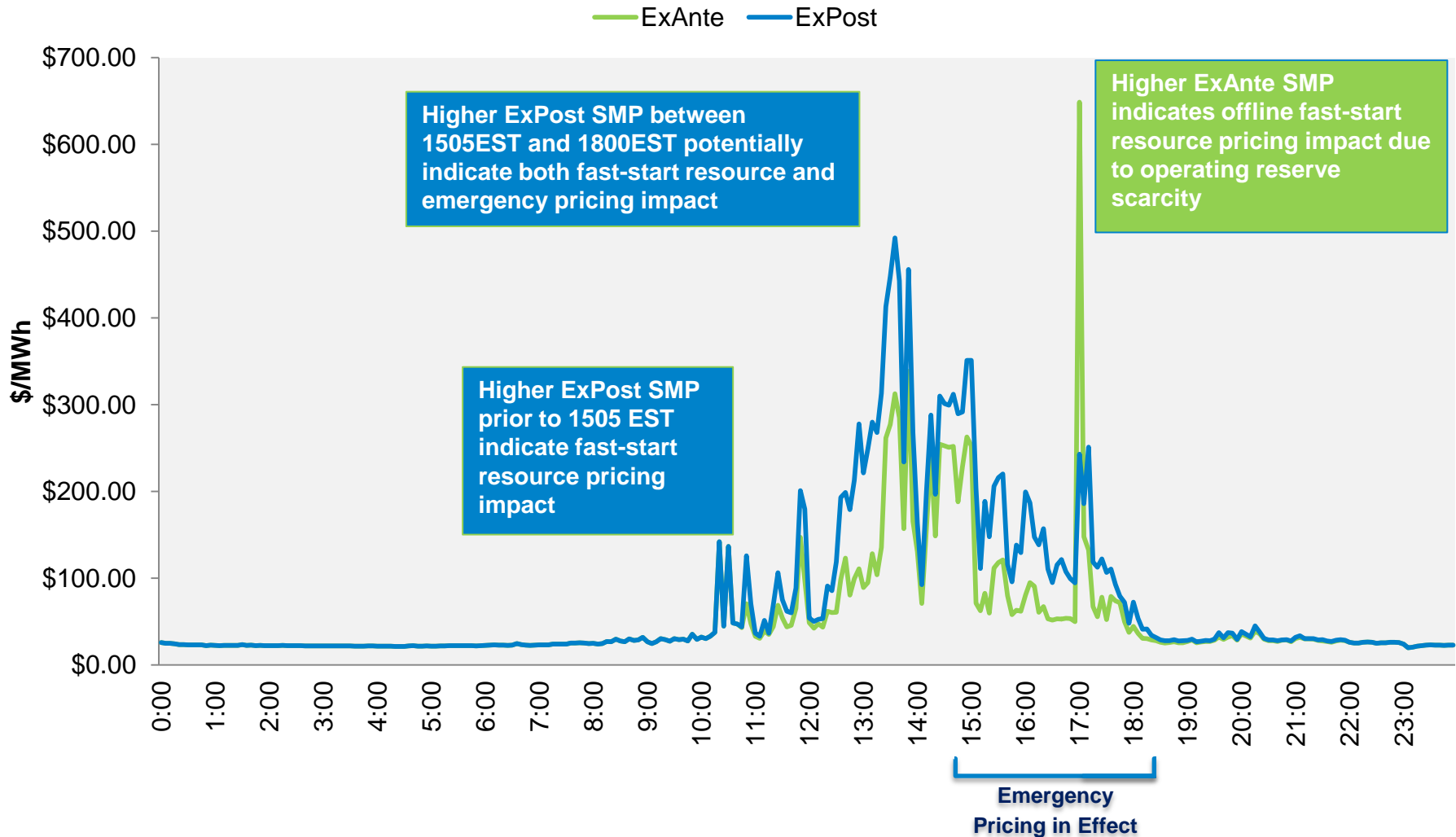
- MISO implemented Load Modifying Resources and Load Management Measures Stage 1 (LMR/LMM) at 15:00 EST
- Not all entities acknowledged and used Advanced Reporting page in MISO Communication System (MCS) per process
- LMR performance to be evaluated after receipt of meter data at the end of October
- New Emergency Demand Response (EDR) in the South has a 12 hour notification time and was not called on



MISO ensured that the Joint Parties were frequently informed about the status of flows and system conditions.



Initiated as part of the Maximum Generation Event, emergency pricing performed as designed.



Lessons learned from the January 17 South Region event allowed for more efficient management of obligations for this event.

Capacity Advisory communication increased situational awareness and encouraged stakeholders to update market data

Improved collaboration, communication, and coordination within MISO, with members and with neighbors

Greater awareness and communication surrounding the Regional Dispatch Transfer constraint

Internal training and drills on Emergency Purchases

Proactive engagement with Generator and Transmission Owners to identify outages flexible to address any tight operating conditions

MISO continues to drive value by looking for improvements to increase preparedness and respond to challenging situations.

Continued improvements on Emergency Pricing

Conduct drills and training on Emergency Purchases with external entities

Improve management of uncertainty between DA and RT load forecasts

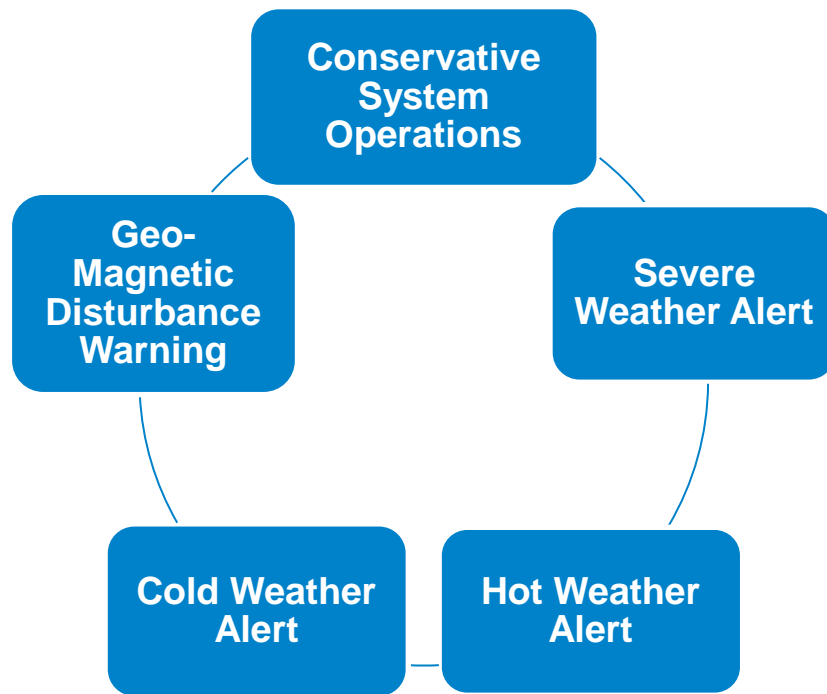
Continue to work with Joint Parties on management of the Regional Dispatch Transfer

Coordinate with RAN* effort to address demand side management and emergency procedures

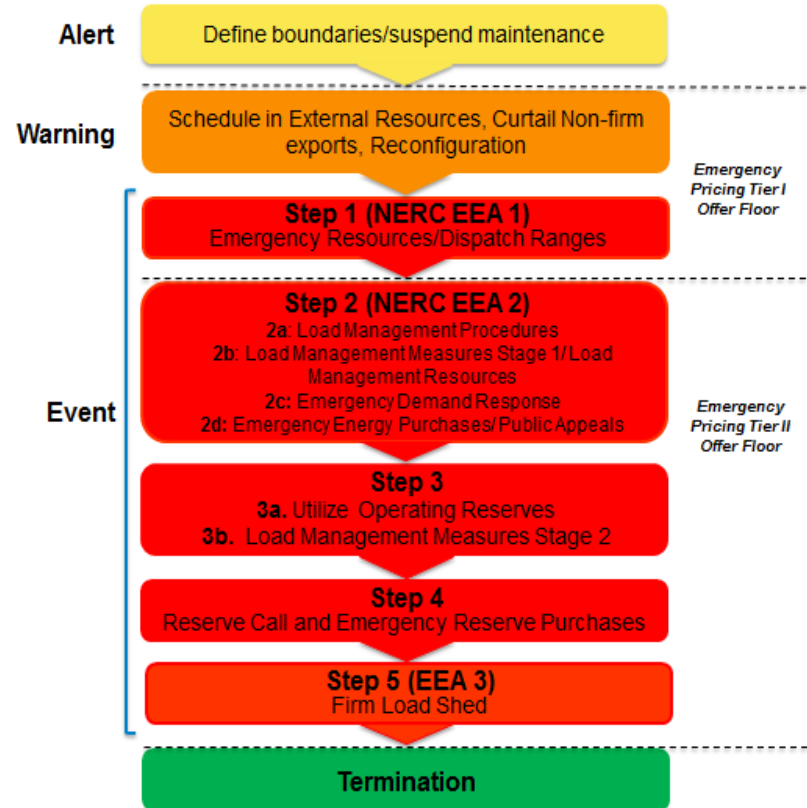
Appendix

MISO's operating procedures ensure reliability and gain access to additional resources during emergency situations.

Emergency Operating Procedures guide operator actions when an event has the potential to, or actually does, negatively impact system reliability



Maximum Generation Emergency Procedures



MISO frequently prepares for emergency situations.



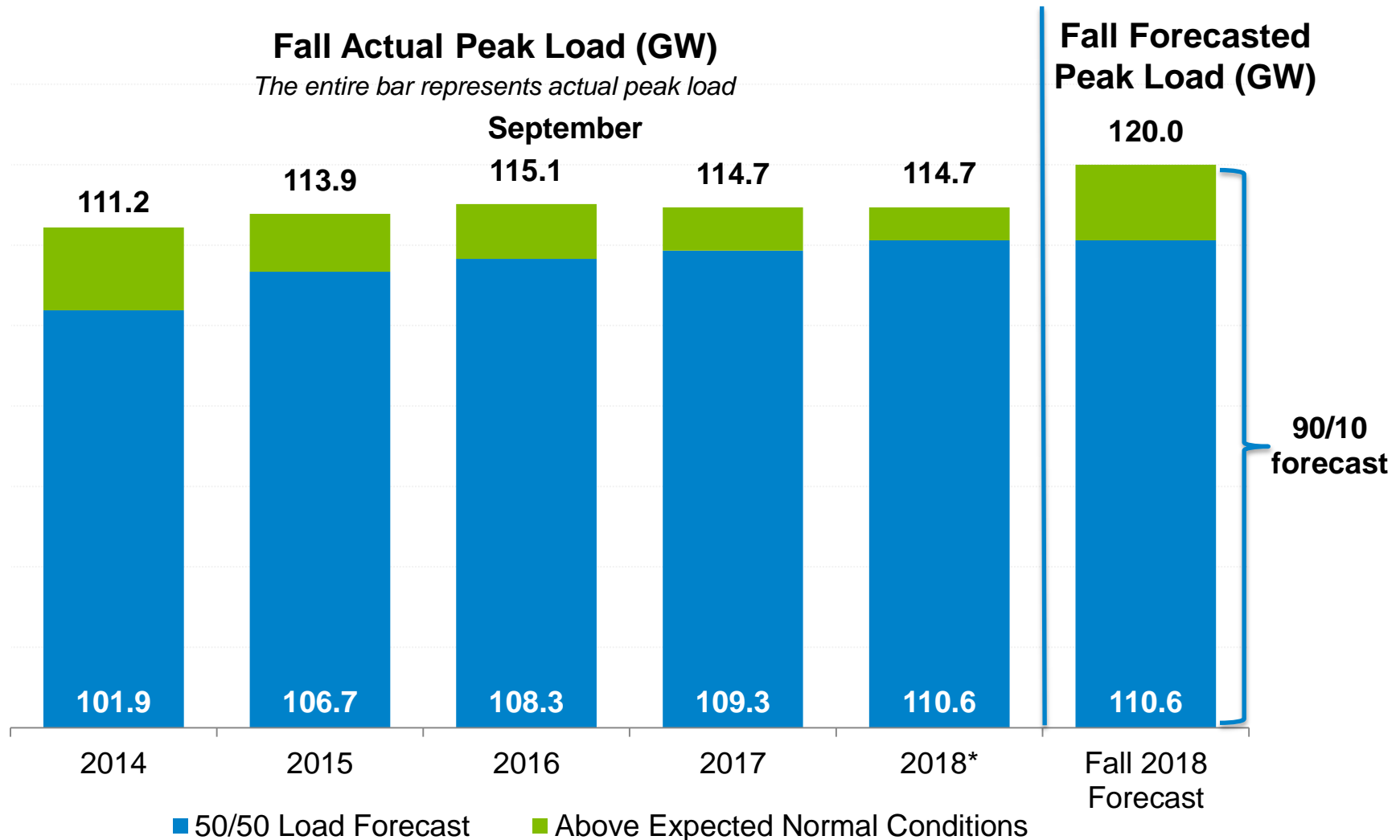
Compounding load forecast errors required implementation of emergency processes to meet South Region obligations.

South Region Only	09/13/2018 87°F	09/14/2018 92°F	09/15/2018 93°F	09/16/2018 94°F
Peak Load	26.9 GW	28.4 GW	29.3 GW	29.3 GW
Henry Hub Gas Price (\$/MMBtu)	2.93	2.93	2.86	2.86
Avg RT LMP (\$/MWh)	\$41.77	\$65.07	\$174.79	\$29.88
Highest RT LMP (\$/MWh)	\$178.91	\$530.07	\$691.55	\$81.8175
Capacity Advisory	Called for Operating Days September 17 and September 18. Raised awareness over the weekend.			
Maximum Generation Alert				
Max Gen Event Step 2				
Conservative Operations				Through 09/19/2018
Max Gen Event Step 1				

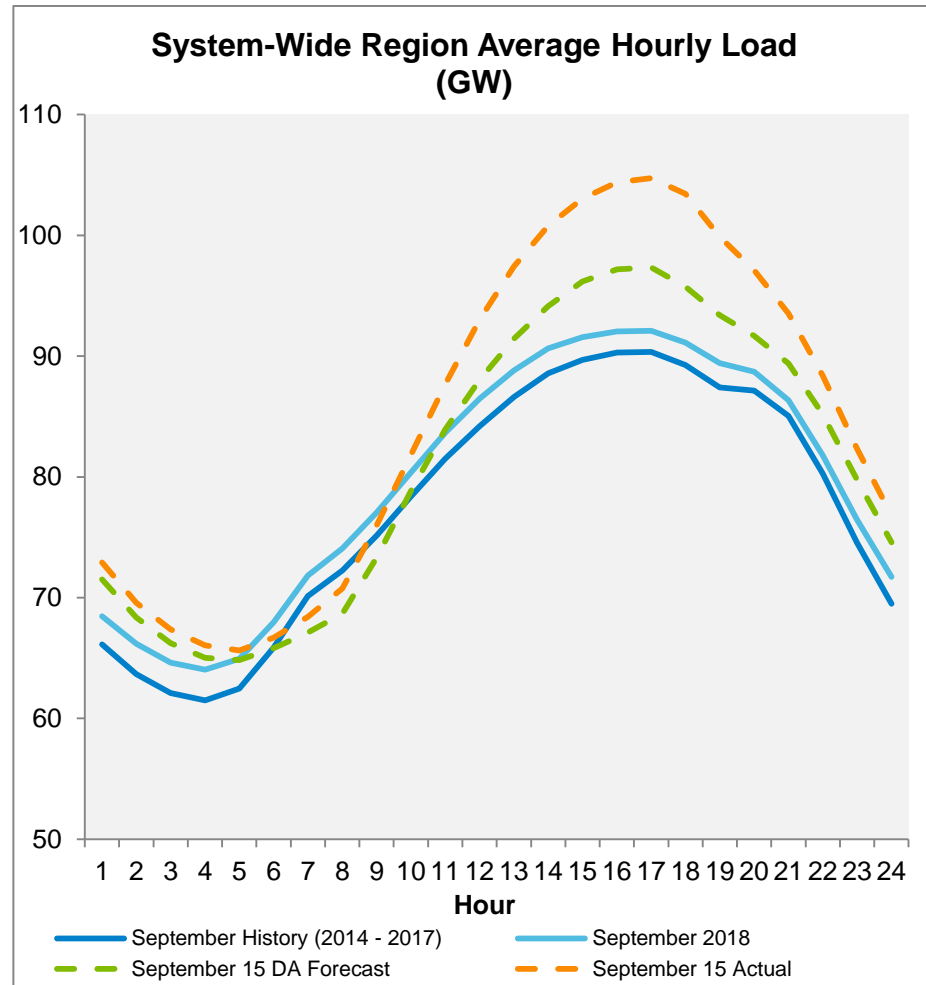
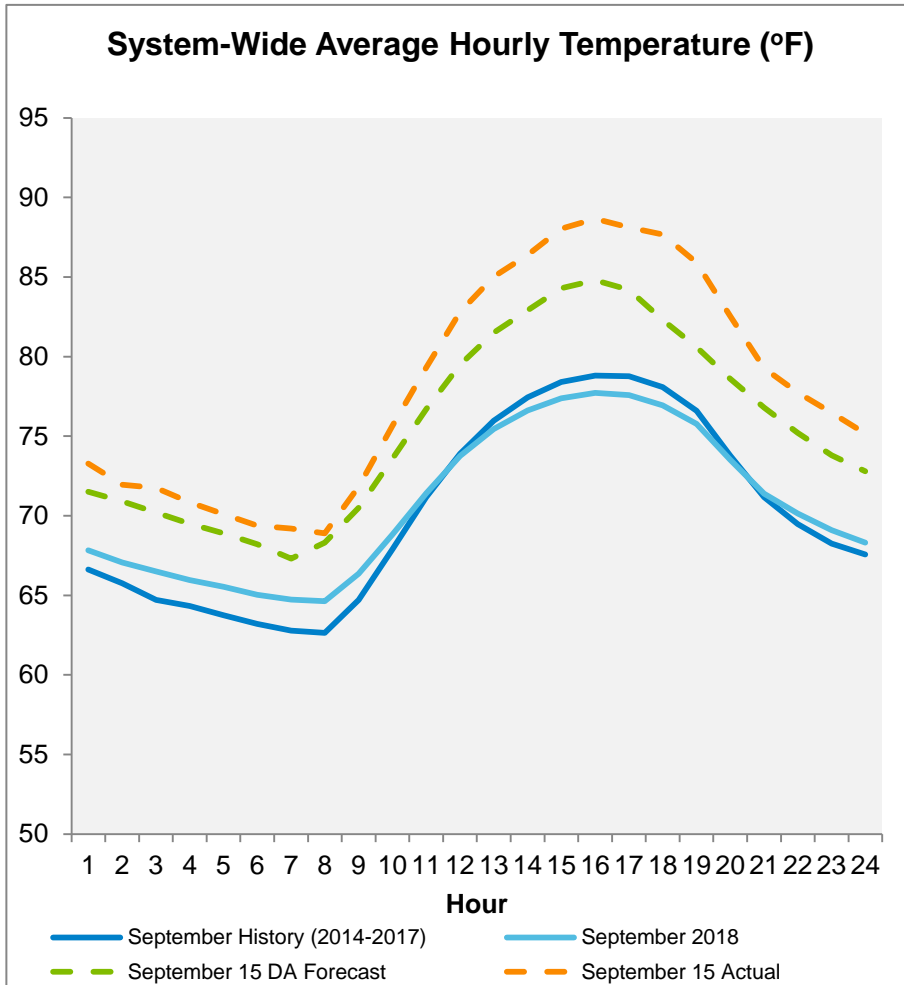
- Temperatures are daily high values
- LMP is calculated as an average of four Hubs in the South region

Shading indicates declaration was active during that day

September to-date peak load follows recent historical trends, aligning more closely with summer system conditions

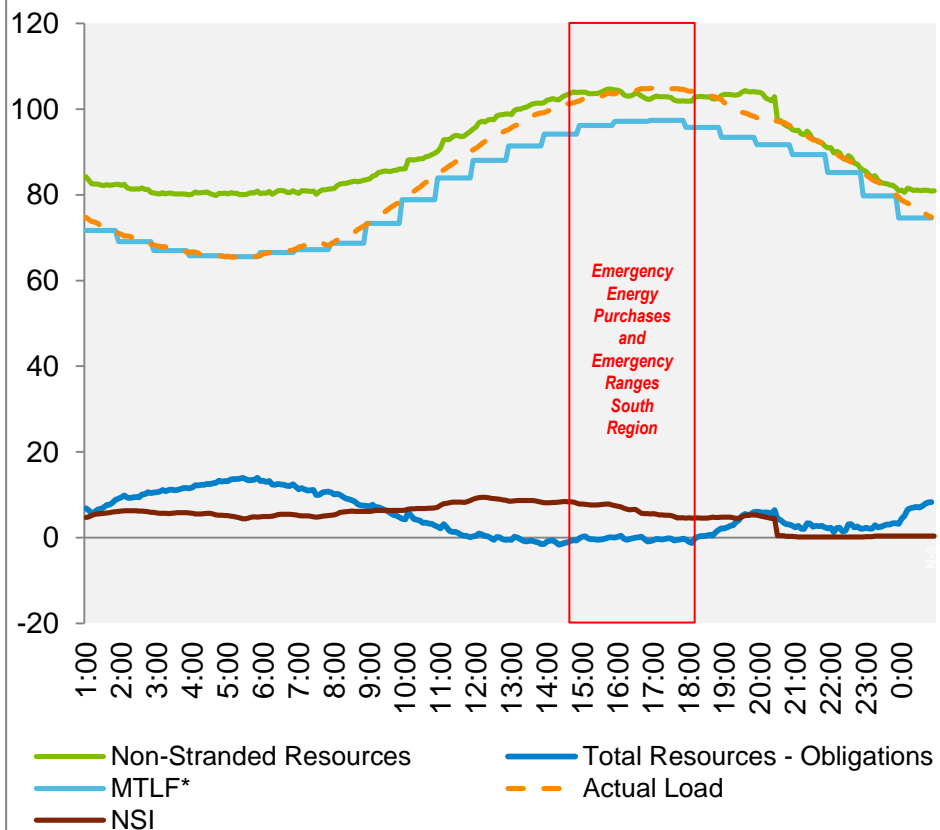


Temperature deviations from average and atypical weekend load patterns were greater for MISO System than for MISO South.

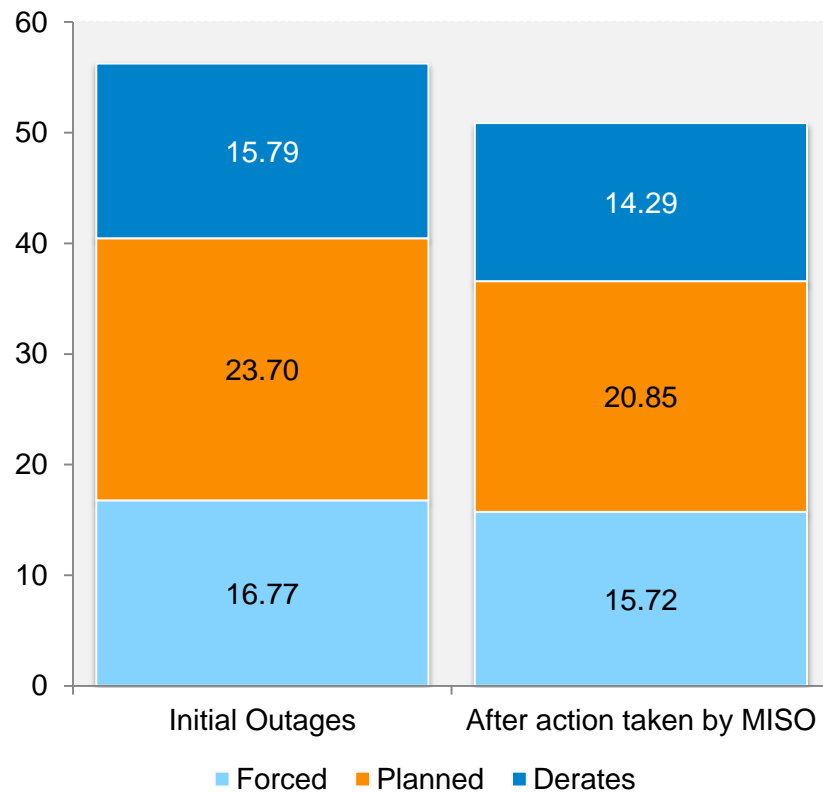


Tight operating conditions existed throughout the MISO footprint. MISO used operating procedures to monitor and respond to changing system conditions.

System-Wide Load and Capacity (GW) – September 15



System-Wide Generation Outages and Derates (GW) – September 15



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The outage chart reflects the data as it resided in the CROW Outage system on 09/21/2018