MISO is one of the largest and most technologically advanced grid operators in the world.

**Market Footprint**
- Generation Capacity = 132,522 MW
- Peak Demand (7/23/12) = 98,576 MW

**Reliability Footprint**
- Generation Capacity = 205,759 MW
- Peak Demand (7/23/12) = 133,368 MW

Does not yet reflect the addition of MISO South to the market footprint, which occurred on 12/19.

Maintaining reliability on over 65,520 miles of transmission lines in 15 states and the Province of Manitoba.
Value proposition identifies $1.9 to $2.4 billion in annual benefits
MISO drives value creation through its three primary functions
- **Reliability**: keeping the lights on
- **Wholesale Market Management**: allowing the sale and transfer of wholesale electricity to reduce costs and promote reliability
- **Regional Transmission Planning**: working with all transmission stakeholders to develop the region’s transmission grid in a way that promotes public interest; reliability, and enables lowest-cost delivery of electricity and implementation of public policies
Changing Generation Landscape – MISO Gen. Mix Past Week

MISO Fuel Mix 1/12 at 9:20 pm

- Coal: 71%
- Natural Gas: 7%
- Nuclear: 11%
- Other: 1%
- Wind: 10%

(MISOnotes)
MISO Energy Mix – A Macro View

Energy Contribution by Fuel Source

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Nuclear</th>
<th>Gas</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>78%</td>
<td>14%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>2010</td>
<td>76%</td>
<td>14%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>2011</td>
<td>75%</td>
<td>13%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>2012</td>
<td>68%</td>
<td>13%</td>
<td>9%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Legend:
- Black: Coal
- Red: Nuclear
- Blue: Gas
- Green: Wind
The nation’s changing energy landscape has a significant impact in MISO

- Coal fired resources, the primary fuel type in the MISO footprint, are under pressure due to:
  - Age/efficiency
  - Environmental regulations / energy policy
  - Competitive natural gas prices

- A combination of retrofits and retirements will remove resources from the system and replacement capacity will be limited in the near-term

- These factors are expected to culminate in the erosion of reserve margins and a higher utilization of gas fired generation

- Recently proposed future regulations on carbon and potential regulations on water will increase the pace and magnitude of the impact

The resulting picture for 2016 is the potential for available capacity to fall below the required reserve margin
The generation fleet in MISO is being affected by multiple phases of environmental regulations

<table>
<thead>
<tr>
<th>Nature of Regulation</th>
<th>PHASE 1</th>
<th>PHASE 2</th>
<th>PHASE 3</th>
<th>PHASE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury and air toxins</td>
<td>Carbon regulations (GHG 111(d))</td>
<td>Water regulations (316(b))</td>
<td>???</td>
<td></td>
</tr>
</tbody>
</table>

| Compliance Dates | 2015 / 2016 | 2016 implementation | To be determined |

| Impacts | • Significant coal retirements | • June 2014 rule release | • Continued pressures on reserve margins |
|         | • Outage coordination challenges | • Increased dependence on natural gas | • Shrinking reserve margins around MISO |
|         | • Shrinking reserve margins around MISO | • Growing dependence on natural gas |
MISO Work on EPA and Natural Gas Issues

- MISO has performed quarterly surveys of coal facilities
  - Majority of coal units will be impacted by EPA regulations
  - Many units will need emission controls
  - Many units may be uneconomic in market

- MISO has engaged in an electric-natural gas coordination taskforce
  - Increased reliance on natural gas requires additional coordination with gas industry
  - Phase III report released in December
OMS-MISO Collaboration to obtain *long-term* view of Resource Adequacy

• OMS and MISO collectively identified the need to gather and review data about future resources and demand and developed survey
• MISO sent survey to registered load serving entities and resource providers; OMS Commissioners followed-up in individual states
• 99% response rate

- Information about all resources, not just coal resources or interconnection queue
- More specific information on demand side resources
- Requests the application of confidence factors for demand and resource forecasts
Survey results point to a 2016 shortfall in MISO’s Central / North Region

### Central & North Regions

<table>
<thead>
<tr>
<th>2016 Resources</th>
<th>2016 Load (14.8% PRM)</th>
<th>Expected Shortfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.7</td>
<td>108.2</td>
<td>8.5</td>
</tr>
</tbody>
</table>

### South Region

<table>
<thead>
<tr>
<th>2016 Resources</th>
<th>2016 Load (14.8% PRM)</th>
<th>Expected Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.9</td>
<td>35.4</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Notes: Current system conditions (including capacity trapped both inter- and intra-regionally) would limit capacity available for transfer from the South Region – currently estimated at 1.5 to 3.0 GW.
Next Steps

• Continue refinements to current analysis and work with Load Serving Entities to double check survey responses

• Provide visibility on zonal resource adequacy (early Feb.)

• Establish South to Central/North capacity transfer availability

• Evaluate potential solutions to stranded capacity resources under varying conditions

• Establish specific availability and use conditions of load modifying resources

• Eliminate barriers to efficient capacity transactions
Optimizing the System at Seams Will Maximize Benefits and Deliver More Value