



MISO Overview

Minnesota House of Representatives
Energy Finance and Policy Committee

February 18, 2024

Midcontinent Independent System Operator (MISO)

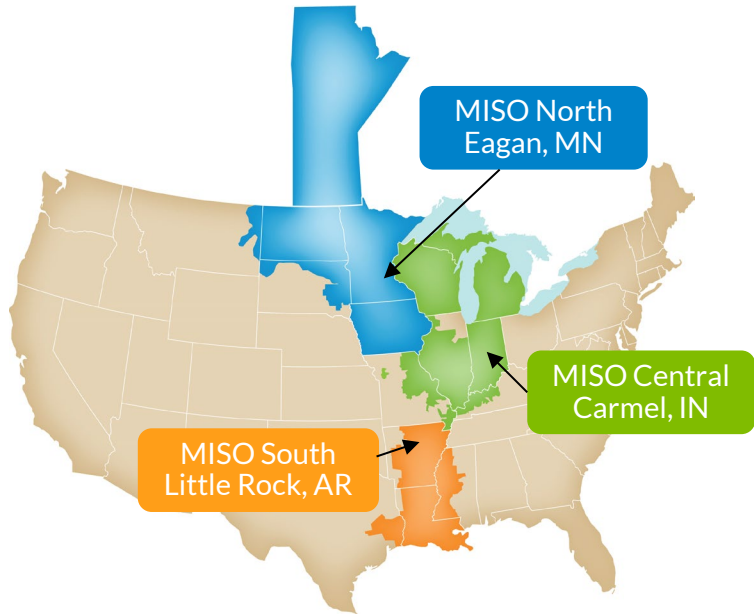


MISO is an independent, not-for-profit, member-based organization responsible for keeping the power flowing across the region reliably and cost-effectively

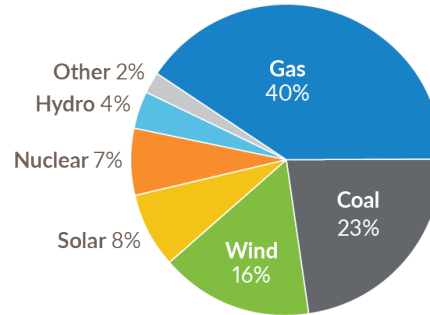
MISO KEY FACTS

Area Served	15 U.S. States & Manitoba, CN
Population Served	~ 45 Million
Transmission Lines	77,000 Miles
Generating Units	> 1,447
Record Demand	127.1 GW 7/20/2011
Wind Peak	25.6 GW 1/12/2024
Solar Peak	8 GW 10/16/2024
Members	59 Transmission Owners
	143 Non-transmission Owners
Market Participants	> 500
Market Transactions	> \$40 billion/yr
Carbon Reduction	Approximately 32% since 2014

MISO regions and generation mix

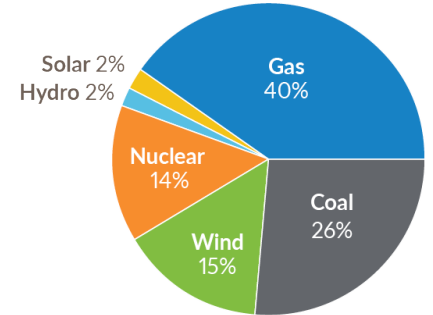


INSTALLED CAPACITY December 2024



202 GW

ENERGY PRODUCTION January-December 2024



638 Million MWh

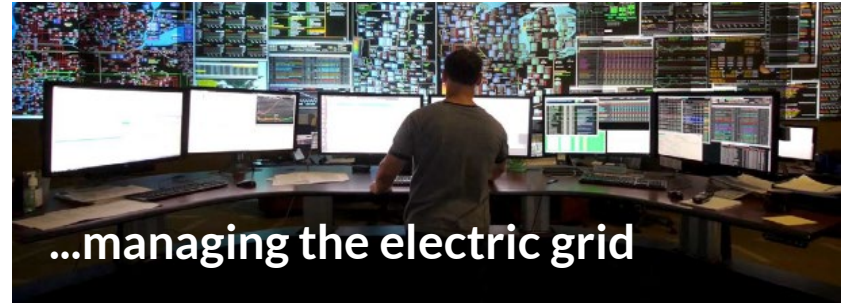
*Other: Diesel, Biomass, Storage, Demand Response Resources

MISO's reliability footprint and regional control center locations

MISO's role as a grid operator is similar to the role of an air traffic controller



- Air traffic controllers manage the movement of planes from point A to point B safely and reliably 24/7/365
- Air traffic controllers don't own the airplanes, the runways, or the terminals



- MISO operators manage the movement of electricity from where it is generated to the local utilities safely and reliably 24/7/365
- MISO doesn't own the generators, the transmission lines, or any part of the electric grid

MISO manages the generation and transmission of high-voltage electricity, while utilities distribute the power to their customers

MISO



MISO directs the generation of multiple types of fuel sources to distribute power over the bulk electric grid.

Regulated by the Federal Energy Regulatory Commission (FERC)



MISO manages the flow of electricity across 77,000 miles of member-owned transmission lines.

MEMBER UTILITIES



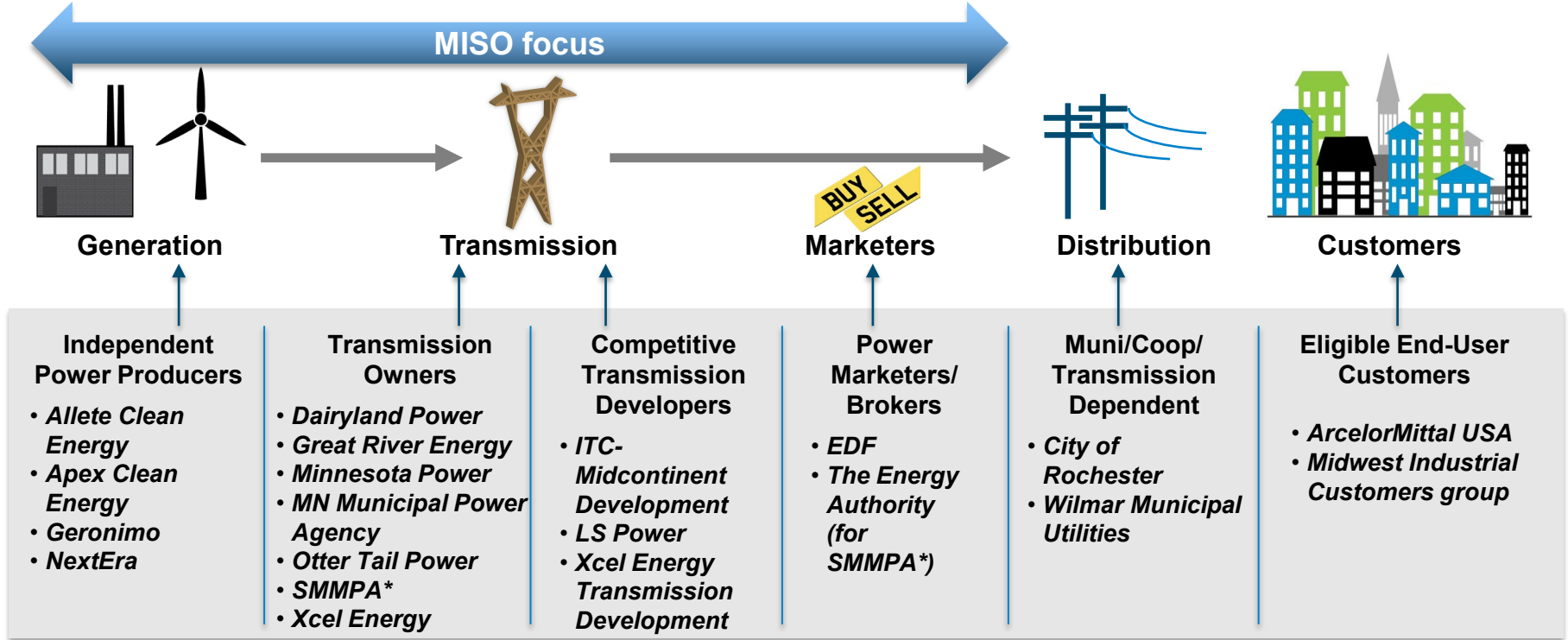
Utilities receive the electricity at their substations for delivery to customers.

Managed by local utilities and subject to state regulatory jurisdiction (e.g., public utility commission)



Customers receive electricity from their utility via the utility distribution system.

MISO members participate across the electricity value chain, and Minnesota is well represented...



MISO Members by Stakeholder Sector; Minnesota examples (not exhaustive)

Other MISO stakeholder 'sectors' (and MN examples): State Regulatory (MN PUC), Public Consumers (MN DOC), Environmental (Clean Grid Alliance), Affiliate (MN Chamber of Commerce)

* Southern Minnesota Municipal Power Agency



MISO membership provides value

Benefit from
MISO scale

More
efficient use
of existing
assets

Reduced
need for
additional
assets

Savings to
customers far
outweigh
costs



Improved Reliability

MISO exceeds industry standards
to improve reliability



Added Customer Value

MISO has delivered an estimated
\$45 billion in value to the MISO
region from 2007-2023



Policy Enablement

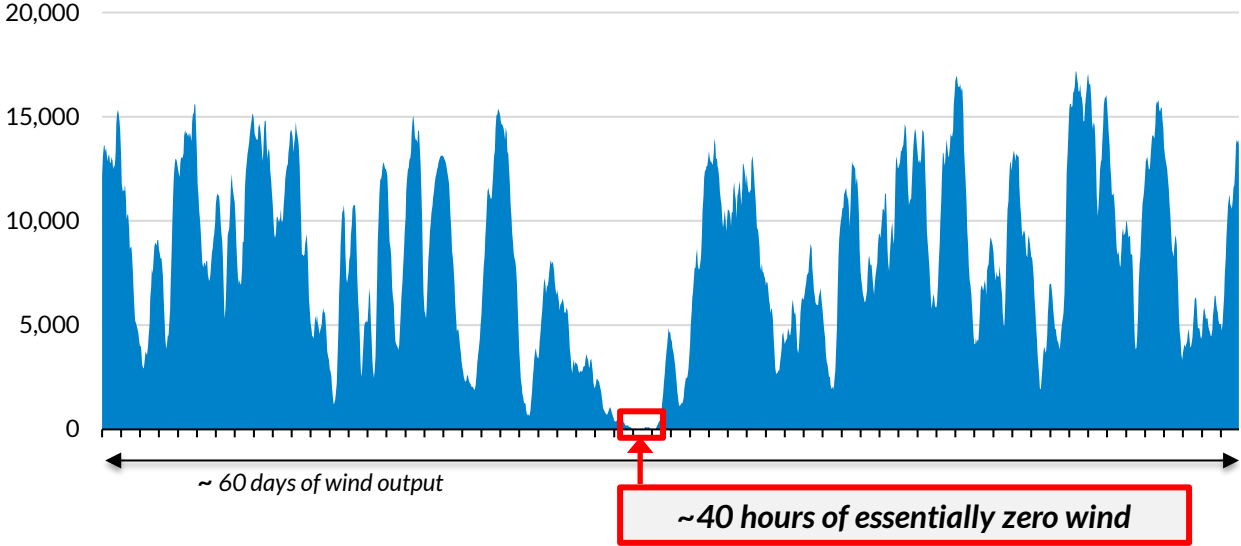
MISO's regional planning can help
customers, cities, states and utilities
meet their policy goals

2023: \$4.9 billion in benefits with a benefit-to-cost ratio of 15:1

Increasing risk and complexity require significant transformational changes to our grid, markets, operations and technology

One example: Potential long duration wind droughts...

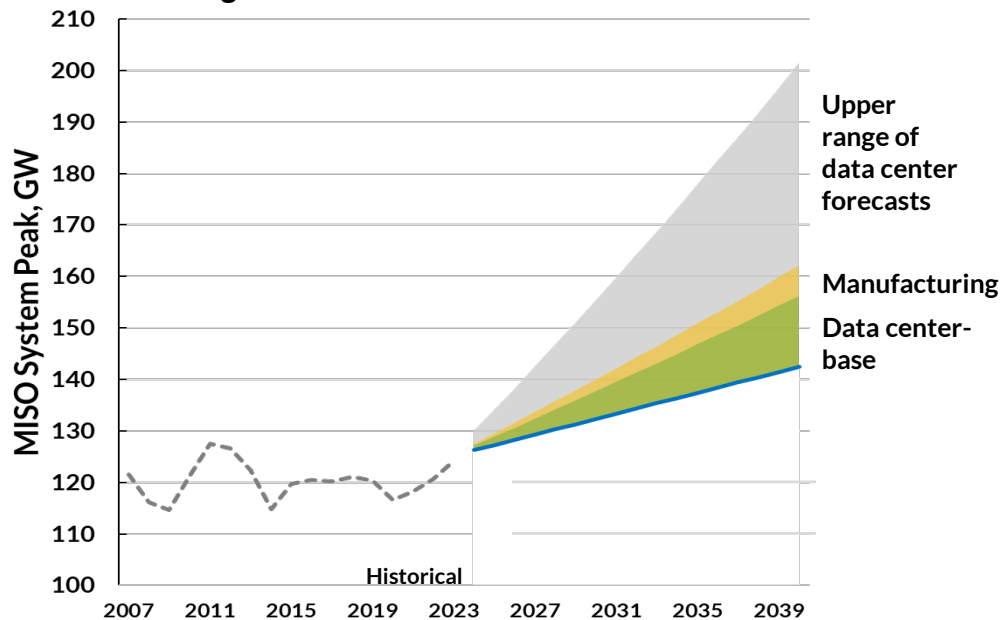
MISO-wide Hourly Wind Output January & February - 2020 (MW)



- *Long duration wind droughts could occur again*
- *Current storage solutions are helpful for shorter term, but not longer-term wind droughts*

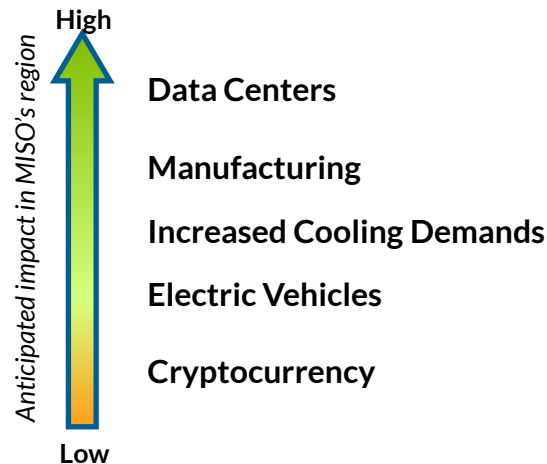
Poor visibility into the magnitude/timing of large load additions can put at risk our ability to reliably accommodate them

Studies¹ anticipate manufacturing growth to favor MISO's service area



Notes: All figures shown are **PRELIMINARY**

- Grid planners have nearly *doubled* their 5-year peak load growth forecasts in recent years
- MISO **anticipates** strong *long-term* load growth driven primarily by:



The 'Reliability Imperative' is the framework we are using to address challenges to reliability in MISO

RELIABILITY CHALLENGES

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



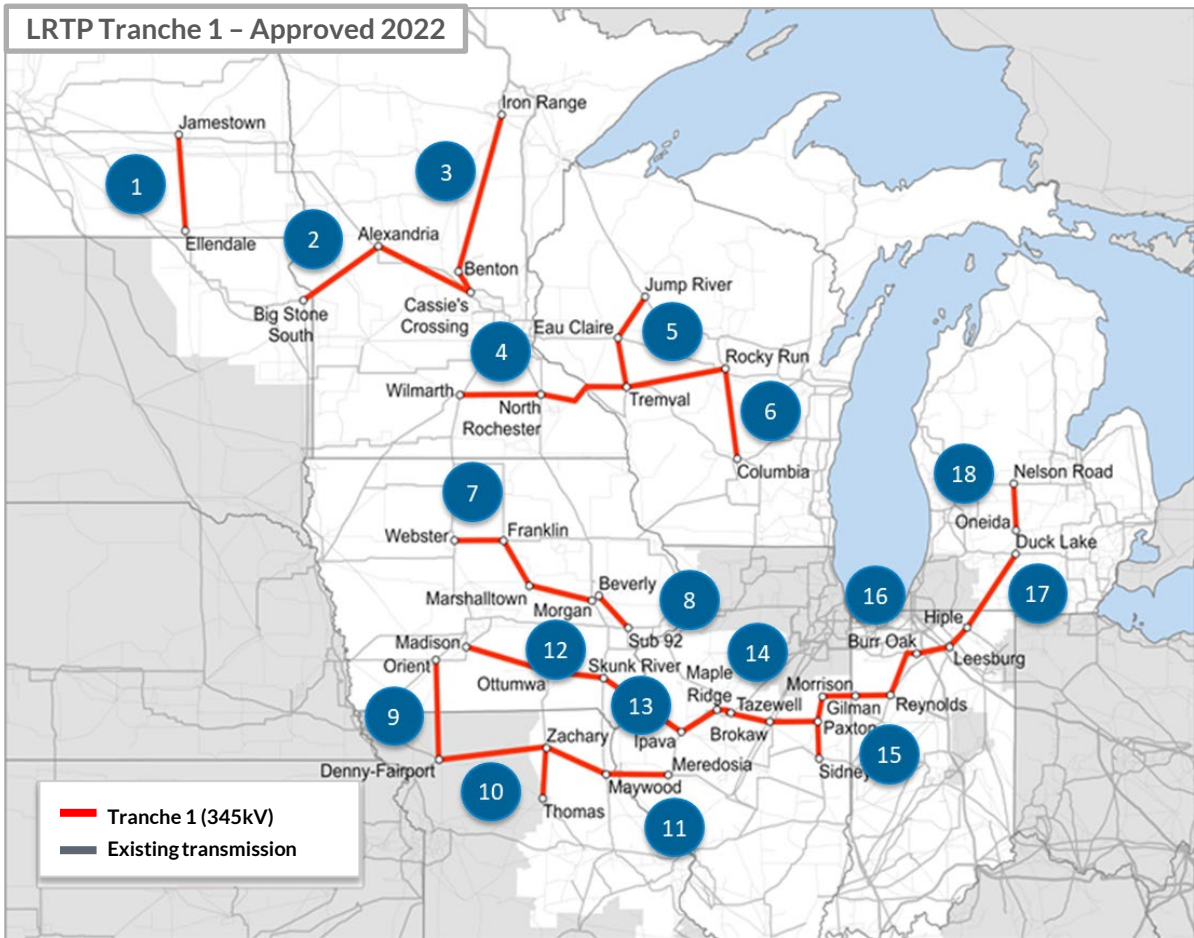
'RELIABILITY IMPERATIVE' KEY INITIATIVES¹

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

¹ Partial listing of initiatives;

² Includes Joint Targeted Interconnection Queue (JTIQ)

Long Range Transmission Planning - Tranche 1: MISO Midwest



- 18 projects across the MISO Midwest subregion
- \$10.3 billion investment, with benefit-to-cost ratio of 2.5:1

ID	Project Description
1	Jamestown - Ellendale
2	Big Stone South - Alexandria - Cassie's Crossing
3	Iron Range - Benton County - Cassie's Crossing
4	Wilmarth - North Rochester - Tremval
5	Tremval - Eau Clair - Jump River
6	Tremval - Rocky Run - Columbia
7	Webster - Franklin - Marshalltown - Morgan Valley
8	Beverly - Sub 92
9	Orient - Denny - Fairport
10	Denny - Zachary - Thomas Hill - Maywood
11	Maywood - Meredosia
12	Madison - Ottumwa - Skunk River
13	Skunk River - Ipava
14	Ipava - Maple Ridge - Tazewell - Brokaw - Paxton East
15	Sidney - Paxson East - Gilman South - Morrison Ditch
16	Morrison Ditch - Reynolds - Burr Oak - Leesburg - Hiple
17	Hiple - Duck Lake
18	Oneida - Nelson Rd.

Questions?

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