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Subcommittee on Energy

“Examining the State of Electric Transmission Infrastructure:  
Investment, Planning, Construction and Alternatives”

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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.
- ***MISO's Transmission Planning and Development Process:*** MISO's grid planning and facilitation of infrastructure investment has been a key contributor to the region's ability to efficiently and reliably manage the ongoing generation portfolio evolution. Our value-based planning process combines planning to address localized and reliability-related transmission issues including compliance with NERC reliability standards, with planning focused on regional and sub-regional solutions to economic and/or public policy issues. Localized planning focuses on the 10 year horizon while the regional planning aspect may look out 20 years or more. The process provides for a review of alternative solutions to identified issues, including non-transmission alternatives to projects identified to address reliability concerns.

Our innovative process was designed to ensure ongoing reliability while facilitating what are sometimes long lead time investments in an environment of policy uncertainty. The long-term aspect of the process uses a scenario based approach to mitigate that uncertainty. We look for projects that will provide value across a range of potential future states. These “no regrets” investments will be prudent no matter the actual future. Nearly \$30 billion of transmission development has been identified in our planning process, with approximately \$6 billion of that stemming from a long-term, regional portfolio of projects recommended in 2011.

- ***Challenges and Opportunities:*** Transmission investments in the MISO region have contributed significantly to a resilient MISO grid. As the generation portfolio continues to evolve to one of more intermittent and distributed generation, additional regional transmission will likely be needed to ensure system reliability and the most economic delivery of power. In a region spanning 15 states, diverse viewpoints make consensus on transmission needs, and how the costs should be allocated, challenging. That consensus becomes even more elusive as we seek to identify transmission needs inter-regionally. Overcoming those hurdles in a timely manner is imperative to ensure the grid of the future is in place to support the generation fleet of the future.

## **MISO Overview**

Good morning Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and members of the Subcommittee. I am Jennifer Curran, vice president of system planning at the Midcontinent Independent System Operator, Inc., or MISO. It is a pleasure to be with you today as you examine the state of our nation's electric transmission system. I hope the insights into how MISO facilitates transmission investments will be useful to your work of shaping U.S. energy policy.

I know this committee is interested in hearing about the facilitation of transmission system investments, including challenges associated with the planning and construction of new transmission lines, the effect of existing federal laws and regulations, and the consideration of non-transmission alternatives. Before I share MISO's insights on these matters, I would 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 (RTOs) 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 ISO to be recognized as an RTO, receiving FERC approval in 2001.

MISO is a 501(c)(4) not-for-profit social welfare organization with responsibility for ensuring the reliability of the high-voltage electric transmission system to deliver low-cost energy to consumers. The system that MISO manages is 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. Our energy markets are also among the largest in the world, with more than \$25 billion in annual gross market charges. MISO also serves as the

reliability coordinator for MISO entities in these 15 states and the Canadian province of Manitoba. A map of the MISO footprint is provided in the Appendix of this testimony.

Currently, the MISO region contains about 66,000 miles of high-voltage transmission assets 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 managing them in the most reliable and cost-effective manner possible. The MISO Region is predominantly comprised of traditionally structured and state regulated utilities. MISO has a robust stakeholder process that allows asset owners, state regulators and all other stakeholders to provide input and guidance to MISO on a regular and ongoing basis.

MISO's mission is to work collaboratively and transparently with stakeholders to enable 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 and quantify these benefits. In 2017 benefits totaled more than \$3 billion. Over the last decade, the cumulative value created is about \$21 billion.

A portion of these benefits results from improved reliability and the optimization of all of the region's resources. However, the transmission system enables the majority of this value – over \$2 billion annually – by allowing the region to harness the substantial diversity benefits provided by our expansive footprint. MISO's region spans areas that can experience significantly different weather at any given time. Demand in those areas peaks at different times. This allows for a

more efficient set of supply resources to be employed across those peaks than would be possible if demand peaked in all areas coincidentally. The transmission grid provides the connections that allow low-cost energy to be transferred across the region and the deferral or avoidance of additional assets built by individual utilities. Our robust transmission system also provides the flexibility and adaptability needed to respond to the profound transformation taking place in the electricity industry.

### **Evolving our Collaborative Planning Process to Accommodate Changing Generation Mix**

We are experiencing significant changes in the resource mix due to a combination of regulatory, political and economic factors. The abundance of low-cost natural gas, combined with legacy environmental regulations targeting emissions from coal-fired power plants and state policies promoting renewables, has put additional pressure on the traditional generation fleet.

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, or receive credits for, excess power delivered 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 75% of the region’s electricity production as recently as 2011, that figure has fallen to less than 50% today. Conversely, while gas supplied just 6% of the region’s energy in 2011, it supplies

about 27% today. And wind, which was essentially at 0% in 2005 and increased to 4% by 2011, is now at 8% and growing rapidly.

Our regional grid planning and facilitation of infrastructure investments have been key contributors to the region's ability to effectively manage this resource portfolio evolution. The transition in the generation fleet over the last decade-plus has required that we advance our transmission planning process to ensure the grid enables and supports efficient delivery of power from the changing generation fleet while remaining reliable and resilient.

In the initial days of MISO planning, the focus was narrowly on reliability planning – “keeping the lights on” – with an emphasis on lowest initial transmission costs as the key driver of customer value; an approach largely consistent with utility planning in the traditional, pre-wholesale market era. However, MISO, in collaboration with our stakeholders, soon began to enhance our planning process to account for project benefits beyond just reliability, including market efficiency improvements and addressing public policy requirements and objectives. The resulting value-based process is designed to maximize value for consumers by identifying transmission which minimizes the combined costs of transmission, generation and the energy on the system, or in other words lowers the total delivered cost to consumers. Each cycle of the process is the culmination of a minimum of 18 months of collaboration between MISO planning staff and stakeholders and is documented in the annual publication of the MISO Transmission Expansion Plan (MTEP). In total, MISO has facilitated nearly \$30 billion in total transmission investment since the first MISO Transmission Expansion Plan in 2003.

The process combines local and regional planning, bringing together needs and projects identified by local utilities with projects identified by MISO through our regional view of the system. Also factored in are policy and economic driven needs as well as expected generator

retirements and additions. Our process also covers the spectrum of near-term through long-term assessments of grid needs. A long term view is essential to ensure that transmission, which can have long lead times compared to some new generation options, does not become the barrier to flexible cost effective supply options that drive the largest part of customer electric bills.

Reliability planning generally has a near- to mid-term focus, looking at system needs in the 1 to 10 year horizon. These projects are justified by their role in complying with North American Electric Reliability Corporation reliability standards and are usually implemented in 2 to 5 years.

The process of developing transmission projects includes, when appropriate, evaluation of alternative transmission projects to address issues. This includes evaluating non-transmission alternatives to ensure the best option is found. Market efficiency planning assesses expected system congestion over the 5 to 15 year horizon and develops transmission plans that reduce or eliminate congestion to enable customer access to lower-cost electricity through the market, recommending transmission projects only when the market efficiency benefits outweigh project costs. The handful of market efficiency projects recommended to date have varied in scale and scope and in some cases span multiple utility territories.

The long-term portion of the process looks out 15 to 20 years and is designed to periodically assess whether industry trends, such as those driven by changing economics and public policy objectives, are creating the opportunity or need for large-scale, regional transmission plans, and to inform nearer-term investment decisions. A scenario-based approach is employed, using a range of potential outcomes to “bookend” the uncertainty associated with various factors that can influence future system needs and thus transmission system design. Variables that are assessed across those different potential outcomes, or futures, include: fuel prices; electricity demand growth forecasts; generation retirements; state and federal policy impacts; and capital costs of

new generation. Futures are created or refreshed on an annual basis to provide a range of views on where the generation mix may evolve. Transmission is planned against these future scenarios, benefits are quantified, and projects whose benefits exceed costs by predetermined thresholds across the scenarios are considered no-regrets investments as they hold up economically against various potential future states, mitigating policy uncertainty.

The process concludes with cost allocation determined by assessment of beneficiaries consistent with the project driver or purpose. Where costs are shared between multiple parties, amounts are based on how much each entity benefits from the project. Ultimately, this question of who pays is the most challenging aspect of the regional planning process. Recommending any large transmission project requires a robust business case and a fairly high level of alignment among stakeholders; specifically, MISO stakeholders must be aligned in the belief that the project will provide the expected benefits, and that the expected distribution of the costs will fairly match the expected distribution of the benefits.

As states in the Midwest were passing Renewable Portfolio Standard mandates and goals, we recognized the growing need for transmission to more economically and reliably deliver the new resource mix that was occurring due to the policy changes. However, a lack of clarity regarding future policy direction and decisions made investing in long-lead transmission lines risky. The planning process described above, in conjunction with Midwest governor and state regulator leadership on assessing transmission need, and determining how to share the costs, provided a path to facilitate needed grid investments in spite of that uncertainty. The approach sought to provide regional backbone transmission in advance of a specific resource need (“build it and they will come”) to ensure greater efficiency in transmission build by thinking about the transmission need holistically. This approach also provided hope that transmission, which has a longer lead



time than generation, could be available to meet generator needs. As a result, in 2011 a portfolio of transmission projects known as Multi-Value Projects (MVP) was approved by the MISO Board of Directors. The approximately \$6 billion dollar MVP portfolio, is made up of 17 projects, with most states in MISO's North and Central Regions being home to at least one. These projects provide reliability, congestion reduction and public policy benefits that are from 2 to 3 times greater than costs across the MISO footprint, and the costs are shared pro rata across MISO. In addition, at the time of approval it was estimated that they were expected to create about 28,000 direct construction jobs and around 50,000 total jobs.

### **Planning for Continuing Fleet Evolution**

Continued execution of this process will be needed going forward, as the generation fleet continues to evolve. Earlier, I mentioned several factors that have been driving portfolio evolution. There is one more; end-use customer preference. Consumers no longer just want reliable, low-cost power – they also want it to be green and many want more control and ownership over powering their homes and businesses. Many utilities in MISO are developing long term resource plans which include increased levels of renewable energy, including in some cases distributed energy resources in the form of rooftop solar. New technologies impacting energy usage are emerging and expected to become competitive or have increased levels of adoption, including energy storage, digital devices such as smart thermostats and electric cars. The amount and type of resources requesting to interconnect to our system suggest the changes in front of us. MISO currently has over 90,000 MW of requests in our generator interconnection queue, an 80% increase just this year. To get a sense of scale, consider that the total installed generation capacity in MISO today is 175,000 MW. Utility-scale wind and solar resources

represent over 85% of the current MW seeking to connect. While many of the projects in the queue will not be built, even a portion will continue to drive changes in the operating profile of the MISO fleet.

The continued growth of utility scale wind and solar as well as distributed generating sources will drive the need for more transmission as electricity generating unit scale decreases and intermittency grows. The ability not only to meet peak demands, but to move bulk power from resource areas to load centers across the footprint in all hours of the day will be needed to improve reliability and efficiency of this new resource fleet. Regional transmission will play an essential role in optimizing the natural and geographic diversity of these resources.

Large regional investment tends to be cyclical. In the case of the MVP portfolio, the projects were designed to address the amount of renewable energy required by the Renewable Portfolio Standards that were in place in 2011. The transmission itself was planned for construction over many years; the final lines are expected to be complete by 2023. Given these types of timelines, it is prudent to evaluate the next set of regional investments required to ensure reliable, resilient and efficient energy delivery.

While design and approval of the Multi-Value Project portfolio took time and compromise, ultimately stakeholders across the region were able to find common ground on the need for the projects, the benefits they would bring, and the need to share the cost. Since the MVPs were developed, a number of things have changed that increase the complexity of the task in front of us. The 15 states and dozens of utilities serving the over 42 million people that make up MISO have a much wider range of resource options available to address their respective policy and economic drivers. The sheer size of the footprint has us revisiting the question of how widely benefits spread, and thus costs should be shared. In most places the amount of electricity needed

at peak times is not growing, and the increase of distributed energy resources makes forecasting what type of electricity needs to plan for much more challenging. The different aggregate operating profile of the new resource mix suggests that, in order to safeguard resilience, there is a need for new benefit measures related to flexibility for the transmission business case. Although MISO's administration of the competitive bidding process has been successful, the introduction of competitive bidding for transmission through FERC Order 1000 created new business interests and created different paradigms for projects with cost allocation versus those without. An increased focus on interregional transmission planning has further expanded the set of interests we seek to align, and highlighted some fundamental differences in viewpoint around how to most efficiently operate the transmission system to maximize the value of the existing assets.

For reasons such as these, along with a broad sense of uncertainty for the future, finding consensus among so many diverse viewpoints on system needs, and who should pay for those system changes, is a significant challenge in planning for additional large scale transmission investment in the MISO region. Nonetheless, we continue to study different aspects of the future fleet to assess the potential issues and clarify transmission needs. Ultimately, we remain focused on transmission that provides value to users of electricity in excess of the costs that new transmission would bring. Timely understanding of what transmission will provide value, no matter what the future holds, is imperative to ensure the grid of the future is in place to support the generation fleet of the future.

MISO, as an RTO, has a unique role in the industry and brings a unique perspective to the challenges we face. We are policy neutral – we don't advocate for any particular policy. MISO instead works to inform policy makers about the impact of planned approaches. We then work

with the states, utilities and all other stakeholders in our regions to ensure any policy is implemented reliably and efficiently. MISO has utilized this role to create \$21 billion in benefits for our region while positioning our members to effectively navigate the continuing evolution of the industry. We are committed to continued facilitation of grid investment through innovative planning and development to optimize the changing resource portfolio and we appreciate the opportunity to help inform the discussions that will shape the path forward.

# APPENDIX

## **MISO Footprint**

