Market Redefinition: Load Modifying Resource Reforms

Resource Adequacy Subcommittee (RASC)

RASC-2019-9

August 21, 2024

Purpose & Key Takeaways

Purpose: Review:

1) MISO's near-term plans to address data discrepancy in DSRI tool
2) Drivers for a need to change framework for all demand side resources
3) Revised proposal for LMRs to participate in MISO Markets

Key Takeaways:

- The system remains reliable, however, there is less capacity available across all hours, which in turn increases the risk of the system needing to use LMRs more frequently and across a wider variety of conditions.
- Risky hours are already beginning to shift from on-peak summer days towards off-peak, lower load periods and LMR accreditation based upon a peak-load hour paradigm is no longer sufficient.
- MISO proposes two participation options for LMRs: LMR Type - I and LMR Type - II
    - LMR Type - I resources, with notification time of up to 6 hours, will be accessible by MISO operations during Max Gen Alerts and above.
    - LMR Type - II resources, with notification time less than 30 minutes, will be accessible by MISO operations during EEA 2.
- MISO will re-initiate discussions on evaluation of changes to method used to allocate Planning Reserve Margin Requirement in coming months.

LMR Reforms

Over the past few years, MISO has focused on multiple Resource Adequacy initiatives to improve pricing and accreditation in response to the Reliability Imperative

'What is needed for reliability?'

Adjustments to parameters, methodologies to reflect operational experience

Key Initiatives:
- ✓ Loss of Load Expectation (LOLE) outage modeling improvements
- ✓ Reliability Based Demand Curve (RBDC) – Approved!
- • LOLE modeling enhancements - ongoing

'What is counted from member resources?'

Evolution of accredited capacity values to reflect the expected capability and availability of the resource during periods of shifting reliability risk

Key Initiatives:
- ✓ Seasonal construct
- ✓ Resource accreditation: thermal, wind, solar and storage - Filed
- • **LMR reforms – Today's focus**

'How do we know what the system will need in the future?'

Maturation of information exchange, modeling, and gap analysis to better inform resource investment and retirement

Key Initiatives:
- ✓ Regional Resource Assessment
- ✓ OMS-MISO Survey enhancements

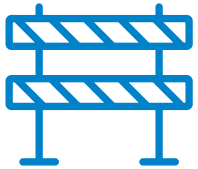
Reliability Imperative, Markets of the Future, MISO Futures, Renewable Integration Impact Assessment (RIIA), Regional Resource Assessment (RRA), Attributes Roadmap

MISO's Insights* & Their Implications on Demand

INSIGHTS	DEMAND IMPLICATION
The acknowledgement of weather-dependent outages and deliverability captures additional risk factors that are projected to appear in future portfolios.	This is expected to shift risk towards non-peak hours and demand should be accredited to its capabilities during risky times.
Accreditation should align with the risk distribution, regardless of the underlying sources of risk modeled, and tracks the contribution of individual resources.	This is the same principle underlying the DLOL based accreditation changes recently filed at FERC and is as applicable for demand resources as it is for generation resources.
The projected increase in risky days and lack of guarantees for availability of emergency and external resources increase the need to rely on demand side resources.	This requires demand resources that can be deployed sooner to ensure reliability of the grid.

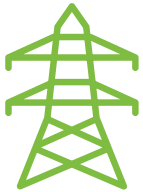
* These insights come from works related to the Reliability Imperative to which links are provided in Slide 4.

MISO analyses and historical performance data have identified several risk factors that MISO should take into consideration for LMR reforms



- ✓ The system is already experiencing challenges. The uncertainty and risk have increased but are currently manageable. However, challenges are expected to continue to accelerate due to increasing uncertainties and risk.
- ✓ Demand-side resource accreditation changes are needed quickly to:
  - ✓ Properly accredit and incentivize resources to report their actual availability to MISO when they are needed in real-time.
  - ✓ Address challenges that are starting to bring risk to the system.

- ✓ The inability to change demand-side resource accreditation could lead to:
  - ✓ Increased future risk due to incentivizing the wrong types of resources.
  - ✓ Demand inefficiently crowding out needed generation and increasing system risk.



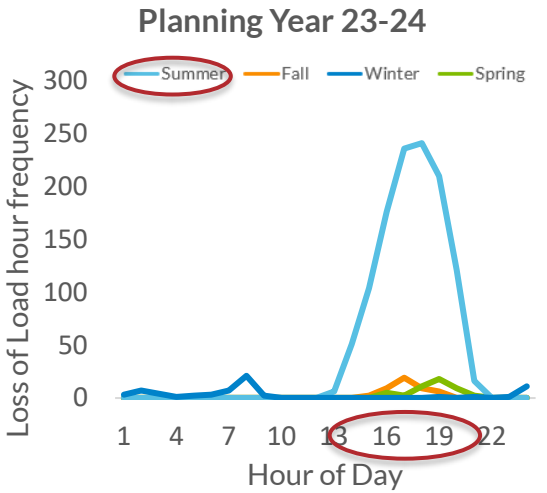
- ✓ Changes to MISO systems and demand resource participation will be needed in the operational horizon to minimize system risk and maintain economic efficiency.

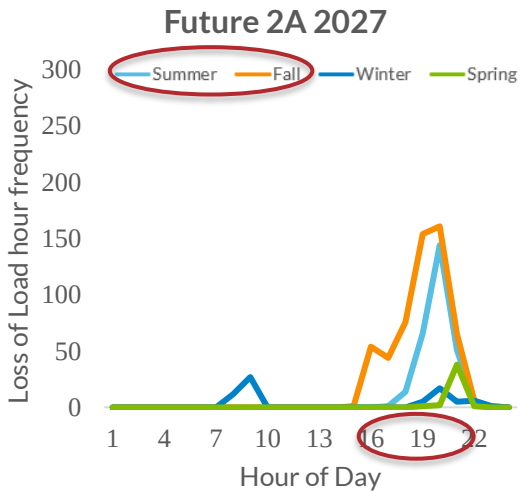
Summer Risky Hours are occurring during lower loads and later in the day than previous years

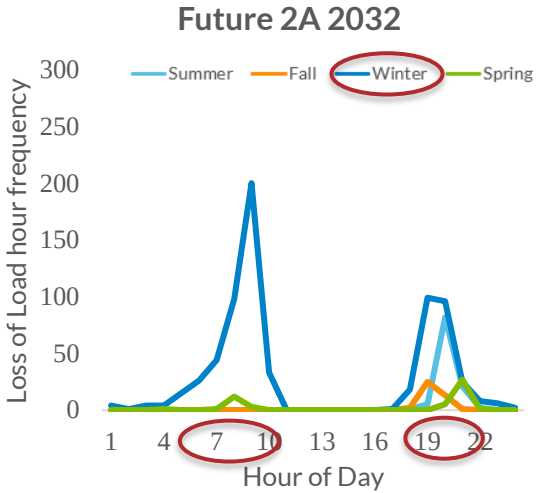
# of Hours with Low Excess Offered Capacity			
Load Level	2018 - 2020		2021 - 2023
> 120 GW	2		13
> 115 GW <= 120 GW	18		74
> 110 GW <= 115 GW	43		69
> 105 GW <= 110 GW	8		47
< 105 GW	0		14
# of Hours experiencing an RA Hour			
> 120 GW	2		13
> 115 GW <= 120 GW	18		52
> 110 GW <= 115 GW	38		52
> 105 GW <= 110 GW	5		38
< 105 GW	0		10

# of Hours with Low Excess Offered Capacity			
Load Level	2018 - 2020		2021 - 2023
12 AM	2		6
1 PM	9		23
2 PM	13		30
3 PM	17		38
4 PM	16		42
5 PM	10		40
6 PM	3		25
7 PM	0		11
8 PM	0		2
# of Hours experiencing an RA Hour			
12 PM	1		4
1 PM	7		13
2 PM	11		24
3 PM	17		30
4 PM	15		33
5 PM	9		32
6 PM	3		22
7 PM	0		6
8 PM	0		1

MISO's analysis demonstrates a shift in risk from summer peak hours to winter shoulder hours







MISO has projected that system risk is shifting from the Summer load peak towards Winter shoulder hours. Data demonstrates this shift has already begun.

Demand may not be able to produce the same capacity value it does during Summer peaks during Fall and Winter risky hours.

Accreditation needs to send accurate signals so that appropriate resources are built and maintained.

Source: MISO Attributes Roadmap, Figure 5 pg. 11

Adjustments to Proposal

MISO has revised the proposed participation options for LMRs based upon stakeholder feedback

1. MISO is proposing two capacity only participation options for Load Modifying Resources (LMR) – No energy market payments for either one

A. LMR Type - I

- Available for deployment during MaxGen Alerts; Max response time: 6 hours
- No requirement to submit an offer in Day Ahead (DA) – the "must offer" will be during Capacity Advisory or emergency declaration hours
- Provides flexibility in number of responses and response time; Accreditation will be based on response time and real-time availability
- Market Participant submits Real Time (RT) availability in MISO Market User Interface (MUI) or Market Portal to be used for commitment (through Look Ahead Commitment) and dispatch (through Unit Dispatch System (UDS) Clearing) in RT

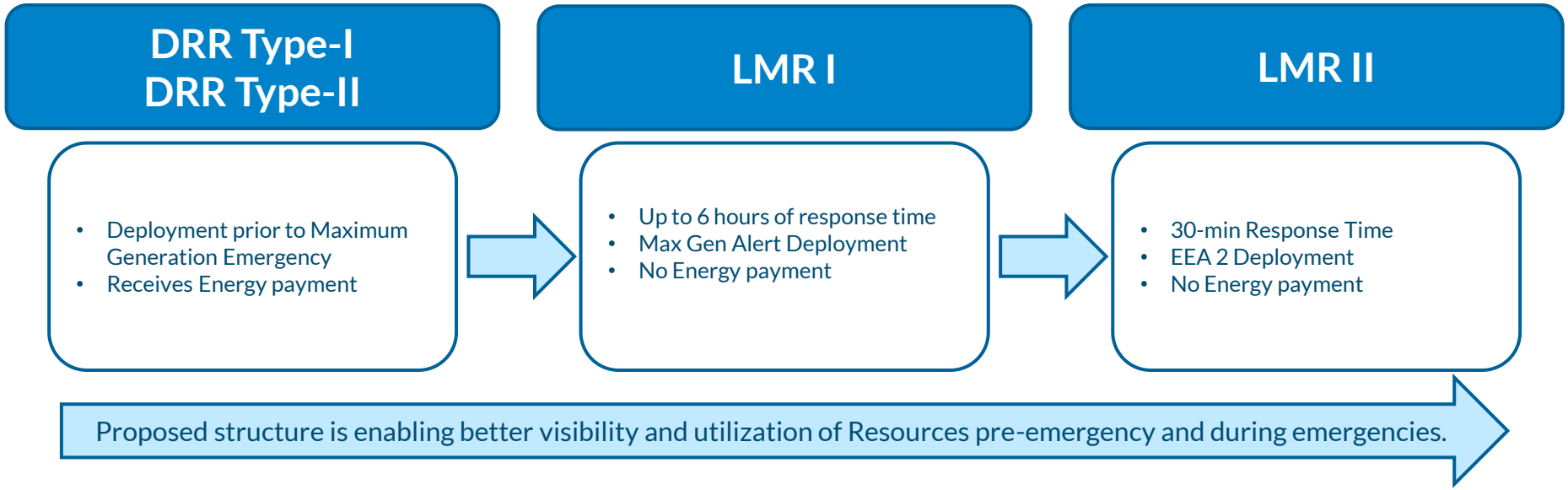
B. LMR Type - II

- Available for deployment during EEA 2 or higher; Max response time: 30 minutes
- No requirement to submit an offer in DA – the must offer will be during Capacity Advisory or emergency declaration hours
- Must be able to respond to all EEA 2 events
- Market Participant submits RT availability in Demand Side Resource Interface (DSRI) or Market User Interface (MUI) (Under investigation); Deployment through MISO Scheduling Instructions

2. MISO also considering changes to existing Demand Response Resource - Type I and II (DRR Type-I and Type-II) options to ensure alignment across all participation models for Demand Resources

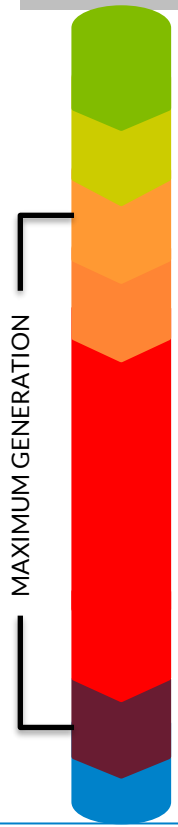
- No requirement to submit an offer in DA – the must offer will be during Capacity Advisory or emergency declaration hours
- Provides flexibility in number of responses and response time; Accreditation will be based on response time and real-time availability

Demand Resources will have varying levels of response time and accreditation depending on the participation option chosen



- No dual-registration
- MISO also considering eliminating the Emergency Demand Resources (EDR) option

MISO is evaluating changes needed to the capacity emergency procedures based upon its LMR proposal



MARKET CAPACITY EMERGENCY PROCEDURE STEPS

Normal Operations		Normal Pricing
Capacity Advisory	Advance notice of forecasted capacity shortage, requests Stakeholders update offer data	
Alert	Define boundaries/suspend maintenance, implement Load Modifying Resources Type – I resources	Emergency Pricing Tier 0
Warning	Schedule in external resources, curtail export transactions, activate reconfiguration	Emergency Pricing Tier I Offer Floor
Event Step 1	Commit emergency resources, declare NERC (Energy Emergency Alert) EEA 1, activate emergency limits	
Event Step 2	Declare NERC EEA 2, implement LMR Type - II, Load Management Measures (LMMs) Stage 1, commit Emergency Demand Response (EDR) resources, emergency energy purchases, public appeals	Emergency Pricing Tier II Offer Floor
Event Step 3	Utilize operating reserves and LMM Stage 2	
Event Step 4	Reserve call and emergency reserve purchases	
Event Step 5	Declare NERC EEA 3, firm load shed, and set Locational Marginal Prices (LMPs) and Market Clearing Prices (MCPs) to the VOLL	Value of Lost Load (VOLL) Pricing
Termination	Terminate Max Gen and possibly Capacity Advisory	Normal Pricing

MISO is considering an accreditation approach for demand resources that is aligned with that of generation resources

- Demand resources will have a historical resource level performance portion of accreditation and a future portion of accreditation.

- Historical performance portion of accreditation will be based on their reported availability during each hour of Capacity Advisory or higher event when not deployed
  - Resource offers should be consistent with actual average hourly load
  - Accreditation will account for Resources that would increase load but do not like Spin reserves provided by Batch Load Demand Response

- Like the DLOL based methodology, the future portion of accreditation comes from a weighing based upon the likelihood that Demand was deployed in the Loss of Load Expectation model during off-peak and on-peak hours
  - E.g. If Demand Resources deployment in the LOLE analysis is 90% during on-peak hours and 10% during off-peak hours; weight of 90% will be applied to historical performance during on-peak hours and weight of 10% will be applied to historical performance during off-peak hours to calculate final accreditation value

Problem Statement

At the July 10th RASC, MISO presented its revised problem statement by adopting the WPPI proposed problem statement with some minor adjustments and other stakeholder suggestions post May RASC meeting*

Problem Statement

With the increased penetration of intermittent resources, changing weather patterns, and growing electrification, higher uncertainty and complexity is expected in the future. This evolving situation requires MISO and LSEs to fully understand the capabilities and responsibilities of all demand resources clearing the Planning Resource Auction (PRA). Rules and procedures need to be developed for effective market participation of such resources while helping MISO maintain reliability during capacity emergency situations.

- Resource accreditation should reflect the availability of resources when they are most needed. MISO's existing accreditation methods for Load Modifying Resources and Demand Response Resources require further evaluation to ensure that the accredited capacity value appropriately reflects each resource's contribution to resource adequacy.
- Real-time availability data for LMRs indicates far less capacity than the PRA-cleared quantity.
- Allowed response times for LMRs require evaluation to better address capacity emergencies (EEA 2 or higher).

Scope

Reform requirements and accreditation practices for all demand response resources, including BTMG, to reflect their real-time availability and ensure reliability during emergencies.

Relevant Market Design Guiding Principles

1. Facilitate non-discriminatory market participation regardless of resource type, business model, sector or location
2. Support market participants in making efficient operational and investment decisions.
3. Maximize alignment of market requirements with system reliability requirements.

*At the May RASC meeting, MISO presented its previous problem statement (included in appendix) related to LMR Reforms and sought feedback from stakeholders.

MISO sees similarity between WPPI's suggested problem statement and MISO's revised problem statement presented at the July 10th RASC

- MISO agrees and acknowledges that the first item identified in WPPI's problem statement can be explored and worked on in the near-term. (see next slide)

MISO Problem Statement	WPPI Problem Statement
With the increased penetration of intermittent resources, changing weather patterns, and growing electrification, higher uncertainty and complexity is expected in the future. This evolving situation requires MISO and LSEs to fully understand the capabilities and responsibilities of all demand resources clearing the Planning Resource Auction (PRA). Rules and procedures need to be developed for effective market participation of such resources while helping MISO maintain reliability during capacity emergency situations. 1. Resource accreditation should reflect the availability of resources when they are most needed. MISO's existing accreditation methods for Load Modifying Resources and Demand Response Resources require further evaluation to ensure that the accredited capacity value appropriately reflects each resource's contribution to resource adequacy. 2. Real-time availability data for LMRs indicates far less capacity than the PRA-cleared quantity. 3. Allowed response times for LMRs require evaluation to better address capacity emergencies (EEA 2 or higher).	Explore and address as needed – 1. The gap between LMR availability and capacity cleared in the PRA MISO has been reporting 2. The difficulty MISO Operators are having effectively using LMRs to address capacity emergencies [Similar to Item # 2 in MISO's Problem Statement] 3. MISO existing accreditation methods for LMRs to ensure that the accredited capacity value appropriately reflects each resource's contribution toward resource adequacy [Similar to Item # 1 in MISO's Problem Statement]

MISO proposed work plan to explore and address gaps between LMR availability in DSRI and capacity cleared in the PRA

Other ongoing efforts related to enhancing participation of Demand Resources in MISO

Locational Enrollment Service; 2024 – 2026

- Finalize timeline for Demand Response Resources (DRRs) and LMRs to use Locational Enrollment Service
- Inform stakeholders about the rollout plan
- Training on the new Locational Enrollment Service

Demand Response Participation Rules (Being discussed at Market Subcommittee); Q3 2024 – Q4 2025

- File Tariff changes to enhance attestation and meter data requirements for all Demand Resources in MISO
- Develop revised BPM language for Measurement & Verification
- Implement proposed changes – Time is TBD

Stakeholder Feedback Request

- MISO is requesting feedback on its revised LMR proposal, specifically if MaxGen Alert deployments are acceptable, by September 5th
- MISO Dashboard ID#: *RASC-2019-9*
- Feedback requests and responses are managed through the Feedback Tool on the MISO website: misoenergy.org/stakeholder-engagement/stakeholder-feedback/

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Appendix

Problem statement and scope of current reform efforts presented at the May RASC meeting

Problem Statement

MISO operators can access LMRs only during emergency operating conditions and need LMRs to respond quickly to manage such conditions and effectively maintain reliability. LMRs currently have a notification time requirement of 6 hours or less, although, in many cases, operators do not know well in advance that they will be needed. Additionally, MISO has observed substantially lower availability of LMRs in real-time compared to the cleared capacity in the PRA. With the increased penetration of intermittent resources, changing weather patterns, and growing electrification, higher uncertainty and complexity is expected in the future. This requires LMRs to be very fast and reliable to be able to respond to MISO signals to help maintain reliability in capacity emergency conditions.

Scope

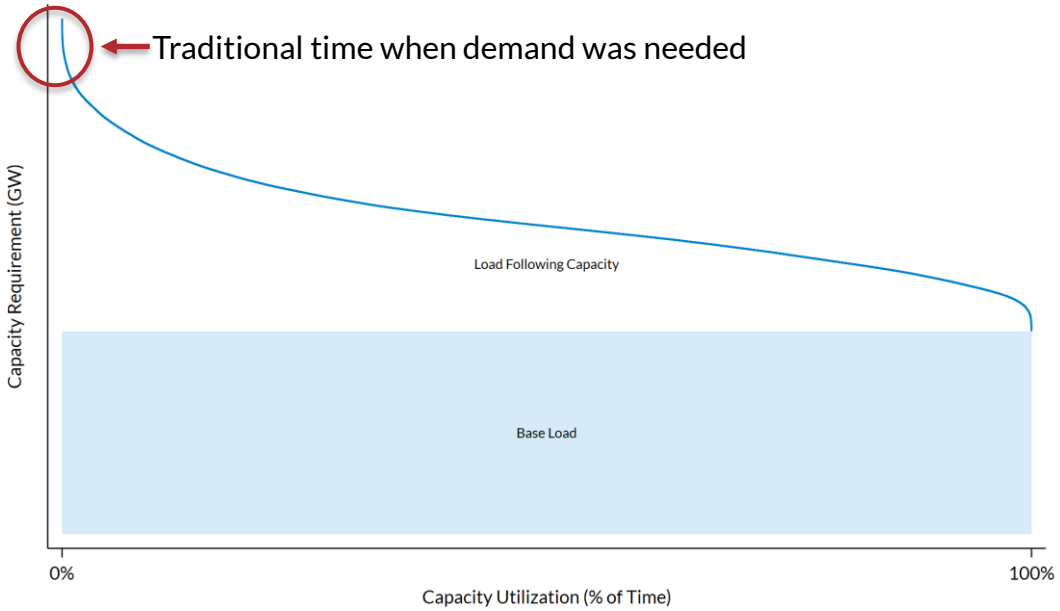
Redefine LMR, enhance participation requirements, and update other DR products to provide alternative avenues for current LMRs to participate in the markets, with a focus on implementing the new requirements effective for PY2028-2029. A FERC Filing in Q3 2024 will allow MISO to send appropriate signals to Market Participants and regulators for making necessary changes related to the LMRs.

Relevant Market Design Guiding Principles

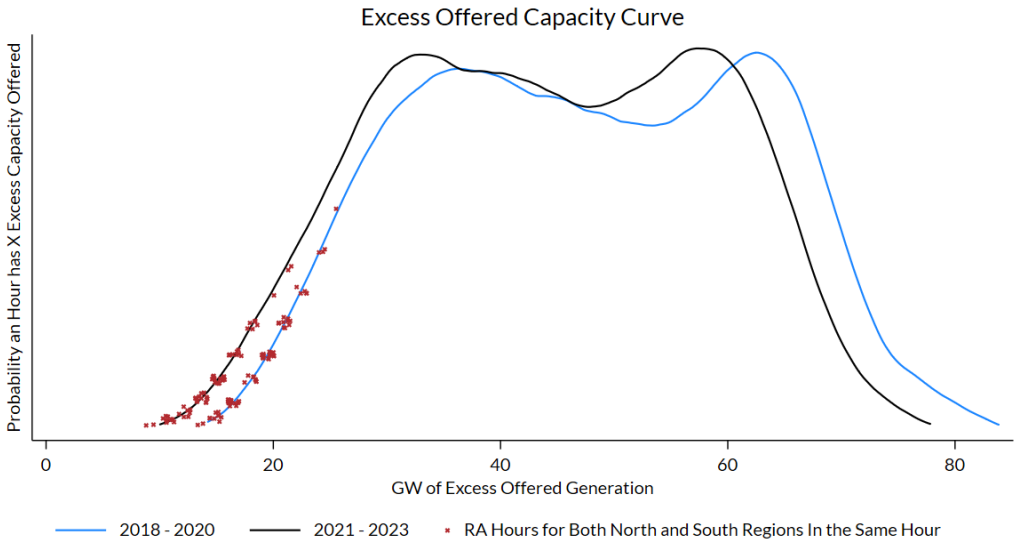
1. Support market participants in making efficient operational and investment decisions.
2. Maximize alignment of market requirements with system reliability requirements.

Historically, demand has been required only during peak hours

- MISO currently identifies the expected reduction of demand to occur at the time of the Transmission Provider's expected Coincident Peak Demand; Module E-1 69A.3.3.
- The generation curve was less volatile. Therefore, net capacity was easier to measure and predict, and the system's design meant that resource adequacy could be maintained all year long if demand is met during the highest peak hours.
- The capacity value of demand must be consistent with the expected reduction in demand.
- If the risky hours are shifting from the traditional peak, then it is inappropriate to measure the capacity value of demand using only its expected reduction at the time of the Transmission Provider's expected Coincident Peak.



The Excess Offered Capacity Curve shows how frequently a given level of excess capacity is offered into MISO using actual data



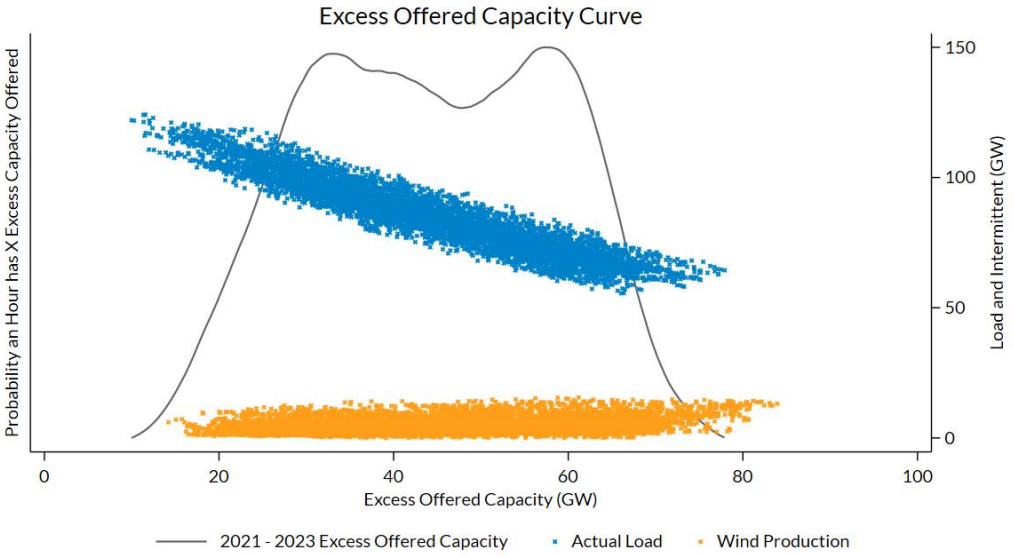
The leftward shift from the 2018-2020 years to the 2021-2023 years shows how the system's excess offered capacity is diminishing. The higher the line, the greater the probability a given level of capacity occurs.

Offered capacity includes emergency max offers, net schedule interchange, and btmg while load is actual hourly load. The excess comes from units operating below emergency limits or units that submitted an offer but were not committed.

The left tail indicates when the system has its lowest levels of excess offered capacity. These times take up a small proportion of total hours (the y-axis) but present the greatest risk to the system (the x-axis) and are comprised of the system Resource Adequacy (RA) hours.

This graph is showing that the system is already experiencing changes that are reducing the excess capacity across all hours, indicating that risky times are becoming more prevalent. Additionally, these risky times are occurring at lower load values and hours that are later in the day.

The relationship between excess offered capacity, load, and wind demonstrates when risk is occurring and allows for prognostications of risky scenarios moving forward



This graph overlays actual load and wind profiles onto the excess offered capacity curve covering Summer 2021-2023.

This is an identical graph as shown on Slide 25 with load and wind overlaid. Wind and load correspond to the right axis. This shows the direct correlation between load and excess offered capacity and how wind impacts these values. When the wind blows and load is low, there is large excess offered capacity. High load and low-wind results in low excess offered capacity.

As Solar begins to penetrate into the system, the relationship between load and excess offered capacity is predicted to start taking an inverted U-shape.

When load is highest, there will be more excess offered capacity due to solar generation. When load is high, but not at its peak, the sun is not shining, and the wind is not blowing the system will experience its greatest Summer and Winter risks.