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January 12, 2024

The Honorable Jeff Duncan
Chairman
U.S. House of Representatives
Subcommittee on Energy, Climate, and Grid Security
2125 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Duncan,

Thank you for the opportunity to testify at the September 28, 2023, hearing on Powering America's Economy, Security, and Our Way of Life: Examining the State of the Power Grid. Per your request, please find attached my responses for the record. Please let me know if I or my staff can be of further assistance.

Kind Regards,

A handwritten signature in blue ink that reads "Todd A. Ramey". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Todd Ramey

cc: The Honorable Diana DeGette, Ranking Member, Subcommittee on Energy, Climate, and Grid Security

Attachment

U.S. House of Representatives Subcommittee on Energy, Climate, and Grid Security

Questions for the Record

September 28, 2023, hearing (Powering America's Economy, Security, and Our Way of Life:
Examining the State of Grid Reliability)

Todd Ramey, Senior Vice President, Markets and Digital Strategy,
Midcontinent Independent System Operator

The Honorable Jeff Duncan

The Honorable Jeff Duncan (Question 1). How can RTO/ISOs advance the deployment of grid enhancing technologies such as Dynamic Line Ratings, Advanced Power Flow Control, and Topology Optimization?

The application of grid-enhancing technologies requires an issue-specific inquiry to determine if the technology is the appropriate solution for a given issue. The RTO/ISO may enable the deployment of these technologies by having the frameworks and platforms in place to help develop grid enhancing technologies when those technologies show promise as a solution to the issue presented. For example, MISO is working with our members to implement the requirements set forth in FERC Order 881 regarding Ambient Adjusted Ratings (AAR) for transmission equipment. In another example, engineers and analysts in our control rooms are working with members to evaluate and develop criteria for implementation of topology optimization strategies to enhance market efficiency.

The Honorable Jeff Duncan (Question 2). How can RTO/ISOs balance resource adequacy challenges while providing certainty and reducing complexity associated with resource planning?

MISO does not have direct authority over resource and/or reliability planning decisions. Responsibility for planning for sufficient resources to provide essential reliability services lies with our Load Serving Entities (LSEs) and state or local regulators. RTO/ISOs do possess a unique footprint-wide view of how the resource plans of their members and states come together to meet reliability needs of the region. MISO's role is to provide transparency into the reliability implications of the existing resource fleet and to provide projections related to system reliability under various future resource scenarios. In addition, MISO is responsible for ensuring our reliability planning processes and markets provide proper incentives to support efficient investment and retirement decisions at the LSE level, such that in aggregate, the MISO region has high probability of delivering reliability under various future operating conditions.

MISO places high value on administering processes that avoid unneeded complexity. However, the reliability attributes of newer, weather dependent resources are different from those of more dispatchable resources they are replacing. This trend towards a resource fleet characterized by a

growing penetration of weather dependent resources inherently introduces additional complexity into the MISO processes and markets that support reliability planning.

The Honorable Jeff Duncan (Question 3). How can RTO/ISOs balance planning for the future resource mix in transmission planning while ensuring the costs for customers remain affordable?

As a federally designated Regional Transmission Organization, MISO provides visibility and insights that help utilities and states to better understand the reliability, sustainability, and affordability implications of their approaches.

MISO has in place several tools to support the resource and transmission planning decisions of its members and states. The [MISO Futures](#) regional resource expansion analysis provides information to help state regulatory authorities and utilities by seeking to find the resource buildout that minimizes the overall system cost while meeting reliability and policy requirements. As a key element of the [Long-Range Transmission Planning](#) (LRTP) initiative and the [Reliability Imperative](#), the MISO Futures and their respective resource expansion plans set the foundation for MISO's long-term [transmission planning](#) analysis in identifying valuable transmission solutions that help enable members' and states' plans in a reliable and cost-effective manner. With a focus on regional issues, LRTP is designed to identify an optimized resource expansion and a least-regrets transmission portfolio (i.e., one based upon the finding that a low-cost approach includes a mix of local and regional generation, where transmission expansion is needed to facilitate regional generation delivery). MISO's [Attributes Roadmap](#) report presents insights and solutions to the priority system attributes where risk to the MISO system is most acute.

The Honorable Jeff Duncan (Question 4). MISO has stated that the “*resource transition is accelerating, resulting in some attributes that used to come ‘for free’ possibly declining below needed levels*” which would ultimately “*(create) new risks to reliability and market efficiency.*” (MISO System Attributes Stakeholder Workshop, 9/21/22). When does MISO anticipate reliability concerns materializing? And how far in advance of that timeframe does MISO anticipate needing to make the planning/market changes necessary to avoid such reliability issues?

Over the last 10 plus year, surplus planning reserve margins in the MISO region have been exhausted through load growth and unit retirements. Since 2022, the MISO region has been operating near the level of minimum planning reserve margin requirements. Concern for sustaining needed reserve margin requirements exist today for the region. While MISO has implemented several reforms in recent years to help to avert near-term risk, the urgent continuation of ongoing and future reforms is critical to mitigating imminent reliability concerns in the coming years. In fact, this past year capacity shortages were averted by the postponement of planned generation plant retirements and making additional capacity available to the region. Looking ahead, [NERC's 2023 Long-Term Reliability Assessment](#) projects a shortfall in the MISO region beginning in 2028, while the [2023 Organization of MISO States Survey](#) shows a potential risk as soon as Planning Year 2025/26.

MISO's 2023 analysis highlights the immediate need for market reforms and new requirements to ensure the sufficiency of three priority attributes where near-term risk is most acute: system adequacy, flexibility, and system stability. The MISO [Attributes Roadmap](#) recommends advancing a combination of current and new proposals over the next ten years, as well as providing ongoing attributes visibility through regular reporting.

The Honorable Jeff Duncan (Question 5). Does MISO believe its current market constructs are sufficient to maintain reliability throughout the resource transformation, or are significant changes necessary?

The evolution of the generation fleet requires significant change to MISO's core reliability planning processes and markets. Several needed changes to our Planning Resource Auction (PRA) have recently been put in place including the introduction of seasonal auctions and enhanced unit reliability accreditation. Future needed enhancements include improving PRA price formation to better reflect the reliability value of accredited capacity and further enhancements to reliability modeling and weather-dependent resource accreditation. As highlighted in MISO's *Attributes Roadmap* report, the current market construct provides a strong foundation, but continued market design enhancements are needed to address the ongoing resource transformation and changing reliability needs of the region, and to manage growing levels of variability and uncertainty.

MISO's day-ahead and real-time energy and ancillary are based on an efficient, robust, and flexible design and will be able to effectively ensure efficient and reliable power system operations throughout the fleet transition without the need for transformational changes. More moderate improvements to these markets are being evaluated for implementation going forward.

The Honorable Jeff Duncan (Question 6). MISO is reviewing and considering revisions to the interconnection rules – with the proposed and backlog of interconnection projects and states adopting more aggressive renewable and clean energy targets – is MISO confident that it can support the interconnection requests in a timely manner?

The exponential growth in interconnection requests has put a strain on MISO and its Transmission Owners' ability to provide useful study results in a timely manner. In response, MISO has developed proposed rule changes, currently pending at FERC under Dockets ER24-340-000 and ER23-341-000, with FERC action requested by January 22, 2024. As outlined in those filings, these rule changes are needed to ensure MISO can support interconnection requests in a timely manner. MISO is confident that if these reforms are approved, it will be better positioned to meet needs of its states and utilities.

The Honorable Jeff Duncan (Question 7). How is MISO going to coordinate between the EPA and DOE to ensure the bulk electric system remains reliable while achieving carbon reduction?

MISO is already engaged and coordinating with the EPA and DOE on reliability matters. MISO, along with certain peers (i.e., ERCOT, PJM, and SPP) filed comments ([August 8, 2023, Joint](#)

[Comments, August 8, 2023, Individual Comments](#), and [December 20, 2023 Joint Supplemental Comments](#)) with EPA in regard to its proposed Greenhouse Gas Emission standards and rules. These comments recommend, among other items, proposed reliability safety valve(s) or provisions to ensure electricity supply and demand stay balanced in order to maintain the security, safety and reliability of the electric grid.

The Honorable Jeff Duncan (Question 8). A historic benefit of wholesale markets is that they created competition and shifted financial risk from ratepayers to private investors.

The Honorable Jeff Duncan (Question 8a). Do you believe that state policies mandating the use of, or providing subsidies for, certain types of generation shift the financial risk back to ratepayers?

As a federally designated Regional Transmission Organization, MISO respects the various state policies and jurisdictional considerations that exist within our 15-state footprint. MISO provides visibility and insights that help utilities and states to better understand the reliability, sustainability, and affordability implications of their approaches. To the extent state policies provide tax or other incentives regarding resource types, MISO's market mechanisms seek to accommodate such policies while also balancing the fair and equitable treatment of all generation resource types.

The Honorable Jeff Duncan (Question 9). Recognizing that MISO is comprised primarily of vertically integrated utilities and operates a residual capacity market, is there evidence that subsidies for grid scale battery storage, solar, and wind resources suppress capacity and energy market prices in your region? If so, please describe.

Generators that have costs that are subsidized or recovered through rates reflect those costs in their offers within the capacity auction and through energy market prices. Specifically, prices in the capacity market are a byproduct of where the supply and demand curve cross, so any factors that impact the supply or demand could affect the prices. Likewise, MISO sees evidence that subsidies for energy production do impact wholesale energy prices.

The Honorable Jeff Duncan (Question 9a). In your opinion, have subsidies negatively affected market outcomes? Do subsidies for batteries, solar, and wind discourage investment for new dispatchable thermal generation? How much have these market conditions contributed to the retirement of existing dispatchable thermal resources?

MISO does not specifically assess the impact of subsidies on market outcomes, whether negative or positive, and cannot quantify their impact on generation investment and retirements. As noted above, subsidies for energy production do impact wholesale energy prices, and the broader impacts to the market prices may impact or factor into investment and retirement decisions for resource owners.

The Honorable Jeff Duncan (Question 9b). Do these subsidies and their effects on markets make your system more reliable or less reliable?

MISO's role is to operate a reliable system in the most efficient manner with the portfolio of resources members bring to it. With or without subsidies, the confluence of policy change is driving rapid change in our region, including changes to that portfolio of resources. This change is leading MISO and its peers to see greater uncertainty in the future as to the ability of accredited capacity to meet increasing demand. Reliability is a forward-looking concept, and MISO continues to look forward to needed changes to its markets to help address these concerns.

The Honorable Jeff Duncan (Question 9c). What steps are you taking to ensure that these subsidies are not unduly discriminatory and preferential, and that rates remain just and reasonable?

The administration and management of subsidies and the setting of applicable rates is outside MISO's scope. This scope is within the jurisdiction of the appropriate federal and state regulatory organizations. MISO is aware of the market design enhancements that are needed to address the ongoing resource transformation and changing reliability needs of the region.

The Honorable Jeff Duncan (Question 9d). Would you consider state renewable mandates as out of market interventions? Would you consider the mandates as a form of market power?

No - for the MISO region, LSE and/or state resource investment and retirement decisions are not market-based. MISO's PRA is a prompt market for accredited capacity and calculates the reliability value of the portfolio of resources that LSEs provide to serve load for the coming year. As such, MISO's PRA is designed to provide transparency and incentives to support efficient retirement and investment decisions going forward.

The Honorable Jeff Duncan (Question 10). Are changes to your resource adequacy construct needed to ensure that sufficient dispatchable thermal resources are, and remain, available to the system? How far in advance of that timeframe do you need to make changes to avoid resource adequacy and reliability issues?

One of MISO's key roles is to provide to its members and states the information and transparency into the current and projected impacts to the bulk electric system and region-wide resource adequacy, including through signals and incentives (or requirements) behind its markets and constructs. MISO does not directly ensure specific resources are or remain available; rather, those investment and retirement decisions are within the scope of resource owners.

Recent changes to MISO's resource adequacy construct – such as seasonal requirements and accreditation, and the proposed adoption of a sloped demand curve – provide improved capacity price signals, which inform the decisions by utilities regarding dispatchable resources with

flexibility attributes. MISO uses supply-demand projections through tools such as the OMS-MISO survey and the Regional Resource Assessment to ensure prioritization and timely implementation of changes to the resource adequacy construct to ensure continued reliability. As for timeframe, the rapidly evolving nature of resource adequacy and reliability challenges require ongoing and timely refinements to the resource adequacy construct.

The Honorable Jeff Duncan (Question 10a). Are forward looking markets like capacity markets needed to procure enough resources that can provide essential reliability services?

MISO's market construct focuses only on the prompt year and as such provides an advance view of reserve requirements and capacity availability, which facilitates efficient clearing of resources necessary to ensure reliability. MISO's PRA reforms discussed above and including improvements to accreditation and attributes are intended to provide further signals and incentives for resource owners to provide essential reliability services.

The Honorable Jeff Duncan (Question 10b). Are you concerned that there will be a recurring need to defer retirements or enter into out of market contracts to retain generators if subsidies persist and the markets do not change to correct inefficiencies?

MISO has concerns about the orderly retirement and addition of electricity resources. As MISO looks to the future through surveys of its members' resource plans (e.g., Regional Resource Assessment and MISO/Organization of MISO States surveys) it sees a growing gap between the resources needed to achieve system adequacy and those that are being planned. To that end MISO is putting forward a suite of proposals which seek to address this gap by focusing the resource adequacy construct on needed reliability attributes (see MISO [Attributes Roadmap](#)) and improving the forecasting of the long-term System Adequacy need to aid in MISO member decision making about future retirements and resource additions.

While MISO in extremely rare cases (e.g., extreme emergency conditions) will purchase real-time energy from neighboring systems, MISO does not enter into out of market contracts to retain generators for system resource adequacy reasons and is not pursuing such a mechanism at this time. Ultimately resource retirement and addition decisions are the purview of asset owners and subsidies are the purview of the states.

The Honorable Jeff Duncan (Question 10c). Do all resources with a capacity obligation or counted towards resource adequacy constructs have a must-offer requirement in the day-ahead market? If not, why not? What effect does not having a must-offer requirement have on the day-ahead and real-time markets?

Resources that clear the capacity market have a must offer requirement in the day-ahead energy market. The exception to this requirement is for certain resources that provide demand response services only during emergency events and/or energy efficiency

resources. The must offer requirement ensures the participation of these resources in the day-ahead market (unless they are on an outage).

The Honorable Jeff Duncan (Question 11). Please describe your generator retirement process. Are current retirement processes that retain resources while transmission upgrades are implemented sufficient to prevent the scale of retirements facing RTOs/ISOs?

MISO evaluates the reliability impacts to the transmission system that may occur from the loss of generation or transmission elements while the proposed generator retirement is offline. The reliability criteria for evaluation includes thermal, voltage, and stability related impacts to the grid. MISO can keep a resource online as a System Support Resource if these reliability issues are identified through our evaluation. However, MISO does not have tariff authority to require a generator resource to remain online past its proposed retirement date for impacts to resource adequacy; however, future pressures may lead us to consider such measures with stakeholders. As noted above, MISO is moving forward with reforms that will have reliability services (or attributes) reflected in its accreditation methodology. Further, resource adequacy-related policy decisions are within the purview of our states. MISO's detailed process for evaluating proposed generator retirements is outlined in the [MISO Tariff](#) (Section 39.2.7) and Business Practice Manual ([BPM](#)) 020.

The Honorable Jeff Duncan (Question 11a). Do you consider issues other than reliability violations on the transmission system when assessing the impacts of proposed generator retirements?

For proposed retirements MISO evaluates only the reliability impacts to the transmission system that may occur from the loss of generation or transmission elements while the proposed generator retirement is offline.

The Honorable Jeff Duncan (Question 11a-i). For example, should violations of other reliability criteria, shortfalls of FERC-approved resource adequacy requirements, or need for essential reliability services be considered when a generator proposes to retire?

Under MISO's current Tariff authority, these are not specifically considered; rather, MISO's purview is limited to the reliability impacts to the transmission system that may occur from the loss of generation or transmission elements while the proposed generator retirement is offline. MISO supports the role of our states and utilities in meeting resource adequacy requirements and stands ready to assist as appropriate.

Also, MISO's resource adequacy construct sets overall adequacy requirements which influence the resource retirement and addition decisions of its members and resource owners. Load serving entities have the obligation to have or contract for enough resources to meet their system adequacy requirements, meaning if they

are making a retirement decision, they need to ensure they have the ability to maintain their adequacy obligation.

The Honorable Jeff Duncan (Question 11b). Should RTOs/ISOs be able to retain generators until the capacity, energy, and essential reliability services they provide are replaced?

While the question of changing the RTO/ISO role in generator retirements is not within our purview, it is the responsibility of RTOs/ISOs to inform and educate the state and local utilities within its footprint how changes to the generation fleet will impact their ability to meet the energy needs of its members with regard to capacity, energy, and essential reliability services. It is also the RTO/ISOs' responsibility to provide the necessary market signals to their footprint to incentivize generators with necessary attributes to remain online to meet the reliability needs of their footprint. MISO has made many reforms to its Resource Adequacy construct and energy/ancillary services markets to this end and is pursuing additional reforms currently with stakeholders. Additionally, MISO is making improvements to its risk assessments to provide improved visibility into these challenges.

However, a need also exists for one or more "reliability safety valve(s)" to resolve reliability conflicts (see MISO's response to question 7 above).

The Honorable Jeff Duncan (Question 12). Electrification of the heating and transportation sectors has the potential to greatly increase electric demand and capacity needs. The nation's top reliability organization, the North American Electric Reliability Corporation (NERC), and leaders from the Federal Energy Regulatory Commission (FERC), have testified that the bulk power system is confronting a potential reliability crisis caused by the potential loss of dispatchable thermal generation. This issue grows greater with the proposed EPA rules that will discourage coal and natural gas-fired generation. When do you anticipate reliability concerns materializing, or have they already materialized? What are you doing to solve this resource adequacy crisis and potential reliability crisis?

Reliability concerns for the MISO region exist today. Broadly, fleet change, more frequent and extreme weather events and increasing electrification all are already increasing reliability challenges and are shaping MISO's work with its stakeholders to reexamine and redefine market constructs and products to ensure the grid remains reliable. MISO is engaged with a number of initiatives to ensure this occurs. MISO has noted, along with certain peers, that the EPA's Greenhouse Gas emission standards and rules, as currently proposed, has the potential to trigger material negative impacts to grid reliability. These material negative impacts will likely be amplified by the additive effects of other regulations that EPA has proposed and finalized in the past few years. Accordingly, from MISO's standpoint as a fuel and technology-neutral system operator, MISO urges the EPA to address grid reliability issues that would be caused by the proposed rules and other air regulations; otherwise, it makes the roles of the RTO/ISOs more difficult to manage the reliability challenges through the energy transition. These actions to address reliability concerns should occur with the robust and thorough input of affected

stakeholders and states as the proposed rules and the associated efforts to decarbonize the nation's electric power sector are extraordinary and technically complex. We must act urgently to avoid a looming disconnect between the additions of new resources and retirement of older resources.

The Honorable Jeff Duncan (Question 12a). How do you plan to retain existing dispatchable generation and incent new entry of dispatchable generation if your markets currently do not?

MISO has already implemented significant, transformational changes to its capacity construct with the likes of seasonal, accreditation and modeling reforms. As noted in MISO's extensive reports – including the *Reliability Imperative* and *Attributes Roadmap* – on the measures needed, the foundational market constructs that are in place today will continue to be effective in the future, but only with significant revisions. MISO is also fortunate that its energy and ancillary markets are a solid, stable foundation; yet, further, significant reforms noted above are needed to the capacity planning and reliability mechanisms, and those are underway with stakeholders.

The Honorable Jeff Duncan (Question 12b). If your system is already facing resource adequacy issues without electrification and demand increase, how will the system be able to sustain large growth amidst significant thermal resource retirements?

Members, states, and MISO must all work together to address these challenges. The Reliability Imperative is MISO's plan to do that. We cannot just hope that we are properly preparing for extreme weather events, electrification, and the increasing use of electricity in homes and businesses. Hope is not a plan, so we must develop a plan together. As noted in the response to question 12, MISO is working with its stakeholders to reexamine and redefine market constructs and products to ensure the grid remains reliable. MISO has also urged EPA to address grid reliability issues that would be caused by the proposed rules and other air regulations. We must act urgently to avoid a looming mismatch between the additions of new resources and retirement of older resources.

The Honorable Jeff Duncan (Question 12c). It appears that capacity obligations and performance requirements fail to reduce the impacts of winter storms. Does your market structure provide incentives for winterization of natural gas infrastructure or firm fuel supplies? What steps is MISO taking to incentivize weatherization of natural gas infrastructure or firm fuel supplies?

As noted in the response to questions 12, MISO has been engaged in a number of initiatives to reexamine and redefine its market constructs and products to ensure that the grid remains reliable. Among the planned resource adequacy process improvements, MISO also intends to refine its requirements and incentives to better reflect the risks and

mitigations resources have as they relate the fuel assurance outcomes to target better resource and system performance in future winter storms.

In regard to the winterization of supply resources, including fuel supplies, MISO has an annual winter preparedness survey of its generation resource owners to inform real-time market operations. Further, MISO has been participating in and supporting parts of the extensive industry discussions on this topic at North American Electric Reliability Corporation (NERC), North American Energy Standards Board (NAESB), National Association of Regulatory Utility Commissioners (NARUC), and other venues. MISO further supports industry discussions that maintain and ensure reliability and affordability for customers while encouraging investments; moreover, reforms are indeed needed. The winterization standards needed – following the extreme Winter Storms Uri and Elliott – should provide for and require an increased, reasonable level of investment and benefit so as to mitigate the risks that we experience with those previous events. The financial incentive for resource and fuel supply owners to invest in such measures is not under ISO/RTO purview. Regardless of the jurisdictional location, however, the state commissions generally have oversight of the resource owners' investments and cost recovery associated with any winterization or weatherization.

The Honorable Jeff Duncan (Question 13). While the interconnection queue is large, not all resources in the queue get built. What percentage of the generation queue has historically come onto the system? How much from the existing queue do you expect to be built?

According to an independent report performed by Charles River Associates (see page 86 of MISO's [queue reform filing](#)), for the 2017 and 2018 queue cycles, which are the latest completed cycles, nearly 70% of the total generation capacity that entered those cycles was eventually withdrawn. MISO expects this trend to continue for the current active cycles. MISO recently implemented additional reforms designed to manage the growing number of queue requests and reduce withdrawal rates in the future.

The Honorable Jeff Duncan (Question 13a). Can you provide an estimate of the gross cost of all the additional renewable capacity you expect to get built?

The capital costs to build renewable capacity is not tracked nor communicated to MISO and is outside MISO's purview. MISO is responsible for determining – with stakeholder input – the cost of transmission to interconnect future generation, and those costs vary widely depending on location.

The Honorable Jeff Duncan (Question 13b). Can you elaborate on the projects that are delayed or canceled due to cost increases?

MISO does not track the exact reasons why generation developers decide not to build their projects with Generator Interconnection Agreements (GIAs). However, in late 2023 MISO sent questionnaires to resources with a GIA that were delayed or missed their

commercial operation date. Of those responding to the survey, the main drivers were supply chain limitations and regulatory/permitting issues.

The Honorable Jeff Duncan (Question 13b-i). What is the reliability impact of these delays and cancelations if they force retirement of existing dispatchable thermal resources, but no new capacity is added?

Overall and as noted above, MISO has concerns about the orderly retirement and addition of supply resources. As MISO looks to the future through surveys of its members' resource plans (e.g., Regional Resource Assessment and MISO/Organization of MISO States surveys) it sees a growing gap between the resources needed to achieve system adequacy and those that are being planned.

MISO evaluates individual unit retirement requests and in separate studies evaluates new generation interconnection requests as clusters within the generator interconnection queue process. However, due to data and modeling limitations, we are unable to identify the relationship between interconnection queue delays and cancellations, forced retirements of existing resources, and their reliability impact.

The Honorable Jeff Duncan (Question 13b-ii). Are these projects subject to financial penalty if they are unable to meet their obligations? Should project financers and sponsors be required to pay for any out of market actions to retain dispatchable thermal resources?

MISO does not assess financial penalties directly to generation owners who fail to meet their Commercial Operation Date, and it does not have an opinion as to whether project financers and sponsors should be required to pay for any such out of market actions. MISO will terminate their interconnection rights if the generator fails to declare commercial operation within three years from the Commercial Operation Date in their Generator Interconnection Agreement. Utilities that are responsible for meeting their customers' energy needs, referred to as Load Serving Entities, may be assessed higher capacity prices through the Planning Resource Auction if they fail to provide adequacy generation to meet their load obligations. Also, generation owners that have generation that clear the auction but fail to generate during peak operating times are required to buy replacement capacity.

The Honorable Jeff Duncan (Question 13c). Can you describe how much additional dispatchable thermal generation capacity you will need to balance the system if renewables are added to meet state goals? Is it financially sensible to add significant amounts of generation to meet state goals only to need to add more dispatchable thermal generation to maintain balance on the system?

MISO supports the role of the states in setting their respective policy goals and states and utilities in meeting resource adequacy requirements. MISO determines the necessary amount of capacity required each season through the Planning Resource Auction including any necessary capacity margins based on potential impacts from the lack of resources, including dispatchable thermal resources, as determined in the Loss of Load Expectation studies. MISO completes long term assessments, including Future 2A studies and the Regional Resource Assessment, to show the reliability implications of the changing resource portfolio. These assessments underscore the critical need for investment in dispatchable resources. MISO's recent *Attributes Roadmap* report also reinforces the importance of having sufficient resources with critical attributes in a resource fleet with significant renewables. MISO does not perform financial feasibility studies for its member utilities.

The Honorable Jeff Duncan (Question 13d). Can additional natural gas-fired generation capacity be served by the current pipeline infrastructure or is additional pipeline infrastructure needed?

MISO does not assess the capability of the natural gas infrastructure supplying additional gas-fired generation within the MISO footprint. Pipeline owners have the responsibility to meet the contractual requirements to serve gas-fired generation.

The Honorable Jeff Duncan (Question 13e). Have you been consulted by EPA or FERC on the proposed power sector regulations?

Yes. EPA consulted MISO on its proposed Good Neighbor and Greenhouse Gas Standards rules.

The Honorable Jeff Duncan (Question 13f). If the EPA rules are enacted, will you be able to reliably operate your system?

It is premature to respond while the EPA's proposed Greenhouse Gas standards and rules are still under consideration. As noted above, MISO, along with certain peer RTOs/ISOs, has provided suggested revisions to the rules that would help mitigate the risks associated with retirements of generation with attributes needed to maintain reliability (when that pace of retirements exceeds the new additions of generation with the same attributes). Without such suggested revisions, it makes the roles of the RTO/ISOs more difficult to manage the reliability challenges through the energy transition. While remaining fuel neutral, we recommend the EPA incorporate the reliability-enhancing provisions that we and other grid operators suggested in our public comments on the proposed rule. Regardless of what a final rule looks like, we will use every operational and market tool at our disposal to operate the system reliably.

The Honorable Jeff Duncan (Question 13g). Should nuclear play a larger role in reliably operating the system and meeting state emission targets?

As a fuel and policy-neutral independent system operator, MISO does not take a position on which resources should be utilized to meet system needs. MISO leverages its insights, expertise, and market price signals to provide information in a transparent manner that its members and states can use to make resource-planning decisions that achieve their policy goals while also supporting regional reliability. MISO's *Attributes Roadmap* report and Regional Resource Assessment are examples of providing that information to members and states.

The Honorable Jeff Duncan (Question 14). What is the expected cumulative cost of the transmission needed to integrate renewables in the queue?

The resources required to meet the decarbonization and renewable energy goals of MISO members require efficient transmission investment to reliably and efficiently integrate into the system. This includes both the creation of a regional backbone, such as MISO's Long Range Transmission Planning Tranche 1 portfolio, and local improvements for individual generation interconnection. Tranche 1 has a total estimated cost of \$10.3 billion. MISO staff is also investigating a second regional portfolio, but the costs of this second LRTP portfolio and localized projects for specific projects are not yet known.

The Honorable Jeff Duncan (Question 14a). Can you describe your coordination efforts with neighboring RTOs/ISOs?

MISO has extensive transmission planning and operational coordination processes in place with its RTO neighbors. Joint Operating Agreements (JOAs) with PJM and SPP provide a detailed process for coordinated system planning, inclusive of cost allocation. MISO also coordinates broadly across the region through such organizations as the Eastern Interconnection Planning Collaborative. MISO and our neighbors also rely heavily on operational coordination, governed by JOAs with PJM and SPP and by NERC reliability requirements with non-market neighbors, to react to real-time and near-term operating conditions.

Recently, MISO and SPP coordinated on the Joint Targeted Interconnection Queue (JTIQ) study, as evaluation of the transmission system at the seam between the two RTOs showed that the system was at capacity. This study resulted in a portfolio to address transmission limitations and enable 28GW of new generation along the shared seam. DOE recently awarded the JTIQ partners \$464.5 million grant through their Grid Reliance and Innovation Partnership (GRIP) program. MISO and SPP are expected to file the JTIQ process with FERC in early 2024.

In addition, MISO coordinates with its peer RTO/ISOs on federal and state policy proposals to help, when applicable, represent the view of independent system operators.

This does and may include the EPA or Department of Energy or others (e.g., the Greenhouse Gas proposed regulations discussed above).

The Honorable Jeff Duncan (Question 14b). What is your position on a minimum transfer requirement between planning regions?

MISO views the benefits of interregional transfer capability using the same foundational principles as our regional transmission planning process, and we also recognize that interregional transfer capability is provided most optimally through interregional coordination in operations and planning. Accordingly, from MISO's experience, the most effective approach to utilizing and improving transfer capability across regions would not be to set a minimum requirement, but instead it would be: 1) to enhance interregional operations to most effectively utilize existing transmission infrastructure; 2) reinforce effective interregional planning; and 3) develop benefit metric(s) associated with interregional transfer capability that could be incorporated into existing planning processes.

The Honorable Jeff Duncan (Question 14c). Would a minimum transfer capability requirement undermine the autonomy of the various RTOs/ISOs and their planning processes?

There is great value in transfer capability between regions but setting a "minimum" transfer capability could undermine autonomy and may not achieve the result intended. For example, calculating and effectuating a "minimum" transfer capability would be difficult as real-time conditions significantly impact the transmission grid's ability to transfer power intra- and inter-regionally. As such, a set minimum may result in increased transmission costs without observed benefits, undermining the overall credibility and autonomy of the associated planning processes. A more productive approach may be to develop a benefit metric associated with transfer capability within and across regions. This benefit metric could be included in existing planning processes to identify transmission solutions that achieve that intended benefit.

The Honorable Tim Walberg

The Honorable Tim Walberg (Question 1). Some utilities within MISO have delayed planned retirement dates of several power plants in response to recent market conditions and MISO's presentation to the Resource Adequacy Subcommittee projects (2022 Regional Resource Assessment) that 2030 may be an inflection point in terms of generation retirements and the need for replacement resources in the MISO region. The tightening of capacity resources across the region with continued power plant retirements and delays in replacement resources is concerning. What are MISO's thoughts about resource adequacy in the next 5-7 years? Is MISO concerned about the retirement of long duration dispatchable/load following plants?

Yes, MISO has concerns about the orderly retirement and addition of supply resources, including the loss of critical, dispatchable generating capacity without the comparable addition of new technologies that would provide the same level of grid support. As MISO looks to the future through surveys of its members' resource plans (e.g., Regional Resource Assessment and MISO/Organization of MISO States surveys) it sees a growing gap between the resources needed to achieve system adequacy and those that are being planned. Members, states, and MISO must all work together to address these challenges. The Reliability Imperative is MISO's plan to do that. We cannot just hope that we are properly preparing for this energy transition as well as extreme weather events, electrification, and the increasing use of electricity in homes and businesses. Hope is not a plan, so we must develop a plan together.

To that end MISO is putting forward a suite of proposals which seek to address this gap by focusing the resource adequacy construct on needed reliability attributes (see MISO [Attributes Roadmap](#)) and improving the forecasting of the long-term System Adequacy need to aid in MISO member decision making about future retirements and resource additions.

The Honorable Tim Walberg (Question 2). The Michigan legislature is proposing increasing its renewable portfolio standard to 60% by 2033 and adding a Clean Energy Standard of 80% in 2035 and 100% in 2040. As Michigan and other states consider adopting more aggressive generation targets, does MISO have concerns as to how resource adequacy and grid reliability (voltage and reactive power) will be maintained?

As noted above, MISO has concerns about the reliability of the system as the fleet transitions. Proactive action is needed to understand and keep ahead of those concerns before they occur. This is why MISO has proposed a wide set of actions targeted at maintaining critical [reliability attributes, as well as its Reliability Imperative report](#). Significant fleet change is possible, but only through diligent and coordinated action by the industry to ensure reliability is maintained.

The Honorable Kelly Armstrong

The Honorable Kelly Armstrong (Question 1). Markets often have difficulty sending the appropriate price signals that account for reliability to support the development of new or improvement of existing dispatchable resources. Planning Resource Auctions appear to set prices below efficient levels, and some lack a demand curve that accurately represents needed capacity, leading to questions about resource adequacy.

The Honorable Kelly Armstrong (Question 1a). Has your organization evaluated the role Planning Resource Auctions play in sending price signals?

Yes, MISO believes that the Planning Resource Auction (PRA) price formulation will be a key element to maintaining a reliable and efficient system. MISO is reforming its resource

adequacy construct to ensure that the PRA sends appropriate price signals. The seasonal construct implemented in 2023 provides information on requirements, capacity, and pricing for each of the four seasons – summer, fall, winter and spring. These seasonal prices are an improvement over the earlier summer-based auction, which provided a single price across the entire year. Additional reforms underway include incorporation of a sloped demand curve and a revised accreditation methodology for resources which are expected to further refine the pricing signal produced through the PRA.

The Honorable Kelly Armstrong (Question 1b). Does the current demand curve establish clearing prices that are alienated from the worth of capacity and reliability?

Prices produced by the current demand curve do not appropriately value capacity as prices are either too low or too high depending upon capacity surplus or deficiency respectively. Implementation of a sloped demand curve will provide prices more reflective of the value of capacity in ensuring reliability.

The Honorable Kelly Armstrong (Question 1c). If your organization is in the process of restructuring a demand curve, will it be implemented in a timeline aggressive enough to send appropriate price signals to dispatchable resources?

MISO is seeking to implement its reforms as soon as possible - while in conjunction with stakeholder processes - to indeed improve those price signals. Subject to FERC approval, the planned implementation of the reforms to the demand curve is the 2025/2026 Planning resource auction that is administered in April/May 2025 for the June 2025 through May 2026 Planning Year.

The Honorable Kelly Armstrong (Question 2). Weather-dependent generation is penetrating the generation mix at an increasing rate.

The Honorable Kelly Armstrong (Question 2a). Has your organization evaluated accreditation processes for these resources?

Yes. MISO is in the process of developing a methodology to appropriately accredit weather-dependent resources and expects to file it with FERC in 2024. MISO has had well established Effective Load Carrying Capability practices for wind resources, the historically dominate weather-fueled resource in MISO. With the rapid growth of solar resources, MISO initiated a comprehensive review of accreditation alternatives to support a FERC filing in 2024.

The Honorable Kelly Armstrong (Question 2a-i). If so, does this accreditation consider the weather risks associated with weather-dependent generation?

Yes, MISO's proposed accreditation considers weather related risks associated with weather-dependent generation. Additionally, the historical Effective Load Carrying Capability method used in MISO for wind has also incorporated weather-driven risks.

The Honorable Kelly Armstrong (Question). Is your organization evaluating seasonal accreditation and/or effective load carrying capability for weather-dependent generation?

Yes, MISO already performs an effective load carrying capability study for wind generation and it has seasonal variation. MISO is working on seasonal accreditation for all resources, including weather-dependent generation, and expects to file these reforms at FERC in 2024, as noted in the response to 2a above. MISO implemented a seasonal resource adequacy construct in 2023. This was a critical step as it allows MISO to accredit resources reflecting their reliability contribution in each season and also set seasonal resource adequacy requirements.

The Honorable Kelly Armstrong (Question 2b). Does your organization have the same reliability standards for weather-dependent generation as it does for dispatchable resources?

MISO applies the same reliability standards to our generation fleet, regardless of fuel type, but different methodologies are used to assess the reliability value of different types of resources with different characteristics. With its expected accreditation filing in 2024, MISO will propose consistent methodologies to assess the reliability value for all resources.

The Honorable Kelly Armstrong (Question 2c). Should changes to capacity accreditation go into effect before other changes to the capacity market?

Accreditation changes are key component to sending the appropriate investment signals and should be adopted whenever implementation is feasible. Reforms to the pricing within the capacity market are more of an immediate gap that should be mitigated as soon as possible. Over time, MISO has and will continue to implement reforms to improve how the Planning Resource Auction and capacity constructs send signals to resource owners and members. Of note, MISO has implemented recently or anticipates implementing: thermal resource accreditation, seasonal accreditation, reliability-based (sloped) demand curve (filing in 2023), and accreditation reform (filing anticipated in 2024).

The Honorable Kelly Armstrong (Question 3). Traditional load forecasting tools rely on customer history and interactions to approximate demand needs, including peak consumption.

The Honorable Kelly Armstrong (Question 3a). To what extent does your organization consider external studies or critiques of load forecasting models when acquiring capacity?

MISO conducts internal validation of member-provided load forecasts to ensure consistency and fix any observed anomalies.

The Honorable Diana DeGette

The Honorable Diana DeGette (Question 1). What actions is MISO taking to ensure that utilities and states with climate goals won't sacrifice those goals by joining or by being a member of your ISO?

[MISO](#) has a vision to be the most reliable and value creating RTO. Since its formation, MISO works hard to enable the goals of its states and members in a reliable manner. MISO is an independent, not-for-profit entity, and membership in MISO is voluntary. The value for members can be seen by MISO's action on transmission planning (Multi-Value Projects and Long-Range Transmission Planning), and through its value proposition, regional operations, and markets. These services serve to greatly enable the achievement of utilities and states climate and other goals. Yet, now, more than ever, it is important that members, states, and MISO all work together to address the challenges associated with the energy transition. The Reliability Imperative is MISO's plan to do that, and it represents a comprehensive, regional plan that enables us to do so while preserving and growing the value of MISO membership. MISO has served and will continue to serve as a desired platform to enable members and states to facilitate their energy goals while also balancing reliability, sustainability, and affordability.