



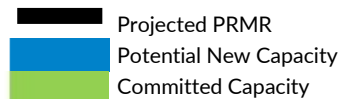
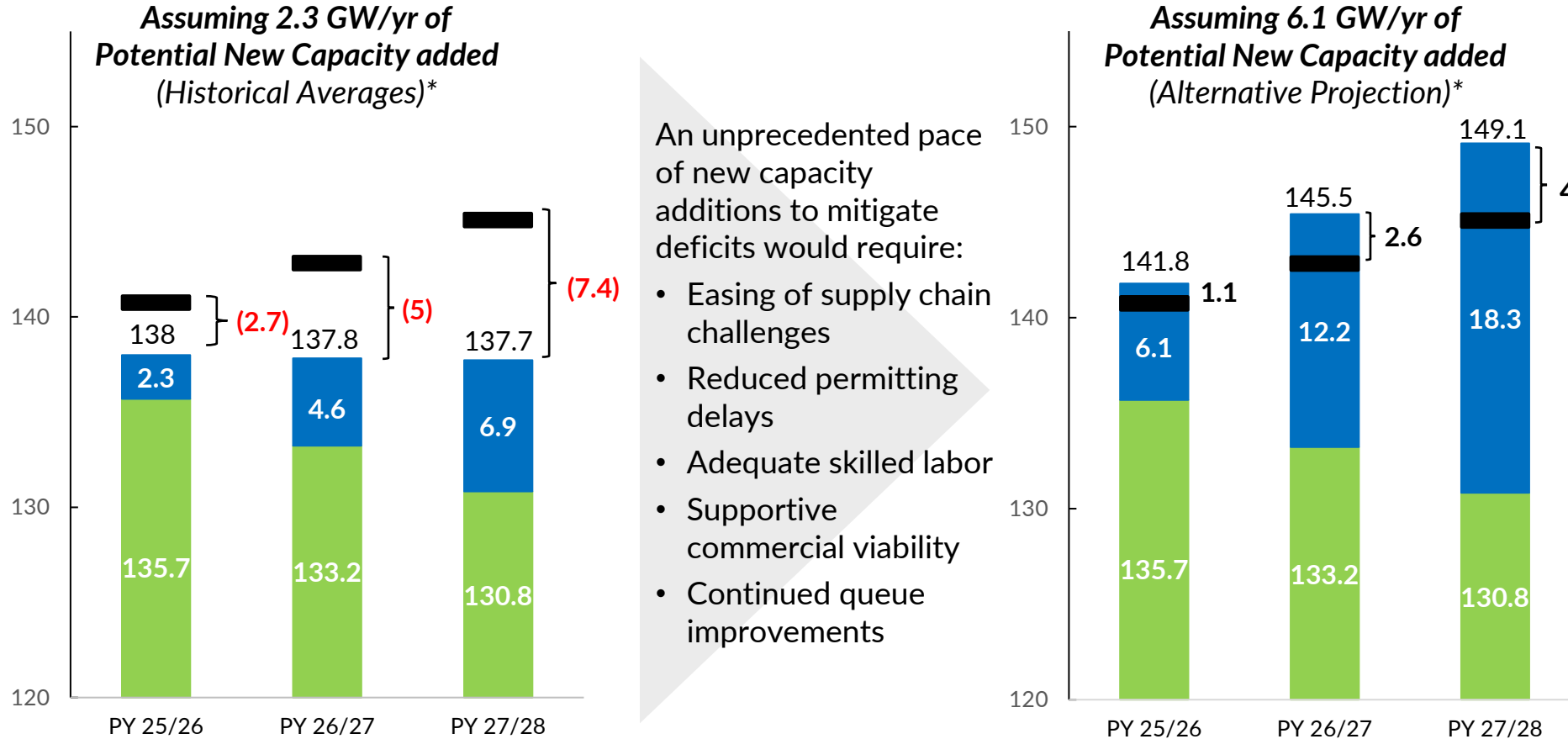
ReliabilityFirst Fall Reliability & Security Summit

MISO Reliability Imperative

September 17, 2024

2024 OMS-MISO Survey indicates increasing capacity deficits requiring a dramatically accelerated pace of new build to mitigate

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



- 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)

* Using methods for Potential New Capacity described in 2024 OMS-MISO Survey presentation

Capacity trends of our RTO neighbors point to declining availability of supportive transfers

PJM

Significant year-over-year supply/demand changes resulted in record prices in capacity auction for 2025/26 delivery year

Offered Supply: - 13.3 GW (down 8.8% vs. prior year)

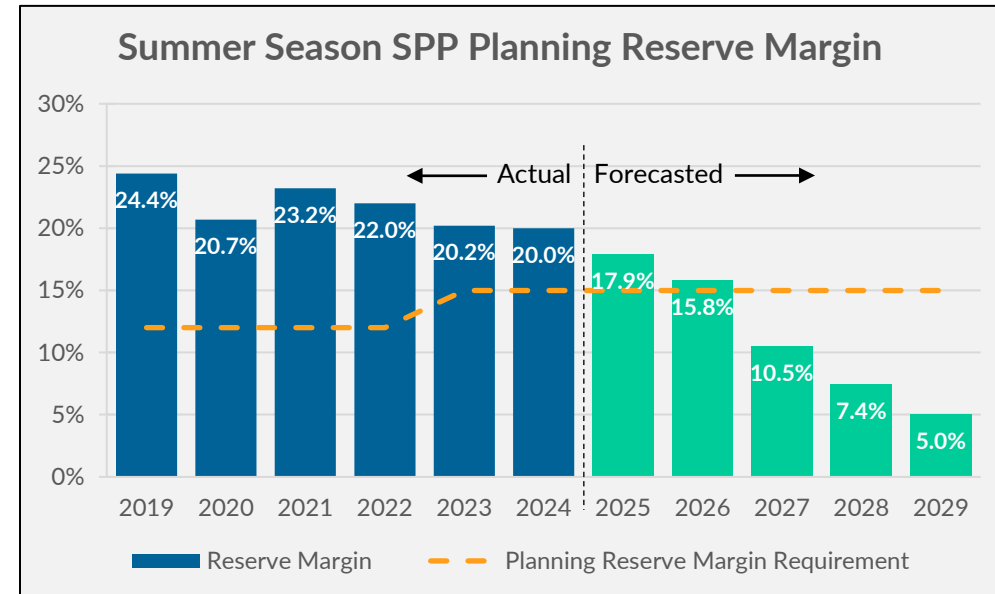
Load: + 3.2 GW (up 2% vs. prior year)

Reserve Margin: 0.7% (vs. 5.4% in prior year)

Clearing Price: ~ \$270 / MW-day (vs. ~\$29 in prior year)

SPP

No capacity auction but reserve margin projected to fall to requirement in 2026 and decline further



Excess capacity of 2,750 MW in 2024 becomes a deficit of 5,950 MW in 2029 due to:

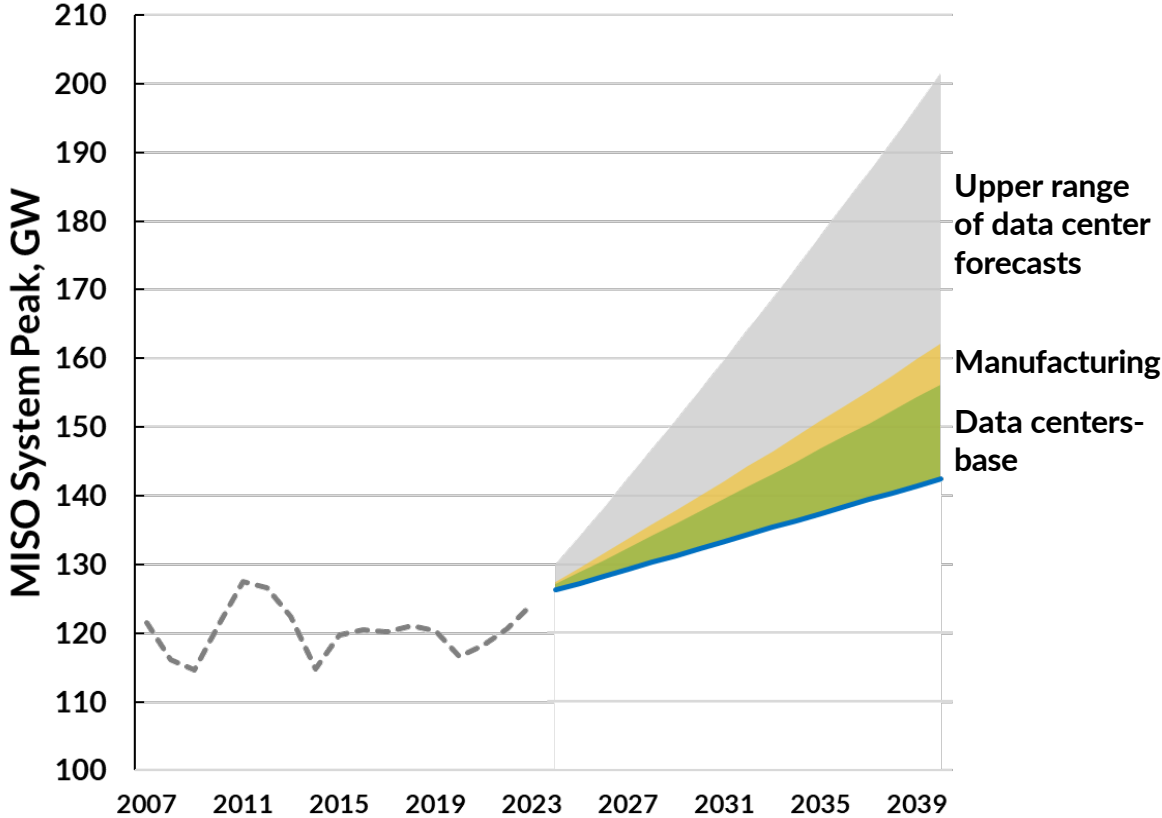
- 10% increase in forecasted demand
- 3% reduction in capacity

Source: PJM 2025/2026 Base Residual Auction Report

Source: 2024 SPP Resource Adequacy Report

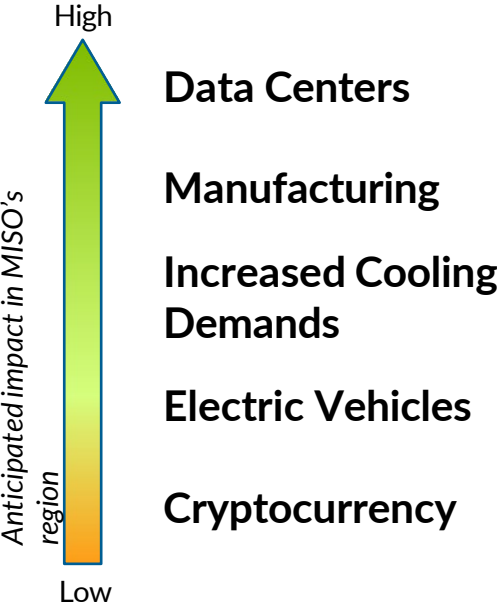
Poor visibility into the magnitude/timing of large load additions is putting at risk our ability to reliably accommodate them

EPRI and Grid Strategies¹ anticipate manufacturing growth to favor MISO's service area



Notes: All figures shown are PRELIMINARY

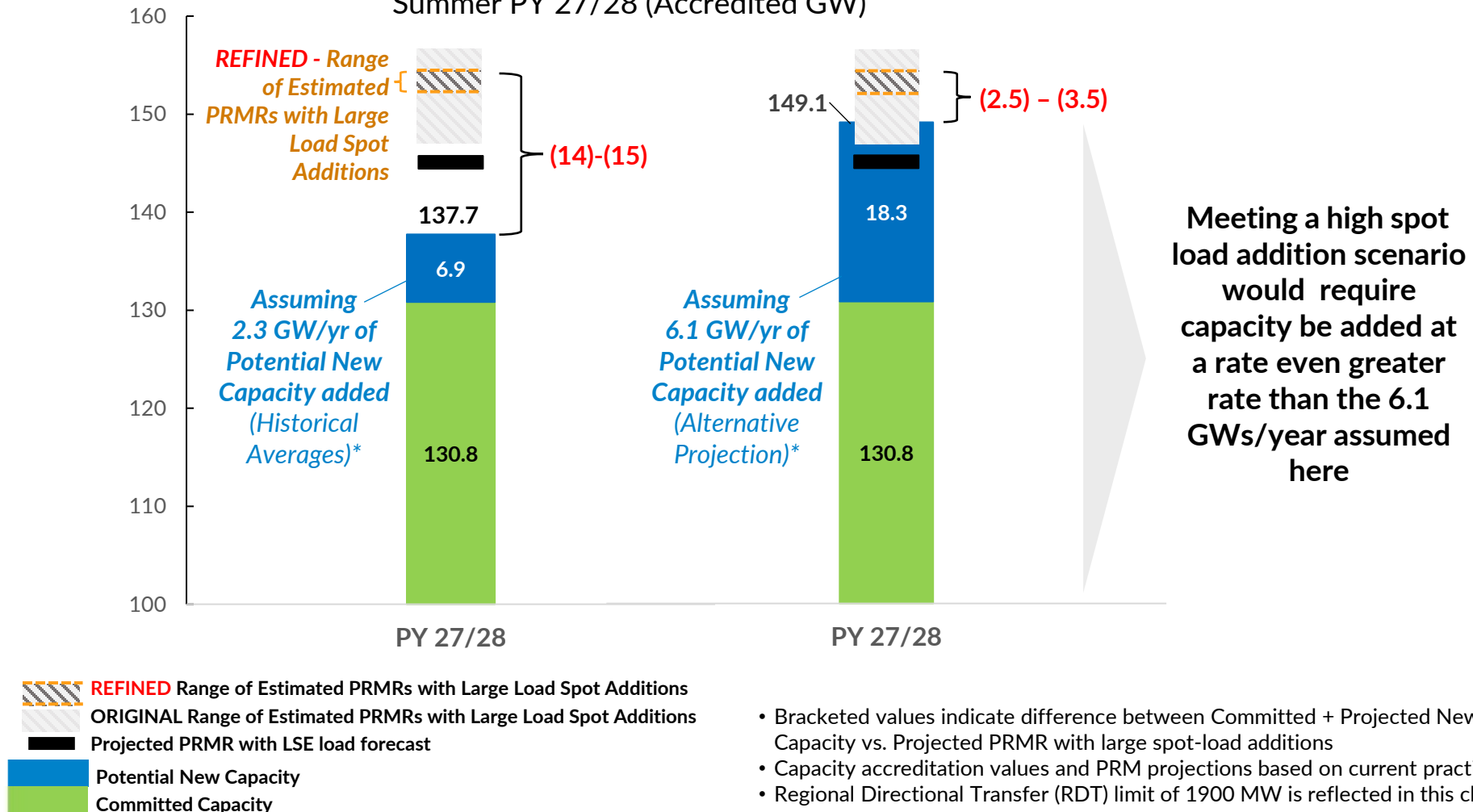
- Grid planners nearly *doubled* their 5-year peak load growth forecasts since last year
- MISO anticipates strong *long-term* load growth driven primarily by:



<https://www.epri.com/research/products/000000003002027930> <https://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf>

The trend of announced large load additions will exacerbate the urgency for new generation, including dispatchable, long-duration resources

MISO Resource Adequacy Projection vs.
 an Expanded Range of Future Large Load Spot Additions*
 Summer PY 27/28 (Accredited GW)



- REFINED** Range of Estimated PRMRs with Large Load Spot Additions
- ORIGINAL Range of Estimated PRMRs with Large Load Spot Additions
- Projected PRMR with LSE load forecast
- Potential New Capacity
- Committed Capacity

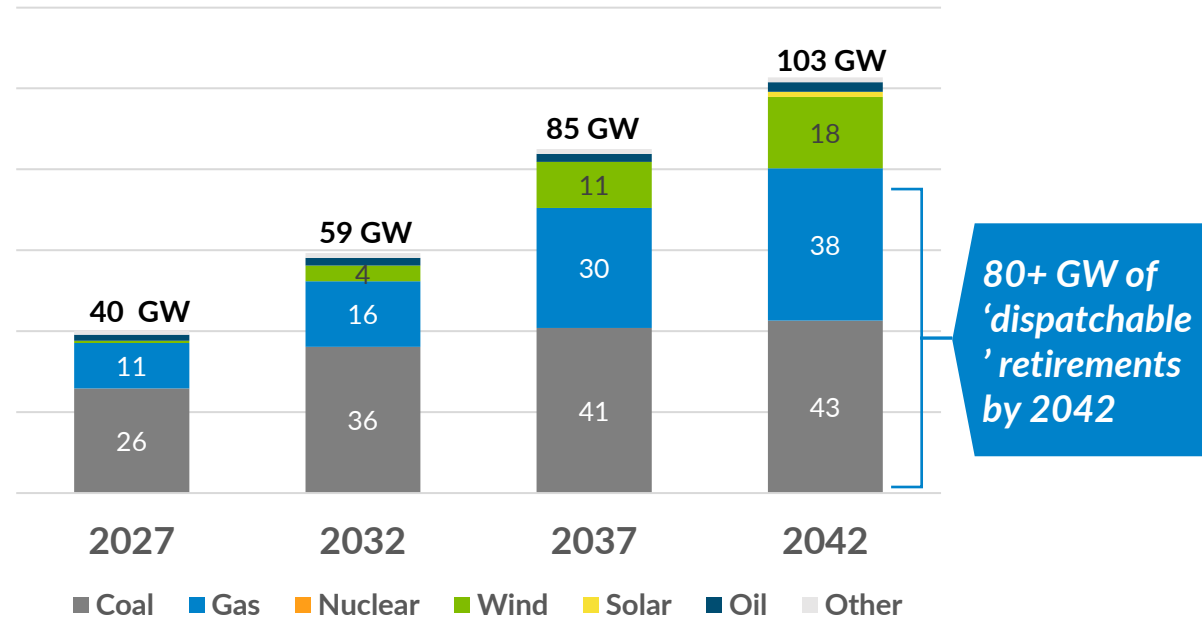
- Bracketed values indicate difference between Committed + Projected New Capacity vs. Projected PRMR with large spot-load additions
- Capacity accreditation values and PRM projections based on current practices
- Regional Directional Transfer (RDT) limit of 1900 MW is reflected in this chart

* Using methods for Potential New Capacity and Large Load Spot Additions described in 2024 OMS-MISO Survey presentation
 PRMR: Planning Reserve Margin Requirement

Policy direction is accelerating thermal unit retirements and increasing the headwinds to new thermal unit development

- Member/state clean energy and decarbonization goals
- U.S. Environmental Protection Agency (EPA) regulations:
 - Carbon Rule
 - Good Neighbor Rule
- Inflation Reduction Act and Infrastructure Bill

Future 2A Total Retirements
(Cumulative GW)



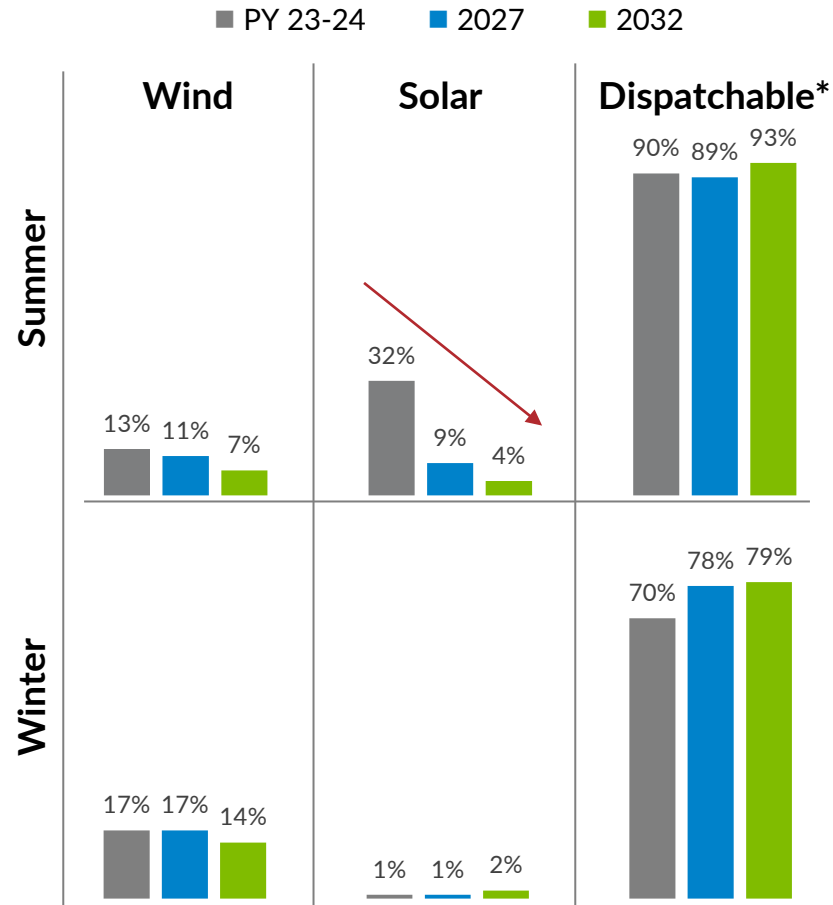
MISO will need to assess Futures to determine if recent developments, especially related to the Carbon Rule, will limit existing resources and may cause additional retirements beyond those assumed here

Filed accreditation changes designed to improve alignment with the reliability value of resources

Approach

- Risk hours expanding from summer peak to also include winter
- Seasonal marginal value based on 'Direct Loss of Load' (DLOL) approach matches accreditation with risk hours based on class and individual asset performance
- Solar accreditation falls off with higher levels of penetration because risk hours are shifted to early evening

Indicative Accreditation Trends (% of installed capacity)



Expected Outcomes

Accreditation based on reliability contribution is the right direction, but it comes with additional coordination challenges as MISO Members evolve their fleets

* Includes coal, gas, nuclear, hydro, pumped storage, etc.

MISO has made considerable progress on evolving our processes and tools to support resource adequacy, but additional coordination can drive more efficient and effective resource planning

Recently Completed / In-Process

Initiative	Objective
Seasonal Requirements in Planning Resource Auction	More accurately reflect variations in resource capabilities and availability
Accreditation Enhancements	Improve alignment of capacity “value” with reliability contribution
Reliability-Based Demand Curve	Improve price signals for capacity and inform investment decisions
Shortage Pricing	Incentivize market participant real-time behavior and actions to avoid potential shortage situations

Next Opportunity

- As the fleet continues to evolve, visibility and clarity will be critical to support timely and prudent action.
- MISO processes and assessments provide insights into the region’s short- and long-term supply and demand picture:

Planning Resource Auction	1 Year
OMS-MISO Survey	5 Years
Regional Resource Assessment	20 Years
MISO Futures	20 Years

- A recent stakeholder survey uncovered a desire to evaluate streamlining MISO’s assessments, which may improve participation.

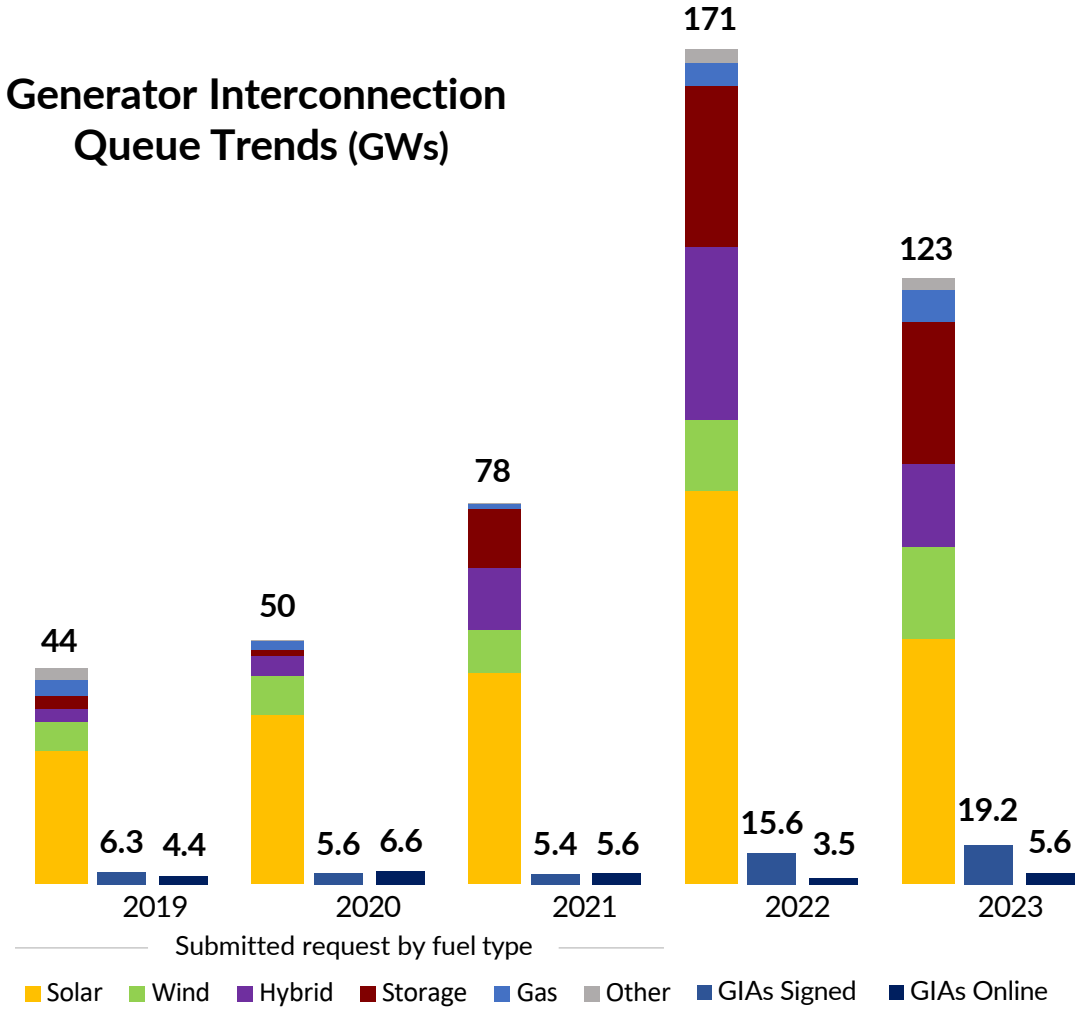
With stakeholder engagement to prioritize and sequence critical work, we expect to make significant progress on other key Market Redefinition initiatives

Examples of deliverables in 2024

Reliability Attributes	Scarcity Pricing	Reliability Metrics	Load Modifying Resource (LMR) Accreditation
<p><i>Integrate solutions identified in the Attributes Roadmap related to priority risks of system adequacy, flexibility, and system stability</i></p>	<p><i>Send the right signals about the value of energy and other products leading up to and during scarcity conditions</i></p>	<p><i>Recognize the limitations of the Loss of Load Expectation metric to determine system adequacy</i></p>	<p><i>Align accreditation with availability and account for characteristics</i></p>
<p>Deliverables</p> <ul style="list-style-type: none">• Ensure resource adequacy and energy market signals are incenting emerging needs• Require capabilities to strengthen the grid	<p>Deliverables</p> <ul style="list-style-type: none">• Present proposed changes to relevant pricing curves for stakeholder feedback• Targeting FERC filing 2024	<p>Deliverables</p> <ul style="list-style-type: none">• Evaluate new or additional risk metrics for resource adequacy assessments and their potential to improve underlying risk models	<p>Deliverables</p> <ul style="list-style-type: none">• Reliability in last stage of emergencies• Visibility in MISO Clearing Engines• Certainty for MISO and Stakeholders• Targeting FERC filing 2024

MISO reforms and Order 2023 measures to improve project readiness appear to be effective as the 2023 Queue volume decreased by 30%

Generator Interconnection Queue Trends (GWs)



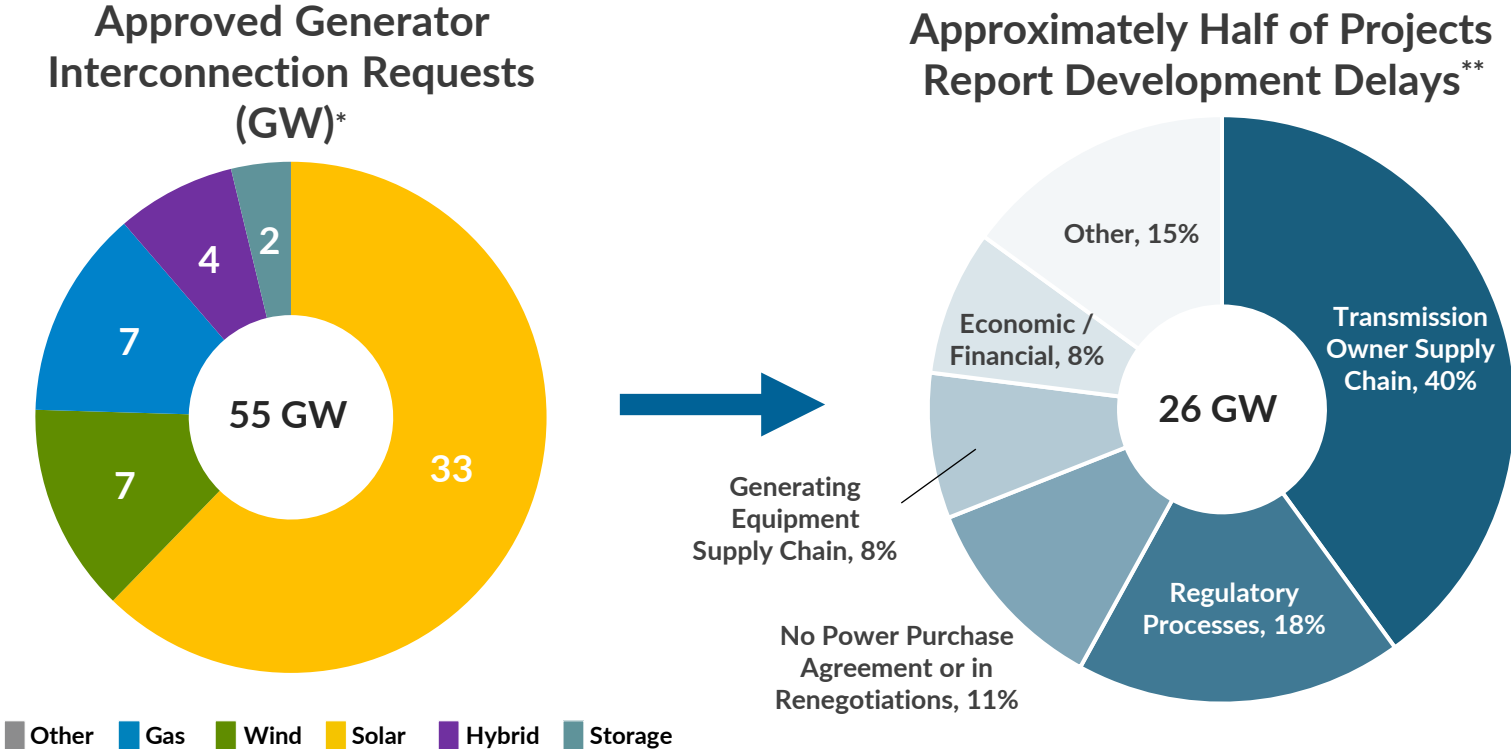
Generator Interconnection Requests

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 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

* The 2023 Generator Interconnection Queue application cycle was deferred to April 2024
 ** Active Queue represents Generator Interconnection requests still active from prior years + 2023 New requests as of 6/12/24

While we are approving more new resources, approximately half continue to experience delays in getting online

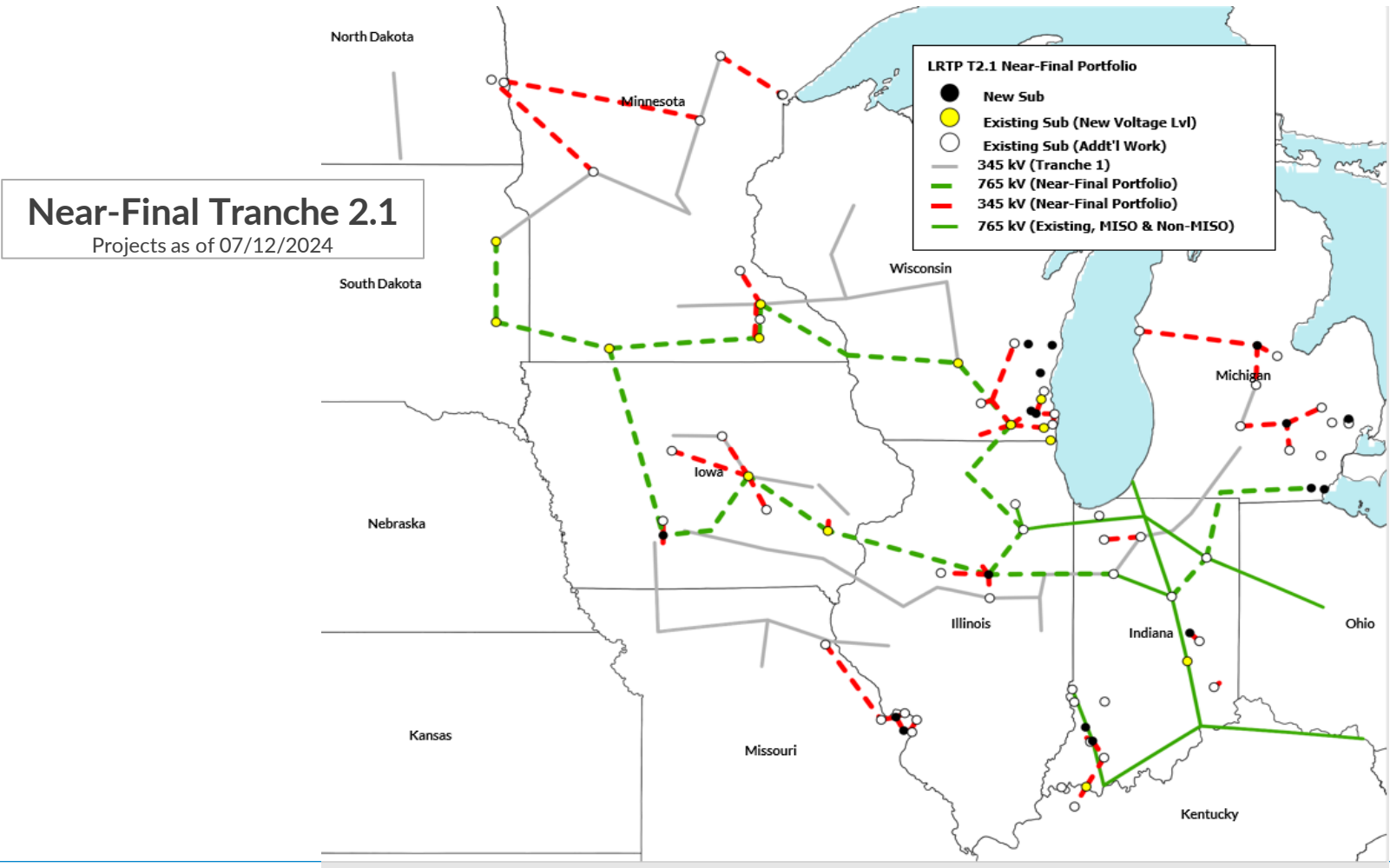


50 GW of resources approved through MISO's interconnection processes are in or awaiting construction with approximately 50% already signaling a delay

*Queue data as of September 4, 2024

** Reasons for delay based on responses from a subset of delayed projects

This work has resulted in a near-final portfolio, which will continue to be refined through business case analysis, with investment expected to be \$21 billion



MISO has been active on many fronts to improve the manageability of its Queue and provide a critical path to timely resource approvals

MISO Queue Cap Proposal	FERC Order 1920	Compliance filings completed in May FERC Order 2023 Compliance	Retirements / Replacement Process
<ul style="list-style-type: none">• Limits GW capacity in each queue cycle study• Helps MISO and neighbors manage the study process and conduct studies more quickly• Proposal specifics previously rejected by FERC will be revised and refiled in 2024	<ul style="list-style-type: none">• Compliance filings due 10 and 12 months after effective date• Requires changes to local, regional, and interregional processes• Requires engagement with states on cost allocation and selection criteria	<ul style="list-style-type: none">• Addresses queue backlogs, improves certainty and prevents undue discrimination for new technologies• Most directives are consistent with MISO reforms filed with FERC in January 2024• MISO adopted approximately 15 reforms	<ul style="list-style-type: none">• MISO improved its resource replacement process to correlate with the Attachment Y process and will continue streamlining processes as retirements accelerate

Coordinating and executing on the priorities within the Reliability Imperative is required to address challenges to reliability

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 INITIATIVES¹

MARKET REDEFINITION	<ul style="list-style-type: none">• Resource Accreditation• Reliability Attributes• Pricing Reforms• Forecast Uncertainties
OPERATIONS OF THE FUTURE	<ul style="list-style-type: none">• Uncertainty & Variability• Planning & Preparedness• Situational Awareness & Critical Communications
TRANSMISSION EVOLUTION	<ul style="list-style-type: none">• Long Range Transmission Planning• Generator Interconnection• Joint Transmission Planning²
SYSTEM ENHANCEMENTS	<ul style="list-style-type: none">• Hybrid Cloud Capability• Fortify Cybersecurity• Advanced Data Analytics Capabilities

¹Partial listing of initiatives;

²Includes Joint Targeted Interconnection Queue (JTIQ)

As MISO executes on Reliability Imperative priorities, broad coordination is needed to consider all actions to support reliability and load growth

- Delaying retirements / maintaining existing fleets continues to be the best immediate lever
- Consideration for relaxed renewable / clean energy goals, providing longer glidepath, to reflect the magnitude of landscape change since many of them were implemented
- Collaboration on potential options for expediting the most critical new resource additions
- Moving LRTP Tranche 1 projects forward quickly and preparations for the same on Tranche 2.1