The results of MISO’s analysis are not recommendations. Instead, they are intended to help policymakers understand impacts of the CPP on the MISO system. As a reminder, the scope of this analysis was developed with stakeholder input before the U.S. Supreme Court decided to stay the CPP while it is being litigated. MISO respects that some states have scaled back or halted work on CPP-related matters in light of the court’s decision.
While EPA’s Clean Power Plan (or other carbon rules) may affect the electric industry in the future, many other forces are already having major impacts.

**Environmental / Regulatory**
- Mercury & Air Toxics Standards (MATS)
- Air-quality standards for ozone, SO₂, etc.
- *Potential greenhouse gas regulations*

**Economics**
- Low-cost natural gas
- Economic recovery
- Demand growth shift
- Infrastructure investment

**State & Federal Policy**
- Renewable portfolio standards
- Energy efficiency/demand-side management programs
- Tax credits
- FERC orders addressing demand response participation in wholesale energy markets

**Evolving Technologies**
- Wind power
- Solar energy
- Energy storage
- Distributed generation
- Load-modifying resources

**Electric Industry**
Study started with a resource forecasting screening analysis to determine effective compliance strategies and a range of compliance costs.

Compliance costs are the difference between production and supply/demand side resource costs from reference case costs. This does not include carbon costs or transmission costs.

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
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 carbon costs or transmission costs.
The production cost model produces optimal hourly economic dispatch considering generation, transmission, and environmental constraints for the following fixed capacity expansion scenarios:

<table>
<thead>
<tr>
<th>Business-as-Usual (BAU)</th>
<th>CPP Constraints (CPP)</th>
<th>Coal-to-Gas Conversions (C2G)</th>
<th>Gas Build-Out (GBO)</th>
<th>Gas, Wind, Solar Build-Out (GWS)</th>
<th>High EE, Wind, Solar Build-Out (EWS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumptions consistent with MTEP15 BAU economic planning model</td>
<td>CPP constraints applied</td>
<td>25% of coal capacity per region is incrementally converted to run on natural gas</td>
<td>25% of coal capacity per region is incrementally retired</td>
<td>30% of coal capacity per region is incrementally retired</td>
<td>EE at 1.5% of energy sales beginning in 2020 with 1.5% year-over-year growth</td>
</tr>
<tr>
<td>12.6 GW of MATS-related coal retirements in MISO</td>
<td></td>
<td>New gas-fired generators are built to compensate for retired capacity</td>
<td>13% of the retired capacity is replaced by new gas units</td>
<td>17% by wind + solar</td>
<td>15% footprint-wide RPS</td>
</tr>
</tbody>
</table>

Assumptions applied across all scenarios

CPP constraints applied
As new non-CO$_2$ emitting resource penetration increases, rate-based compliance becomes less expensive.

Each scenario includes a resource mix that is assumed to have been built due to economic or policy drivers other than the CPP, and compliance impacts are measured using this resource mix.
Under rate-based compliance, continued investment in non-CO$_2$ emitting resources is necessary to mitigate CO$_2$ price increases

- Less stringent initial compliance targets lead to lower CO$_2$ prices in early years
- Early deployment of renewables drives down CO$_2$ prices under rate-based compliance
- Continued deployment of renewables is needed to sustain these lower prices
- Coal retirements have a bigger impact on CO$_2$ prices under mass-based compliance
System dispatch faces relatively less change under mass-based compliance
Most states see a mass-based compliance advantage unless a regional heavy penetration of renewables and energy efficiency is achieved.

Blue indicates lower production costs under sub-category rate compliance. Green indicates lower production costs under mass compliance.

Gradient charts show the relative difference between rate-based production costs and mass-based production costs, when all states use the same compliance mechanism.

If all states move towards non-CO₂ emitting resources the rate/mass advantage holds, but if a small number of states move towards non-CO₂ emitting resources they will see a rate advantage.
Under a ‘patchwork’ mix of both rate & mass compliance, states with a rate advantage may lose that benefit if other states go mass.

Patchwork models use the 2030 CPP scenario.

As the process of creating patchwork model is iterated, individual states without a strong advantage between rate and mass will tend toward the regional compliance advantage.
Retirement analysis identifies coal capacity that could retire under various levels of CO\textsubscript{2} reduction

**Reductions by 2030 from 2005 levels**
- Partial CPP models a 17% emission reduction
- Final CPP models a 34% emission reduction
- Accelerated CPP models a 43% emissions reduction

Reference case does not include CPP constraints.

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
A range of coal capacity retirement levels was modeled for each CO₂ reduction scenario.

Retirement levels that produce a minimum range of total system costs are identified for each scenario.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Range (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final CPP</td>
<td>16 – 21</td>
</tr>
<tr>
<td>Accelerated CPP</td>
<td>24 – 30</td>
</tr>
<tr>
<td>Partial CPP</td>
<td>8 – 11</td>
</tr>
</tbody>
</table>

*Dollar figures are 2016 USD in billions and include capital and production costs.*
A single retirement level was then selected for each scenario based on resultant emissions reduction and system cost*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Coal Retirement Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial CPP</td>
<td>8 GW</td>
</tr>
<tr>
<td>Final CPP</td>
<td>16 GW</td>
</tr>
<tr>
<td>Accelerated CPP</td>
<td>24 GW</td>
</tr>
</tbody>
</table>

Dotted lines = emission targets
Solid lines = emissions resulting from modeled retirements

* System costs include capital and production costs
MISO’s Analysis of the final Clean Power Plan

MISO’s CPP Workshop – What is in the final rule?

CPP Analysis Scope:

Regional near-term modeling results:

State impacts from regional results of near-term modeling:

Mid-term modeling results:

Final Report on MISO’s CPP Analysis:

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

Additional questions? Please contact:
Jordan Bakke at jbakke@misoenergy.org
Maire Waight at mwaight@misoenergy.org
Appendix 1: Study structure
The final rule study evaluates CPP compliance pathways and will inform the transmission planning process

- **Near-Term Modeling** (Understanding compliance pathways)
  - Rate/mass comparison
  - Rate/mass interaction
  - State/regional compliance
  - Trading options
  - Compliance sensitivities
  - Relative compliance costs

- **Mid-Term Modeling** (Preparing for transmission overlay development)
  - Potential generation retirements
  - Optimal resource expansion
  - Renewables penetration
  - Renewables mix
  - Renewables siting

- **Long-Term Modeling** (Developing transmission overlay)
  - Will be informed by state compliance plans
  - Will use futures formulated through MTEP17 process
  - Updates to assumptions as needed over MTEP18 and ‘19 cycles

**MISO’s CPP Final Rule Study**

MISO’s near-term analysis does not attempt to recommend compliance pathways, optimize the resource mix, identify optimal electric transmission expansion, or identify optimal gas pipeline expansion.
Different cost categories for CPP implementation require different models

- **Capital**
  - Resource Forecasting Models

- **Production**
  - Production Cost Models

- **Transmission**
  - Production Cost Models
  - Reliability Models

- **Gas Pipeline**
  - Resource Forecasting Models
  - Gas Pipeline Models

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
What tools can we use to study impacts of the CPP and other drivers of industry transition?

**Reliability Models**
- Tell us what transmission upgrades are needed to maintain system reliability; quantify potential voltage, thermal and stability impacts.

**Production Cost Models**
- Tell us how resources are dispatched and where there is transmission system congestion; simulates market behavior.
- Energy production costs are factored into the model.

**Resource Forecasting Models**
- Tell us the type, timing and amount of new resources needed to serve future load.
- Resource capital costs and energy production costs are factored into the model.

**Gas Pipeline Models**
- Tell us impacts on gas pipeline flows and gas storage usage.
- Economics of producing and shipping gas are factored into the model.
What is MISO doing to understand and plan for the CPP?

<table>
<thead>
<tr>
<th>MTEP (Planning for a wide range of futures)</th>
<th>Base Business Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP Draft Rule Study</td>
<td>Resource forecasting models</td>
</tr>
<tr>
<td></td>
<td>Production cost models</td>
</tr>
<tr>
<td>CPP Final Rule Study</td>
<td>Resource forecasting models</td>
</tr>
<tr>
<td></td>
<td>Production cost models</td>
</tr>
<tr>
<td>CPP MISO-PJM Study</td>
<td>Resource forecasting models</td>
</tr>
<tr>
<td></td>
<td>Production cost models</td>
</tr>
<tr>
<td>CPP State Reliability Assessment</td>
<td>Reliability models</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ad-hoc Studies

- Resource forecasting models
- Production cost models
- Reliability models
- Gas pipeline models
The EPA altered the building blocks in the final rule and switched to defining BSER on a regional level

<table>
<thead>
<tr>
<th>Final Clean Power Plan Building Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heat rate improvement at existing coal-fired EGUs (assuming best practices and equipment upgrades)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best System of Emission Reduction (BSER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Interconnection</td>
</tr>
<tr>
<td>4.3%</td>
</tr>
<tr>
<td>Western Interconnection</td>
</tr>
<tr>
<td>Texas Interconnection</td>
</tr>
</tbody>
</table>
Appendix 2: Additional Model Inputs and Outputs
Notes

The results of MISO’s analysis are not recommendations. Instead, they are intended to help policymakers understand impacts of the CPP on the MISO system. As a reminder, the scope of this analysis was developed with stakeholder input before the U.S. Supreme Court decided to stay the CPP while it is being litigated. MISO respects that some states have scaled back or halted work on CPP-related matters in light of the court’s decision.

- All models assume reliability is maintained through the addition of new resources
- Models reflect current generation, assumed retirements and resource expansion, including
  - Units with signed Generator Interconnection Agreements (GIA)
  - Resources forecasted as part of the MTEP15 7-step process to meet planning reserve margins and renewable portfolio standards
- Additional scenarios look at other possible resource changes beyond current trends with the assumption that the changes would occur regardless of the CPP
- Results in this presentation model:
  - Trading ready sub-category rate and mass based compliance
  - Interstate energy and emissions trading across the Eastern Interconnect
- Generators are counted for compliance in the state in which they are physically located
Modeled 77 cases to reflect a range of potential compliance actions and pathways

<table>
<thead>
<tr>
<th>Reference case (BAU) (3 runs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Business-as-usual (BAU) model includes known and forecasted resource plans</td>
</tr>
<tr>
<td>• 3 years (2022, 2025, 2030)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BAU + CPP constraints (39 runs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No change in capacity (MW) from BAU</td>
</tr>
<tr>
<td>• CPP constraints applied at state, regional and Eastern Interconnection levels</td>
</tr>
<tr>
<td>• Average rate, sub-category rate, mass, mass/NSC*, mixed mass**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative resource scenarios + CPP constraints (24 runs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Change in capacity (MW) from BAU</td>
</tr>
<tr>
<td>• CPP constraints applied at the Eastern Interconnection level</td>
</tr>
<tr>
<td>• Sub-category rate, mixed mass**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensitivities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Patchwork mix of Rate and Mass</td>
</tr>
<tr>
<td>• Gas prices</td>
</tr>
<tr>
<td>• w/wo Fermi 3</td>
</tr>
</tbody>
</table>

* NSC = New Source Complement
** Mixed mass = MISO states comply under mass target and non-MISO regions comply under mass + NSC targets

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
In the CPP scenario, coal unit capacity factors decrease greatly over time under the CPP, more dramatically with a rate-based implementation.

Coal units run more in the near term under rate-based compliance and in the long term under mass-based compliance.
Coal unit capacity factors with coal retirements and significant penetration of renewables

Each point on the graph represents a single coal unit’s capacity factor. For example, 45% of the coal units in the 2030 rate scenario have a capacity factor greater than ~60%.

Low capacity factors indicate units may not be economically viable.
Coal units face increased risks under CPP compliance

In 2030, both compliance pathways increase coal cycling, ramping, hours offline and units idled compared to the BAU.

As the stringency of compliance increases, coal units move from dispatching as baseload to intermediate to peaking units.

Intermediate units tend to see the most operational performance impacts.

Coal units cycle and ramp less in rate-based compliance because they are running less often.

PLEXOS modeling includes certain coal unit operating constraints: minimum up time, minimum down time, ramp rates, start costs, min/max capacity, heat rate curves, variable O&M, maintenance and outages.
Mass-based compliance produces a more balanced mix of buyers and sellers within MISO

States selling ERCs see more value under rate-based compliance.

Mass-based compliance produces a more balanced mix of buyers and sellers within MISO.

Modeling includes Fermi 3 in Michigan. Vertical lines show range of emission trading over all scenarios. Resource forecast siting assumptions influence the outcome of rate/mass advantage.

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Mass-based compliance produces a more balanced mix of buyers and sellers within MISO

Resource forecasting siting assumptions influence the outcome of rate/mass advantage.

Modeling includes Fermi 3 in Michigan.
Generation will rise/fall in similar locations under both rate & mass, so transmission expansion, if needed, will be similar under both rate & mass.

Maps shown result from the CPP scenario.

While the magnitude and location of impacts on generation change with varying capacity expansion scenarios, within each scenario the impact of rate and mass compliance are similar.
Under current capacity trends, all MISO states have a mass based compliance advantage

(R) indicates a state is modeled under rate compliance, (M) indicates a state is modeled under mass compliance

<table>
<thead>
<tr>
<th>State</th>
<th>CPP 1st Mixed</th>
<th>CPP 2nd Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>SD</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>IL</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>IA</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>MO</td>
<td>(M)</td>
<td>(M)</td>
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<tr>
<td>MN</td>
<td>(M)</td>
<td>(M)</td>
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<tr>
<td>LA</td>
<td>(R)</td>
<td>(M)</td>
</tr>
<tr>
<td>TX</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>MI</td>
<td>(R)</td>
<td>(M)</td>
</tr>
<tr>
<td>MS</td>
<td>(R)</td>
<td>(M)</td>
</tr>
<tr>
<td>KY</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>WI</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>AR</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td>ND</td>
<td>(R)</td>
<td>(M)</td>
</tr>
</tbody>
</table>

A dark green box indicates that mass costs are less expensive.

A dark blue box indicates that rate costs are less expensive.

A change in cell color across columns indicates a change in compliance advantage.

An (R) in a green box indicates that although the state previously saw an advantage with rate, that advantage is lost when a group of other states choose mass compliance.

The CPP 2nd mixed rate/mass model results show that all input advantages match the output advantages, indicating the system has reached an equilibrium.
Gas generation & emissions under current resource trends

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Peak Day – GWS

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Shoulder Day – EWS

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
2030 Yearly Trends – EWS

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
Interconnection-wide curtailment of renewable energy does not change drastically between capacity scenarios, however unit-by-unit curtailment trends may differ based on siting of new RE.

Eastern Interconnection

- **Mass Curtailment (GWh)**
  - **BAU**: 7%
  - **GWS**: 6%
  - **EWS**: 6%
  - **GWS**: 8%
  - **EWS**: 6%

- **Rate**
  - **BAU**: 7%
  - **GWS**: 6%
  - **EWS**: 7%

Example Units

- **Mass Curtailment (GWh)**
  - **BAU**: 6%
  - **GWS**: 6%
  - **EWS**: 6%
  - **GWS**: 92%
  - **EWS**: 28%

- **Rate**
  - **BAU**: 6%
  - **GWS**: 69%
  - **EWS**: 6%
  - **GWS**: 75%
  - **EWS**: 7%

*Percentages shown are curtailment percentages of total available energy

- ERC-producing new RE is curtailed less in rate-based compliance, especially during times of negative prices.

<table>
<thead>
<tr>
<th>GWS Rate Compliance Scenario</th>
<th>GWS Mass Compliance Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative-Price Generation (MWh)</td>
<td>Negative-Price Unit-Hours</td>
</tr>
<tr>
<td>New Wind</td>
<td>5,589,543</td>
</tr>
<tr>
<td>Existing Wind</td>
<td>8,912</td>
</tr>
</tbody>
</table>
Appendix 3: Capacity Retirements and Expansion Maps
Coal-to-Gas (C2G) conversion sites
Gas Build-Out (GBO)

Retirement Sites

Expansion Sites

Results of MISO’s Analysis of EPA’s Clean Power Plan (October 2016)
Gas/Wind/Solar (GWS)

Retirement Sites

Expansion Sites

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
EE/Wind/Solar (EWS) expansion sites
Appendix 3: State Example Slides
The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

- In 2025 and 2030, the increasingly stringent targets lead Arkansas’ coal- and gas-heavy fleet to have a cost advantage under mass-based compliance.

- In the capacity scenarios studied, Arkansas needs to buy ERCs or allowances to maintain compliance, except when a large amount of coal retirements positions it as an allowance seller.
The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

In 2025 and 2030, the increasingly stringent targets lead Kentucky’s coal-heavy fleet to see a cost advantage under mass-based compliance except when a heavy penetration of renewables and EE leads to a convergence in rate and mass costs.

In all of the alternative capacity scenarios studied, Kentucky needs to buy ERCs or allowances to maintain compliance.

**Blue** indicates lower production costs under sub-category rate compliance.

**Green** indicates lower production costs under mass compliance.

Results of MISO’s Analysis of EPA’s Clean Power Plan (October 2016)
State Summary - Louisiana

Blue indicates lower production costs under sub-category rate compliance. Green indicates lower production costs under mass compliance.

- Under rate-based compliance, Louisiana’s steam turbine gas units are regulated under the same rate as steam turbine coal, and can therefore produce high-priced ERCs in 2030, creating additional value.

- Louisiana sees a cost advantage under rate-based compliance unless industry trends lead to replacement of coal units with natural gas.

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.
The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

In 2025 and 2030, the increasingly stringent targets lead Illinois to see a cost advantage under mass-based compliance except when a heavy penetration of renewables and EE leads to a rate-based cost advantage.

In most of the alternative capacity scenarios studied, Illinois is a net seller of ERCs and allowances, except when a regionally-heavy penetration of renewables and EE allows more other states to compete in the emissions market.
State Summary - Indiana

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

- In 2025 and 2030, the increasingly stringent targets lead Indiana’s coal-heavy fleet to see a cost advantage under mass-based compliance except when a heavy penetration of renewables and EE leads to a rate-based cost advantage.

- In the capacity scenarios studied, Indiana would need to buy allowances or ERCs to maintain compliance, except when a heavy penetration of gas or renewables positions it as a seller (GBO, GWS).
State Summary - Iowa

**Scenario Inputs**

- **Steam Turbine**
- **CC**
- **CT**
- **Renewable**
- **EE**
- **Nuclear**
- **Other**

- +1800 MW
- +676 MW

**Scenario Outputs**

<table>
<thead>
<tr>
<th>Year</th>
<th>CPP</th>
<th>C2G</th>
<th>GBO</th>
<th>GWS</th>
<th>EWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>2030</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- *Blue* indicates lower production costs under sub-category rate compliance.
- *Green* indicates lower production costs under mass compliance.

- Although the resource mix changed significantly on a regional level, Iowa's resource mix was not impacted under most scenarios. With no incremental renewables to produce ERCs under rate-based compliance, mass-based compliance is less expensive.

- Only about 40% of Iowa's renewable capacity in the CPP scenario is eligible to generate ERCs due to restrictions on installation dates.

- The increase in renewables and energy efficiency in the EWS scenario leads rate-based compliance to be less expensive than mass-based compliance.
Increasing change in system build-out from current state

<table>
<thead>
<tr>
<th></th>
<th>2022</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP w/o Fermi 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2G</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>GBO</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>GWS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EWS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Blue indicates lower production costs under sub-category rate compliance.
Green indicates lower production costs under mass compliance.

- In 2025 and 2030, Michigan has a strong rate-based compliance advantage in most scenarios due to the ERC-producing Fermi 3, scheduled to go in service in 2025. Conversely, without Fermi 3, mass-based compliance is shown to be less expensive.

- In the capacity scenarios studied, Michigan consistently is a net seller of ERCs and allowances, with or without the installation of Fermi 3.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

Scenarios include Fermi 3.

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.
State Summary - Minnesota

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

Blue indicates lower production costs under sub-category rate compliance.
Green indicates lower production costs under mass compliance.

- In 2025 and 2030, the increasingly stringent targets lead Minnesota to see a cost advantage under mass-based compliance except when a heavy penetration of renewables and EE leads to a rate-based cost advantage.

- In the capacity scenarios studied, Minnesota is a net buyer of allowances and ERCs, except when increased coal retirements position it as an allowance seller or increased renewable and EE penetration positions it as an ERC seller.
Blue indicates lower production costs under sub-category rate compliance.
Green indicates lower production costs under mass compliance.

- In 2030, the increasingly stringent targets lead Mississippi’s coal- and gas-heavy fleet to see a cost advantage under mass-based compliance except when a heavy penetration of renewables and new gas leads to a rate-based cost advantage.

- In the capacity scenarios studied, Mississippi is a net seller of allowances and a net buyer of ERCs unless a regionally-heavy penetration of renewables and EE positions it as an ERC seller.

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

Results of MISO's Analysis of EPA's Clean Power Plan (October 2016)
State Summary - Missouri

Blue indicates lower production costs under sub-category rate compliance.
Green indicates lower production costs under mass compliance.

- In 2025 and 2030, the increasingly stringent targets lead Missouri’s coal-heavy fleet to see a cost advantage under mass-based compliance, except when a heavy penetration of renewables and EE leads to a convergence in rate and mass costs.

- In the capacity scenarios studied, Missouri is a net buyer of ERCs and allowances, except when a large fleet transition from coal to gas in the state positions it as an allowance seller.

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.
State Summary - North Dakota

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

- In the alternate capacity scenarios, the increasingly stringent targets lead North Dakota’s coal-heavy fleet to see a cost advantage under mass-based compliance, in 2030 except when a heavy penetration of new renewables and EE leads to a rate-based cost advantage.

- North Dakota sees a rate-based cost advantage under current capacity trends as well, because 63% of the state’s renewable units qualify to produce ERCs due to their installation dates.
State Summary - South Dakota

Blue indicates lower production costs under sub-category rate compliance. Green indicates lower production costs under mass compliance.

- In 2025 and 2030, the increasingly stringent targets lead South Dakota to see a cost advantage under mass-based compliance.

- In the capacity scenarios studied, South Dakota is a net seller of ERCs and a net buyer of allowances unless a regionally-heavy penetration of renewables and EE positions it as a seller.

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario. As a result, EWS rate compliance would likely be less expensive than EWS mass.
State Summary - Wisconsin

The model assumes a regional heavy penetration of renewables and EE as an input to the EWS scenario.

As a result, EWS rate compliance would likely be less expensive than EWS mass.

Blue indicates lower production costs under sub-category rate compliance.
Green indicates lower production costs under mass compliance.

- In 2025 and 2030, the increasingly stringent targets lead Wisconsin’s coal- and gas-heavy fleet to see a cost advantage under mass-based compliance, except when a regionally-heavy penetration of renewables and EE lead to a rate-based cost advantage.

- In the capacity scenarios studied, Wisconsin is a net buyer of both ERCs and allowances.

Results of MISO’s Analysis of EPA’s Clean Power Plan (October 2016)