2023 Long-Term Resource Assessment

RF performs an annual assessment to ensure that its footprint has adequate resources to serve anticipated load demand for the next 10-year period. Each assessment area within RF (i.e., PJM and MISO) has a targeted reserve margin level, which identifies the minimum number of resources needed to meet a loss of load expectation (LOLE) of one day in 10 years. The results of this assessment express each area's ability to meet the targeted reserve margin level. RF developed this assessment collaboratively with data provided from both PJM and MISO. This article will share some highlights from this assessment.

Key Findings

- PJM is projected to have a 0.81% load growth rate over the next 10 years and will meet its target reserve margin requirement of approximately 15%, which includes both Existing-Certain and Tier 1 resources.
- MISO is projected to average a 0.42% load growth rate from 2024 through 2033.
- The MISO target reserve margin, which includes both Existing-Certain and Tier 1 resources, is projected to not satisfy its reserve margin target starting in 2028 and continuing for the rest of the 10-year period. The largest reserve margin deficit was identified in 2032, which was 19,255 MW below the target reserve margin.
- MISO transitioned to its first year of seasonal Capacity Auctions (summer, fall, winter, spring). The switch to a seasonal construct now highlights non-summer risk, but it also derives seasonal accreditation and seasonal resource adequacy requirements.
- Drivers of the increase in the MISO Reserve Margin requirement are electric demand, particularly the demand in electric vehicles, and an increase in intermittent resources.

PJM

Capacity and Reserve Margin

PJM resources are projected to be 198,695 MW in 2024 and increase to 271,139 MW by the end of 2033. The resource calculations include planned generation retirements, planned generation additions and changes, and an addition of 50% of the Tier 2 projects presently listed in the generation interconnection queue.

The left-side figure on the following page shows the reserve margin for PJM from 2024 through 2033. Please note that varying resource scenarios are used to gauge how much of the generation queue (i.e., generation that is yet to be built) is needed to stay above the target reserve margin. The blue line represents PJM's reserve margin with both Existing-Certain and all Tier 1 resources. On average, PJM has a 34% reserve margin and is expected to meet and significantly exceed its target reserve margin (of approximately 15%) from 2024 through 2033.

Peak Demand

The right-side figure on the following page displays actual demand data with a 10-year forecast of demand for PJM. PJM's 10-year forecasted growth indicates that peak demand has steadily increased over time. Based on the latest 2023 forecast, PJM is projected to average a 0.81% load growth per year over the next 10 years. The PJM summer peak demand in 2024 is projected to be 149,737 MW and increase to 160,971 MW in 2033 for total internal demand (TID). Annualized 10-year growth rates for individual PJM transmission zones range from -0.3% in Commonwealth Edison Company to 2.2% in Virginia Electric and Power Company.

Frequently Used Terms

Existing-Certain: Includes operable capacity expected to be available to serve load during the peak hour with firm transmission.

Tier 1: Includes capacity that is either under construction or has met all the required milestones for interconnection.

Tier 2: Includes capacity that has requested an interconnection but has not met some required milestones or executed certain agreements.

Tier 3: Other planned capacity that does not meet the requirements of Tier 1 and Tier 2.

Confirmed Retirements: Capacity with formalized and approved plans to retire. Please note that generator retirements are evaluated on a case-by-case basis by PJM and MISO for potential reliability impacts. If it is determined that reliability impacts exist, the Generation Owner is requested to defer retirement until the reliability impacts are addressed. In this assessment, all confirmed generator retirements are assumed to occur after any reliability concerns are addressed.

Unconfirmed Retirements: Capacity that is considered likely to retire by resource owners, but the formal notification has not been submitted to the respective party. Also included are units for which such notice has been made, but a reliability impact assessment or mitigation is pending.

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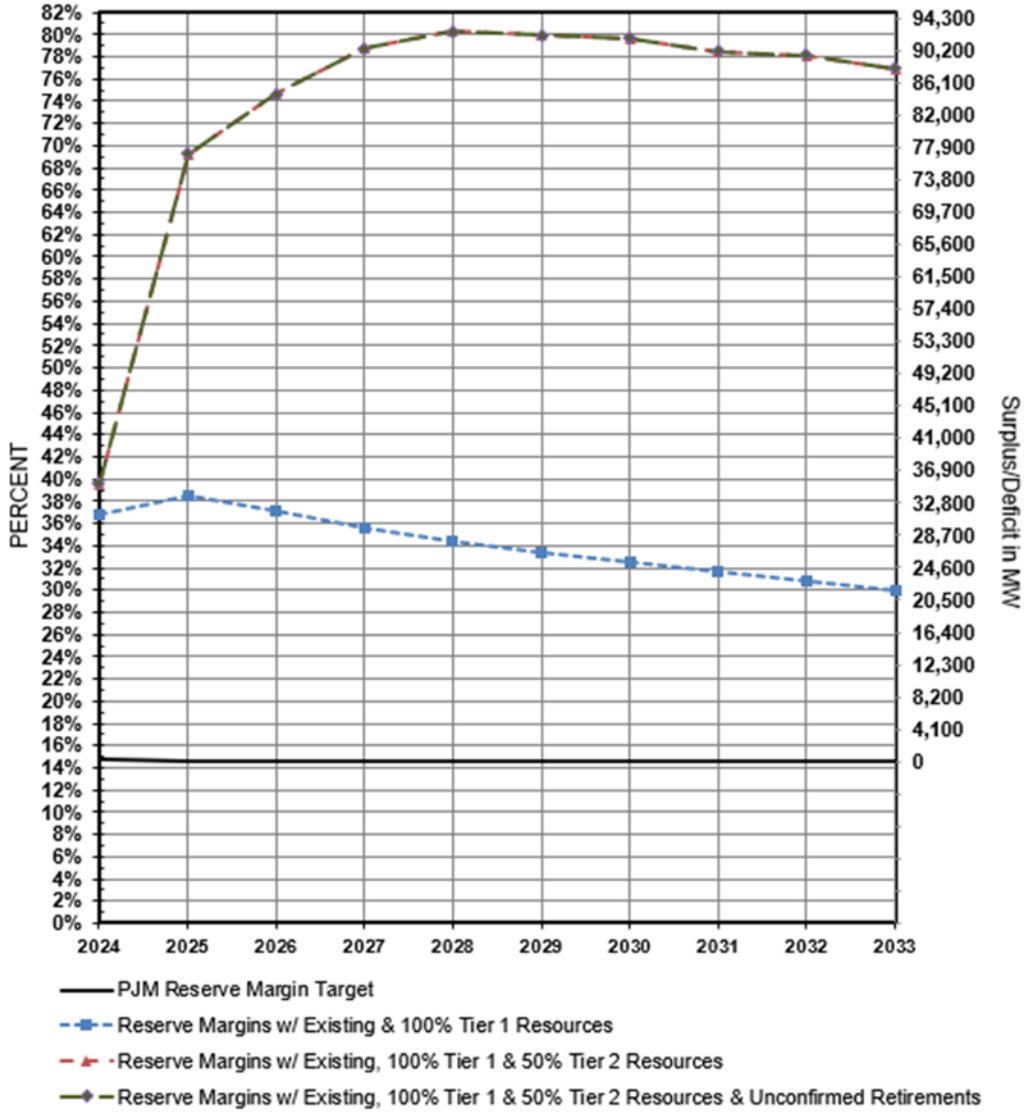
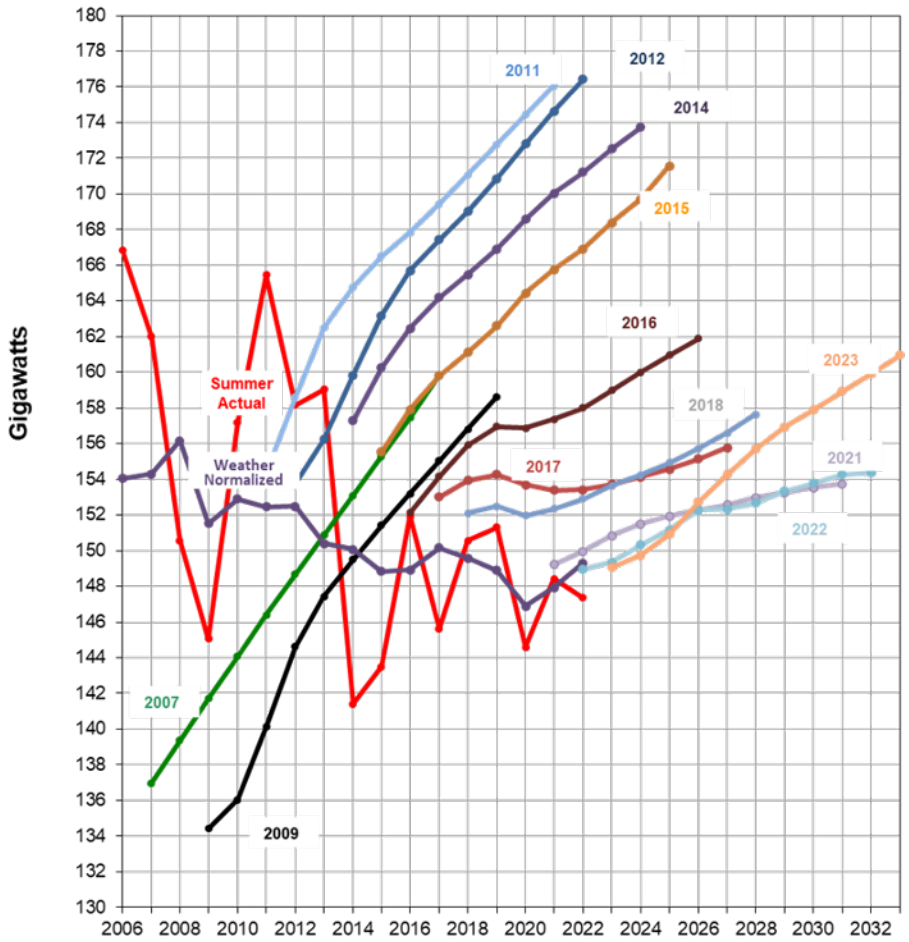
PJM RTO Summer Reserve Margin Projections 2024 - 2033



PJM RTO Peak Demand Data Actual 2006 - 2022 Select 10 Year TID Forecasts Through 2033



2011 Includes the expansion of the PJM RTO footprint with First Energy (ATSI) and Duke Energy Ohio and Kentucky
2013 Includes the expansion of the PJM RTO footprint with East Kentucky Power Cooperative
2019 Includes the expansion of the PJM RTO footprint with Ohio Valley Electric Cooperative

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MISO

Capacity and Reserve Margin

MISO resources are projected to be 146,823 MW in 2024 and then increase to 149,011 MW by the end of 2033. This resource calculation includes planned generation retirements, planned generation additions and changes, and Tier 2 and Tier 3 projects from the generation interconnection queue.

Coal and nuclear availability to provide resource adequacy contributions has declined by 300 MW and 140 MW respectively. This is mainly due to retirements but it is not as large as projected last year due to delayed retirements. New wind and wind accreditation increased 725 MW, and solar and solar accreditation increased 920 MW. Natural gas additions to meet resource adequacy requirements in MISO went up by 4 GW.

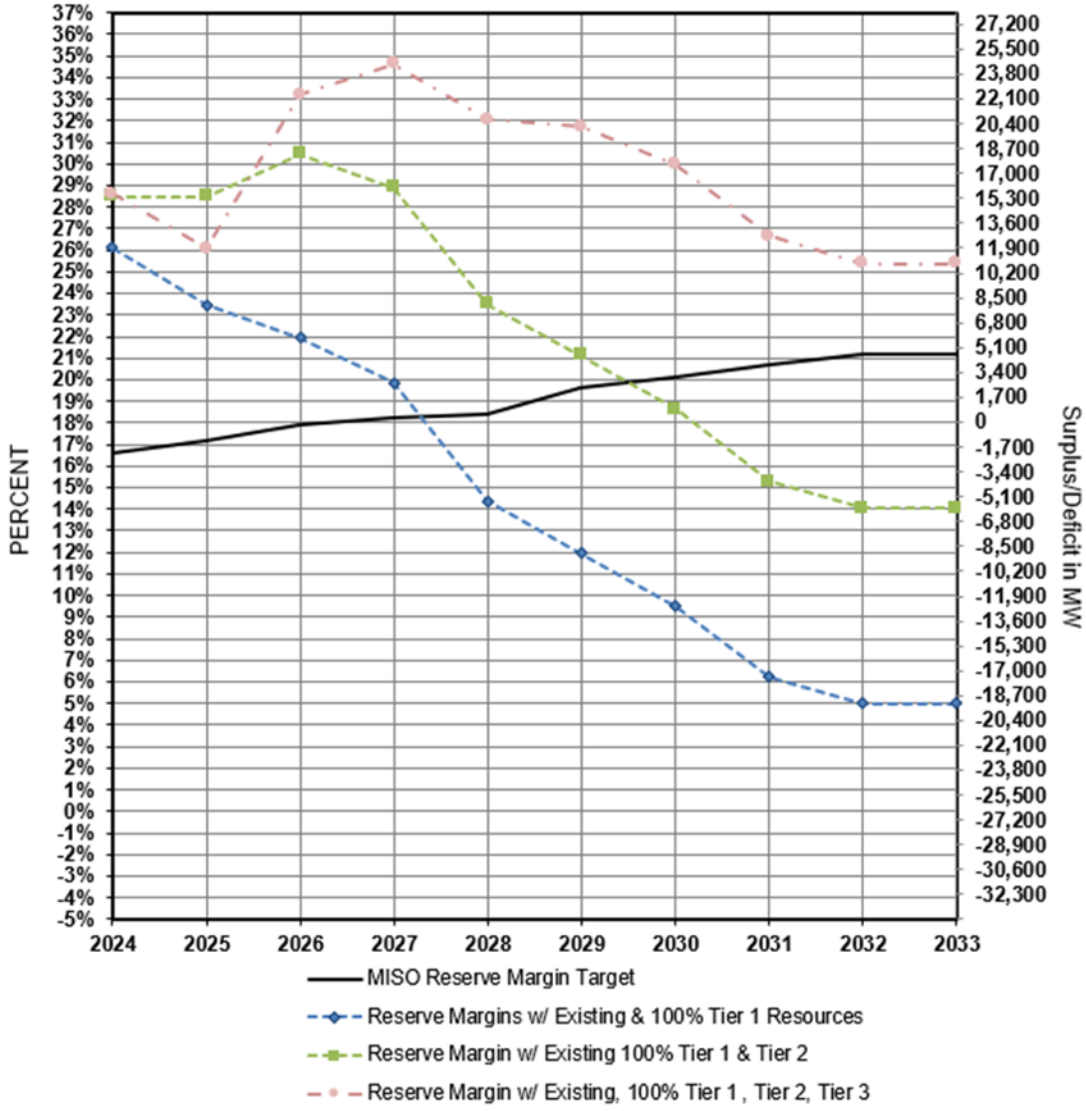
There are over 49 GW of generation installed capacity (predominantly solar) with signed generation interconnection agreements in MISO that are projected to come online within the next five years. Some projects have experienced delays in achieving commercial operation due to supply chain issues, even as late as the post-agreement phase. MISO tariff changes and interconnection queue processes are reducing interconnection queue timelines.

Recognizing that many projects for new generation terminate the interconnection process before completion, MISO applies a factor to the Tier 2 and Tier 3 resource capacities based on the study phase and likelihood of resources coming online.

The effect is to reduce the capacity of prospective new resources for more accuracy in long-term planning by accounting for the uncertainty and delays of new resources completing the interconnection process.

The figure to the right shows the reserve margin for MISO from 2024 through 2033. Please note that varying resource scenarios are used to gauge how much of the generation

MISO RTO
Summer Reserve Margin Projections
2024 - 2033



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queue (i.e., generation that is yet to be built) is needed to stay above the target reserve margin.

MISO's anticipated reserve margin, which includes Existing-Certain and all Tier 1 resources, does not satisfy the target for 2028.

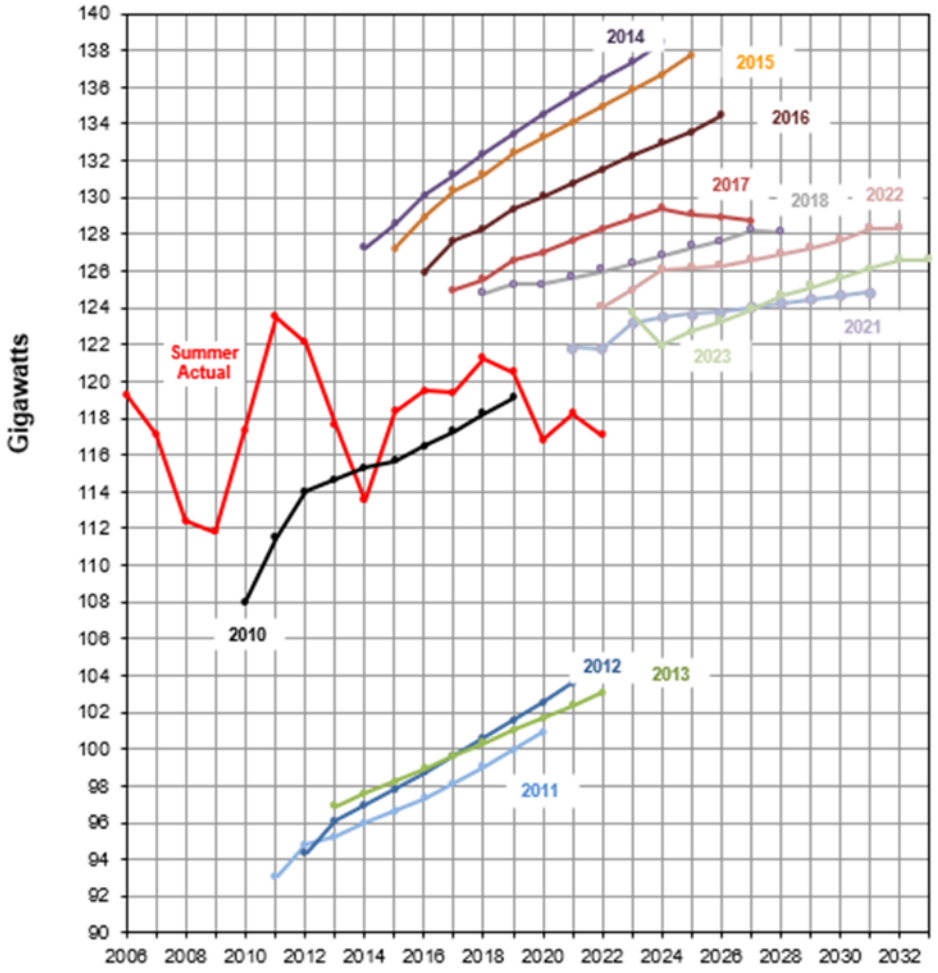
The MISO anticipated reserve margin projected for 2028 is 4,729 MW below the reserve margin target. Continuing in 2029, the projected reserve margin is 8,987 MW below the target and continues to decline to 19,255 MW below the target in 2033. These values are represented in the figure on the previous page with the blue line.

Peak Demand

The figure to the right displays actual demand data with a 10-year forecast of demand for MISO. MISO's 10-year forecasted growth indicates that peak demand has steadily increased over time.The projected MISO annual load growth rate for 2024 through 2033 is approximately 0.42%.

The MISO summer peak demand is projected to be 121,933 MW in 2024 and 126,593 MW in 2033 for total internal demand (TID).

MISO RTO Peak Demand Data
Actual 2006 - 2022
Select 10 Year TID Forecasts Through 2033



2011 Includes the reduction of the MISO RTO footprint with First Energy (ATSI), Cleveland Public Power and Duke Energy Ohio and Kentucky moving to PJM RTO
2014 Includes the expansion of MISO RTO footprint with MISO South