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MISO Applies Operations Research to Energy and Ancillary Services Markets Unlocking Billions of Savings

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The Midwest Independent Transmission System Operator (MISO) used operations research (O.R.) to design and launch its energy and ancillary services markets. Through these markets, O.R. allowed MISO to improve reliability and to increase efficiencies in the use of power plants and transmission grid assets resulting in billions of dollars saved. Their work was highlighted in the 2011 Franz Edelman Award Competition with their work, "MISO Unlocks Billions in Savings Through

the Application of Operations Research for Energy and Ancillary Services Markets."

For many years, the power industry in the U.S. consisted of utilities that had a localized focus ignoring that there might be a better regional solution. This localized focus, as well as the utilities' ability to control their transmission lines, created barriers for other utilities wanting to buy and sell electricity from each other. This resulted in utilities maximizing the use of their own power plants and transmission lines at the expense of the larger electrical system.

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During the 1990s, the Federal Energy Regulatory Commission (FERC), a power industry regulator at the national level, pushed to restructure the industry to reduce individual utilities' market power and to drive more efficiency into the utilization of the U.S. fleet of power plants and transmission lines. As a part of this restructuring effort, FERC began encouraging the formation of Regional Transmission Organizations (RTO). RTOs are the "air traffic controllers" of the transmission grid—they assure that power travels where it needs to go at the lowest possible cost and with the highest level of reliability, considering the physical constraints of the electricity system.

In 2001, FERC approved MISO as the nation's first RTO.

Today, MISO is an essential link in the safe, cost-effective delivery of electric power across 13 U.S. states and the Canadian province of Manitoba serving approximately 40 million people. Membership of MISO includes 35 transmission owners and 100 non-transmission owners. MISO has operational control over 55,000 miles of transmission lines and over 1,500 power plants totaling 145,966 megawatts of power plant capacity.

Driven by the goal of minimizing delivered energy costs in a reliable fashion, MISO leveraged advances in computing capabilities and O.R. algorithms to launch its original energy market on April 1, 2005 and its upgraded energy and ancillary services markets on January 6, 2009.

MISO's energy and ancillary services markets are O.R. products. It is a commodities market that facilitates real-time and day-ahead trade transactions in energy and ancillary services. Through market bids and offers, MISO notifies power plants every 5 minutes of the amount of energy required to meet demand. The power plants providing the energy are the lowest cost producers that satisfy demand while respecting the physical constraints of the electrical system. Running the markets over a large region further maximizes efficiencies due to economies of scale. In 2009, MISO cleared \$24 billion in market transactions.

By leveraging O.R., MISO added significant value to the midwest region through improved reliability and increased efficiencies of the region's power plants and transmission assets. Based on its annual Value Proposition study, MISO region realized between \$2.1 and \$3.0 billion in cumulative savings from 2007 through 2010. MISO estimates an additional \$6.1 to \$8.1 billion of value will be achieved through 2020.

"The Midwest ISO is able to provide this value by applying new, complex analysis and optimization techniques on a broad regional basis," said John R. Bear, president and CEO of MISO. "This enables both improved use of existing electric system assets as well as a reduced need for future assets."

WATCH VIDEO OF MISO 2011 EDELMAN FINALIST PRESENTATION



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