2021-22 MISO Seasonal Readiness Forum
Tuesday October 26, 2021

I. Welcome - JT Smith, Senior Director, MISO Operations
II. Lessons Learned
- New Procedures Resulting from Winter 2020-21 – Trevor Hines
- Guest Speaker - Randy Capra, General Manager of Power Generation, NSP

III. Preparedness
- RAN Seasonal Construct Filing Update - Geoff Brigham
- NERC Cold Weather Standards Update (EOP 11 / Data Standards) - Bobbi Welch

IV. Seasonal Assessments
- Generation - Eric Rodriguez /Tim Bachus
- Transmission - Tamal Paul / Ritam Misra
- Winterization Survey Results - Mike Mattox

IV. Readiness
- DSRI (new tool) overview - Mike Carrion
- Procedure Reminder - Mike Carrion

V. FERC 2020 Arctic Event Report Review – Heather Polzin, FERC
VI. Q&A

Housekeeping

- All audio lines are muted and video is disabled to start the meeting
- **If you are dialed in via phone: *6 to mute and unmute**
- **If you are dialed in through your computer: Click on phone icon to mute and unmute**
- Do not put your call on hold
- We will pause after each topic for questions / discussion
- Please announce your name and affiliation when speaking
- WebEx Chat and Raised Hand features are not monitored

2021-22 Winter Readiness Forum

Key Takeaways

- **Lessons learned –** Operator training enhanced to include last winter events.
- **Expect Resource Tightness -** Resources available to meet demand expectations but high load and low generation availability scenarios show need for emergency procedures and access to LMRs along with the potential for additional actions.
- **Better Situational Awareness –** Increased response rate provides more information to MISO operations.
- **Fuel Availability –** Gas availability for the winter is expected to be like past years. However, higher prices for natural gas are making coal fired generation manage their resources across the Eastern Interconnect.

Lessons Learned: Winter 2020/2021

Trevor Hines

MISO Reliability Manager

South Region

MISO Reports worth a look…

MISO Forward 2021 Report

- The changing nature of demand
- Decarbonization
- Decentralization
- Digitalization

MISO's Reliability Imperative

- Market redefinition
- Long range transmission planning
- Operations of the future
- Market system enhancements

February 2021 Arctic Event

- Event details
- Lessons learned
- Implications for the Reliability Imperative

MISO gathered Lessons Learned from last winter and organized them into five groups in the MISO Arctic Event Report

System Planning
Transmission & Markets

Preparation
- Seasonal
- Event Based

System Operations
- Regional Directional Transfer (RDT)
- Load Shed Procedures/Processes
- Staffing & Tools

Credit/ Collateral

Communication

Corrective Actions have been taken since last winter…

- Operator Training focusing on extreme conditions and tool use
  - Including participation in Stakeholder operator training to share experiences and improve execution in an emergency
- The Winterization and Annual Gas Fuel surveys were combined, and questions were updated
  - Increase participation and information sharing

Corrective Actions (continued)

- Regional Dispatch Transfer (RDT) and collaboration with Joint Parties
  - Impacted Flowgates tool now in NERC's Interchange Distribution Calculator (IDC)
  - RDT now included in MISO's Coordinated Seasonal Assessment analysis
  - Ongoing conversations related to the operation of RDT
- Tool Use and Staffing
  - Collaboration to improve timing of executing processes and on-call staffing needed to execute offline studies

With Operations of the future, MISO is identifying and evaluating ways to leverage improved visibility and digital strategy to better manage future operational uncertainty

People

- Adaptable
- Shift synergies
- Less fragmented

Process

- Inquiry-driven
- Automated
- Seamless IT/Ops integration

Technology

- Timely
- Integrated
- Reliable
- Enabling

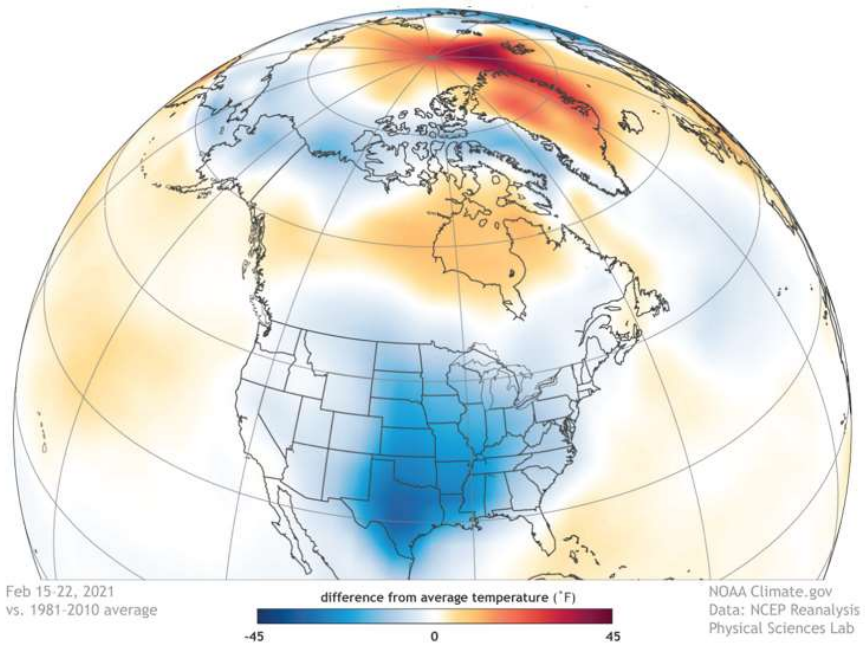
Contact Info

Trevor Hines
thines@misoenergy.org

CONFIDENTIAL

- NSP Generation
- Cold Weather Presentation
- October 26, 2021

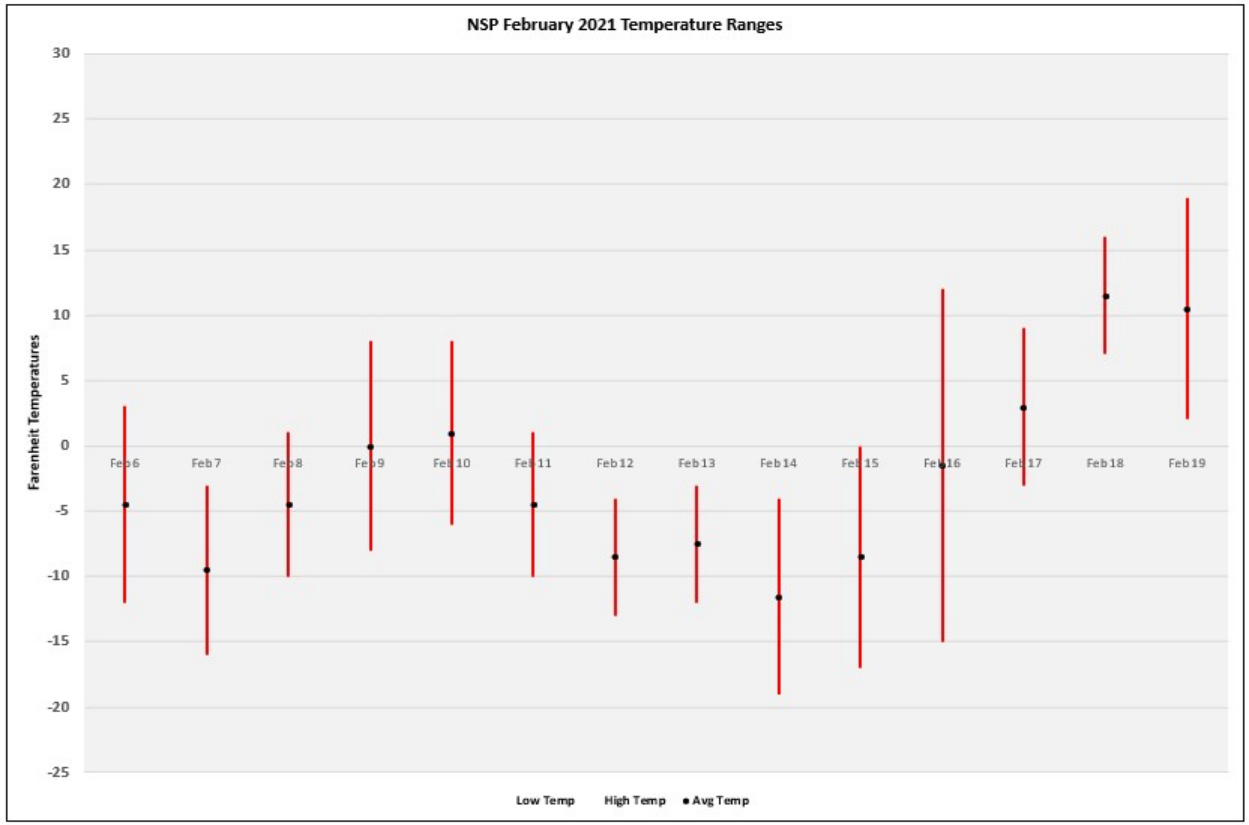
February 2021 Extreme Cold Weather



- Coldest February since 1989
- Four days in February with NSP temperatures below -15 degrees F, nine days below -10F.
- Below average temperatures impacted every jurisdiction in Xcel Energy's service territory

National Oceanic and Atmospheric Administration
Xcel Energy Meteorologist, MSP Readings, 2021

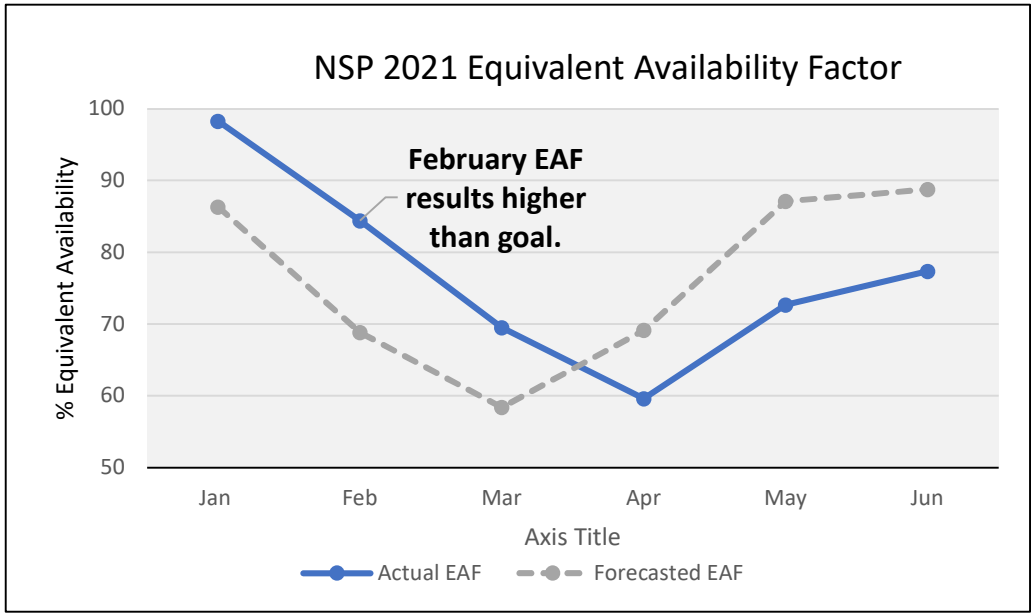
NSP February Extreme Cold Temperatures



Xcel Energy Meteorologist, MSP Readings, 2021

NSP Generation (Plant) Availability Performance

Plant actual performance during February 2021 was above the Corporate goals and forecast.



Xcel Energy Reliability Metrics, 2021

Equivalent Availability Factor (EAF) is the measure of plant availability. EAF is the plant's availability at its maximum rating expressed as a percentage of all available hours in the time period.

Annual Winter Preparedness

- Annual Cold Weather Preparations driven by Generation Winterization Preparation Policy and Task Checklists.
- Preparations include NERC Reliability Guidelines for Generating Unit Winter Weather Readiness components.
- Generating plant preparations include physical cold weather prevention tasks, review of equipment vulnerabilities, review of operator rounds, and safety practices.
- Historical cold weather lessons learned are shared between generating facilities.

Xcel Energy Supply Operations, 2021

Weather Event Communications

During Weather Events:

- Daily planning meetings between Power Operations, Generating Plants, Environmental, Technical Support Groups, Fuel Supply, Transmission.
- Daily Weather Report from Xcel Meteorology; Load Report from Power Operations.
- MISO Conservative Operations, Generation Alerts or Warnings trigger prescribed responses by generating plants.
- Generating Plants prepare for additional staffing to verify field operations and fuel handling support.

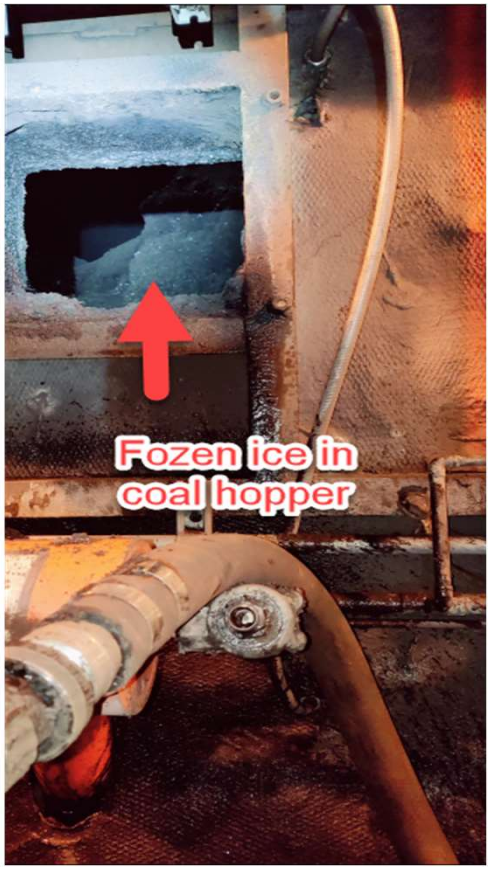
Xcel Energy Supply Operations, 2021

Frozen Coal Issues

Frozen coal in surge hopper at Sherco Plant.

Coal retains more moisture on cold days.

The hopper door shows the tip of 140 tons of frozen coal.



Xcel Energy Supply Operations, 2021

Cold Weather Improvement Project Example

Red Wing Plant installed a second stage heater to de-ice biomass fuel and reduce frozen fuel plugs. Results: All in-feed fuel plugs were eliminated in 2021.

Xcel Energy Supply Operations, 2021

2021 NSP Lesson Learned and Action Items

Good Practices to Continue

- Power Operations dispatched all plants early to ensure availability.
- Power Operations did not cycle units during the extreme temperature days, rather kept on minimum load when below design unit start temperatures.
- Additional staffing to handle frozen coal and perform operator rounds.
- Daily planning meetings with all contributing business areas.

Xcel Energy , NSP LL Database, 2021

2021 NSP Lesson Learned and Action Items

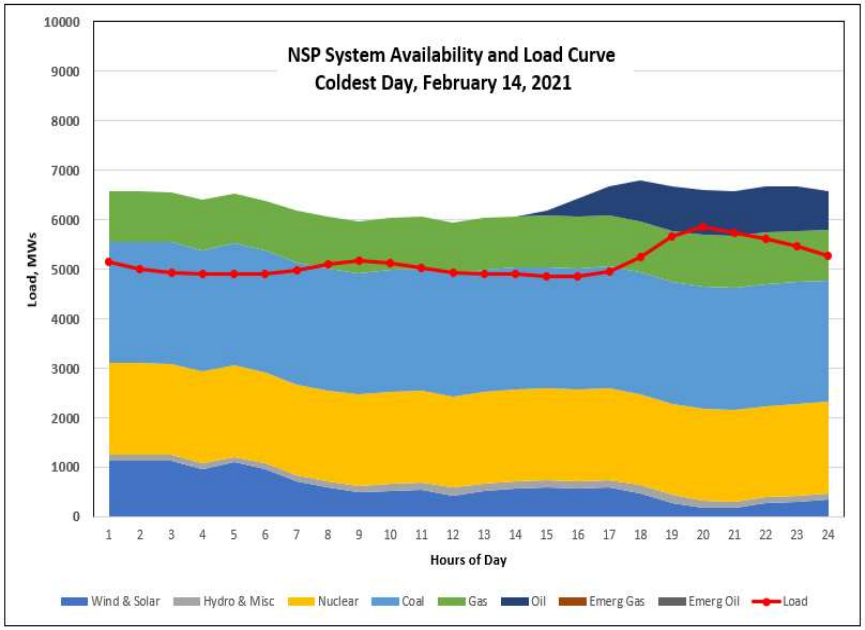
Practices with Improvement Tasks

- Engage Fuel Supply Department to supply additional train sets earlier than original schedule to allow for frozen coal unloading issues. [Real time action]
- Fuel Supply is exploring fuel oil delivery contract options to ensure fuel delivery schedule with suppliers. [In progress]
- Plants to increase temperature monitoring on critical piping heat tracing by installing thermocouples. [Item has been added to all plant Winter Preparation Checklists]
- Increase overall fuel oil supply at dual fuel capable facilities. [Completed]

Energy , NSP LL Database, 2021

Conclusion

- NSP System met the highest native load on February 14 with lows at -19F (coldest day)
- NSP generating facilities performed well and exceeded Corporate Availability goals
- Good extreme weather practices were reinforced
- 2021 Lesson Learned improvements in progress



Xcel Energy Power Operations, 2021

CONFIDENTIAL

Xcel Energy®

Resource Adequacy Reforms

Geoff Brigham

MISO Program Manager

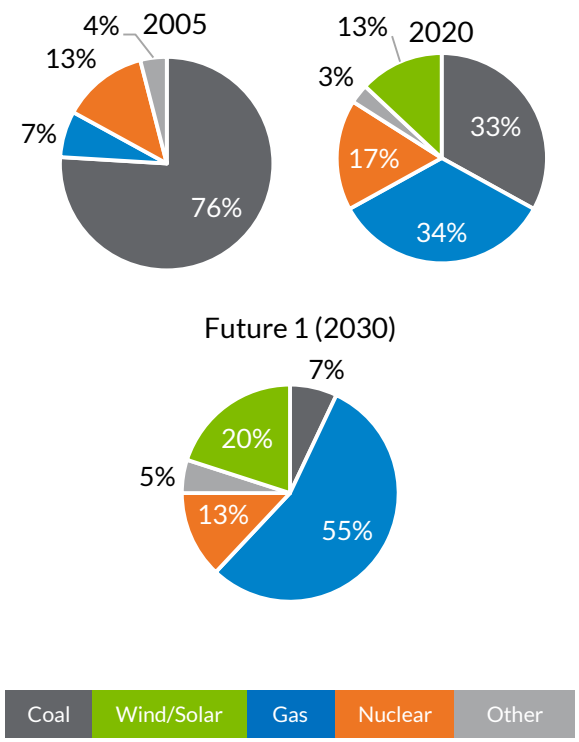
Purpose & Key Takeaways

Purpose: Review and discuss the foundational elements of MISO's Resource Adequacy (RA) reforms.

Focus areas:

- Evolving system needs and MISO's Reliability Imperative
- Next-steps of Resource Adequacy reform:
  - Seasonal requirements
  - Resource accreditation
  - Planning Resource Auction and Day-Ahead Performance Obligation

MISO's response to the Reliability Imperative requires coordinated efforts in markets, planning, operations, and systems



RELIABILITY IMPERATIVE

Market Redefinition
Long-Range Transmission Planning
Operations of the Future
Market System Enhancement

List is not representative of all efforts

MISO is actively pursuing multiple workstreams to ensure ongoing reliability and value creation

MISO's Response to the Reliability Imperative

Since 2018, the Resource Availability and Need program has worked to increase system reliability and will continue to do so through market redefinition

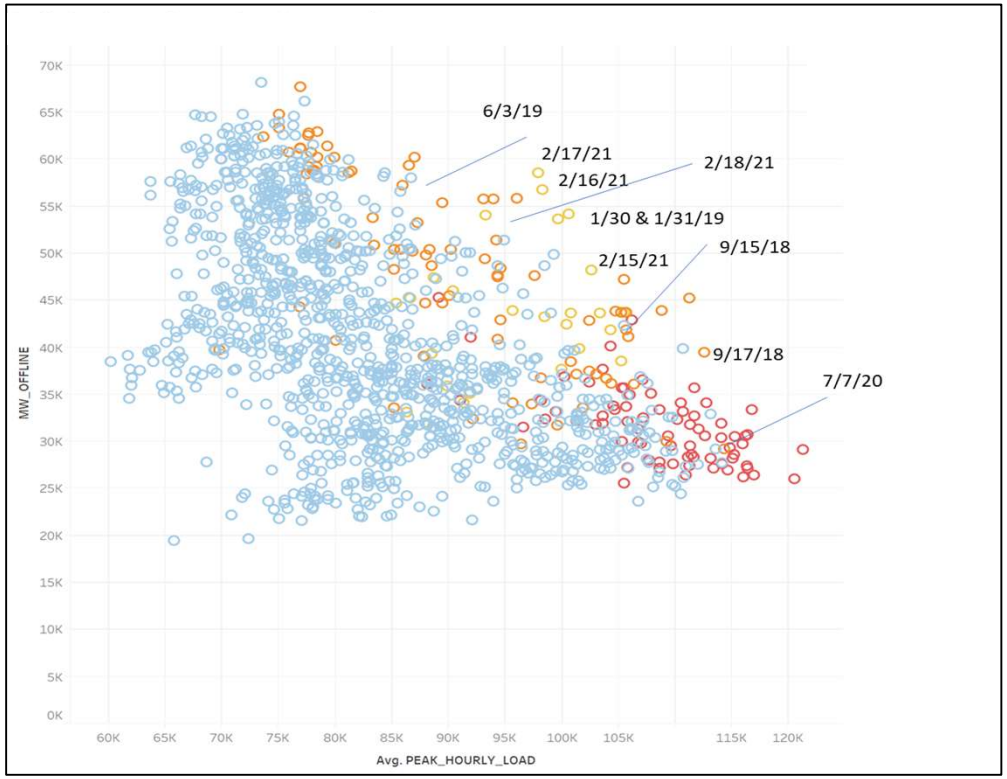
	Identify Reliability Needs	Planning Horizon	Operating Horizon
Progress to Date	• Five RAN whitepapers • Stakeholder engagement and workshops	• Outage coordination • Load Modifying Resources (LMR) • LMR accreditation • ICAP deliverability	• Multiday Operating Margin (MOM) forecast • Emergency pricing filing
2020-21 Focus	• Define system reliability needs and capabilities	• Develop sub-annual planning and PRA reform • Resource accreditation reform	• Further enhancements to MOM forecast • Propose emergency and scarcity pricing reforms
Future Market Redefinition Focus	• Improved modeling approaches and risk characterization • Evaluation of severe weather risk • Evaluation of other required capabilities/ attributes	Accreditation • Evaluation of ELCC for renewables • LMR/ DR availability • AME resources	• Additional scarcity pricing reforms • Uncertainty management market approaches • Seams improvements

ICAP = Installed Capacity
PRA = Planning Resource Auction
ELCC = Effective Load Carrying Capability

DR = Demand Response
AME = Available Maximum Emergency

RA reforms emphasize resource reliability contribution during times of highest risks and greatest needs

Daily Peak Hourly Load vs. Outages/ Derates



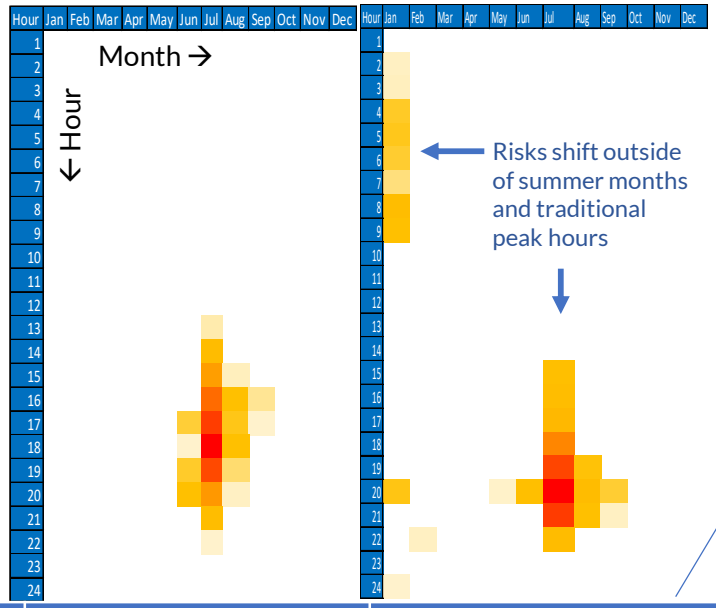
RA Day Season

- Not RA Day
- Spring/ Fall RA Day
- Summer RA Day
- Winter RA Day

- Offline MW includes planned and forced outages
- Data represents January 2018 – May 2021

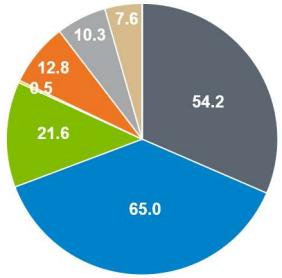
Analysis of MISO's expected 2025 resource mix shows that risks shift towards winter and evening hours, even with an assumption of optimal outage planning

Risk Assessment * (% of total Expected Unserved Energy MWh)

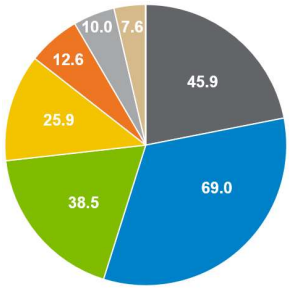


Load	Current Portfolio	2025 Scenario
Summer Peak	124,448 MW	126,622 MW
Winter Peak	106,543 MW	107,072 MW

Current Portfolio: ICAP Capacity Mix



2025 Scenario: Forecasted ICAP Capacity Mix based on OMS-MISO Survey reported retirements and new resources from late-stage queue



Coal | Gas | Wind | Solar | Nuclear | Other | Demand Response

ICAP = Installed Capacity

The next steps for Resource Adequacy Construct reform continue to better position MISO to meet the challenges of the Reliability Imperative

Sub-annual construct: Change from current annual summer-based construct to four distinct seasons

Outcomes: (1) Identify reliability needs unique to each season (2) Align resource availability with seasonal needs (3) Facilitate seasonal outages or partial year operations

Improved accreditation: Align resource accreditation with availability in the highest risk periods

Outcomes: (1) Increase confidence in capacity that MISO can count on (2) Provide improved signals for availability and coordination (3) Improve outage coordination processes

Minimum capacity requirement: Require at least 50% of capacity to be secured for each Load Serving Entity, prior to the Planning Resources Auction

Outcomes: (1) Support MISO reliability with the changing risk profile and lower excess reserve margins (2) Reinforce a fundamental assumption that all Load Serving Entities are appropriately planning

Design squarely aimed at key reliability risks and has been modified to appropriately incorporate stakeholder feedback

Key Area of Stakeholder Engagement	Responsive Elements
Loss of Load Expectation (LOLE) modeling	Enhanced modeling methods for renewables, forced outages, and planned outages and further enhancements continue
"Resource Adequacy hours" concept versus general availability	Revised definition and application of Resource Adequacy hours and new accreditation tier to reflect general resource availability
Planned outage coordination	A seasonal construct that facilitates seasonal outages for transitioning fleet and accreditation exemptions for well-coordinated, long-lead planned outages
Transition	Gradual phase-in of enhanced outage coordination through Planning Year 2026-27

△ = stakeholder meeting or workshop ▲ = File RA Construct to FERC

Contact Info

Geoff Brigham
gbrigham@misoenergy.org

NERC Cold Weather Standards Update

Bobbi Welch

MISO Standards and Assurance

History

Cold Weather standards were developed to address lessons learned following extreme cold weather events:

- Feb 2011 Southwest Cold Weather Event
- Jan 2014 Polar Vortex Review
- Jan 2018 South Central Cold Weather Event Report
- Feb 2021 Pending

Sense of Urgency

- Development underway when Feb 2021 event occurred
- In response, NERC expedited the development process
  - June 17, 2021 - Standards filed at FERC
  - August 24, 2021 - Standards approved by FERC
  - **April 1, 2023** – Effective date for new standards
- During the interim, a NERC Alert for **Cold Weather Preparations for Extreme Weather Events** was issued due September 17, 2021

What's New?

Enhancements to EOP-011, IRO-010 and TOP-003

Emergency Preparedness and Operations (EOP-011-2)

- GO must implement cold weather preparedness plans, including
  - Annual inspection and maintenance of freeze protection measures
    - GO not required to install freeze protection
  - Cold weather operating limitations
    - Minimum historical operating temperature
    - Weather Definition (Geographical location, climate, and GO experience with operation during cold weather events)
- GO/GOP must provide unit-specific training to maintenance or operations personnel regarding cold weather preparedness plans
    - Method, process and frequency up to entity

GO = Generator Owner GOP = Generator Operator

Operational Reliability Data Specifications

- Parallel provisions in IRO-010-5 (for Reliability Coordinators) and TOP-003-5 (for Transmission Operators and Balancing Authorities)
- RC/TOP/BA must have provisions for the notification of BES generating unit(s) during local forecasted cold weather to include:
  - Operating limitations and generating unit(s) minimum temperature
  - Periodicity for providing data
  - Deadline for providing data

Implementation Plan

- Timeline: 18 months
- Justification: Availability of engineering studies needed by entities
- EOP-011-2 Implementation Guidance
  - To determine the "minimum historical operating temperature," it is recommended:
    - The analysis be based on no less than five (5) years of operational data
    - Include the most recent extreme cold weather event data if outside the five-year timeframe

Contact Info

Bobbi Welch
bwelch@misoenergy.org

MISO Standards & Assurance
StandardsandAssurance@misoenergy.org

Generation Assessment

Tim Bachus

MISO Resource Adequacy

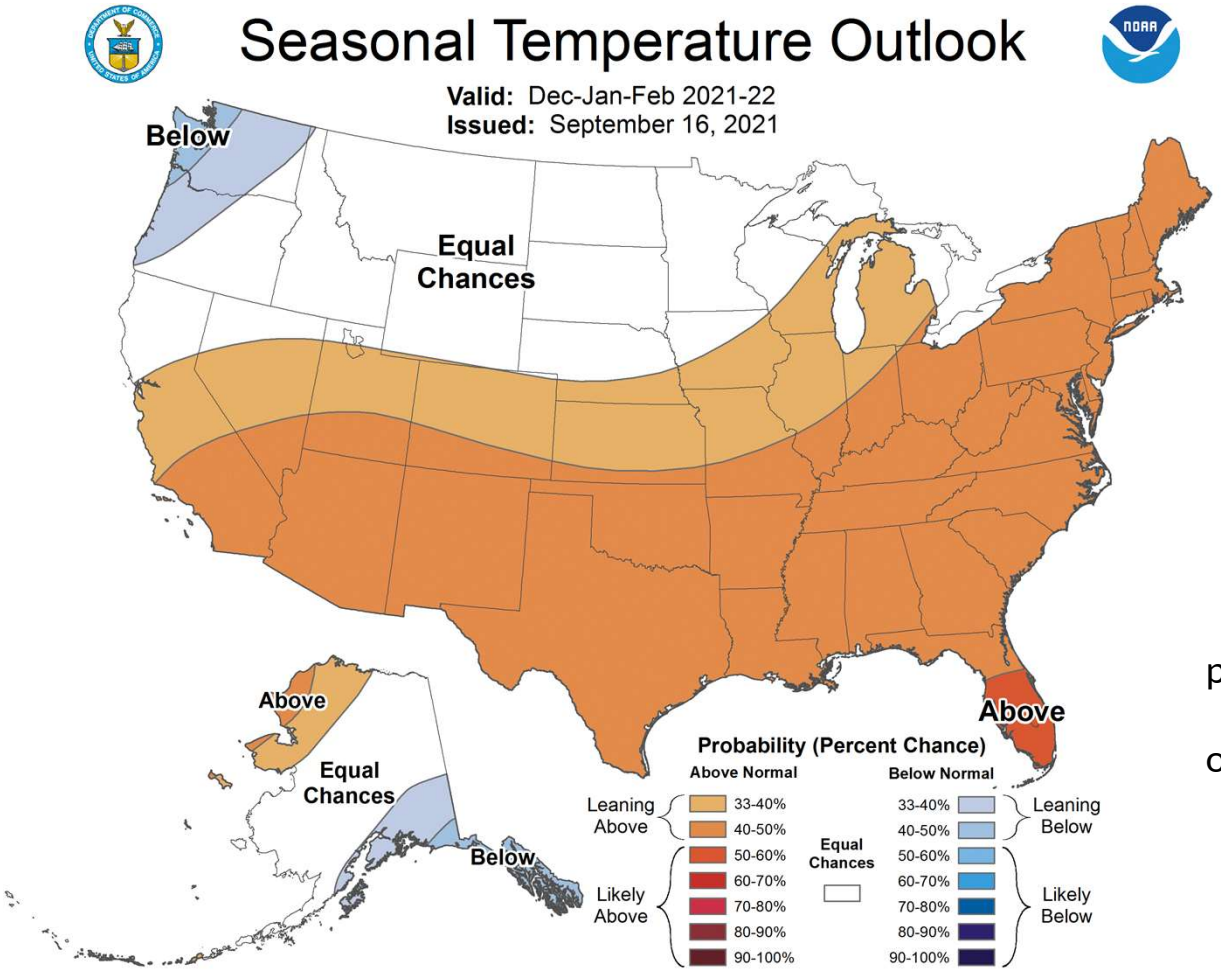
Under typical demand and outage scenarios, adequate firm resources are projected to be available to cover Winter months, although January may be challenging in an extreme weather event

MISO 2021-2022 Winter Forecast	
December 50/50 Peak Forecast	94 GW
December Projected Available Capacity*	105 GW
January 50/50 Peak Forecast	101 GW
January Projected Available Capacity*	106 GW
February 50/50 Peak Forecast	95 GW
February Projected Available Capacity*	108 GW

2021-22 Winter monthly projected available capacity is net of 5-year average monthly historical generation outages during peak periods

**Includes Installed Capacity of Planning Resource Auction cleared resources, with wind and solar at capacity credit, net of historical generator outages*

NOAA Temperature and Precipitation Forecasts



All-time Winter Peak

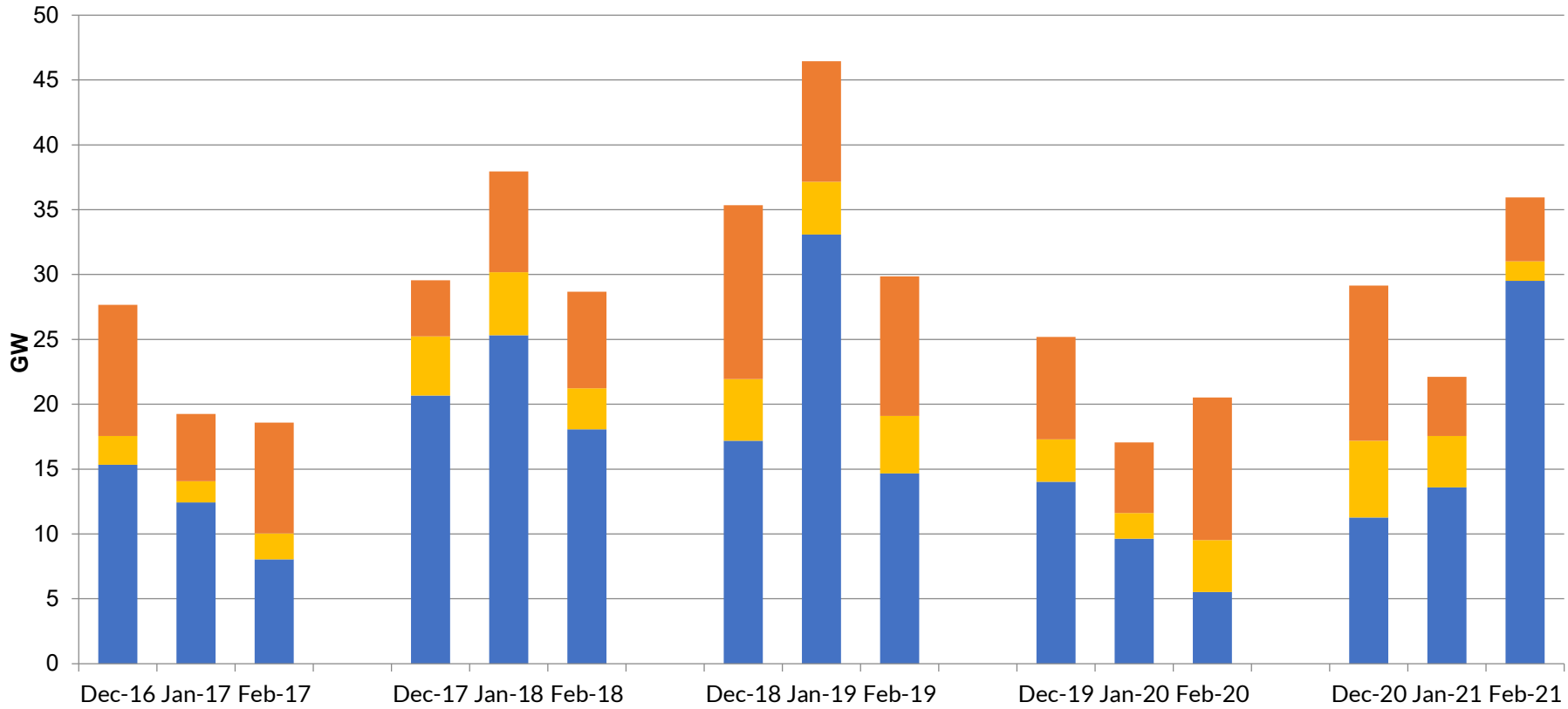
109 GW on January 6th, 2014

Precipitation Forecast

NOAA forecasts above average precipitation across most of Zones 2, 4, 6 and 7 while it is expected that parts of Zones 9 and 10 will be slightly below normal

Source: National Oceanic and Atmospheric Administration (NOAA)

During the monthly peaks of the last winter season, historical outages varied above and below average for each of the months in the season



Forced Outages
Maintenance Outages
Planned Outages

	Forced Outages (GW)	Total Outages (GW)
Average of 15 monthly peaks	16.6	28.2
Maximum seasonal peak	33.1	46.4

Source: Generating Availability Data System (GADS)

Two deterministic scenarios (typical and worst case) are evaluated to capture potential risk this upcoming winter

Generation

Probable Capacity

- Removes an **average** volume of resource outages[1] (forced, planned, and maintenance)

Low Generation Capacity (Worst Case Outage)

- Removes a **worst-case** volume of resource outages[1] (forced, planned, and maintenance), typically because of non-normal weather conditions

Load

Probable Load Forecast

- 50/50 forecast[2], provided by Market Participants

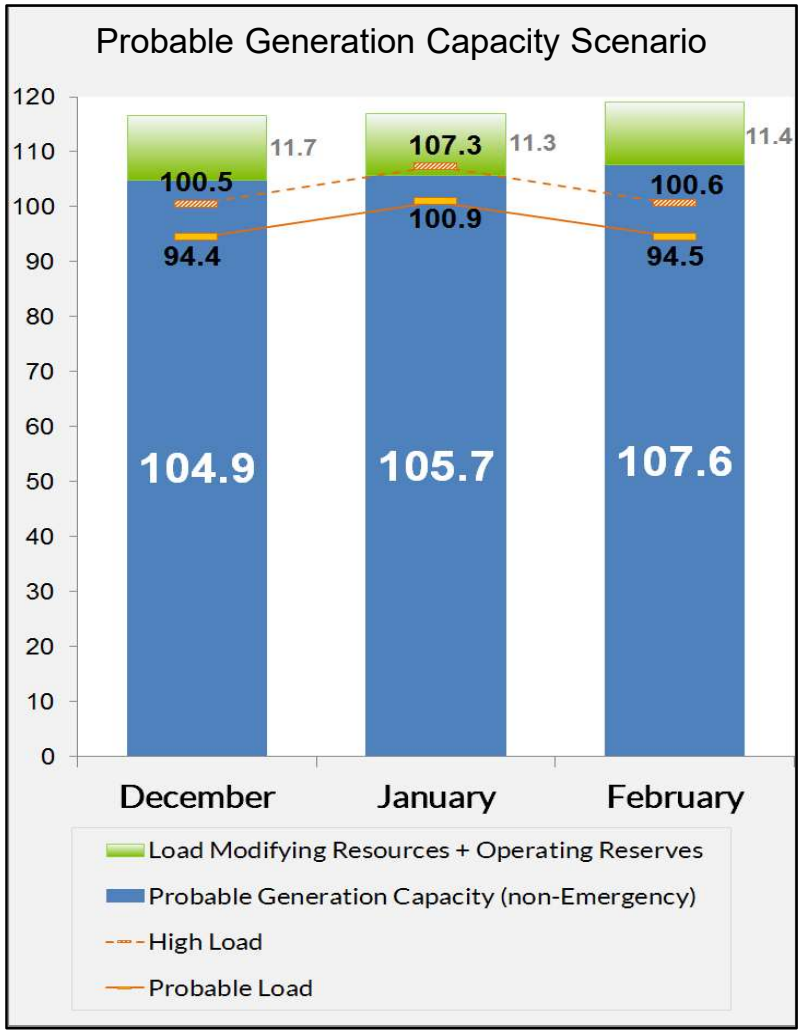
High Load Forecast

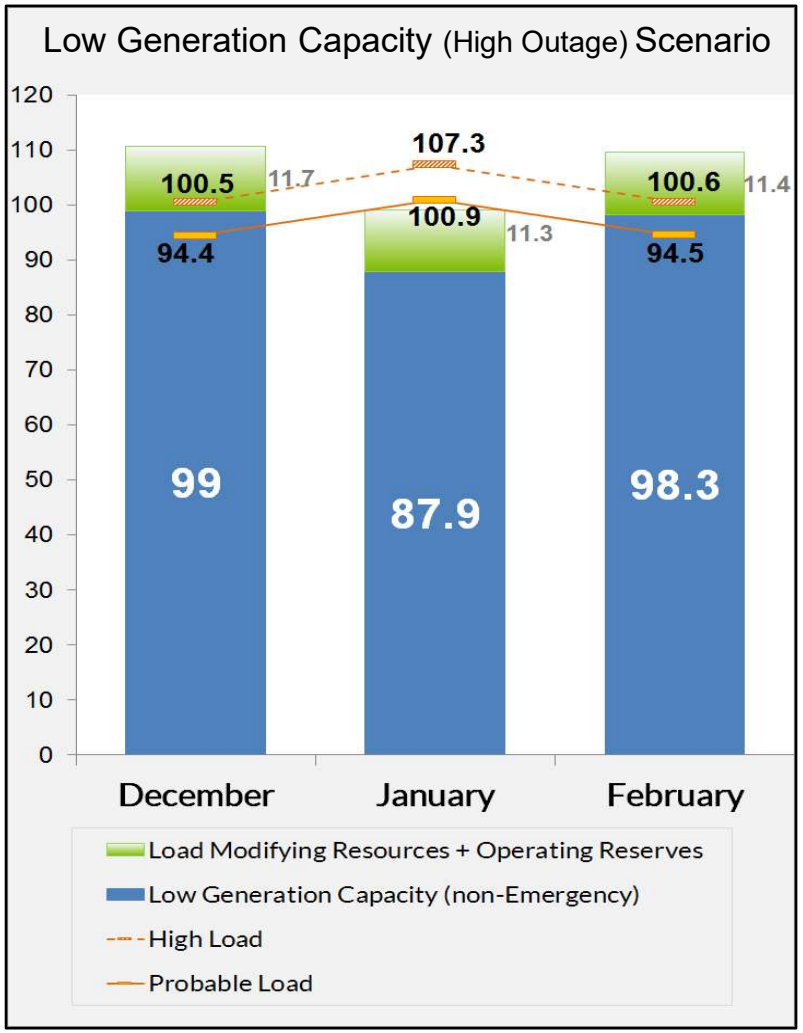
- 90/10 forecast[3]

1 Based on 5-year historical outage information provided by Resource Owners
2 50% chance of the actual load being lower and 50% chance of the actual load being higher
3 90% of the actual load being lower and 10% chance of the actual load being higher

A combination of both high load and high outages could drive operational challenges for the Winter 2021-22 season

Winter 2021-22 Resource Adequacy Projections – System-wide

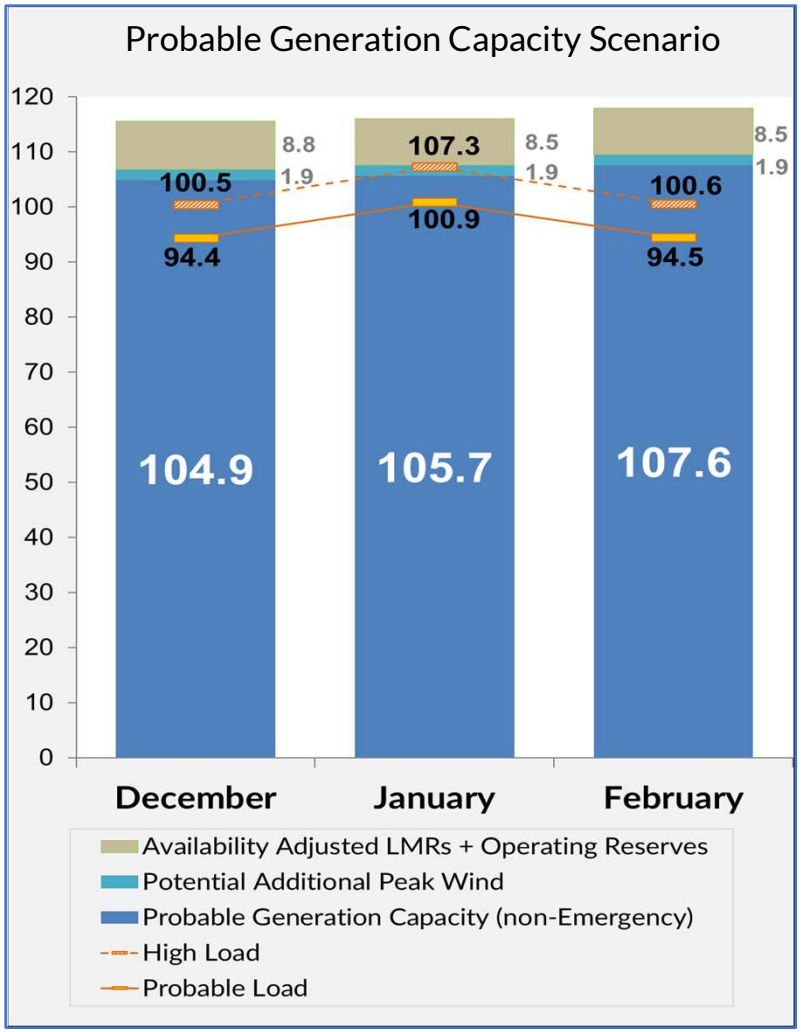




The low generation capacity of January highlights outage conditions experienced on the MISO system during the polar vortex of 2019

Alternative Probable Generation scenario showing LMR values at expected contribution levels and including potential additional wind generation

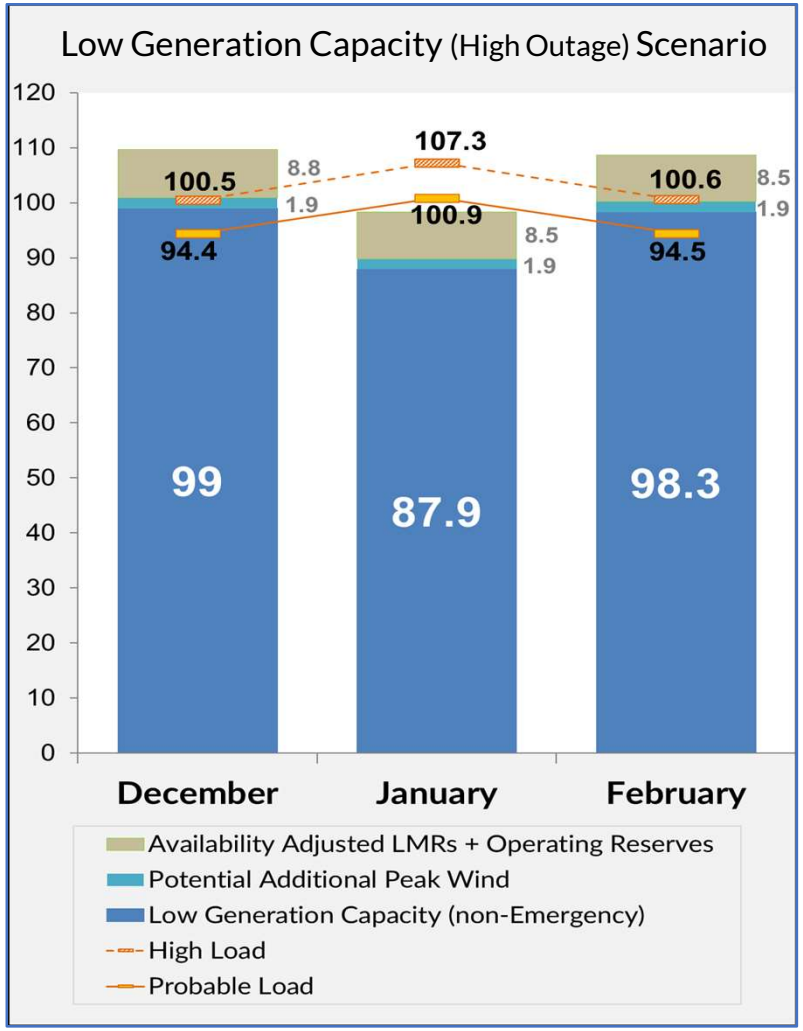
Winter 2021-22 Resource Adequacy Projections – System-wide



- Availability Adjusted LMRs calculated by applying the ratio of expected vs. available LMRs in Winter 2020 to the expected LMR amounts in Winter 2021 – Source: MISO Monthly Operations Report
- Additional wind generation of 1.9 GW is a rough assumption of potentially available additional wind capacity in the Winter season
- Operating Reserves maintained at 2.4 GW

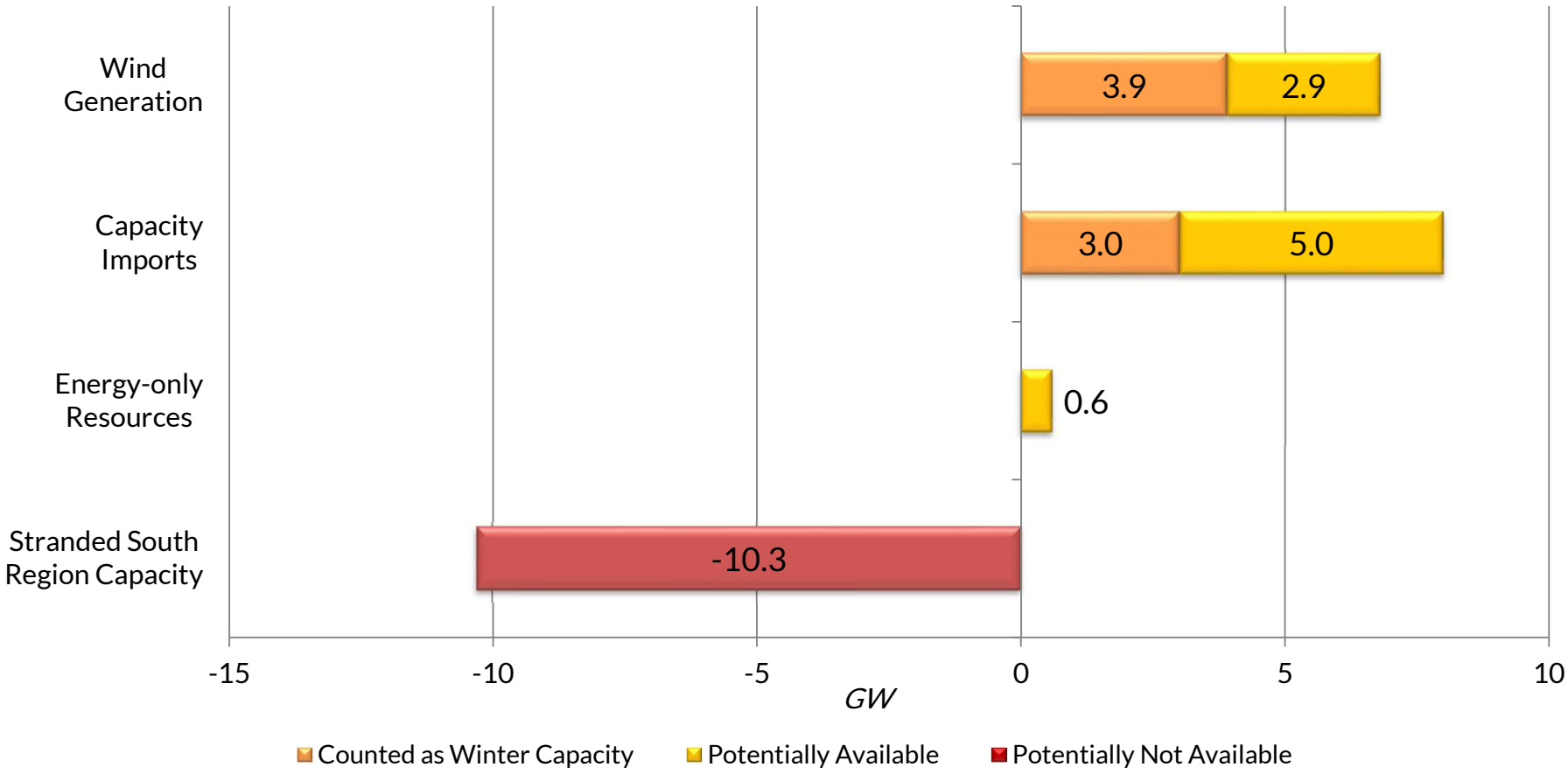
Alternative Low Generation/High Outage scenario showing LMR values at expected contribution levels and potential additional wind generation

Winter 2021-22 Resource Adequacy Projections – System-wide



- Availability Adjusted LMRs calculated by applying the ratio of expected vs. available LMRs in Winter 2020 to the expected LMR amounts in Winter 2021 – Source: MISO Monthly Operations Report
- Additional wind generation of 1.9 GW is a rough assumption of potentially available additional wind capacity in the Winter season
- Operating Reserves maintained at 2.4 GW

The need for emergency procedures will be impacted by the availability of non-firm resources



Contact Info

Tim Bachus

tbachus@misoenergy.org

Winter Resource Assessment: Transmission

Tamal Paul
Ritam Misra
MISO Engineering

The transmission limitations in the system are within the expected norms for the upcoming Winter

Steady-State AC Contingency Analysis	Regional Directional Transfer (RDT Studies)	Load pocket studies
• Evaluate the effects of simple and complex contingencies on the MISO footprint and Tier-1 areas • IROL review • **No major constraints that do not have mitigations for this summer**	• Evaluate the impact of RDT on MISO's neighboring entities • Some RDT flowgates are already in MISO processes • **3 additional RDT flowgates not previously in MISO's processes found**	• Evaluate import capability for four MISO load pockets in the South: Amite South, DSG, WOTAB, and Western load pockets • **Study still ongoing**

Steady State AC Contingency Analysis – Contingencies Evaluated

Category P1 > 100 kV

- P1.1 – fault generator (>50 MW)
- P1.2 – fault transmission circuit
- P1.3 – fault transformer
- P1.4 – shunt device
- P1.5 – block single dc pole

P1 Contingency Files are submitted by Stakeholders

Gas-Electric Contingencies

No major constraints that do not have mitigations for this winter

RDT Flowgate Impact Studies

Criterion:

Regional Directional Transfers will be considered to impact flowgates if one or more of the flowgate criteria is met.

1. Single monitored element flowgate with ≥ 5% TDF
2. Double monitored element flowgate ≥ 7.5% TDF
3. Three monitored element flowgate ≥ 10% TDF
4. Four or more monitored elements only by mutual agreement between MISO RC and a neighboring RC
5. 25% or more flow of a single-monitored element flowgate limit as a result of RDT and with a minimum of 1.5% TDF

Results:

3 additional flowgates not previously identified sent to MISO Operations

FG ID	Flowgate Name
2643	San Souci-Driver 500 kV flo Holland Bottoms 500 kV
26418	LooseCreek Franks 345kV flo Bland Franks 345 kV
26720	LogtownWest-FRENCHBRNCH 230kV flo FRANKLIN E-Mcknight 500 kV

Import Limits Study for MISO Load Pockets

- Simulate peak load conditions for four MISO load pockets as shown below:

  - Amite South
  - DSG (Downstream of Gypsy)
  - WOTAB
  - Western load pocket

- Perform transfer studies into these load pockets
- Identify import limits for the load pockets
- Study is still ongoing; results pending

Contact Info

Tamal Paul
tpaul@misoenergy.org

Ritam Misra
rmisra@misoenergy.org

Winterization Survey Results

Mike Mattox

MISO Senior Advisor, Planning

Purpose & Key Takeaways

Purpose:

Review survey results

Key Takeaways:

- Greatly improved participation
- Generation prepared for winter
- Improvement in preparedness from last year

Executive Summary

- MISO appreciates stakeholder participation in the 3rd Generation Winterization Survey
- MISO generation generally prepared for winter operations
- Significant increase in responses rate

Response rate as % of MW	Generator Winterization	Gas Fuel Specific Questions[1]
2021	90%	91%
2020	71%	83%
2019	60%	72%

[1]Prior to 2021 this was a separate survey

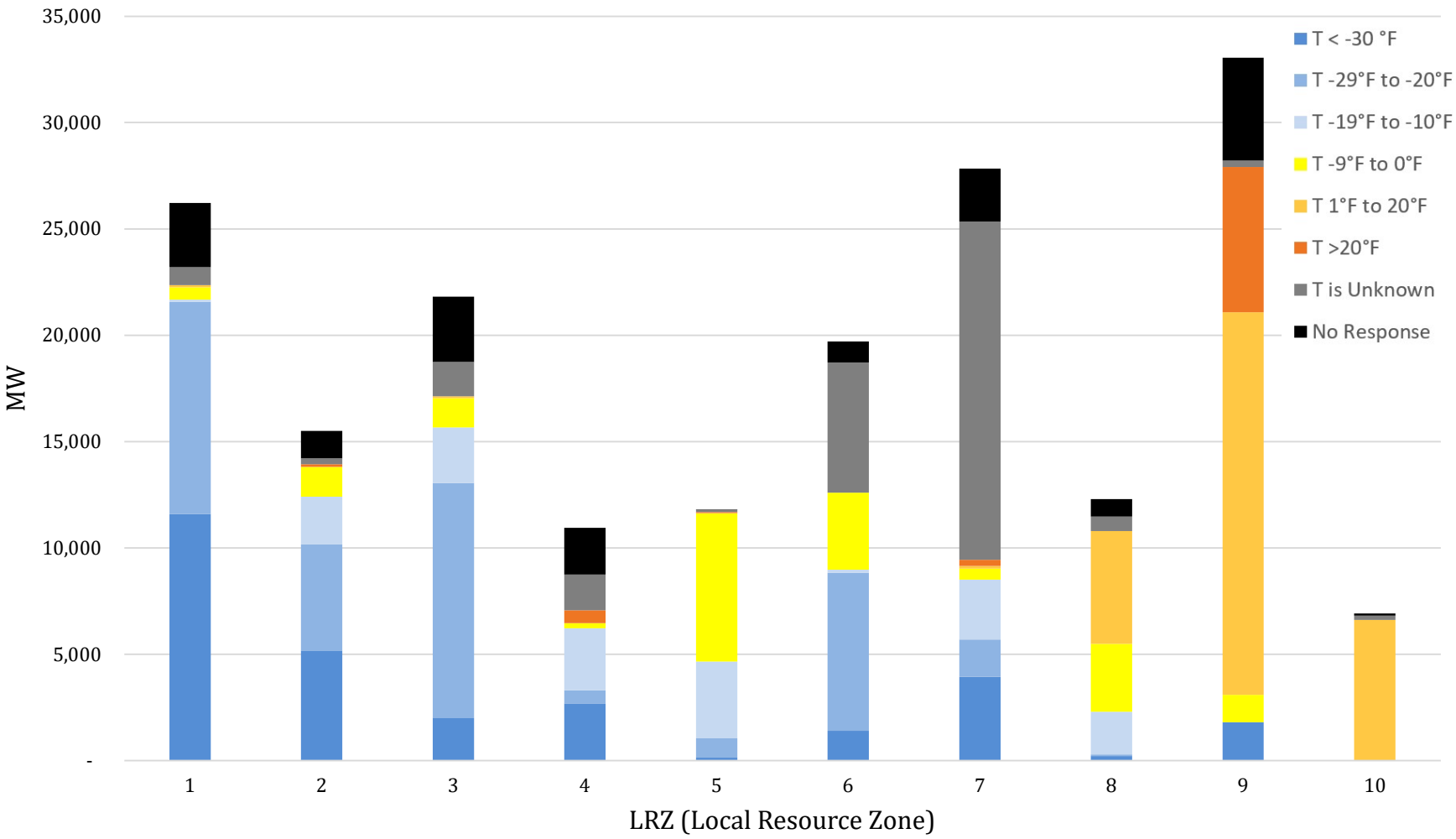
Generator Winterization

Notable Results for units responding to survey

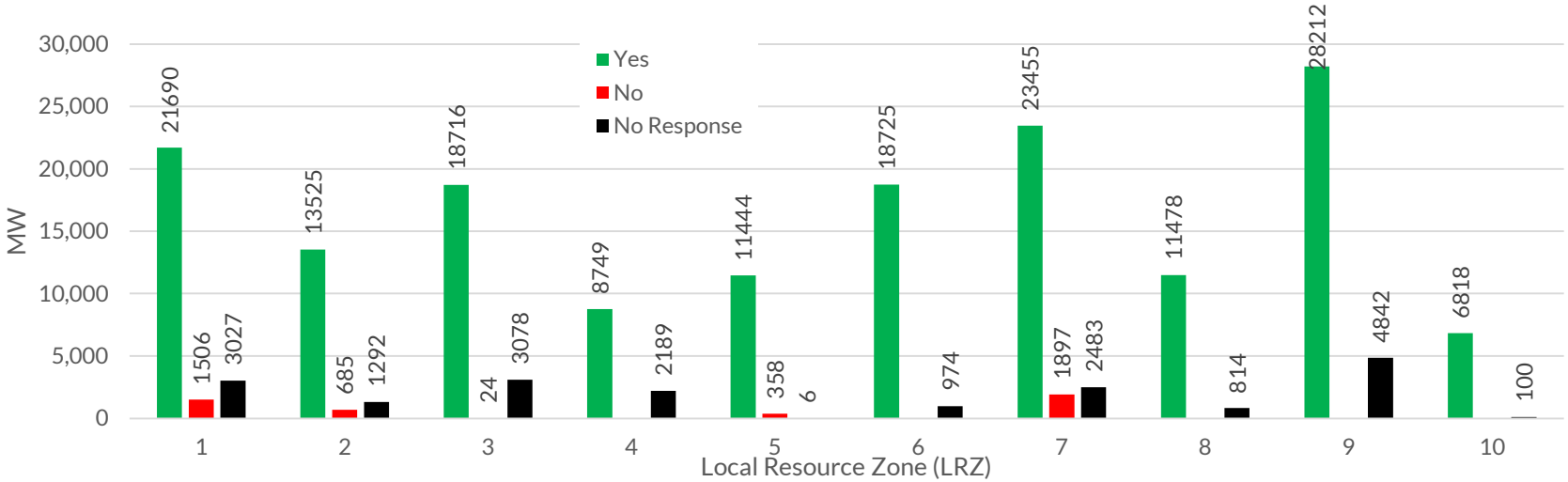
- 97% have a plan to prepare for winter
- 88% have reviewed NERC's Guidelines for Unit Winter Weather Readiness
- 83% have a severe cold weather checklist
- Responses from 2020 showed improvement in preparedness

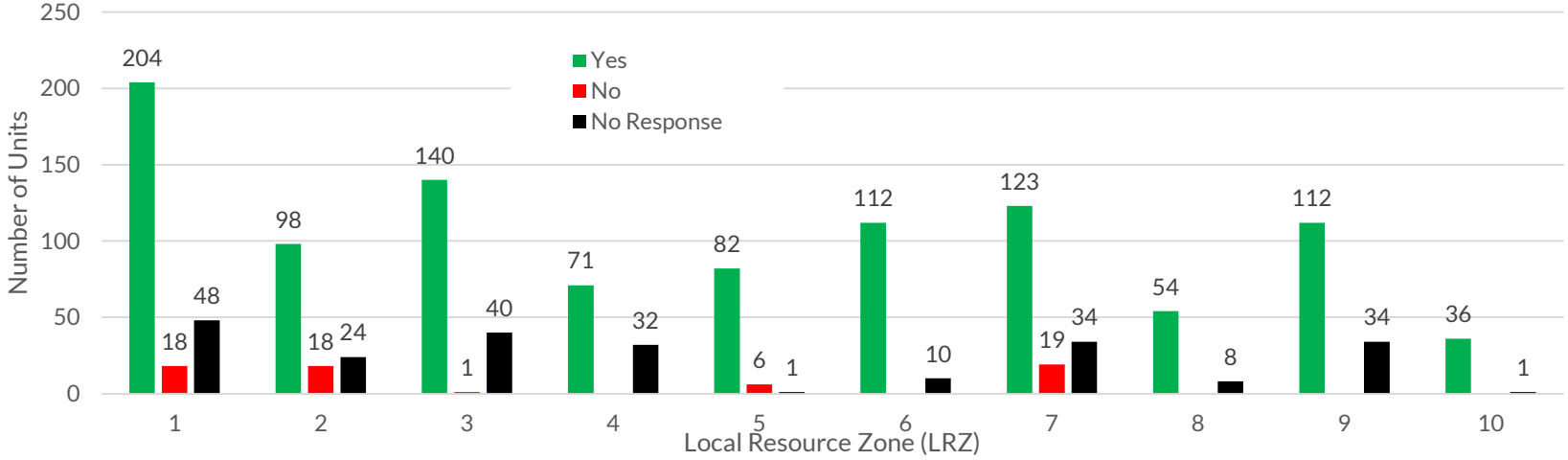
Note: values are as a % of MW

Temperature Rating by LRZ

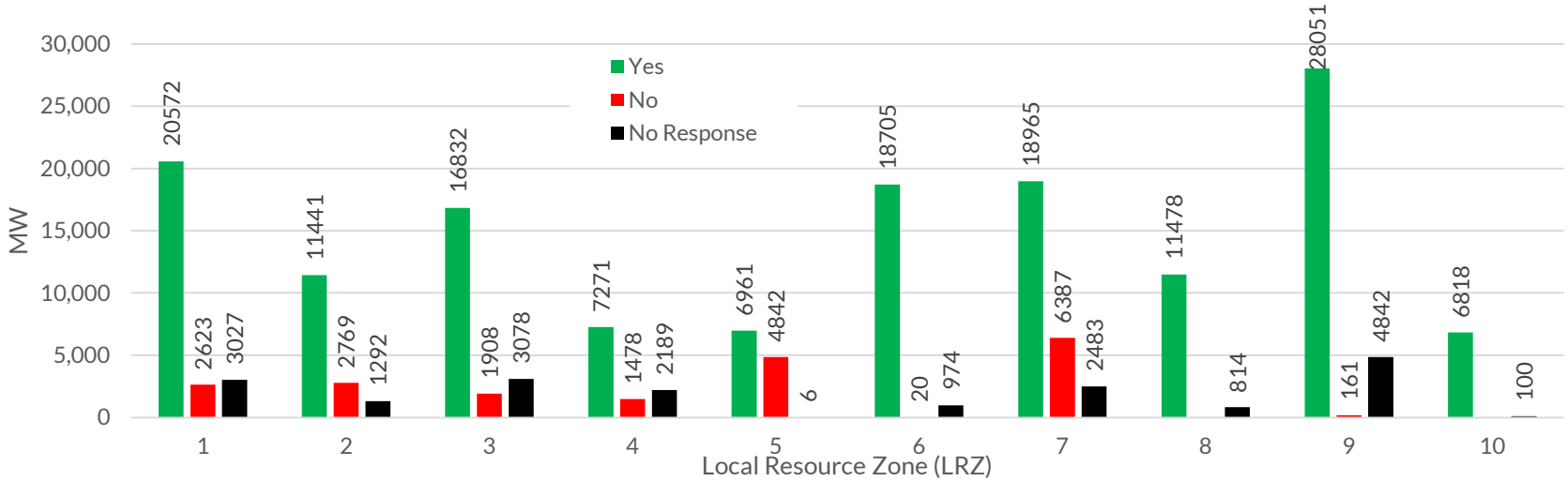


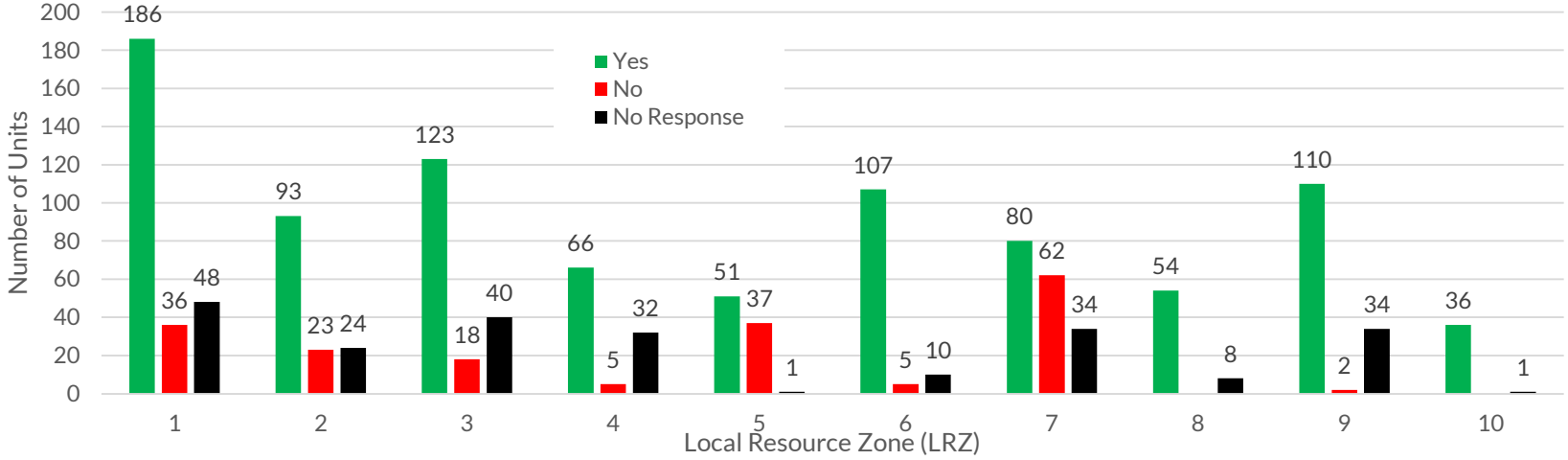
Has a Plan to Prepare for Winter



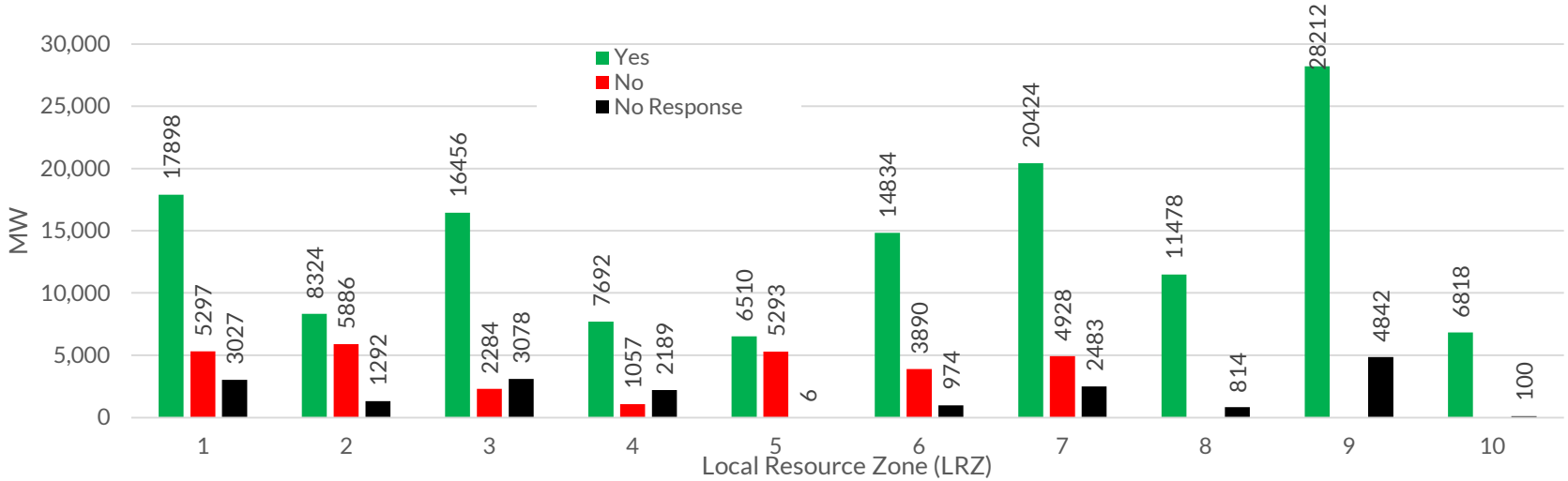


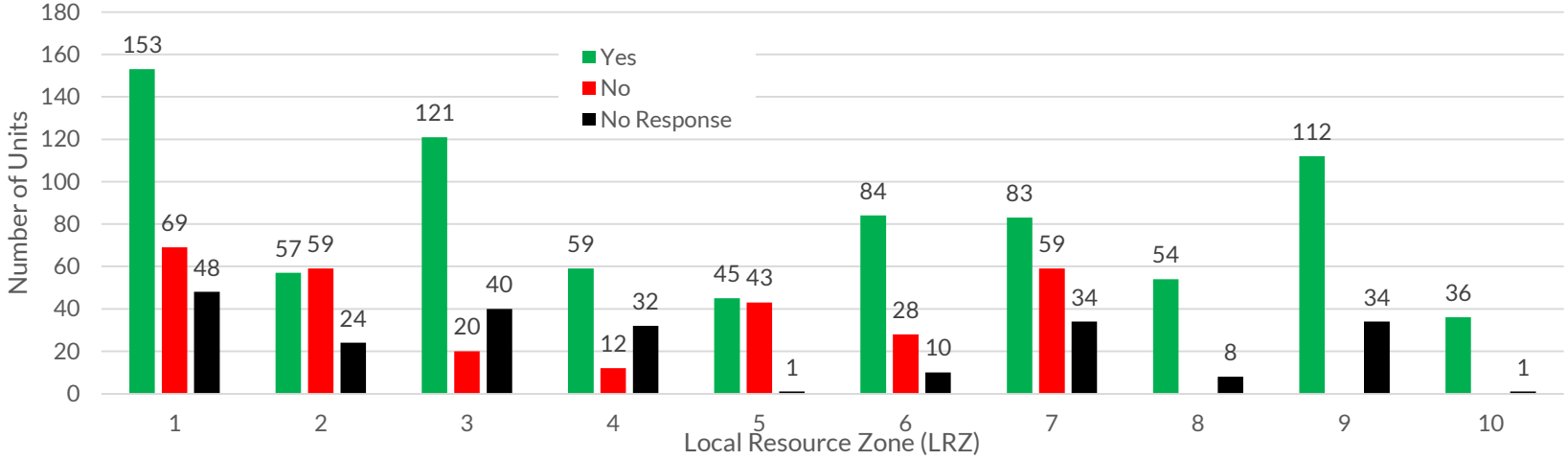
Has Reviewed NERC Guidelines



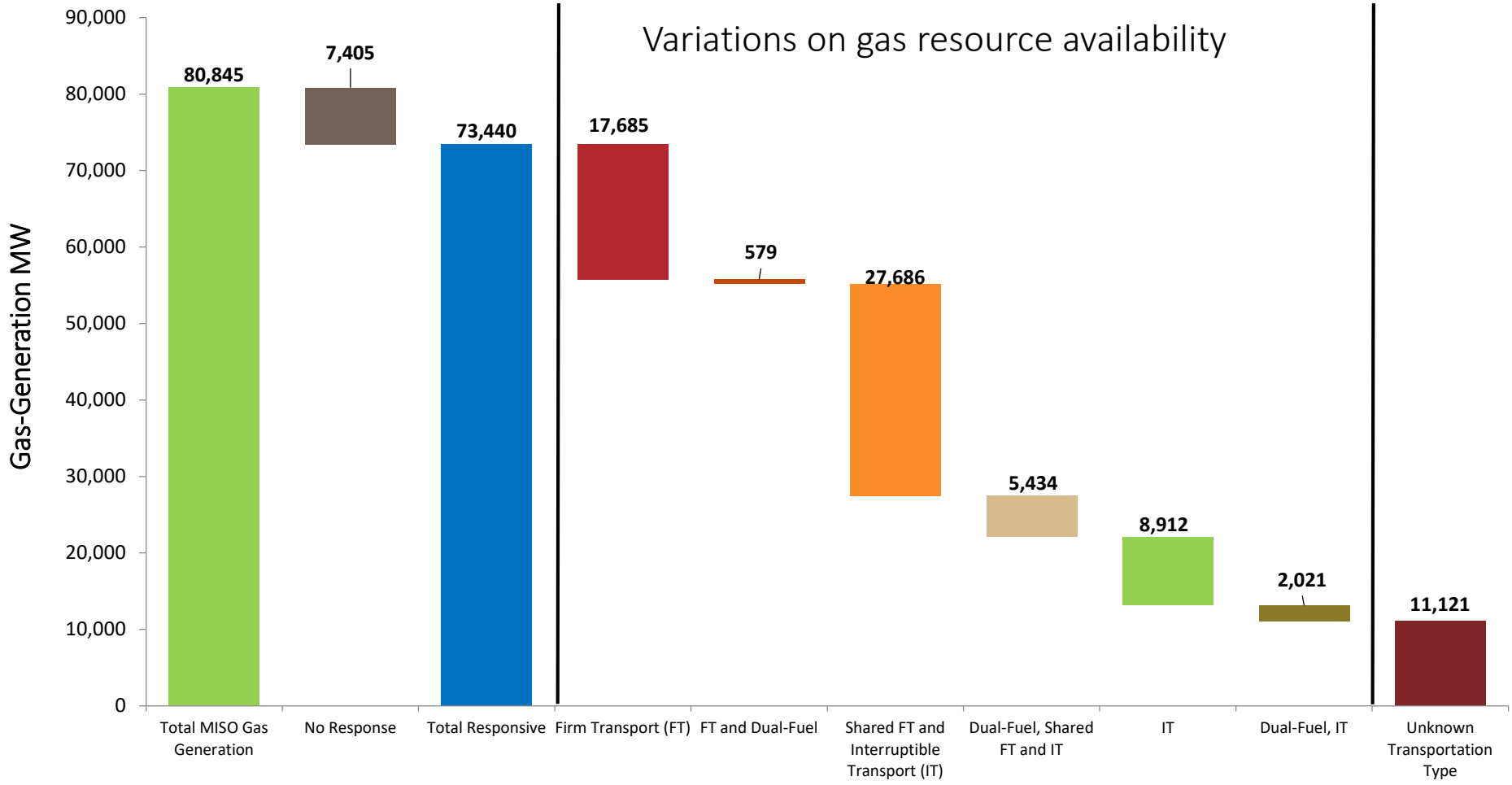


Has Procedure for Extreme Cold Weather Event





2021 Gas Fuel Survey Results



FT is Firm Transportation, IT is Interruptible Transportation

Survey Data Use in Real-Time Ops

- Real-time operations uses gas generation specific data
  - Associate generators with specific gas pipelines
  - Monitor gas pipelines critical notices
  - Assess impact of OFO (Operational Flow Order) based on transport firmness
- Real-time operations uses temperature data to improve situational awareness
  - Assess expected performance of generators
  - Reach out to specific generators of concern

Contact Info

Mike Mattox
mmattox@misoenergy.org

Joe Eilers
jeilers@misoenergy.org

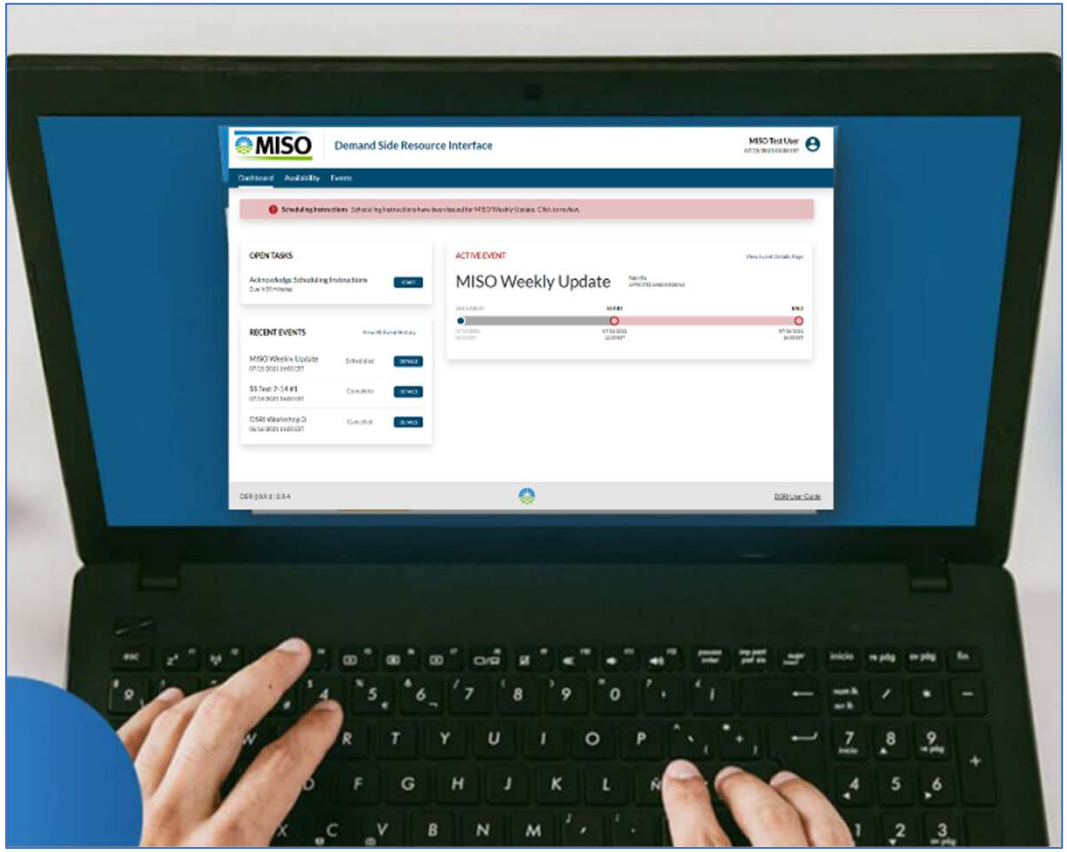
Readiness

- DSRI Tool Overview
- Gas & Electric Coordination
- Procedure Review

Mike Carrión

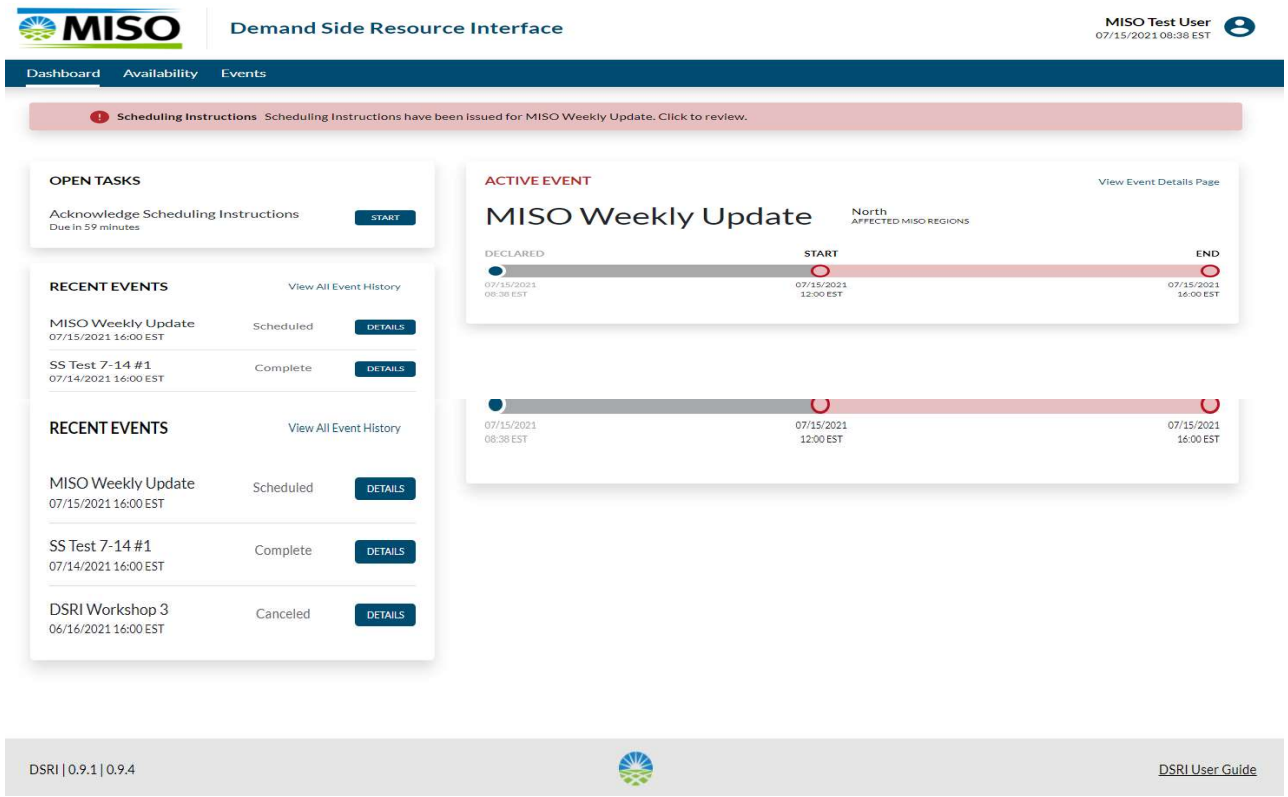
MISO Principal Operator

Readiness: DSRI Tool Overview



Demand Side Resource Interface (DSRI)

IR049 – Update to demand response deployment tools resulted in the creation of the Demand Side Resource Interface (DSRI) to provide MPs a better way to manage Load Modifying Resources



INTEGRATED ROADMAP

Demand Side Resource Interface (DSRI)

- The DSRI can be accessed directly from the Market Portal or via the following links:
  - PROD environment: https://markets.midwestiso.org/dsri/
  - CCE environment: https://cce.midwestiso.org/dsri/
- The Production (PROD) environment of DSRI has been launched on MISO's new Critical Infrastructure Protection (CIP) platform on July 1, 2021, which provides benefits due to improvements in the underlying technology.

INTEGRATED ROADMAP

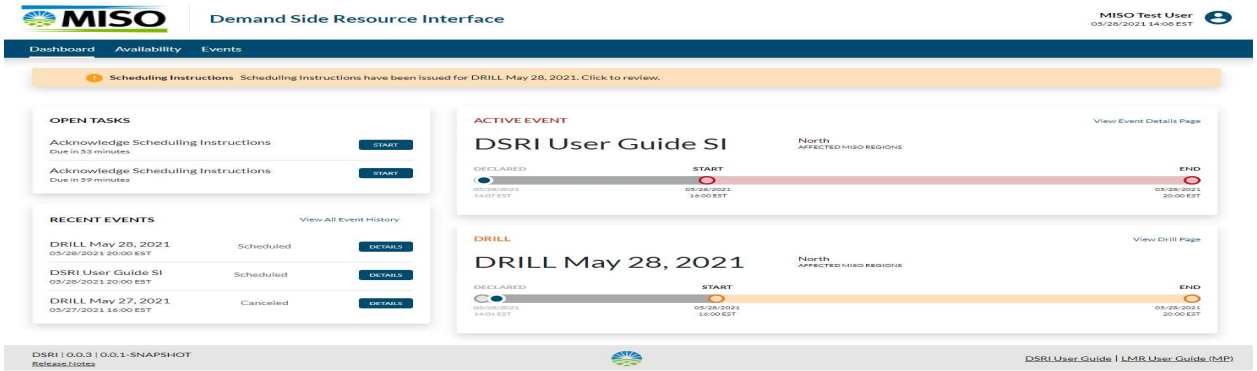
Demand Side Resource Interface

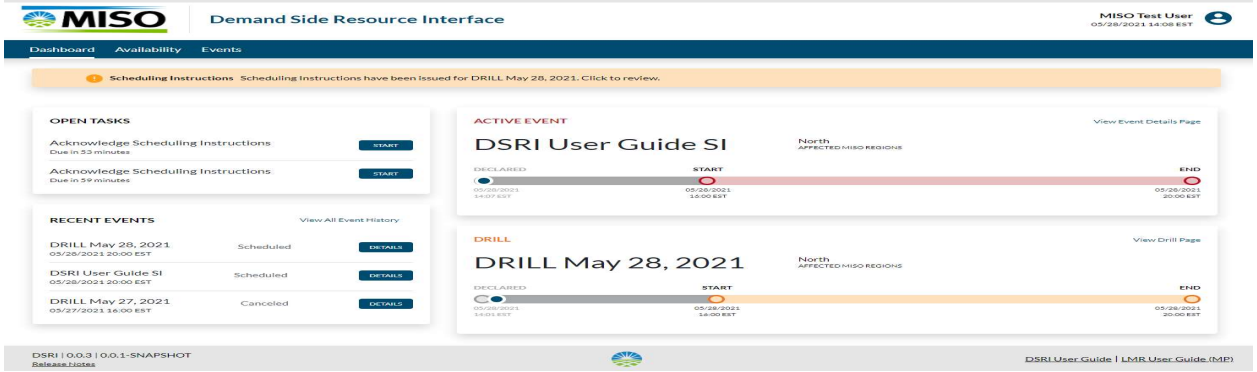
Allows Market Participants the ability to manage their LMR Fleet including updating LMR Availability, receiving Scheduling Instructions (SI), and responding to SI via Resource Deployment

Launch DSRI

Demand Side Resource Interface (DSRI)

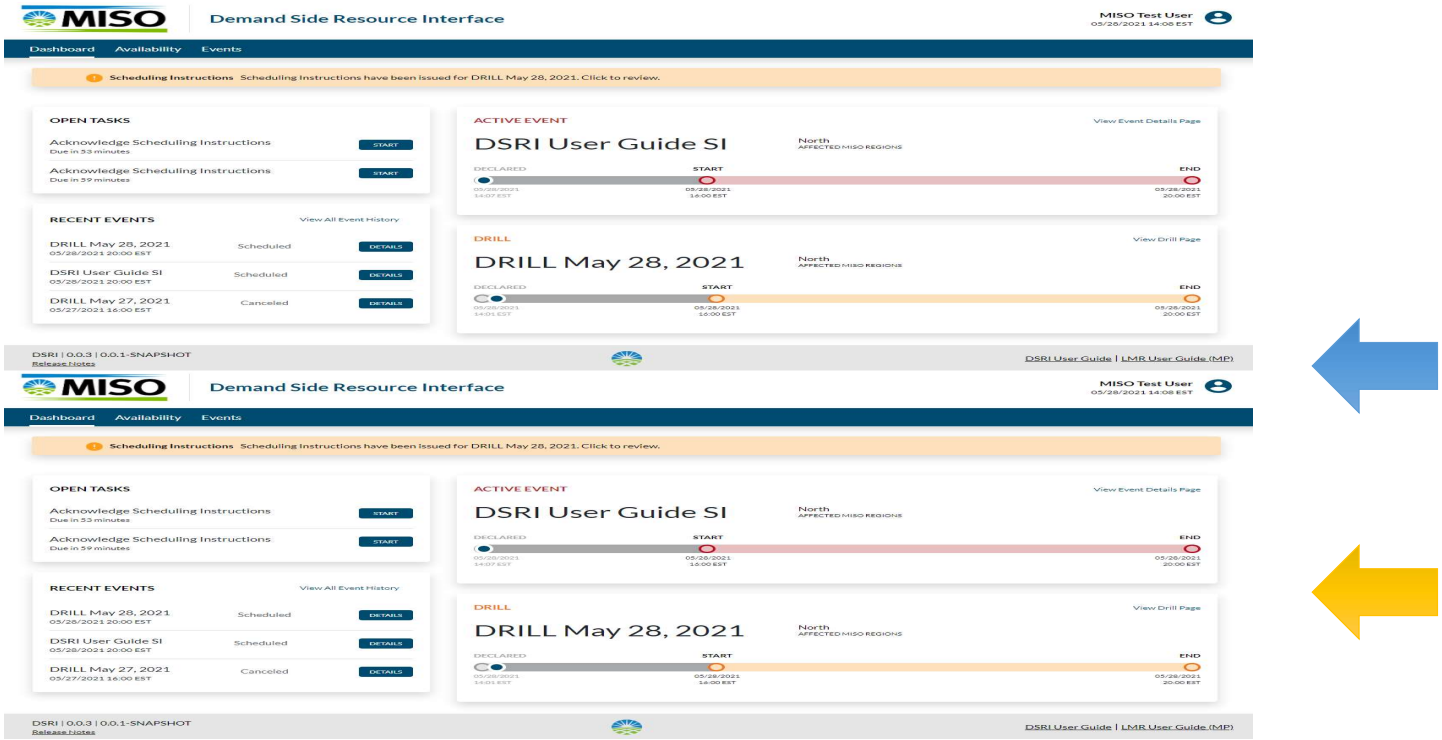
The **Dashboard** is the DSRI's landing spot from the Market Portal. It will indicate if there are any Open Tasks that the Market Participant (MP) will need to perform as a result of an LMR Scheduling Instruction Event or Drill, as well as a quick link to the most recent three LMR Scheduling Instruction events.





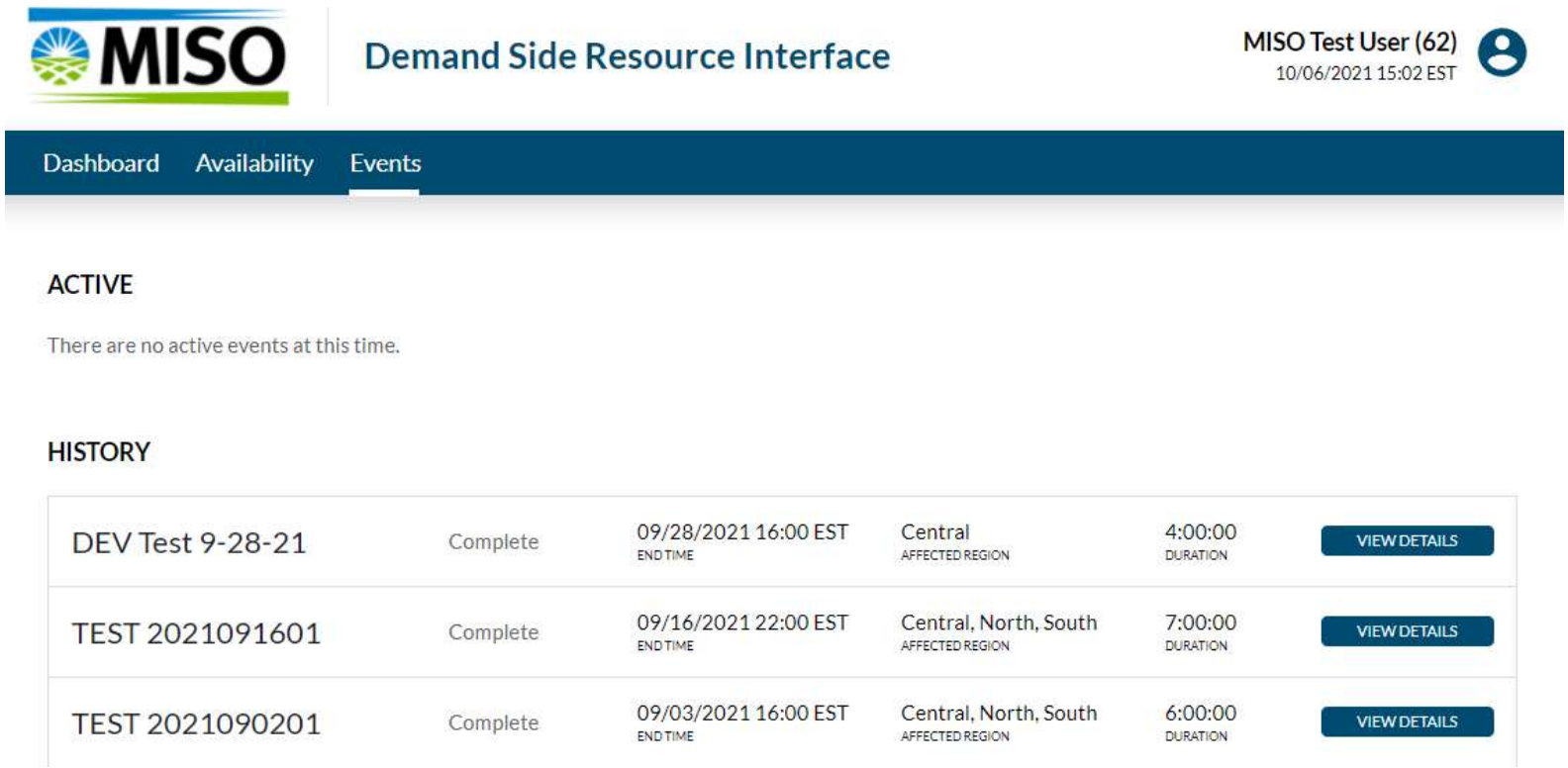
Demand Side Resource Interface (DSRI)

The **Dashboard** indicates if there are any active or upcoming LMR Scheduling Instruction Event (in **RED**), or any active or upcoming LMR Scheduling Instruction Drills (in **ORANGE**). Any LMR Scheduling Instructions sent to an MP will result in an audible (beep) and visual alert (banner).



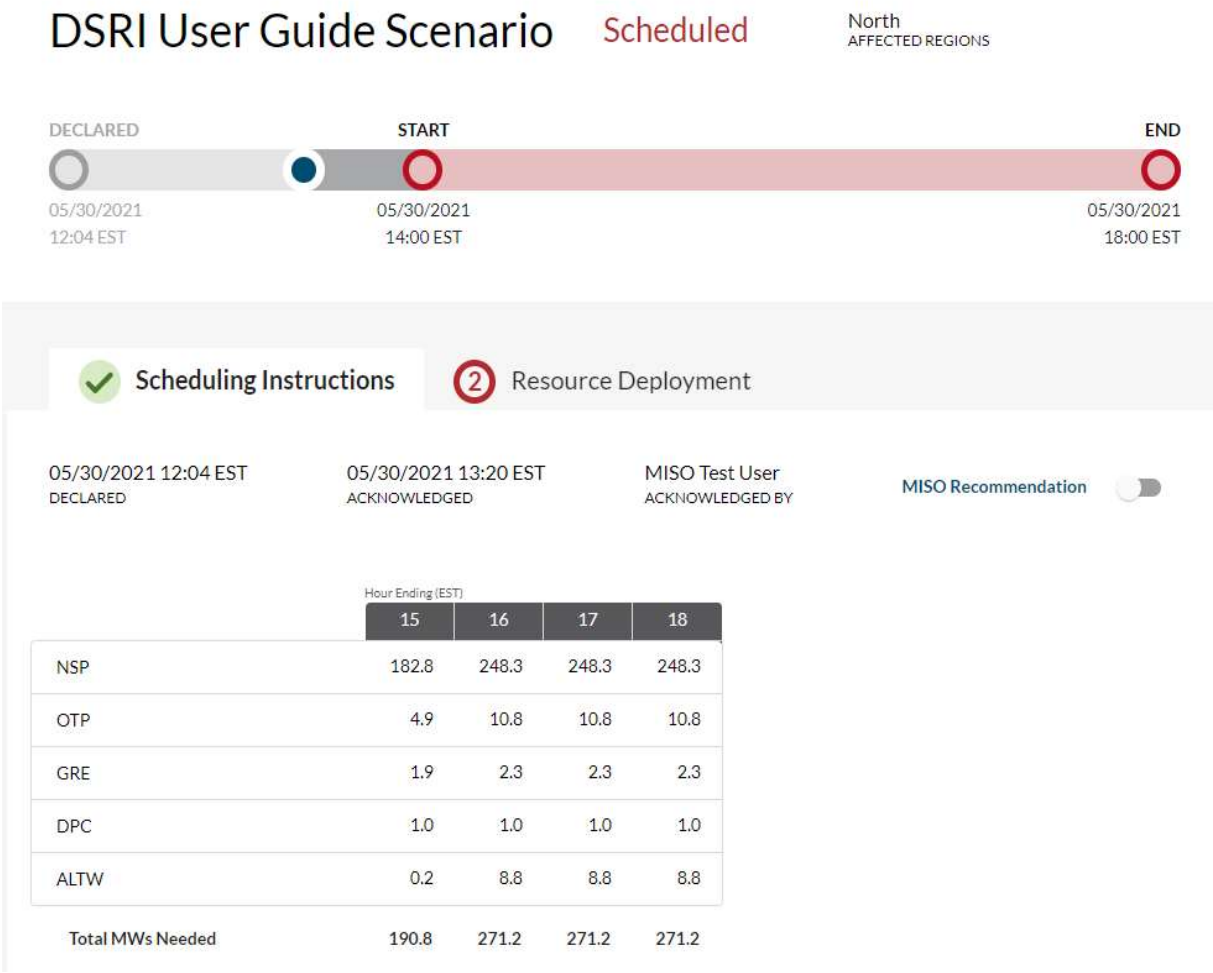
Demand Side Resource Interface (DSRI)

MPs can review LMR Scheduling Instructions of active or former events and drills on the **Events** tab:



Demand Side Resource Interface (DSRI)

For each Event (actual event or a drill), MPs will be able to **Acknowledge** their LMR Scheduling obligations and **Submit** their Resource Deployment



	15	16	17	18
NSP	182.8	248.3	248.3	248.3
OTP	4.9	10.8	10.8	10.8
GRE	1.9	2.3	2.3	2.3
DPC	1.0	1.0	1.0	1.0
ALTW	0.2	8.8	8.8	8.8
Total MWs Needed	190.8	271.2	271.2	271.2

Demand Side Resource Interface (DSRI)

- LMR Scheduling Instructions issued to MPs are based on current and forecasted system conditions that will be used to help preserve the BES and maintain system integrity and reliability
- For each of these events, MISO requests that each MP/AO meet their LMR Scheduling Instructions by using the following implementation criteria
  - LMRs with longer notification times are utilized prior to shorter notification resources
  - LMRs with the highest MW resources are selected first
  - LMRs with the longest duration of run hours are utilized prior to short duration resources

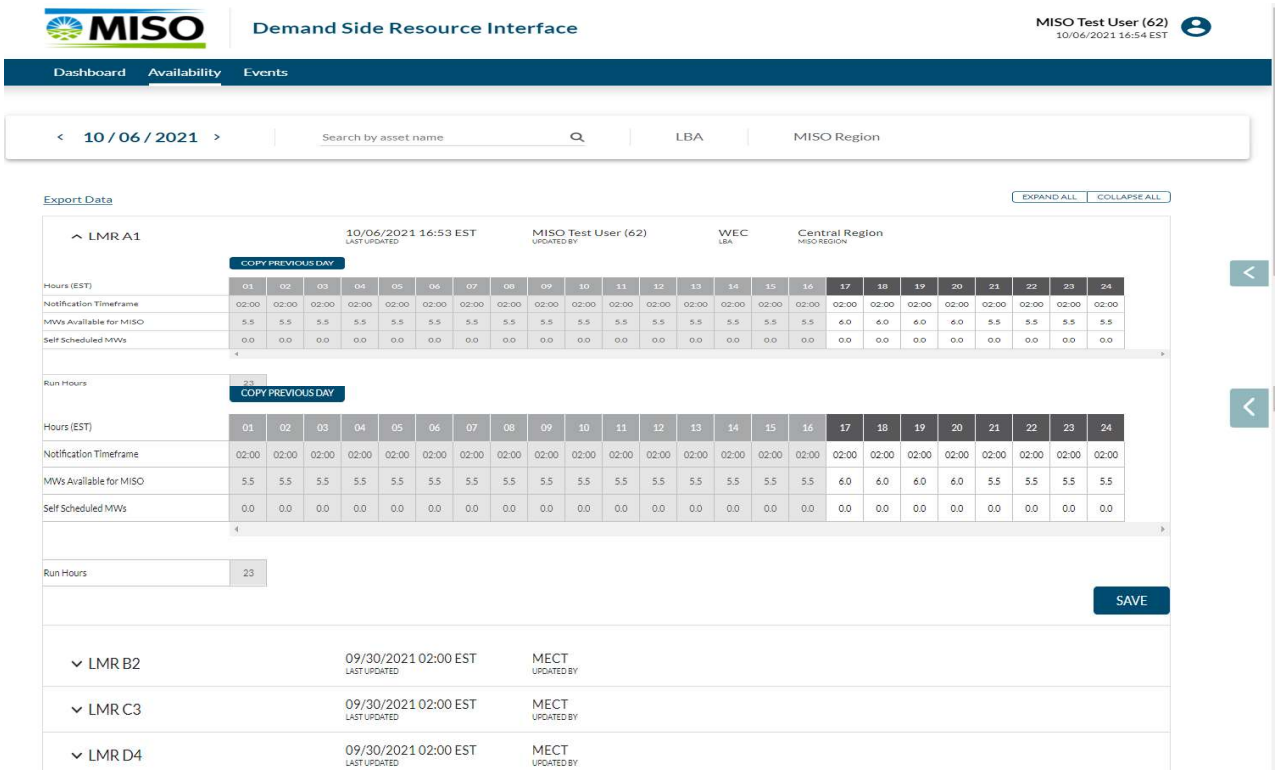
Demand Side Resource Interface (DSRI)

The DSRI is now the sole tool that MPs can use to ensure that their LMR Availability is current at all times

If MISO begins to have capacity issues, the Shift Manager uses the MISO Communication System (MCS) to send messages to remind MPs to update LMR Availability; amongst other stakeholder actions needed

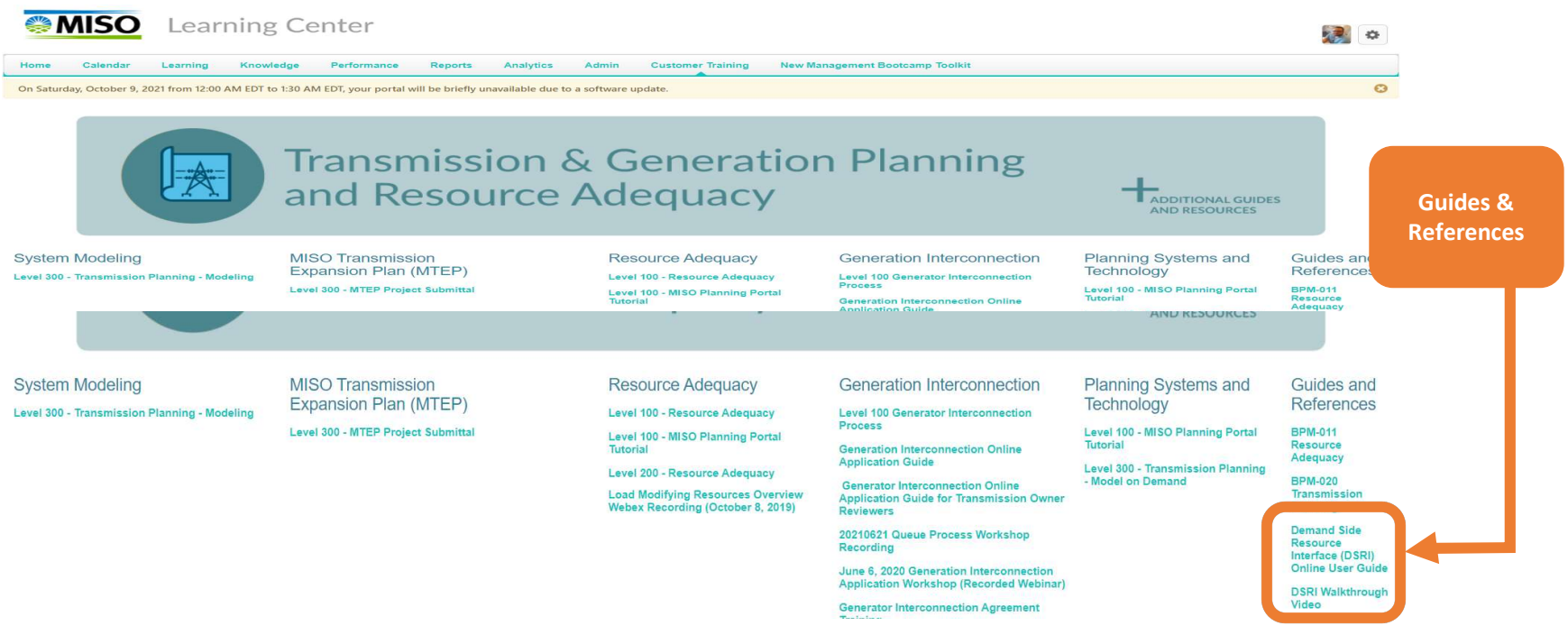
Demand Side Resource Interface (DSRI)

An MP can update their LMR Availability directly onto the **Availability** tab or via an LMR Availability API.



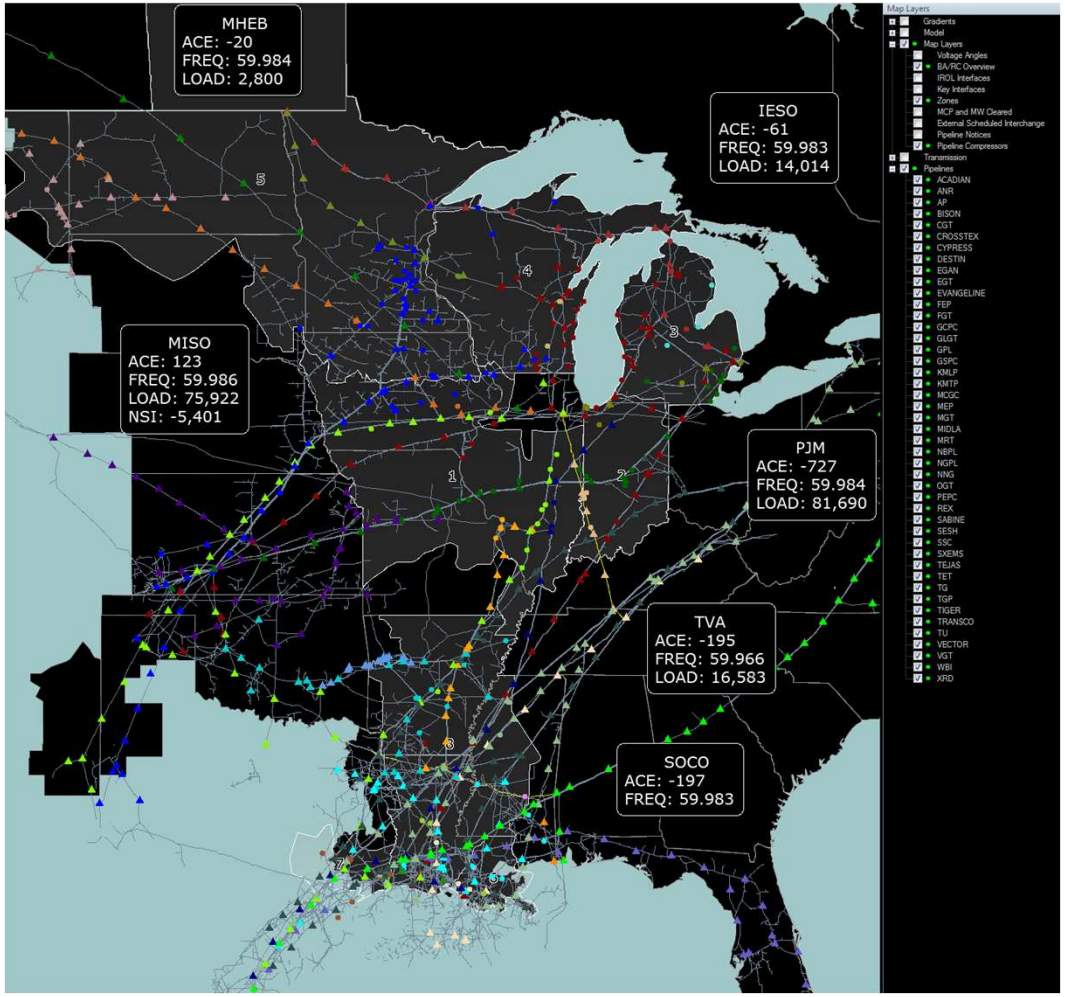
Demand Side Resource Interface (DSRI)

The **DSRI Online User Guide** and a **Walk-Through video** is available on the MISO Learning Center:



Readiness: Gas & Electric Coordination

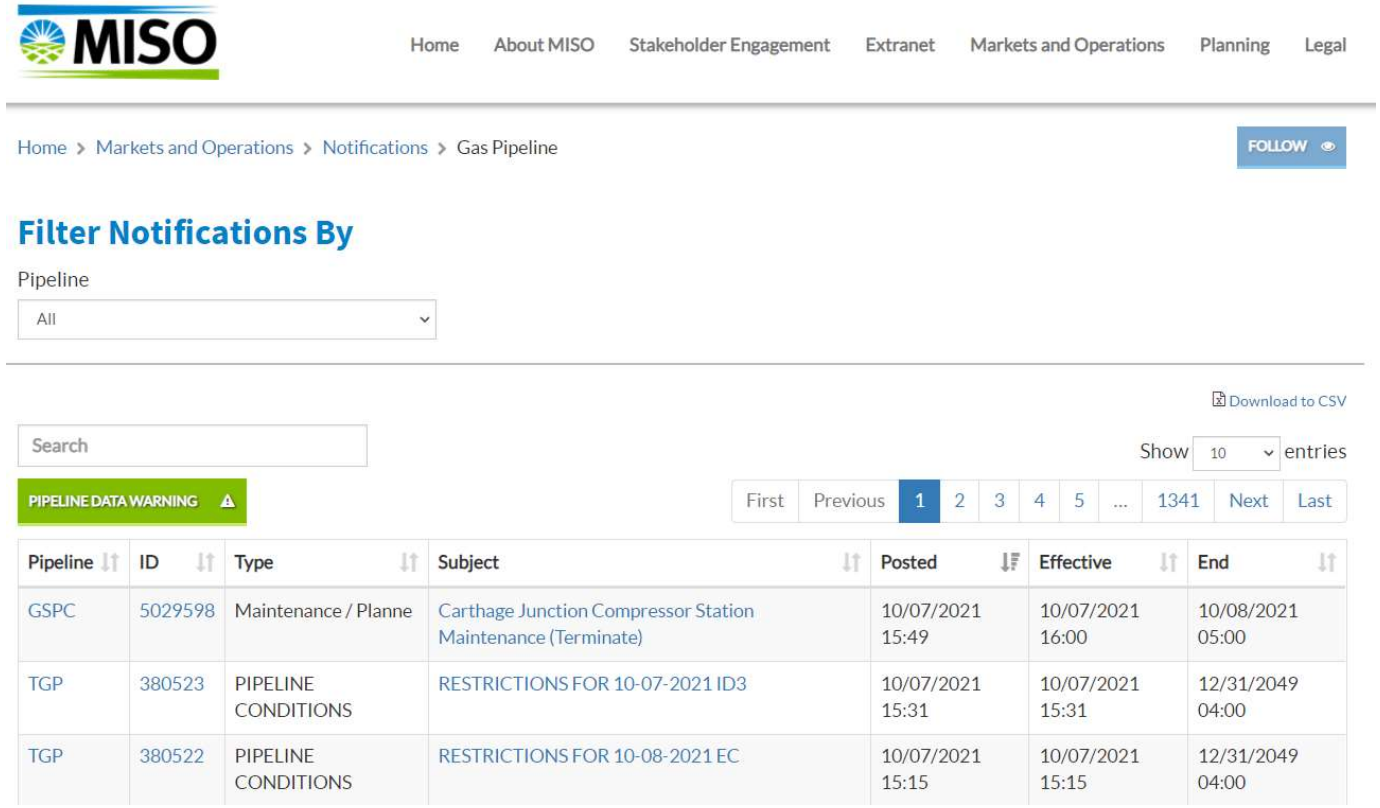
Gas pipeline and storage access throughout the MISO footprint support Winter generation needs



- Gas demand for electric power sector continues to increase as coal units retire
- Prolonged cold temperatures could impact pipeline delivery, withdrawals, and prices
- **Gas demand has grown, and MISO's evolving fleet will propel gas demand even higher.**

MISO's Gas Pipeline Notification allows Stakeholders to review public EBB Critical Notices from various pipelines

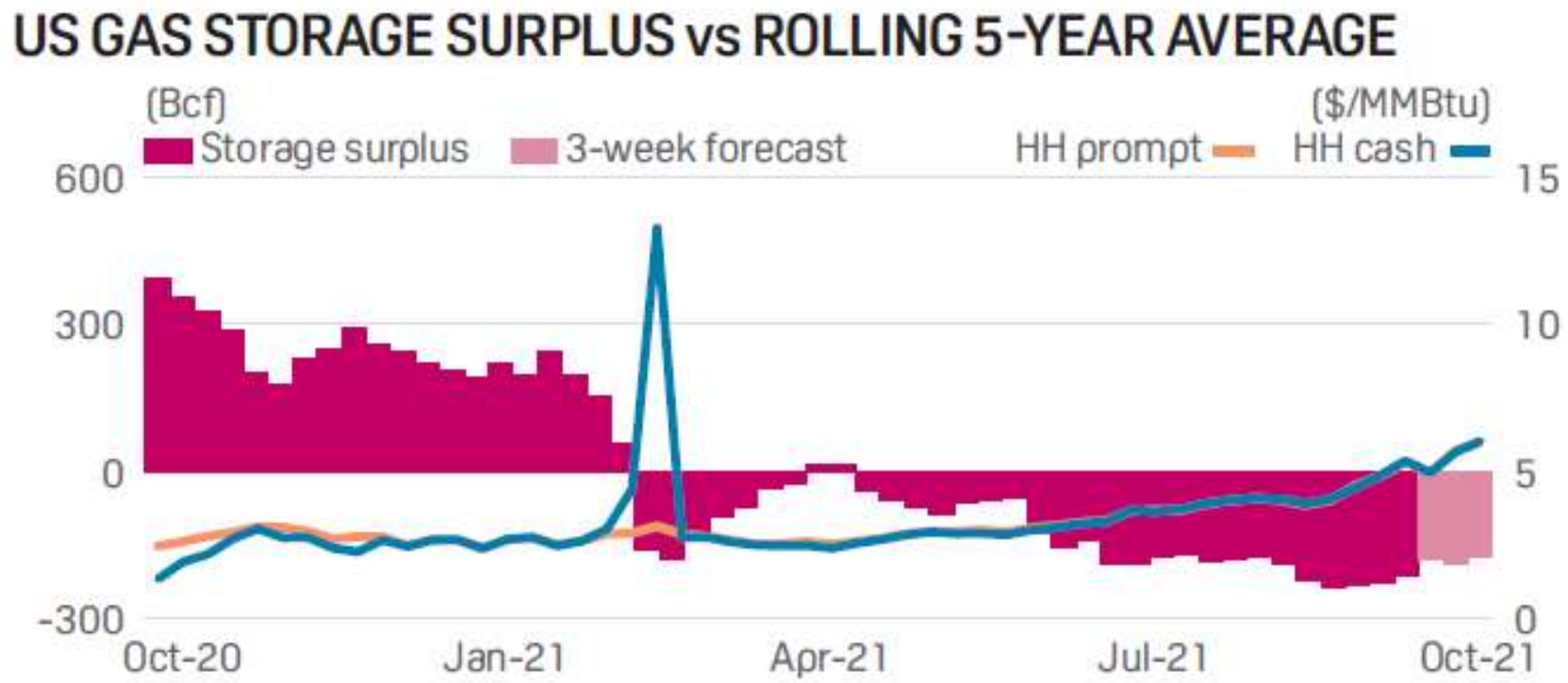
The Gas Pipeline notification page can be accessed directly from the MISO public website: https://www.misoenergy.org/markets-and-operations/notifications-overview/gas-pipeline/



Pipeline	ID	Type	Subject	Posted	Effective	End
GSPC	5029598	Maintenance / Planne	Carthage Junction Compressor Station Maintenance (Terminate)	10/07/2021 15:49	10/07/2021 16:00	10/08/2021 05:00
TGP	380523	PIPELINE CONDITIONS	RESTRICTIONS FOR 10-07-2021 ID3	10/07/2021 15:31	10/07/2021 15:31	12/31/2049 04:00
TGP	380522	PIPELINE CONDITIONS	RESTRICTIONS FOR 10-08-2021 EC	10/07/2021 15:15	10/07/2021 15:15	12/31/2049 04:00

North American Winter Storm Uri's affect on US Gas Storage (2/15/21 – 2/20/21)

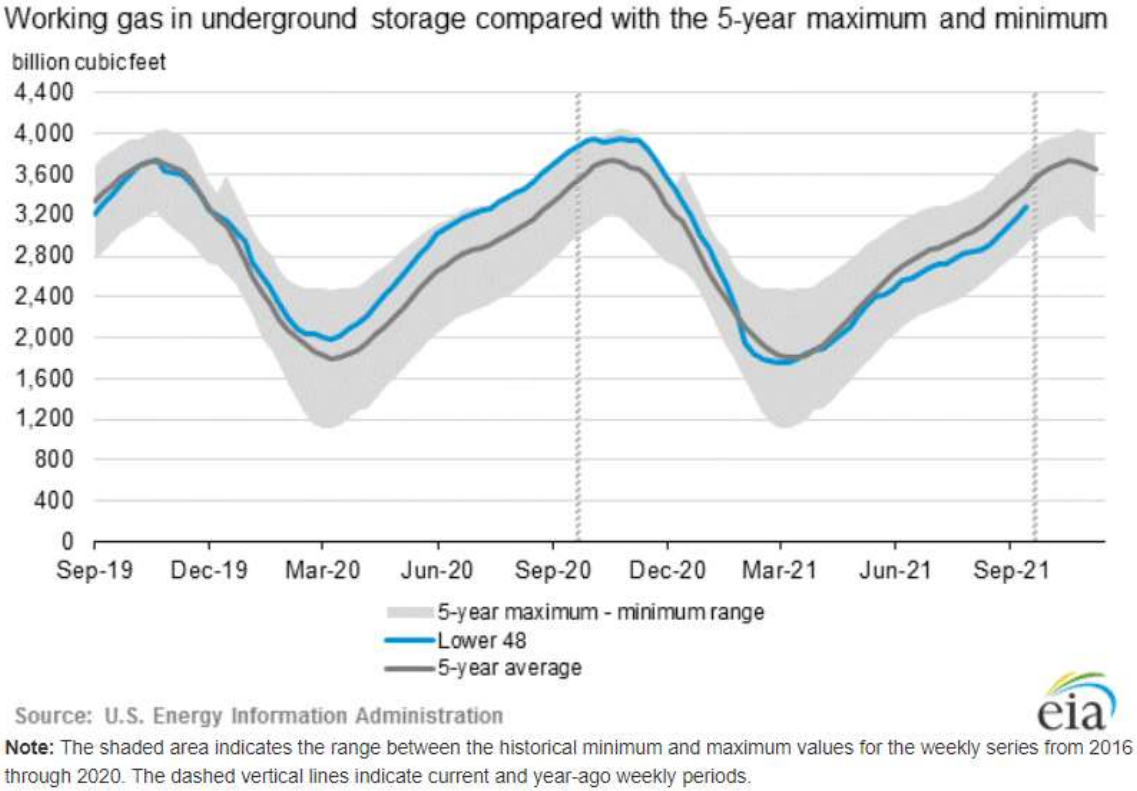
During the February 2021 Cold Weather event, a significant amount of gas was utilized to serve residential and power generation customers; which in turn, required gas operators to withdraw a significant amount of gas from storage facilities.



Data Source: S&P Global Platts Gas Daily Report for October 8, 2021

EIA Natural Gas Storage Summary

- Gas demand for 2021 were **much higher** than that of 2020; partially due to the global pandemic.
- Although US natural gas storage volumes in the week ended Oct. 1 increased by the largest build of the current injection season, **working natural gas in underground storage nationwide is below the five-year average.**

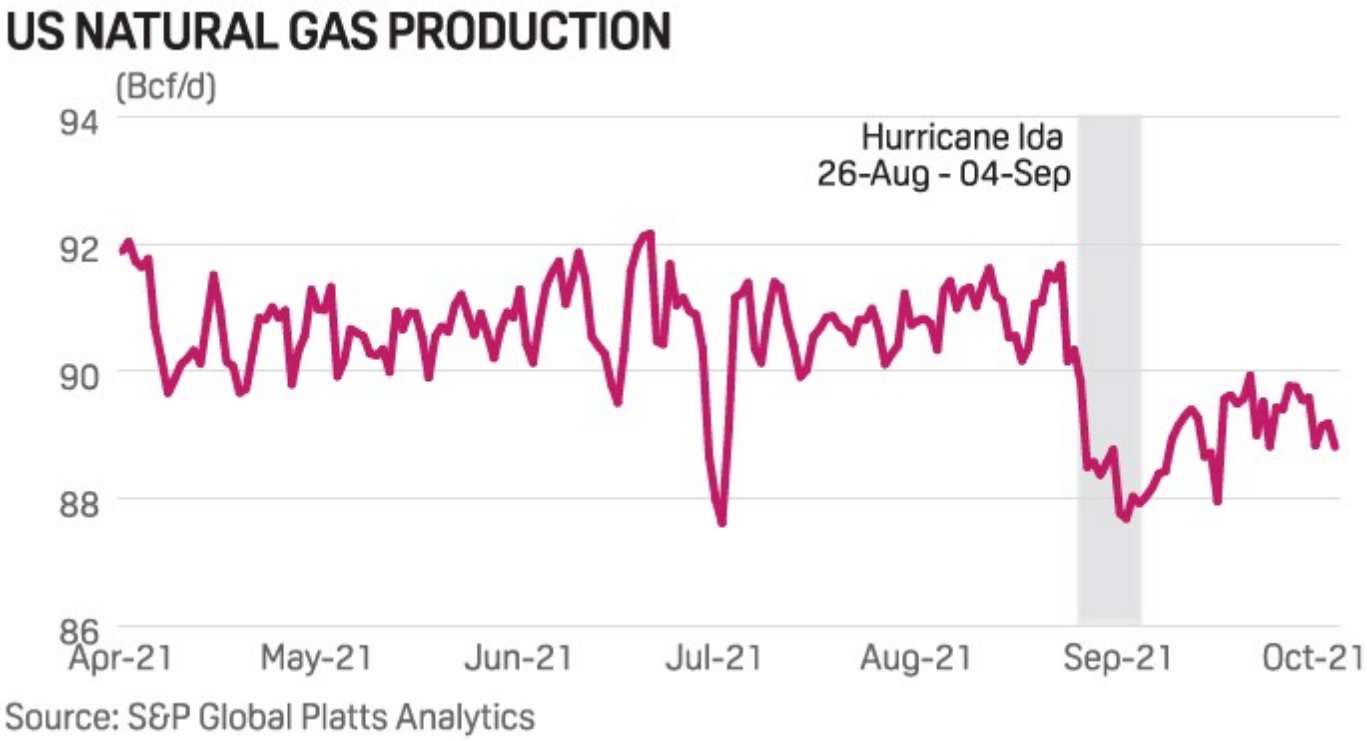


Note: The shaded area indicates the range between the historical minimum and maximum values for the weekly series from 2016 through 2020. The dashed vertical lines indicate current and year-ago weekly periods.

Data Source: U.S. Energy Information Administration Weekly Natural Gas Storage Report for week ending October 1 (https://ir.eia.gov/ngs/ngs.html)and S&P Global Platts Gas Daily Report for October 7, 2021

S&P Global Platts Report on US Natural Gas Production

Hurricane IDA's affect on the US Gas industry at the end of August 2021, has caused a significant reduction in US gas production (similar to the effects of Hurricane Laura at the end of August 2020):



Data Source: S&P Global Platts Gas Daily Report for October 5, 2021

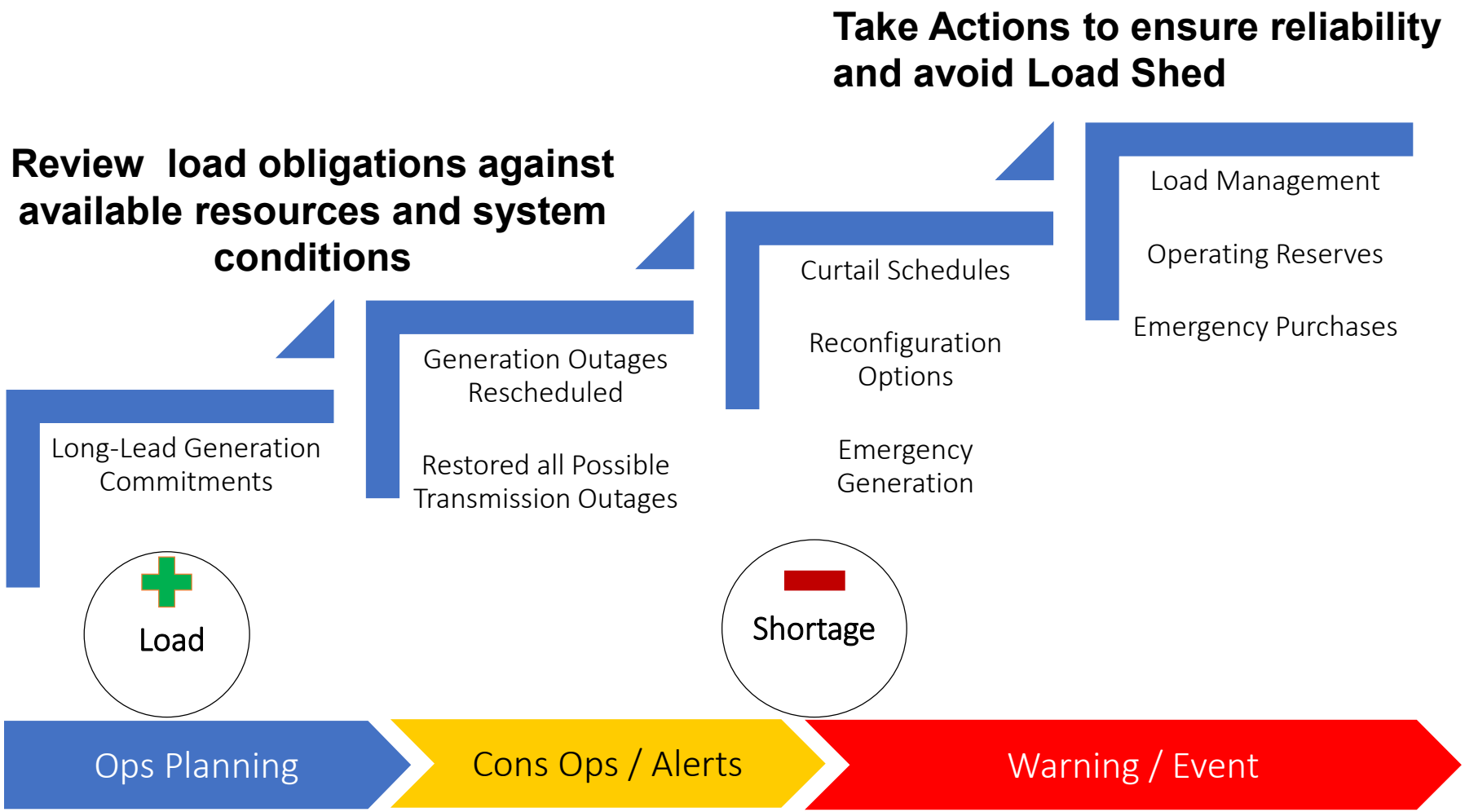
Readiness: Procedure Review

Procedures Review

Conservative System Operations Procedure
SO-P-NOP-00-449

MISO Market Capacity Emergency Procedure
SO-P-EOP-00-002

MISO prepares for extreme conditions in advance. In Real-Time, unplanned outages and other unknowns may require additional actions

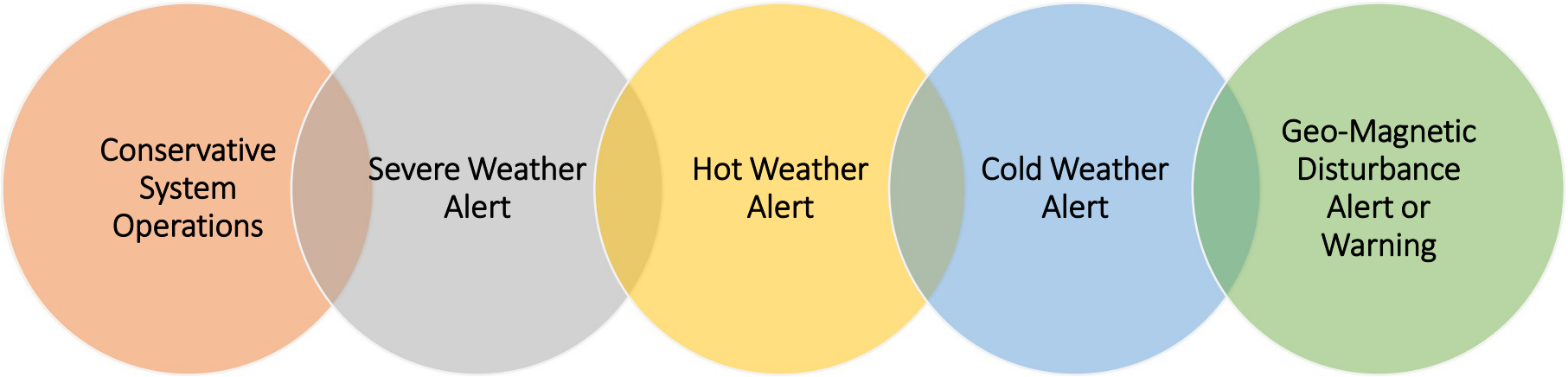


Implementation of Transmission Advisory

- **Provides situational awareness that an area or region within the MISO RC footprint has sustained significant <u>transmission</u> system damage.**
  - Due to extreme weather, e.g. major hurricane, tornado, ice storm
- **Provides MISO and its members with the ability to escalate reliability actions as necessary to ensure reliability of the affected area. Such escalation could include:**
  - Local Transmission Emergency (LTE)
  - Transmission System Emergency (TSE)

Conservative System Operations

- Five declarations are used to prepare operating personnel and facilities for extreme weather conditions or abnormal conditions that will, or have the potential to, impact the Bulk Electric System (BES):

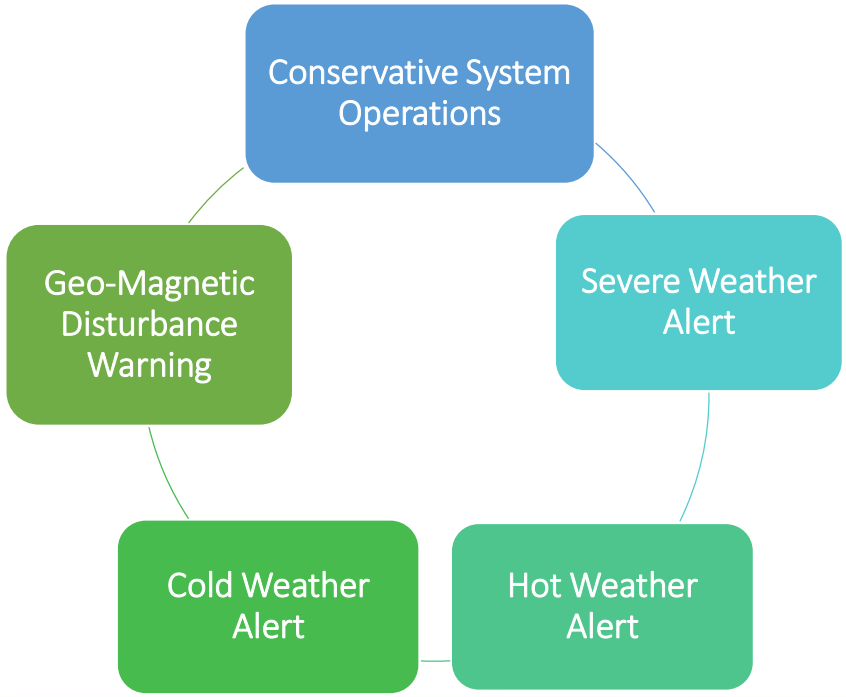


- Allows MISO & regional operators to defer or cancel transmission or generation outages to increase transfer capability and capacity .
- Provide instructions for returning planned outages/maintenance equipment to service, if possible, in the impacted areas
- Suspend all work on critical computer systems
- Prepare for the implementation of Emergency Procedures

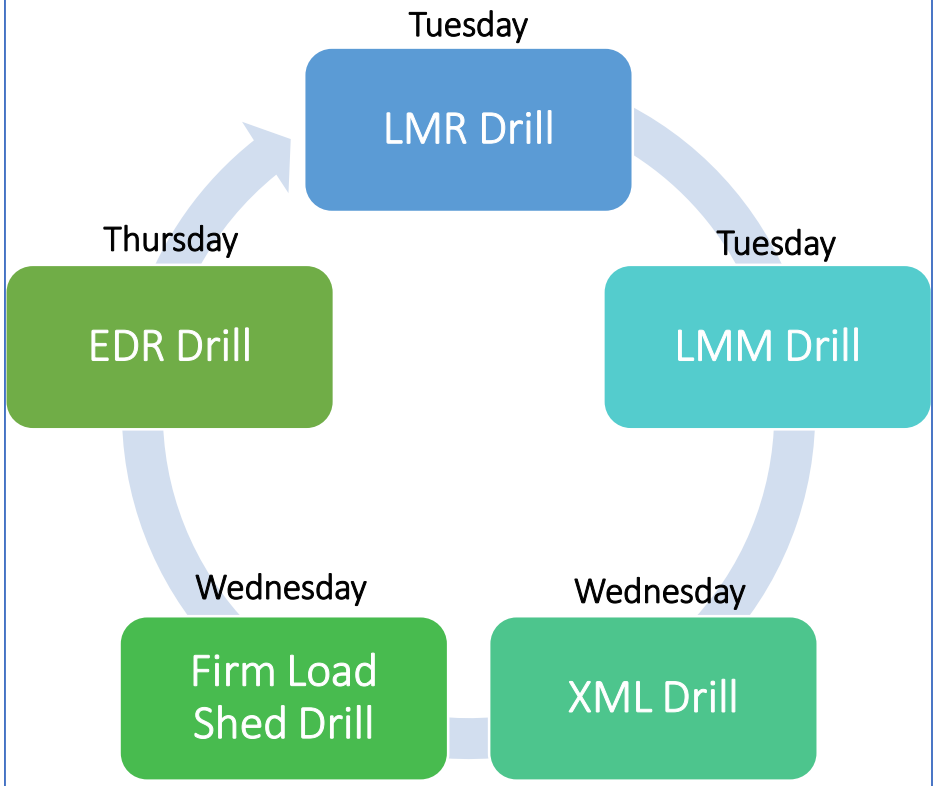
Data Source: Conservative System Operations SO-P-NOP-00-449 Rev: 5

Operators use emergency procedures and partner with members to drill on emergency process to ensure readiness in all operating situations

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



Monthly Drills



Power Restoration Drills: Two Drills held Oct 5/6 & 19/20
Summer Readiness Drills: 6 Thursdays in April and May 2021

Data Source: SO-P-NOP-00-449 Rev 5 Conservative System Operations and SO-P-EOP-00-002 Rev 12 MISO Market Capacity Emergency procedures

Market Capacity Emergency Procedure Steps

New in 2021

Capacity Advisory	• Advance notice of forecasted capacity shortage, requests Stakeholders update offer data	
Alert	• Define boundaries/suspend maintenance, set Emergency Pricing Tier 0 Offer Floor	Emergency Pricing Tier 0 Offer Floor
Warning	• Schedule in External Resources, Curtail export transactions, Reconfiguration, and set Emergency Pricing Tier 1 Offer Floor	Emergency Pricing Tier 1 Offer Floor
Step 1	• Commit Emergency Resources, Declare NERC EEA 1, Activate Emergency Limits	
Step 2	• Declare NERC EEA 2, Implement LMRs, LMMs Stage 1, Commit EDR Resources, Emergency Energy Purchases, Public Appeals, and set Emergency Pricing Tier 2 Offer Floor	
Step 3	• Utilize Operating Reserves, and LMMs Stage 2	Emergency Pricing Tier 2 Offer Floor
Step 4	• Reserve Call and Emergency Reserve Purchases	
Step 5	• Declare NERC EEA 3, Firm Load Shed, and set LMPs and MCPs to the VOLL	
Termination	• Max Gen and, possibly, Capacity Advisory Termination	

Data Source:SO-P-EOP-00-002 Rev 12 MISO Market Capacity Emergency

Contact Info

Mike Carrión

mcarrion@misoenergy.org

Keynote Speaker: 2020 Arctic Event – Preliminary Findings

Heather Polzin / David Huff

FERC

Thank you for joining us today!

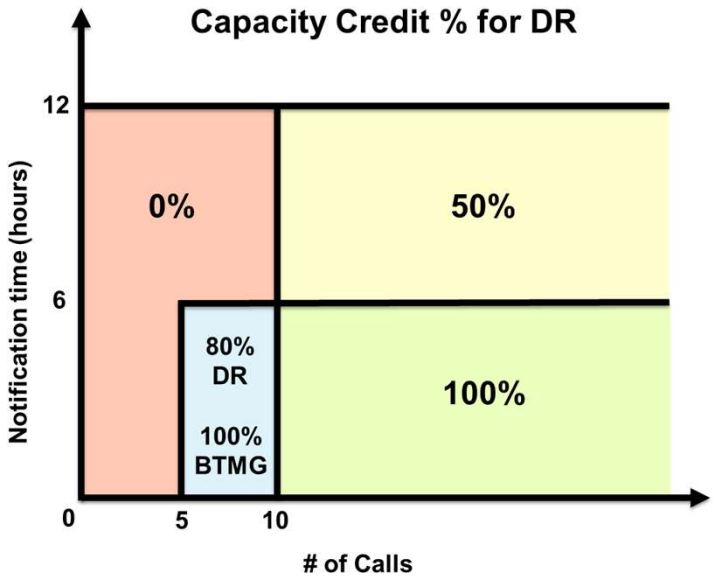
Appendix I:
Load Modifying Resource Accreditation Updates

LMR accreditation based on the critical factors of notification times and call limits will begin in the 2022-2023 Planning Year

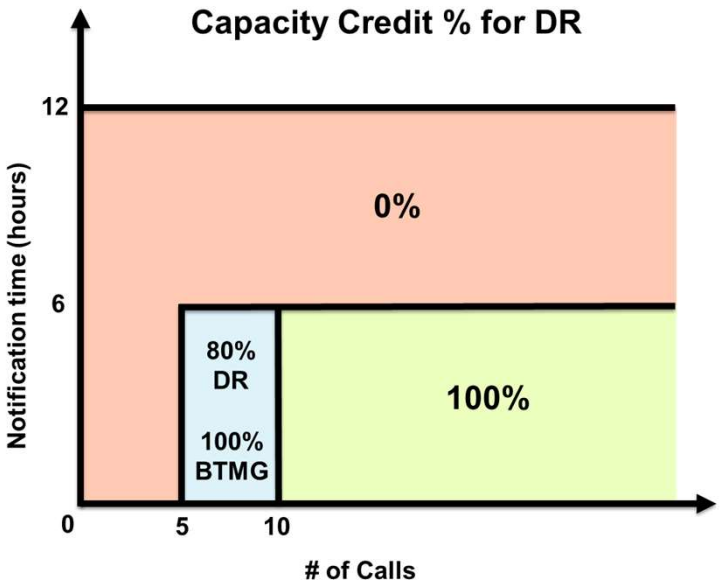
- Current accreditation methodologies to remain in place through the 2021-2022 Planning Year
- MISO's final LMR accreditation proposal reflected a delay by 1 year of the proposed changes, as many stakeholders requested, to provide sufficient time to adjust contracts and complete required state processes
- The final proposal also retained partial credit for LMRs having notification times over 6 hours until 2023-2024 Planning Year

As requested, MISO revised the proposal, which provides a transition to allow stakeholders time to adequately prepare

22/23 Planning Year



23/24 Planning Year



MISO encourages stakeholders that can obtain reductions in notification times or increase call limits to do so prior to the 22/23 Planning Year, especially in LRZs that have greater reliance on LMRs

FERC Filing and Approval

- MISO filed LMR accreditation changes at FERC on 5/18/2020 under Docket #: ER20-1846-000

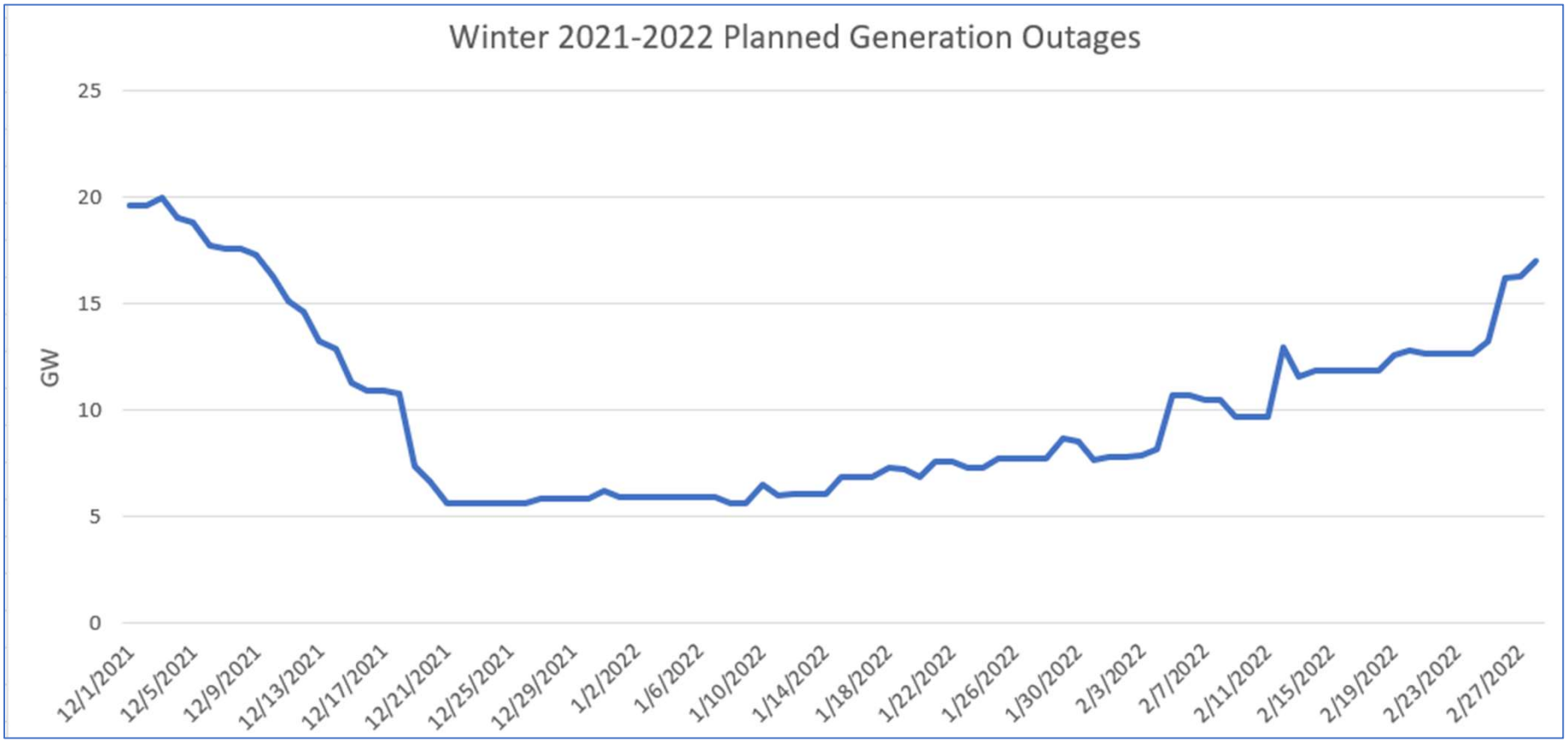
- On August 14, the Commission issued an Order accepting the LMR accreditation filing, effective August 16, 2020, as requested

- MISO continues to discuss the Resource Adequacy Construct and Resource Accreditation at the Resource Adequacy Subcommittee (RASC)

Intermittent Deliverability ICAP

- Intermittent resources are required to demonstrate deliverability for conversion of UCAP to ZRCs in the PRA.
- Unlike with conventional where deliverability up to nameplate is required for full conversion, deliverability only up to the highest sampled observance (output during the top 8 annual peaks from the wind ELCC capacity credit study or submitted data templates for solar & run-of-river) is required for full conversion.
- Any historical system injection that exceeds demonstrated deliverability (NRIS + ERIS w/ TSR) is capped down to the amount of demonstrated deliverability for that intermittent resource.
- There was a small decline in the percentage of intermittent resource UCAP conversion, however, it is difficult to say how much of that was due to the Deliverable ICAP requirements. The actual amount of UCAP conversion for intermittent units actually increased from last year, which can be attributed to new resources coming on line for 21-22.
- Overall, it would appear that the Deliverable ICAP requirements ultimately had very little impact on the ability of MPs to convert their ERIS UCAP.

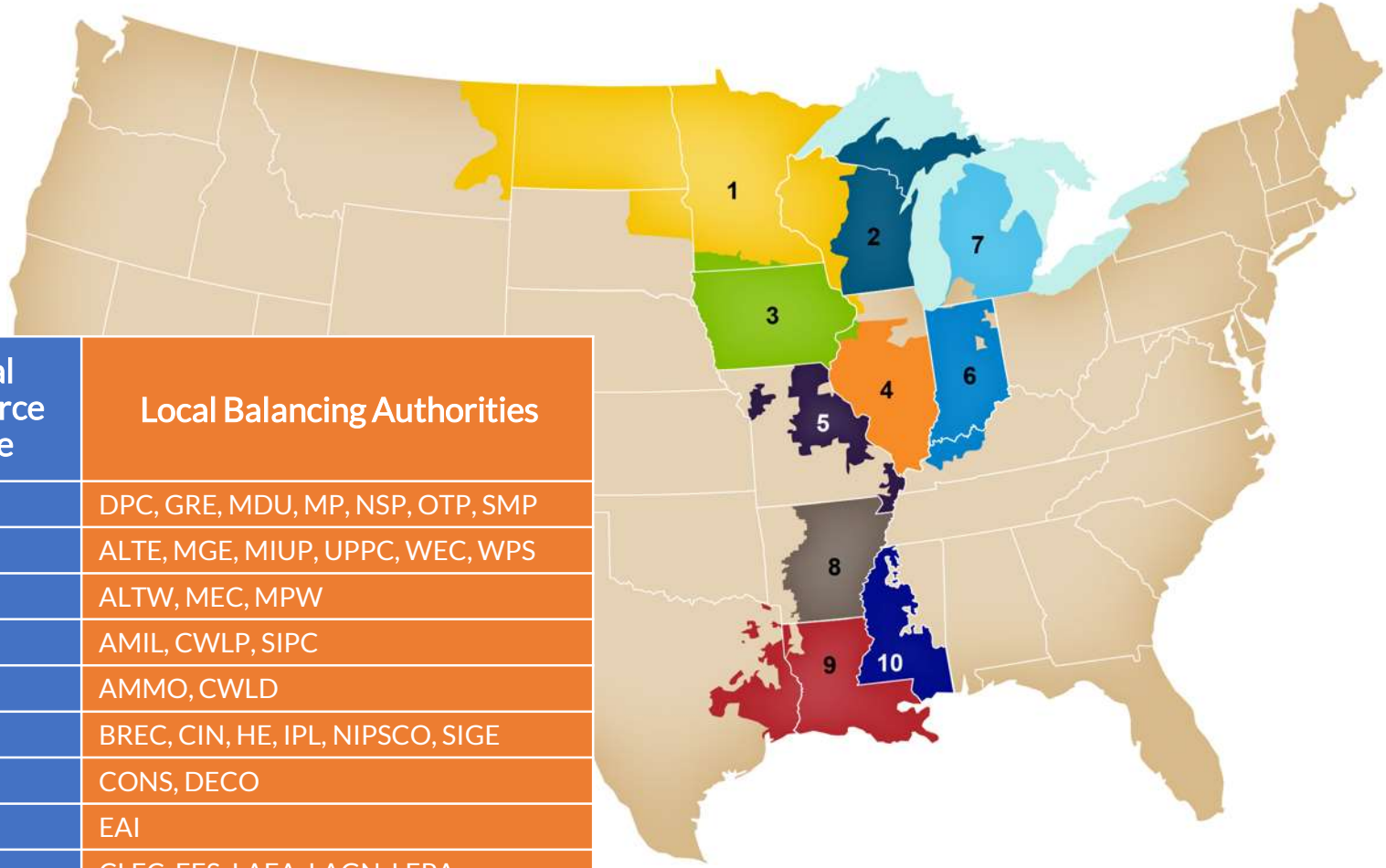
Appendix II: Generation Resource Assessment



Source: Control Room Outage Window (CROW)

Appendix III:
Winterization Survey

MISO LRZ Map



Local Resource Zone	Local Balancing Authorities
1	DPC, GRE, MDU, MP, NSP, OTP, SMP
2	ALTE, MGE, MIUP, UPPC, WEC, WPS
3	ALTW, MEC, MPW
4	AMIL, CWLP, SIPC
5	AMMO, CWLD
6	BREC, CIN, HE, IPL, NIPSCO, SIGE
7	CONS, DECO
8	EAI
9	CLEC, EES, LAFA, LAGN, LEPA
10	EMBA, SME

Survey Questions

Does the resource have a plan to prepare for winter or have all known actions to prepare already been taken? * ○ Yes ○ No

What ambient air temperature can the plant reliability operate at for an extended period of time, i.e. >24 hours. Please provide your best estimate based on design temperature, historical operating temperature or current cold weather performance temperature determined by an engineering analysis.

◉ Temperature limit is known

*Temperature

*Units

Fahrenheit

○ Temperature limit is unknown

○ There is no temperature that impacts operation

Has plant management and/or maintenance personnel reviewed the current NERC Guideline Generator Unit Winter Weather Readiness – Current Industry Practices? * ○ Yes ○ No

Is there a corporate or plant procedure for an extreme cold weather event or have all known actions to prepare already been taken? * ○ Yes ○ No