Topics Covered

• MISO Update
• MISO-OMS Survey
• Generation Interconnection Queue
• Distributed Energy Resources
• MISO/SPP Coordinated Transmission Study
MISO Update
THE ENERGY INDUSTRY
Several factors are affecting the industry and MISO region

- Economics
- Plant Age
- Regulations
- Policy
- Technology

The impact to MISO is lower reserve margins and a changing resource mix

Here’s what we’re doing to ensure reliability

- Facilitating efforts to ensure adequate resource capacity exists in all areas of the footprint
- Streamlining processes for new electricity sources to connect to the grid
- Enabling transmission investment needed to support the generation portfolio of the future
- Ensuring operational practices can reliably accommodate the shifting resource mix, including improved coordination with the natural gas industry
MISO/OMS Survey
Overview of MISO-OMS Survey

- Cooperative effort to quantify how much electricity-generating the region will have for the next 5 years.
- Voluntary survey illustrates how existing and anticipated future resources compare to the region’s Planning Reserve Margin Requirements (PRMR) a measure of future demand and reserve expectations.
- The survey is especially important now, given that the region’s historical reliance on coal-fired energy is evolving due to factors such as environmental regulations, low gas prices and state renewable standards.
Existing resources, potential retirements, and new resources create a range of resource balances

Projected Regional Capacity Position in Installed Capacity (ICAP) GW (% Reserves)

- Regional outlook includes projected constraints on capacity, including Capacity Export Limits and the Sub-regional Power Balance Constraint.
- These figures will change as future capacity plans are solidified by load serving entities and state commissions.
- **Potential New Capacity** represents 35% of the capacity in the final stage of the MISO Generator Interconnection queue, as of May 11, 2017.
- **Potentially Unavailable Resources** includes potential retirements and capacity which may be constrained by future firm sales across the Sub-regional Power Balance Constraint.
Changes in Missouri (Zone 5) include both forecasted load reductions and an increase in Net Zonal Transfers

Zone 5 2018 Outlook
Committed Capacity Projection Variations
since 2016 OMS MISO Survey
In GW (ICAP)

- New resources include resources with newly signed Interconnection Agreements and new Load Modifying Resources
- Increased availability results from deferred retirements and internal resources with reduced commitments to non-MISO load
- Positions include reported inter-zonal transfers, but do not reflect other possible transfers between zones
Generation Interconnection
Most Recent Generator Interconnection Queue

With the addition of 2017-Aug projects, the Generation Interconnect Queue has grown to 355 projects totaling 59 GW

Charts indicate publicly available queue data as of August 2017

MISO Definitive Planning Area Map

- **East Area (ATC) DPP**
  - GW: 3.9 GW
  - Requests: 27

- **East Area (ITC) DPP**
  - GW: 9.6 GW
  - Requests: 47

- **West Area DPP**
  - GW: 22.7 GW
  - Requests: 138

- **Central Area DPP**
  - GW: 13.6 GW
  - Requests: 71

- **South Area DPP**
  - GW: 8.9 GW
  - Requests: 68

**Total Gen by Fuel**

- Wind: 51.0
- Gas: 12.0
- Solar: 6.0

**DPP Trends**

- 2014: 9.2
- 2015: 6.6
- 2016: 13.5
- 2017: 39.4

- Total: 58.8 GW

**Notes:**

- The Queue now has 140 MW of battery storage requests
- Requested projects have in service dates ranging from 2017-2022
- Detailed queue cycle information can be found [MISO’s website](http://www.misoenergy.org)
Missouri Generation Interconnection Queue

**Missouri: Incoming Queue Generation**
(MW) by Requested in Service Date

- Pre-existing Queue: 1,096
- New Submissions: 489
- Pre-existing Queue 2017-2021: 100
- New Submissions 2017-2021: 465

*Solar and wind capacity factors of 50% and 15.6% applied respectively*
Distributed Energy Resources
Significant new DER is forecasted – external forces could accelerate pace of change

Smart thermostats are resulting in measurable reductions in load — according to Nest, as of March 2017 their smart thermostats have saved roughly 193,000 MWh per month. That’s the same amount of energy created by 27 thousand wind turbines in a month.

1 IHS reference case forecast
2 MISO planning futures

Utility scale PV represents majority of growth
Compared to today, DERs pose challenges and opportunities when it comes to planning, operations and potentially markets.

**Planning**
DERs need to be incorporated into the traditional planning process.

**Operations**
Short term net load requirements will become more dynamic and more challenging to forecast.

**Markets**
Markets can be enhanced to include DERs if deemed useful by membership.
MISO/SPP
Coordinated Study
During the 2016 MISO-SPP Coordinated Study, MISO and SPP both advanced a potential interregional project for regional review.

MISO's regional review identified a regional solution that cost less than the interregional project.

Order 1000 provides that interregional projects be selected if they are more cost effective than regional solutions.

MISO finds great value in interregional coordination, including evaluation of projects that could benefit regions across seams, despite the fact that it doesn’t always result in a finding that an interregional solution is most economical.