The Future of Baseload Capacity

Gulf Coast Electricity Transmission Summit

October 16, 2014

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MISO’s Scope

- End-use Customers: 42 million
- Maximum Demand: 126,000 MW
- Transmission (69 - 500kV): 66,000 miles
- Generation: 176,000 MW
- Market Participants: 391
- Gross Market Charges: $20.3 billion (2013)
Summary

- Of the four major baseload capacity types:
  - Coal capacity is retiring and not being replaced in kind
  - Nuclear can be built in regulated states but not elsewhere
  - Hydro is essentially built-out
  - Gas is the remaining choice

- Renewables are being pushed at the federal and state levels with both policy and financial incentives.

- Renewables are intermittent but can approach baseload status through broad geographic implementation.

- If you can’t build traditional resources then non-traditional resources have to be considered…new solutions must be adopted.
Traditional baseload capacity in the Eastern Interconnect (EI) is primarily a mix of coal, gas, oil and nuclear resources…

- **EI Capacity = 12%**
- **MISO Capacity = 7%**

- **EI Capacity (Gas CC + Oil) = 25%**
- **MISO Capacity (Gas CC) = 25%**

- **EI Capacity = 35%**
- **MISO Capacity = 40%**

- **EI Capacity = 5%**
- **MISO Capacity = 1%**
...but the generation fleet in MISO and EI is being affected by fuel prices, energy policies and multiple environmental regulations.

**Nature of Regulation**

- **MATS**
  - Mercury and Air Toxics Standards

- **CSAPR & CWIS**
  - Cross State Air Pollution Rule and Cooling Water Regulations (316(b))

- **Clean Power Plan 111(b) & (d)**
  - CO$_2$ from existing and new power plants

- **NAAQS & Coal Ash**
  - New air quality standards/Coal ash storage

**Compliance Dates**

- **MATS**
  - 2015 / 2016

- **CSAPR & CWIS**
  - As early as 2015

- **Clean Power Plan 111(b) & (d)**
  - 2015/16 (New)
  - 2020 & beyond (Existing)

- **NAAQS & Coal Ash**
  - ??

**Impacts**

- **MATS**
  - Significant coal retirements
  - Outage coordination challenges
  - Shrinking reserve margins around MISO
  - Growing dependence on natural gas

- **CSAPR & CWIS**
  - NO$_x$ requirements tightened
  - Higher plant compliance costs influence retirement decisions

- **Clean Power Plan 111(b) & (d)**
  - New coal requires CCS; baseload capacity options reduced
  - Significant coal retirements
  - Increased dependence on gas and carbon neutral resources

- **NAAQS & Coal Ash**
  - Increased costs
  - Other potential impacts depend on regulations

These impacts will change the baseload resource mix, erode reserve margins and increase reliability risk.
In 2011, MISO projected 12.6 GW of coal retirements by 2016 primarily due to MATS.

Since 2012, MISO has conducted quarterly surveys of asset owners in its footprint to better understand compliance plans and unit status.

Approximately 15% of coal capacity in the MISO footprint is projected to retire by 2016.
Capacity retirements currently modeled by MISO range from 12 GW to 30 GW
One carbon management strategy alone may not be able to achieve emission reduction targets.
Preliminary results show that, for given policy and economic conditions, certain combinations of carbon reduction strategies are more cost effective than others. Strategies modeled do not represent an exhaustive range of compliance options.
Future baseload capacity may look very different…

If economics and/or regulations prohibit the construction of traditional electric generation baseload resources, non-traditional resources must be considered and new solutions must be adopted.
29 states + Washington DC and 2 territories have Renewable Portfolio Standards (8 states and 2 territories have renewable portfolio goals)

Source: DSIRE™ - Database of State Incentive For Renewables & Efficiency
Gas prices have historically been volatile; analysts forecast less price volatility

Historical Henry Hub gas price from the Energy Information Administration (8/2014).

Nominal Henry Hub natural gas price forecasts for MISO’s 2015 regional transmission planning process.
Resource forecasts from MISO’s MTEP15 study process project build-out of renewable and gas resources.
Current paradigm

Goal
Minimum Total Cost: Energy, Capacity and Transmission

Local Model
High Capacity Cost
Low Transmission Cost

Regional Model
High Transmission Cost
Low Capacity Cost

Total Cost ($)

H Capacity Cost L
L Transmission Cost H
Future baseload structure will require a larger regional transmission system to help maintain reliability.

<table>
<thead>
<tr>
<th>Total Cost ($)</th>
<th>Local Model</th>
<th>Regional Model</th>
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</thead>
<tbody>
<tr>
<td>Diversity Requirements</td>
<td>More gas, less emissions free</td>
<td>More emission free</td>
</tr>
<tr>
<td>Transmission Cost</td>
<td>Lower Transmission Need/Cost</td>
<td>Higher Transmission Need/Cost</td>
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Goal: Minimum Total Cost: Energy, Capacity and Transmission
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