What is MISO?

• MISO stands for **Midcontinent Independent Transmission System Operator**

• MISO is a Regional Transmission Operator (RTO)

• An RTO is a Federal Energy Regulatory Commission (FERC)-regulated control area operator of the electric transmission grid

• MISO does not own any transmission or generation assets and cannot have affiliation with any members

• MISO is a non-profit organization

• Membership in MISO is voluntary
MISO’s role is concentrated in a few key areas

<table>
<thead>
<tr>
<th>What We Do</th>
<th>Implications</th>
</tr>
</thead>
</table>
| Provide independent transmission system access | > Equal and non-discriminatory access  
> Compliance with FERC requirements  
> Eliminate transmission rate pancaking |
| Deliver improved reliability coordination through efficient market operations | > Improved regional coordination  
> Enhanced system reliability  
> Independent lowest cost unit commitment, dispatch, and congestion management |
| Coordinate regional planning                     | > Integrated system planning  
> Broader incorporation of renewables  
> Balance transmission and generation tradeoffs |
| Foster platform for wholesale energy markets      | > Encourage prudent infrastructure investments  
> Facilitation of regulatory initiatives  
> Market price/value discovery                |
MISO was formed to open wholesale markets with growth based on reliability and value creation

1 Due to CPP stay, timing for State Rule Discovery is unknown. Slide reflects timeline before the stay.
MISO is the Grid/Market Operator for 15 states in the Central U.S. plus the Canadian Provence of Manitoba

<table>
<thead>
<tr>
<th></th>
<th>MISO</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Voltage Transmission - miles</td>
<td>65,520</td>
<td>200,000 +</td>
</tr>
<tr>
<td>Installed Generation - GW</td>
<td>195</td>
<td>1,009</td>
</tr>
<tr>
<td>Installed Generation – # of Units</td>
<td>1700</td>
<td>19,000</td>
</tr>
<tr>
<td>Annual System Load – Billion kWh</td>
<td>670</td>
<td>3,900</td>
</tr>
<tr>
<td>People Served - Millions</td>
<td>42</td>
<td>320</td>
</tr>
</tbody>
</table>

MISO’s Vision – To be the most reliable, value-creating RTO
# RTO Comparison: Structure & Governance

<table>
<thead>
<tr>
<th>Structure</th>
<th>MISO</th>
<th>CAISO</th>
<th>PJM</th>
<th>SPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Territory</td>
<td>15 states + Manitoba</td>
<td>Nodal: 2 states EIM: 6 states</td>
<td>13 states + DC</td>
<td>14 states</td>
</tr>
<tr>
<td>Corporate tax status</td>
<td>501(C)(4) Social welfare nonprofit</td>
<td>501(C)(3) Nonprofit to lessen gov’t burden</td>
<td>Taxable limited liability corporation</td>
<td>501(C)(6) Nonprofit as business league</td>
</tr>
<tr>
<td>Utility Oversight</td>
<td>Regulated except IL, MI (10%): retail choice</td>
<td>CA: retail choice NV: regulated</td>
<td>DC, PA, NJ, DE, MD: Retail choice</td>
<td>Regulated</td>
</tr>
<tr>
<td>Number of Directors</td>
<td>10, including CEO</td>
<td>5</td>
<td>10, including CEO</td>
<td>7, including CEO</td>
</tr>
<tr>
<td>Director placement</td>
<td>• Nominated by board • Elected by MISO membership</td>
<td>• Governor appointed • Confirmed by state senate</td>
<td>• 9 elected by PJM members • CEO appointed by board</td>
<td>• 6 elected by SPP members • President appointed by board</td>
</tr>
<tr>
<td>Director term</td>
<td>3 years</td>
<td>3 years</td>
<td>3 years</td>
<td>3 years</td>
</tr>
<tr>
<td>Regulator</td>
<td>FERC</td>
<td>FERC</td>
<td>FERC</td>
<td>FERC</td>
</tr>
</tbody>
</table>
# RTO Comparison: Energy & Capacity Markets

<table>
<thead>
<tr>
<th></th>
<th>MISO</th>
<th>CAISO</th>
<th>PJM</th>
<th>SPP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy &amp; Ancillary Service Markets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly, Day-ahead</td>
<td>Co-optimized</td>
<td>Co-optimized</td>
<td>Co-optimized</td>
<td>Co-optimized</td>
</tr>
<tr>
<td>Real-time</td>
<td>5-min co-optimized, dispatch, hourly settlement</td>
<td>5-min co-optimized, dispatch, 15-min settlement</td>
<td>5-min settlement &amp; dispatch, based on DA/rebid offers, hourly co-optimization</td>
<td>5-min co-optimization, dispatch &amp; settlement</td>
</tr>
<tr>
<td>Virtual trades</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Must offer</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Resources needed to meet RA requirement only</td>
</tr>
<tr>
<td>Offer cap</td>
<td>$1,000/MWh</td>
<td>$1,000/MWh</td>
<td>$2,000/MWh</td>
<td>$1,000/MWh</td>
</tr>
<tr>
<td>Ancillary Services</td>
<td>• Spin&lt;br&gt;• Supplemental (nonspin)&lt;br&gt;• Regulation</td>
<td>• Regulation up&lt;br&gt;• Regulation down&lt;br&gt;• Spin&lt;br&gt;• Nonspin</td>
<td>• Regulation&lt;br&gt;• Synchronized reserves (spin)&lt;br&gt;• DA scheduling reserves (DASR)</td>
<td>• Regulation up&lt;br&gt;• Regulation down&lt;br&gt;• Spin&lt;br&gt;• Supplemental (nonspin)</td>
</tr>
<tr>
<td><strong>Capacity Market</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auctions</td>
<td>Annual Capacity Auction</td>
<td>LSE resource adequacy requirement</td>
<td>Centrally Procured Capacity Markets</td>
<td>Supply must cover energy obligation daily</td>
</tr>
<tr>
<td>Auction timelines</td>
<td>LSE capacity obligation set by state or MISO&lt;br&gt;Voluntary capacity auction March prior to delivery year</td>
<td>N/A</td>
<td>Every May three years prior to delivery year&lt;br&gt;Incremental auctions 20, 10 &amp; 3 months prior to delivery year</td>
<td>N/A</td>
</tr>
<tr>
<td>Demand curve</td>
<td>Vertical</td>
<td>N/A</td>
<td>Sloped</td>
<td>N/A</td>
</tr>
</tbody>
</table>
MISO Market Overview - Electricity Markets

MISO operates:

- A spot and forward commodity market for electric energy and related products
- Markets for related derivative products

The spot commodity market functions within context of an integrated regional transmission system that must be maintained within tightly controlled operational parameters. Since electric supply and demand must be balanced on an instantaneous basis, the physical delivery system is an integrated element of the electricity commodity market.
Reliability and Market Operations are Mutually Reinforcing…

Reliability
Reliable system operation is delivered by efficient markets
• Markets allow reliability to be managed cost effectively
• Prices provide strong incentives for generation and load behavior that fosters system reliability

Market
Market enables market participants to pursue economic goals while maintaining reliable and efficient operations at all times
Four primary markets are MISO’s tools to manage generation and transmission...

**Resource Adequacy**
- Prompt year ahead forward “planning reserve”
- Assures capacity exists to produce energy and ancillary products

**Financial Transmission Rights Market**
- Hedge risk of transmission congestion costs
- Preserves transmission rights through ARR allocation

**Day-Ahead Market**
- Forward energy and operating reserves
- Commits generation
- Establishes next day financial commitments by hour

**Real-Time Market**
- Spot energy and operating reserves
- Transparent economic signals
- 5-minute energy dispatch to satisfy system demand and manage transmission congestion

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**Annual Auction**

**FTR Monthly/Seasonal/Annual Auction and ARR Annual Allocation**

**Resource Offers, Demand Bids and Physical Schedules**

**Resource Offers and Physical Schedules**
Day-Ahead and Real-Time markets include four products; price formation begins with the co-optimization of these resources...

- **REGULATING RESERVES**
  - 5 Min Response/On-line
  - Automatic Generation Control (AGC) equipped and expected to follow 4-second set points

- **SPINNING RESERVES**
  - 10 Min Response/On-line

- **SUPPLEMENTAL RESERVES**
  - 10 Min Response/Off-line or On-line
Day-Ahead Market plans for the operating day and is financially binding...

Day-Ahead Market

- Results in financially binding market clearing for next Operating Day
- DA prices set for cleared supply and demand
- Reflects participants’ expectations of next day
- Unit commitment and hourly operating schedules
- Pre-pay for energy, transmission, and operating reserves
- Congestion arising from expected system conditions based on bids and offers, forecast transmission topology
Day-Ahead Market (OD-1) – Majority of Transactions Occur Here…

1100hr 1500hr

Generation Resources Offers

Load Serving Entities Bids

Day-Ahead Supply and Demand Schedules

Day-Ahead LMPs and MCPs

Unit Start/Stop Instructions
Mechanisms to participate in the energy market

- **Generation Resource**
  - Traditional, Intermittent, Dispatchable Intermittent

- **Demand Response Resource**
  - Type I and II

- **External Asynchronous Resource**

- **Virtual Transactions**

- **Demand Bids**

- **Stored Energy Resource**

- **Physical Schedules**

- **Financial Schedules**
Real-Time Market is a spot market for balancing current system conditions...

- **Addresses Real-Time system conditions**
- **Dispatches lowest-cost resources every 5-minutes**
- **Provides transparent economic signals**
- **Balances RT supply and demands**
- **Satisfies demand without overloading the network**
- **Guides operational and investment decisions**
Real-Time Market – Operating Day…

- Based on the network model, updated supply offers, physical schedules and a load forecast, the MISO systems send dispatch targets
Real-Time Clearing Processes

MISO uses Security Constrained Economic Dispatch to balance the injections and withdrawals, manage the congestion, and set Real-Time prices

**Inputs**
- Load Forecast
- Network Model
- Interchange Schedules
- Resource Offers and Parameters

**Outputs – every 5 minutes**
- Real-Time LMPs and MCPs
- Resource dispatch targets for
  - Energy
  - Regulating Reserve
  - Spinning Reserve
  - Supplemental Reserve
Value Proposition is an estimate of the value of running the MISO region through a central RTO vs traditional methods.
The MISO 2015 Value Proposition

Benefit by Value Driver
(in $ millions)

1. Improved Reliability: $145-$217
2. Dispatch of Energy: $140-$154
3. Regulation: $67-$74
4. Spinning Reserves: $32-$35
5. Wind Integration: $316-$377
6. Compliance: $91-$117
7. Footprint Diversity: $1,289-$1,950
8. Generator Availability Improvement: $213-$263
9. Demand Response: $75-$149
10. MISO Cost Structure: $(267)

Total Net Benefits: $2,101-$3,069

Market – Commitment and Dispatch

Generation Investment Deferral
MISO member net benefits are over $16B since 2007

- Improved Reliability
  - Value of additional energy served based on RTO transmission performance versus non-RTO regions
  - MISO has outperformed total RTO region reliability every year since 2012
  - Economies of scale in Compliance work

- Reduced Need for Additional Assets
  - Footprint diversity allows the pool to share resources reducing capacity need for reserves
  - Generator availability improves with market reducing need for additional resources
  - Demand response growth delays need for generation

- More Efficient Use of Existing Assets
  - Security constrained energy dispatch ensures least cost generation is deployed first
  - Ancillary Service Market frees cheaper capacity for energy and secures regulation service and reserves at competitive cost
Price and data transparency in the MISO market provides a host of benefits

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Before MISO</th>
<th>With MISO</th>
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<tbody>
<tr>
<td></td>
<td>Bilateral markets lacked price and data transparency,</td>
<td>Every market participant can see pricing and information,</td>
</tr>
<tr>
<td></td>
<td>leaving participants searching for which plants are operating at what cost.</td>
<td>increasing market efficiencies</td>
</tr>
</tbody>
</table>

| Investment | Bilateral markets provided insufficient price signals which resulted in    | MISO’s energy market price signals provide investors in generation       |
|            | inefficient investment and placement of generation resources and           | assets the underlying data required to develop forecasts for future      |
|            | transmission infrastructure                                                 | wholesale prices. Price forecasts, in turn, provide the necessary basis |
|            |                                                                            | for market driven investments                                            |

| Reliability | Bilateral markets achieved reliability based on contractual rights and     | MISO enhances reliability by informing all market participants of grid   |
|             | industry standards with little thought to economic impacts                 | conditions and market operations through the public posting of electricity |
|             |                                                                            | prices and other key system information                                 |
|             |                                                                            | Prices in the MISO energy market reflect real-time system conditions,    |
|             |                                                                            | high market prices indicating where more generation is needed and lower  |
|             |                                                                            | market prices signifying the reverse                                    |
MISO’s transmission planning process is focused on minimizing total cost of delivered power to consumers

<table>
<thead>
<tr>
<th>Transmission Expansion Planning Model</th>
<th>Before MISO</th>
<th>With MISO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Reliability-based model</td>
<td></td>
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<tr>
<td></td>
<td>– Focused primarily on grid reliability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Typically considers a short time horizon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Seeks to minimize transmission build</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Value-based model</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Focused on value while maintaining reliability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Reflects appropriate time scales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Seeks to identify transmission infrastructure that maximizes value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Identifies the comprehensive value (reliability, economic, and policy) of projects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning Scale and Efficiency</th>
<th>Before MISO</th>
<th>With MISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Local view</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Objective of expansion is to address local needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– 26 individual entities optimizing the system within their area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Regional view</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Objective of expansion is to address aggregate regional needs consistent with value-based plans in addition to meeting local needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Offers opportunities to find efficiencies across multiple Transmission Owners</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Allocation</th>
<th>Before MISO</th>
<th>With MISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Free rider issues caused by a lack of alignment between transmission cost and the causers and beneficiaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• MISO helps facilitate the cost allocation of transmission to minimize free rider issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• MISO regional cost allocation matches costs roughly commensurate with beneficiaries</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MISO’s role continues to evolve as the industry’s requirements change

Externalities

- Federal and State
- Known and Unknown
- Traditional and Unconventional
- Precedent and Direction

ISO – RTO Paradigm

- Policy
- Markets
- Technology
- Stakeholders
- Members
- Fuels
- Grid
- Regulation
- Risks

Supply and Demand

- Design and Operation
- Emerging and Future
- Formal and Informal
- Current and Future

Future MISO Role

- Ensure reliability
- Create value for members and consumers
- Enable efficient infrastructure investment
- Maintain unbiased analytic foresight for future markets
- Educate stakeholders on future market possibilities

Ensure reliability
Create value for members and consumers
Enable efficient infrastructure investment
Maintain unbiased analytic foresight for future markets
Educate stakeholders on future market possibilities