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Subcommittee on Energy

"Review of the operations and effectiveness of the nation's wholesale electricity markets"

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Executive Summary

- ***Midcontinent Independent System Operator, Inc. (MISO) Overview:*** MISO is a 501(c)(4) not-for-profit social welfare organization established to ensure the reliability of the high-voltage electric transmission system to deliver low-cost wholesale energy to consumers. MISO manages about 66,000 miles of high-voltage transmission lines and 175,000 megawatts of electricity-generating capacity and serves about 42 million people across all or parts of 15 states. This regional platform creates $3 billion in annual benefits for members and consumers.

- ***Experienced in the Changing Energy Landscape:*** The electricity industry is being impacted by a combination of regulatory, political and economic factors. The MISO region has already experienced a dramatic shift. While coal-fired generation supplied 76% of the region's electricity production as recently as 2005, that figure has fallen to just 46% today. Conversely, while gas supplied just 7% of the region's energy in 2005, it supplies about 27% today. And renewables, which were essentially at 0% in 2005, are at 8% and growing rapidly today.

- ***Navigating the Evolving Portfolio:*** MISO continues to innovate as we execute on the processes and functions that have allowed us to successfully and reliably navigate the significant change to-date.

    - We have partnered with our States and utilities to survey the resource needs of our footprint and the most recent results in June 2017 indicate that there are sufficient resources to meet demand through 2022.

    - We facilitate infrastructure investment through regional grid planning. This process has resulted in the approval of over $26 billion in grid investments, including a $5.6 billion portfolio of projects approved in 2011 as the first Multi-Value Projects, which were estimated to create about 28,000 direct construction jobs and around 50,000 total jobs. We will continue to identify solutions today that provide benefits regardless of the actual future state, so called no-regrets investments, well out in the future.

    - MISO also works to continuously improve our markets, driving efficiency and reliability through innovative market design features and services. Through our market roadmap process we work with stakeholders to identify, prioritize and plan future changes that foster wholesale electric markets that deliver reliable and economically efficient outcomes. We have also been working closely with the natural gas industry to address issues associated with the region's increasing reliance on gas-fired power generation.

Good morning Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and members of the Subcommittee. I am Richard Doying, executive vice president and chief operations officer at the Midcontinent Independent System Operator, Inc., or MISO. It is a pleasure to be with you today as you examine the operations and effectiveness of our nation's wholesale electricity markets. I hope the insights I share with you today about how MISO manages wholesale markets and operates a regional electrical grid will be useful to your work of shaping U.S. energy policy.

I know this committee is interested in hearing about how factors such as environmental regulations, the retirement of coal-fired power plants and the increasing use of natural gas and renewables are affecting our nation's electricity industry. Before I discuss MISO's perspective on these matters, I'd first like to provide a little background about our organization.

The Federal Energy Regulatory Commission's (FERC) Order 2000, issued in 1999, established Regional Transmission Organizations (RTO) to be independent entities that plan and operate the electric grid on a regional basis to maintain reliability and maximize efficiency. MISO was the first RTO to receive FERC approval in 2001.

MISO is a 501(c)(4) not-for-profit social welfare organization with responsibility to ensure the reliability of the high-voltage electric transmission system to deliver low-cost wholesale energy to consumers. The wholesale markets that MISO manages are the largest in North America in terms of geographical scope, serving about 42 million people across all or parts of 15 states, stretching from the Canadian border to the Gulf of Mexico. They are also among the largest in the world as measured by transactional value, with more than $25 billion in annual gross market charges. MISO also serves as the reliability coordinator for the Canadian province of Manitoba.

Currently, the MISO market region contains about 66,000 miles of high-voltage transmission with an aggregate value of approximately $38 billion, as well as 175,000 megawatts of electricity-generating capacity. MISO does not own any of these assets. Instead, with the consent of our asset-owning members and in accordance with our FERC-regulated tariff, MISO exercises functional control over the region's transmission and generation resources with the aim of utilizing them in the most cost-effective and reliable manner possible. MISO has a robust and strong stakeholder process that allows asset owners, state regulators and all stakeholders to provide input and guidance to MISO on a regular and ongoing basis.

MISO's mission is to facilitate the reliable delivery of low-cost wholesale energy to the end use customers in our footprint. We achieve this through innovative wholesale market operations and transmission grid planning. Through execution of those functions and a focus on affordable energy we generate substantial benefits for the end-use consumers served by our member utilities. MISO performs an annual study, called the Value Proposition, to measure these benefits. In 2016 benefits totaled approximately $3 billion. Over the last decade, the cumulative value created is about $18 billion. A significant portion of these benefits come from the region's resources being pooled and shared, which results in the deferral/avoidance of additional asset build by individual utilities. This value creation has continued even in the face of a significantly changing energy landscape.

The electricity industry is in the midst of a profound transformation due to a combination of regulatory, political and economic factors. These include environmental regulations targeting emissions from coal-fired power plants; state policies promoting renewables; and the abundance of low-cost natural gas spawned by advances in hydraulic fracturing and horizontal drilling. Additionally, energy-efficiency initiatives and "demand-side" programs that compensate

customers for reducing their electricity use are growing in popularity, as are emerging technologies such as energy storage and distributed-energy systems like rooftop-mounted solar panels that allow homeowners to generate their own energy and sell their excess power back to the grid.

In the MISO region, which has historically been heavily reliant on coal-fired electricity generation, the impacts have been notable. For example, while coal-fired generation supplied 76% of the region's electricity production as recently as 2005, that figure has fallen to just 46% today. Conversely, while gas supplied just 7% of the region's energy in 2005, it supplies about 27% today. And renewables, which were essentially at 0% in 2005, are at 8% and growing rapidly today.

Due to the ongoing nature of the factors driving these changes, MISO expects the trends to continue into the future. I understand many people are very concerned about how these changes are affecting energy prices, wholesale markets and the reliability of the nation's electrical grid. While the changing landscape presents some challenges, MISO continues to evolve and innovate as we execute on the processes and functions that have allowed us to successfully navigate the significant change that we have already experienced in our footprint.

One impact of the transitioning fleet is declining reserve margins. The MISO region is predominately comprised of traditionally structured and state regulated utilities. Under this regulatory regime, the responsibility for ensuring that enough resources will be available to meet the demand for electricity while maintaining an adequate supply of reserves—a concept known as achieving "resource adequacy"—rests with load-serving entities (LSEs) and state regulatory agencies where applicable. However, MISO has partnered with those entities on an annual survey mechanism that creates visibility and transparency into the near- and mid-term regional

supply and demand picture that has facilitated actions needed to ensure ample resources continue to be in place to maintain long-term grid reliability. The latest iteration of the survey, conducted during the first half of 2017, demonstrates that generating capacity in the MISO region will exceed demand plus reserve margin requirements through at least 2022.

Our regional grid planning and facilitation of infrastructure investment has also been a key contributor to the region's ability to effectively manage the resource portfolio evolution. This process, which is driven by input from MISO stakeholders, is designed to maximize value for consumers while minimizing the costs of transmission, generation and the energy on the system. As a part of this process, MISO identifies essential transmission projects that will improve the reliability and efficiency of energy delivery in the region over the next 10 years and beyond – ensuring transmission is available where needed to transmit energy from new resources to where it is consumed. These projects are included in the MISO Transmission Expansion Plan (MTEP), an annual publication that is the culmination of 18 months of collaboration between MISO planning staff and stakeholders.

Through this process MISO has facilitated the approval of over $26 billion in grid investment. This includes a $5.6 billion portfolio of projects approved in 2011 as the first Multi-Value Projects. The portfolio is made up of 17 projects, with each state in MISO's North and Central Regions being home to at least one. These projects provide reliability and efficiency benefits, and were primarily designed to support and accommodate different state renewable energy policies. This group of projects is expected to generate benefits that exceed costs by 2.5 times. In addition, they were estimated to create about 28,000 direct construction jobs and around 50,000 total jobs.

Our long-term planning process that identified this portfolio is a scenario-based approach that uses a range of potential outcomes to "bookend" the uncertainty associated with the different factors that can influence future system needs and thus transmission system design. Those assumptions include things such as coal and natural gas prices; the demand for electricity; generation retirements; and state mandates for certain amounts of renewable energy. We will continue to utilize this process to identify solutions today that provide benefits regardless of the actual future state, so called no-regrets investments, well out in the future.

As the industry continues to evolve, planning across RTO borders to improve our ability to fully maximize and optimize collective resources will be more crucial. FERC Order 1000 contains a component that directs interregional coordination between neighboring RTOs. While this has helped to spur efforts between entities, regional differences in approaches and methodologies can mute progress. Given the increasing importance of maximizing existing resources in the future to meet customer needs, this is an opportunity for improvement.

MISO also works to continuously improve our markets, driving efficiency and reliability through innovative market design features and services. Our Market Enhancement Program team works closely with our stakeholders and the Independent Market Monitor to identify, develop and implement market design improvements. Through our market roadmap process we work with stakeholders to identify, prioritize and plan future changes that foster wholesale electric markets that deliver reliable and economically efficient outcomes. A couple of examples include:

- An enhanced pricing structure that better reflects the total cost of generation, reducing out-of-market costs and allowing more resources to participate in the market, thus improving market outcomes.

- A market product that creates a reserve of energy resources capable of rapid output changes that can quickly respond to short-term demand variations, thus improving reliability and reducing price volatility.

We have also been working closely with the natural gas industry to address issues associated with the region's increasing reliance on gas-fired power generation. While this trend is being driven by economics, it can also pose challenges for the power industry. For example, gas-fired power plants could find it difficult to procure all the fuel they need to operate during extreme winter weather, when large amounts of gas are used to heat homes. MISO has launched numerous efforts to ensure that gas-fired units can operate reliably during extreme winter conditions and other circumstances, including:

- Establishing direct communications with gas pipeline operators.
- Aligning our Day-Ahead electricity market with the gas industry's timelines for scheduling next-day pipeline deliveries of gas.
- Administering a voluntary "Winter Generator Fuel Survey" that increases our awareness of the gas-delivery arrangements in our region.

RTOs have a unique role in the industry and bring a unique perspective to the challenges we face. We are policy takers – we don't advocate for any particular policy, but instead work with the states, utilities and all other stakeholders in our regions to ensure any policy is implemented reliably and in the most efficient manner. MISO has utilized this role to create nearly $18 billion in benefits for its region while positioning it to navigate the continuing evolution of the industry. We appreciate the opportunity in front of us to help our region through this change and to inform the discussions that will shape the path forward.