The MISO Grid: Transmission Plans and Market Trends

LAMPAC Midwest Minneapolis, MN August 7, 2024

MISO

MISO & neighboring U.S. electric grid operators

MISO (Midcontinent Independent System Operator)

- 15 states + Manitoba
- 45 million customers
- \$25 40 billion annual market
- ~ 3,000 generation units with 190,000 MW of installed capacity
- ~ 75,000 miles of high voltage transmission lines
- ~ 200 member utilities

1

> 500 market participants







What does MISO do?

1. Efficient Wholesale Market Management & Operations to Ensure Reliability

- Conduct day-ahead and realtime energy and operating reserves markets
- Manage least-cost, economic dispatch of generation units
- Monitor and schedule energy transfers on the high voltage transmission system



2. Comprehensive Regional Transmission Planning

- Long-range transmission planning
- New generator interconnection and retirement
- Long-range studies, such as Renewable Integration Impact Assessment (RIIA)

MISO's Vision: Be the most reliable, value-creating RTO



The entire electric industry is challenged by a hyper-complex risk environment





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



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



- 'Duck curve' effect will increase with higher solar penetration
- Operating conditions will require increased flexibility (~40 GW of 'up-ramp' capability)



Because resources and load are changing faster and more profoundly than anticipated, the transition is posing adverse challenges to reliability

Load Additions & Growth

New energy-intensive facilities and electrification trends could dramatically increase load needs

Issue

Ability to meet both economic development and policy goals simultaneously may be challenged

Pace of Resource Additions

Even resources with full interconnection approval can experience significant delays in coming online

Issue

Potential delays in plans for new resource additions with the necessary capabilities may imply a lack of sufficient reliability attributes going forward

Resource Accreditation Changes

Accurately forecasting a resource's availability to contribute to meeting future reliability needs is vital

Issue

Resource accreditation that reflects their true availability during high-risk periods is increasingly important

Pace of Resource Retirements

Dispatchable resources may retire prematurely due to environmental regulations and clean energy policies

Issue

Need to maintain transition resources and moderate retirements until new technologies are viable at grid scale



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



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



1: <u>https://www.epri.com/research/products/00000003002027930</u> <u>https://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf</u>



Notes: All figures shown are PRELIMINARY

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

OMS-MISO Survey Resource Adequacy Projection

Summer (Accredited GW)



An unprecedented pace of new capacity additions to mitigate deficits would require:

- Easing of supply chain challenges
- Reduced permitting delays
- Adequate skilled labor
- Supportive commercial viability
- Continued queue improvements

Need <mark>5-6 GW/yr</mark> of Potential New Capacity added to avoid shortfalls

- Potentially Unavailable Resources Potential New Capacity
- **Committed Capacity**

Notes:

- Bracketed red values indicate difference between Committed+ Projected New Capacity and projected PRMR
- Capacity accreditation values and PRM projections based on current practices
- Methods for Potential New Capacity described in <u>2024 OMS-MISO Survey presentation</u>
 OMS = Organization of MISO States (State Regulators)
 PRMR = Planning Reserve Margin Requirement



Public

Long Range Transmission Planning (LRTP)

Transmission investment is increasing: MISO Transmission Expansion Plan (MTEP) investment includes two cycles with large portfolios of regional Multi-Value Projects (MVPs), and more to come...



* MTEP = MISO Transmission Expansion Plan (regular annual 'bottoms up' planning process)

LRTP = Long-Range Transmission Plan ('top down' region-wide planning process)



Long Range Transmission Planning is designed to manage the uncertainty of our shared future...

Recognize member and state goals across the entire footprint

 \rightarrow

Define a forward-looking resource expansion which conforms to member goals

Apply guardrails in several scenarios to show reliability and transmission value



Identify a least-regrets transmission build-out that hedges uncertainty

Recognize some issues will be addressed by MTEP and Queue

Focus on regional transmission solutions, rather than localized issues

MISO's obligation is to plan to meet the goals and objectives of our members and states reliably and efficiently



Tranche 1 represents the first iteration and includes 18 projects across the MISO Midwest subregion estimated at \$10.3 billion



		Est. Cost (\$M,
ID	Project Description	2022)
1	Jamestown – Ellendale	\$439M
2	Big Stone South – Alexandria – Cassie's Crossing	\$574M
3	Iron Range – Benton County – Cassie's Crossing	\$970M
4	Wilmarth – North Rochester – Tremval	\$689M
5	Tremval – Eau Clair – Jump River	\$505M
6	Tremval – Rocky Run – Columbia	\$1,050M
7	Webster – Franklin – Marshalltown – Morgan Valley	\$755M
8	Beverly - Sub 92	\$231M
9	Orient – Denny - Fairport	\$390M
10	Denny – Zachary – Thomas Hill – Maywood	\$769M
11	Maywood – Meredosia	\$301M
12	Madison – Ottumwa – Skunk River	\$673M
13	Skunk River – Ipava	\$594M
14	Ipava – Maple Ridge – Tazewell – Brokaw – Paxton East	\$572M
15	Sidney – Paxson East – Gilman South – Morrison Ditch	\$454M
16	Morrison Ditch – Reynolds – Burr Oak – Leesburg – Hiple	\$261M
17	Hiple – Duck Lake	\$696M
18	Oneida - Nelson Rd.	\$403M
	Total Project Portfolio Cost	\$10.3B



The Tranche 2 portfolio focuses on creating a 765 kV transmission 'highway' within the MISO region to maximize value based on land use, line distances, transfer levels and costs

1 - 765 kV Circuit



Tranche 2 does not eliminate the consideration of HVDC, 345 kV or 765 kV for future needs

3 - 500 kV Circuits



6 - 345 kV Single Circuits



3 - 345 kV Double Circuits





The Tranche 2.1 portfolio is near-final and will continue to be refined through workshops and business case analysis





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

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

KEY INITIATIVES¹



¹Partial listing of initiatives; ²Includes Joint Targeted Interconnection Queue (JTIQ)

Public