MISO Update

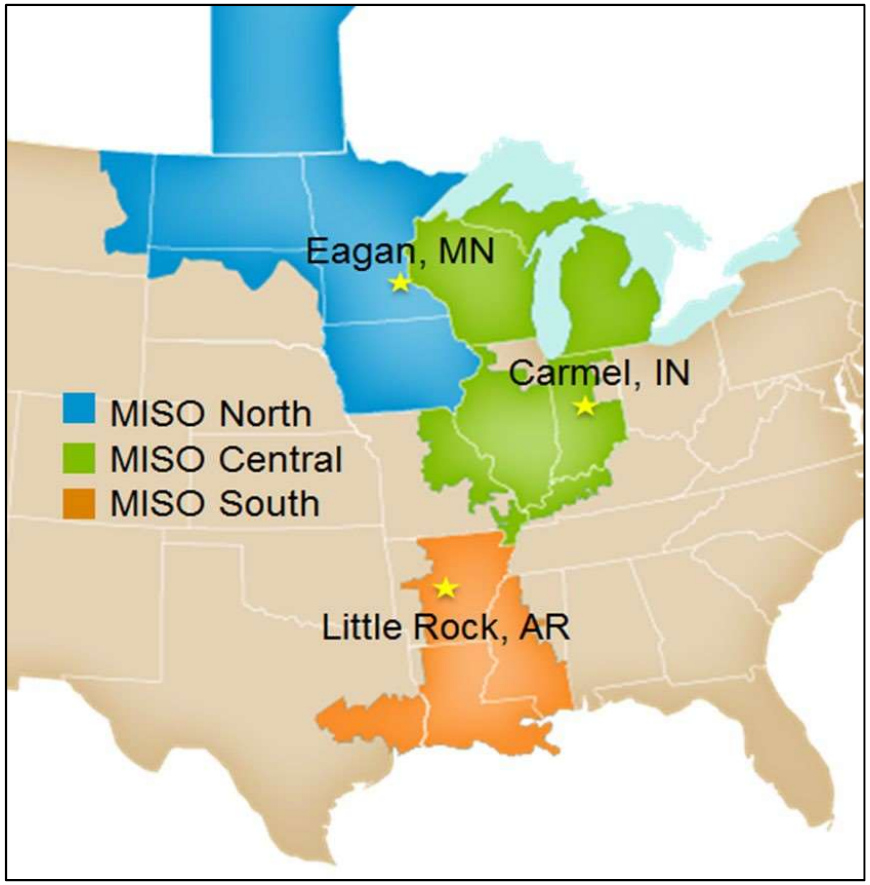
Michigan Public Service Commission

April 18th, 2019

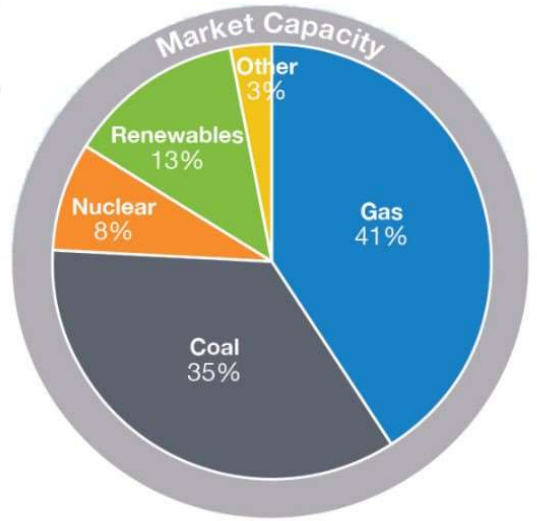
Discussion Topics

- Winter and Seasonal Operations
- Resource Adequacy
  - 2019-2020 Planning Resource Auction results
- Energy Storage Resources – FERC Order 841
- MISO Forward Report

MISO is an independent, non-profit organization responsible for maintaining reliable and cost-effective delivery of power in 15 states and one Canadian province



MISO by-the-numbers	
High Voltage Transmission	65,800 miles
Generation Capacity	174,000 MW
Peak System Demand	127,125 MW
Customers Served	42 million

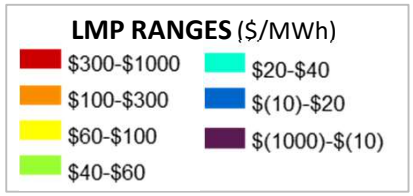


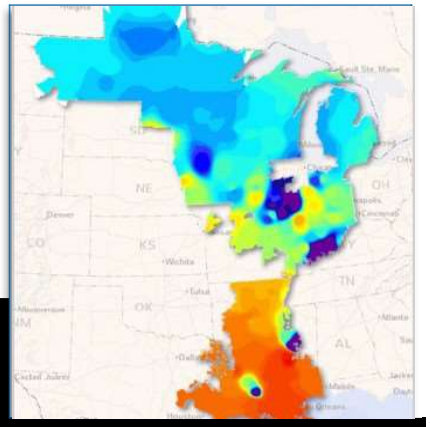
Winter and Seasonal Operations

Executive Summary

- MISO's reliability, markets, and operational functions performed well during winter
- Extremely cold temperatures on January 30-31 required MISO to deploy and lean on voluntary load modifications to maintain reliability; lessons learned will improve future operational performance
- This spring adequate resources are available to meet load, but a modest probability of reaching into load modifying resources is driven by high load and high outage conditions
- Summer Readiness Workshop scheduled for April 23rd

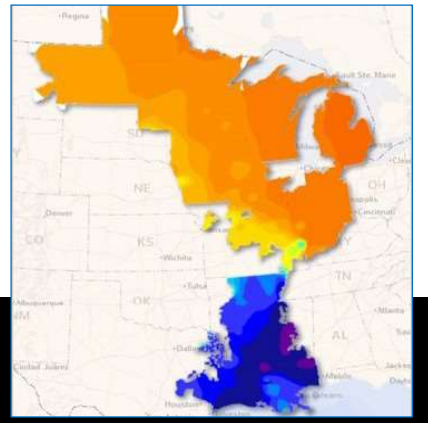
North/Central region experienced extreme cold weather this January, similar to the extreme cold weather in the South region last year





January 17, 2018
South Region

Minimum Temperature	13°F
System Peak Load	106 GW
Unplanned Outages	13 GW
Scheduled LMRs*	0.9 GW
Emergency Purchases	1.2 GW

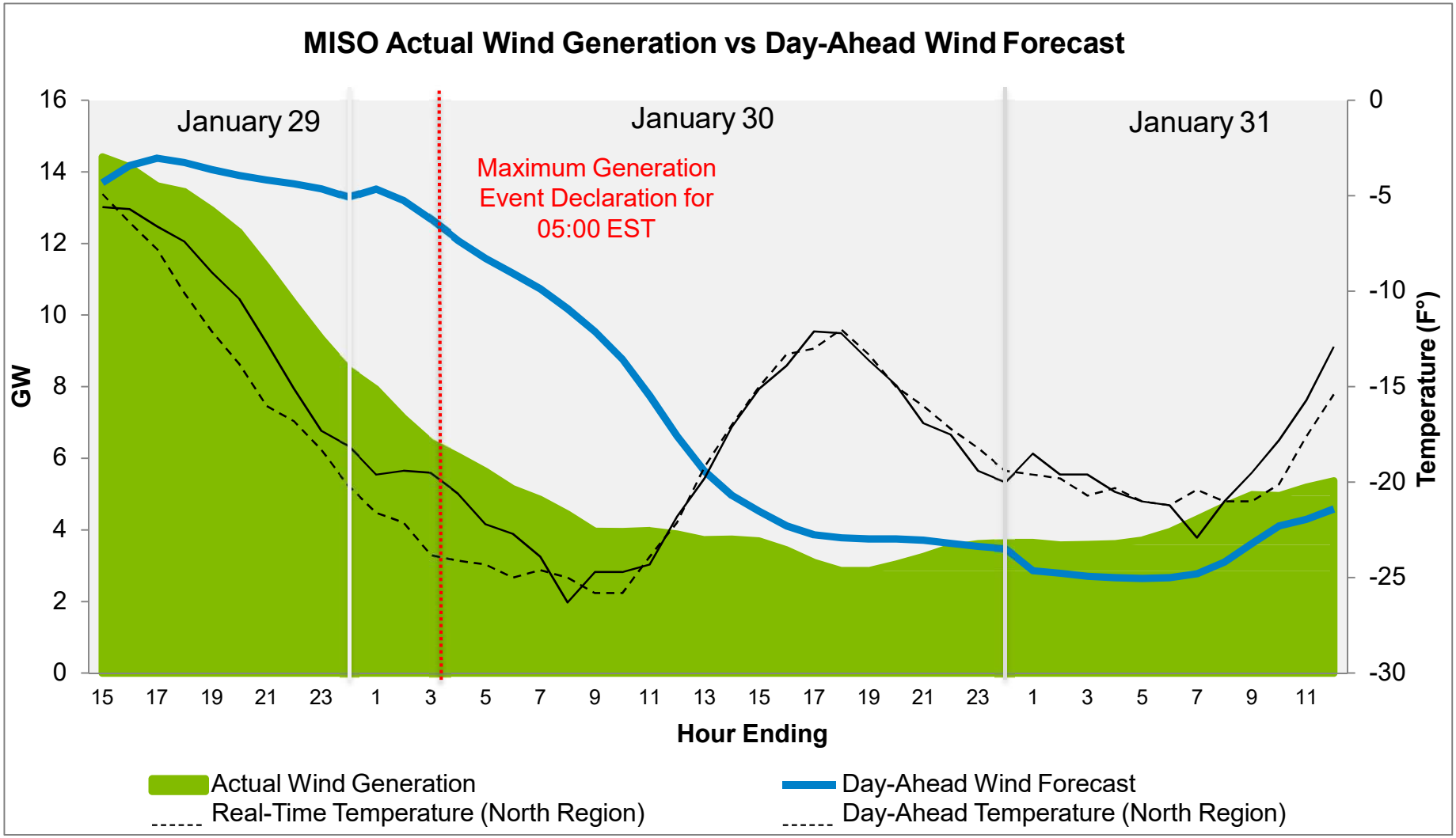


January 30-31, 2019
North/Central Region

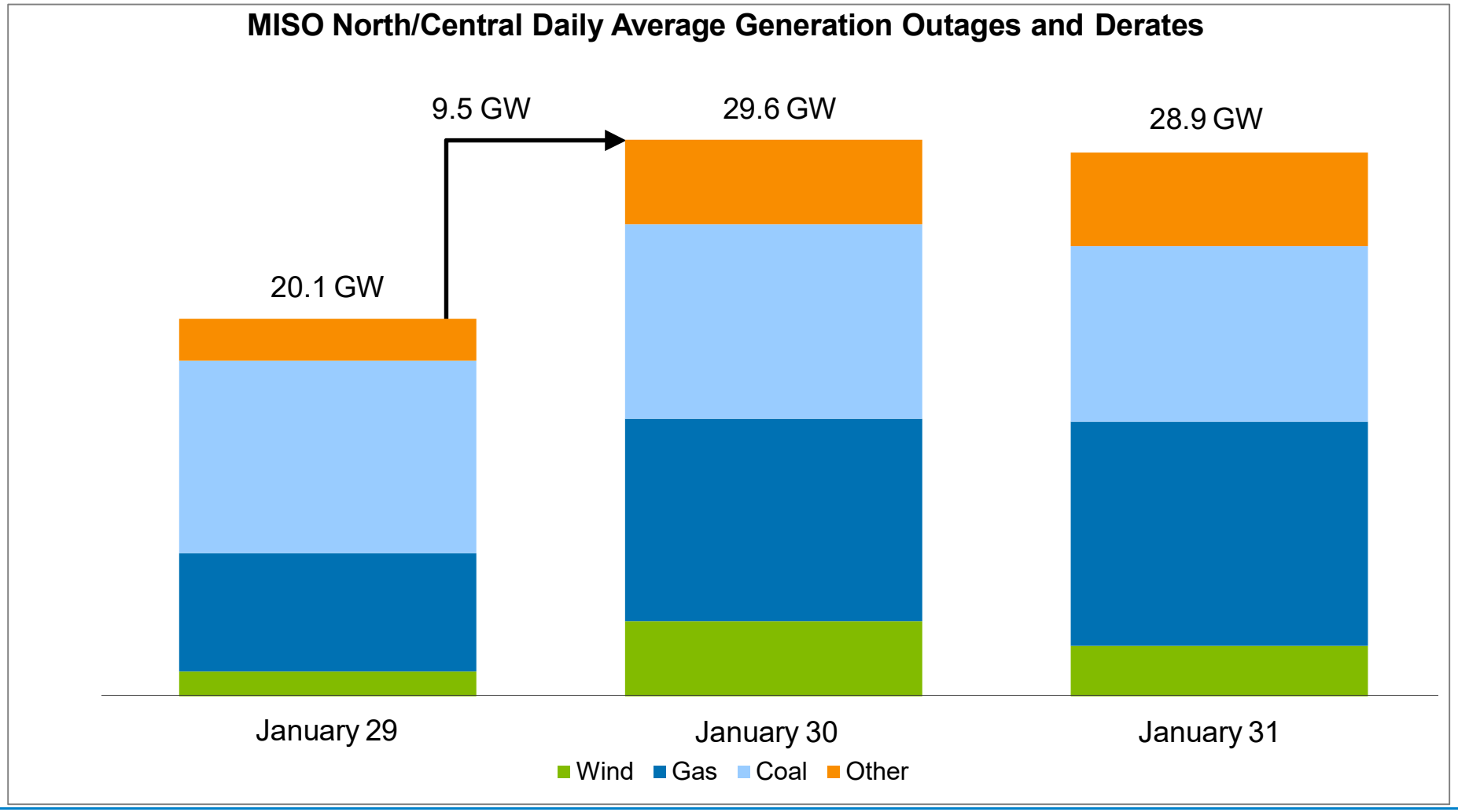
Minimum Temperature	-26°F
System Peak Load	101 GW
Unplanned Outages	29 GW
Scheduled LMRs*	2.5 GW
Emergency Purchases	Not Needed

*LMRs = Load Modifying Resources

An earlier than expected drop in wind output increased insufficiency risk early on the morning of January 30th

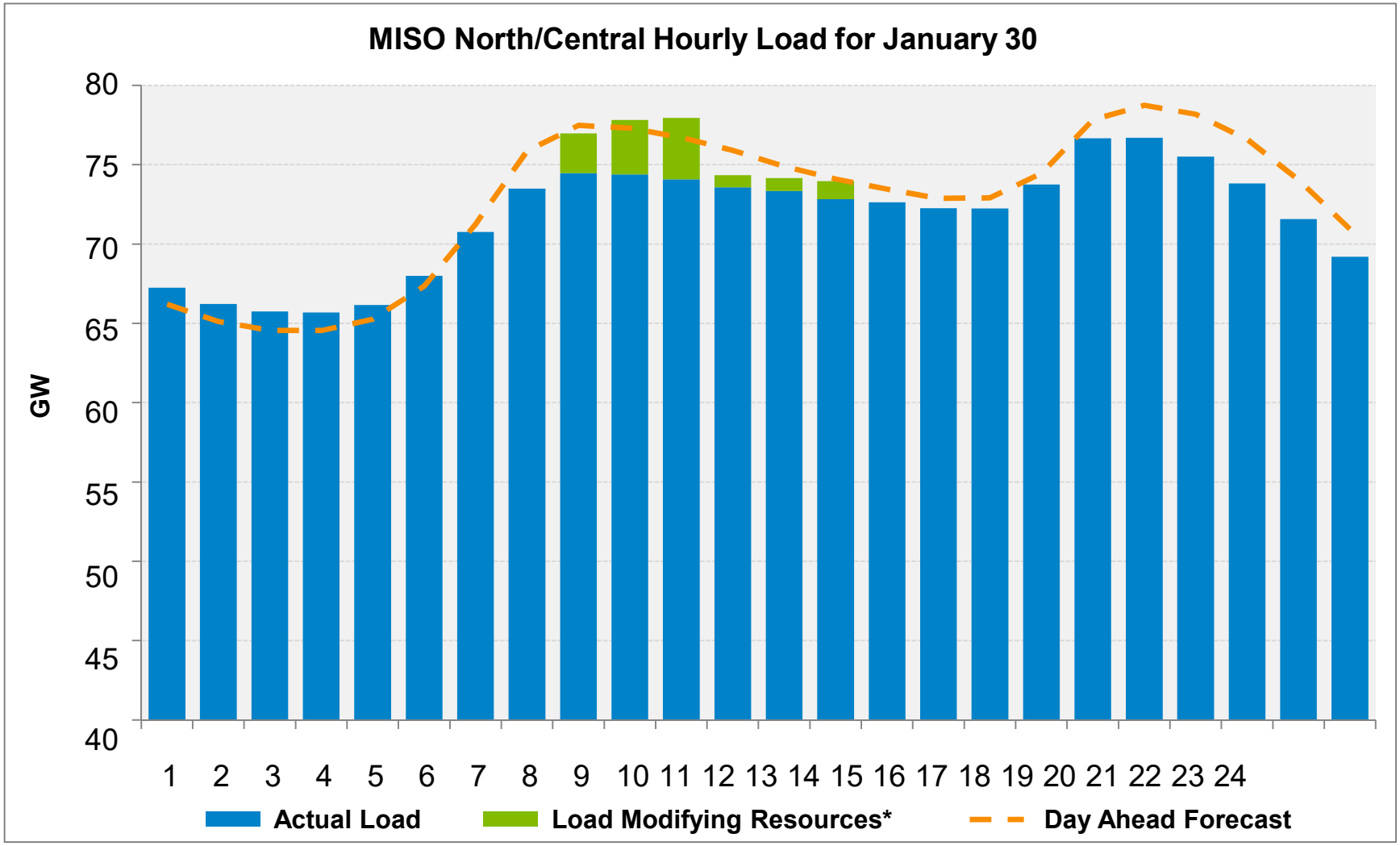


Subsequent conventional generation failed starts, load forecast uncertainty and risk of additional outages prompted the access to Load Modifying Resources



The outage chart reflects the data as it resided in the CROW Outage system on February 11, 2019
Wind often reported as derate over the time period

Deployed and voluntary load modifications and school and business closings reduced demand by 3 GW or more

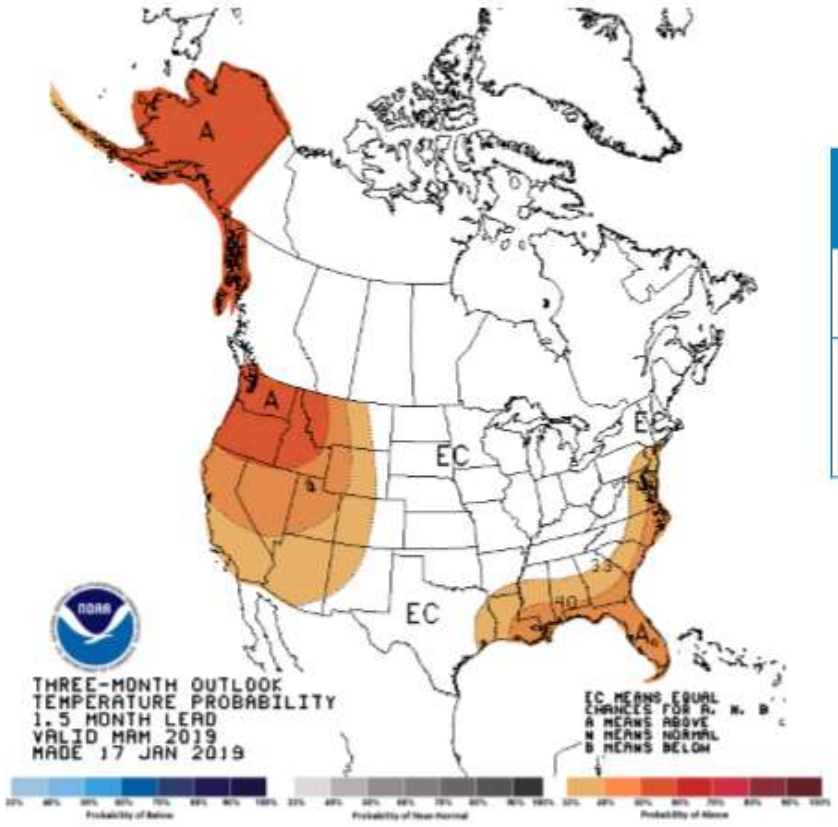


* Does not include impact of closings not accounted for in forecast
Load Modifying Resource performance to be evaluated after receipt of meter data towards the end of March

Experience provided lessons learned that will enable us to improve future operational performance

- Improve wind forecasting with additional resource parameters
- Incorporate facility closing impacts into load forecast
- Review emergency pricing rules
- Improve Load Modifying Resource availability & performance
- Improve generation availability & performance

150 GW of resources available to cover demand and outages for Spring 2019 with warmer than normal temperatures forecasted in South region



MISO Preliminary 2019 Spring Forecast	
Spring Peak Forecast	101 GW
Total Projected Available Capacity	150 GW

All-time Spring Peak:
107 GW on May 29th, 2018

NOAA forecasts warmer than normal temperatures for the MISO South region

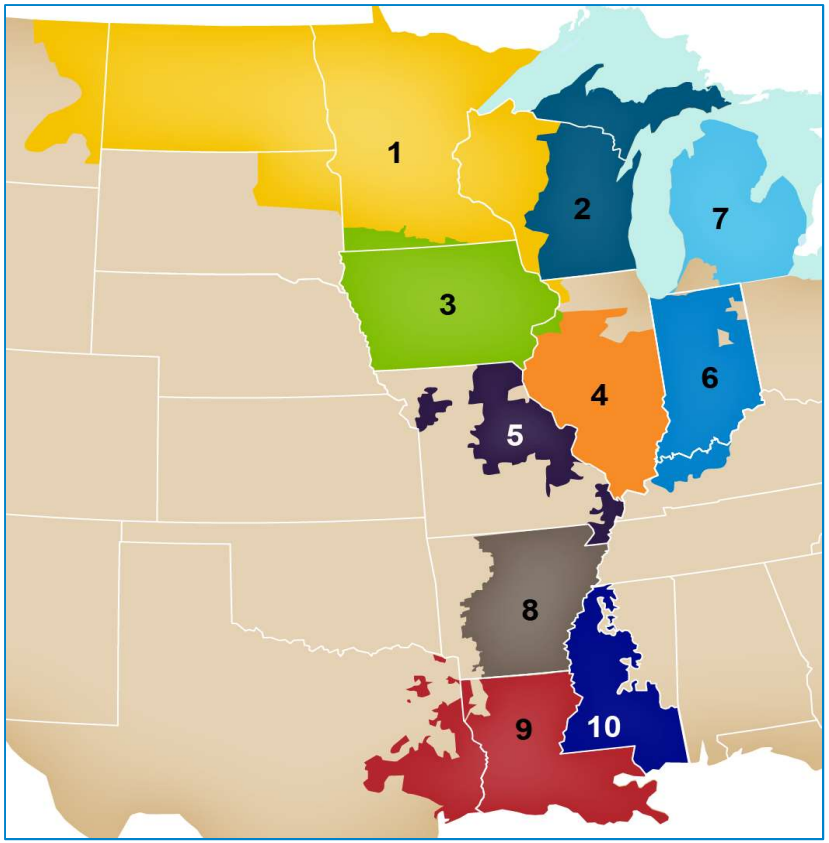
Resource Adequacy

Resource Adequacy Requirements

- Annual Obligation for LSE's
  - Planning Year period is from June 1st to May 31st
  - Multiple methods of achieving and demonstrating resource adequacy, including self-supply, bilateral contracting and market-based acquisition via the Planning Resource Auction.
- Overview of Planning Resource Auction
  - Occurs two months ahead of Planning Year
  - Residual Auction - allows buyers and sellers to balance resource portfolio prior to Planning Year
  - Includes a locational requirement indicating the amount of capacity that must be secured from resources within each zone to meet reliability standards
  - If there are insufficient resources to meet demand in the auction, Resource Adequacy may not be achieved.

2019-2020 Planning Resource Auction Results

Lower Peninsula of Michigan cleared at $24.30/MW-Day and rest of the MISO footprint cleared at $2.99/MW-Day



- MISO Region has adequate resources to meet its Planning Reserve Margin Requirement of nearly135,000 MW
- Regional generation supply consistent with the 2018 OMS-MISO Survey
- This year's clearing price of $2.99 for the bulk of the region is lower than last year's predominant price of $10 due to lower offer prices from Market Participants
- Zone 7's clearing price exceeds the rest of the region largely because its Local Clearing Requirement increased nearly 6% year-over-year

Energy Storage Resources

Energy Storage Resources – FERC Order No. 841

What is MISO's definition of an Energy Storage Resource (ESR)?

- An ESR is a Resource capable of receiving Energy from the Transmission System and storing for later injection of Energy back to the Transmission System
- This includes all technologies, including but not limited to; batteries, flywheels, compressed air, and pumped-hydro.
- An ESR may be located at any point of grid interconnection on the Transmission System or local distribution system

What is FERC Order No. 841?

- In April of 2018, FERC directed RTOs/ISOs, like MISO, to revise their tariffs to facilitate the participation of Energy Storages Resources (ESRs) in the RTO/ISO markets.
- The ESR participation model must:
  - Ensure that ESRs are eligible to provide all services that the ESR is capable of
  - Ensure the ERS can be dispatched and fully participate within the market
  - Account for physical and operational characteristics

What is changing for ESRs?

- MISO's Order 841 compliance filing proposed a new resource type that recognizes the unique physical and operational characteristics of storage resources.
- Storage Energy Resource (SER) Type II is modeled/dispatched like Demand Response Resource ("DRR") – Type II, but settled like other Generation Resources; and will manage own state of charge.

Implementation Timeline for FERC Order No. 841

- May 16, 2018 – Order No. 841 became effective
- December 3, 2018 – Deadline to submit tariff revisions to implement requirement of Order No. 841
- December 3, 2018 – MISO submits compliance filing
  - Several protests and comments were filed in response to this compliance filing
- March 12, 2019 – MISO filed an Answer
- December 19, 2019 – Deadline for implementation of the ESR participation model

MISO Forward Report

Overview of MISO Forward Report

- The first MISO Forward Report focuses on the impacts of de-marginalization, decentralization and digitalization – the "3Ds"
- To address the opportunities and challenges driven by these trends, MISO identified three core needs:

  Availability, Flexibility and Visibility
- MISO will continue to collaborate with stakeholders to prioritize and work through action plans to address these needs

Link to MISO Forward Report: https://www.misoenergy.org/forward/