Key Takeaways and Agenda

The MISO-OMS Survey and generator interconnection queue provide an outlook for the supply-demand balance and resource expectations over the next five years.

MISO is focused on enhancing our markets and transmission planning efforts in preparation for the changing portfolio.

Seams processes are key to providing reliable, least cost energy to customers and will become even more important going forward.

- MISO-OMS Survey
- Generation Interconnection Queue
- Distributed Energy Resources
- Transmission Cost Allocation Proposal
- MISO-SPP Interregional Planning
- January 17th Event
MISO/OMS Survey
MISO Region is projected to have adequate resources to meet its Planning Reserve Requirement for 2019; continued action will be needed to ensure sufficient resources are available going forward

- The region is projected to have 0.6 GW to 6.6 GW resources in excess of the regional requirement, based on responses from over 97% of MISO load
- Beyond 2019, decrease in resource commitments could lead to more risk to resource adequacy than previously projected
  - Lower resource commitments are mainly focused in Zones 4 and 7
  - Fewer resource commitments lead to higher likelihood of using emergency resources
- Demand forecast continues to decrease similar to previous projections
  - 2019 summer peak forecasts decreased 1.5 GWs from 2017 projections
  - Regional 5 year growth rate is 0.3%, down from 0.5% last year
In 2019, regional surpluses are sufficient to cover areas with potential resource deficits

The MPSC recently made a determination that the Michigan LSE’s have adequate resources (owned or contracted) to meet projected resource adequacy through 2021, this aligns with the upper range of the OMS MISO survey projections for zone 7

Regional surpluses and potential resources are sufficient for all zones to serve their deficits while meeting local requirements

Positions include reported inter-zonal transfers, but do not reflect other possible transfers between zones

Exports from Zones 8, 9, and 10 were limited by the Sub-regional Power Balance Constraint
Continued focus on load growth variations and generation retirements will reduce uncertainty around future resource adequacy assessments

- The MPSC recently made a determination that the Michigan LSE’s have adequate resources (owned or contracted) to meet projected resource adequacy through 2021, this aligns with the upper range of the OMS MISO survey projections for zone 7
- Regional surpluses and potential resources are sufficient for all zones to serve their deficits while meeting local requirements
- Positions include reported inter-zonal transfers, but do not reflect other possible transfers between zones
- Exports from Zones 8, 9, and 10 were limited by the Sub-regional Power Balance
Zone 5 capacity balances were impacted by newly reported zonal transfers

**Regional 2019 Outlook**
**Committed Capacity Projection Variations**
since 2017 OMS MISO Survey

In GW (ICAP)

- **-0.5**
- **-0.1**
- **-0.1**
- **-0.0**
- **0.5**
- **0.1**

- **Forecasted Regional Deficit:** 2017 OMS-MISO Survey
- **Forecasted Load Reductions**
- **Increased Reserve Requirement due to Higher Forced Outage Rates**
- **New Resources since 2017**
- **Increase Availability of Existing Resources since 2017**
- **Net Zonal Transfers to Zone 5 loads**
- **Forecasted Regional Surplus:** 2018 OMS-MISO Survey

**New resources** include resources with newly signed Interconnection Agreements and new Load Modifying Resources

**Decreased availability** results from new retirements and potential retirements
Generation Interconnection
The MISO region must prepare for the fleet transition indicated by the interconnection queue.

MISO Active Queue by Study Area

- **East Area (ATC/UP) DPP**
  - Size: 7.3 GW
  - Requests: 51

- **East Area (ITC) DPP**
  - Size: 13.6 GW
  - Requests: 77

- **West Area DPP**
  - Size: 32.5 GW
  - Requests: 200

- **Central Area DPP**
  - Size: 23 GW
  - Requests: 122

- **South Area DPP**
  - Size: 16.7 GW
  - Requests: 111

*Includes 615 MW storage*
Missouri Generation Interconnection Queue

Interconnection Queue based on “nameplate” capacity of projects

Interconnection queue based on expected capacity (capacity of 15.6% for wind and 50% for solar)

*All quantities rounded to the nearest MW
Distributed Energy Resources
Focus Areas for DER enhancements

Promote flexibility and build on FERC’s long record of supporting tailored approaches

Facilitate regional coordination between RTOs, States, and distribution utilities

Support MISO’s efforts to build a product that ensures reliability and promotes market efficiencies
Encouraging FERC to allow regionally different needs for value drive priorities

States in MISO’s Footprint are at the low end of the DER adoption curve

Infrastructure and policies mandating necessary infrastructure are generally lagging

- (Non-MISO) HI, CA
- MN, IL
- MO, MI, IA, TX
- WI, IN, AR, KY, LA, MT, ND, SD, MS

MISO and OMS are coordinating on Distributed Energy Resource integration with reliability as chief focus.

DER integration is significantly more complex than historic market enhancements.

### DRAFT Illustrative Five Year Timeline

<table>
<thead>
<tr>
<th>Identify DER Business Impacts</th>
<th>Explore Options to Create &amp; Maintain Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection Coordination</td>
<td>Tariff &amp; Business Practice Manuals</td>
</tr>
<tr>
<td>OMS Engagement</td>
<td>Communication Coordination &amp; Standards</td>
</tr>
<tr>
<td>Stakeholder Engagement</td>
<td>DER Integration Options</td>
</tr>
<tr>
<td>Governance &amp; Policy</td>
<td>DER Integration Approach</td>
</tr>
<tr>
<td>Model Changes for DERs</td>
<td>Short &amp; Medium Term Load Forecasting Improvements</td>
</tr>
<tr>
<td>Tariff &amp; Business Practice Manuals</td>
<td>FTR Impact Assessment</td>
</tr>
<tr>
<td>Communication Coordination &amp; Standards</td>
<td>Situational Awareness Improvements</td>
</tr>
<tr>
<td>DER Integration Approach</td>
<td>Identify Visibility Requirements for Go-Live</td>
</tr>
<tr>
<td>Identify Visibility Requirements for Planning</td>
<td>Identify Visibility Requirements for High Penetration</td>
</tr>
<tr>
<td>Identify Visibility Requirements for Planning</td>
<td>Energy, Ancillary Services &amp; Capacity Market Changes</td>
</tr>
<tr>
<td>Situational Awareness Improvements</td>
<td>MSE New Platform DER Enhancements</td>
</tr>
<tr>
<td>Identify Visibility Requirements for Planning</td>
<td>Metrics</td>
</tr>
<tr>
<td>State &amp; Federal Policies</td>
<td>Develop Future Market Changes</td>
</tr>
<tr>
<td>Applied Energy Group Study Forecasting DER Penetration in MISO Footprint</td>
<td></td>
</tr>
</tbody>
</table>

### Areas of Need:

- **Business Model**
- **Market Participation**
- **Integration Approach**
- **System Enhancement**
- **Governance & Policy**
- **Tool Enhancement**
- **Visibility Enhancement**
- **Monitor**
Conclusion

• There is no need for a short timeframe for DER orders
• Flexibility, coordination and reliability are critical
• MISO has significant initiatives focused on DER integration, including technical R&D and state policy engagement
Transmission
Cost Allocation Reforms
MISO Cost Allocation Proposal: June 2018

Aligns who pays with who benefits over time from a regional transmission expansion perspective.

Represents changes that address identified cost allocation issues, seeks to improve the alignment of costs and benefits for future regional transmission projects, and considers the diverse positions of stakeholders.

MISO is targeting filing tariff changes by the third quarter of 2018, with an effective date of January 1, 2019.
Notable Changes in the Cost Allocation Proposal

• Regional Projects
  • Lower Market Efficiency Project (MEP) voltage threshold to 230kV
  • Create new project category for economic projects below 230kV
    • 100% allocation to local Transmission Pricing Zone
    • Name: Local Economic Project
    • Include local zone B/C ratio criteria of 1.25
  • Eliminate 20% postage stamp component from MEP cost allocation

• Interregional Projects
  • Lower the voltage threshold for interregional MEPs to 100kV on both the PJM and SPP seam
MISO-SPP
Interregional Planning
Seams processes are key to providing reliable, least cost energy to customers and will become even more important going forward.

Key Attributes of Seams Processes

- Efficient
- Equitable
- Reliable

Importance of Seams Processes Going Forward

1. Managing the evolving resource portfolio and tightening reserve margins
2. Realizing the benefits of the Order 1000 transmission planning process
3. Ensuring we have an equitable process for managing parallel flows across the Eastern Interconnect
MISO and SPP have performed two Coordinated System Plan (CSP) Studies

The past two CSP Studies have not resulted in approved interregional transmission projects

Past studies have shown the current MISO-SPP Joint Operating Agreement (JOA) requirements can limit interregional opportunities

What specific changes can MISO and SPP make to the JOA to enhance the interregional process and pave the way for more successful outcomes?
Enhancing the Interregional Study Process

Modifying the JOA to eliminate barriers to getting mutually beneficial projects approved will allow the studies to be more effective and successful.

Specific changes to the JOA will foster increased interregional opportunities

- Remove the $5M cost threshold
- Remove joint model requirement & legacy APC methodology
- Adding an avoided cost benefit metric

Why these enhancements?

- Closer alignment of interregional evaluation outcome with regional review results
- Significant efficiency gains achieved
- Increases potential mutually beneficial projects to be evaluated

Historical Studies & Precedent

- Proposed low cost beneficial projects unable to be studied (i.e. 2016-2017 Study $500k Lawrence-Sioux Falls 115 kV Terminal Equipment Upgrades)
- Joint models increases time and effort required to build models and perform analysis (i.e. 2016-2017 CSP Study took nearly 18 months )
- MISO/PJM, NYISO/ISONE/PJM implement similar changes; independently & FERC directed
January 17th Event
MISO spends a lot of time preparing for emergency situations
Record low South temperatures, high load, and unavailable generation contributed to operating challenges throughout the week of January 15.

- **Extreme Cold Temperatures and Atypical Load**
  - Below average temperatures for the South Region challenged load forecasting and drove higher than normal load.

- **Outages**
  - Forced generation outages and delayed outage returns intensified already tight conditions.

- **Neighboring systems in the South experienced similar conditions**
  - MISO communicated with neighbors during the event on real-time conditions.
MISO prepared for high load days in advance. In Real-Time, unplanned generator outages required additional actions.
MISO, SPP, and Joint Parties have been meeting to discuss lessons learned and areas for enhancement

- Improve communications before and during events
- Clarify expected joint actions during emergency events
- Improve consistency of regional transfer flow calculation