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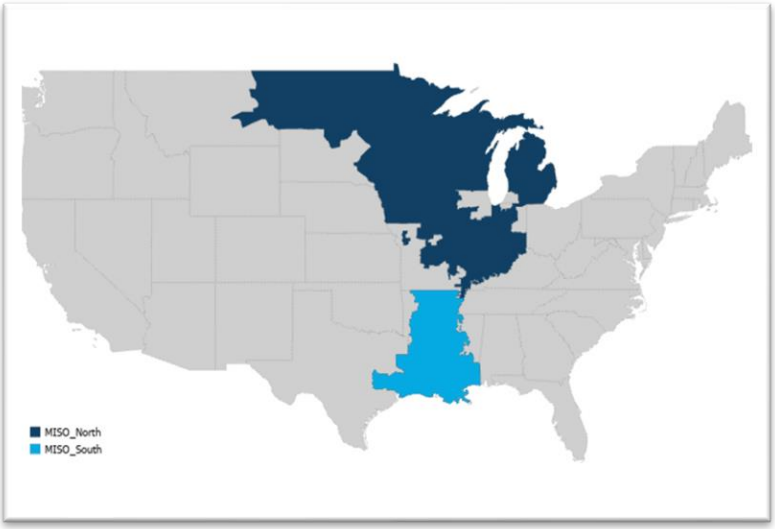
MISO 101 Primer: Part 1
Introduction to MISO

This document is the first in a series of publications intended to provide readers with a basic understanding of MISO (Midcontinent Independent System Operator). This series will cover a variety of topics fundamental to understanding MISO's role in our energy system, including—but not limited to—transmission planning, reliability coordination, and the wholesale electricity market. This series aims to inform policy practitioners who wish to better understand and engage with energy policy and grid issues in the Midcontinent region.

Introduction to the Midcontinent Independent System Operator (MISO)

MISO (pronounced "MY-so") became the first Federal Energy Regulatory Commission (FERC)-approved RTO in 2001. Three years prior in 1998, several transmissions owning utilities, or TO's, recognized the benefits of connecting their grids and centralizing its operation. These utilities opted to turn over functional control of their transmission networks to MISO to more effectively share power generation resources to save customers money. In 2013, Entergy Corporation and other southern utilities joined MISO, adding what is now referred to as "MISO South" to MISO's control area[1]. As of 2022, MISO's footprint spans 15 states, from Minnesota to Louisiana, and crosses an international border into Manitoba, Canada, serving approximately 42 million people. Today, MISO's southern and northern regions are only marginally linked via transmission. The whole MISO region has a peak annual load around 125 gigawatts. The north-south tie only allows 3 gigawatts to flow between the regions.

Figure1: The MISO region



MISO's core functions

MISO's core role in the regional electric grid is to help utilities manage the physical flow of electricity across the transmission system so that customers have a consistent supply of electricity at an affordable cost. Doing so requires coordinating across all of its member utilities on multiple time scales. They coordinate on a second-by-second basis to operate the system, over the next 10 to 20 years to plan the system, and everything in between.

MISO works in three primary functional areas: transmission system operations, transmission planning, and wholesale electricity markets. Each area is subject to stakeholder engagement and regulatory oversight by state and federal regulators.

GRID OPERATIONS

MISO's member utilities own the power plants and transmission lines that make up the region's bulk power system. Those members give MISO functional control of the transmission grid, thus making MISO the "grid operator". It is MISO who communicates with power plant operators, sending "dispatch" instructions to tell them how much power to produce and by controlling transmission switches and other devices to manage the flow of electricity within the safe tolerances of the grid's thousands of elements.

MISO control room (photo courtesy of MISO Energy)

MISO sends these instructions from control centers located in Carmel, IN and Eagan, MN. Engineers and other staff process generation and load forecasts, generation and transmission outage information, and other system conditions to run reliability studies and ensure enough generation capacity where and when it is needed to meet load.

TRANSMISSION PLANNING

MISO conducts transmission planning activities to ensure the region's grid is reliable and economically efficient. MISO does not plan generation resources; utilities and states do. MISO's job is to knit the individual utility plans together and plan transmission alongside the utilities to deliver the most public benefit for every dollar invested, including improved reliability, reduced energy costs, and reduced carbon emissions.

MISO has multiple cyclical transmission planning processes running in parallel throughout the year. These include electricity generator interconnection reliability studies, local and regional reliability studies, economic studies, and public policy studies. These processes are intended to align with MISO's Guiding Principles for transmission planning[2]. These studies use models that simulate the effects of future generation additions and retirements on the grid. Once reliability problems or economic opportunities to deliver cheaper electricity are identified, multiple

transmission line options are put into the models to find the solution that delivers the most value for customers.

WHOLESALE MARKETS

MISO's wholesale electricity markets aim to facilitate the economic delivery of electricity to all customers in the region. Generators offer to sell electricity to the market and MISO's market software solves for the least cost use[3] of those offers to minimize energy cost to customers while accounting for grid limitations or constraints[4].

MISO *runs multiple markets*. There is an annual generation capacity market, a daily day-ahead energy market, and a real-time energy market. The capacity market is a once-per-year auction in which utilities can trade credits for megawatts of generation capacity to make sure they all have enough available to serve their load. The day-ahead and real-time markets are used to trade energy and a handful of other products like ancillary services to maintain reliability.

MISO's markets and operations are closely linked, informing one another to co-optimize reliability and economics.

Each of these three core functions will be the focus of future publications to take a deeper dive.

Conclusion

While MISO is not the most well-known part of the electric system, it plays a critical role in providing affordable and reliable electricity to millions of people and businesses. Its markets facilitate the efficient and reliable operation of the grid. And its centralized transmission planning role ensures the electricity supply remains that way.

For questions, comments, and feedback, please contact Matt Prorok, Senior Policy Manager, Great Plains Institute at mprorok@gpisd.net.

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1 Reuters Staff, "TIMELINE-Entergy transition to MISO caps years of wrangling", *Reuters*, December 10, 2013, https://www.reuters.com/article/utilities-entergy-miso/timeline-entergy-transition-to-miso-caps-years-of-wrangling-idUSL2N0JL24U20131210

2 Board of Directors – Midcontinent Independent System Operator, Inc, "Statement of Guiding Principles for the MISO System Planning Process", June 2021, https://cdn.misoenergy.org/System%20Planning%20-%20Statement%20of%20Guiding%20Principles113847.pdf

3 Potomac Economics, *2021 State of the Market Report for the MISO Electricity Market: Analytic Appendix* (Independent Market Monitor for the Midcontinent ISO, June 2022), 33-78, https://cdn.misoenergy.org/2021%20State%20of%20the%20Market%20Report625295.pdf

4 "Market Vision," MISO, accessed September 19, 2022, https://www.misoenergy.org/markets-and-operations/market-roadmap/