



# Reliability in Transition

Michigan Energy Providers Conference

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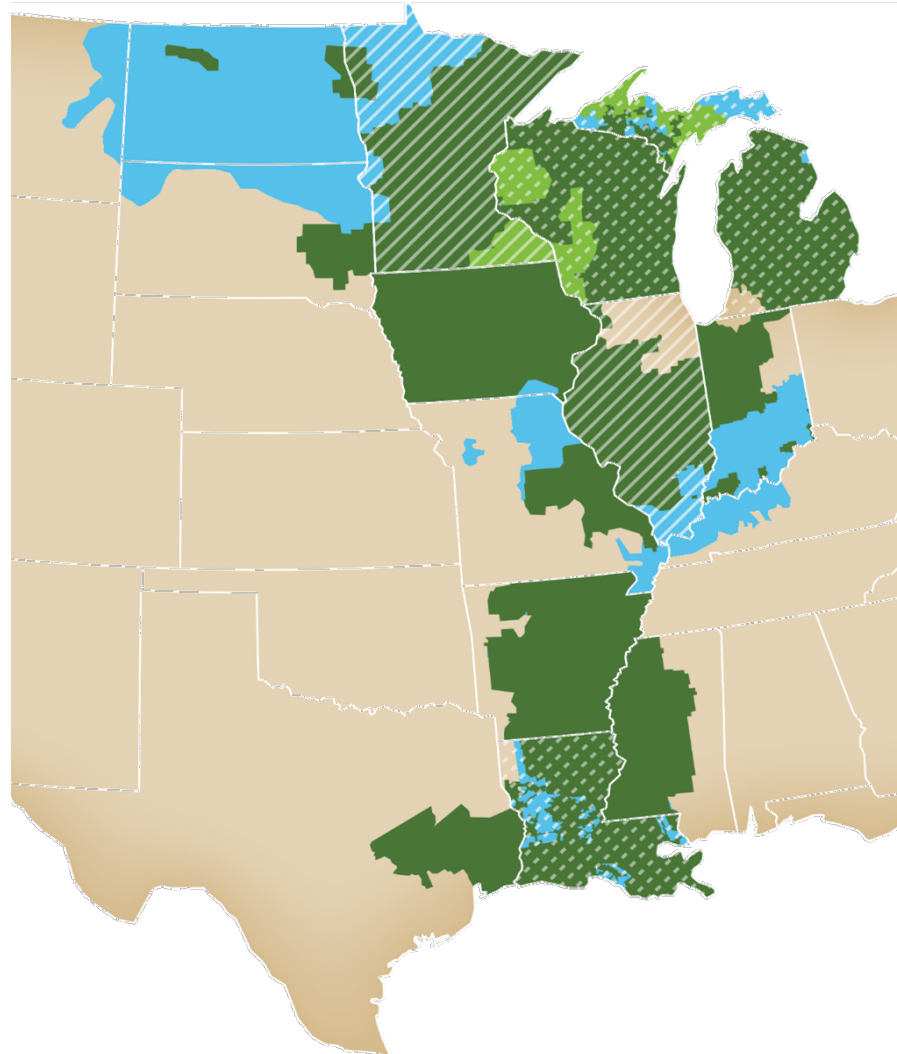
July 27, 2023

# Executive Summary



- Aggressive decarbonization goals and policies are driving rapid portfolio change, resulting in increasing variability and diminishing reliability attributes
- Enhanced reliability risk evaluation and management tools are needed to handle the uncertainty rising from increased variability and more extreme weather
- Promising new technologies are far from commercial maturity, requiring reliance on transition resources as reliability insurance
- Our shared Reliability Imperative requires a comprehensive transition plan to balance reliability, affordability and sustainability, including:
  - Risk evaluation
  - Resource accreditation, including fuel assurance
  - Attribute requirements
  - Pricing and incentives (wholesale and retail)
  - System planning (e.g., Long Range Transmission Planning)

# Ambitious decarbonization goals have been announced, accelerated, or increased – signaling significant changes ahead



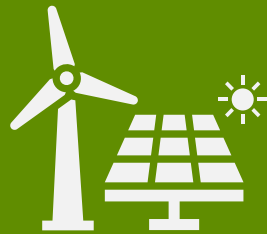
## Decarbonization Goals\*

- MISO Region
- Utilities with 80%+ targets
- Utilities with 50%+ targets
- ▨ States with enforceable decarbonization goals
- ▩ States with aspirational decarbonization goals

Transformation is progressing at an astonishing pace and will speed up over the next several years

### Fleet Changes

MISO members and states have set ambitious goals to partially or fully decarbonize



### Fuel Assurance

Availability of resources may be challenged by economic, supply chain or other issues



### Extreme Weather

Severe weather events are becoming more extreme and occurring more frequently



### Electrification

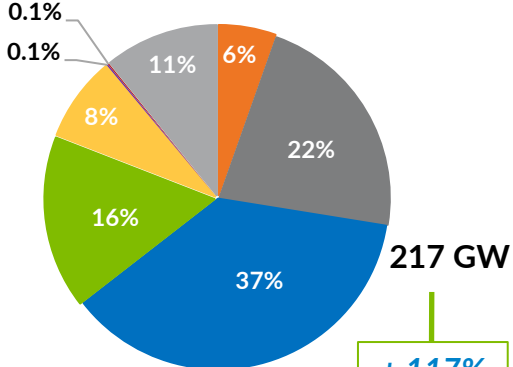
Demand for electricity will grow as electric vehicles increase, industry sectors trend towards renewables



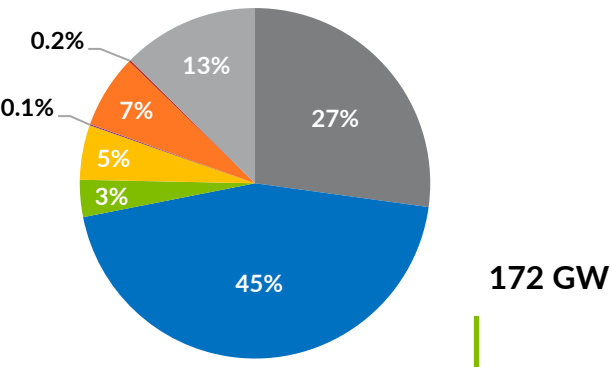
# MISO's Future 2A anticipates significant resource additions, retirements and load growth with a trend towards increasing renewables

2023

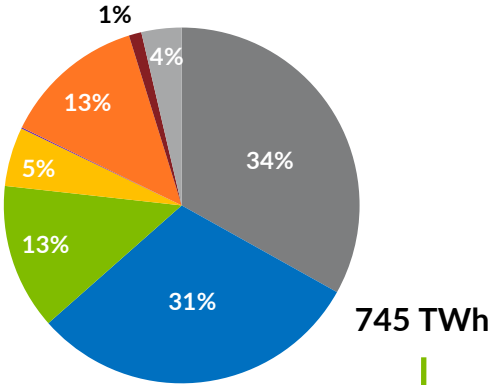
**Installed Capacity**



**Accredited Capacity**

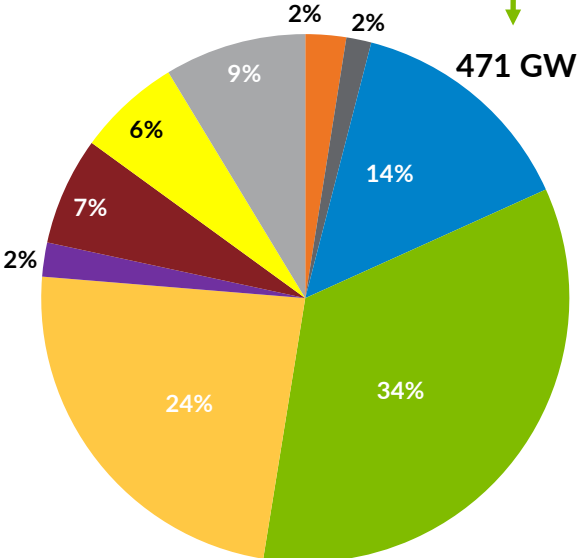


**Energy Production**

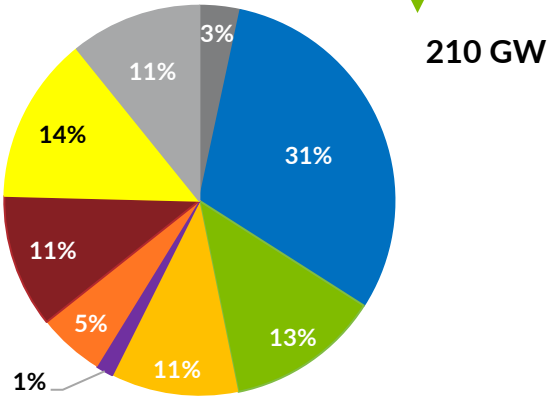


2042

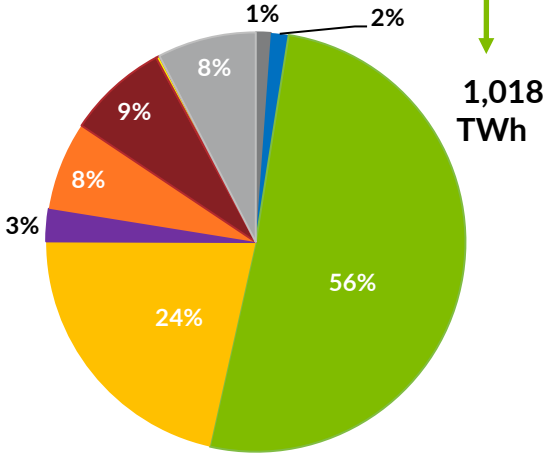
**Installed Capacity**



**Accredited Capacity**



**Energy Production**



+ 117%

+ 22%

+ 37%

# MISO's Reliability Imperative guides the transformation needed to maintain reliability for the grid of the future



## RELIABILITY IMPERATIVE

### Market Redefinition

Develops significant market enhancements and optimizations to ensure continued reliability and value in anticipation of the changing resource mix, more frequent extreme weather events, and increasing electrification

### Transmission Evolution

Assesses the region's future transmission needs and associated cost allocation holistically, including transmission to support utility and state plans for existing and future generation resources

### Operations of the Future

Focuses on the skills, processes and technologies needed to ensure MISO can effectively manage the grid of the future under increased complexity

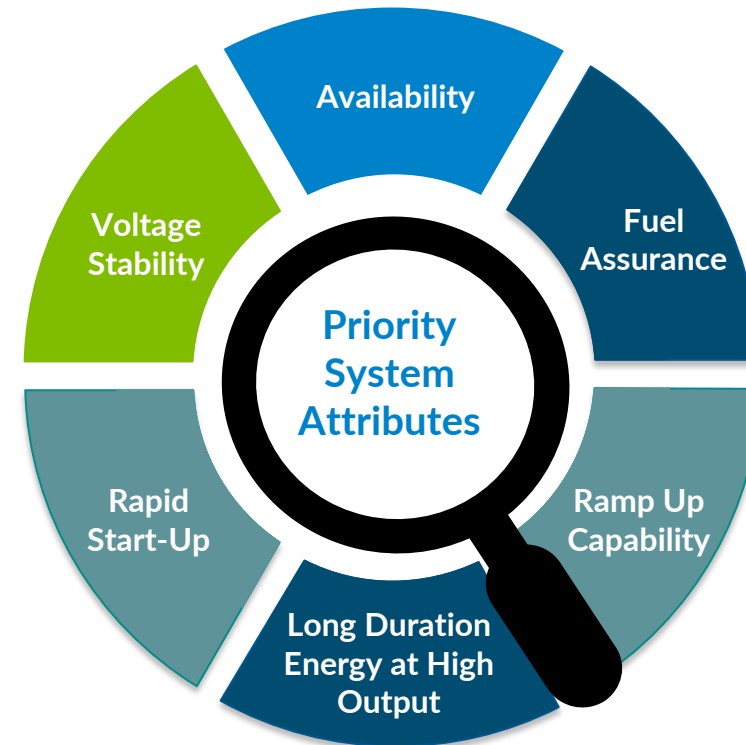
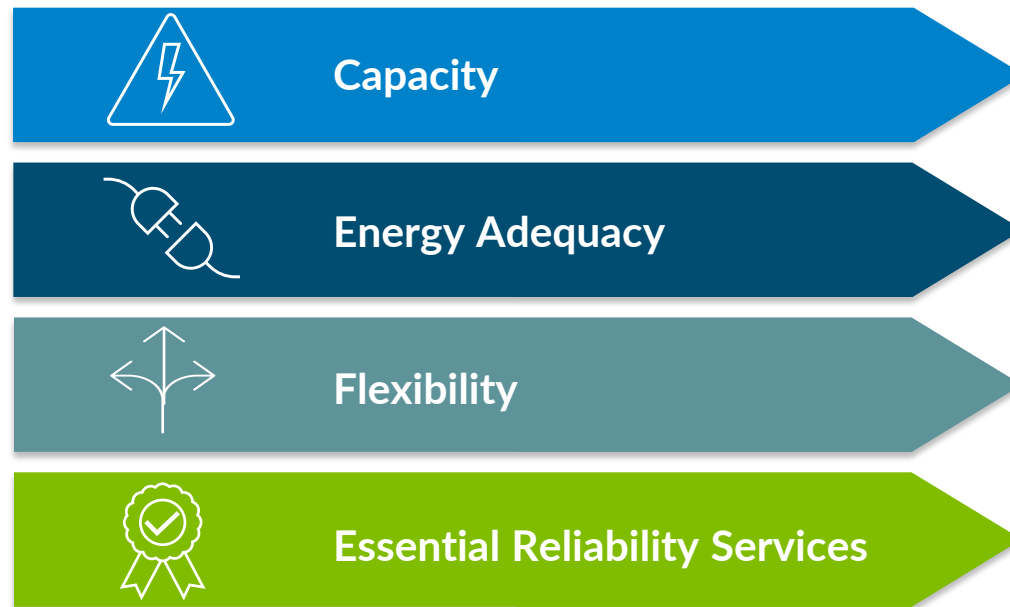
### System Enhancements

Creates flexible, upgradeable, and secure systems that integrate advanced technologies to process increasingly complex information and evolve with the industry

# Higher variability and complexity have significant implications for reliability and energy adequacy in the region

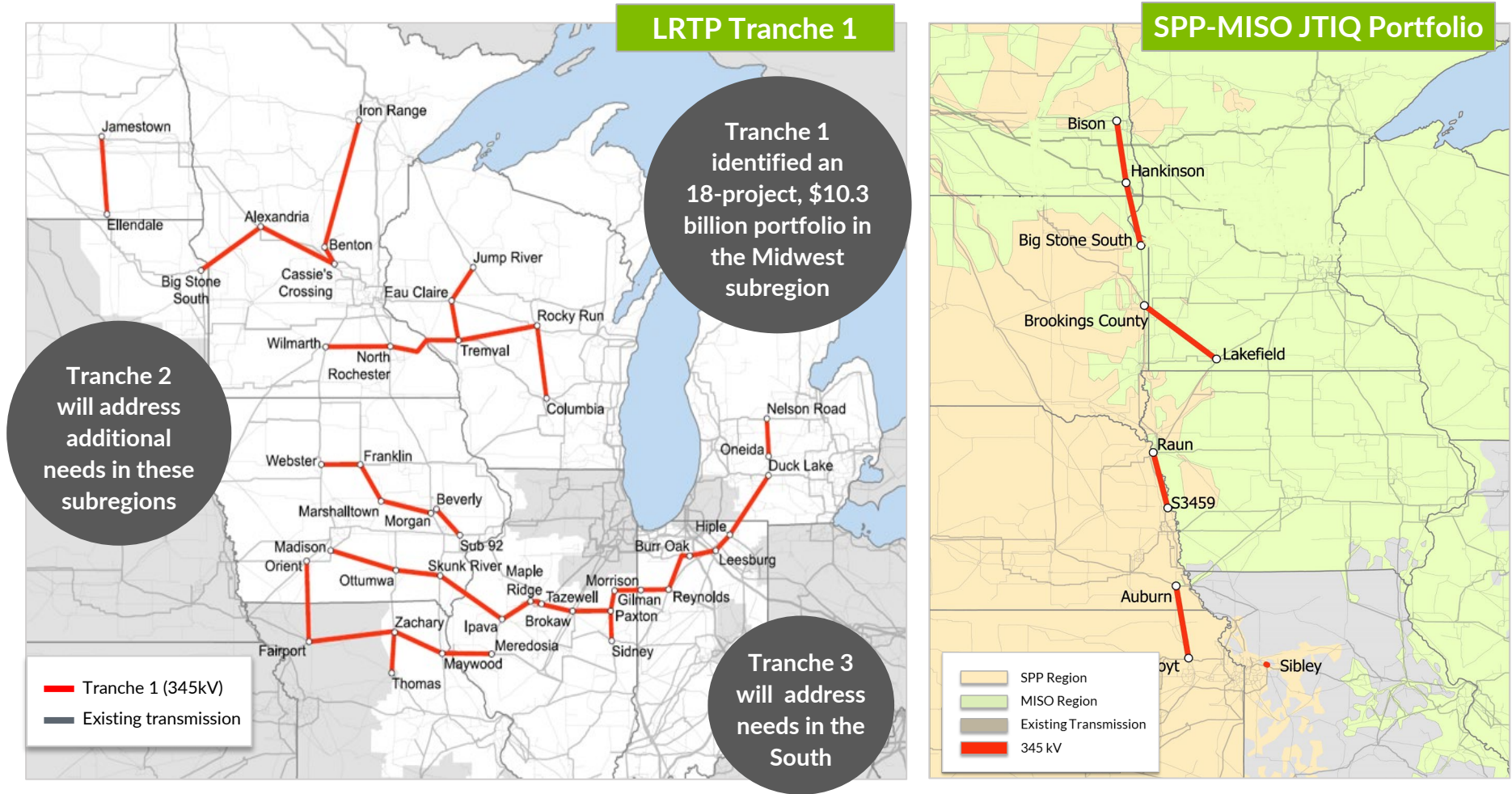
|                               | PAST   | PRESENT  | FUTURE   |
|-------------------------------|--|--|--|
| <b>RISK EVALUATION</b>        | <ul style="list-style-type: none"> <li>Capacity planned for single peak hour using 1-in-10 standard</li> </ul>     | <ul style="list-style-type: none"> <li>Seasonal resource adequacy</li> <li>Energy adequacy in all hours</li> <li>Extreme weather</li> </ul>  | <ul style="list-style-type: none"> <li>Expected unserved energy; days/ weeks</li> <li>Adequacy of key reliability attributes</li> </ul>  |
| <b>MARKET EVOLUTION</b>       | <ul style="list-style-type: none"> <li>Energy</li> <li>Capacity</li> <li>Ancillary services</li> </ul>             | <ul style="list-style-type: none"> <li>Seasonal accreditation</li> <li>Pricing/incentive</li> <li>Attribute definition</li> <li>Seams coordination</li> </ul>                            | <ul style="list-style-type: none"> <li>Hourly energy adequacy</li> <li>Accreditation of attributes</li> <li>Fuel assurance</li> <li>Seams optimization</li> </ul>              |
| <b>TOOL ENHANCEMENT FOCUS</b> | <ul style="list-style-type: none"> <li>Regional load and weather forecasting</li> <li>System efficiency</li> </ul> | <ul style="list-style-type: none"> <li>Extend visibility horizon</li> <li>Variable generation and weather forecasting</li> <li>Coordination with fuel suppliers and neighbors</li> </ul> | <ul style="list-style-type: none"> <li>Uncertainty management; artificial intelligence</li> <li>Granular weather forecasting</li> <li>Retail/wholesale coordination</li> </ul> |

As part of Market Redefinition, MISO has identified priority attributes that must exist in ample aggregate amounts to maintain reliability





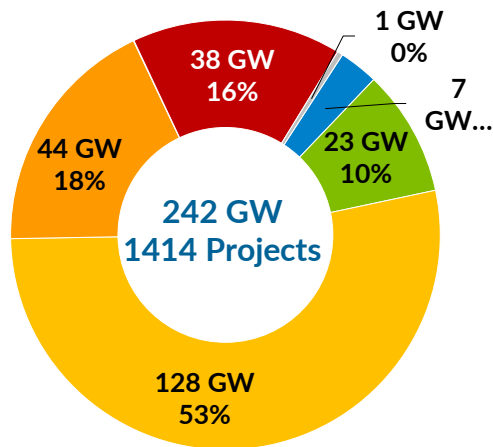
# MISO's Long Range Transmission Plan (LRTP) and the SPP-MISO Joint Targeted Interconnection Queue (JTIQ) Portfolio are helping address Transmission Evolution



While MISO's Interconnection Queue currently contains 242 GW, 49 GW of approved resources are awaiting construction, having delayed operation by an average of more than 650 days

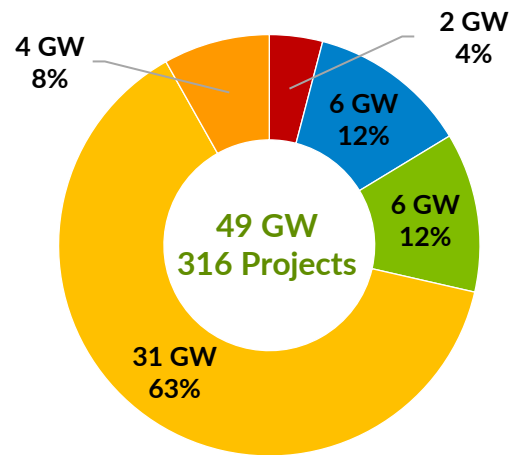
### ACTIVE PROJECTS

In addition to 242 GW of active projects in the queue process...



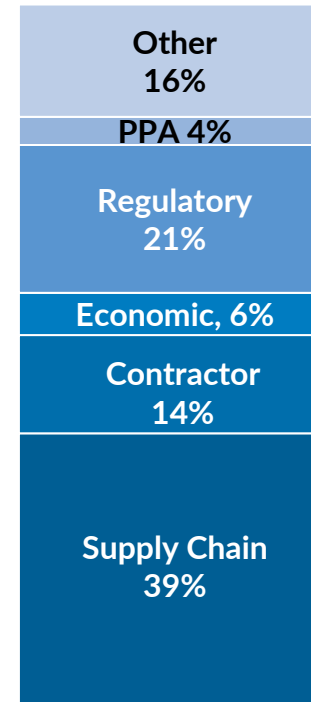
### MISO APPROVED PROJECTS

...49 GW of MISO approved projects with a Generator Interconnection Agreement are not yet in-service...



### REASONS FOR DELAY

...primarily due to supply chain, regulatory, and contractor issues



Fuel Type  
 ■ Other ■ Gas ■ Wind ■ Solar ■ Hybrid ■ Storage

# Continued collaboration is needed to address the Reliability Imperative

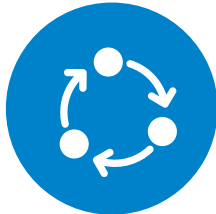
## TAKEAWAYS



**Capacity Market Improvements**  
Support for improving pricing in MISO's capacity market



**Attributes Development**  
Support and awareness of wholesale market changes for resource attributes (may affect state and utility resource planning)



**Interconnection Queue Reform**  
Support for efficient queue studies and readiness considerations



**Resource Accreditation Reform**  
Ensuring resources are valued based on availability when needed



**Future Outlooks**  
Collaborating on OMS-MISO Survey, Planning Resource Auctions, Regional Resource Assessments and Futures work



**Transmission Permitting and Construction**  
Timely permitting and development