Initial Results for MISO’s Near-Term Analysis of EPA’s Final Clean Power Plan

Planning Advisory Committee
December 16, 2015
MISO will report key findings ahead of the coming deadlines that states must meet

MISO’s Goals:

- Inform policymakers as they formulate compliance strategies
- Enable the reliable, efficient implementation of CPP-related policy decisions made by our member-states and asset-owners

<table>
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<th>MISO’s timeline for analyzing the Clean Power Plan (through 2018)</th>
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<td>Near-Term Modeling</td>
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<td>Understanding compliance pathways</td>
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<td>Mid-Term Modeling</td>
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<td>Preparing for transmission overlay development</td>
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<td>Long-Term Modeling</td>
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<td>Developing transmission overlay</td>
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EPA’s timeline for states to implement the Clean Power Plan (through 2018)

- Sep 2015 - Feb 2016: Near-term analysis
- Jan 2016 - Jun 2016: Mid-term analysis
- Sep 2016: Initial State Plans (or request for extension) due
- Nov 2017: Deadline for EPA to issue federal plan for states failing to submit approvable plan*
- Sep 2018: All final state plans due

*While this date is the initial deadline for the EPA, they have indicated they will issue a federal plan for states failing to submit one as soon as possible.
MISO validated its CPP modeling by confirming the CO₂ reduction potential of EPA's building blocks
A range of sensitivities was modeled to provide insight into various compliance strategies.

<table>
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<tr>
<th>Modeling Parameter</th>
<th>Sensitivities Modeled</th>
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<tr>
<td>Demand and energy growth rates</td>
<td>0.8% (reference)</td>
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<tr>
<td>Natural gas prices* ($/MMBtu)</td>
<td>4.30 (reference), +/- 2.00</td>
</tr>
<tr>
<td>Renewable Portfolio Standards</td>
<td>Existing RPS mandates (reference, ~14%), 20% Regional RPS, 30% Regional RPS</td>
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<tr>
<td>CO₂ costs ($/ton CO₂)</td>
<td>0 (reference), 10, 25, 50, 100</td>
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<tr>
<td>Incremental coal retirements** (% of nameplate capacity)</td>
<td>No additional retirements (reference), 12.5% (7 GW), 25% (14 GW), 37.5% (21 GW), 50% (28 GW)</td>
</tr>
<tr>
<td>Energy efficiency (as a % of total energy sales)</td>
<td>Base (reference, EE mandates and goals), economic EE potential in BAU, economic EE potential in CPP</td>
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Every combination of the above sensitivities was modeled, totaling 675 simulations.

* Will be updated with current forecasts in mid-term modeling
**Beyond 12.6 GW of assumed MATS retirements
Results indicate flexibility in compliance strategies allows for lower compliance costs*

*Compliance costs are the difference between production and supply/demand side resource costs from reference case costs. This does not include electric and gas infrastructure costs. CO\textsubscript{2} costs are used solely as dispatch modifiers and are not included here.
Costs of compliance strategies are greatly influenced by natural gas prices

*Compliance costs are the difference between production and supply/demand side resource costs from reference case costs. This does not include electric and gas infrastructure costs. CO₂ costs are used solely as dispatch modifiers and are not included here.
Coal capacity retirements may be likely, but depend significantly on other variables.

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Next steps

• January PAC
  – Present additional near-term analysis results
Contact info

• EPA regulations webpage
  https://www.misoenergy.org/WhatWeDo/EPARegulations/Pages/111(d).aspx

• Additional questions? Please contact:
  Jordan Bakke at jbakke@misoenergy.org
The final rule study will evaluate CPP compliance pathways and inform the transmission planning process

<table>
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<tr>
<th>Near-Term Modeling (Understanding compliance pathways)</th>
<th>Mid-Term Modeling (Preparing for transmission overlay development)</th>
<th>Long-Term Modeling (Developing transmission overlay)</th>
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<tbody>
<tr>
<td>- Rate vs. mass comparison</td>
<td>- Potential generation retirements</td>
<td>- Will be informed by state compliance plans</td>
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<tr>
<td>- Rate and mass interactions</td>
<td>- Optimal resource expansion</td>
<td>- Will use futures formulated through MTEP17 process</td>
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<tr>
<td>- State vs. regional compliance</td>
<td>- Wind/solar zones</td>
<td>- Updates to assumptions as needed over MTEP18 and ‘19 cycles</td>
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<tr>
<td>- Trading options</td>
<td>- Renewables penetration/mix</td>
<td></td>
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<tr>
<td>- Federal plan</td>
<td>- Renewables siting</td>
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<tr>
<td>- Range of compliance sensitivities</td>
<td>- Thermal siting with new ozone rule</td>
<td></td>
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<tr>
<td>- Relative compliance costs</td>
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Using Existing PLEXOS and EGEAS models*

Using new EGEAS models* and external research

Using new EGEAS, PLEXOS and PROMOD models

*MISO’s CPP Final Rule Study

- Existing draft rule models will be updated with final rule parameters.
- Evaluated using three proposed CPP futures.
EE levels by color

Carbon emissions in 2030 compared to equivalent mass-based reduction target (tons)

20-year Net Present Value of Compliance Costs ($B)

Zone of Non-Compliance

Zone of Over Compliance

Target

*Compliance costs are the difference between production and supply/demand side resource costs from reference case costs. This does not include electric and gas infrastructure costs. CO$_2$ costs are used solely as dispatch modifiers and are not included here.
RPS levels by color

Zone of Non-Compliance

Zone of Over Compliance

Target

20-year Net Present Value of Compliance Costs ($B)

Carbon emissions in 2030 compared to equivalent mass-based reduction target (tons)

Renewable Builds

RPSL  RPSM  RPSH

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CO2 price by color

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