Executing Through the Energy Transition

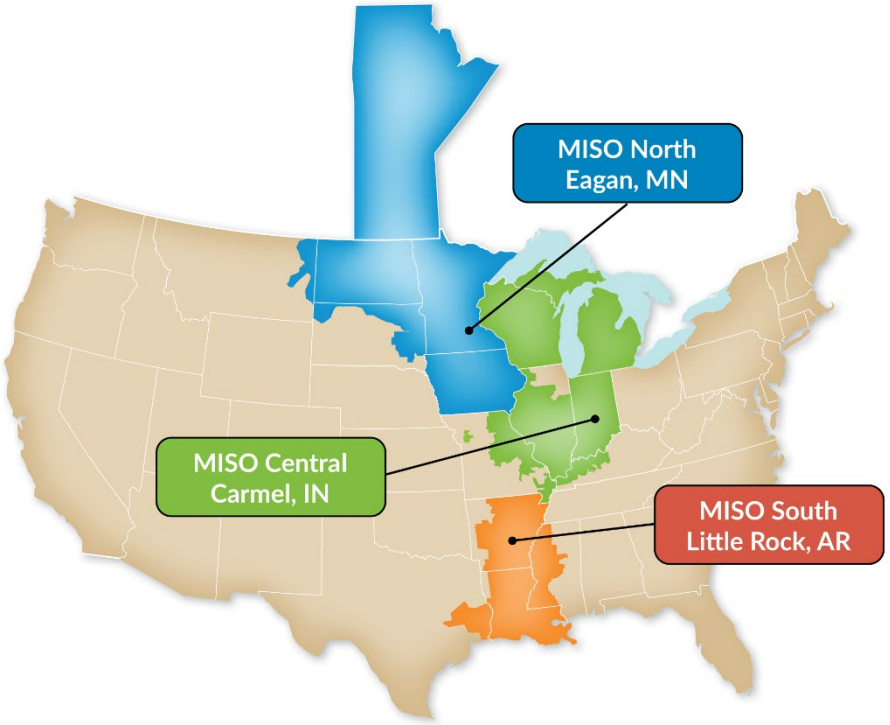
Missouri 2024 Resource Adequacy Policy Summit

August 13, 2024

Executive Summary

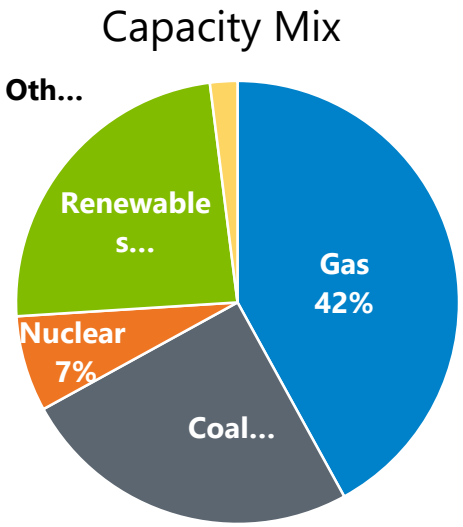
- Broad agreement exists around significant load increases ahead although visibility into magnitude and timing is currently limited
- A survey of member plans indicates capacity is insufficient to support this type of load growth
- New technologies that could replace current sources are not going to be commercially mature for some time
- Many approved new resources are encountering significant challenges and will be delayed getting online
- A coordinated transition plan is required, including deferring retirements until other options are available

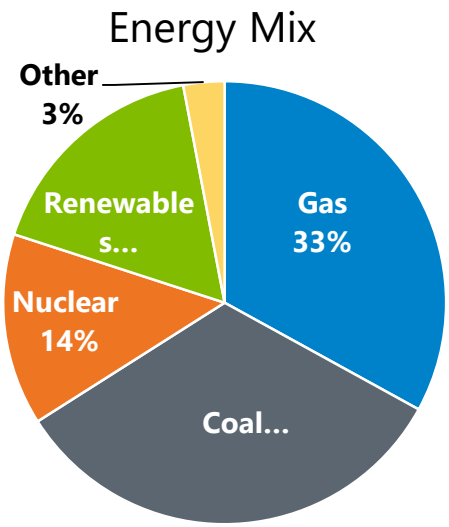
MISO is an independent, non-profit Regional Transmission Organization (RTO) responsible for maintaining reliable and cost-effective delivery of power in 15 states and Manitoba



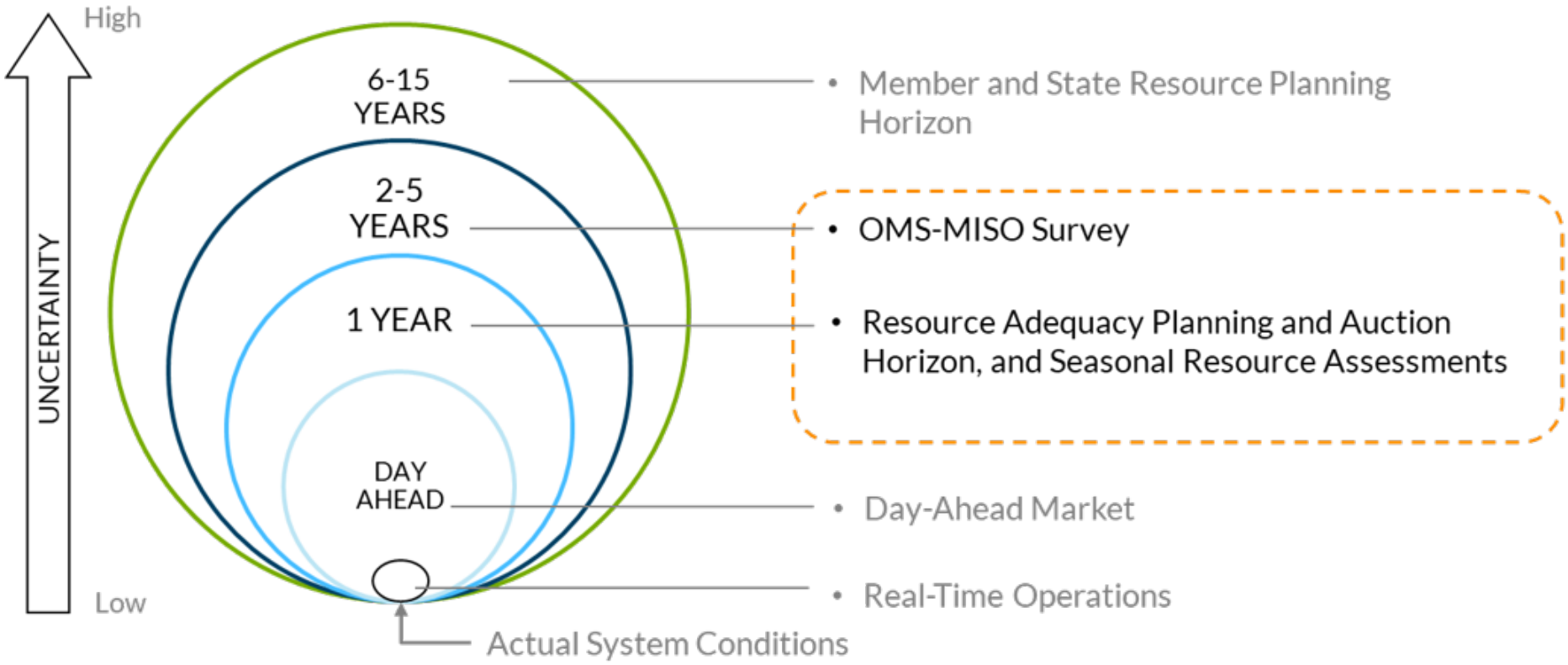
MISO's reliability footprint and locations of regional control centers.

MISO by the numbers	
High Voltage Transmission	**75,000 miles**
Generation Capacity	**191,000 MW**
Peak Summer System Demand	**127,125 MW**
Customers Served	**45 Million**





MISO's resource adequacy processes are designed to support States and ultimately provide the resources needed to maintain reliability



MISO's resource adequacy construct establishes planning reserve requirements, resource accreditation values, and capacity pricing

Requirements

How many MWs are needed to ensure reliability?

- **Regional/footprint-wide**
  - Seasonal* Planning Reserve Margin Requirements
- **Zonal (10 zones)**
  - Local Reliability Requirement
  - Local Clearing Requirement
  - For each season

Determined annually, for each season separately

Accreditation

How are available MWs counted?

- **Thermal resources**
  - Availability during historical risk periods
- **Renewable resources**
  - ELCC studies
- **In the future, for all resources#**
  - Availability during modeled risk periods**

Determined annually for each season separately

Pricing

What is the price of capacity?

- **Planning Resource Auction**
  - Supply offers
  - Demand curve**
  - Cleared resources
  - Capacity sufficiency/deficiency at regional and zonal level
  - Capacity prices

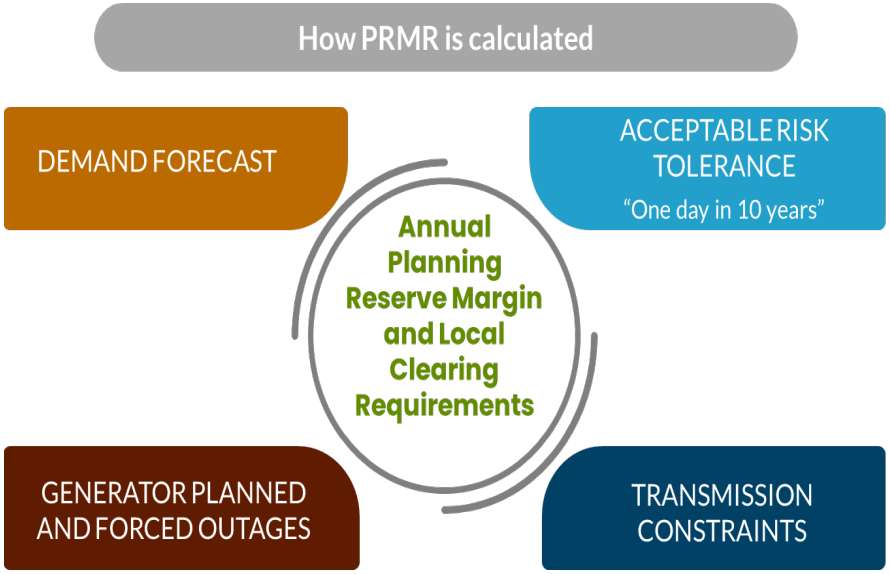
Conducted annually, simultaneously for each season (producing individual prices for each season)

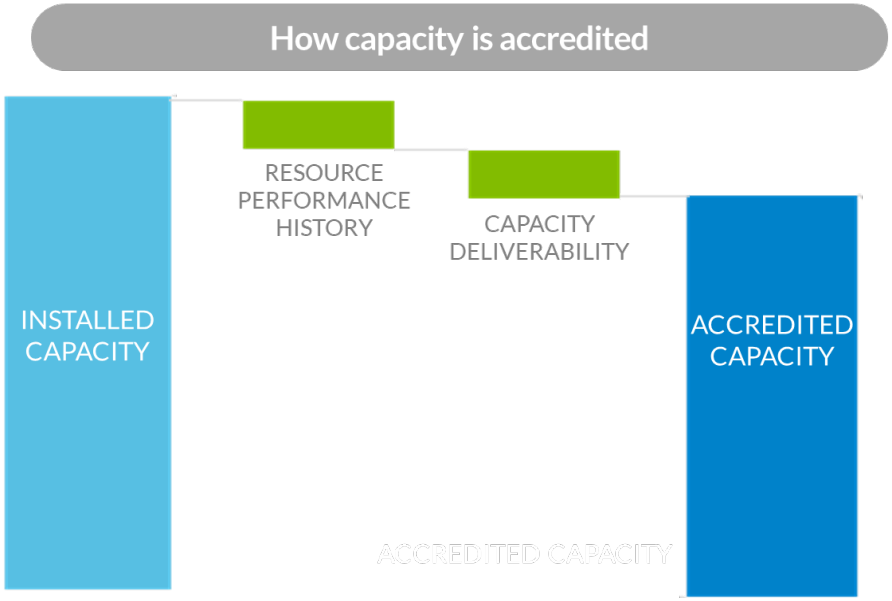
* MISO's resource adequacy construct considers four seasons – summer, autumn, winter and spring
** Proposed, based on ongoing/future reforms, yet to be implemented
# All resources, except for Load Modifying Resources

Reserve margin requirement and accreditation methodologies factor in historic generator performance, among other inputs

The Planning Reserve Margin Requirement is calculated using probabilistic analyses to meet a planned loss of load risk target

Accredited resource value reflects the amount of capacity the resource is expected to provide during tight operating conditions

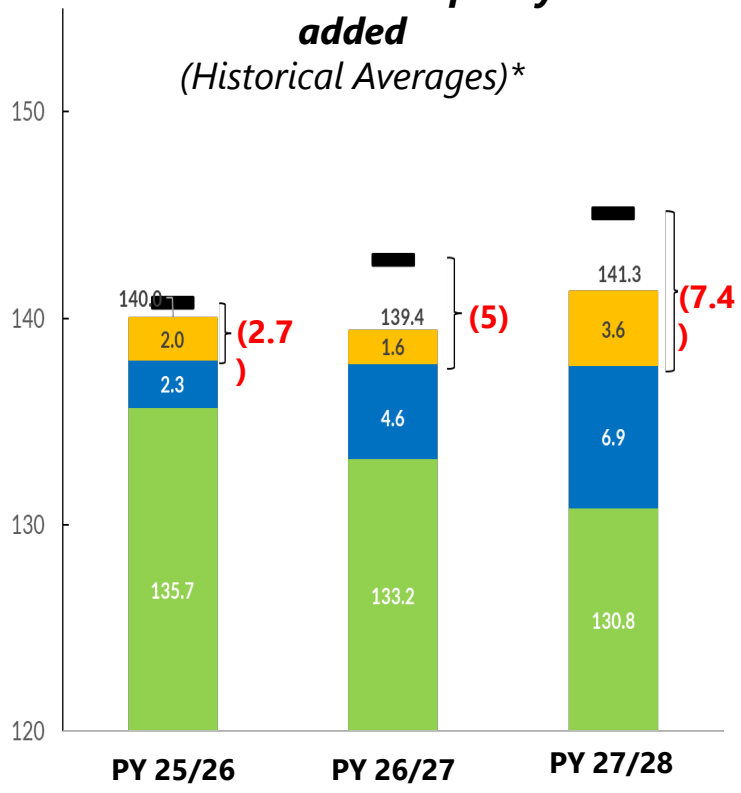




An unprecedented rate of capacity additions will be needed to keep up, and that may even be insufficient in a high-load growth scenario

OMS - MISO Survey Resource Adequacy Projections – Summer (Accredited GW)

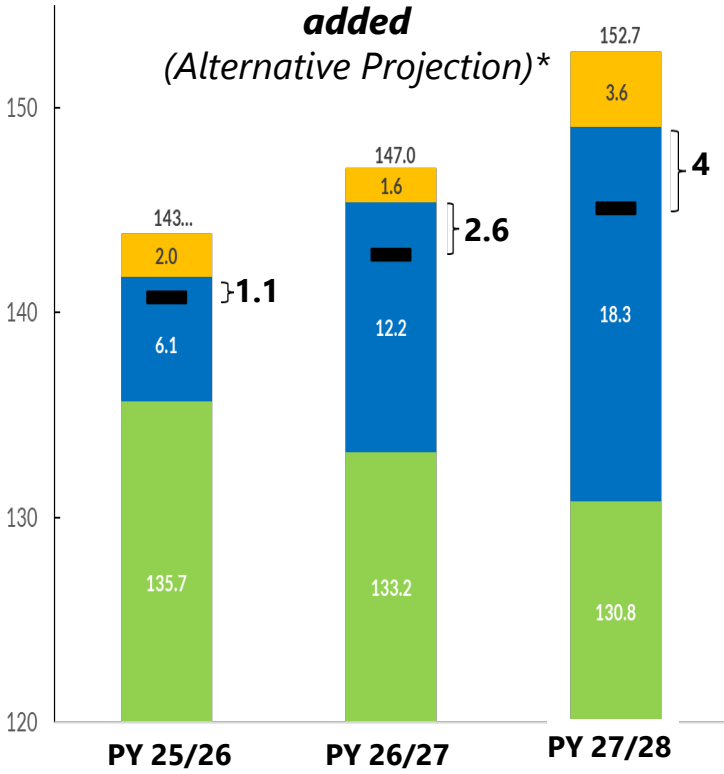
Assuming 2.3 GW/yr of Potential New Capacity added
*(Historical Averages)**



An unprecedented pace of new capacity additions to mitigate deficits would require:

- Easing of supply chain challenges
- Reduced permitting delays
- Adequate skilled labor
- Supportive commercial viability
- Continued queue improvements

Assuming 6.1 GW/yr of Potential New Capacity added
*(Alternative Projection)**



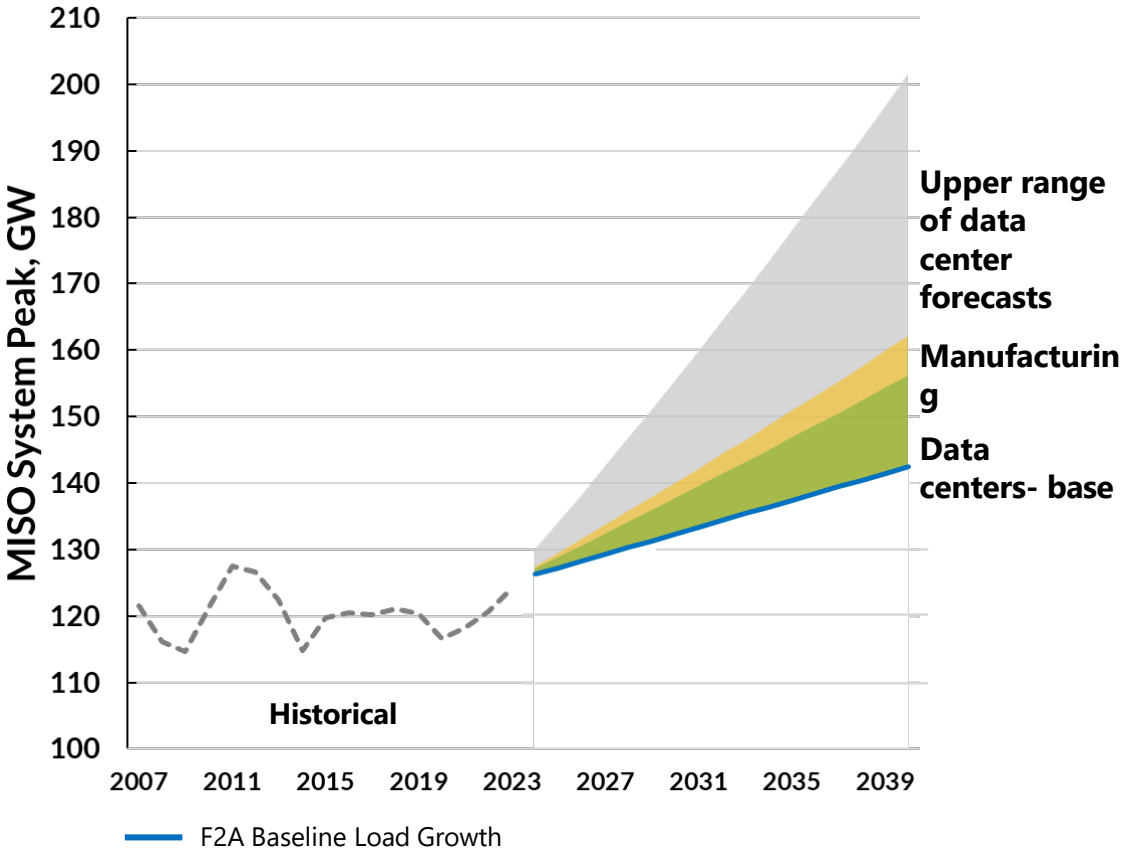
Projected PRMR
Potentially Unavailable Resources
Potential New Capacity
Committed Capacity

- Bracketed values indicate difference between Committed+ Projected New Capacity and projected LSE PRMR
- Capacity accreditation values and PRM projections based on current practices
- Regional Directional Transfer (RDT) limit of 1,900 MW is reflected in this chart

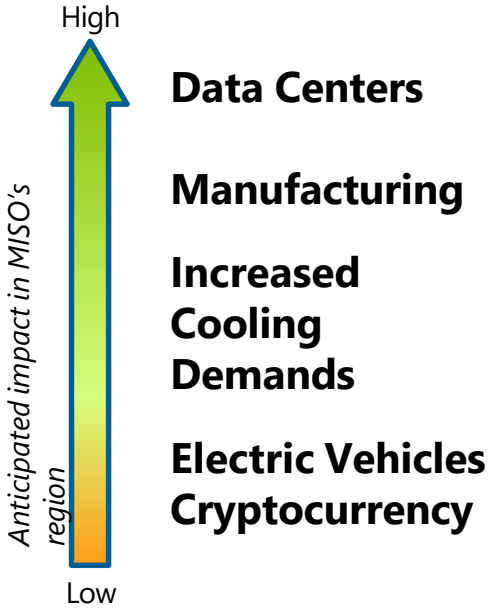
PRMR: Planning Reserve Margin Requirement *All references to capacity indicate Seasonal Accredited Capacity (SAC)*

The rapid addition of new large loads resulting from robust economic development efforts are exacerbating the challenges posed by the clean energy transition

EPRI* and Grid Strategies anticipate manufacturing growth to favor MISO's service area



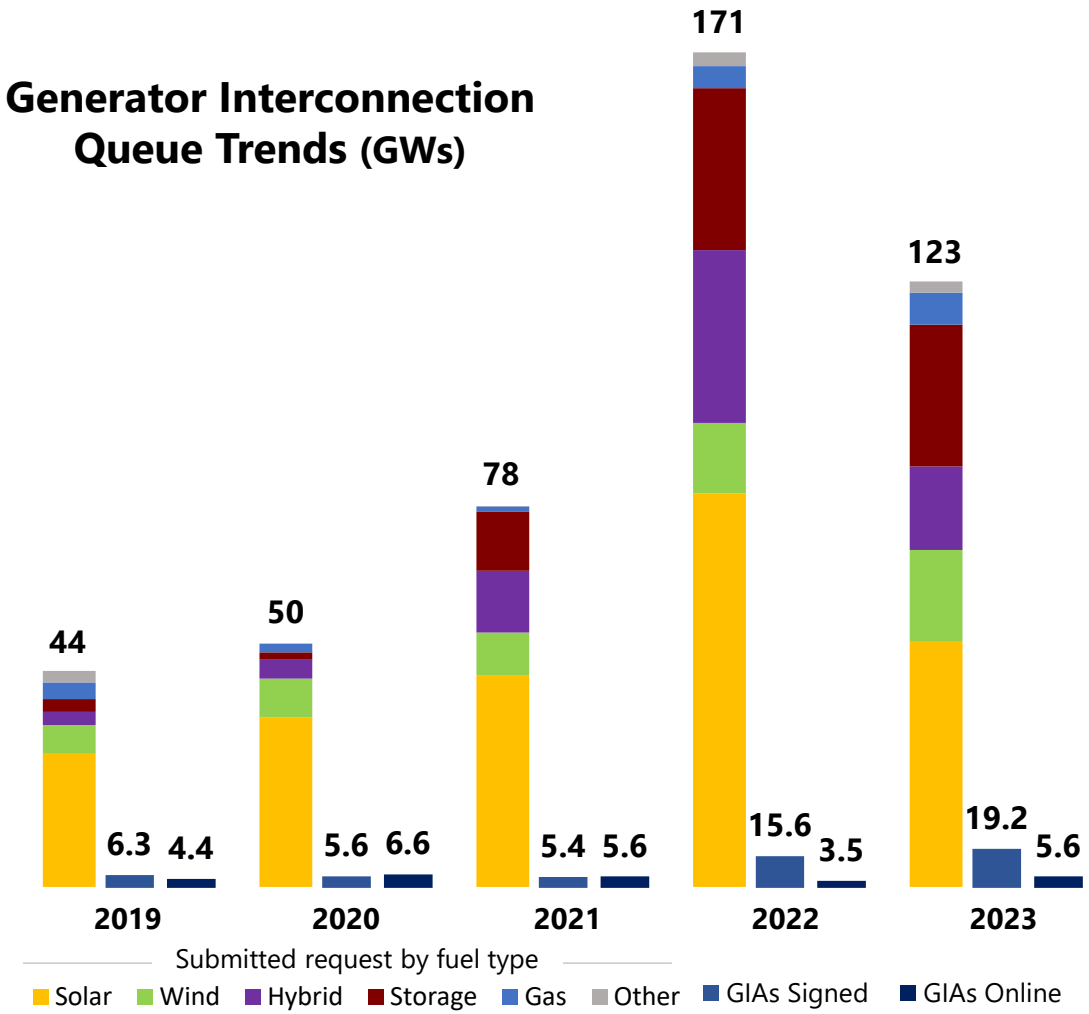
- Grid planners nearly *doubled* their 5-year peak load growth forecasts since last year
- MISO anticipates strong *long- term* load growth driven primarily by:



Note: *All figures shown are PRELIMINARY*

*EPRI = Electric Power Research Institute

Significant new resources continue to be planned and approved, but few possess the required reliability attributes of retiring assets…



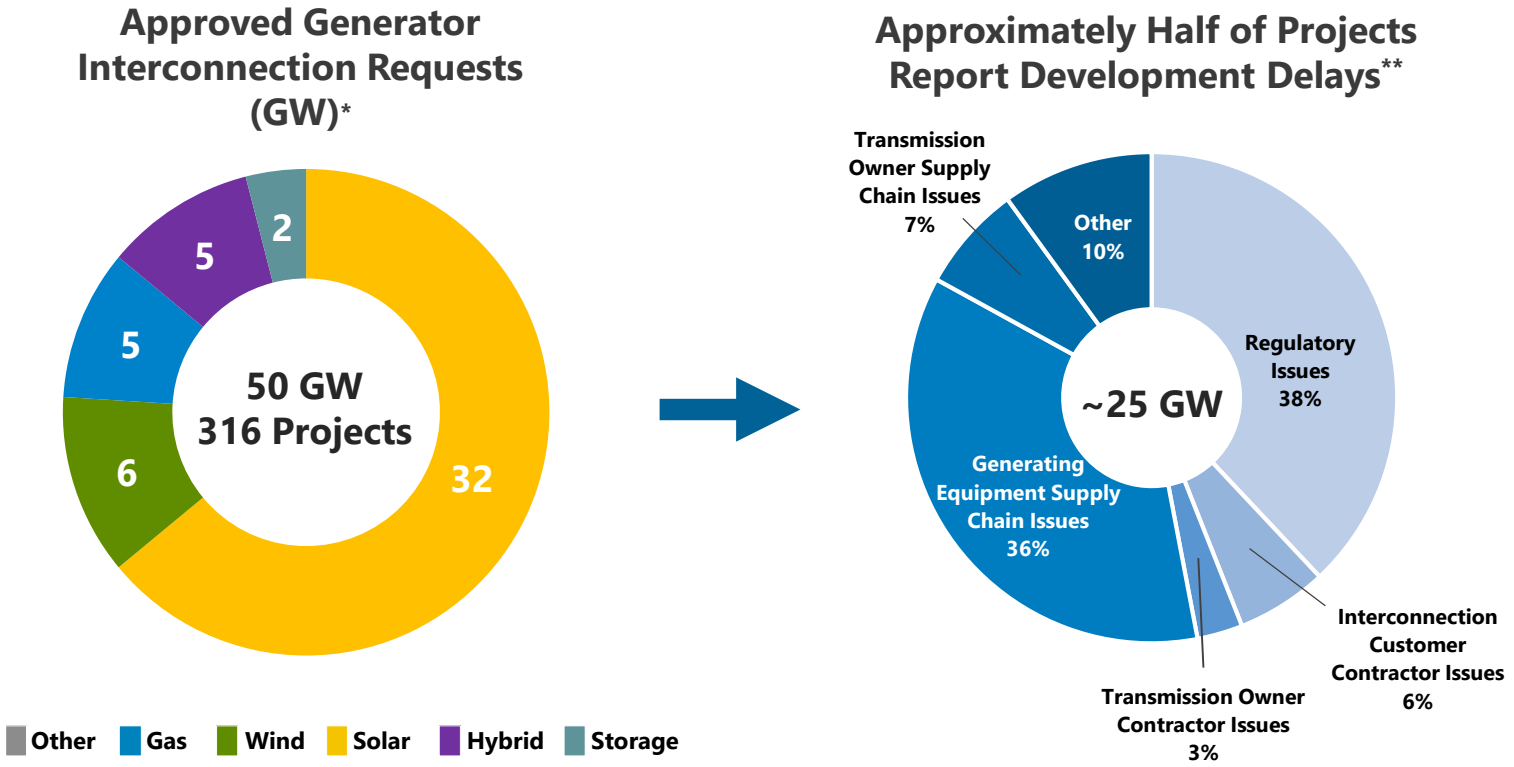
Generator Interconnection Requests

GI Requests	2023 New	Active Queue**
Size	**123 GW**	**349 GW**
Solar	41%	49%
Storage	23%	21%
Hybrid	14%	16%
Wind	15%	11%
Gas	5%	2.5%
Other	2%	0.5%

- Reforms that contributed to a 30% reduction in 2023 cycle submissions included withdrawal penalties and improvement to site control rules
- Signed Generator Interconnection Agreements are increasing
- Construction delays continue, with an average of ~5 GW per year of nameplate capacity coming online annually

** *Active Queue* represents Generator Interconnection requests still active from prior years + *2023 New* requests as of 6/12/24
Note: All GW values represent installed capacity (ICAP)

...and many of the already approved new resources are experiencing delays in getting online



50 GW of resources approved through MISO's interconnection processes are in or awaiting construction with approximately 50% already signaling a delay with an average of 650 days to commercial operation

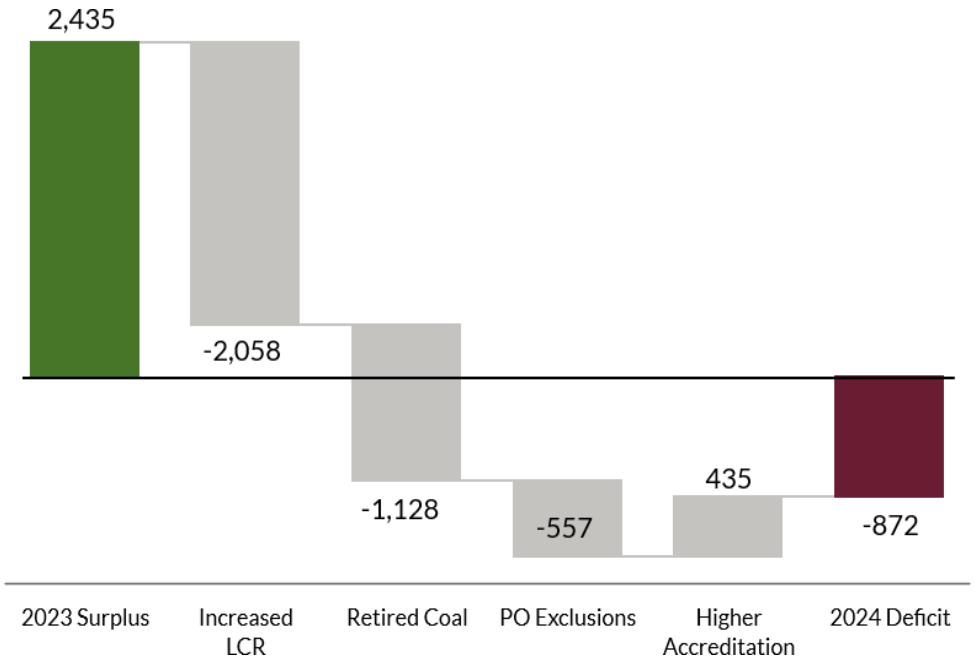
*Queue data as of June 1, 2024
** Reasons for delay based on responses from a subset of delayed projects

Missouri experienced a capacity shortfall in the 2024 Planning Resource Auction in the Fall and Spring seasons

2024 Planning Resource Auction Clearing Prices

All Zones (except Zone 5)	Zone 5:
• **Summer:** $30/MW-day	• $30/MW-day
• **Fall:** $15/MW-day	• $719.81/MW-day
• **Winter:** $0.75/MW-day	• $0.75/MW-day
• **Spring:** $34.10/MW-day	• $719.81/MW-day

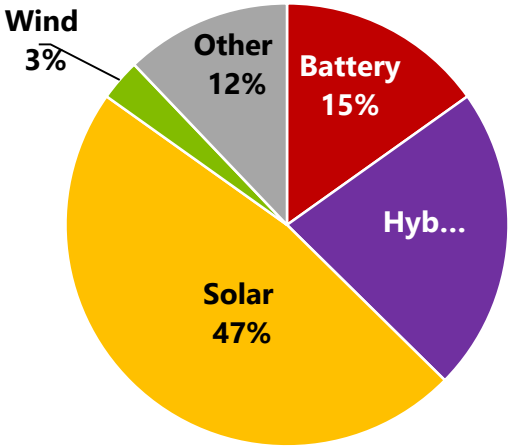
Year-Over-Year Changes in Zone 5 – Fall Season



PO: Planned Outage

A focus on moving approved generation projects forward in a timely manner, and adding needed attributes will be critical to mitigate the shortfall and support load growth

Active Generator Interconnection Request in Missouri
12,399 MW (64 Projects)



Queue Status	MISO Total	Missouri
Active Queue	349 GW	12.4 GW
Signed Generator Interconnection Agreement (GIA), Not Yet Online	~50 GW	3.4 GW
Signed GIA and Communicated Delay of Commercial Operation Date	~25 GW	2.2 GW

MISO is engaged on broad, transformative work within the Reliability Imperative required to reliably enable member and state plans

RELIABILITY CHALLENGES

- Attributes needed to ensure reliability will become more scarce
- Extreme weather events are more frequent and severe
- Large single-site load additions and incremental load growth
- Fuel-assurance issues with gas pipelines and other energy infrastructure
- Supply chain and permitting issues are delaying generation projects
- Investor preferences to/not to finance new energy projects

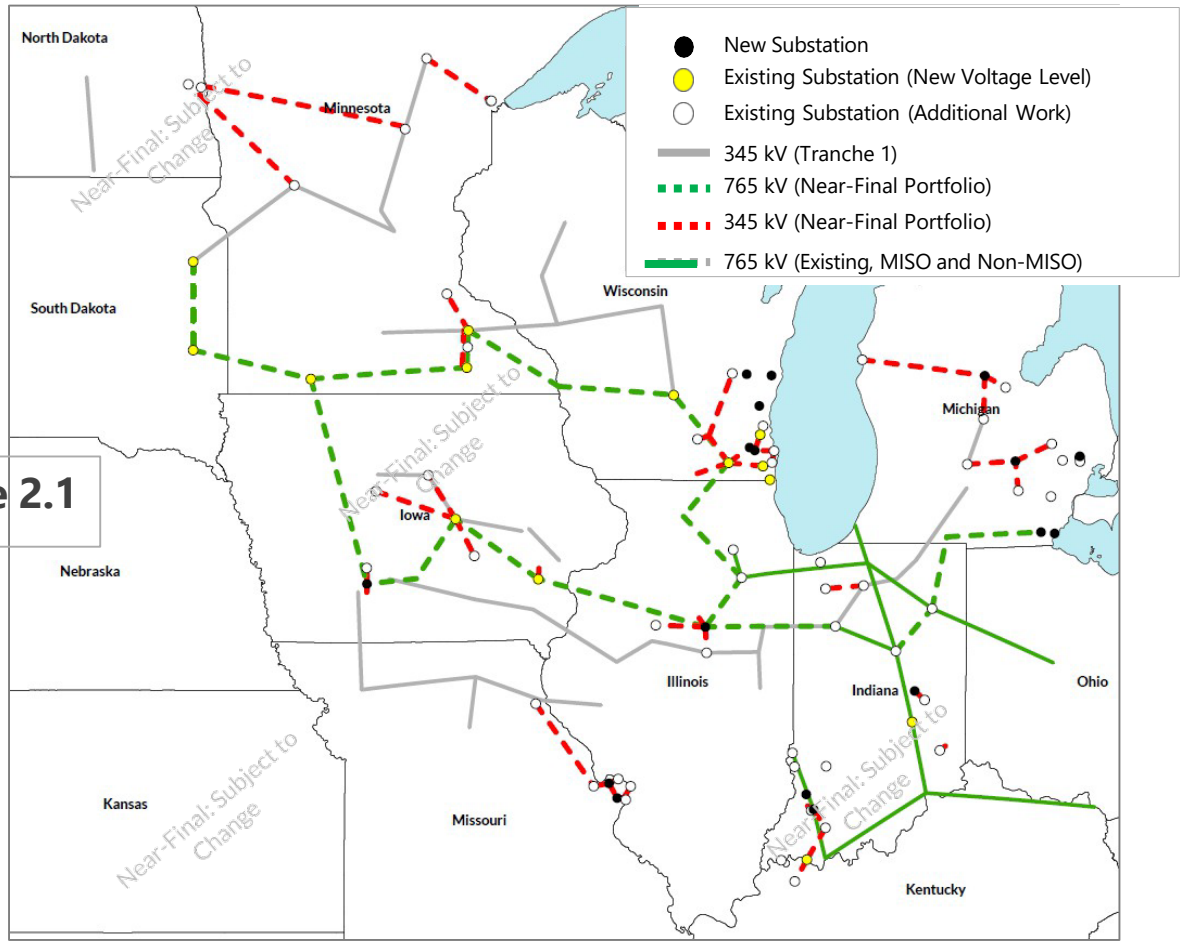
KEY INITIATIVES[1]

MARKET REDEFINITION	▪ Resource Accreditation ▪ Reliability Attributes ▪ Pricing Reforms ▪ Forecast Uncertainties
OPERATIONS OF THE FUTURE	• Uncertainty & Variability • Planning & Preparedness • Situational Awareness & Critical Communications
TRANSMISSION EVOLUTION	• Long Range Transmission Planning • Generator Interconnection • Joint Transmission Planning[2]
SYSTEM ENHANCEMENTS	• Hybrid Cloud Capability • Fortify Cybersecurity • Advanced Data Analytics Capabilities

[1]Partial listing of initiatives;
[2]Includes Joint Targeted Interconnection Queue (JTIQ)

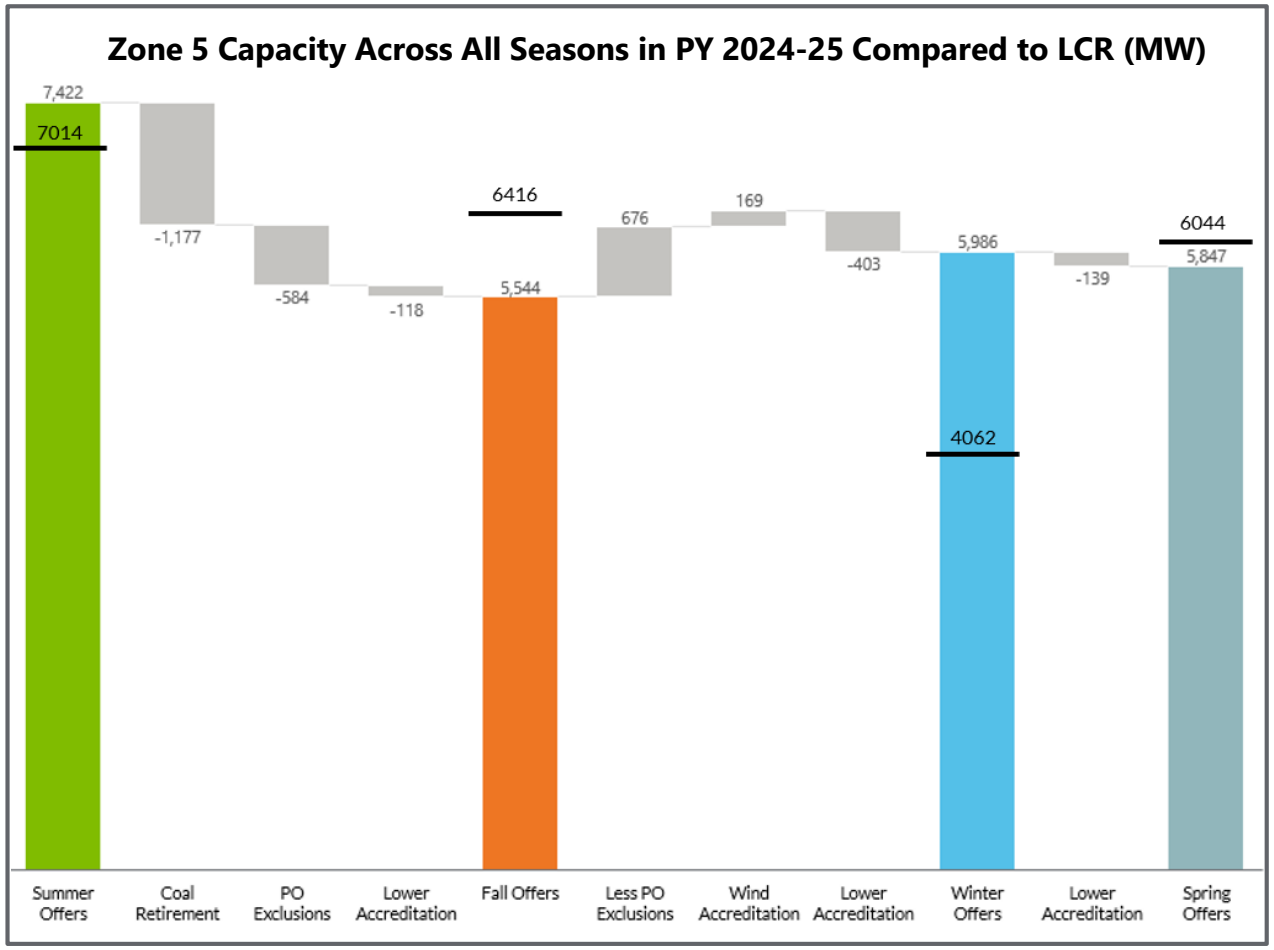
The current phase of Long-Range Transmission Planning work is focused on a ~$25 billion portfolio that will deliver significant reliability and economic benefits

Near-Final Tranche 2.1
Projects as of 07/12/2024



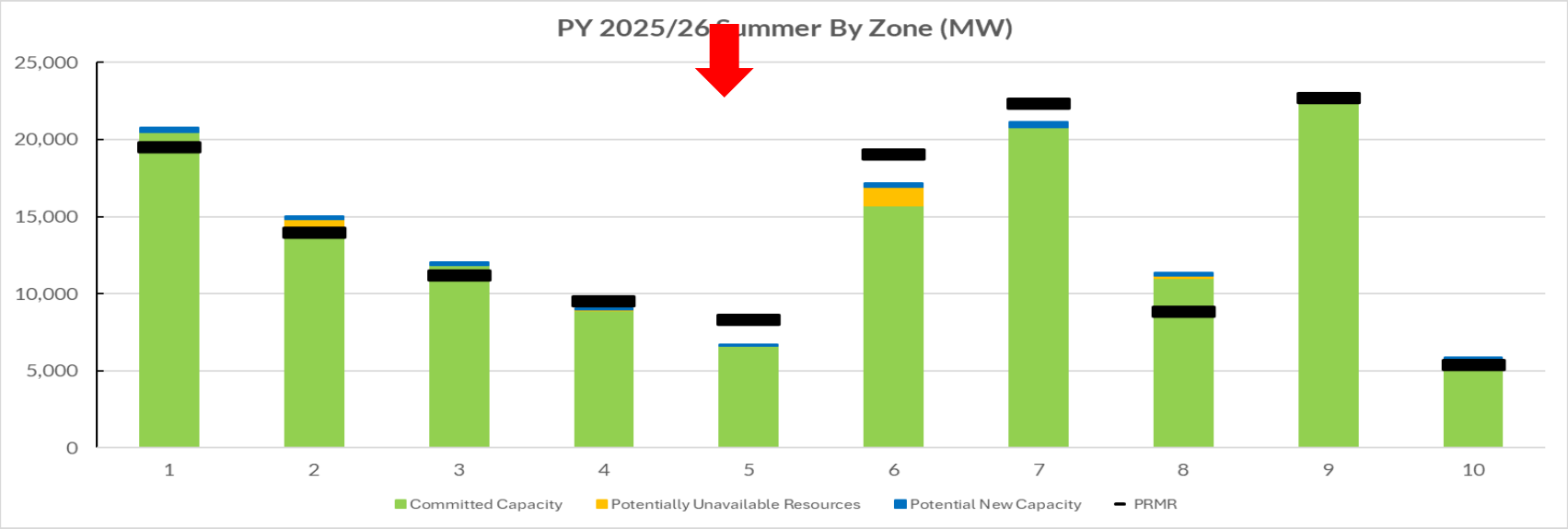
Appendix

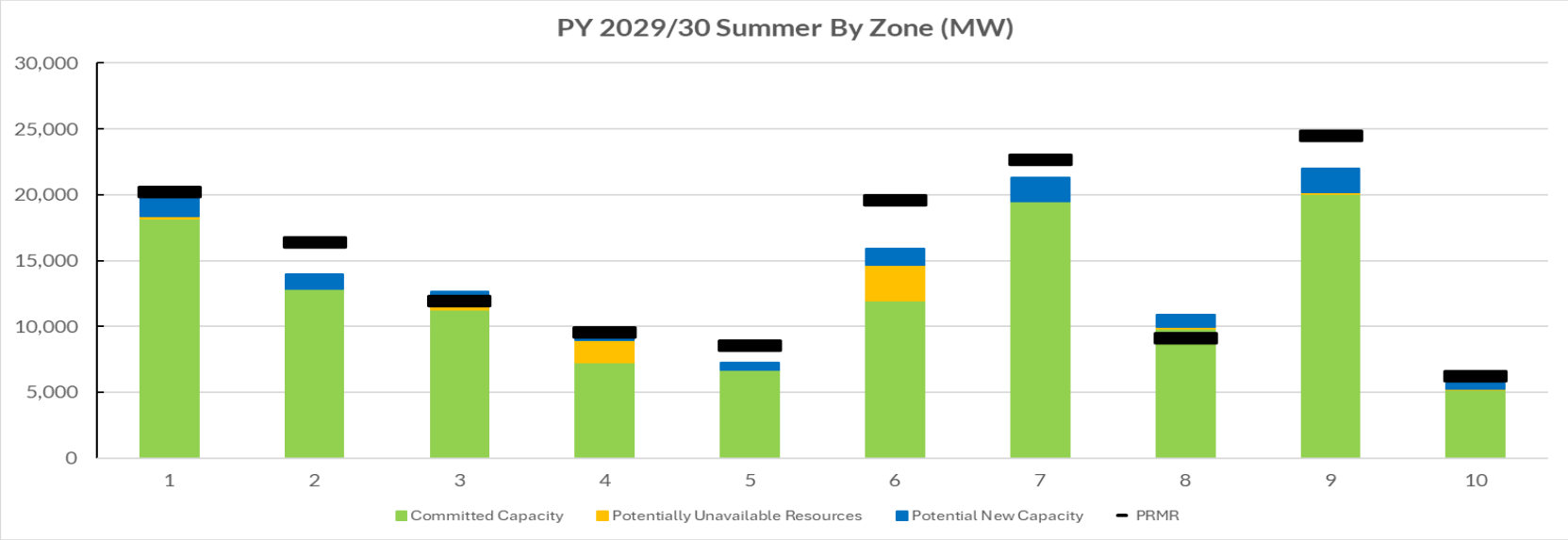
Seasonal variation in requirements and available capacity help explain the resource adequacy position in Zone 5



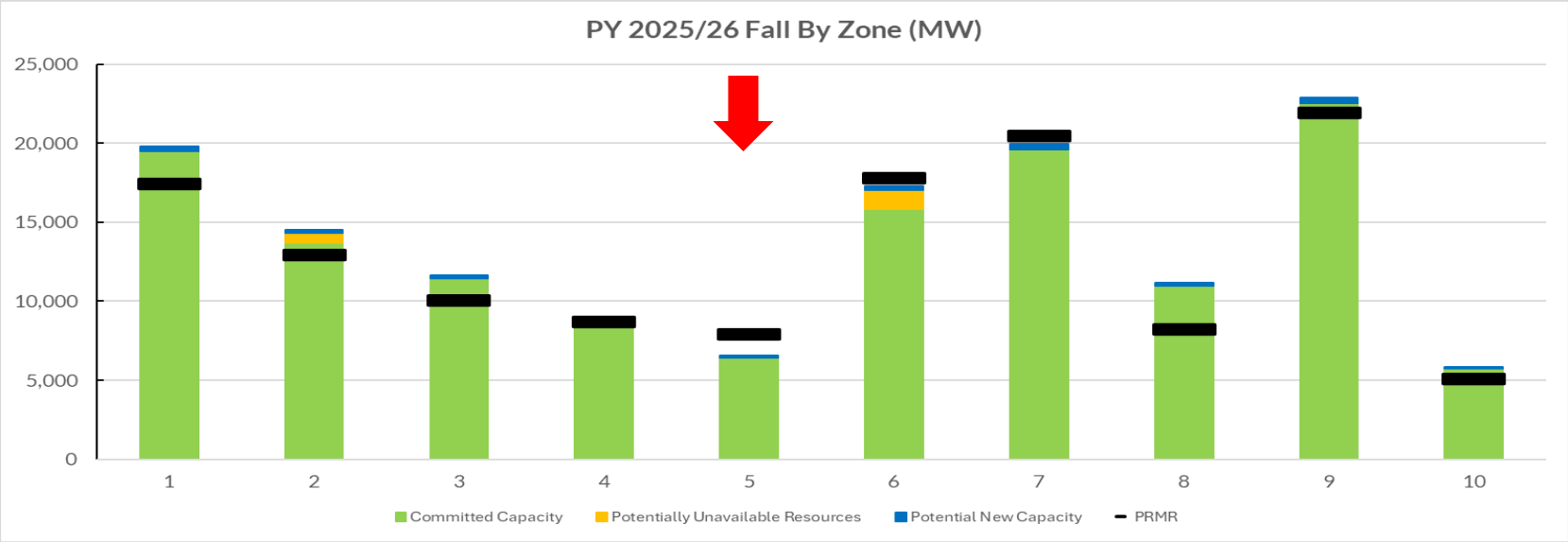
- Large coal retirements contribute to capacity deficiency; planned outages increase the gap in fall
- Lower Local Clearing Requirement in winter aids winter sufficiency
- Winter Local Clearing Requirement driven by relatively lower demand, Local Reliability Requirement and a higher import limit

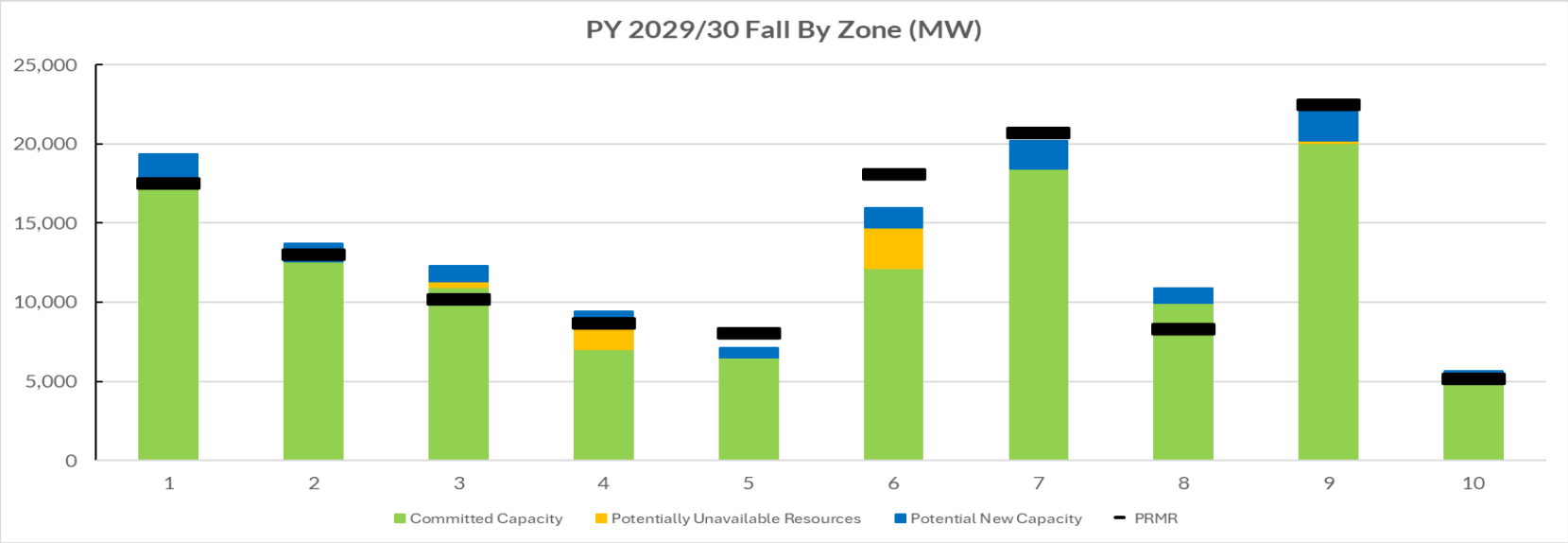
2024 OMS-MISO Survey – Summer



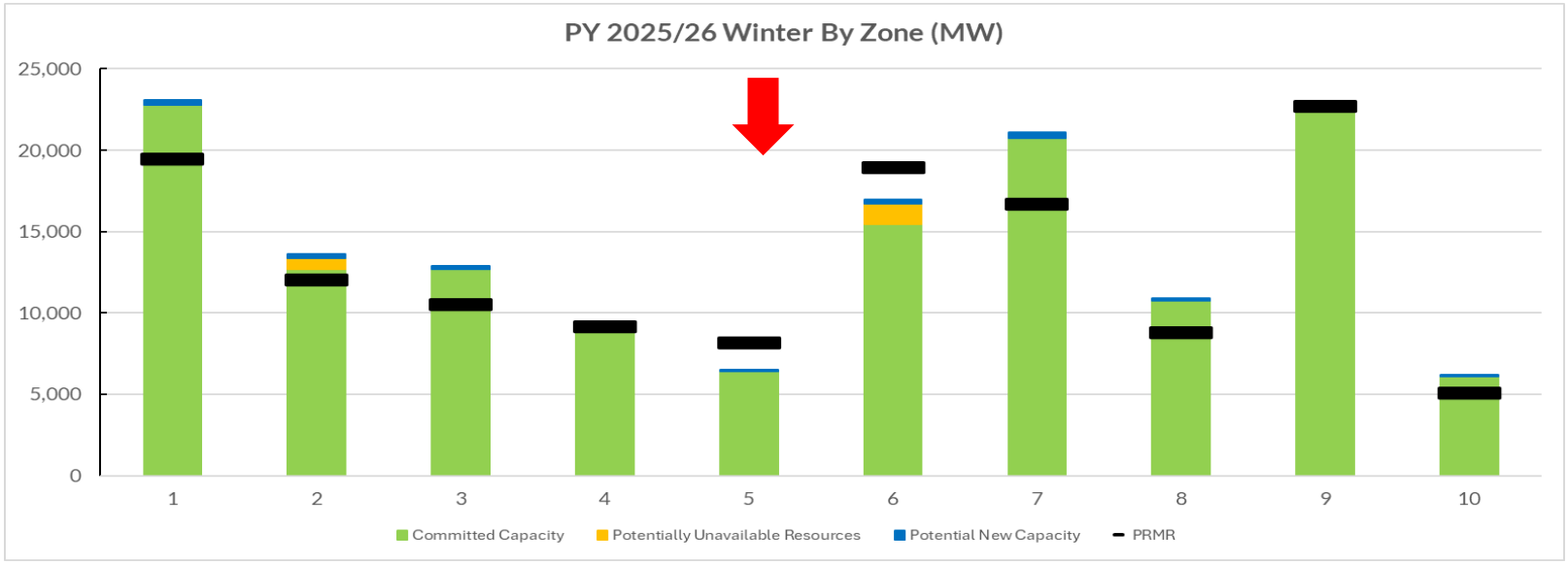


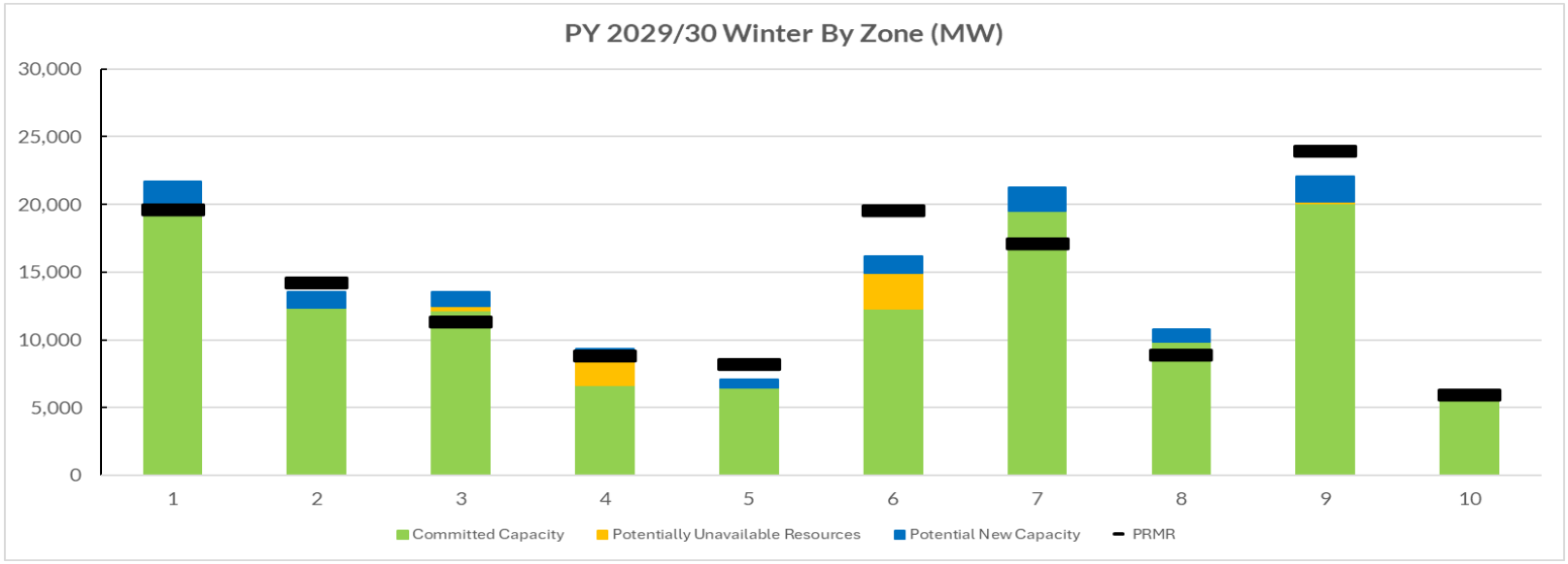
2024 OMS-MISO Survey – Fall





2024 OMS-MISO Survey – Winter





2024 OMS-MISO Survey – Spring