MISO Resource Adequacy Needs and Impacts of the Proposed ERAS Process

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NOTICE

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Executive Summary

On March 17, 2025, Midcontinent Independent System Operator (MISO) filed with the Federal Energy Regulatory Commission (FERC) an updated tariff that includes a process for expediting resources through the interconnection process. The expedited process, known as the Expedited Resource Addition Study (ERAS), will be available for resources identified by state utility commissions and other Relevant Electric Retail Regulatory Authorities (RERRA) as necessary to meet a resource adequacy or reliability need claimed by the RERRA, a load-serving entity (LSE), or interconnection customers.

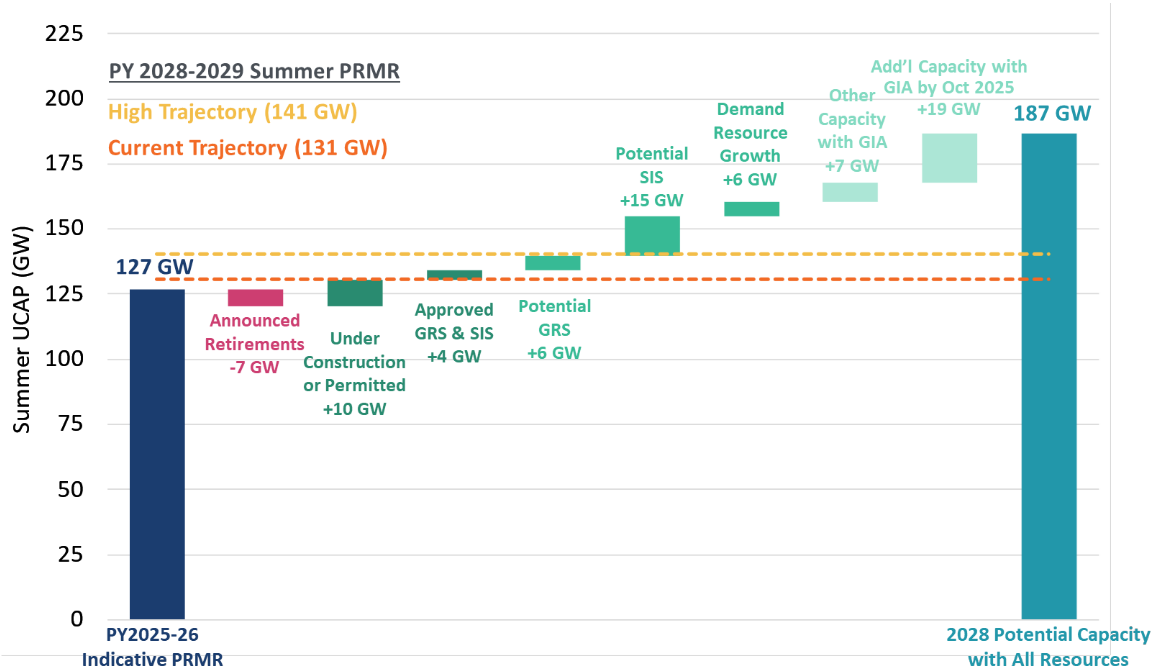
In its FERC filing, MISO specifically refers to two recent surveys and studies completed in 2024 to support its need for implementing the ERAS approach: the Organization of MISO States (OMS)-MISO Survey and the North American Electricity Reliability Corporation (NERC) Long Term Reliability Assessment (LTRA). Both assessments of MISO resource adequacy identify a need for a significant increase in resource additions in future years.

We have reviewed MISO data and find that the need is overstated for two primary reasons. First, MISO's updated load growth projections and accreditation approach tend to reduce the identified need. Second, neither study considers the full set of resources that could come online to meet future MISO resource adequacy needs through 2030, nor the recent increase in the rate of MISO capacity additions in 2023 and 2024.

We completed an updated analysis of MISO resource adequacy needs based on the most recent load forecasts and the recently approved Direct Loss of Load (DLOL) method for resource accreditation. The results of our analysis are summarized in the figure below. If the current outlook through Planning Year (PY) 2028-2029 were to materialize, 10 to 20 GW UCAP of new capacity additions will need to come online by the start of PY 2028-2029, depending on the rate of future load growth. This level of need will require MISO to add 3.4 to 6.8 GW UCAP per year of new capacity additions through PY 2028-2029.

Based on MISO's December 2024 Long-Term Load Forecast, we estimate PY 2028-2029 Planning Reserve Margin Requirement (PRMR) of 131 to 141 GW UCAP, as shown by the yellow and orange dashed lines in the figure below. To meet the capacity need, we estimate the existing capacity under DLOL accreditation (dark blue bar of 127 GW UCAP), currently announced retirements (pink bar of -7 GW UCAP) and several potential sources of new capacity (green bars of 66 GW UCAP). In total, we identify 66 GW UCAP of resources with the potential to be developed by PY 2028-2029—which is enough to conclude that MISO is likely to have sufficient resources to meet expected demand in PY 2028-2029.

POTENTIAL CAPACITY FOR ACHIEVING PLANNING YEAR 2028-2029 SUMMER PLANNING RESERVE MARGIN REQUIREMENT



Notes: PRMR and supply UCAP based on DLOL accreditation approach. See Appendix A for details on each category of new resources.

The sources of new potential capacity to meet the MISO PY 2028-2029 PRMR fall into three categories:

- 14 GW UCAP of resources are currently in advanced stages of development (shown by the dark green bars in the figure above), including resources under construction or permitted with a commercial online date prior to PY 2028-2029 (10 GW UCAP) and resources that have already been approved to utilize existing interconnection rights through the fast-track Generation Replacement Service (GRS) or Surplus Interconnection Service (SIS) processes (4 GW UCAP). If all of these resources are built, this capacity alone would be sufficient to meet the PY2028-2029 Summer PRMR under the Current Trajectory forecast.
- An additional 26 GW UCAP of resources could be added without additional interconnection-related network upgrades (medium green bars), including resources that could likely utilize existing interconnection rights by way of the GRS (6 GW UCAP) or SIS (15 GW UCAP) or by increasing the penetration of demand-side resources (6 GW UCAP).

- A final 26 GW UCAP of resources projected to have a signed Generator Interconnection Agreement (GIA) by October 2025 (i.e., approximately when the first ERAS cycle would be executing GIAs). This includes resources that already have GIAs but are not yet under construction or permitted (7 GW UCAP) plus active resources in Definitive Planning Phase (DPP) cycles with a GIA execution date prior to October 2025 (19 GW UCAP).

MISO needs only 16% of the potential capacity additions identified above to come online by PY 2028-2029 to meet the Current Trajectory Summer PRMR and 31% of the identified additional resources would need to come online to meet the High Trajectory Summer PRMR. If we assume that 90% of resources currently in advanced stages of development are completed, half of the potential GRS capacity is developed, no further requests for SIS are approved, and no further demand response additions are made, just 5 GW UCAP of generation from the DPP process would be needed to ensure resource adequacy in the High Trajectory case. The amount of capacity that is available to be online in PY 2028-2029 could even be higher than those shown in the chart if (1) the currently announced 7 GW UCAP of retirements are delayed, (2) a portion of the 62 GW UCAP of resources currently completing DPP-2022 cycles are constructed, or (3) if higher DLOL natural gas resources are installed through the SIS or GRS processes instead of battery storage resources.

Based on these results, creating a new expedited interconnection process to advance selected resources through the generator interconnection process does not appear to be urgent or currently necessary on a permanent, market-wide basis.

We have also identified several aspects of the proposed ERAS process that could limit its effectiveness in encouraging timely new resource additions and potentially result in adverse impacts to existing and future interconnection customers and ratepayers in MISO, including:

- ERAS may delay completion of existing DPP studies,
- ERAS does not encourage or require utilization of existing grid capacity,
- ERAS does not prioritize resources that are most ready to be constructed,
- ERAS does not provide criteria or requirements to identify a resource adequacy need, and
- ERAS could reduce competition for meeting resource adequacy needs.

Implementing ERAS is not necessary to meet future reliability needs and may be counterproductive due to the adverse impacts to interconnection customers and ratepayers noted above. MISO instead should focus on expediting the processing of requests through existing interconnection processes to avoid further delays for interconnection customers.

I. Introduction and Report Outline

The ERAS process proposed by MISO consists of an expedited interconnection study process that would be available to resources on the written request of a RERRA.[1] The proposed ERAS process includes the following elements:

- **ERAS Timing and Duration**: If approved as requested, the first ERAS study will begin in June 2025 with the goal of executing GIAs by approximately September 2025.[2] Subsequent ERAS studies will initiate quarterly. ERAS will sunset in December 2028, or the end of the 2027 DPP cycle, when MISO anticipates typical queue processing time will be reduced to one year.[3] If implemented along this timeline, MISO could conduct approximately 14 ERAS cycles through 2028.
- **Required In-Service Date**: ERAS projects are required to be in service by 2032. Projects submitted in 2025 and 2026 are required to submit an in-service date that is no more than 3 years after the submission date, and will have an additional 3-year grace period to come online. Projects submitted in 2027 and 2028 are required to submit an in-service date no later than the end of 2028, and will have the additional 3-year grace period to come online.[4]
- **Projects Eligible for ERAS**: Interconnection Customers with an executed agreement demonstrating that their resource will be used to satisfy an entity's claimed resource adequacy reliability need can be submitted into ERAS.[5] Such an agreement can take one of four forms enumerated by MISO.[6] In addition, the specific interconnection request must be accompanied by a notification by the applicable RERRA confirming the resource should be

[1] MISO, Expedited Resource Addition Study Filing Transmittal Letter, Docket No. ER25-1674, March 17, 2025 (ERAS Filing).

[2] ERAS Filing, pp. 2 and 4.

[3] ERAS Filing, p. 24.

[4] ERAS Filing, p. 21.

[5] ERAS Filing, p. 17.

[6] ERAS Filing, pp. 17-18. These four forms include "a) A Load Serving Entity acknowledgement to self-supply; b) A Power Purchase Agreement (PPA) between the Interconnection Customer submitting the project for ERAS consideration and the entity with the load to be served and/or its Load Serving Entity; c) An agreement that calls for the Interconnection Customer to develop the Generating Facility described in the Interconnection Request and subsequently transfer ownership or control of such Generating Facility to the LSE or entity with the load to be served (Build-Own-Transfer Agreement); or d) Other agreement between the entity submitting the Interconnection Request, including the RERRA acknowledgment letter, and the entity with the load to be served, or its Load Serving Entity, stating that the ERAS project will be used to meet an identified resource adequacy and/or reliability need."

considered in the ERAS process to meet a resource adequacy or reliability need identified by the RERRA, an LSE, or an interconnection customer.[7] However, MISO does not require that the resource have been approved by the applicable siting authority for construction or in any other respect.[8] There are no scoring requirements or other methods to rank ERAS projects for their readiness or use of available system capacity.[9]

- **Participation Fee and Withdrawal Penalties:** Projects in active DPP cycles at or before Decision Point 2 can transfer to the ERAS process, if they satisfy the eligibility requirements.[10] Projects that exit the DPP queue can do so at the existing off ramps (Decision Points 1 and 2) and are subject to withdrawal penalties associated with the DPP.[11] To participate in ERAS, an Interconnection Customer must pay a non-refundable application fee of $100,000, a milestone M2 payment of $24,000 per MW, and, upon signing the EGIA, agree to pay for any associated network upgrades.[12]

This report first summarizes MISO's justification for implementing the ERAS framework, including its own resource adequacy concerns and the NERC LRTA resource adequacy outlook in MISO. Next, we present independent analysis of the future MISO resource adequacy needs with a focus on Planning Year (PY) 2028-2029 and the potential scale of capacity additions that could enter the market to meet future resource adequacy needs in the absence of ERAS. Finally, we discuss the implications of MISO instituting ERAS as proposed, including its impacts on future interconnection customers and costs on MISO ratepayers, and notable differences from recently approved emergency interconnection proposals in other regions.

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7 ERAS Filing, pp. 1-2. RERRA is defined as "an entity that has jurisdiction over and establishes prices and/or policies for providers of retail electric service to end-customers, such as the city council for a municipal utility, the governing board of a cooperative utility, the state public utility commission or any such entity."

8 ERAS Filing, p. 125, proposed Tariff attachment X at § 3.9.1(1) ("A RERRA's written notification is not intended to constitute or provide evidence of any final determination of need or suitability of the project for any purpose by the issuing entity beyond requesting that the Transmission Provider apply the ERAS process for such project").

9 ERAS Filing, pp. 25-26.

10 ERAS Filing, pp. 900-901, testimony of Andrew Witmeier at 19:14-20:17.

11 ERAS Filing, p. 901, testimony of Andrew Witmeier at 20:9-13.

12 ERAS Filing, pp. 21 and 56. EGIA is defined as "the interconnection agreement for the Expedited Resource Addition Study established between the Transmission Provider and/or the Transmission Owner and the Interconnection Customer as set forth in Section 3.9 of this Attachment X,"

II. Review of MISO Resource Adequacy Assessments

MISO states that it developed the ERAS approach to address future load growth and maintain resource adequacy. In its FERC filing, MISO specifically refers to two recent surveys and studies completed in 2024 to support its need for implementing the ERAS approach: the OMS-MISO Survey and the NERC LTRA. In this section, we briefly summarize these analyses of MISO's future resource adequacy needs and identify limitations of these resource adequacy assessments that we address in the following section.

Our review of the OMS-MISO Survey and NERC 2024 LTRA focuses on PY 2028-2029 because that is the first auction where resources that complete the proposed ERAS process will have a significant impact on meeting MISO resource adequacy needs (slightly less than 3 years after the completion of the first ERAS study cycle).

A. OMS-MISO Survey of MISO Resource Adequacy

MISO and OMS regularly collaborate to survey future resource adequacy needs in the MISO wholesale electricity market, releasing the most recent version of their findings in June 2024.[13] To assess the outlook for MISO resource adequacy, the OMS-MISO Survey developed a high-level estimate of future planning reserve margin requirements (PRMR) for its system and the future resource additions and retirements for meeting rising demand based on the information available at the time.

As a base assumption for projecting future load, the OMS-MISO Survey relied on the peak load forecasts provided by MISO LSEs as of early 2024. The survey also considered two higher load growth projections based on a range of large load additions from publicly available reports. These two growth rates included: (1) a low-end estimate informed by public announcements of load additions at the time, and (2) an aggressive estimate based on third-party load growth projections.[14]

13 OMS and MISO, 2024 OMS-MISO Survey Results, June 20, 2024. (OMS-MISO Survey).

14 OMS-MISO Survey, p. 13.

For the projected supply capacity, OMS and MISO surveyed existing resource owners to identify the amount of "Committed Capacity" that is most likely to be available in future years, including external resources with firm contracts to serve MISO load.[15] In addition to the Committed Capacity, the survey also provides two projections of "Potential New Capacity" based on (1) the 3-year historical (2020 to 2022) average rate of capacity additions (referred to as the 3-Year Historical Average) of 2.3 GW per year, and (2) estimates from new resources with a signed GIA (referred to as the Alternative Projection) of 6.1 GW per year.[16] Forecasts of future supply and demand in the survey rely on the existing resource accreditation and planning reserve margin approaches that will be utilized in the PY 2025-2026 to PY 2027-2028 Planning Reserve Auctions (PRAs) before switching to DLOL accreditation starting in the PY 2028-2029 PRA.[17]

Based on their analysis, the OMS-MISO survey estimates that the MISO market will require significant new capacity additions, as shown in Figure 1 below. Based on the LSE-developed load forecasts, the PY 2025-2026 outlook ranges from a 2.7 GW shortfall to a 1.1 GW surplus depending on which of the projections of Potential New Capacity is utilized. Continued load growth and retirements through 2030 would require a sustained rate of new resource additions. Depending on the scale of new capacity additions over time, the OMS-MISO Survey projects PY 2028-2029 to have a resource deficit of 11.8 GW to a resource surplus of 3.4 GW. [18]

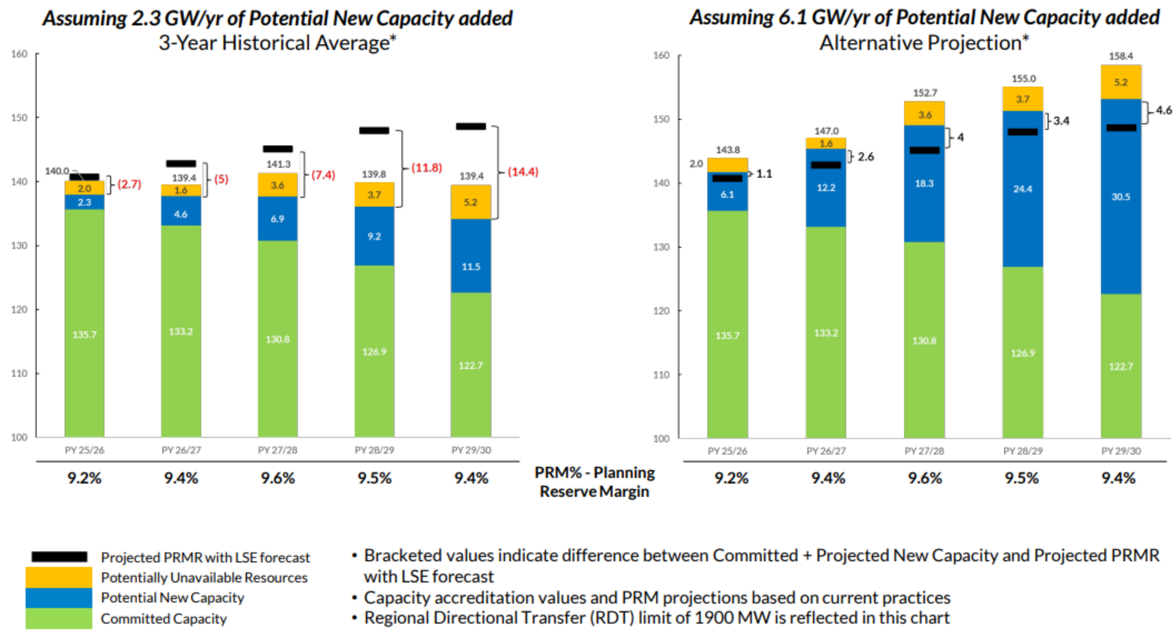
[15] OMS-MISO Survey, p. 6.

[16] OMS-MISO Survey, p. 6.

[17] MISO, Resource Accreditation White Paper, March 2024, p. 28.

[18] The PY 2028-2029 PRMR is based on a peak load forecast of 135 GW and a Planning Reserve Margin of 9.5%. OMS-MISO Survey, p. 7.

FIGURE 1: MISO RESOURCE ADEQUACY PROJECTION – SUMMER (GW)



Source: 2024 OMS-MISO Survey Results, slide 7.

The OMS-MISO Survey next evaluates projected resource adequacy needs under higher load growth accounting for large load additions. Based on the information available at the time of the survey, large load customers add about 12 GW of reserve requirements for PY 2028-2029. At this scale of load growth, the OMS-MISO Survey suggests a shortfall of 9 GW to 24 GW in PY 2028-2029.[19]

In the course of our review of the survey, we identified that several assumptions in the OMS-MISO Survey are outdated and that the survey relies on a limited set of capacity additions that could support future resource adequacy needs.

- MISO's December 2024 Long-Term Load Forecast, which accounts for updated information on large load additions, projects a lower high-end peak demand of 137 GW for PY 2028-2029 compared to the OMS-MISO Survey high-end peak demand of 147 GW for the same year.[20,21]

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[19] OMS-MISO Survey, p. 14.

[20] MISO, Long-Term Load Forecast, December 2024, p. 4. 2028 Peak Load for High Trajectory Case estimated based on Figure 1.

[21] The OMS-MISO Survey high-end 2028 peak load forecast of 147 GW is based on the projected PRMR of 160.7 GW (the sum of 126.9 GW plus 9.2 GW plus 12.5 GW plus 12.0 GW) and the PRM% of 9.5%, rounded to the nearest GW based on page 14.

- The OMS-MISO Survey relies on the current resource accreditation and planning reserve margin (PRM) approach and not the FERC-approved DLOL approach that will be implemented starting with PY 2028-2029. The most recently released indicative DLOL accreditation values and PRM for PY 2025-2026 differ significantly from the same values using the existing approach. For example:
  - The OMS-MISO Survey assumes a PRM of 9.2% for PY 2025-2026 summer based on the current approach, while the indicative DLOL-based PRM for PY 2025-2026 is 1.7%.[22]
  - For wind accreditation, the PY 2025-2026 summer ELCC for wind is 20.8%, while the indicative DLOL for PY 2025-2026 is 7% demonstrating the significant impacts of implementing DLOL in PY 2028-2029.[23]
- The OMS-MISO Survey considers a subset of new capacity resources with an executed GIA through the DPP process. The survey does not assess the capacity that could be developed in the near-future based on the completion of ongoing DPP interconnection studies, alternative interconnection options for new supply, such as GRS or SIS, or demand-side resource growth.
- The OMS-MISO Survey relies on a historical average of new resource additions from 2020 to 2022 for its lower rate of new resource additions, which corresponds to years with significant interconnection process challenges and supply chain constraints created by the COVID-19 pandemic, tariffs, and other regulatory hurdles.[24] This historical rate is not representative of future capacity additions. MISO has recently noted a significant increase in the rate of resource additions since 2022, including 5.6 GW ICAP (approximately 1.9 GW UCAP) in 2023 and 7.5 GW ICAP (3 GW UCAP) in 2024.[25]

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[22] MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025.

[23] MISO, Planning Year 2025-2026 Wind and Solar Capacity Credit Report, March 2025, p. 1.

[24] Mark Bolinger, et al., Utility-Scale Solar, 2023 Edition, October 2023, p. 8 (“Utility-scale additions in 2022 did not reach 2021 levels as less capacity came online over the summer, in part due to temporary anti-dumping/circumvention tariffs and supply chain inspections related to Uyghur Forced Labor Prevention Act.”)

Ryan Wiser, et al,, Land-Based Wind Market Report, 2023 Edition, August 2023, p. vii (“2022 was a relatively slow year in terms of new wind power deployment—the lowest since 2018—due in part to ongoing supply chain pressures, higher interest rates, and interconnection and siting challenges, but also the reduction in the value of the PTC that was in place up until the passage of the Inflation Reduction Act (IRA) in August 2022.”)

[25] RTO Insider, MISO Members Grapple with 54 GW in Incomplete Gen, Predict Storage Expansion, March 2025, (“Aubrey Johnson, the RTO’s vice president of system planning and competitive transmission, said members have recently been picking up the pace on generation additions despite the delays. He said members managed to add a record 7.5 GW in nameplate capacity in 2024, up from 5.6 GW in 2023 and 3.5 GW in 2022. In the first half of 2025, the RTO expects to have 5 GW in new nameplate capacity. Members have added 1.4 GW in nameplate capacity since the beginning of the year.”)

- MISO is increasing the pace of its interconnection studies with the goal of completing all open DPP cycles by the fall of 2026.[26] In addition, automation of the interconnection process has demonstrated significant benefits in recent pilot studies.[27]

Given the number of changes since last summer, the OMS-MISO Survey does not provide an up-to-date outlook for the scale and type of resources that would be necessary to support meeting MISO's future resource adequacy needs.

B. NERC Assessment of MISO Resource Adequacy

NERC assesses in its annual LTRA report multiple aspects of reliability, including long-term resource adequacy. NERC applies the same analysis across each region to evaluate the region's likelihood of meeting the projected future reserve margin, expressed as a percent of projected peak demand.

For MISO, the NERC 2024 LTRA projects a "Reference Margin Level" to represent the future demand for capacity resources to achieve long-term resource adequacy (similar to the projected PRMR in the OMS-MISO survey).[28] The projected MISO Reference Margin Level is based on the MISO PY 2024-2025 Loss of Load Expectation (LOLE) report. [29] NERC estimates two potential future reserve margins based on the projected supply in MISO: the Anticipated Reserve Margin and the Prospective Reserve Margin. Both the Anticipated and Prospective Reserve Margins include existing resources net of announced retirements, transfers from other regions, and new capacity currently under construction or with an approved Interconnection Service Agreement. The Prospective Reserve Margin adds resources earlier in the development process that have completed feasibility studies or submitted an interconnection service request.

NERC's analysis of MISO resource adequacy through 2029, shown below in Figure 2, finds that both the Anticipated Reserve Margin and Prospective Reserve Margin are below the Reference Margin Level in 2025 and 2026, but increase in 2027 to above the Reference Marginal Level. The longer-term reserve margins then decrease increasingly further below the reference level

[26] MISO, Definitive Planning Phase Schedule, March 1, 2025, p. 1.

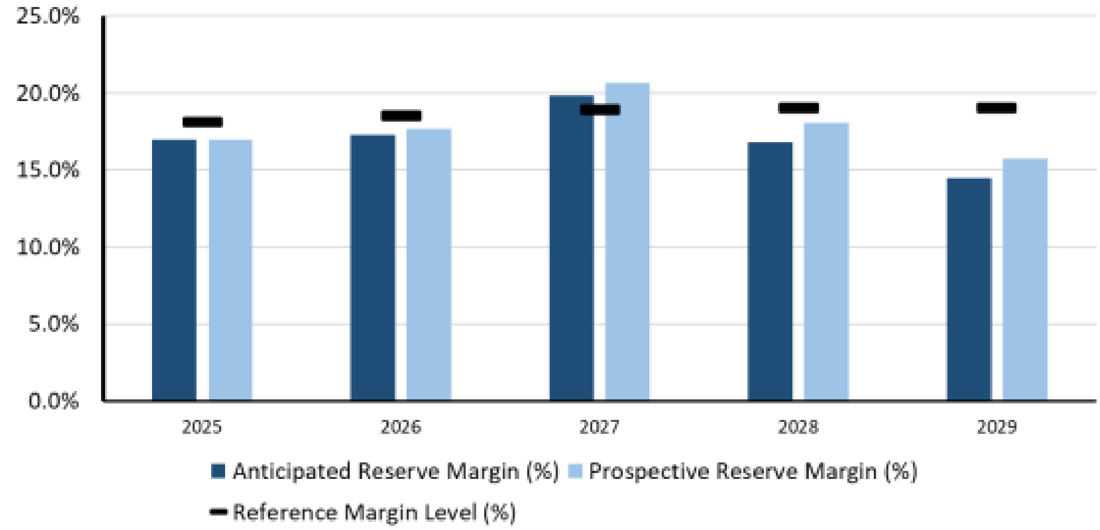
[27] FERC, Commissioner Rosner's Letters to ISOs/RTOs Regarding Interconnection Automation, March 2025.

[28] NERC, 2024 Long Term Reliability Assessment, December 2024, p. 142.

[29] MISO, Planning Year 2024-2025 Loss of Load Expectation Study Report, April 2024, p. 60.

in 2028 and 2029. Based on its analysis, the NERC 2024 LTRA designates MISO as "High Risk" for resource adequacy concerns.

FIGURE 2: MISO FIVE-YEAR PLANNING RESERVE MARGIN - SUMMER



Source: NERC, 2024 Long Term Reliability Assessment, December 2024, p. 13.

NERC relies on an outdated MISO study to project the Reference Reserve Margin Level of 19% for 2028 that is no longer the most up-to-date estimate provided by MISO.[30] The most recent LOLE study estimates a lower Reference Margin Level of 16.3% for PY 2028-2029 in ICAP terms.[31] With the ongoing evolution of MISO's capacity accreditation, MISO will set its future PRMR in UCAP terms, as noted above.

The LTRA Anticipated Reserve Margin case adds 6.1 GW per year of new resources from 2025 to 2027 on average, consistent with the higher Alternative Projection in the OMS-MISO Survey.[32] However, the NERC LTRA reduces projected additions to only 3.2 GW in 2028, resulting in a deficit in 2028 due to the projected load growth, with very limited additions in 2029 and 2030, as shown in Figure 3 below. The declining trends of resource additions projected by NERC do not offset the sustained rate of announced resource retirements of about 3 GW per year that NERC includes in its projections through 2029. The mismatch in the rate of retirements and resource additions plus ongoing load growth results in their projection showing insufficient future capacity in 2028 and 2029. If NERC assumed the rate of new capacity additions of at least 6 GW continues in 2028 and 2029 as suggested in MISO's Alternative

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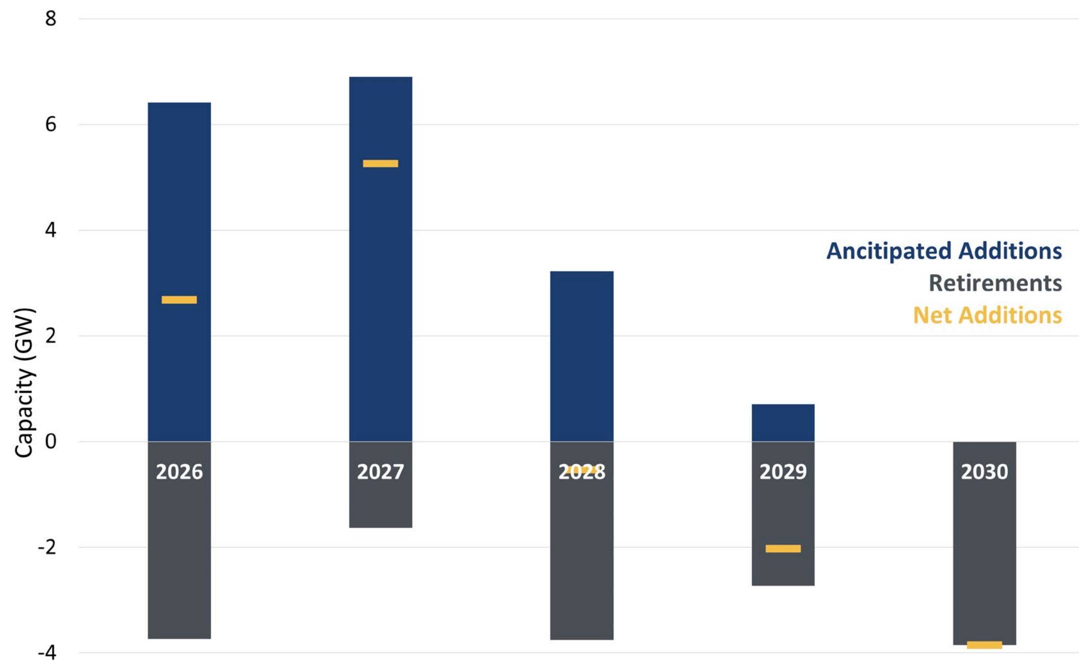
[30] MISO, Planning Year 2024-2025 Loss of Load Expectation Study Report, April 2024, p. 60.

[31] MISO, Planning Year 2025-2026 Loss of Load Expectation Study Report, March 13, 2025, p. 65.

[32] NERC, 2024 Long Term Reliability Assessment, December 2024, pp. 41 and 137.

Projection, MISO would have sufficient resources to exceed the projected Reference Margin Level in each future year.

FIGURE 3: NERC 2024 LTRA MISO ANTICIPATED ADDITIONS AND RETIREMENTS



Source: Brattle analysis of NERC 2024 LTRA.

The differences in approach for projecting long-term retirements and additions reflects a key challenge in assessing long-term resource adequacy based on NERC's approach. While the interconnection process provides the best near-term view on resources that are progressing towards construction and coming online through 2027, it provides only limited insights into longer term additions from 2028 to 2030. However, as the outlook for shortfalls emerge due to the projected demand growth and announced retirements , the market will induce further capacity additions by responding to capacity price signals and increasing needs identified in resource planning studies. As noted above the pace of new resource additions has already increased and improvements to the interconnection study process will allow more resources to come online in the coming years. For these reasons, it is unreasonable for NERC to project declining capacity additions in 2028 to 2030 in its LTRA.

Finally, the LTRA does not assume any increase in demand response resources in MISO over this time period, and actually projects a decrease of 140 MW from 2025 to 2028. As discussed in more detail below, MISO's projected increase in demand response participation undermines this conclusion.

III. Capacity Additions for Meeting PY 2028-2029 PRMR

Given the limitations of the recent MISO resource adequacy assessments summarized above, we analyzed the future resource adequacy balance in MISO focusing on PY 2028-2029. At a high level, our analysis utilizes a different approach than either the OMS-MISO Survey or the NERC LTRA by accounting for several factors including (1) the updated load forecasts published by MISO in late 2024, (2) updated reserve margins based on the PY 2025-2026 Indicative DLOL study, (3) the latest resource accreditation assumptions based on the approved DLOL-based approach, and (4) a more comprehensive set of likely new potential resource additions including demand response, generation replacement interconnection, and surplus interconnection service, as well as resources with a signed GIA. Table 1 below highlights the primary differences between the data and assumptions used by the 2024 OMS-MISO Survey and those adopted in our analysis, which is described in more detail below.

TABLE 1: ANALYSIS OF MISO'S 2028-2029 RESOURCE ADEQUACY

PY 2028-2029 Estimates	2024 OMS-MISO Survey Results	Brattle MISO RA Analysis
Publication Date	June 2024	April 2025
Summer Peak Load Forecast	135 – 147 GW[1]	128 – 137 GW[2]
Summer PRM %	9.5%[1]	2.3%[3]
Summer PRMR	148 – 161 GW UCAP	131 – 141 GW UCAP
Accreditation Method	Current Accreditation	DLOL-based Accreditation
Potential Resource Additions	DPP Interconnection Queue	DPP, GRS, SIS, Demand Resources

Source and notes:

[1] MISO, 2024 OMS-MISO Survey Results, June 20, 2024, pp. 7 and 14. Load forecast = Projected PRMR / (1 + PRM).

[2] MISO, Long-Term Load Forecast, December 2024, Figure 1, Current and High Trajectory.

[3] MISO, Planning Year 2025-2026 Loss of Load Expectation Study Report, March 2025, p. 63. MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025, p. 4. See Appendix A for more details.

A. Analytical Approach

To evaluate the potential for new capacity resources to meet the growing resource adequacy needs in MISO, we assessed each aspect of MISO's resource adequacy market with the goal of identifying the amount of resources needed to meet PY 2028-2029 resource adequacy needs and the potential new resource additions that could be added to achieve the projected PY 2028-2029 capacity requirement.

Across our analysis, we calculated resource accredited capacity based on the Indicative DLOL for PY 2025-2026 for each resource type.[33] For storage DLOL in 2028, we assumed a DLOL of 62% based on the high end of previously released indicative PY 2025-2026 values and the trend towards higher storage DLOL values by 2030 reported in the MISO 2024 RRA report.[34]

- **PY 2028-2029 PRMR**: We rely on the MISO 2024 Long-Term Load Forecast released December 2024 that includes three forecasts for 2028 peak demand.[35] We utilize the Current Trajectory (middle forecast) and High Trajectory (highest forecast).[36] We set the PY 2028-2029 Summer PRM at 2.3% based on the PY 2025-2026 Indicative DLOL study of 1.7% and the projected trend in PRM from PY 2025-2026 to PY 2028-2029 from the most recent LOLE study.[37] We then multiply the summer 2028 peak load forecasts by the estimated PRM to calculate the PY 2028-2029 PRMR.
- **Existing Capacity Resources for PY 2025-2026**: We start with the total capacity MISO expects to be available for PY 2025-2026 based on the DLOL accreditation approach.[38] We removed capacity with a signed GIA and commercial online date between March and May 2025 to avoid double counting with later categories.
- **Announced Retirements after PY 2025-2026**: We reduce the existing PY 2025-2026 capacity to account for future announced retirements. Based on reported retirement dates from the Hitachi ABB Generating Unit Capacity (GUC) database, we account for all announced retirements from June 2026 (the start of PY 2026-2027) to September 2028 (the end of the PY 2028-2029 summer season).[39]

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33 MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025.

34 MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, December 13, 2024; MISO, 2024 Regional Resource Assessment, January 2025, p. 7.

35 MISO, Long-Term Load Forecast, December 2024, Figure 1.

36 Alternative projections of large load additions primarily accounts for differences in the load forecast.

37 MISO, Planning Year 2025-2026 Loss of Load Expectation Study Report, 2025, p. 65; MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025.

38 MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025, p. 4.

39 Energy Velocity Suite, Generating Unit Capacity, accessed January 31, 2025.

- **Capacity Under Construction or Permitted**: We include resources that are under construction or have completed permitting with a projected commercial online date between March 2025 and May 2028 based on the GUC database.[40]
- **Approved GRS or SIS Capacity**: We include resources approved by MISO to utilize existing interconnection capacity through the GRS and SIS processes. GRS allows retiring resources to transfer its interconnection rights to a new resource, such as a retiring coal plant transferring its rights to a new gas resource. SIS allows the addition of new resources to an existing resource or GIA to utilize its interconnection rights, such as adding storage to an existing solar resource. Projected resource potential for these categories is based on the GRS and SIS queues posted as of March 2025.[41] Approved GRS and SIS resources listed in the GUC as under construction or permitted are included in the previous category and removed from this one to avoid double counting.
- **Potential GRS Capacity**: Additional new resources can utilize existing interconnection capacity at retiring resources. Resources in this category include new resources that are listed as "Active" in the GRS queue and new resources that could be developed at the location of retiring resources that have not yet been submitted to the GRS process. Recent GRS queue data shows that 61% of coal plants retiring between 2023 and 2025 have requested or received approval to be replaced through the GRS, demonstrating that GRS is being highly utilized in MISO to add new capacity resources.[42] We conservatively assume lower DLOL battery storage resources (62%) are built at all retiring resources that have not yet submitted a GRS request instead of higher DLOL gas resources (88%).[43] Alternatively, the retirement of existing resources could be delayed to meet peak demand periods, which would tend to result in higher accredited capacity than replacing the existing resources with storage. For example, the 1,023 MW Columbia Energy Center in Wisconsin was scheduled to retire in 2026 but will now remain online and may be converted to burning natural gas by

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40 Energy Velocity Suite, Generating Unit Capacity, accessed January 31, 2025. We included resources listed in the GUC database listed as Testing, Under Construction, Site Prep, or Permitted with an online date between June 2025 and June 2028.

41 MISO, GI Interactive Queue, January 10, 2025. Note that the SIS and GRS queues were last updated on January 10, 2025, at the time of this report.

42 Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025; MISO, Generator Replacement Requests, accessed 2 February 2025.

43 Battery storage is a modular resource that can be sized more easily to utilize the existing interconnection rights and does not require access to a fuel source.

2030.[44] For this analysis, we assume resources retire as currently planned and are replaced with storage.

- **Potential SIS Capacity**: Additional new resources can utilize available headroom at existing resources to maximize their interconnection rights. The SIS queue demonstrates that developers are seeking to maximize existing interconnection capacity through the SIS process with 5.5 GW ICAP (2.3 GW UCAP) of completed or active requests. In the six-month period from June 2024 to November 2024 (the date of the most recent SIS request), interconnection customers submitted 2.2 GW ICAP (1.1 GW UCAP) of SIS requests, demonstrating that significant capacity has recently entered the SIS queue and a significant interest in the use of the SIS process.[45] We estimate future potential SIS capacity by assuming all operating solar and wind resources with Network Resource Interconnection Service (NRIS) that have not yet submitted an SIS request can add storage to its GIA via SIS.[46] Existing wind and solar were included in our analysis due to their large existing capacity and relatively low DLOL accreditation. Based on existing SIS requests and input from renewable energy owners, we assume storage capacity is installed equivalent to 80% of solar nameplate capacity and 70% of wind nameplate capacity.
- **Demand Resource Growth**: MISO forecasts growth in demand resources in its Futures scenarios. We include demand resource growth by PY 2028-2029 based on the forecasted increase in demand response and behind-the-meter generation in Future 2A.[47] We then applied the ratio of the Offer (Zonal Resource Credit) over the ICAP Confirmed for Summer 2024 published in MISO's PRA results to estimate the equivalent UCAP contribution of demand resources.[48]

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[44] WPS News Center, Wisconsin energy companies announce plan to continue operations at Columbia Energy Center, commit to exploring conversion to natural gas, December 2024.

[45] The reasons for a lack of new SIS requests since mid-November is unclear, but new projects may be delayed due to MISO internal processes or uncertainty in the DLOL accreditation.

[46] We assume 69% of operating solar and 61% of operating wind have NRIS based on the MISO Interconnection Queue. See also Table 4 for completed SIS requests.

[47] MISO, MISO Futures Report, November 1, 2023, p. 87.

[48] MISO, PRA Detailed Report Plan Year 2024-25, 2024, tab "ZRC by Type". The ratio of the Offer (Zonal Resource Credit) over the ICAP Confirmed for Summer 2024 is equal to 83% for Demand Resources, and 37% for Behind-the-Meter Generation. MISO is currently updating its approach to demand resource accreditation, which is likely to reduce the accreditation of both existing and new demand response resources in MISO.

- **Other Capacity with Executed GIA**: We add capacity with an executed GIA in the DPP interconnection queue database that is listed as "Not Under Construction" with an online date between June 2025 and May 2028.[49]
- **Additional Capacity with GIA by October 2025**: Additional capacity in the DPP interconnection queue database is scheduled to execute GIAs by October 2025, including resources in the DPP-2019, DPP-2020, and DPP-2021 cycles.[50] The cutoff date was selected based on the expected completion of the first ERAS study and the likelihood that resources with an executed GIA by October 2025 can be constructed in time to contribute to MISO resource adequacy in PY 2028-2029 based on the posted commercial online dates in the DPP interconnection queue.[51]

We started by evaluating the full potential of developing resources in each category and then apply different assumptions for how much of the potential resources may be added to meet the PY 2028-2029 PRMR. Full details of our analysis for each category are provided in Appendix A.

B. Capacity Addition Analysis Results

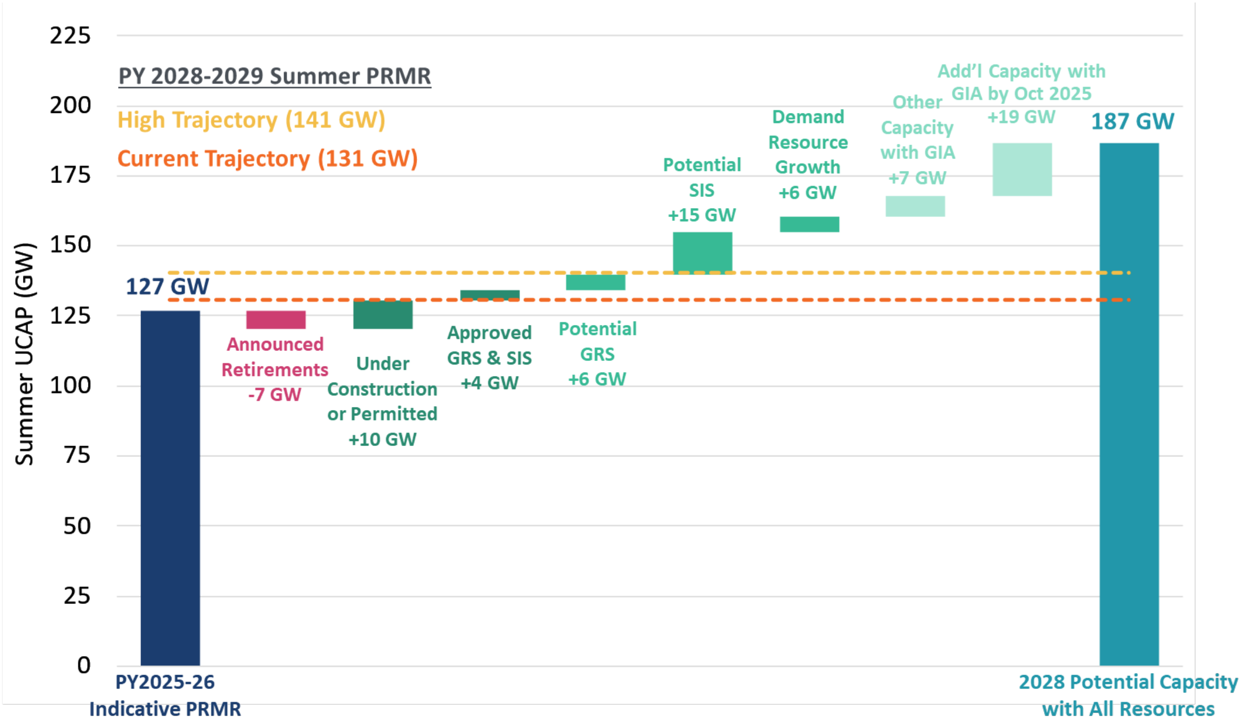
Based on our analysis, we calculated a PY 2028-2029 summer PRMR ranging from 131 to 141 GW UCAP accounting for the higher end of MISO's updated load forecast and an updated indicative DLOL-based PRM of 2.3%, as shown by the yellow and orange dashed lines in Figure 4 below. The total capacity that is currently operating (dark blue bar), net of retirements (pink bar), plus capacity resources in advanced development (dark green bars) or with the potential to come online by summer 2028 (medium and light green bars) add up to 187 GW UCAP (teal bar). This analysis demonstrates that there is already sufficient resource potential in development through existing interconnection processes to meet the PY 2028-2029 resource needs without ERAS.

49 Resources with an executed GIA with an online date prior to June 2025 are assumed to be included in the indicative PY 2025-2025 PRMR.

50 MISO, Definitive Planning Phase Schedule, March 1, 2025, p. 1.

51 The commercial online date is based on the "Negotiated In-Service Date" where available. Otherwise, the "Application In-Service Date" was used.

FIGURE 4: POTENTIAL CAPACITY FOR ACHIEVING MISO PY 2028-2029 PRMR



Notes: PRMR and supply UCAP based on DLOL accreditation approach. PY2025-26 Indictive PRMR slightly lower than reported by MISO due to adjustments for resources that have not yet completed construction prior to start of PY 2025-2026 in June 2025.See Appendix A for details on each category of existing and new resources.

Accounting for existing resources for PY 2025-2026 and announced retirements through summer 2028, we estimate 120 GW UCAP of existing resources will remain online during PY 2028-2029, creating a need for 10 to 20 GW UCAP of new resources by the start of PY 2028-2029, depending on the rate of future load growth. This level of need will require MISO to add 3.5 to 6.8 GW of UCAP per year of new capacity additions through PY 2028-2029.

As shown in the figure above, to meet the PY 2028-2029 capacity need, we estimate 14 GW UCAP of resources are currently in advanced stages of development (as shown by the dark green bars), including resources that are under construction or permitted with a commercial online date prior to PY 2028-2029 (10 GW UCAP) and resources that have already been approved to utilize existing interconnection rights through the GRS or SIS process (4 GW UCAP). If all of these resources are built, this capacity alone would be sufficient to meet the PY 2028-2029 Summer PRMR under the Current Trajectory forecast.

An additional 26 GW UCAP of resources could potentially be added without additional interconnection-related network upgrades (medium green bars). These resources can either utilize existing interconnection rights by way of the GRS (6 GW UCAP) or SIS (15 GW UCAP) processes or by increasing the penetration of demand-side resources (6 GW UCAP).

Finally, the MISO interconnection queue may include up to 26 GW UCAP of resources with a signed GIA as of October 2025, including 7 GW UCAP that already have GIAs but are not yet under construction or permitted plus 19 GW UCAP that remain active in DPP cycles with a GIA execution date prior to or in October 2025, based on the latest MISO DPP schedule.[52]

In total, we identify 66 GW UCAP of resources with the potential to be developed by PY 2028-2029, although not all of these resources will ultimately enter service. MISO needs 16% of the identified potential capacity to come online by PY 2028-2029 to meet the Current Trajectory planning reserve margin requirement and 31% to come online to meet the High Trajectory needs. As noted earlier, the amount of capacity that is available to be online in PY 2028-2029 could be higher if we assumed currently announced retirements are delayed, additional resources from ongoing DPP cycles are constructed, or higher DLOL natural gas resources are installed through the SIS or GRS processes.

Given the uncertainty in future development, we created four scenarios to identify alternative approaches for meeting the PY 2028-2029 summer High Trajectory PRMR based on the potential resources identified above. Table 2 below shows the assumptions underlying these scenarios, which assume gradually lower levels of new capacity from potential GRS, SIS or demand resources in each scenario, resulting in increasingly greater reliance on DPP capacity. For example, Scenario 1 demonstrates that if 90% of under construction and permitted projects and approved GRS and SIS capacity are built and 50% of potential GRS, SIS, and demand response are added, MISO would not need to add any capacity from the DPP queue to have sufficient capacity to meet the Current or High Trajectory needs.

At the other end in Scenario 4, if 90% of under construction and permitted projects and approved GRS and SIS capacity are built, half of potential GRS is added, but no potential SIS or demand response are added, MISO will need 5 GW UCAP of DPP projects, or 19% of the capacity with a GIA or expected to execute a GIA by October 2025. In other words, even if we assume that no further requests for SIS are approved and no further demand response additions are made, 5 GW UCAP of generation from the DPP process would be needed to ensure resource adequacy under the High Trajectory PRMR.

The results of each scenario are shown in Note: DPP resources are in UCAP terms.

52 MISO, Definitive Planning Phase Schedule, March 1, 2025, p. 1.

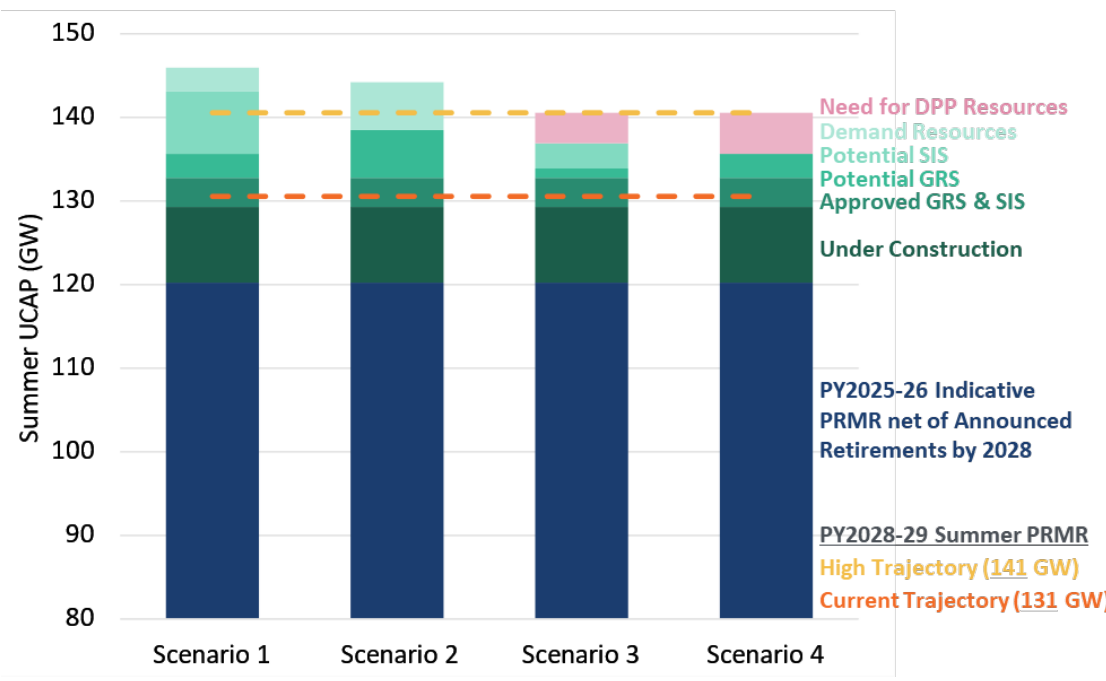
Figure 5 below, demonstrating that different combinations of resources can support MISO meeting its PY 2028-2029 resource needs under the Current Trajectory and High Trajectory cases.

TABLE 2: ASSUMED PY 2028-2029 CAPACITY ADDITIONS BY PROCESS

Resource Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Under Construction and Approved GRS & SIS	90%	90%	90%	90%
Potential GRS	50%	100%	20%	50%
Potential SIS	50%	0%	20%	0%
Potential Demand Resources	50%	100%	0%	0%
DPP Resources to Meet Current Trajectory PRMR	**0 GW**	**0 GW**	**0 GW**	**0 GW**
DPP Resources to Meet High Trajectory PRMR	**0 GW**	**0 GW**	**3.7 GW (14%)**	**5.0 GW (19%)**

Note: DPP resources are in UCAP terms.

FIGURE 5: SCENARIOS FOR MISO'S RESOURCE ADEQUACY IN PY 2028-2029



C. Findings from MISO Resource Additions Analysis

Analyzing a comprehensive set of potential resource additions demonstrate that there are several existing pathways utilizing current interconnection processes and already available fast-track options for the MISO market to meet the projected resource adequacy need in future years, and specifically in PY 2028-2029. Based on these results, creating a new expedited interconnection process is not necessary to meet resource adequacy needs.

IV. Impacts of ERAS on the MISO Market

Based on our review of the filed ERAS approach, we identify below several aspects of the proposed ERAS process that could limit its effectiveness in encouraging timely new resource additions and potentially result in adverse impacts to customers in MISO, including:

- ERAS may delay completion of existing DPP studies,
- ERAS does not encourage or require utilization of existing grid capacity,
- ERAS does not prioritize resources that are most ready to be constructed,
- ERAS does not provide criteria or requirements to identify an urgent resource adequacy need, and
- ERAS could reduce competition for meeting resource adequacy needs.

As described in the ERAS filing, other regions have received approval of emergency fast-track queue proposals in recent months.[53] FERC's recent approval of PJM's Reliability Resource Initiative (RRI) provides a roadmap towards elements of an accelerated queue process in MISO or other regions that could also be approved.[54] Given the timeliness of the PJM RRI Order, the elements outlined in Commissioners' Rosner and Phillips' concurrence illustrate a helpful framework against which to evaluate the ERAS proposal.[55] As we note below, the ERAS proposal features limitations in many areas that Commissioners Rosner and Phillips specifically

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[53] See ERAS Filing, p. 32; 190 FERC ¶ 61,084 (2025) (PJM RRI Order).

[54] See PJM RRI Order at Commissioners Rosner, Phillips, concurring at 6-12.

[55] Notably, even with the factors below weighting in favor of PJM's proposal in each case (as compared to ERAS), Commissioner Rosner and Phillips identified approval of PJM's RRI as a "close call." See PJM RRI Order at Commissioners Rosner, Phillips, concurring at 12.

noted as criterial to their approval of PJM's RRI. We discuss these and other limitations of the ERAS proposal in more detail below.

A. ERAS may delay completion of existing DPP studies

As noted above, our analysis confirms that there is significant new capacity that can come online by PY 2028-2029 if studies are completed based on the current DPP schedule. Implementing and running a new ERAS interconnection process in parallel to processing existing DPP, GRS, and SIS requests will require additional MISO staff resources. Without ERAS, these MISO staff resources could instead be utilized for implementing improvements to the existing interconnection processes (such as through process automation) and completing those studies. Over the past year, while MISO has been focused on improving its interconnection process, the schedule for completing the DPP cycles has been delayed by 10-16 months for DPP-2021, 11 months for DPP-2022, and 11 months for DPP-2023. MISO has been unable to meet its already-delayed schedules for processing existing interconnection processes. Adding a new process will put additional strain on MISO staff resources and may further delay the completion of the ongoing DPP cycles. As a bookend estimate: if ERAS were to delay DPP studies by a year and, subsequently, delays the completion of 1 GW ICAP of solar and 1 GW ICAP of wind resources by a year, ERAS would increase production costs by $114 million.[56]

B. ERAS does not prioritize or require utilization of existing grid capacity

ERAS includes no requirement or criteria for prioritizing resources that utilize existing transmission capacity or minimize the need for new network upgrades that could be exposed to similar supply chain delays.[57] The lack of such requirements or prioritization criteria is likely to limit the effectiveness of ERAS to bring online additional capacity in the near-term, as MISO has identified transmission-owner delays in completing network upgrades as the single largest

56 Based on the 2023 wholesale market value of wind ($14.40/MWh, 41.8% capacity factor) and solar ($32.55/MWh, 21.6% capacity factor) for MISO reported by LBNL.

57 Rob Gramlich, et al., Unlocking America's Energy: How to Efficiently Connect New Generation to the Grid, August 2024, pp. 36-53. "Transmission providers should adopt interconnection processes that efficiently interconnect new resources at locations on the system with existing and proactively planned grid capacity ('headroom'). Significant near-term opportunities exist to increase the rate of interconnection and can be unlocked by processing those interconnection requests to access headroom on a 'fast-track.'"

factor delaying the ability of projects with signed GIAs to achieve commercial operation within the MISO region.[58]

By contrast, the PJM RRI includes scoring criteria focused on limited network upgrade impacts that will result in limited impact on existing interconnection customers and low likelihood of need for network upgrades.[59]

MISO has proposed an ERAS approach that does not prioritize the use of existing headroom on the system and so may not (1) reduce the time and MISO staff resources needed for studying and granting EGIAs to resources, (2) reduce the risks of resources dropping out of the ERAS process due to high network upgrade costs or long network upgrade construction schedules, or (3) reduce the time and costs for constructing required network upgrades. ERAS has no mechanism in place to prioritize resources that reduce interconnection-delay risks by utilizing existing or planned headroom on the grid and screen out resources that would likely be unable to provide resource adequacy due to lack of transmission capacity (e.g., that require new long-lead-time network upgrades).

An expedited interconnection process without requirements to utilize existing headroom will tend to increase network upgrade costs ultimately paid for customers compared to an expedited process that prioritizes utilizing existing system headroom. Based on historical network upgrade costs in MISO, each 1 GW of resources developed through ERAS instead of developing similar resources that utilize existing capacity will on average increase network upgrade costs by $25 to $125 million.[60]

C. ERAS does not prioritize most-ready resources

MISO has identified a need for adding new capacity prior to 2028. However, ERAS includes neither requirements for resources submitted into ERAS to be online by 2028 to meet the forecasted shortfalls nor criteria for prioritizing the most “shovel-ready” projects.

58 MISO Board of Directors, Strategy Update: Reliability Imperative, September 19, 2024, p. 6. MISO System Planning Committee of the Board of Directors, Generator Interconnection Queue Update, December 10, 2024, p. 7.

59 As noted by Commissioner Chang in her dissent, the PJM RRI includes the ability to utilize existing headroom as a part of its scoring criteria, but only gives it 5% weight of the overall score.

60 Based on historical network upgrade costs reported by LBNL of $25/kW to $125/kW.

ERAS will not ensure that shovel-ready resources able to most easily meet the forecasted immediate need are prioritized.[61] In addition, ERAS does not limit withdrawals prior to execution of the EGIA, or limit previously withdrawn resources from entering subsequent ERAS cycles. Further, while MISO relies on and references repeatedly the requirement for ERAS resources to remain responsible for assigned network upgrade costs even if they drop out of the queue, this requirement only attaches once the ERAS resource executes the EGIA.[62]

D. ERAS does not provide criteria or requirements for RERRAs to identify a resource adequacy need

MISO currently runs a PRA market to ensure that the LSEs in each zone within its market has sufficient resources on its system to maintain resource adequacy. As detailed earlier in the report, the PRA includes specific rules regarding the amount of capacity needed to maintain resource adequacy and accreditation of capacity. Yet, the ERAS approach does not specify any such criteria or process requirements for how the RERRA will determine that a resource adequacy need exists in future PRAs and that insufficient resources are in development to meet that need without ERAS. Without clear criteria for what constitutes an ERAS resource adequacy need, MISO will be unable to evaluate whether such a resource adequacy need actually exists and whether an ERAS study is necessary to meet that need. Critically, this is a flaw that Commissioners have recently indicated could undermine acceptance of emergency-only interconnection proposals.[63]

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[61] ERAS Filing, p. 21 ("ERAS projects submitted in 2025 and 2026 will have a commercial operation date ("COD") no more than 3 years from submission date, and the 3-year grace period in the pro forma GIA will provide those projects with up to six years to come online. ERAS projects submitted in 2027 and 2028 must have a commercial operation date no later than December 31, 2028 with the same 3-year grace period afforded to all Interconnection Customers by MISO's GIA. MISO agreed not to allow the pre-GIA three-year standard extension allowed to DPP Interconnection Requests for ERAS projects. Thus, all ERAS projects will be operational no later than 2032.").

[62] ERAS Filing, p. 21 ("First, to participate in ERAS, an Interconnection Customer must pay a non-refundable application fee of $100,000, a milestone M2 payment of $24,000 per MW, and, upon signing the EGIA, agree to pay for any associated network upgrades even if the project is ultimately withdrawn from ERAS.").

[63] See PJM RRI Order at Commissioners Rosner, Phillips, concurring at 10, stating that proposed metrics not tied directly to identified and supported resource adequacy need would not be reasonable.

E. ERAS could reduce competition for meeting claimed resource adequacy needs

ERAS will provide new generation resources submitted into its process a distinct (and possibly unfair) advantage to entering the market over potentially more cost-effective resources that do not have access to ERAS. In this way, ERAS could reduce the competitive landscape for meeting resource adequacy needs in MISO's market and increase costs to customers. Estimating the cost impacts of reduced competition is challenging without specific circumstances to evaluate. However to provide a high-level estimate, if the lack of competition increased installed costs by 5% each 1 GW UCAP of resources supported by ERAS would increase customer costs by about $5.9 million per year to $6.8 million per year.[64]

V. Conclusion

Our analysis of future MISO resource adequacy needs finds that the rate of new capacity additions will have to increase, as noted in the OMS-MISO Survey and NERC LTRA. However, we also find that there is sufficient capacity that could meet those future needs through fast-track options already available in the existing interconnection processes. In addition, the proposed ERAS approach for accelerating interconnection of new resources is not well designed to address urgent resource adequacy challenges as it does not target the primary challenges delaying the development of new resources (such as transmission construction-related delays) and may have some negative impacts on other interconnection customers and the MISO market by adversely impacting the ongoing DPP cycles, not prioritizing resources that utilize existing headroom on the system, not setting tighter timelines to come online, and reducing competition to meet resource adequacy needs.

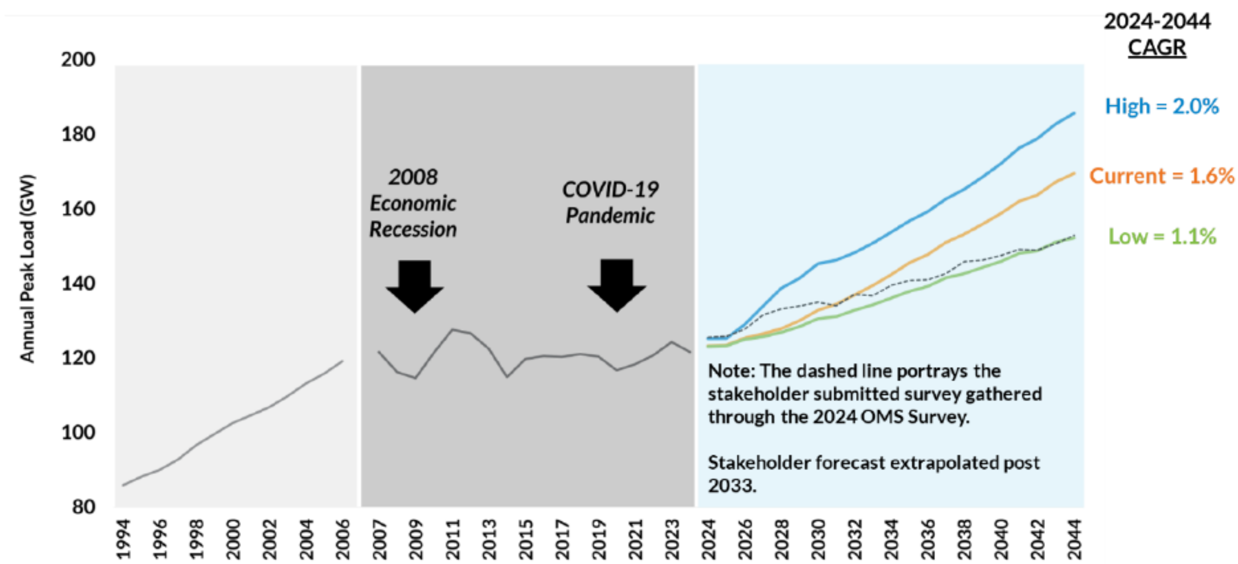
[64] Cost impacts based on MISO, MISO Cost of New Entry (CONE) and Net CONE Calculation for Planning Year 2025/2026, September 23, 2024, p. 11.

Appendix A: Detailed Analysis of MISO PY 2028-2029 Resource Adequacy Needs

PROJECTED PY 2028-2029 PLANNING RESERVE MARGIN REQUIREMENT

We estimate the projected PY 2028-2029 summer PRMR utilizing the MISO estimated peak load plus the forecast planning reserve margin requirement for the corresponding season and planning year. As shown in Figure 6 below, MISO's summer 2028 peak load is based on its Long-Term Load Forecast, with projected needs of 128 GW in the Current Trajectory and 137 GW in the High Trajectory case. The Current Trajectory case accounts for technology adoption trends and future industry policy, including load growth from data centers, domestic manufacturing, and green hydrogen production. The High Trajectory case assumes more aggressive load growth and accelerated EV adoption.

FIGURE 6: MISO PEAK DEMAND TRAJECTORIES BASED ON LONG-TERM LOAD FORECAST



Source: MISO, Long-Term Load Forecast, December 2024, p. 4.

MISO's PY 2025-2026 Indicative DLOL study forecasts a summer PRM of 1.7% for PY 2025-2026.[65] We estimate a summer PRM of 2.3% for PY 2028-2029 based on the growth rate of PRM percentages under the current accreditation methodology.[66] The PY 2025-2026 LOLE Study Report indicates a summer PRM UCAP of 7.9% for PY 2025-2026 and 8.5% for

[65] MISO, Planning Year 2025-2026 Indicative Direct Loss of Load (DLOL) Results, February 20, 2025.

[66] MISO, Planning Year 2025-2026 Loss of Load Expectation Study Report, March 13, 2025, p. 65.

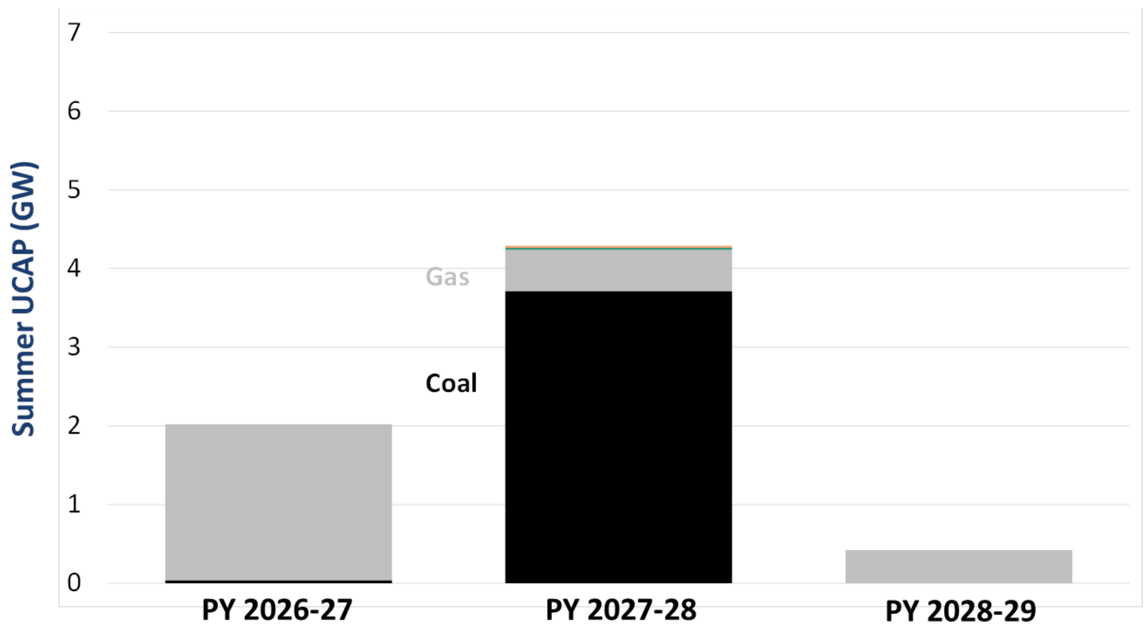
PY 2028-2029. We applied the ratio between the two to the summer PRM UCAP of 1.7% for PY 2025-2026 under the DLOL accreditation to obtain a summer PRM UCAP of 2.3% for PY 2028-2029.[67]

Using a PY 2028-2029 summer PRM UCAP of 2.3%, we estimate a requirement of approximately 131 GW under the Current Trajectory and 141 GW under the High Trajectory.[68]

POST-PY 2025-2026 ANNOUNCED RETIREMENTS

Between June 2026 and September 2028, 7 GW UCAP of capacity is scheduled to retire.[69] Figure 7 below shows that announced retirements are all fossil resources, primarily coal, followed by gas.

FIGURE 7: MISO ANNOUNCED RETIREMENTS THROUGH PY 2028-2029



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025. For PY 2028-2029, we only included resources with a retirement date prior to the end of the PY 2028-2029 summer period.

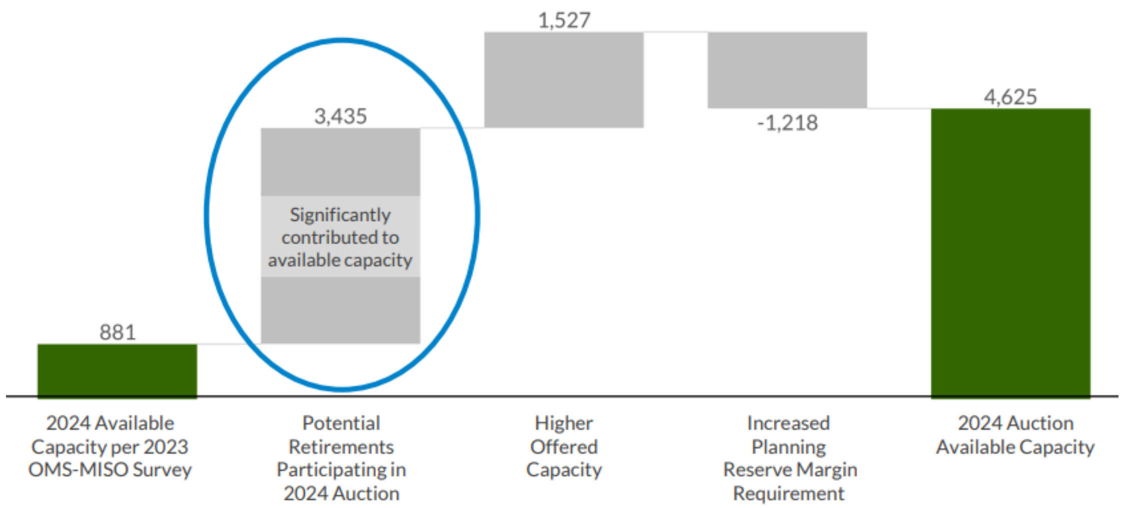
67 We multiply the ratio of (1 + PY 2025-26 PRM %) / (1 + PY 2028-29 PRM%) under the current accreditation to (1 + PY 2025-26 PRM%) under the DLOL accreditation to obtain (1 + PY 2028-29 PRM%) under the DLOL accreditation (i.e., 1.079 / 1.085 x 1.017 = 1.023).

68 To estimate the requirement, we multiply the load forecasts from the Current and High Trajectory by (1 + PY 2028-29 PRM%), respectively (i.e., 128 GW x 1.023% = 131 GW and 137 GW x 1.023% = 141 GW).

69 Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025.

We conservatively assume in our analysis that all announced retirements occur as currently planned. Notably however, Figure 8 indicates that recently 3.4 GW of delayed retirements contributed to the available capacity in 2024. If this trend continues, additional capacity may remain online to meet the PY 2028-2029 summer PRMR and reduce the need for new resource additions.

FIGURE 8: DELAYED RETIREMENTS CONTRIBUTED SIGNIFICANTLY TO 2024 AVAILABLE CAPACITY

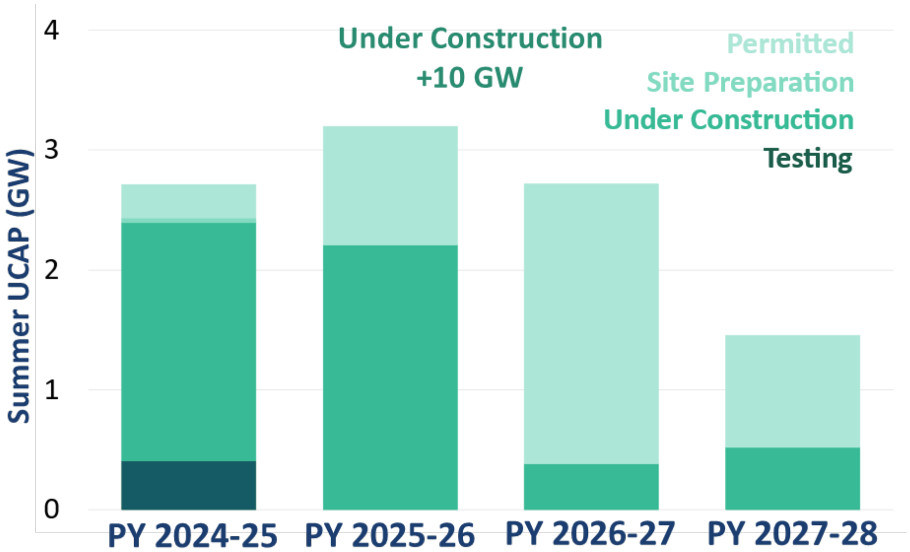


Source and note: MISO, Long Term Resource Adequacy, September 17, 2024, p. 7. Capacity is shown as accredited UCAP based on the existing accreditation method.

UNDER CONSTRUCTION OR PERMITTED CAPACITY

Resources that are currently under construction or permitted with an expected online date of June 2028 are well positioned to come online by the summer of 2028. The capacity in development during PY 2024-2025 only includes resources that have not yet come online as of March 2025. Based on the latest resource updates, approximately 10 GW UCAP is currently under construction or permitted could come online by PY 2028-2029. Figure 9 shows that approximately half (5.5 GW UCAP) is currently under construction and the other half (4.5 GW UCAP) is permitted. We considered any resources categorized as Testing, Under Construction, Site Preparation or Permitted with a commercial online date prior to June 2028 in the Energy Velocity Suite GUC database.

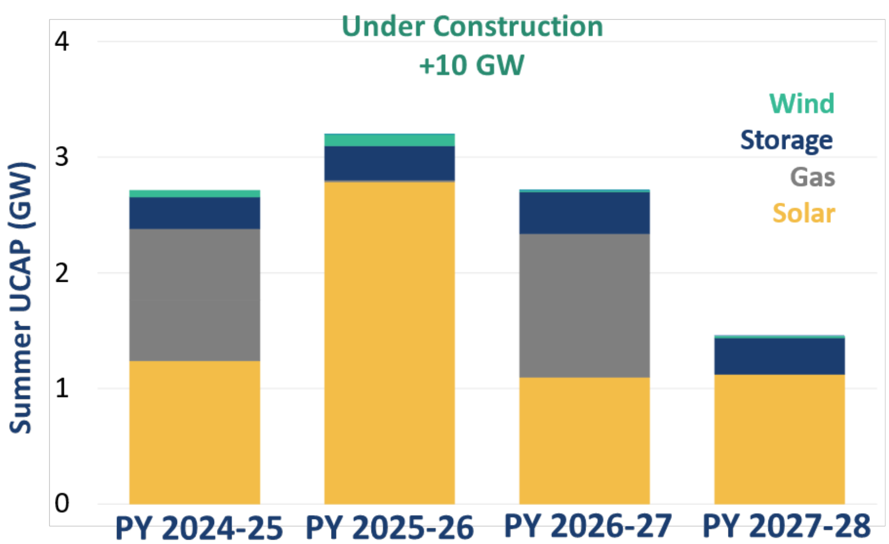
FIGURE 9: UNDER CONSTRUCTION OR PERMITTED CAPACITY BY PROJECT STATUS



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025.

Figure 10 indicates that the majority of resources under construction or permitted is solar, followed by gas, storage and wind. Even with a relatively low summer DLOL of 39%, under construction or permitted solar is projected to add 6.2 GW UCAP for meeting future resource adequacy needs.

FIGURE 10: UNDER CONSTRUCTION OR PERMITTED CAPACITY BY RESOURCE TYPE



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025.

GENERATION REPLACEMENT SERVICE CAPACITY

GRS takes advantage of existing transmission infrastructure and interconnection rights at the retiring resources' Point of Interconnection (POI) to allow new resources to connect more rapidly and cost-effectively.

Table 3 below summarizes completed MISO GRS requests for resources retiring from 2019-2025. MISO has already approved 3.7 GW UCAP to be replaced with new resources, mostly gas, solar, and storage. We remove 820 MW of resources from this category as those resources are already under construction and included in the prior category.

TABLE 3: MISO COMPLETED GENERATION REPLACEMENT SERVICE REQUESTS IN SUMMER UCAP (MW)

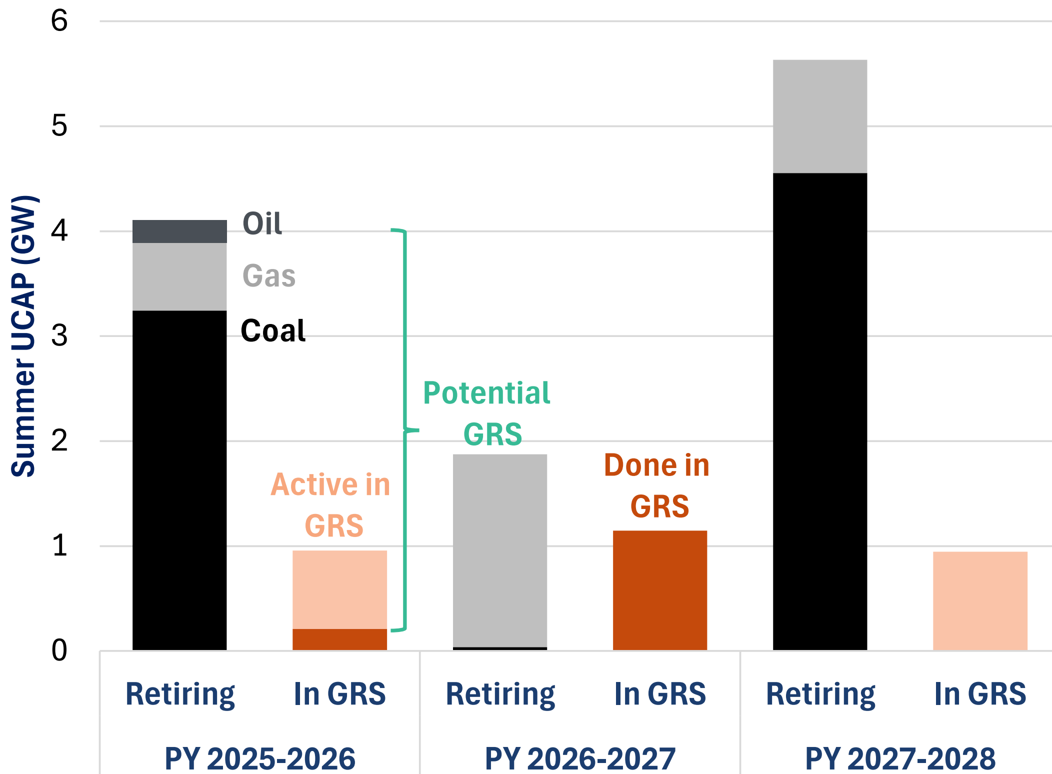
Units Going Offline		Replacement Fuel Type			
Fuel Type Being Replaced	**Total Capacity**	**Gas**	**Solar**	**Solar/Battery**	**Storage**
Coal	2,544	825	425	126	507
Gas	1,346	1,024	107	0	187
Nuclear	547	0	154	114	0
Solar	15	0	0	0	62
Gas/Oil	28	43	0	0	0
Wind	2	0	133	0	0
Biomass	7	0	9	0	0
Under Construction Already	**-820**	-516	-203	-100	
Total Replacement	**2,894**	**1,375**	**624**	**140**	**756**

Source: MISO, Generator Replacement Requests, accessed 2 February 2025. Note: The total capacity column includes the UCAP total of the retiring resources while the replacement fuel type columns include the UCAP of the resources coming online. The final total replacement total is the sum of resources coming online, as they represent a different amount of UCAP contribution to MISO than the retiring resources.

Based on the current GRS queue, an additional 0.7 GW UCAP has requested GRS and remains active in the queue between PY 2025-2026 and PY 2027-2028. Most of the active GRS requests are gas and storage resources aiming to replace retiring coal. We include this capacity under the "Potential GRS Capacity" in Figure 11 below. In addition, 7 GW UCAP is projected to retire between PY 2025-2026 and PY 2027-2028, mostly coal, that has not yet requested GRS for replacing the retiring capacity. The existing interconnection capacity at these retiring resources creates an additional 5.8 GW UCAP of potential to address MISO's resource adequacy needs by 2028 via GRS.

Figure 11 below shows resource retirements by year and fuel type. The total potential GRS capacity is the combination of the active GRS requests, about 0.7 GW of UCAP, and the remaining 8 GW of retiring capacity that has not yet requested or completed GRS, which we assume are replaced uniformly with storage (62% DLOL). The total potential GRS capacity is 5.8 GW UCAP.

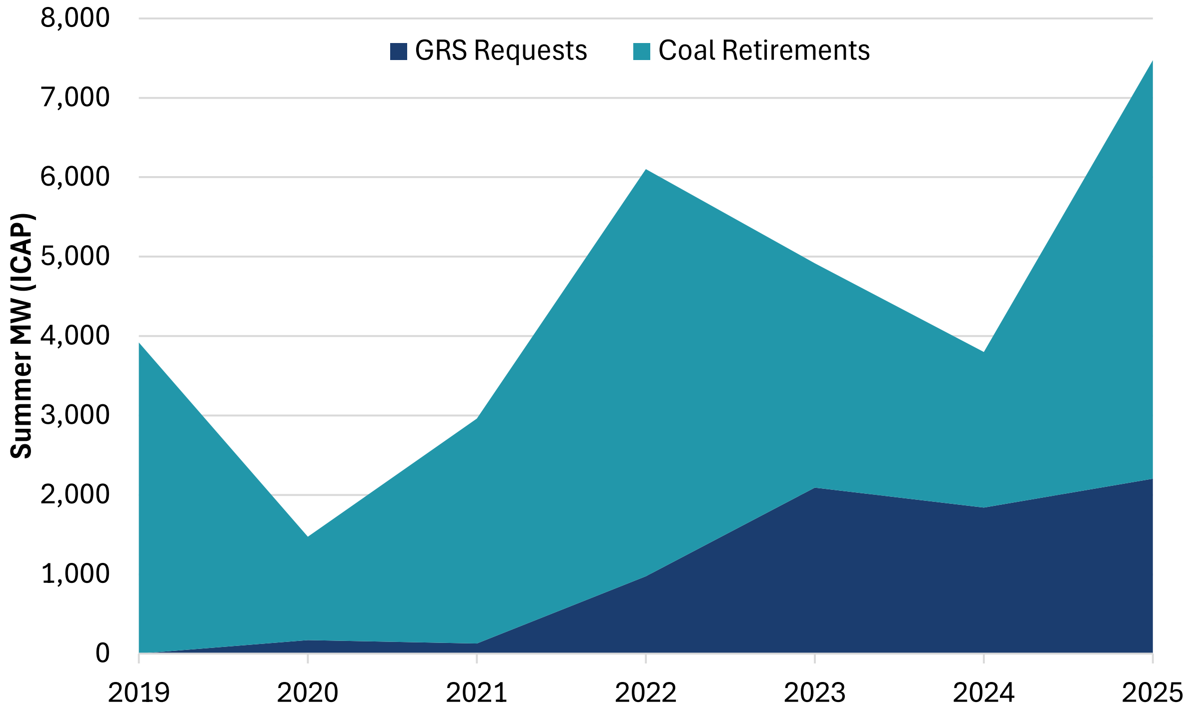
FIGURE 11: MISO RETIREMENTS AND GENERATION REPLACEMENT SERVICE REQUESTS



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025; MISO, Generator Replacement Requests, accessed 2 February 2025. Note: The active potential in GRS includes all summer UCAP capacity active in the GRS queue for resources retiring in the listed year while the remaining potential for GRS assumes any capacity not currently active or completed in the GRS is replaced by a storage resource with a DLOL of 62%.

Recent use of the GRS suggests that MISO can reasonably expect to achieve this scale of capacity additions from the GRS in the future. GUC data from 2021 to 2025 shows about 18 GW of ICAP coal retirements in MISO, of which about 7.2 GW, or 40%, has already requested or completed replacement requests through the GRS. As shown in Figure 12 below, the rate of GRS use has also been increasing over time. Even if only 40% of the potential GRS capacity calculated above is realized, the GRS would still contribute more than 2.3 GW of UCAP to MISO through 2028.

FIGURE 12: MISO COAL PLANT RETIREMENTS AND GRS REQUESTS (BY PLANT RETIREMENT YEAR)



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025; MISO GRS, Generator Replacement Requests, accessed 2 February 2025. Note: All dates are by the GUC's reported plant retirement date.

SURPLUS INTERCONNECTION SERVICE CAPACITY

SIS, similar to GRS, utilizes existing transmission infrastructure to allow new resources to connect to the system without requiring interconnection-related network upgrades. The SIS allows resources to request interconnection at the sites of existing resources that do not fully utilize their interconnection rights at their point of interconnection. A developer could, for example, request to use a solar facility's existing interconnection rights to add storage capacity that discharges when solar is not generating or is below its maximum output to better utilize the existing transmission infrastructure.

Table 4 below shows the completed MISO SIS requests submitted from 2020 to 2024. The majority of these requests have aimed to use surplus headroom at solar and wind generation sites by adding storage capacity. Since wind and solar resources have low summer DLOL values, their interconnection rights have considerable headroom to add storage, gas, or other resources.

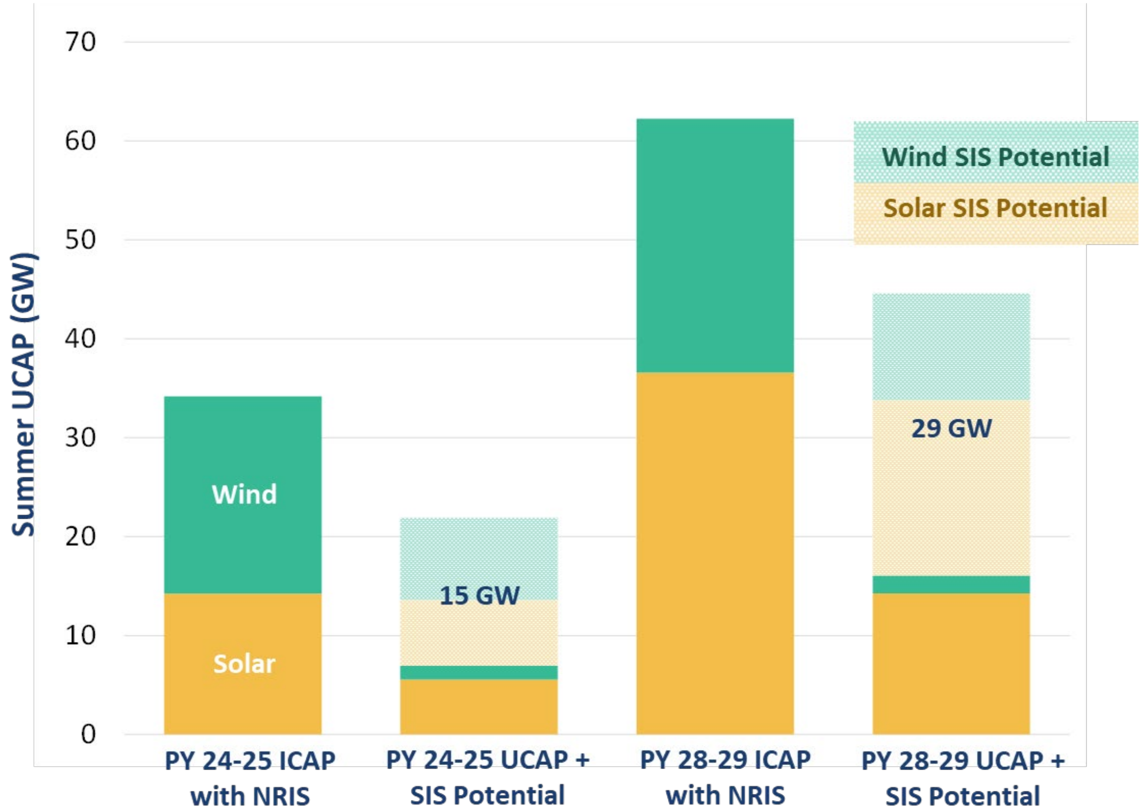
TABLE 4: MISO COMPLETED SURPLUS INTERCONNECTION SERVICE REQUESTS IN SUMMER UCAP (MW)

Original Fuel Type		Surplus Fuel Type Aiming to Connect		
Original Fuel Type	**Total MW**	**Storage**	**Solar**	**Wind**
Coal	28	0	0	28
Gas	53	0	53	0
Solar	388	388	0	0
Steam - Coal	5	5	0	0
Wind	361	254	93	14
Total	**852**	**646**	**146**	**60**

Source: MISO, Surplus Interconnection Service Requests, accessed 2 February 2025.

In addition to resources that have already requested SIS, we assume that all operating solar and wind resources with a NRIS listed in the GUC database could add storage capacity through the SIS process. To estimate the additional potential from SIS, we calculated the percentage of solar and wind resources with NRIS in the queue. We then applied that percentage of NRIS to the current or forecast capacity of solar and wind resources. We assume storage capacity is installed equivalent to 80% of solar capacity and 70% of wind capacity, based on existing SIS requests and input from renewable energy developers. Lastly, we applied the storage DLOL accreditation of 62% and removed the existing SIS capacity already considered in Table 4 to estimate 15 GW UCAP of potential additions through the SIS process.

FIGURE 13: POTENTIAL SURPLUS INTERCONNECTION SERVICE CAPACITY



Source: Energy Velocity Suite, Generating Unit Capacity, accessed 31 January 2025.

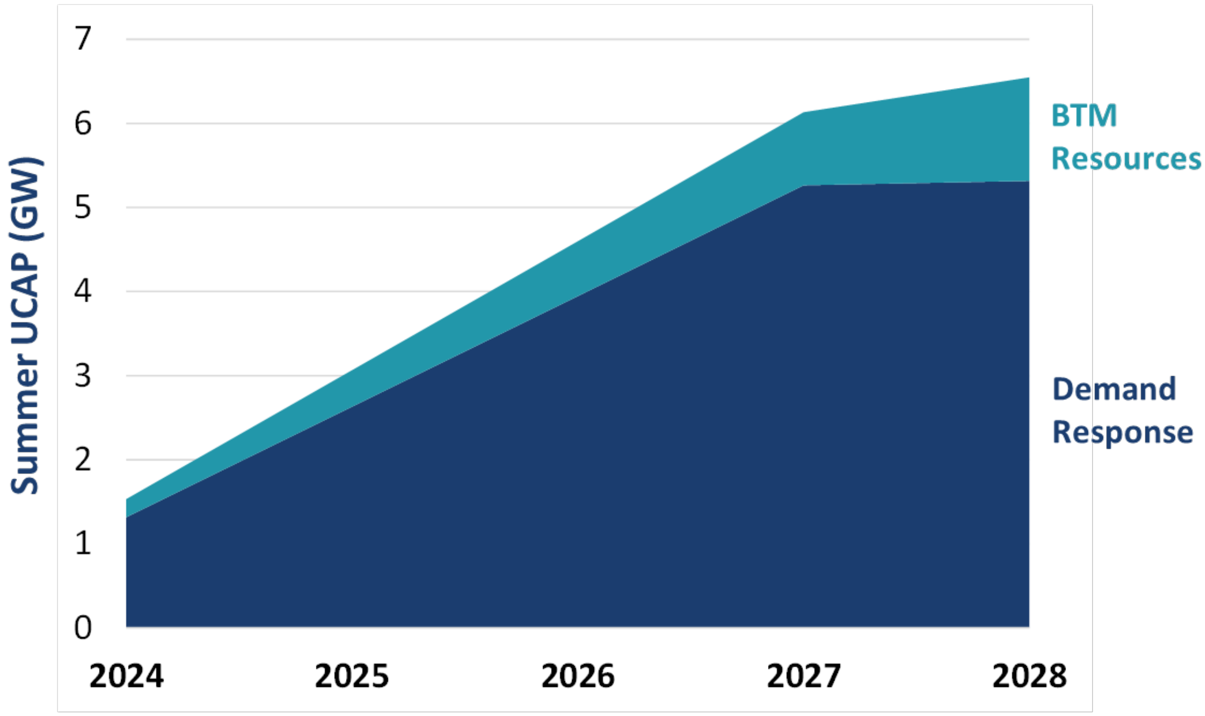
DEMAND RESOURCES

Demand resources serve as another option for meeting resource adequacy needs. For example, if demand responds by reducing load, then less supply is needed to meet that demand. To estimate demand resource growth to PY 2028-2029, including demand response and behind-the-meter (BTM) generation, we relied on MISO's forecast of demand resources in its Futures.[70] We adopt the demand resource forecast from the median scenario, Futures 2A, as shown in Figure 14 below. We estimate that approximately 5.7 GW UCAP of demand resources could be added to the MISO system by PY 2028-2029, including demand response and BTM generation.[71]

70 MISO, MISO Futures Report, November 1, 2023, p. 87.

71 Energy efficiency is excluded due to uncertainties associated with its forecast.

FIGURE 14: MISO DEMAND RESOURCE GROWTH



Source: MISO, [MISO Futures Report](), November 1, 2023, p. 87.

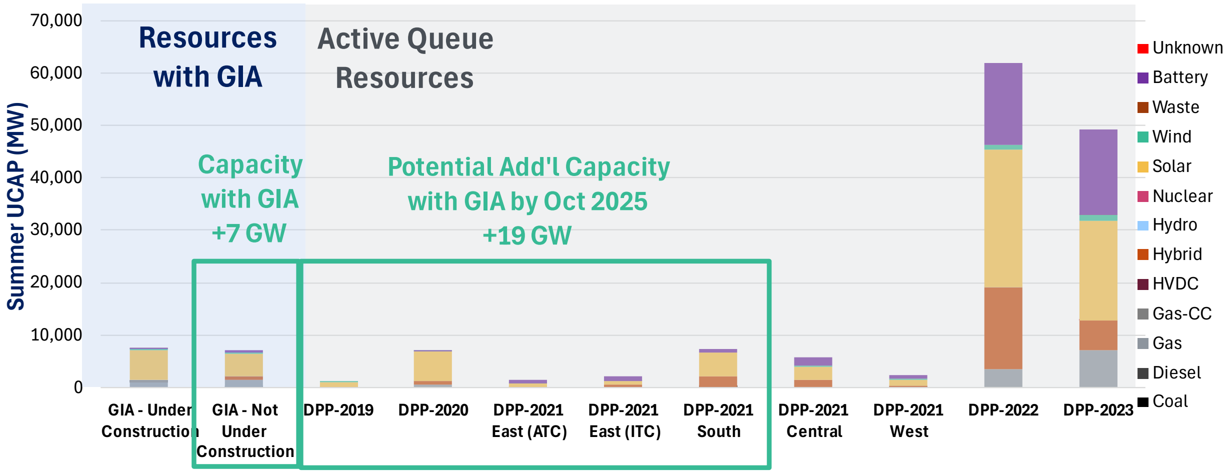
DPP CYCLE CAPACITY

To estimate resource additions from the DPP, we distinguish between capacity with an executed GIA (but not listed as under construction) and potential additional capacity with a GIA by October 2025. The cutoff of October 2025 is the month after the earliest possible date that resources entering the proposed ERAS process could receive a GIA.

Figure 15 shows that approximately 7 GW UCAP of capacity already has an executed GIA but is not currently under construction. In addition, approximately 19 GW UCAP of additional capacity currently in the DPP-2019, DPP-2020 and DPP-2021 cycles could receive an executed GIA by October 2025.[72] The majority of these resources are solar, followed by hybrid resources, such as solar and storage, and storage alone.

[72] MISO, Definitive Planning Phase Schedule, March 1, 2025, p. 1.

FIGURE 15: DPP GENERATION CAPACITY BY CYCLE



Source: MISO, Interactive Queue, accessed 2 February 2025. Note: For the DPP-2021 cycle, the Central and West regions have expected completion dates past 2025 and are not included in the total potential additional capacity with GIA by October 2025 estimate.

An even greater scale of resources is active in subsequent DPP cycles that could support MISO resource adequacy but may experience higher rates of attrition. The DPP-2022 cycle includes over 60 GW UCAP of resources that are projected to execute GIAs by February 2026 and DPP-2023 cycle includes about 50 GW UCAP that could execute GIAs by August 2026,.

VI. List of Acronyms

DLOL	Direct Loss of Load, proposed accreditation approach
DPP	Definitive Planning Phase, interconnection process
ERAS	Expedited Resource Addition Study
FERC	Federal Energy Regulatory Commission
GIA	Generator Interconnection Agreement
GIQ	Generation Interconnection Queue
GRS	Generation Replacement Service; replacing generation with a new type of generation at an already active interconnection point on the grid
ICAP	Installed Capacity or Nameplate Capacity
LOLE	Loss of Load Expectation
LSE	Load Serving Entity
LTRA	Long-Term Reliability Assessment
MISO	Midcontinent Independent System Operator
NERC	North American Electricity Reliability Corporation
OMS	Organization of MISO States
PPA	Power Purchase Agreement
PRA	Planning Resource Auction
PRMR	Planning Reserve Margin Requirement
PY	Planning Year, from June 1 to May 31
RERRA	Relevant Electric Retail Regulatory Authority
RRI	Reliability Resource Initiative, PJM’s recently approved one-time emergency interconnection queue proposal
SAC	Seasonal Accredited Capacity
SIS	Surplus Interconnection Service; connecting new resources to an existing point of interconnection
TO	Transmission Owner
UCAP	Unforced Capacity