



Seasonal Assessment — Generation Summer 2022

Summer Readiness Workshop
Resource Adequacy

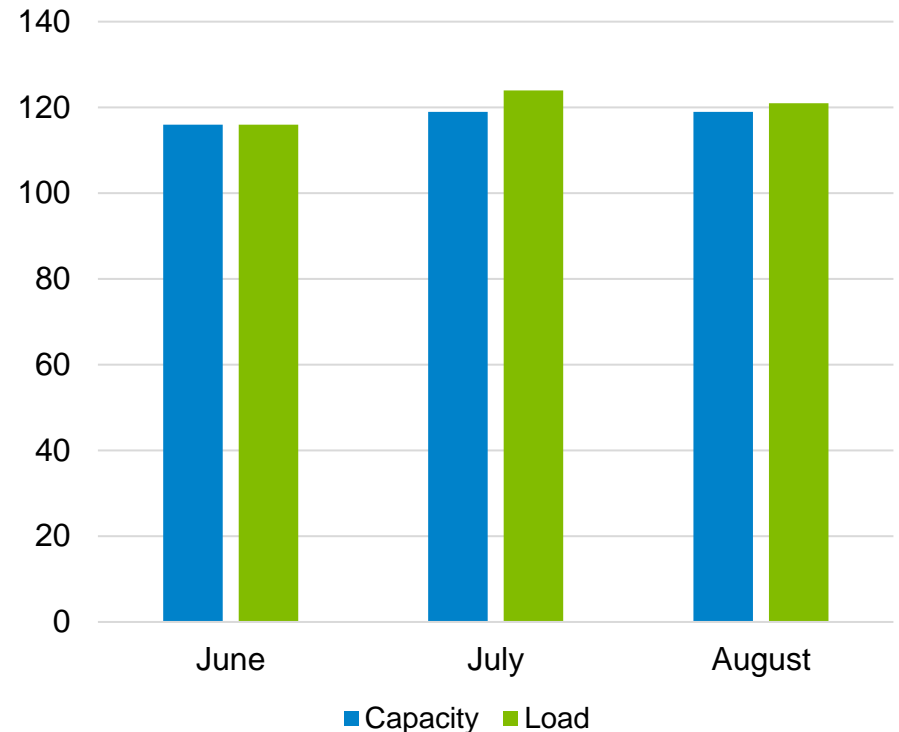
Key Takeaways

- Under typical demand and generation outages, MISO is projecting insufficient firm resources to cover summer peak forecasts
- Emergency resources and non-firm energy imports are projected to be needed to maintain system reliability
- Seasonal assessment aligns with cleared resources from the most recent Planning Resource Auction

Under typical demand and outage scenarios, firm resources are projected to be insufficient to cover peak load of summer months

MISO 2022 Base Summer Forecast

June Probable Peak Load Forecast	116 GW
June Projected Available Capacity*	117 GW
July Probable Peak Load Forecast	124 GW
July Projected Available Capacity*	119 GW
August Probable Peak Load Forecast	121 GW
August Projected Available Capacity*	119 GW



For every month, emergency resources would be required to meet peak load conditions

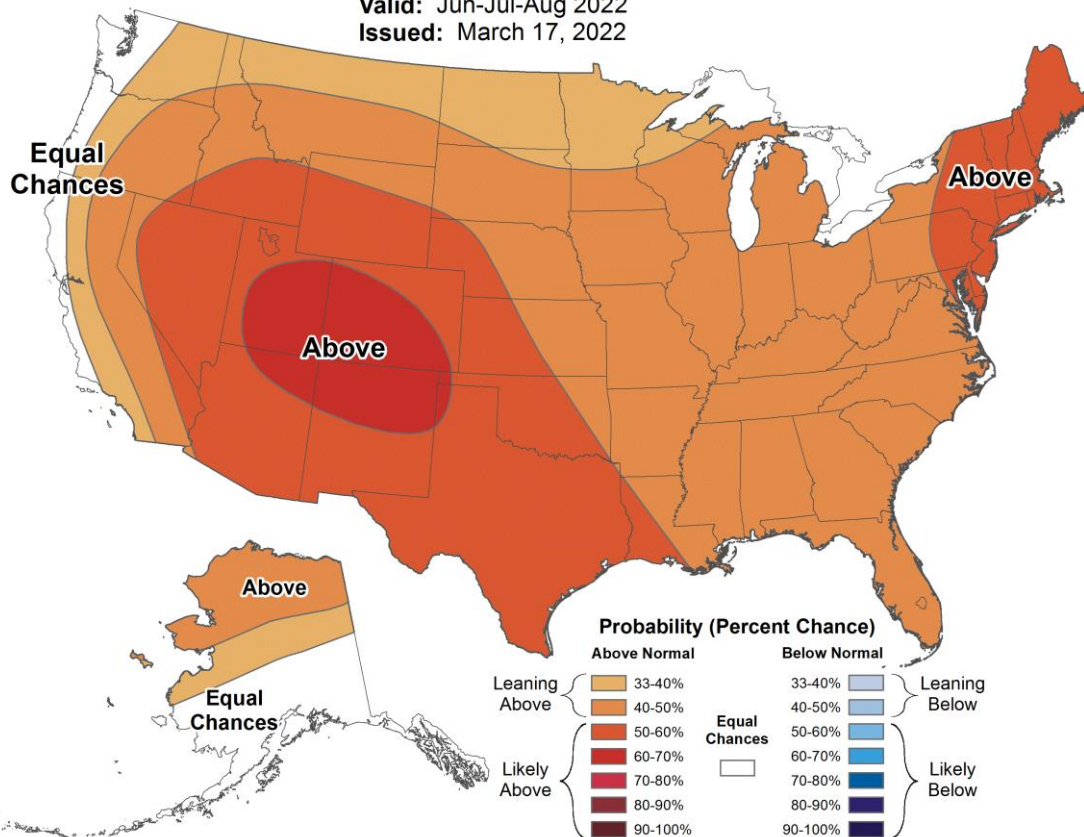
NOAA Temperature and Precipitation Forecasts



Seasonal Temperature Outlook



Valid: Jun-Jul-Aug 2022
Issued: March 17, 2022

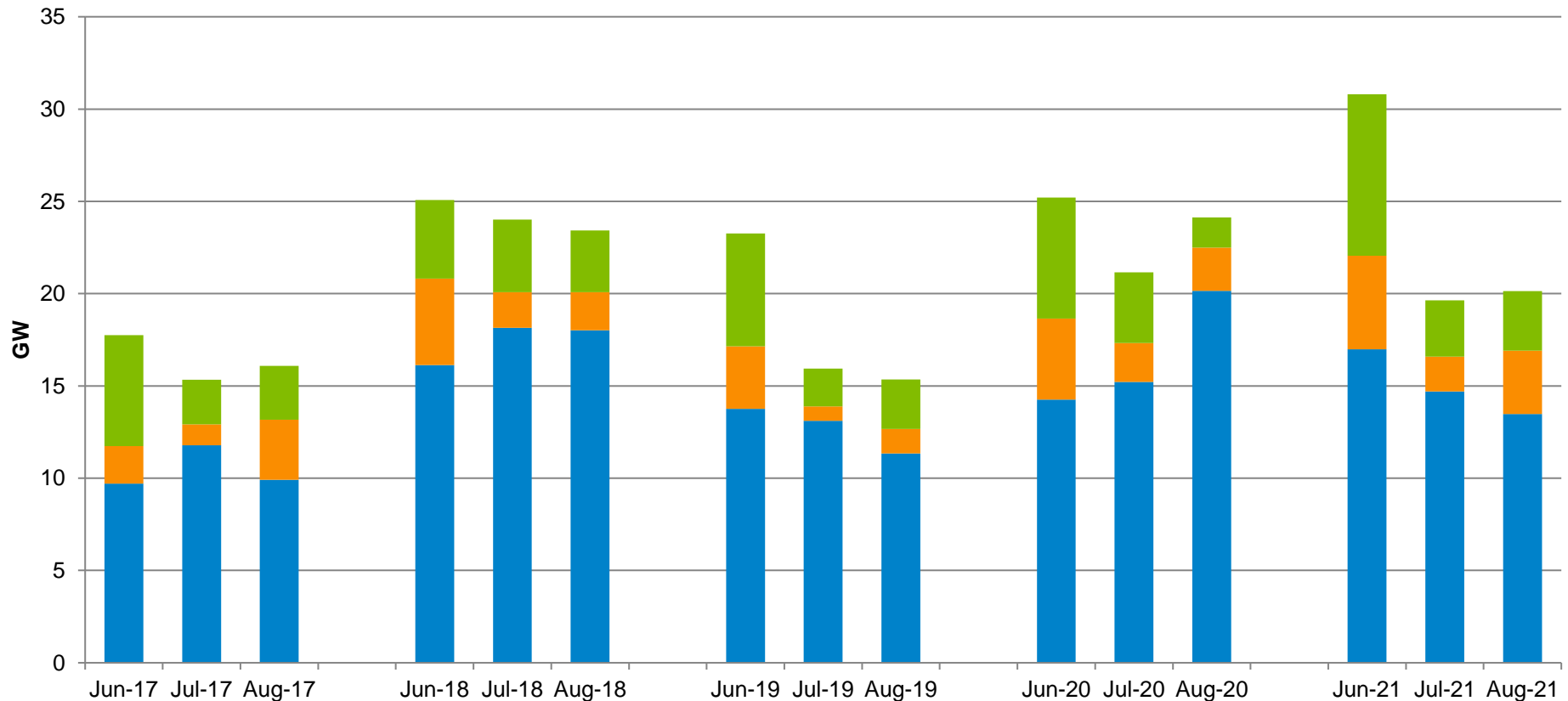


All-time Summer Peak
127 GW on July 20, 2011

Precipitation Forecast

NOAA forecasts below average precipitation across most of Zones 1 through 5 and Zone 8 while it is expected that the remainder of the footprint will see average precipitation levels

New maximum seasonal peak for cumulative generation outages occurred in June 2021



- Forced Outages
- Maintenance Outages
- Planned Outages

	Forced Outages (GW)	Total Outages (GW)
Average of 15 monthly peaks	14.4	21.2
Maximum seasonal peak	20.1	30.8

Two deterministic scenarios (typical and worst case) are evaluated to project potential system risk this summer

Generation

Probable Capacity

- Removes an **average** volume of resource outages¹ (forced, planned, and maintenance)

Low Generation Capacity (Worst Case Outage)

- Removes a **worst case** volume of resource outages¹ (forced, planned, and maintenance), typically because of non-normal weather conditions

Load

Probable Load Forecast

- Base 50/50 forecast², provided by Market Participants

High Load Forecast

- Higher 90/10 forecast³



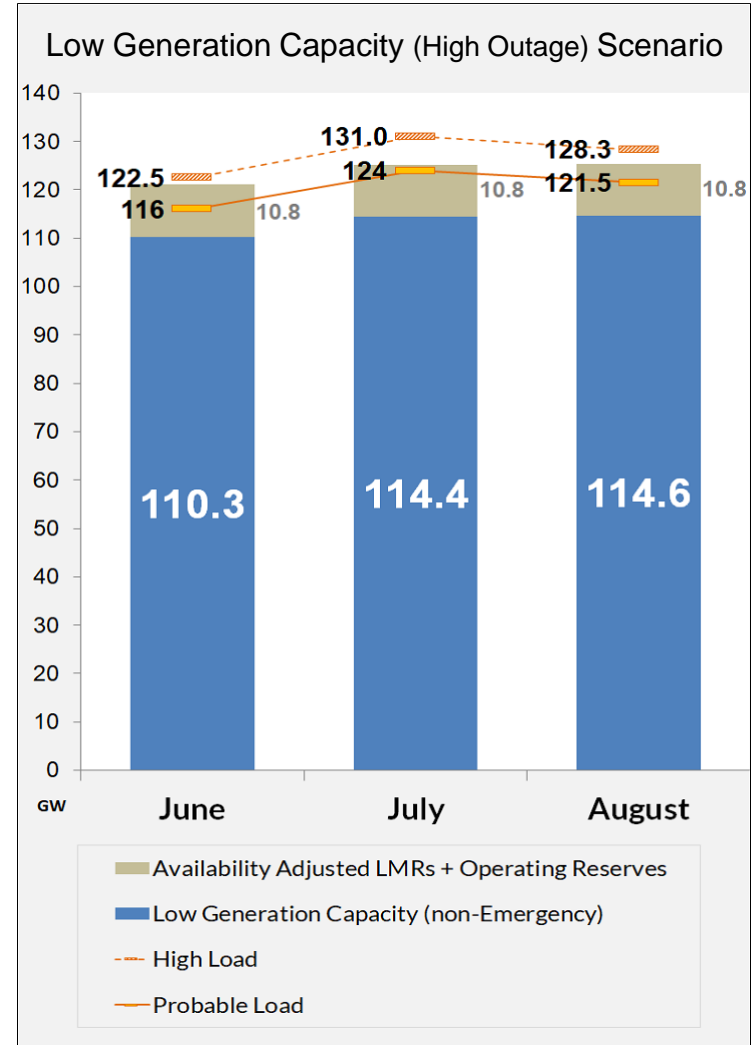
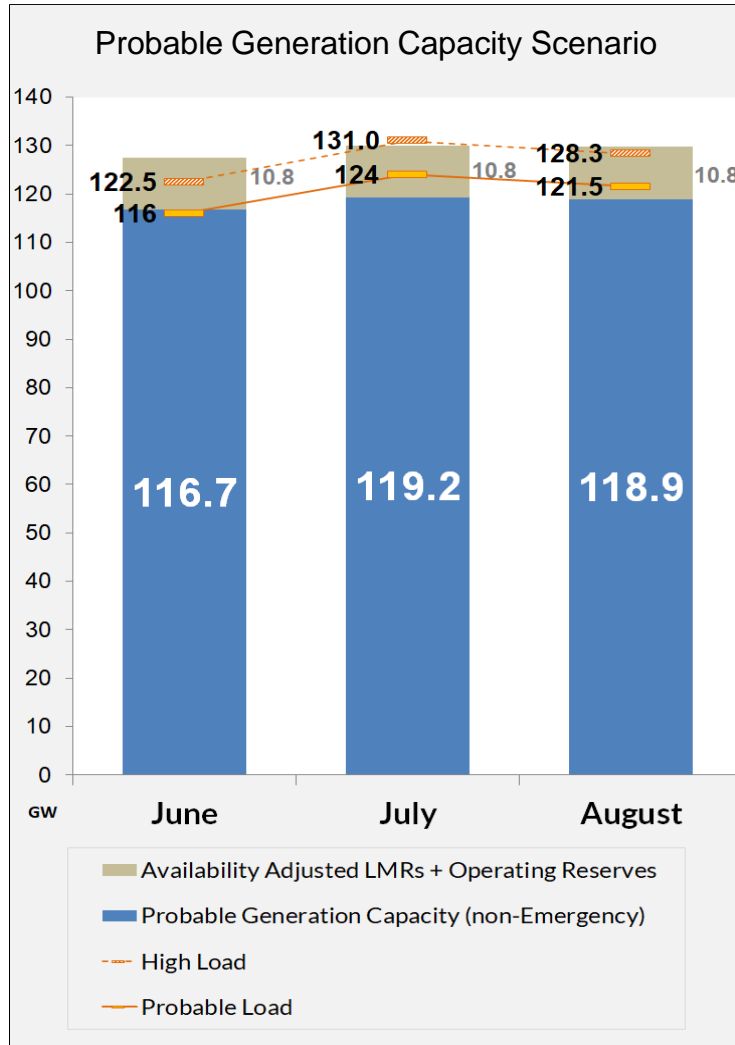
1 Based on 5-year historical outage information provided by Resource Owners

2 50% chance of the actual load being lower and 50% chance of the actual load being higher

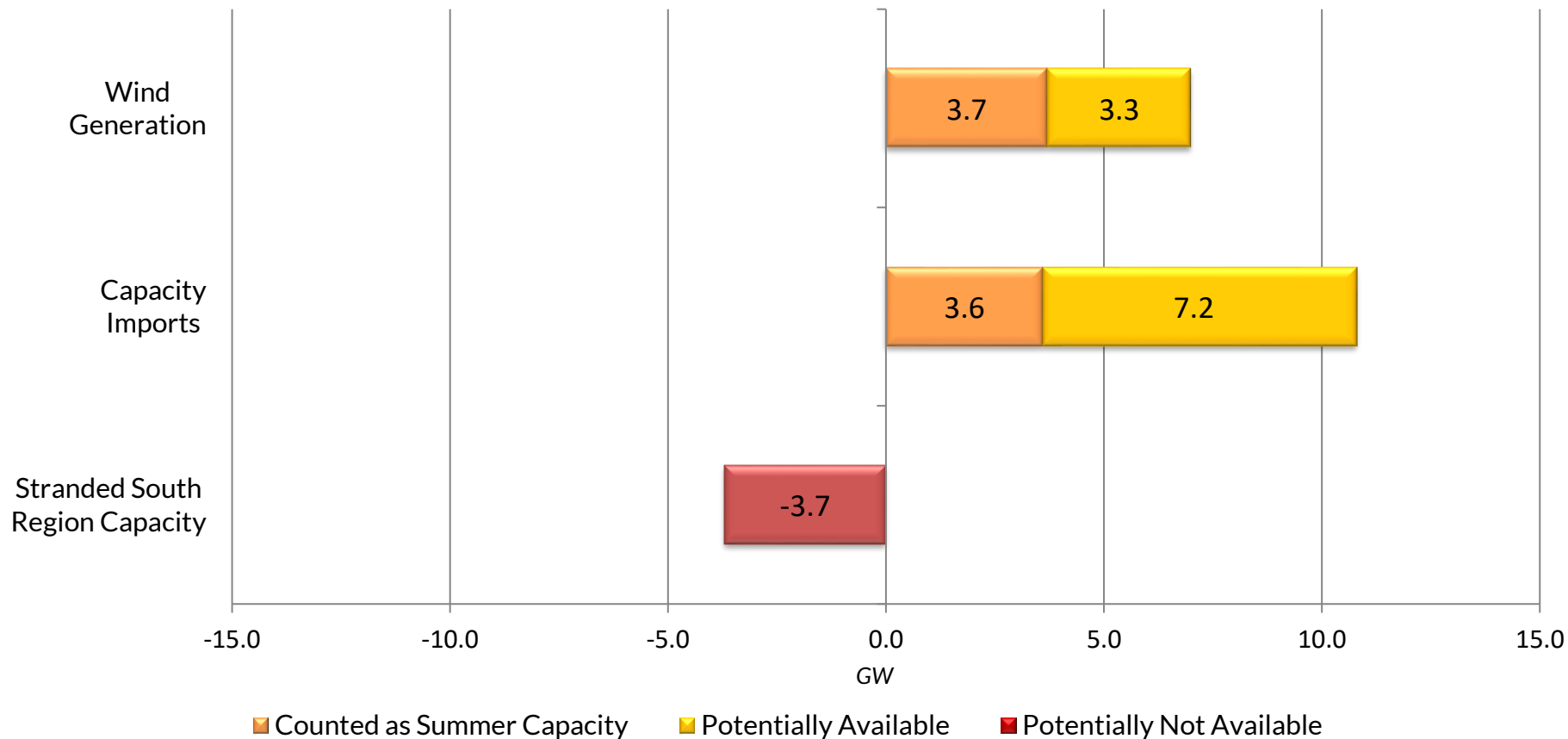
3 90% chance of the actual load being lower and 10% chance of the actual load being higher

Emergency resources and non-firm energy imports are projected to be needed to maintain system reliability

Summer 2022 Resource Adequacy Projections – System-wide



The need for emergency procedures will be impacted by the availability of non-firm resources





Appendix

Definitions

Projected Available Capacity:

Includes the total Installed Capacity of non-intermittent generation that cleared the most recent Planning Resource Auction, decremented by historical seasonal outages on peak. Historical outages are calculated as 5-year rolling average and max volumes of cumulative thermal generator outages, coincident with the peak day for each month over the last 5 years. Intermittent capacity is included at monthly expected generation during seasonal peak hours. Only firm external imports that cleared the auction are included. This capacity excludes emergency resources—Load Modifying Resources and operating reserves.

Stranded South Region Capacity:

Generation in the South region of the MISO footprint in excess of regional load obligations that is constrained by contractual limitations on firm transmission rights shared with neighbors, resulting in a transmission bottleneck that causes the generation to be undeliverable to the North/Central region of the footprint.

Scenarios Breakdown

	Probable Generation Capacity Scenario			Low Generation (High Outage) Capacity Scenario			Definitions
	June	July	August	June	July	August	
Capacity (non-Emergency)							
Non-Intermittent Generation (ICAP)	127.9	127.9	127.9	127.9	127.9	127.9	Installed Capacity (ICAP) of Non-intermittent resources (CPNode) that cleared or were used in a FRAP for the 2022-23 Planning Resource Auction.
Average Outages	-24.4	-19.2	-19.8				5-year seasonal average of cumulative non-intermittent generation outages on monthly peak day. Includes forced, planned, and maintenance outage types. Source: GADS.
High Outages				-30.8	-24	-24.1	5-year seasonal max of cumulative non-intermittent generation outages on single highest peak day corresponding to each month. Includes forced, planned, and maintenance outage types. Source: GADS.
Intermittent Generation (UCAP)	6.2	6.2	6.2	6.2	6.2	6.2	Unforced Capacity (UCAP) of Intermittent resources (CPNode) that cleared or were used in a FRAP for the 2022-23 Planning Resource Auction. Includes wind, solar, and run-of-river.
Additional Wind Generation on Peak	3.4	0.7	1	3.4	0.7	1	3-year average wind generation during summer peak hours (scaled to current wind fleet) beyond PRA-accredited CPNode wind capacity. Includes 1 GW haircut for all months to better reflect operational limitations (rough assumption with consensus among MISO staff).
Firm External Resources	3.6	3.6	3.6	3.6	3.6	3.6	Firm external imports that cleared the 2022-23 Planning Resource Auction.
Sub-Total	116.7	119.2	118.9	110.3	114.4	114.6	
Availability Adjusted LMRs + Operating Reserves							
Demand Response	5.3	5.3	5.3	5.3	5.3	5.3	Demand Response resources that cleared the 2022-23 Planning Resource Auction, with a 70% adjustment applied to reflect historical availability. Adjustment based on MCS/DSRI data.
BTMG	3.2	3.2	3.2	3.2	3.2	3.2	Behind-the-Meter Generation resources that cleared the 2022-23 Planning Resource Auction, with a 70% adjustment applied to reflect historical availability. Adjustment based on 4 years of MCS/DSRI data.
Operating Reserves	2.4	2.4	2.4	2.4	2.4	2.4	Units that are only dispatched during emergency procedures. Source: MISO Operations.
Sub-Total	10.8	10.8	10.8	10.8	10.8	10.8	
Total Supply	127.5	130.0	129.7	121.1	125.2	125.4	
Load							
Base Load	116.0	124.0	121.5	116.0	124.0	121.5	Monthly system-wide Coincident Peak Forecasts (50/50), submitted by the Load Serving Entities.
High Load	122.5	131.0	128.3	122.5	131.0	128.3	Monthly system-wide Coincident Peak Forecast (90/10). Zonal load forecast uncertainty (LFU) adders applied to monthly peak load forecasts. The LFUs are calculated at the zonal level by applying a standard deviation to the zonal peaks from each of the 30 annual load shapes that are modeled in the LOLE study process and then applying a normal-inverse distribution. 90% chance for monthly peaks to be lower, 10% chance for them to be higher than value.
Remaining Projected Firm Reserves							
Reserve* Margin, net of Base Load	11.5	6.0	8.2	5.1	1.2	3.9	Represents, during emergency procedures, either (+) capacity surplus or (-) projected need for non-firm support, following deployment of emergency resources. Accounts for 50/50 base load.
Reserve* Margin, net of High Load	5.0	-1.0	1.4	-1.4	-5.8	-2.9	Represents, during emergency procedures, either (+) capacity surplus or (-) projected need for non-firm support, following deployment of emergency resources. Accounts for 90/10 high load.