Price Signals Activating Power System Flexibility

——Demand-Side Flexibility Practices in the U.S. Midwest

Abstract: Maintaining energy security and grid reliability while integrating variable renewable energy has become a growing challenge for power systems worldwide. As the share of renewable energy grows, greater system flexibility is needed to balance electricity supply and demand. Electricity customers with time-shiftable loads, on-site generation or storage can help provide this flexibility while reducing their own costs. This case study examines how the Midcontinent Independent System Operator (MISO) has expanded demand-side flexibility through market and regulatory reforms. MISO's experience highlights the need for accurate price signals, transparent and iterative regulation, and market rules that let distributed resources tap multiple value streams based on their capabilities.

Keywords: demand-side flexibility; wholesale electricity pricing; market power mitigation; distributed energy resources; renewable resource adequacy

I Background

The Midcontinent Independent System Operator (MISO) is a pioneer in integrating demand-side flexibility into power system operations in the United States. As a nonprofit independent system operator, MISO manages electricity supply across 15 U.S. states and the Canadian province of Manitoba, operating both the system dispatch center and wholesale electricity markets under the regulation of the Federal Energy Regulatory Commission (FERC). MISO is the second-largest power system operator in North America and manages a power system with a growing share of wind and solar generation. As renewable energy deployment continues to expand, the region faces an increasing need for flexible resources to help balance electricity supply and demand while maintaining reliability.

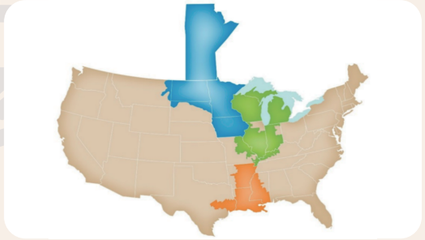


Figure 1. MISO manages electricity supply range (orange, green, and blue areas)

II Key Measures

(1) Using wholesale price signals to reflect system supply and demand

• MISO sets a relatively high price cap to send a strong price signal to utilities, encouraging them to reduce costs by using demand-side flexibility through tariff design or program mechanisms.

• MISO also sets the offer and market price floor at -USD500/MWh as an emergency backstop, which is reached only during periods of severe oversupply. It also allows prices to become substantially negative and continues to explore ways to reduce the frequency of negative prices, helping prices better reflect supply-demand conditions and guide resource response.

(2) Using transparent retail prices to encourage consumers to shift electricity use

• Allowing prices to fluctuate over a relatively wide range, including negative prices during periods of excess supply, sends more accurate signals to generation, storage, and flexible loads, encouraging them to adjust electricity production or consumption in response to system conditions.

(3) Using market rules to enable aggregated participation of demand-side resources

• MISO, federal regulators, and state regulators play complementary roles in establishing rules for virtual power plants (VPPs). MISO implements wholesale market participation rules approved by FERC, while state regulators oversee retail demand response programs and electricity rates.

• In 2020, FERC required MISO and other regional transmission organizations to enable distributed energy resources to participate fairly in wholesale markets and receive market services on par with conventional resources. Since then, MISO has worked with stakeholders and FERC to develop DER aggregation models, update market rules, revise tariff mechanisms, and address metering, telemetry, and coordination with distribution utilities.

(4) Using capacity mechanisms to recognize the reliability value of demand-side resources

• MISO adopts a layered resource adequacy framework. Utilities develop integrated resource plans, covering 15–20 years, that are subject to state regulatory review to guide long-term resource procurement.

• MISO complements these plans with annual resource adequacy assessments and seasonal capacity auctions, providing price signals and coordinating near-term capacity needs.

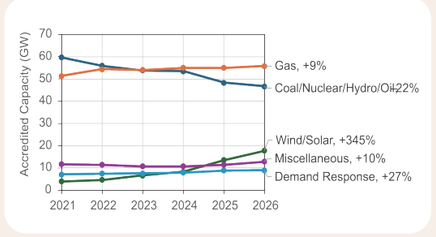


Figure 2. Summer capacity procured through MISO resource adequacy auctions, 2021–2026 (Image source: MISO)

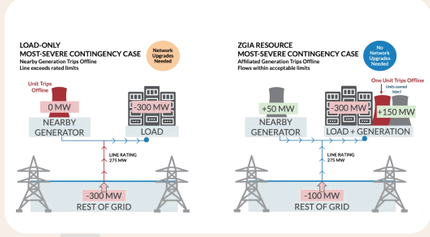


Figure 3. ZGIA enables loads with on-site generation to reduce demand on the rest of the grid's transmission and generation capacity (Image source: MISO Planning Advisory Committee)

III Lessons Learned

Coordinating price signals with appropriate safeguards can encourage flexible resource response, while transparent procedures and continuous rule refinement strengthen confidence in market institutions. Recognizing multiple value streams and adopting fit-for-purpose market rules can enable diverse resources to participate on a fair basis, while consistent standards help ensure that resources are valued according to their actual reliability contributions. Flexible interconnection rules and incentive mechanisms can further encourage loads to better adapt to system needs, improving power system flexibility and resource allocation efficiency.

Case provided by CCICED Special Policy Study
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