Utility name: Midcontinent Independent System Operator, Inc.

Contact information of person completing questions:

1. Please identify planned unit retirements
    a. Unit, capacity, date of planned retirement
    b. Plan for load replacement and rationale/estimated cost associated with that plan
    c. Are these planned retirements a result of the Clean Power Plan?
    d. Has your utility modified its retirement plans based on the final Section 111(d) rule?
    e. Is there a possibility that these plans will change based on the state compliance plan?
    f. What implications/costs would be involved if your utility needed to move a planned retirement date to assist with state compliance (e.g., a planned retirement is scheduled for 2035, but the retirement is moved to 2029)?

2. Please provide the estimated cost of compliance with the final Section 111(d) rule based on each of the following scenarios or assumptions:

    a. Missouri uses a mass-based approach and allocates allowances pro-rata based on an historical baseline (sometimes referred to as grandfathering) using one of the following parameters:
        i. CO2 emissions
        ii. Heat input
        iii. Net Generation
    b. Missouri uses a mass-based approach as described in scenario "a" and allowances are either:
        i. Irrevocable even if a unit retires or
        ii. Redistributed to existing affected units if a unit retires
    c. Missouri uses a mass-based approach and allocates allowances as described in Scenario "a" and includes set-asides for one or more of the following:
        i. Renewable energy projects
        ii. Energy efficiency projects
        iii. Existing NGCC output-based
    d. Missouri uses a mass-based approach and allocates allowances based on updating output-based allocations where affected sources and potentially one or more of the following are eligible to receive allocations based on their pro-rata share of updated generation levels each compliance period:
        i. Renewable generating resources that began operation post 2012
        ii. New/uprated nuclear
        iii. Energy from qualified biomass
        iv. Energy savings from post 2012 demand-side energy efficiency measures
    e. Missouri uses a mass-based approach and, similar to the RGGI regional auction model, auctions allowances with proceeds deposited into an energy efficiency investment fund. Assume a market clearing price per allowance of:
        i. $5.50;
        ii. $7.50.

f. Missouri uses a mass-based approach and allocates allowances as described in Scenarios "a" or "d" and includes a new source complement.
g. Missouri uses a mass-based approach and allocates allowances as described in Scenarios "a" and "d" and sets aside five percent (5%) of allowances for renewable energy or energy efficiency.
h. Missouri takes advantage of the Clean Energy Incentive Program.

MISO is conducting an analysis of the final Clean Power Plan in multiple phases. The goal of the analysis is to provide our member-states and asset owners with objective information that can be utilized as they contemplate compliance strategies, and to ensure that CPP implementation does not jeopardize reliability or undercut the benefits of economic dispatch. The analysis entails three phases and will be ongoing through November 2018.

The first phase, near-term modeling, will help states and asset owners understand different compliance pathways. Modeling efforts include rate and mass interactions, state vs regional compliance, trading options, relative compliance costs, and ranges of compliance sensitivities across various parameters.

Attached to this response, as Exhibit A are materials that show near-term modeling results to date. Observations of these results are described in the materials, and can be summarized as:

- Flexibility in compliance strategies allows for lower compliance costs.
- Compliance costs are subject to the directional path of various parameters, notably future gas prices.
- Early compliance targets can be met through state-based renewable portfolio standards and re-dispatch of the current generation fleet. The MISO region transmission Multi-Value Projects (MVPs) are leveraging renewable generation for the benefit of the entire region. However, comprehensive planning needs to start today to meet increasingly stringent compliance targets in the mid-2020s and beyond.
- New non-CO2 emitting resources would be needed to mitigate significant changes in generation dispatch under rate-based compliance.
- The coal fleet faces increased risks under the Clean Power Plan.
- New non-CO2 emitting resource are needed to mitigate CO2 emissions/allowance prices increases.
- System dispatch faces relatively less change under mass-based compliance, and thus may require less capital investment.

Mid-term modeling, scheduled to conclude in June, 2016, will help prepare for potential transmission overlay development. The mid-term modeling analysis will contemplate potential generation retirements, optimal resource expansion, renewables siting, penetration, and location. In addition, the modeling will constrain thermal siting to relevant ozone rule compliance. Analyses will be conducted using three proposed futures: a future that assumes full compliance with the Clean Power Plan, a future that assumes further compliance beyond the requirements of the Clean Power Plan, and a future that assumes less-than-full compliance with the Clean Power Plan. By modeling these three futures, MISO's stakeholders can better understand the breadth of "no regret" activities as well as actions necessary to ensure compliance and pursue further goals.

The goal of MISO's long-term modeling, scheduled to occur between July 2016 and November 2018, is to develop a transmission overlay for use in MISO's MTEP process. The long-term modeling will be informed by state compliance plans.

While MISO has not completed analyses directly responsive to this request, MISO looks forward to opportunities to assist the Commission, and will continue to provide updates as modeling efforts continue.

3. Please describe any anticipated reliability issues or capacity constraints if Missouri implements a compliance plan that includes the following scenarios or assumptions:
    a. Missouri uses a mass-based approach and allocates allowances pro-rata based on an historical baseline using one of the following parameters:
        i. CO2 emissions
        ii. Heat input
        iii. Net Generation
    b. Missouri uses a mass-based approach as described in scenario "a" and allowances are either:
        i. Irrevocable even if a unit retires or
        ii. Redistributed to existing affected units if a unit retires
    c. Missouri uses a mass-based approach and allocates allowances as described in Scenario "a" and includes a set-aside for one or more of the following:
        i. Renewable energy projects
        ii. Energy efficiency projects
        iii. Existing NGCC output-based
    d. Missouri uses a mass-based approach and allocates allowances based on updating output-based allocations where affected sources and potentially one or more of the following are eligible to receive allocations based on their pro-rata share of updated generation levels each compliance period:
        i. Renewable generating resources that began operation post 2012
        ii. New/uprated nuclear
        iii. Energy from qualified biomass
        iv. Energy savings from post 2012 demand-side energy efficiency measures
    e. Missouri uses a mass-based approach and, similar to the RGGI regional auction model, auctions allowances with proceeds deposited into an energy efficiency investment fund. Assume a market clearing price per allowance of:
        i. $5.50;
        ii. $7.50.
    f. Missouri uses a mass-based approach and allocates allowances as described in Scenarios "a" or "d" and includes a new source complement.
    g. Missouri uses a mass-based approach and allocates allowances as described in Scenarios "a" and "d" and sets aside five percent (5%) of allowances for renewable energy or energy efficiency.
    h. Missouri takes advantage of the Clean Energy Incentive Program.

While MISO has not completed analysis directly responsive to this request, MISO looks forward to opportunities to assist the Commission, and will continue to provide updates as modeling efforts continue.

4. If Missouri uses a mass-based approach without a new source complement and allocates fixed irrevocable allowances pro-rata based on an historical baseline without any set-asides, to what extent would your company's compliance approach likely rely upon purchasing allowances from the market and/or building new natural gas combined cycle capacity? Explain if and how this would this change if the new source complement and/or an alternative allowance allocation process were used?

5. Are you aware of an approach that Missouri may be able use in its plan to address emissions leakage to new units while minimizing cost and reliability impacts? If so, explain the approach. If not, which approaches to address emissions leakage in the state plan would be most likely to increase cost or cause reliability concerns?

MISO recently held a workshop to explain the concept of leakage, and provisions included in the Clean Power Plan that states can use to address leakage, including, but not limited to, the New Source Complement. Attached to this response, as Exhibit B are materials from the workshop hosted by MISO on November 6th, 2015. Specifically, pages 32 through 37 explain leakage concepts, summarize the options that are provided to states to mitigate leakage in their compliance plans, and explain the New Source Complement.

6. If Missouri takes advantage of the Clean Energy Incentive Program, will your utility's current plans for plant investment be modified? If yes, please explain.

7. Are there drawbacks to Missouri taking advantage of the Clean Energy Incentive Program? If yes, please explain.

8. Are there drawbacks to setting aside allowances for renewable energy or energy efficiency projects other than the Clean Energy Incentive Program? If yes, please explain.

9. Are there drawbacks to auctioning allowances? If yes, please explain.

10. Is there a trading approach that will mitigate any anticipated reliability concerns or capacity constraints (i.e., is there a specific combination of states, RTOs, trading ready etc.)?

MISO's near-term modeling includes modeling of state-by-state compliance, and regional compliance. We anticipate that State-by-state results will be available in mid-February, 2016, and can be shared with the Commission. As a general matter, experience indicates that larger-scale compliance approaches utilize economies of scale to reduce compliance costs. A regional compliance approach should be less costly for the MISO region than a series of state-by-state approaches. This cost savings increases when considered together with the already-realized benefits of regional coordinated reliability and market services, the benefits of which could be reduced by sub-regional compliance approaches. See MISO's near-term results, provided with this response, for more information.

11. Is there a trading approach that will minimize the estimated cost of compliance?

See response to question 10 above. Near-term modeling points to mass-based approaches as lower-cost than rate-based approaches, and regional compliance approaches as lower-cost than sub-regional approaches.

12. Could another state's approach to CPP compliance (rate vs. mass, allocation approaches, trading approaches, new source complement, etc.) affect your utility's compliance with the CPP in Missouri? If yes, please explain.

13. Could another state's approach to CPP compliance affect your utility's compliance with the Renewable Energy Standard in Missouri? (For example choosing to bundle Emission Rate Credits with Renewable Energy Credits.) If yes, please explain.

14. To what extent will your utility's existing renewable resources or RECs and existing energy efficiency programs contribute to compliance with the CPP in Missouri? In other states? Please explain.

15. Will statutory or regulatory changes be needed to facilitate Missouri's compliance with the CPP? Please explain.

16. Does your utility anticipate any changes or impacts to its long-term planning or IRP related to the submission of transmission plans or reliability checks, and specifically as those changes relate to work with the RTOs or AECI?

17. Does MISO have any Attachment Y concerns that could cause a delay in implementing a state CPP compliance plan?

    It is too early in the process to definitively state whether generator retirements undertaking MISO's Tariff provisions under Attachment Y could delay implementation of a state's CPP compliance plan. Generator retirement actions and necessitated Attachment Y activity is dependent on how a state may choose to comply. MISO's tariff provides flexibility for asset owners to plan for future retirement implications such that they can successfully implement a state's CPP compliance plan. For example, MISO's tariff includes Attachment Y-2 informational studies for potential generation retirements that can help asset owners make informed retirement decisions. The Attachment Y provisions of MISO's tariff exist to ensure that retiring assets do not cause reliability issues. The Clean Power Plan addresses the need to consider reliability by requiring that the states' compliance approaches undergo a reliability assessment. MISO is currently working with states and the Organization of MISO States to define a process and schedule for conducting reliability assessments of state plans.

18. Does SPP envision a situation where there could be potential reliability conflicts between the CPP and North American Electric Reliability Corporation standards which will compel delays in scheduled generator retirements?

19. Does AECI envision a situation where there could be potential reliability conflicts between the CPP and North American Electric Reliability Corporation standards which will compel delays in scheduled generator retirements?

20. Does your utility expect adequate coordination between MISO, SPP, and AECI in order to facilitate CPP compliance? What is your utility doing to communicate with these entities regarding CPP compliance? Please explain.

21. What steps are MISO, SPP, and/or AECI taking to ensure adequate coordination with each other and their members regarding CPP compliance? Please explain.

SPP, MISO, and AECI have begun discussions in an effort to develop a coordination plan that will be provided to Missouri and other affected states upon completion. The coordination plan is expected to include 1) general scoping and timing expectations for studies to be performed, 2) information needed from Missouri and other affected states to facilitate study performance, 3) and guidelines for coordination among the study participants.

22. What transmission and/or distribution upgrade or building needs does your utility anticipate as a result of the CPP (e.g., new lines, upgrades to transformers or substations, AMI)?

As discussed in MISO's response to question 2, long-term planning and modeling CPP compliance (scheduled to begin in July 2016), will both reflect, and further inform, MISO's MTEP transmission planning process.

23. MISO and Platts recently estimated (http://www.platts.com/latest-news/electric-power/houston/misos-expected-cost-to-comply-with-us-cpp-varies-21631026) that changes in several factors, including the price of natural gas (between $2.30 to 6.30/MMBtu), could lead to large ranges in the potential cost of compliance with the CPP. How does your utility plan to mitigate the risk of compliance cost overruns due to natural gas market uncertainties?

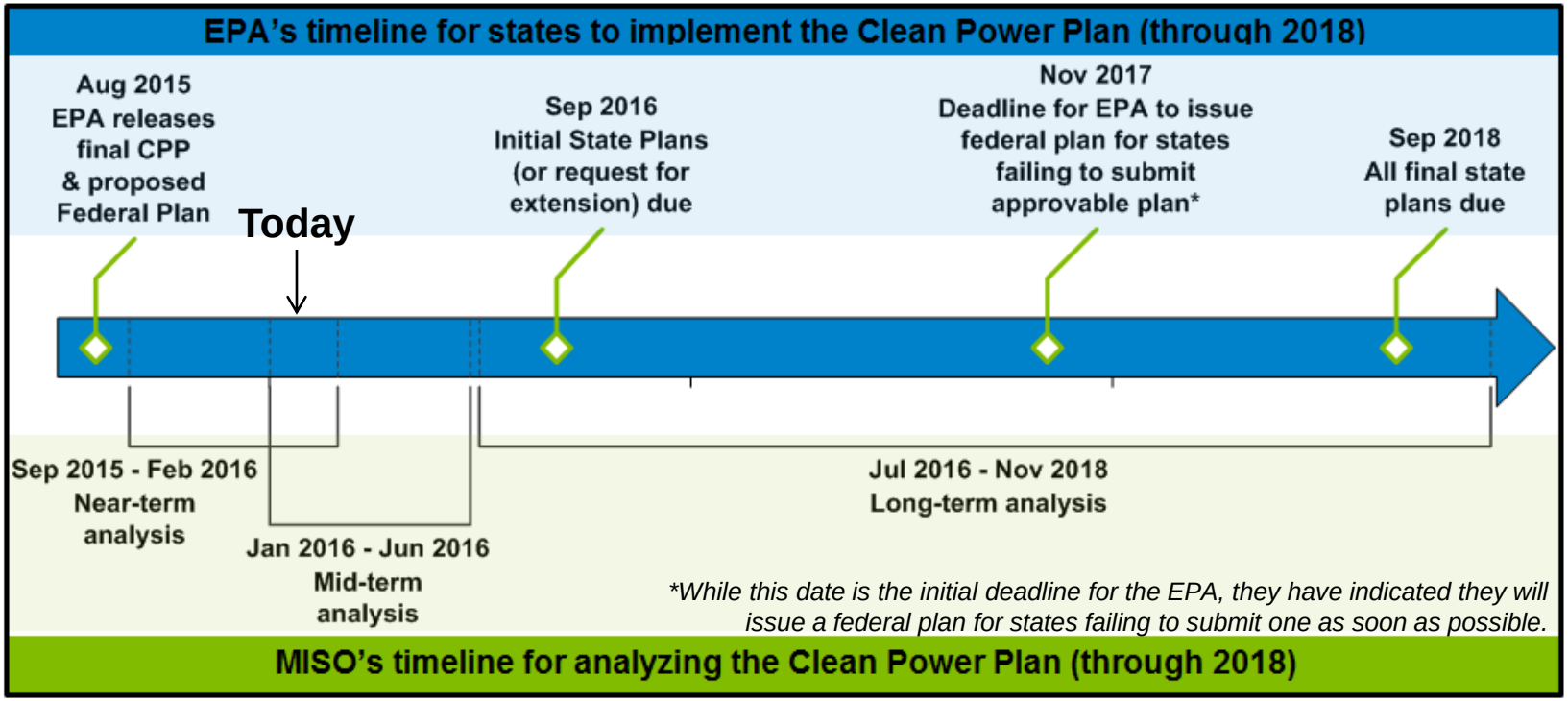
Results for MISO's Near-Term Analysis of EPA's Final Clean Power Plan

Planning Advisory Committee
January 20, 2016

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



Near-Term Modeling
Understanding compliance pathways

Mid-Term Modeling
Preparing for transmission overlay development

Long-Term Modeling
Developing transmission overlay

Key observations

◯	***Under current resource trends and regional trading…***
1	Regionally, mass-based compliance is less expensive than rate-based compliance, with the gap increasing over time.
	Early compliance targets can be met through renewable portfolio standards and coal to gas re-dispatch, but comprehensive planning needs to start today to meet increasingly stringent compliance targets in the mid-2020s.
2	New non-CO_2 emitting resources would be needed to mitigate large changes in generation dispatch under rate-based compliance.
3	The coal fleet faces increased risks under the CPP.
◯	***Under current and alternative resource trends and regional trading…***
4	New non-CO_2 emitting resources would be needed to mitigate CO_2 price increases.
5	System dispatch faces relatively less change under mass-based compliance, and thus may require less capital investment.

Important Caveats

- **Models assume all states choose either trading-ready mass or trading-ready rate**
- **Models assume a liquid carbon market**
- **Transmission infrastructure and gas infrastructure implications were not examined in this phase of modeling**
- **Models use MTEP15 natural gas price forecast ($4.67 in 2015)**

Modeled 66 cases to reflect a range of potential compliance actions and pathways

Reference case (BAU) (3 runs)

- Business-as-usual (BAU) model includes known and forecasted resource plans
- 3 years (2022, 2025, 2030)

BAU + CPP constraints (39 runs)

- No change in capacity (MW) from BAU
- CPP constraints applied at state, regional and Eastern Interconnection levels
- Average rate, sub-category rate, mass, mass/NSC*, mixed mass**

Alternative resource scenarios + CPP constraints (24 runs)

- Change in capacity (MW) from BAU
- CPP constraints applied at the Eastern Interconnection level
- Sub-category rate, mixed mass**

* NSC = New Source Complement

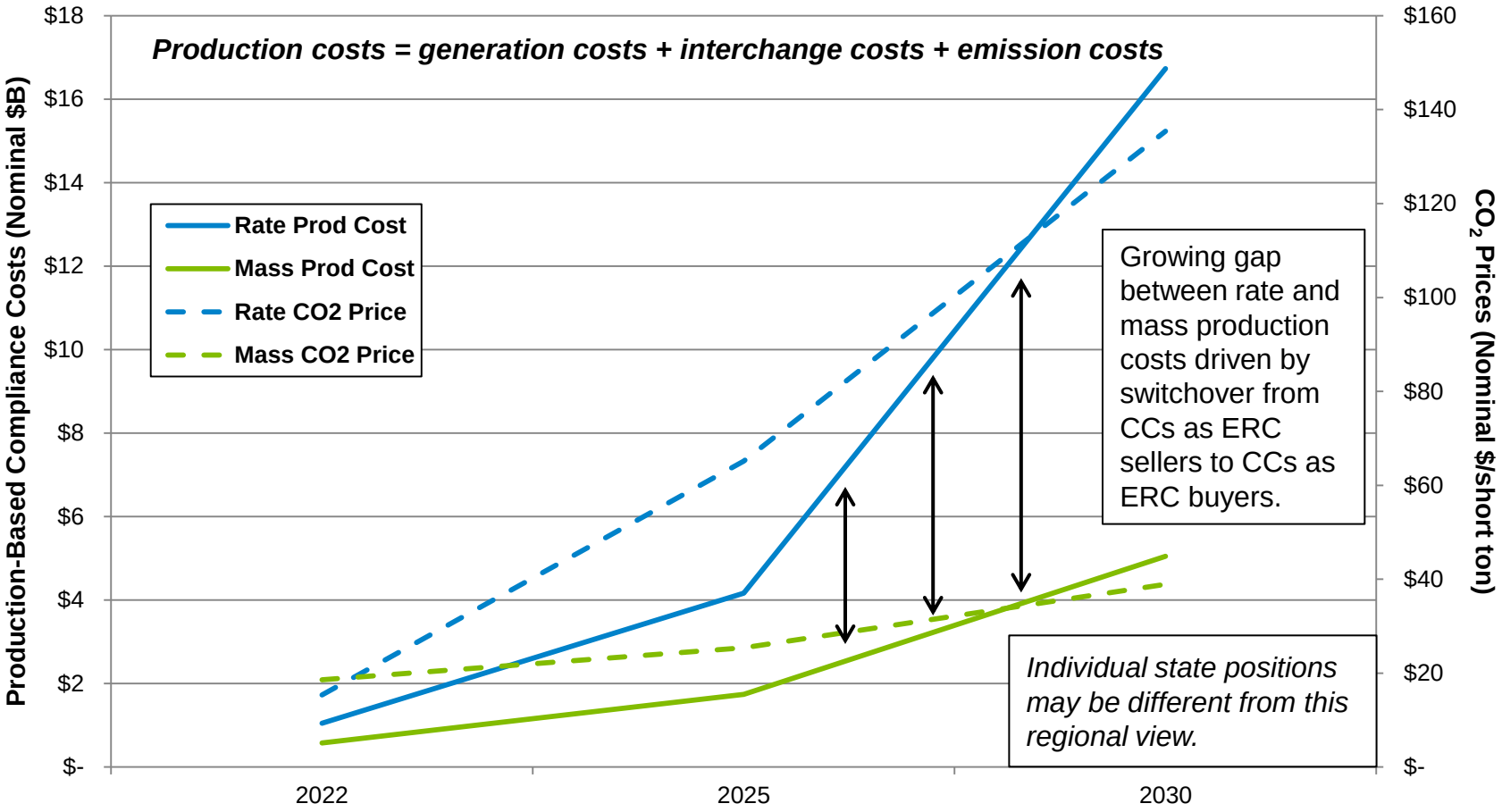
** Mixed mass = MISO states comply under mass target and non-MISO regions comply under mass + NSC targets

Initial analysis measures ability of the system to comply with the CPP given current resource trends

- **Models current generation fleet 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
- **Models CO_2 emissions constraints and interstate energy and emissions trading**
- **Models all states as choosing either rate- or mass-based compliance**
- **Models a single set of economic variables; additional analysis will be performed to examine the impact of changes to these variables**

1

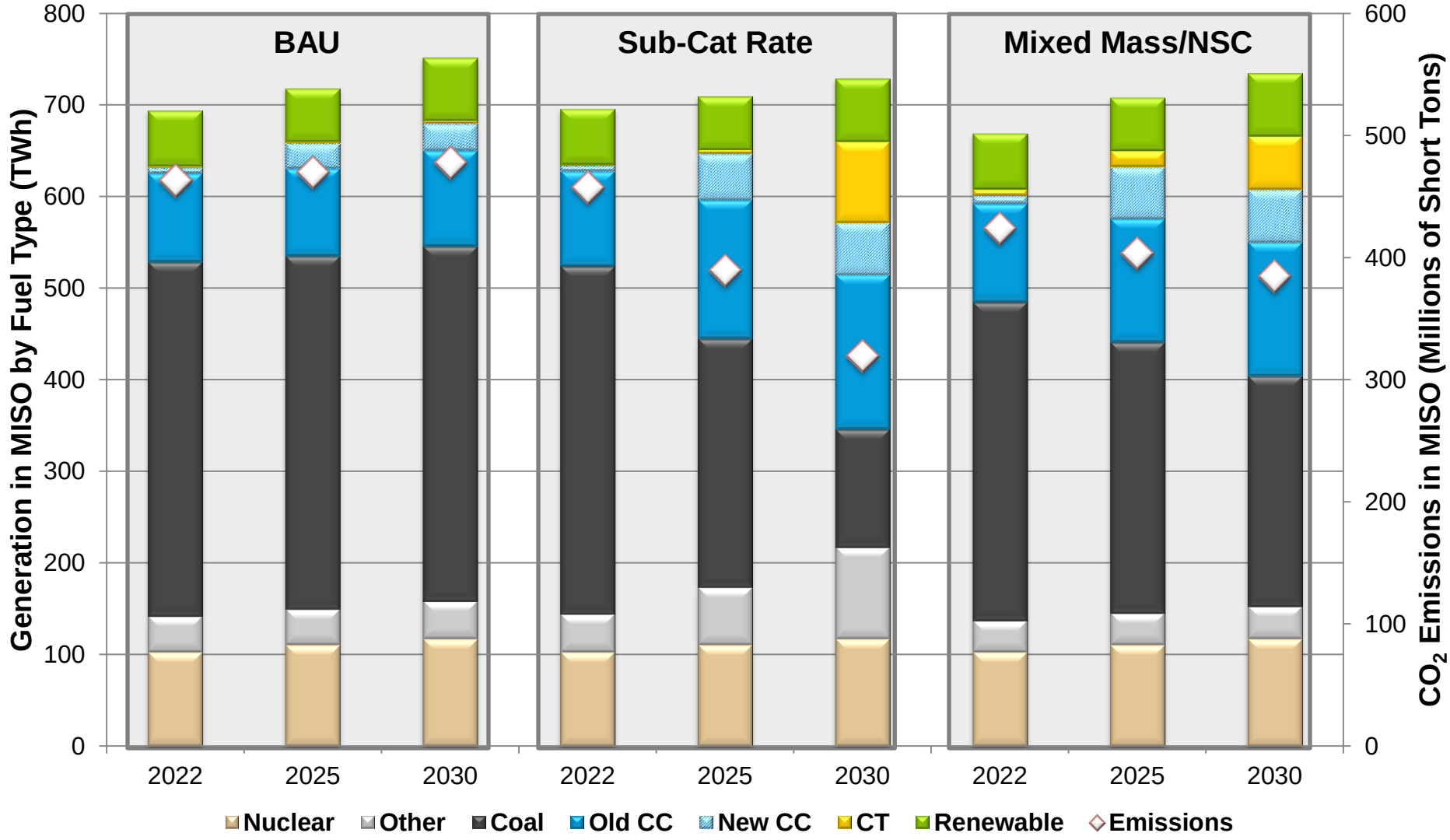
Regionally, mass-based compliance is less expensive than rate-based compliance, with the gap increasing over time



Early compliance targets are met through renewable portfolio standards and coal to gas re-dispatch, but comprehensive planning needs to start today to meet increasingly stringent compliance targets in the mid-2020s.

This calculation does not account for capital costs, transmission infrastructure costs and gas infrastructure costs.

2 New non-CO_2 emitting resources are needed to mitigate large changes in generation dispatch under rate-based compliance

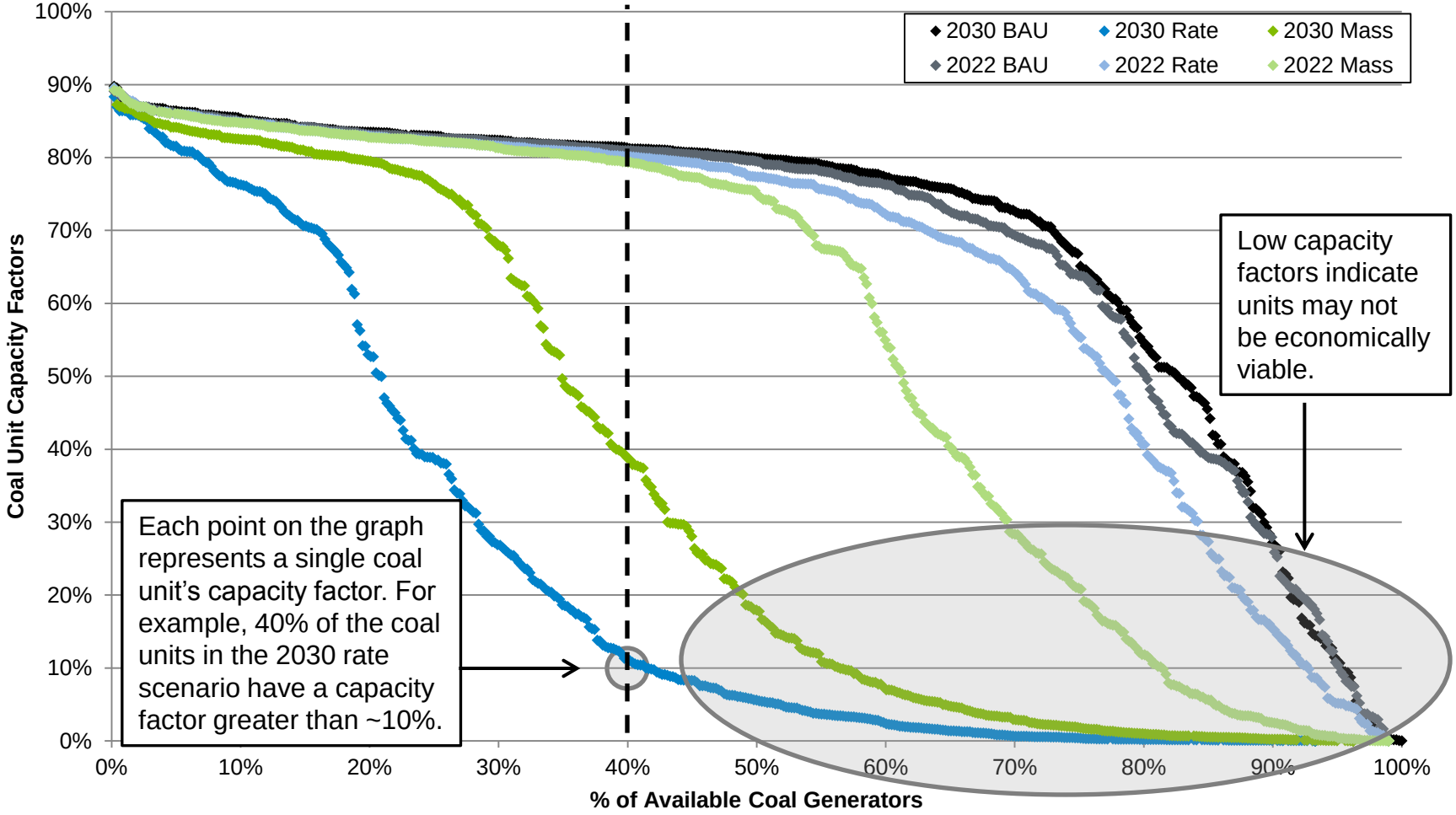


* NSC = New Source Complement

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

3

Coal unit capacity factors decrease greatly over time under the CPP, more dramatically with a rate-based implementation

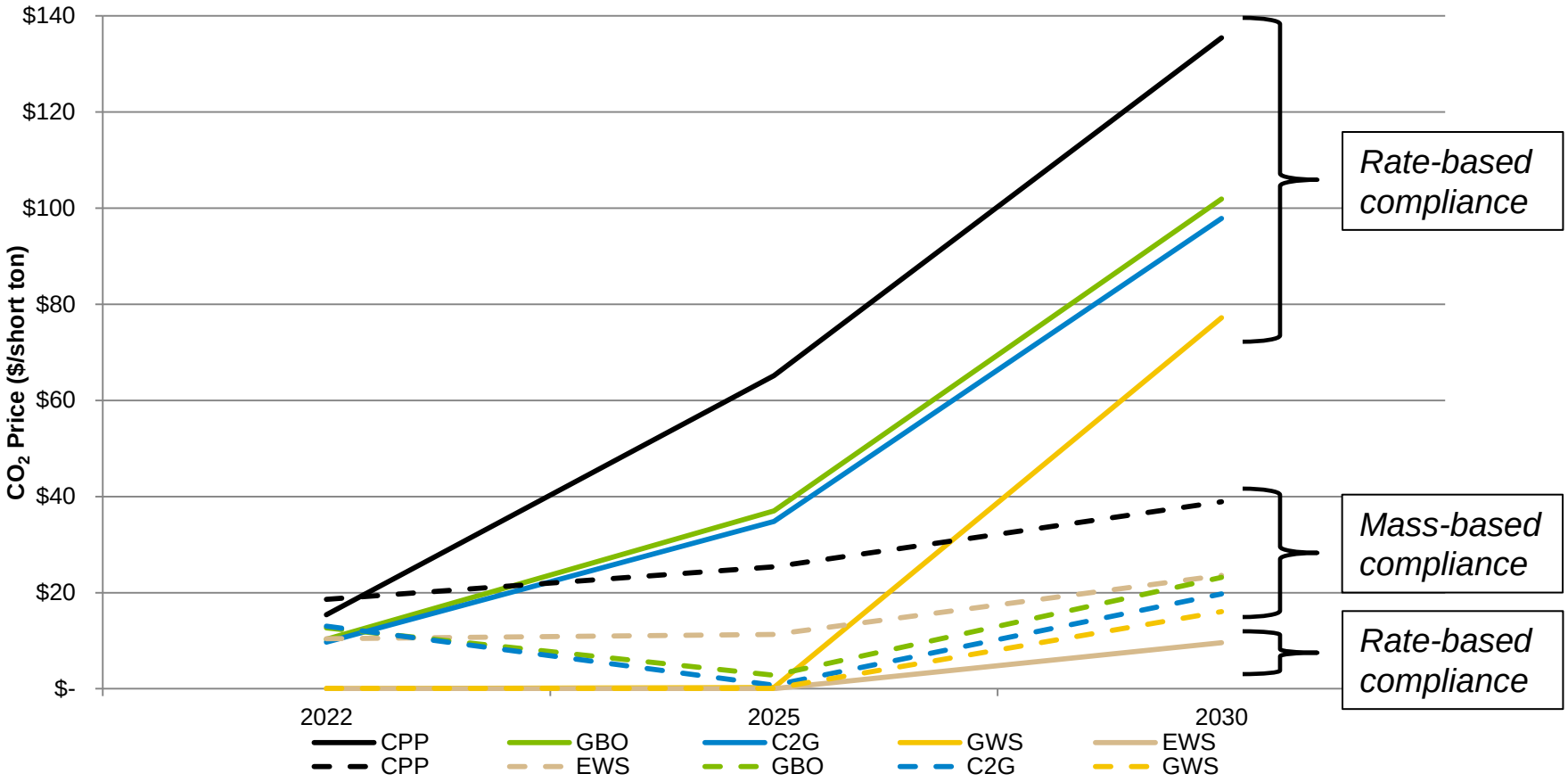


Coal units run more in the near term under rate-based compliance and in the long term under mass-based compliance.

Subsequent analysis examined ability to comply using a diverse set of feasible alternative resource trends

- **Scenarios are designed to measure the impact that changes to the resource mix have on compliance outcomes**
- **Resource scenarios modeled are the same as those in the draft rule analysis**
  - Coal retirements (C2G, GBO, GWS)
  - Gas build-out (C2G, GBO, GWS)
  - Renewables build-out (GWS, EWS)
  - Energy efficiency implementation (EWS)
- **Resource scenarios are not optimized for CPP compliance and resource capital costs were not considered when developing the scenarios**
- **Models all states as choosing either rate- or mass-based compliance**

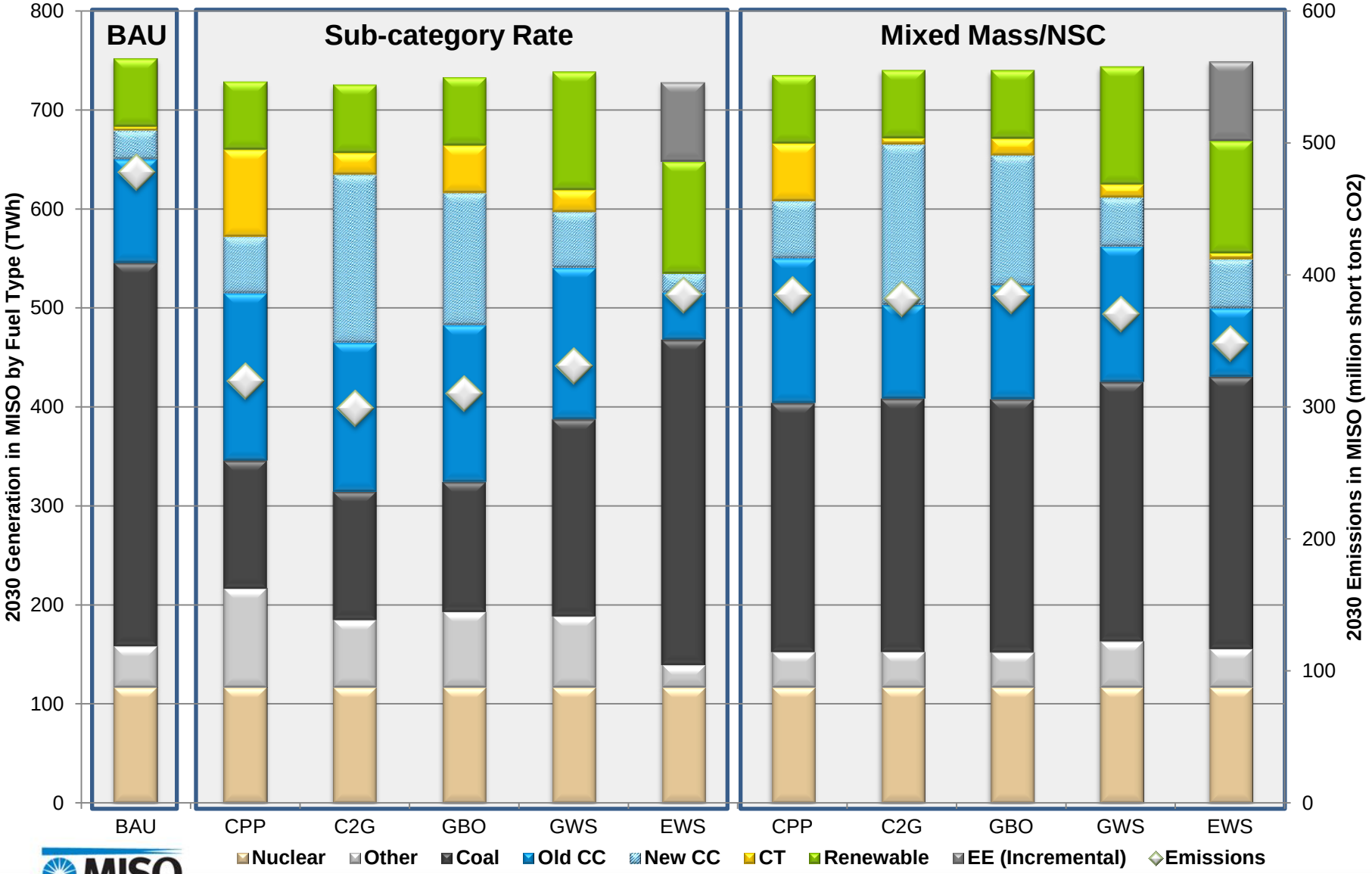
4 Continued investment in non-CO_2 emitting resources is necessary under rate-based compliance to keep emission prices lower



- 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

5

Coal fleet faces less risk of decreased dispatch under mass-based compliance



Next steps

- February PAC
  - Continue discussion of MISO's analysis of the final CPP

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

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APPENDIX

The final rule study will evaluate CPP compliance pathways and inform the transmission planning process

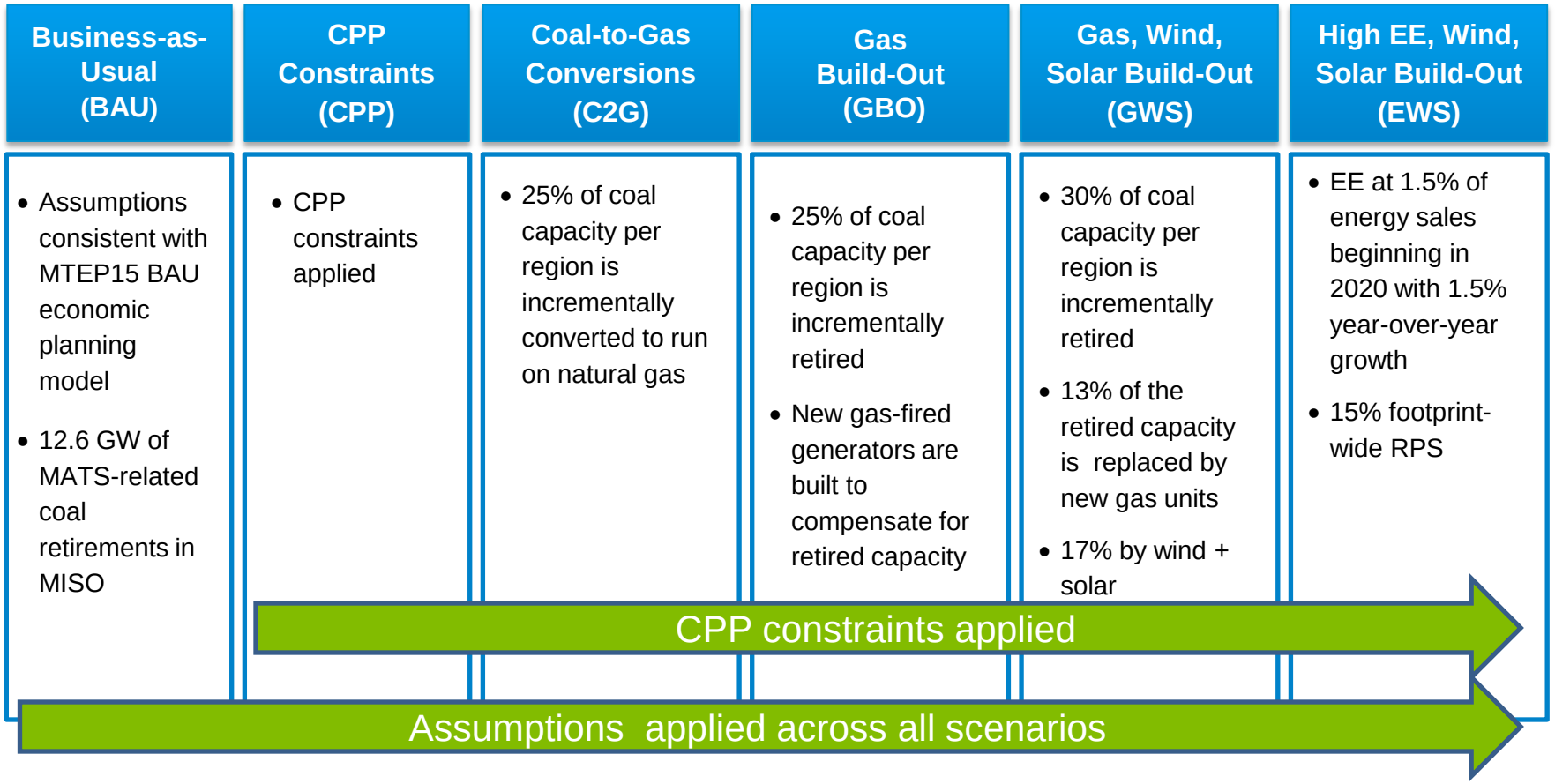
Near-Term Modeling (Understanding compliance pathways)	Mid-Term Modeling (Preparing for transmission overlay development)	Long-Term Modeling (Developing transmission overlay)
• Rate vs. mass comparison • Rate and mass interactions • State vs. regional compliance • Trading options • Federal plan • Range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

**Existing draft rule models will be updated with final rule parameters.*

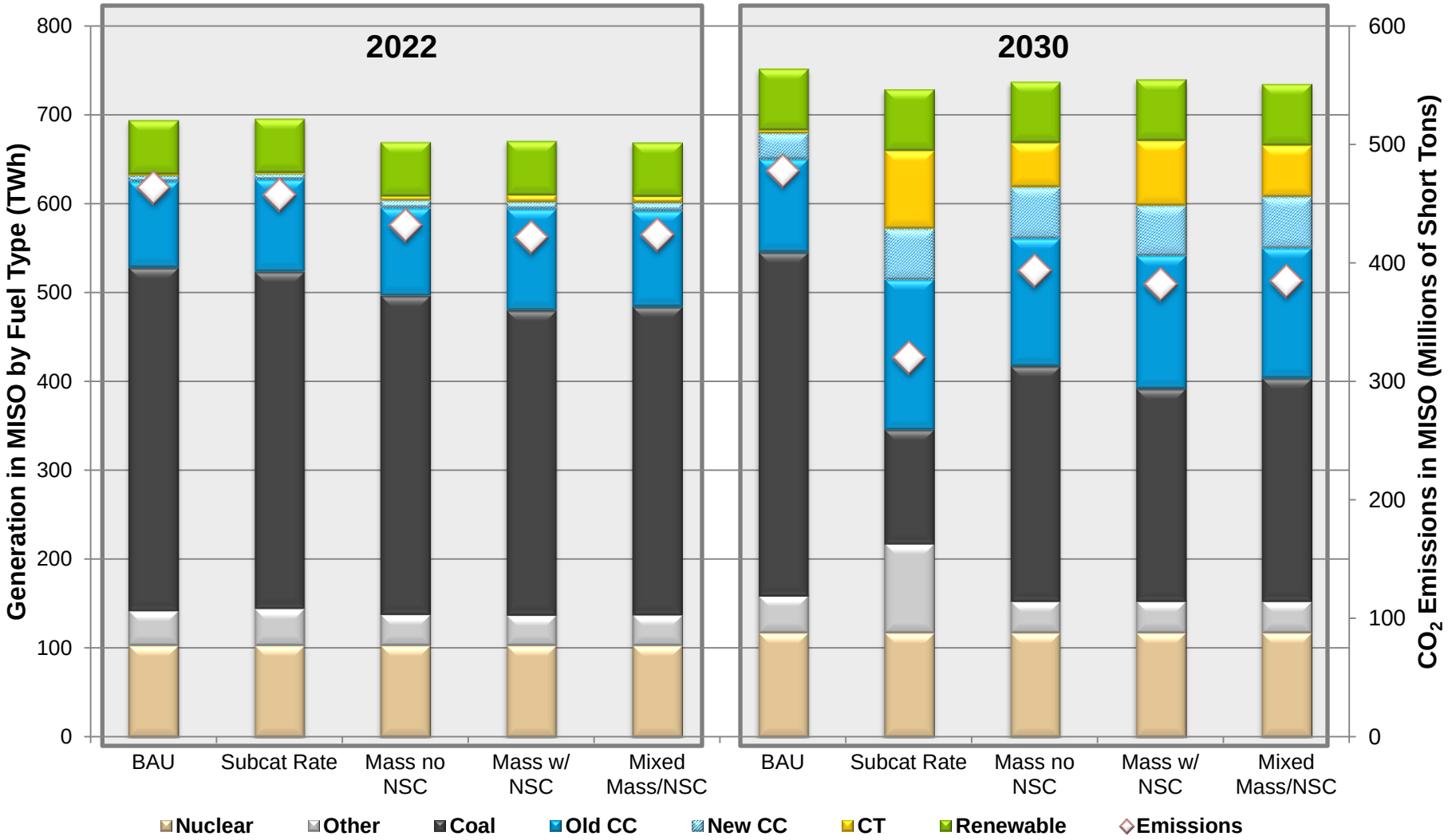
**Evaluated using three proposed CPP futures.*

MISO's CPP Final Rule Study

Near-term production cost model scenarios



② Given current capacity trends, generation dispatch changes less under mass-based compliance



* NSC = New Source Complement

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

3

Coal units face increased risks under CPP compliance

	Definition	2022 Mixed Mass/NSC	2022 Sub-category Rate	2030 Mixed Mass/NSC	2030 Sub-category Rate
Cycling*	Number of unit starts	58%	-29%	71%	55%
Ramping*	Total MW traveled (ramp up + ramp down)	11%	2%	30%	7%
Hours offline*	# of hours of zero generation	68%	3%	157%	246%
Total MWh*	Total generation	-10%	-2%	-36%	-68%
Units idled	# of units offline all year	0	0	6	9

**Percent change from BAU scenario.*

- 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.

MISO's Clean Power Plan Workshop

November 6, 2015

Overview

- High-level introduction to the EPA's final Clean Power Plan & proposed Federal Plan
- What changed from the draft CPP to the final CPP?
- How did the EPA calculate rate and mass goals?
- What are the routes states can take to compliance?
- Overview of the EPA's proposed Federal Plan
- ERCs, allowances and trading

The Clean Power Plan is just one of several major EPA regulations affecting the electric power industry

	MATS	CSAPR & CWIS	Clean Power Plan & New Source CO_2 Standards	Ozone
Regulation	Mercury and Air Toxics Standards	Cross State Air Pollution Rule & cooling water intake structure rule (316(b))	CO_2 limits for existing & new power plants	National Ambient Air Quality Standard (NAAQS) for ozone
Compliance Dates	In effect	Both in effect	Existing: Beginning 2016[1] New: Beginning in 2015	In effect; EPA finalized a more stringent version in Oct. 2015
Impacts	• Significant coal retirements • Outage coordination challenges • Shrinking reserve margins around MISO • Growing dependence on natural gas	• NOx requirements tightened • Higher compliance costs influence plant retirement decisions	• Significant coal retirements • Greater dependence on gas and CO_2-neutral resources • Possible impacts on economic dispatch • New coal builds much more expensive & unlikely	• Existing units could have to install new controls or modify their operations • Possible retirement of coal and/or gas units • Harder to build new coal & gas-fired generation in 'nonattainment' areas

[1] – States must submit "initial" implementation plans by Sept. 6, 2016, and final plans by Sept. 6, 2018.

Introduction to the EPA's *final* Clean Power Plan & *proposed* Federal Plan

Notes

- The intent of this presentation is to help inform stakeholders on the content of the EPA's Clean Power Plan and *proposed* Federal Plan.
- The following slides represent MISO's interpretation of these regulations in their current forms; the EPA is the ultimate expert on these matters.
- The forum for discussion of MISO's Clean Power Plan analysis is MISO's Planning Advisory Committee.

In Aug. 2015, the EPA issued…

- The final **Clean Power Plan** (CPP)[1]
  - Pursuant to Section 111(d) of the CAA
  - Applies to existing electric generating units (EGUs)
- The proposed **Federal Plan** for compliance with the CPP[3]

The focus of the following slides is on the CPP & the Federal Plan.

- The final **New Source Performance Standards** (NSPS)[2]
  - Also known as Carbon Pollution Standards or CPS
  - Pursuant to Section 111(b) of the Clean Air Act (CAA)
  - Applies to new, modified and reconstructed EGUs.

1 - See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf for the final CPP.
2 - See http://www3.epa.gov/airquality/cpp/cps-final-rule.pdf for final NSPS.
3 - See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22848.pdf for proposed Federal Plan.
Also see "Definition of Affected Sources" on p64715 in the final CPP.

Basics of the CPP

The CPP (or final rule) applies to the following categories of electric power generators ("affected EGUs"):

(1) steam generating units
(2) stationary combustion turbine portion of combined cycle and combined heat and power (CHP) units

…that commenced construction on or before January 8, 2014

- The CPP aims to achieve a ~32% reduction in CO_2 emissions by the electric power sector by 2030 from 2005 levels.
  - Establishes the best system of emissions reduction (BSER) to achieve carbon pollution reduction.
  - Establishes CO_2 emissions rate and mass targets based on the BSER.
  - Lays out several possible paths for states to achieve compliance.

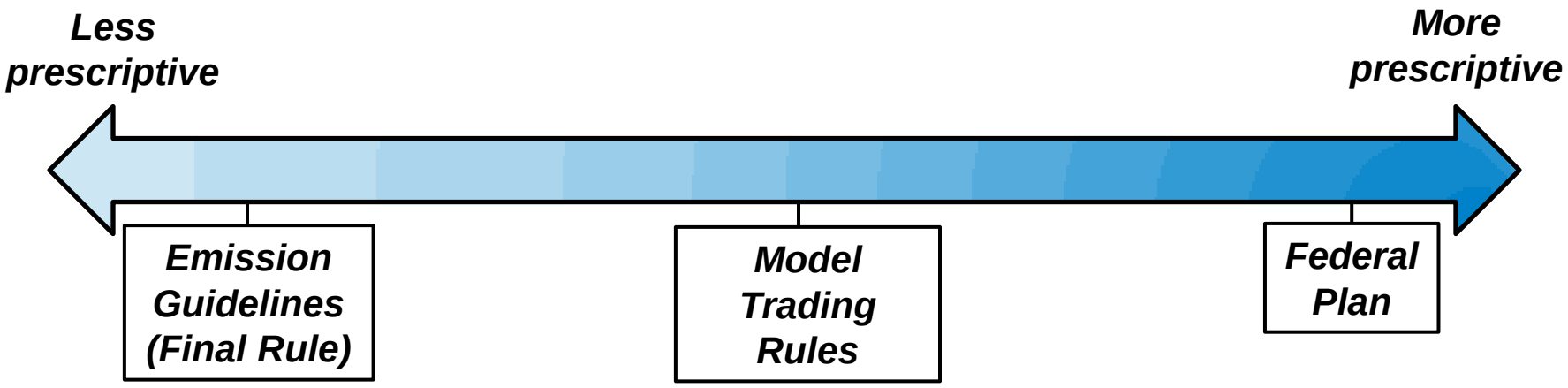
See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22848.pdf for the proposed Federal Plan.
See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf for the final CPP.

Basics of the proposed Federal Plan

- The **Federal Plan** is the EPA's backstop to the CPP, clarifying what the EPA will do if a state:
  - Does not submit a state plan
  - Submits a state plan the EPA cannot approve
- The Federal Plan also establishes **"model trading rules"** for states to use in part or whole as they formulate their compliance plans.

See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22848.pdf for the proposed Federal Plan.
See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf for the final CPP.

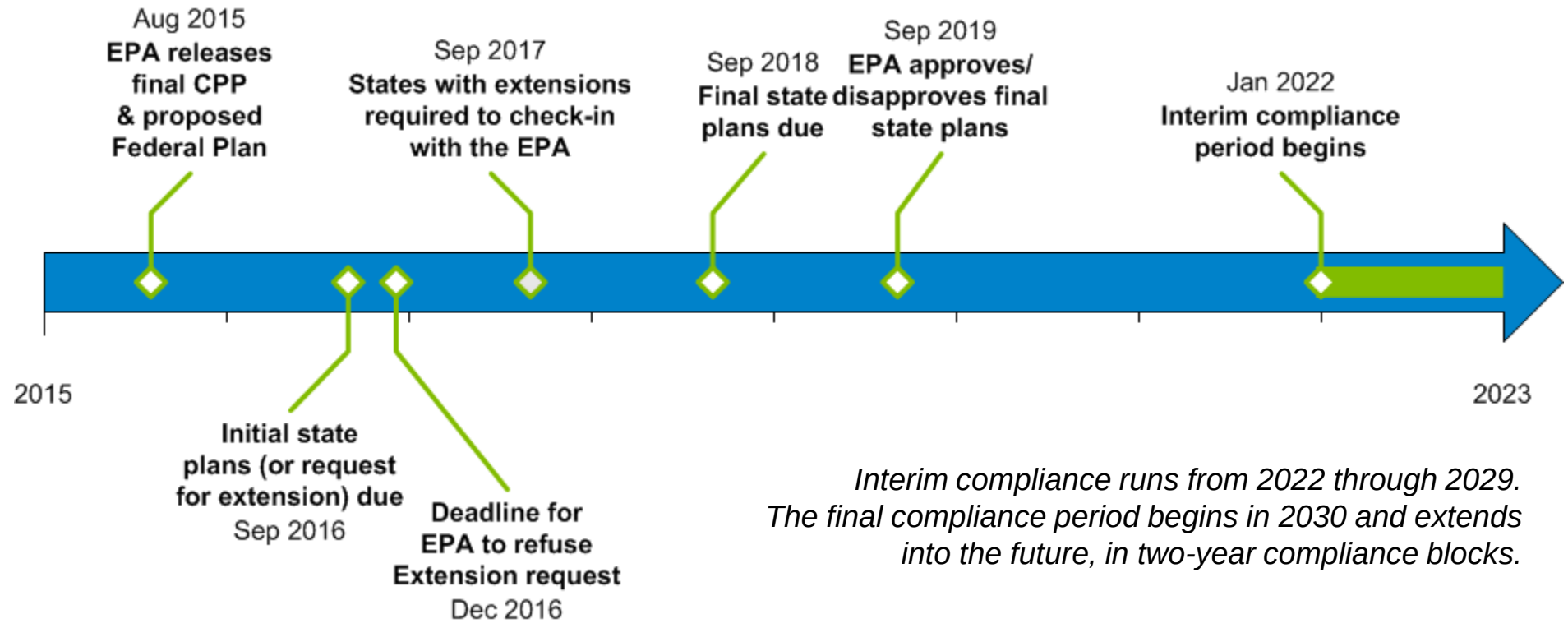
How does the final rule relate to the Federal Plan and the model trading rules?



A state-submitted compliance plan designed in accordance with the final rule, an EPA-promulgated Federal Plan, and a state-adapted model trading rule are different means—of <u>equal stringency</u>—to the same compliance ends.

See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22848.pdf for the proposed Federal Plan.
See http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf for the final CPP.

High-Level Clean Power Plan Timeline



Interim compliance runs from 2022 through 2029. The final compliance period begins in 2030 and extends into the future, in two-year compliance blocks.

What changed from the draft CPP to the final CPP?

Key differences from draft to final CPP

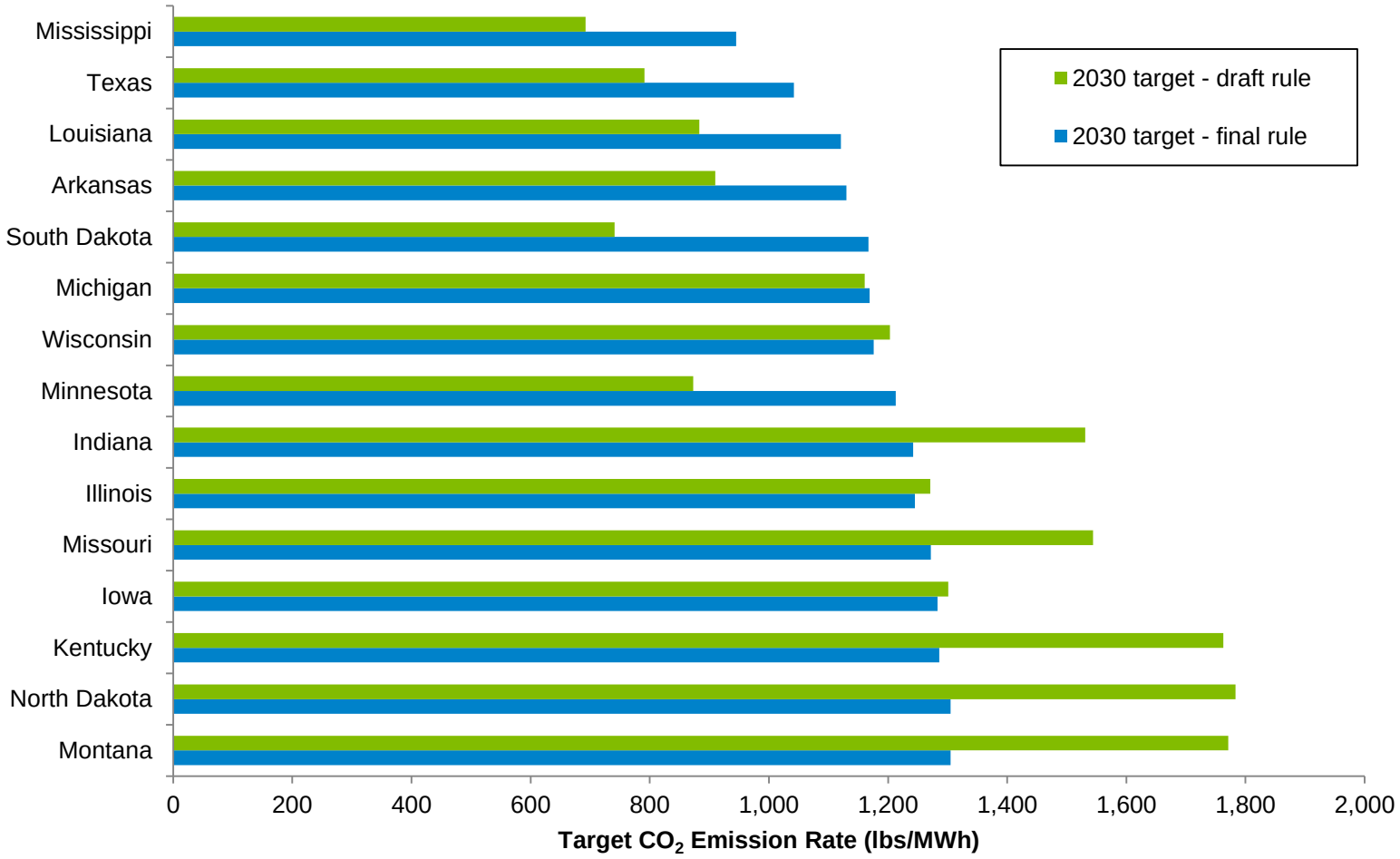
Major Changes	***New Features***
Interim period begins in 2022 instead of 2020 (no more “2020 cliff”)	Establishes CO_2 mass targets in addition to CO_2 rate targets
Combustion turbines are no longer affected EGUs (i.e. they are not subject to CO_2 emissions limits)	Establishes a Clean Energy Incentive Program (CEIP) to encourage early action renewables build-out and energy efficiency implementation
Energy efficiency building block is no longer included in the determination of BSER	Lays out trading-ready plans
Changes in CO_2 emissions target stringencies for most states	Includes a reliability safety valve (RSV)
Goals are calculated on a regional level	Includes language to address leakage

The EPA altered the building blocks in the final rule and switched to defining BSER on a regional level

Final Clean Power Plan Building Blocks		
1. Heat rate improvement at existing coal-fired EGUs (assuming best practices and equipment upgrades)	2. Increased usage of natural gas combined cycle units to 75% capacity factor (based on net summer capacity)	3. Increase in cleaner generation sources

Best System of Emission Reduction (BSER)			
	1: Heat rate improvement	2: Max NGCC energy potential	3: Max renewable energy potential
Eastern Interconnection	4.3%	988 TWh	438 TWh
Western Interconnection	2.1%	306 TWh	161 TWh
Texas Interconnection	2.3%	204 TWh	107 TWh

Emission reduction targets are more uniform in the final rule



The range of emission rate targets across states in MISO is tighter in the final rule than in the draft rule. Before/after (draft /final rule) rates for each state should not be compared due to the change in calculation methodology.

How did the EPA develop the CO_2 rate and mass emission goals?

High-level overview of CO_2 rate and mass emission goals calculation

First, the EPA calculated regional rate goals…

Applied building blocks to 2012 baseline generation and emission data.

→

Determined sub-category emission rate goals for each compliance year.

Then, the EPA calculated state mass goals…

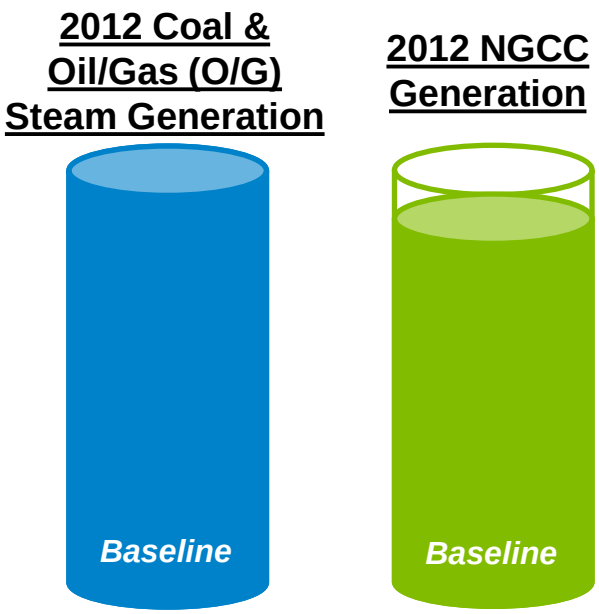
Calculated mass emissions for each compliance year using rate goals and 2012 baseline generation.

→

Adjusted emissions to ensure equivalency between mass and rate compliance.

Calculating regional rate goals

Step 1	Step 2
Gather 2012 baseline data and adjust to reflect deviations from characteristic behavior	Aggregate data into categories on a regional level (Eastern Interconnection, Western Interconnection, Texas Interconnection)



See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals

Step 3	• Calculate baseline emission rates for each interconnection from 2012 data: $$\textbf{Fossil steam emission rate} = \frac{\sum fossil\ steam\ emissions}{\sum fossil\ steam\ generation}$$ $$\textbf{NGCC emission rate} = \frac{\sum NGCC\ emissions}{\sum NGCC\ generation}$$
Step 4	• Implement Building Block 1 - Adjust fossil steam rate to account for improved heat rate - NGCC rate is unchanged

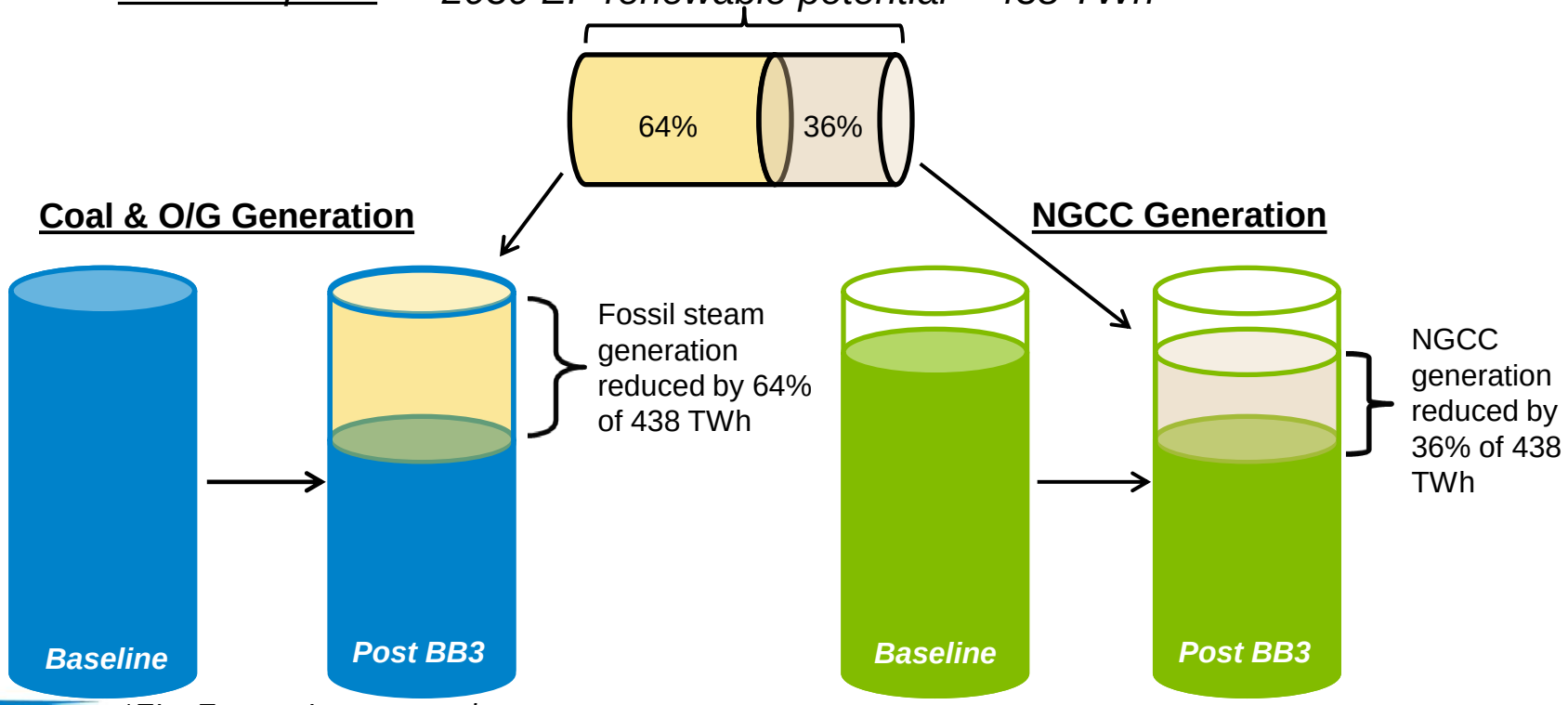
See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals

Step 5

- Implement Building Block 3
  - Calculate renewable generation (RE) for each region
  - Assign RE to replace either fossil steam generation or NGCC generation based on their % shares of total fossil generation

For example… *2030 EI* renewable potential = 438 TWh*



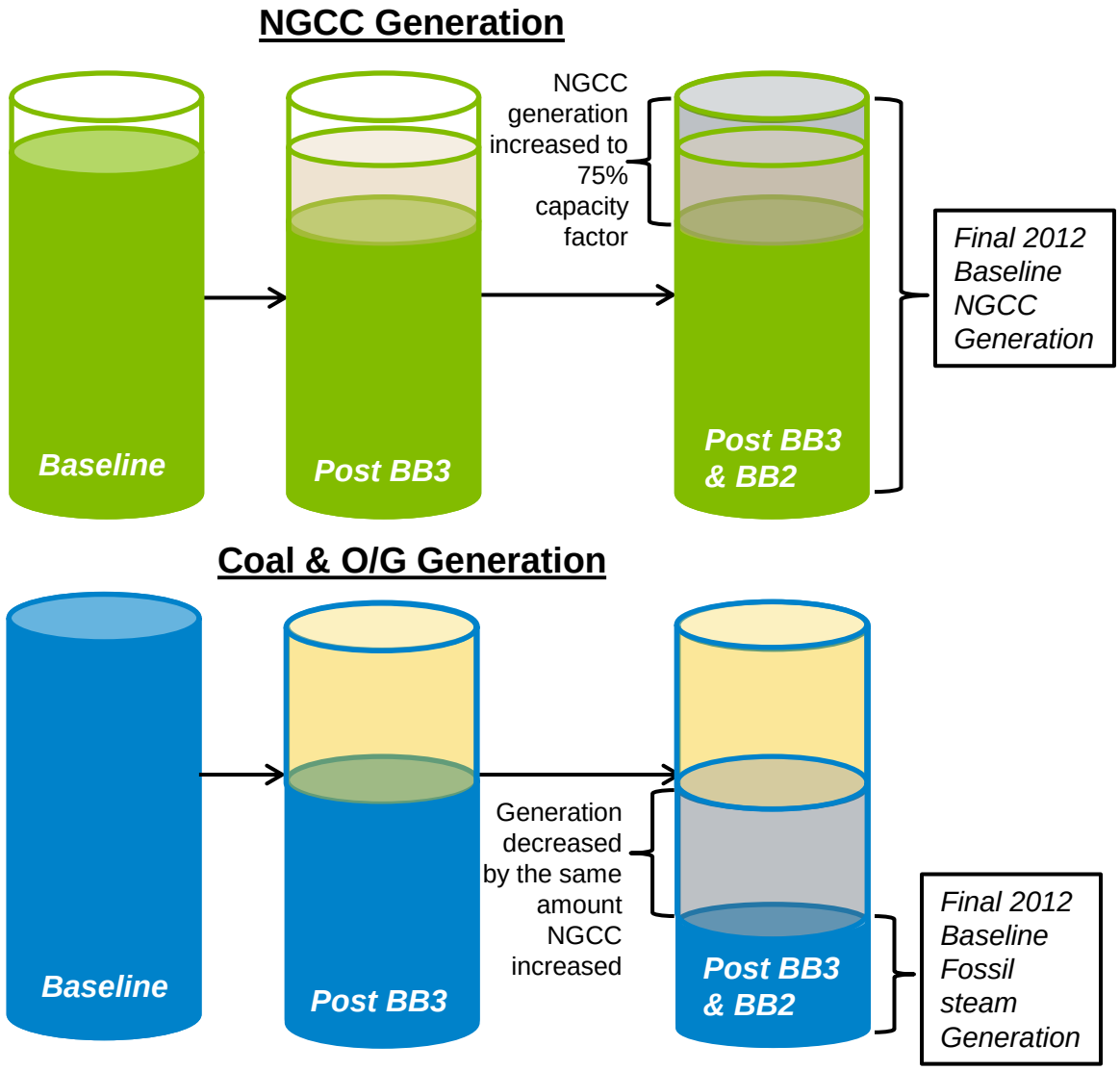
*EI = Eastern Interconnection

See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals

Step 6

- Implement Building Block 2
  - NGCC generation potential is equal to regional NGCC fleet summer capacity operating at a 75% capacity factor



See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals

Step 7	Calculate final sub-category emission rates

Fossil Steam Emission Rate

$$\frac{\text{Post BB fossil steam generation} \times \text{Post BB fossil steam emission rate} + \text{Incremental NGCC generation} \times \text{NGCC emission rate}}{\text{Post BB fossil steam generation} + \text{Incremental NGCC generation} + \text{Fossil steam \% share of RE}}$$

NGCC Emission Rate

$$\frac{\text{Post BB NGCC generation} \times \text{NGCC emission rate}}{\text{Post BB NGCC generation} + \text{NGCC \% share of RE}}$$

See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals

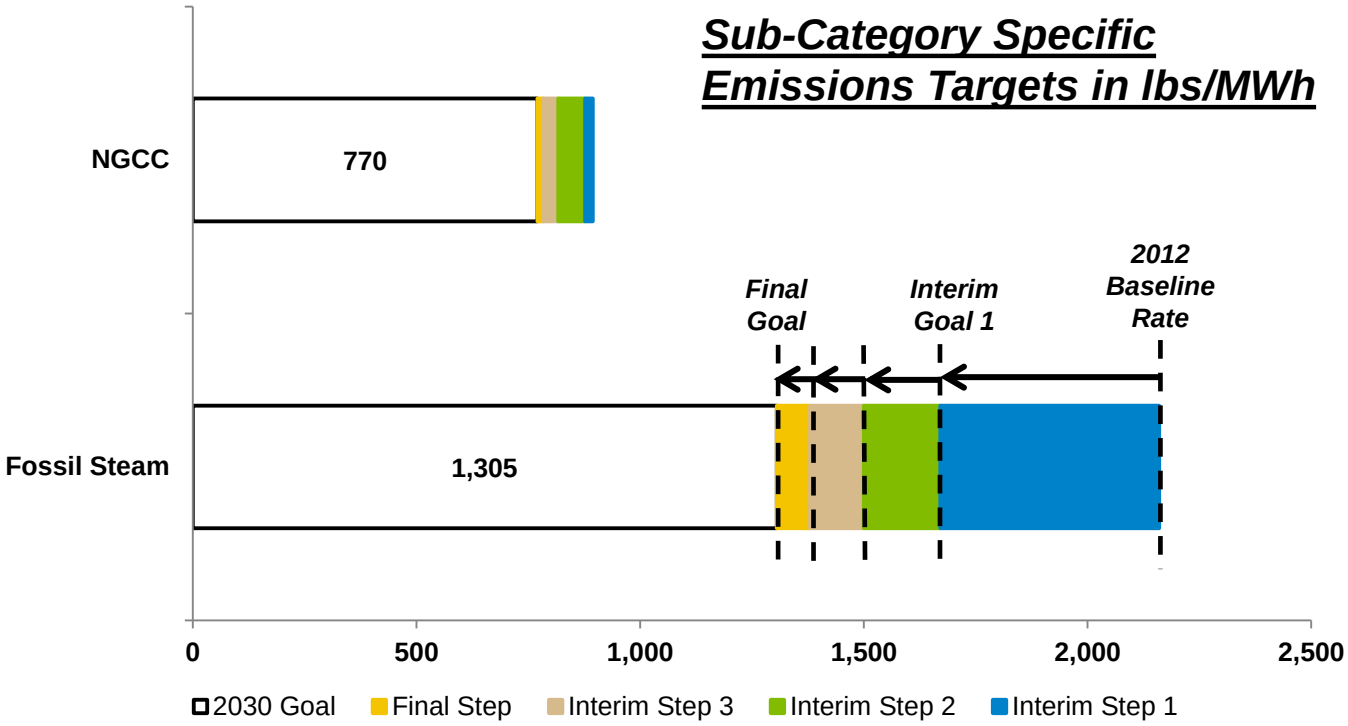
Step 8	Choose the least stringent sub-category rates for each year

For example – In 2030, EI rates are chosen to apply to the contiguous US (excluding Vermont, which does not have any affected EGUs)

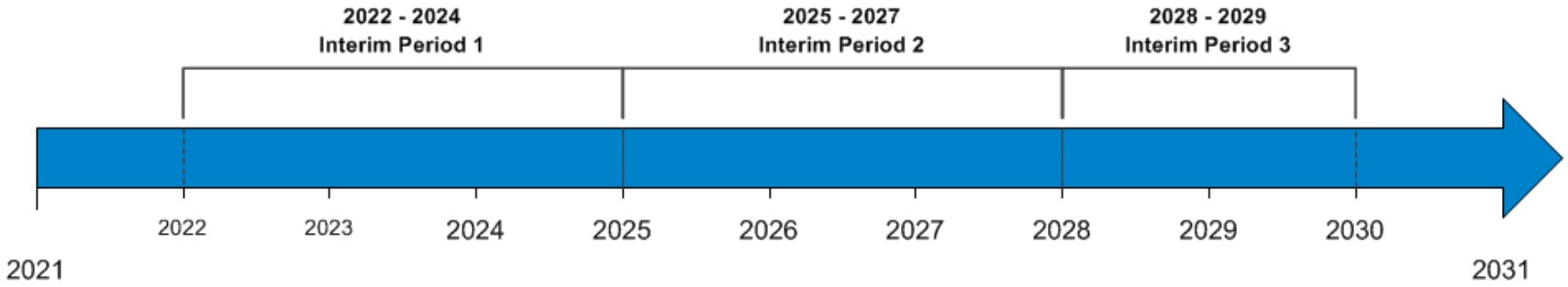
Interconnection	NGCC rate	Fossil steam rate
Eastern Interconnection	*770 lbs/MWh*	*1,305 lbs/MWh*
Western Interconnection	690 lbs/MWh	360 lbs/MWh
Texas Interconnection	697 lbs/MWh	237 lbs/MWh

See TSD "Emission Performance Rate Goal Computation"

Calculating regional rate goals



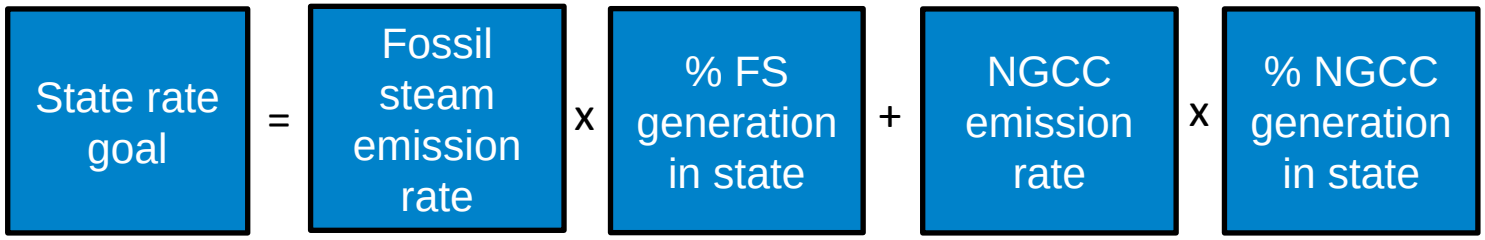
- **Goals are calculated for each year and averaged into 3 interim compliance periods**



See TSD "Emission Performance Rate Goal Computation"

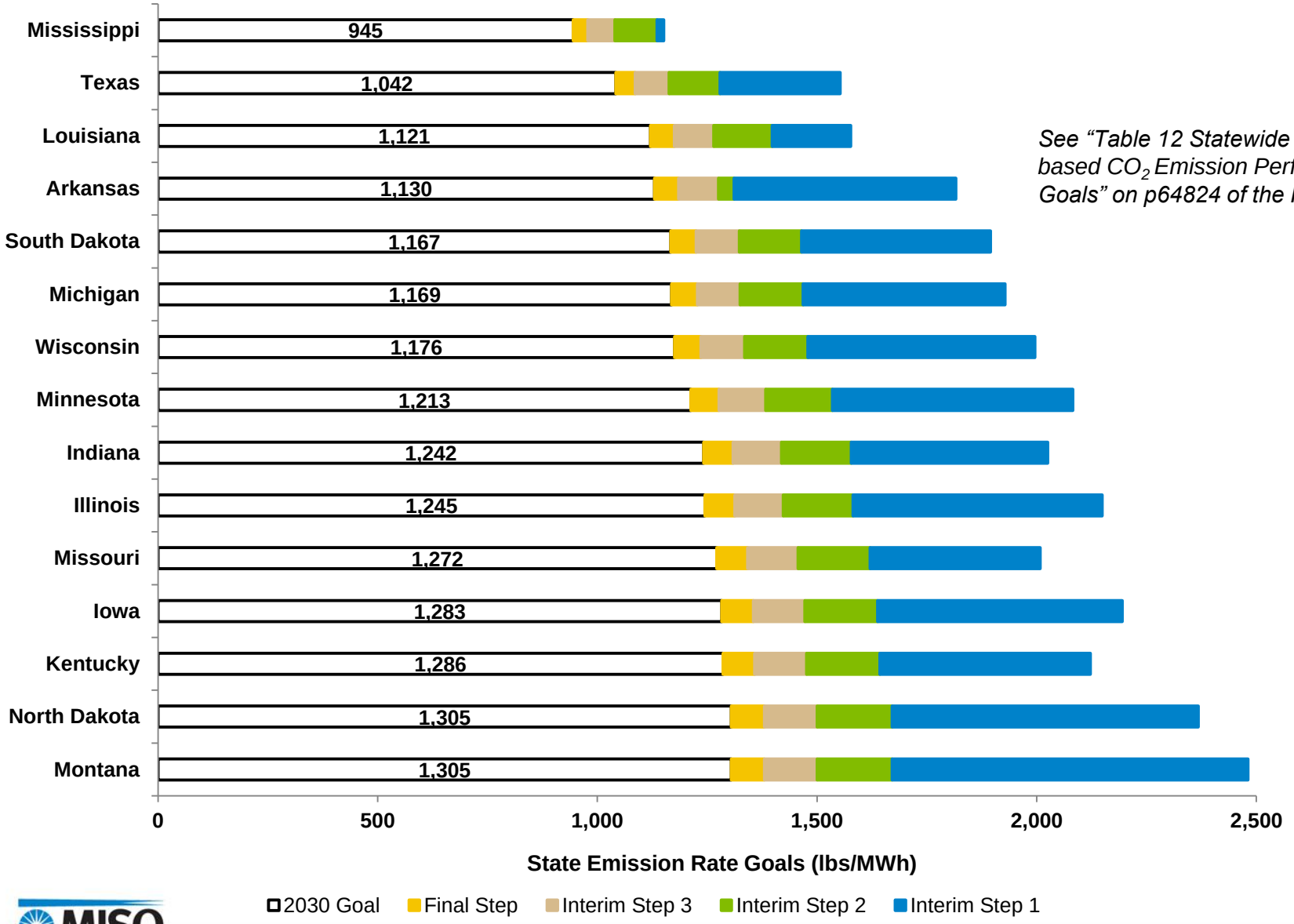
Calculating state rate goals

- State rate goals are calculated as a weighted average of sub-category emission rates based on the state's affected generation mix
- States may choose to:
  - Enforce sub-category emission rates on affected EGUs
  - Enforce state-wide emission rates



See TSD "Emission Performance Rate Goal Computation"

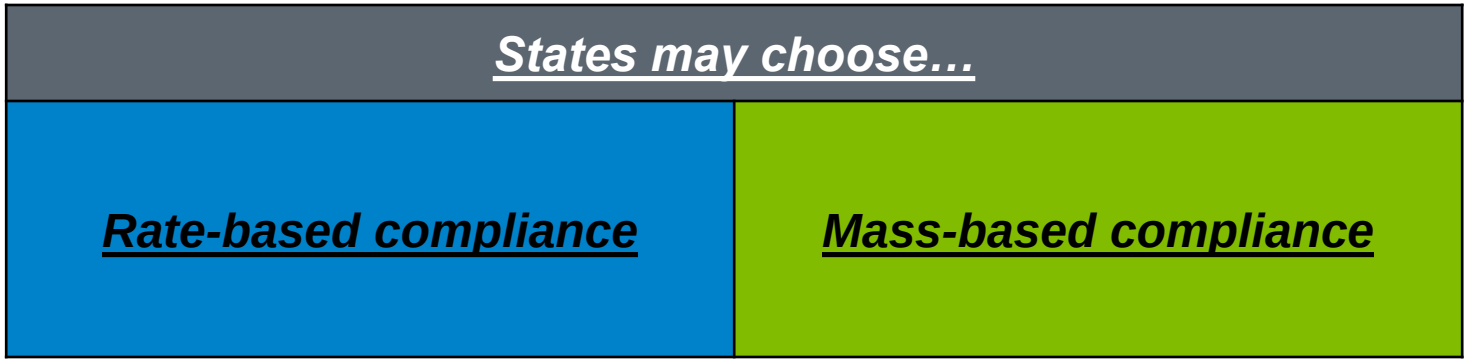
Calculating state rate goals



See "Table 12 Statewide Rate-based CO_2 Emission Performance Goals" on p64824 of the Final Rule

Converting rate goals to mass goals

- The EPA also provided a detailed conversion to mass goals in response to comments received on the draft rule.

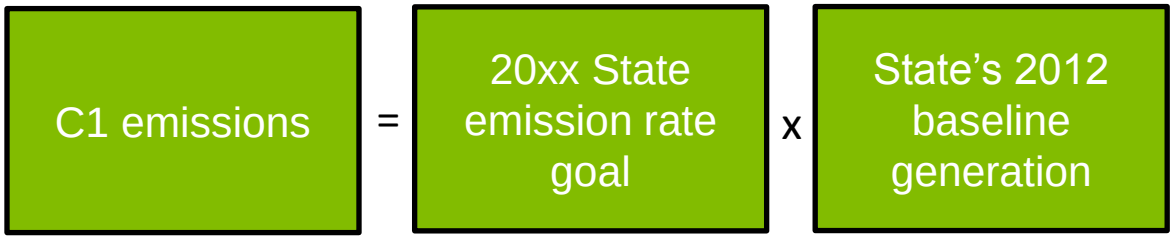


- The EPA states that these two compliance methods are *equivalent implementations of the BSER.*

Converting rate goals to mass goals

- **Mass goals have three components:**
  1. Emissions calculated directly from each state's emission rate goal
  2. Emissions calculated from potential increased dispatch of affected EGU under rate-based compliance if full amount of BB3 RE were to be deployed (i.e. RE that is otherwise not needed to meet selected national goals)
  3. *OPTIONAL* Emissions associated with the new source complement

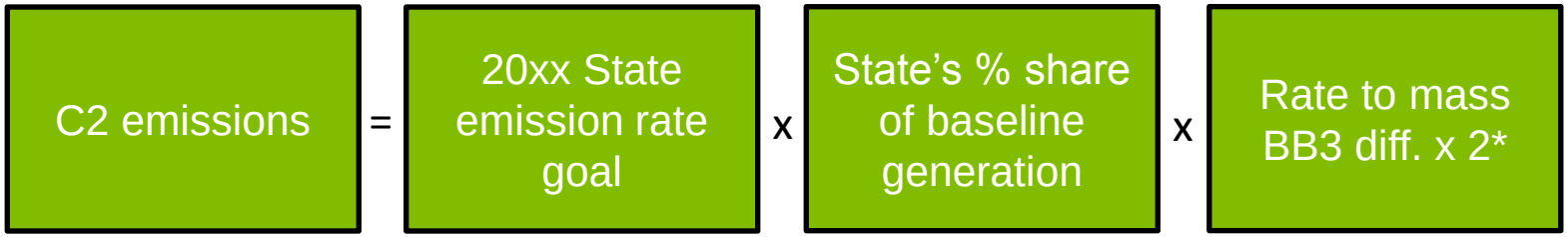
- **Component 1:**



See TSD "Emission Performance Rate Goal Computation"

Converting rate goals to mass goals

- **Component 2:**



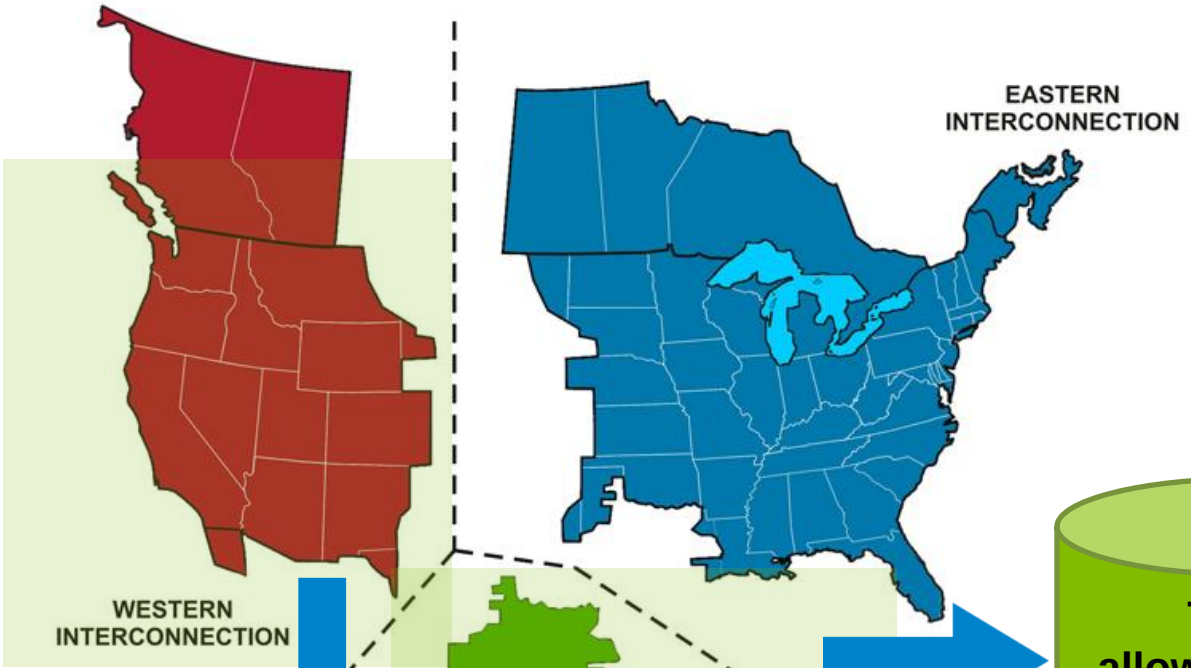
  - Calculated for regions whose sub-category emission rates are lower than the chosen national sub-category emission rates
  - Adjust additional BB3 renewable generation not needed to meet the less stringent goals
  - Sum rate to mass differences across all regions and distribute across all states based on their % share of baseline generation

**Every zero-emitting MWh added to the denominator of an EGU's emission rate would enable an EGU to add another MWh of generation with twice the emissions intensity of the standard, as the changes would average to 0.*

See TSD "Emission Performance Rate Goal Computation"

Converting rate goals to mass goals

- **Component 2:**



Source: DOE

E.g. in 2030, component 2 of the mass goals is calculated from the Western and Texas Interconnections

These allowances are then redistributed across all of the states

See TSD "Emission Performance Rate Goal Computation"

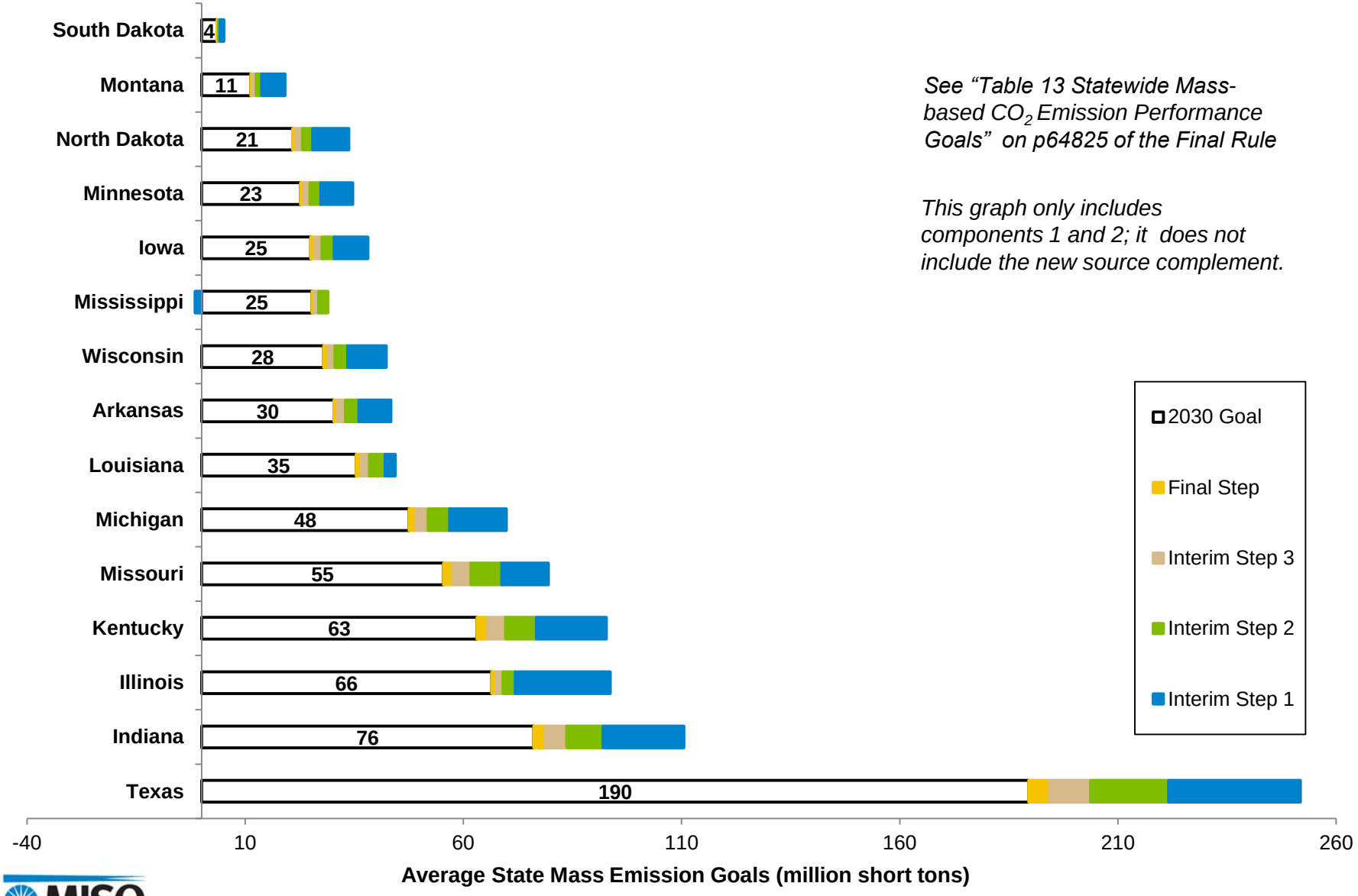
Converting rate goals to mass goals

- **Component 2:**
  - Translates the ability of generation to increase to meet load growth under rate-based compliance
    - Regions whose rates were more stringent than those chosen have additional RE potential
    - An additional MWh of RE serves as an offset and allows an affected EGU to increase its output as well
  - Maintains equivalency of BSER implementation between rate and mass

This component takes into account generation growth that could be used to serve future load growth.

See TSD "Emission Performance Rate Goal Computation"

Calculating state mass goals



See "Table 13 Statewide Mass-based CO_2 Emission Performance Goals" on p64825 of the Final Rule

This graph only includes components 1 and 2; it does not include the new source complement.

What is leakage?

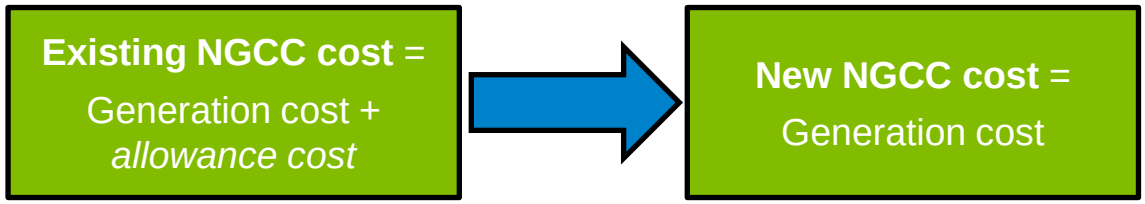
Leakage is the shift of generation from existing generators covered by the CPP to new generating units that are not covered by the final rule.

- **The EPA addresses the risk of leakage for the following reasons:**
  - Leakage does not align with the EPA's efforts to reduce CO_2 emissions
  - Leakage does not incentivize a future fleet of low- and non-CO_2 emitting resources as intended by the EPA
  - Leakage could negate equivalency between rate- and mass-based targets

See "Addressing Potential Leakage in Determining the Equivalence of State-Specific CO_2 Emission Performance Goals" on p64822 in the final rule

Who is impacted by leakage provisions?

- **States that implement mass-based compliance**



Dispatch shifts generation to units not covered by the final CPP

  - Generation shift does not align with EPA's goal of implementing the BSER

- **Not a risk for states that implement rate-based compliance**

  - Increased dispatch of existing NGCC generators is incentivized under a rate-based plan by the potential to earn Emission Rate Credits (ERCs).
  - New NGCCs cannot earn ERCs.
  - This arrangement helps to level the playing field for existing units that need to meet the emission standards and new units that do not.

See "Addressing Potential Leakage in Determining the Equivalence of State-Specific CO_2 Emission Performance Goals" on p64822 in the final rule

How can leakage be addressed in a state plan?

Option	Example
Utilize the **new source complement** (NSC) to set a mass target for new plus existing source emissions	MN's mass goal = 22.7 million tons MN's NSC = 0.25 million tons **New unit emissions + existing unit emissions ≤ 22.95 million tons**
Use **allowance allocation methods** that counteract incentives to shift generation from existing to new sources	Use the **output-based allocations** and **allowance set-asides for RE**, as described in the model rule
Prove that leakage is **unlikely to occur** due to unique state characteristics	States that have **pre-existing policies** that address the issue of leakage

See "Requirement for emission budget trading plan to address potential leakage" on p64887 in the final rule

What is the new source complement?

The *new source complement* provides additional allowances to mass-based states for emissions from new sources associated with satisfying incremental demand.

- The EPA details this new source complement as an optional addition to the baseline mass goals.
- States may choose the EPA-calculated numbers, or develop their own new source complement contingent on EPA approval.
- If the EPA-calculated numbers are chosen, the new source complement is a presumptively approvable means of addressing leakage.

See TSD "New Source Complements"

How was the new source complement calculated?

Step 1	Step 2	Step 3
Determine load growth and the generation needed to meet it based on the EIA's 2015 Annual Energy Outlook (AEO) on a regional level	Subtract generation of units that were under construction in 2012 and not reflected in historical data	Subtract generation growth already accounted for in calculating component 2 of state mass targets

Adjusted generation for the new source complement = Incremental generation based on EIA's 2015 AEO - Generation under construction in 2012 - Generation growth incorporated in mass goal

See TSD "New Source Complements"

How was the new source complement calculated?

Step 4	Step 5
Distribute allowances to all states based on their % share of affected generation	Repeat steps 1-4 for all compliance years

New source complement emissions = State's % share of baseline generation x Adjusted generation for new source complement x New source performance standard 111(b) emission rate

As calculated on the previous slide

See TSD "New Source Complements"

What is the reliability safety valve?

The *reliability safety valve* (RSV) is a mechanism by which states are temporarily allowed a period of non-compliance for a reliability emergency.

- **The RSV provides a 90-day period during which the affected EGU meets an alternative standard, not the assigned emission standard**
  - Under the RSV, emissions in exceedance of standard *not counted against goal*
- **It also provides an additional period after initial 90 days during which the EGU operates under an alternative standard**
  - The state must revise its plan
  - Emissions in exceedance of standard *counted against goal*

See "Reliability safety valve" on p64877 in the final rule

What are the criteria for using the RSV?

Criteria
• An unforeseeable situation due to a catastrophic event
• An EGU is compelled to operate during the event to prevent failure of the grid
• An EGU is violating constraints laid out in its state plan

Examples
• Catastrophic event that damages equipment needed for reliable grid operation
• Major storm damage requiring a large NGCC plant to shut down
• Nuclear unit that must cease generating unexpectedly

See "Reliability safety valve" on p64877 in the final rule

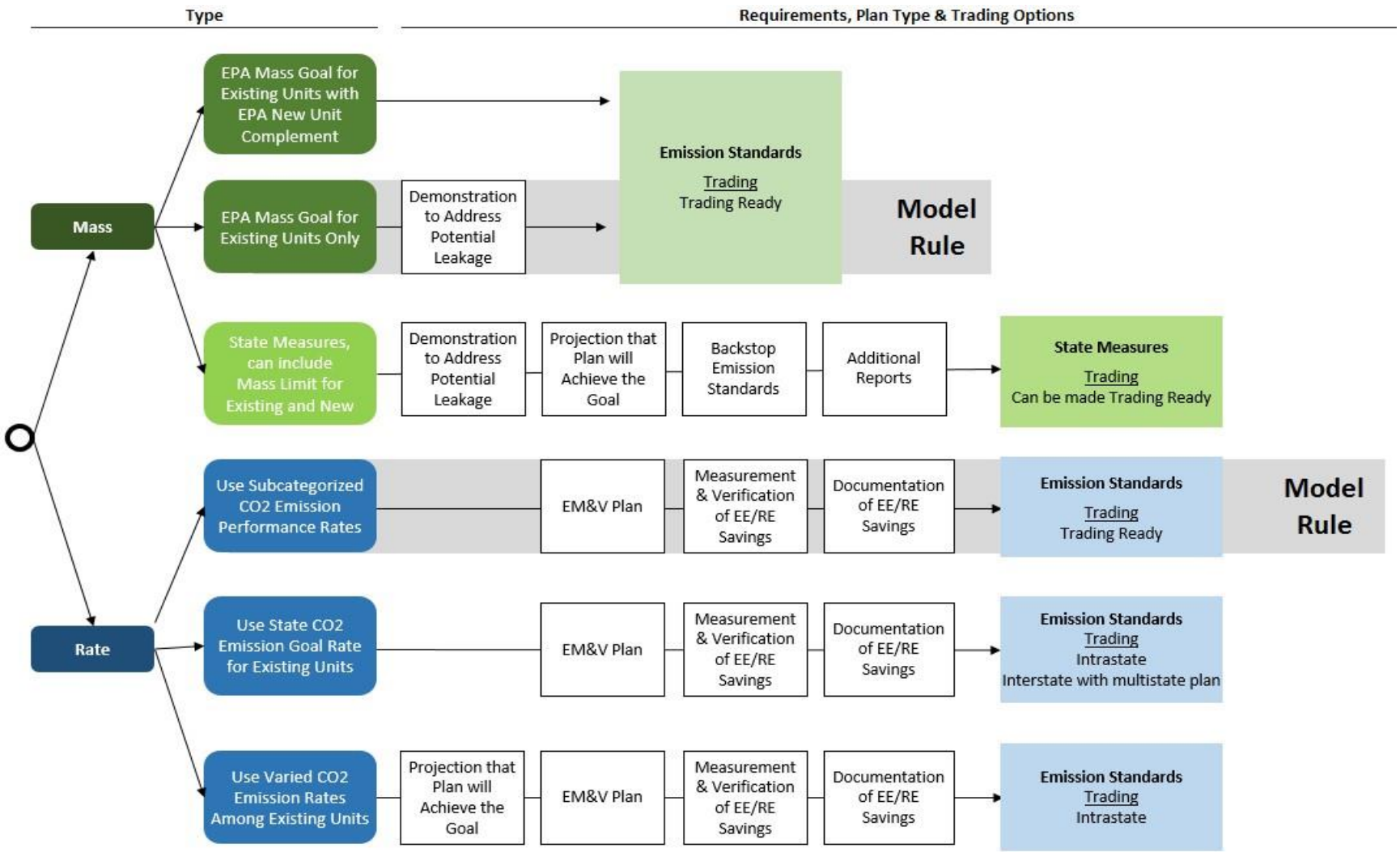
What documentation is needed for the RSV?

- States must notify the EPA of the event within 48 hours of its occurrence
- States must submit documentation detailing the nature of the event and the projected time Included to repair the problem
- States must submit supporting comments from their Reliability Coordinator (RC) confirming the reliability emergency

See "Reliability safety valve" on p64877 in the final rule

What are the routes states can take to compliance?

EPA-defined options for state plan design



Source: EPA 2015

Mass-based paths for compliance

	Option 1: Mass compliance w/new source complement	Option 2: Mass compliance w/alternative treatment of leakage	Option 3: State measures alternative to EPA mass targets
EPA-calculated mass emission targets	yes	yes	no
Federally enforceable emission standards?	yes	yes	uses state law to require emission reduction
Allows interstate trading?	yes	yes	can include interstate trading
How is leakage addressed?	using new source complement	using alternative methods	using an EPA-approved method

Additionally, a state measures plan requires a federally enforceable backstop (for which the federal plan can be used) and must include a projection of how the state will meet EPA's targets.

See "State Plan Approaches" on p64675 in the final rule
See "Multi-state coordination: mass-based emission trading programs" on p64892 in the final rule

Rate-based paths to compliance

	Option 4: Subcategory emission rates	Option 5: Statewide emission rates	Option 6: Alternative emission rates
EPA-calculated emission rate targets?	yes	yes	no
Federally enforceable emission standards?	yes	yes	yes
Allows interstate trading?	yes	*conditionally**	
Requires projection that plan will meet EPA's targets			yes

**States must establish a weighted-average emission rate goal from the individual state rate goals and 2012 baseline generation.*

See "State Plan Approaches" on p64675 in the final rule
See "Multi-state coordination: rate-based emission trading programs" on p64910 in the final rule

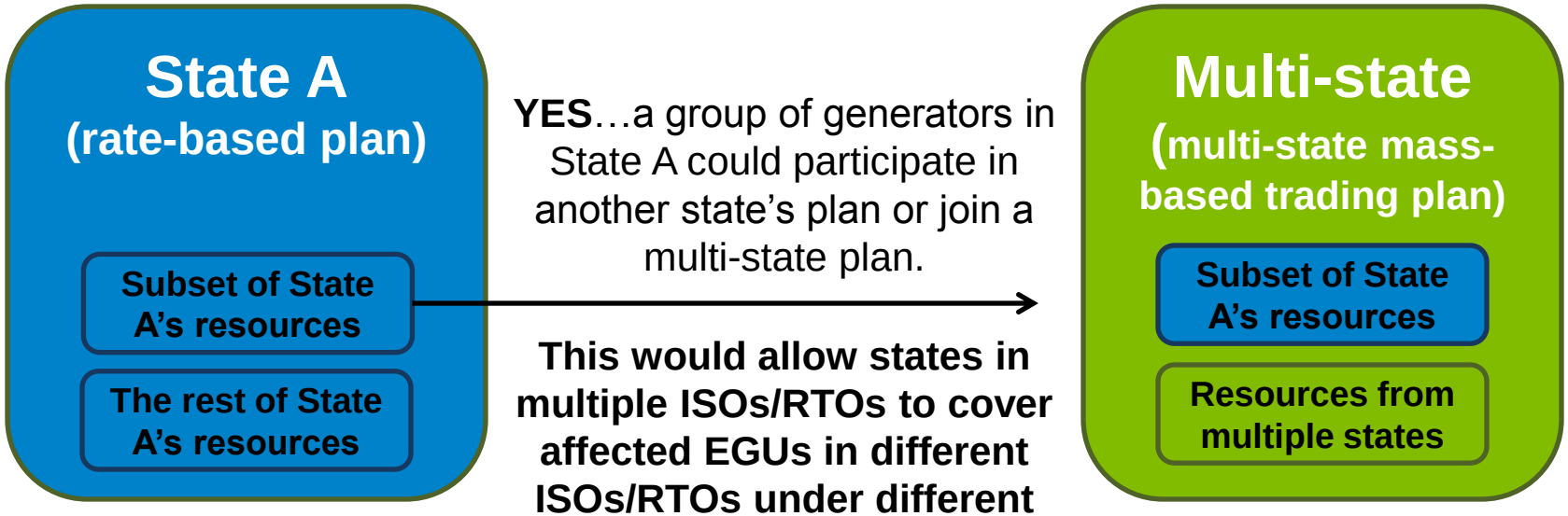
Multi-state paths to compliance

Multi-State Joint Plan	Multi-State Trading Plan
• Joint plans that aggregate the rate or mass goals of each participating state • Must be of same structure (emissions standards, state measures) • Joint mass goal is sum of individual mass goals • Joint rate goal is weighted average of individual rate goals	• Individual state goals and plans are retained, but plans allow interstate trading of ERCs or allowances • Trading is allowed between/amongst states with the same approach (rate with rate, mass with mass) • Detailed discussion of trading to follow

States may enter into more than one multi-state plan, e.g. a subset of units in a state could join a rate plan, while another subset in that same state joins a mass plan, however the two subsets may not trade with one another.

See "Multi-state plans and multi-state coordination" on p64838 in the final rule

Can subsets of the resources in one state participate in other state or multi-state plans?



*This applies for the **final rule** and the **model trading rules**.*

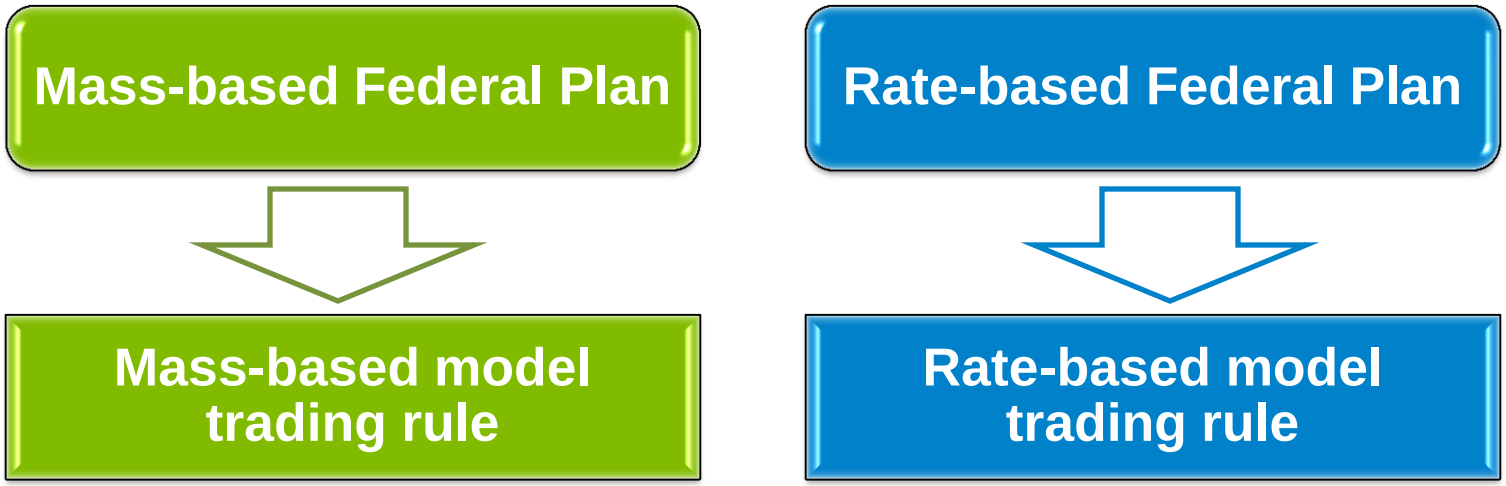
- *The scenario above is one of many potential iterations of a state's resources participating in other state's plans or in multi-state plans. Another example is that of a vertically integrated utility with service territory that crosses state lines.*
- *Regardless of the arrangement, each affected EGU will be covered by only one plan.*

Also see "Multi-state plans that address a subset of EGUs in a state" on p64840 of the final rule

Overview of the EPA's Proposed Federal Plan

The Federal Plan and model rules propose trading-ready approaches to compliance

EPA has indicated its intent to select a **single** Federal Plan approach—either rate or mass—and has recognized the advantages of a **mass-based** approach.



The Federal Plan includes model trading rules for states to use in part or whole in the formulation of their state plans. These model trading rules will be finalized in summer 2016.

The proposed Federal Plan outlines a path to compliance for states that 1) do not submit a state plan or 2) submit a plan that is not approvable by the EPA.

What are the differences between the Federal Plan and the model trading rules?

- The Federal Plan is for the EPA to use in the case that a state does not submit an approvable plan.
- The model trading rules are for the states to use, in part or whole, for state compliance.
- The model trading rules are generally *less prescriptive* than the corresponding rate- or mass-based Federal Plan.

Compliance with the final rule under a state-designed plan allows more latitude than compliance under the Federal Plan or model trading rules.

What are the differences between the Federal Plan and the model trading rules?

- **Under the model trading rules, states can opt out of the program to credit early action renewable energy and energy efficiency* (whereas this program is built into the Federal Plan).**
  - This is the key difference between the mass-based model trading rule and the mass-based Federal Plan.
- **Under the rate-based model trading rule:**
  - States can dictate partners or geographic scope for trading
  - More resources are eligible to generate Emission Rate Credits (ERCs) and states can propose different accounting methods for ERCs

Basics of the mass-based Federal Plan and model trading rule

- Requires individual affected EGUs to meet emission standards set using the CO_2 emission performance rates in the final rule
- For each compliance period (e.g. 2022-2024), the EPA will distribute a state's CO_2 emissions budget for that period to affected EGUs within that state, where

1 allowance = 1 short ton CO_2

- Allowances can then be transferred, bought, sold or banked.
- Affected EGUs must surrender allowances after each compliance period equal to CO_2 emissions generated during that period.

Allowance distribution under the mass-based Federal Plan and model trading rule

- **The EPA will distribute allowances to individual affected EGUs for states under the Federal Plan, using the following steps:**

Step #1
Determine the average annual generation for each affected EGU for 2010-2012

Step #2
Sum values from Step #1 to get the state's total annual average historic generation

Step #3
Divide the result of Step #1 by the result of Step #2 for each affected EGU to get a ratio, per unit, of individual-to-aggregate generation

Step #4
Multiply Step #3 ratios by the state's total allowances (less set-asides) to determine each affected EGU's allowance allocation

- **Under the Federal Plan or model trading rule, a state can elect to determine its allowance distribution**

The EPA will distribute allowances 7 months prior to the start of each compliance period (e.g. on May 1st 2021 for the 2022-2024 compliance period).

See "Proposed Allocation Approach and Alternatives" on p65019 in the Federal Plan.

If a state elects to distribute allowances under the mass-based Federal Plan or model trading rule…

- …it must address leakage and implement the Clean Energy Incentive Program (or CEIP).
- …it must apply the allocation to all years within a given compliance period (e.g. for all three years of the 2022-2024 period).
- …it could auction allowances or allocate allowances to load-serving entities, for example.
- …it will still be eligible to participate in the federal mass-based trading program.

Additionally, a state can replace the mass-based Federal Plan in a future compliance period with an EPA-approved state plan.

See "State-determined Allowance Distribution" on p65027 of the Federal Plan
See "Treatment of States Entering or Exiting the Trading Program" on p65029 of the Federal Plan

Allowance banking and borrowing under the mass-based Federal Plan and model trading rule

- **Can allowances be held past the compliance period for which they were distributed?**
  - **Yes**, allowances can be banked for later use (or held indefinitely).
- **Can allowances be "borrowed"?**
  - Allowances can be "borrowed" *within* a compliance period but not across compliance periods
  - E.g. no "borrowing" for generation in 2023 from not-yet-distributed 2025-2027 allowance budget.

See "Mass-Based Implementation Approach" on p65011 and "Initial Distribution of Allowances" on p65015 of the Federal Plan

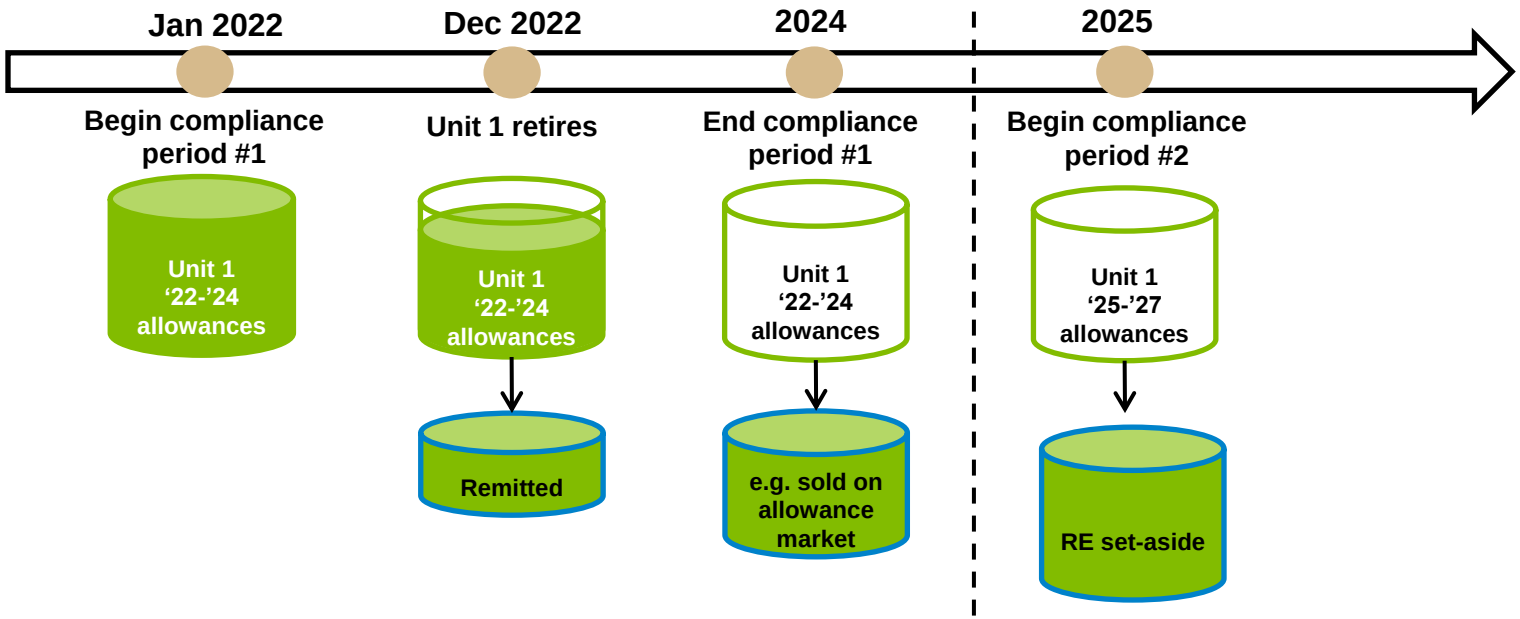
Allowance remittance under the mass-based Federal Plan and model trading rule

- **When do EGUs have to remit allowances?**
  - Allowance true-up is due by May 1st of the year following the compliance period
  - E.g. by May 1st, 2025 for the 2022-2024 compliance period
- **What happens if the EGU doesn't have enough allowances by the deadline?**
  - It will have to remit 2 allowances within the next year for every 1 allowance owed that wasn't in its allowance account.
  - It may be subject to additional penalties under Clean Air Act.

See "Compliance With Emissions Limitations" on p65031 of the Federal Plan

Under the mass-based Federal Plan and model trading rule, what happens to allowances when a unit retires*?

- If an affected EGU in state A does not operate for 2 full calendar years, the unit's allowances will be allocated to state A's RE set-aside



* The same consideration applies for modified or reconstructed units

See "Allocation to Units that Change Status" on p65026 in the Federal Plan

Basics of the rate-based Federal Plan and model trading rule

- Compliance is quantified using emission rate credits or ERCs, where

Like allowances, ERCs can be bought, sold or banked.

- There is no “ERC budget” as there is for allowances; rather, individual units must comply with their sub-category emission rate limitation (lbs CO_2/MWh) as established in the EGs.
- **ERCs owed:** If affected EGUs emit above the sub-category rate, they must acquire enough ERCs to offset the overage.
- **ERCs earned:** ERCs can be generated by affected EGUs or other entities that supply zero- or low-emitting electricity resource to the grid.

See “Rate-Based Approach” sections starting on p64970 (summary) and p64989 (details) of the Federal Plan.

Details on the rate-based Federal Plan and model trading rule

- **When do EGUs have to remit ERCs?**
  - By Nov 1st of the year following the end of the compliance period, e.g. by Nov 1st, 2025 for the 2022-2024 period
- **What happens if the EGU doesn't have enough ERCs by the remittance deadline?**
  - It will have to remit two ERCs "as soon as available" for every ERC due.
  - It may be subject to additional penalties under the Clean Air Act.
- **When a unit retires, it has to pay its ERC debt and can hold, sell or transfer any remainder ERCs—and is no longer eligible to generate ERCs.**

See "Compliance Demonstration" on p64998 and "Compliance with Emissions Standards" p65009-10 of the Federal Plan.

Allowances and Emission Rate Credits (ERCs)

Introduction to ERCs and allowances

In a *rate-based* state, compliance is measured in **ERCs.**

1 emission rate credit (ERC) = 1 "zero emitting" MWh

An ERC market would facilitate trading amongst rate-based states.

*Trading between the rate-world and the mass-world is **not** allowed.*

An allowance market would facilitate trading amongst mass-based states.

1 allowance = 1 short ton CO2

In a *mass-based* state, compliance is measured in **allowances.**

Which measures can earn (generate) ERCs?

The following measures are eligible to generate ERCs under the final rule. Only generation/energy savings in 2022 and beyond qualifies.		
Wind	Qualified biomass	Demand-Side Energy Efficiency
Solar	Waste-to-Energy	Demand-Side Management
Geothermal	Nuclear	Transmission & Distribution measures
Hydro	Combined Heat and Power	Wave/Tidal
Carbon Capture and Sequestration	Distributed generation	International RE resources

- All measures must have been installed/uprated/implemented by 1/1/13 or later to qualify
- Additional measures may be approved by the EPA
- ▭ indicates measures that are also eligible to generate ERCs under the Federal Plan

The fine print: *All measures must result in CO_2 emissions reduction for a grid-connected facility. This could be in the form of substitute generation (e.g. increased generation from an eligible wind unit replaces generation from an affected EGU) or decreased energy consumption at a grid-connected facility (e.g. DSM and EE programs).*

See "General eligibility requirements for resources used to adjust a CO2 emissions rate" on p64896 of the final rule.
See "Considerations for CO2 Emissions Reduction Measures That Occur at Affected EGUs" starting on p64999 of the Federal Plan.

How does the EPA calculate the number of ERCs earned or owed?

- **Using the following equation:**

$$\text{ERCs earned or owed} = \frac{\text{EGU standard} - \text{EGU operating rate}}{\text{EGU standard}} \times \text{EGU generation}$$

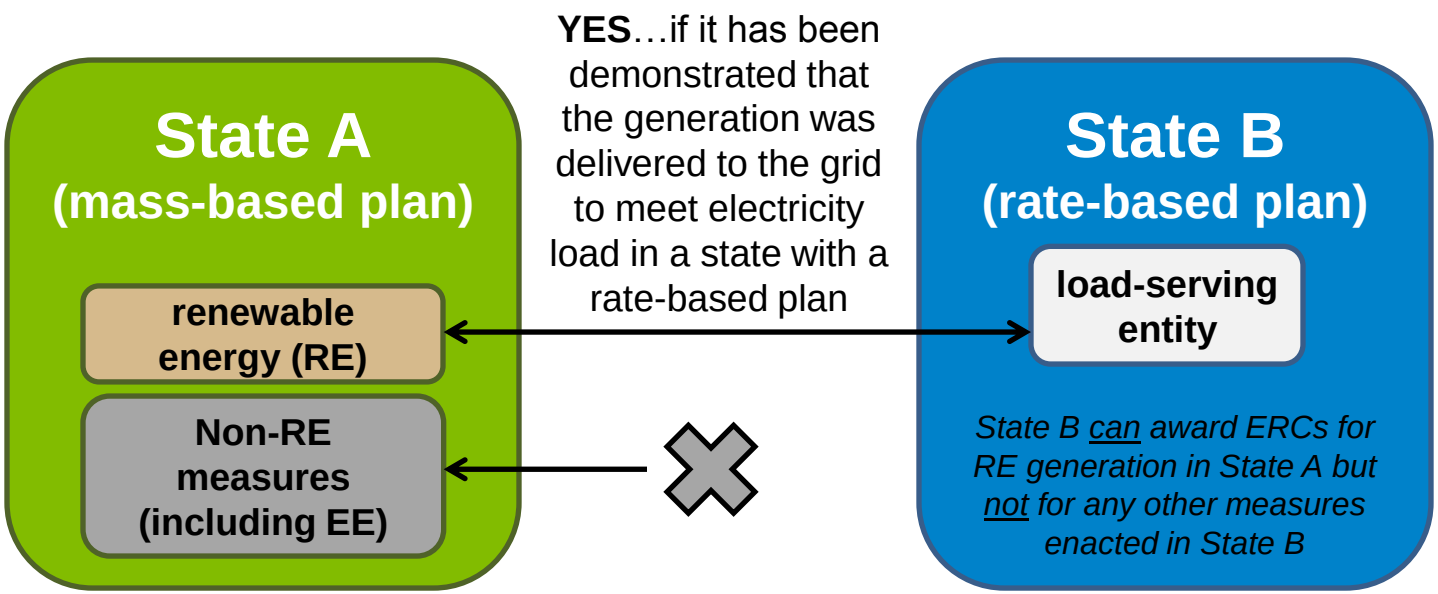
*If EGU standard **>** EGU operating rate, the unit will **earn** ERCs. If EGU standard **<** EGU operating rate, the unit will **owe** ERCs.*

- **Sample calculation of ERCs earned/owned**

$$\text{ERCs earned or owed} = \frac{1{,}500\ \frac{\text{lbs CO2}}{\text{MWh}} - 2{,}000\ \frac{\text{lbs CO2}}{\text{MWh}}}{1{,}500\ \frac{\text{lbs CO2}}{\text{MWh}}} \times 1\ \text{million MWh} = 333{,}334\ \text{ERCs owed}$$

See "ERCs Generated and Owed Against a Standard on p64991 of the Federal Plan.

Can renewable energy measures in a mass-based state be issued ERCs?

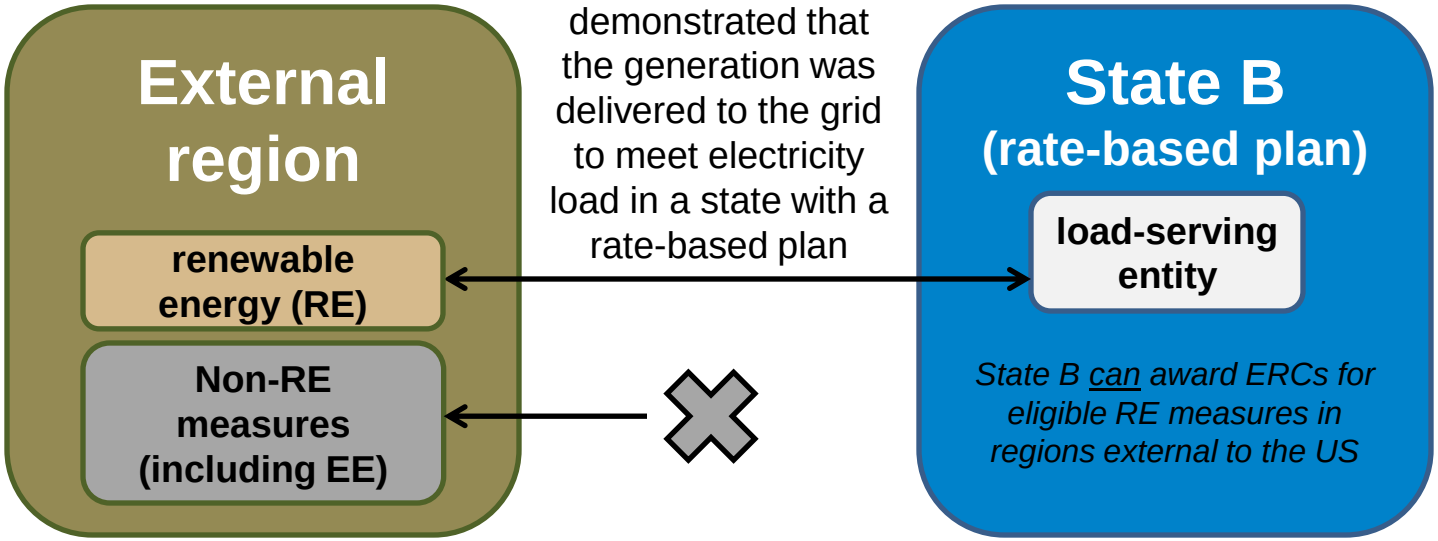


*This applies for both the **final rule** and the **Federal Plan**.*

- *This exception has been made for RE given its unique role in the BSER calculation.*
- *RE receiving ERCs from State B cannot receive ERCs or allowances from any other state for those same MWh.*
- *A rate-based multi-state system can be substituted for State B in the above scenario.*

See "Issuance of ERCs for Measures used to Adjust an Emission Rate" starting on p64999 of the Federal Plan.
Also see "Measures that occur in states with mass-based plans" on p64897 of the final rule.

Can renewable energy measures outside of the US be issued ERCs?



*This applies for both the **final rule** and the **Federal Plan**.*

Additional eligibility requirements under the final rule and the Federal Plan still apply.

See "Issuance of ERCs for Measures used to Adjust an Emission Rate" starting on p64999 of the Federal Plan.
Also see "Measures that occur in states, including areas of Indian country, that do not have affected EGUs" on p64898 of the final rule.

What are Gas-Shift ERCs (GS-ERCs)?

- **Partial-credit ERCs awarded to affected NGCCs for incremental increases in generation**
  - Designed to incentivize increased dispatch up to the 75% capacity factor target the EPA assumed in applying the BSER
- **They can be sold, transferred or banked but cannot be used for compliance by NGCCs (only by steam generating units).**
- **The sale of GS-ERCs could help offset the cost of ERCs owed.**
- **The number of GS-ERCs earned will be a fraction of the unit's operation during the year.**

See "Incremental NGCC ERCs" on p64991 of the Federal Plan.

How does the EPA determine the number of GS-ERCs awarded per year to a given unit?

1. The total net generation **(NGCC Generation)** of the affected NGCC unit during the year for which GS-ERCs are being calculated is determined.

2. Incremental NGCC generation needed to reach 75% NGCC regional capacity is divided by that same capacity to calculate **Factor #1 (Incremental Generation).**

$$\text{Incremental Generation Factor (IGF)} = 1 - \frac{\text{Regional 2012 NGCC Baseline}}{\text{75\% NGCC Regional Capacity}}$$

(Selecting the region with the least stringent compliance target, for the regional baseline and capacity, in line with the final rule.)

3. The affected NGCC's emission rate is compared to the fossil steam standard rate, to produce **Factor #2 (Emission Factor).**

$$\text{Emission Factor} = 1 - \frac{\text{NGCC Emission Rate}}{\text{Steam Standard}}$$

4. These two factors are applied to the NGCC generation to determine the GS-ERCs awards for the individual affected NGCC in a given year.

$$\text{GS} - \text{ERCs earned} = \text{NGCC Generation x IGF x Emission Factor}$$

See "Incremental NGCC ERCs" on p64991 of the Federal Plan.

Could an NGCC simultaneously earn GS-ERCs and owe ERCs?

- **Yes.** The calculation of GS-ERCs for an NGCC is independent of the calculation of ERCs generated or owed against the NGCC standard
- ERCs earned/owed:

$$\text{ERCs earned or owed} = \frac{771\ \frac{\text{lbs CO2}}{\text{MWh}} - 850\ \frac{\text{lbs CO2}}{\text{MWh}}}{771\ \frac{\text{lbs CO2}}{\text{MWh}}} \times 1\ \text{million MWh} = \mathbf{102,464\ ERCs\ owed}$$

- GS-ERC Emission Factor

$$\text{Emission Factor} = 1 - \frac{771\ \frac{\text{lbs CO2}}{\text{MWh}}}{1{,}404\ \frac{\text{lbs CO2}}{\text{MWh}}} = \mathbf{0.45}$$

$$\text{Incremental Generation Factor} = 0.26$$

Single value for all NGCCs, calculated by the EPA

- GS-ERCs earned:

$$\text{GS} - \text{ERCs earned} = 1\ \text{million MWh x } 0.26 \text{ x } 0.45 = 117{,}000\ \text{GS} - \text{ERCs earned}$$

See "ERCs Generated and Owed Against a Standard on p64991 of the Federal Plan.

Which measures can be allocated allowances?

The following measures are eligible to receive allowances under the final rule.		
Wind	Qualified biomass	Demand-Side Energy Efficiency
Solar	Waste-to-Energy	Demand-Side Management
Geothermal	Nuclear	Transmission & Distribution measures
Hydro	Combined Heat and Power	Wave/Tidal
Carbon Capture and Sequestration	Distributed generation	International RE resources
Affected EGUs	New NGCCs (via the New Source Complement)	

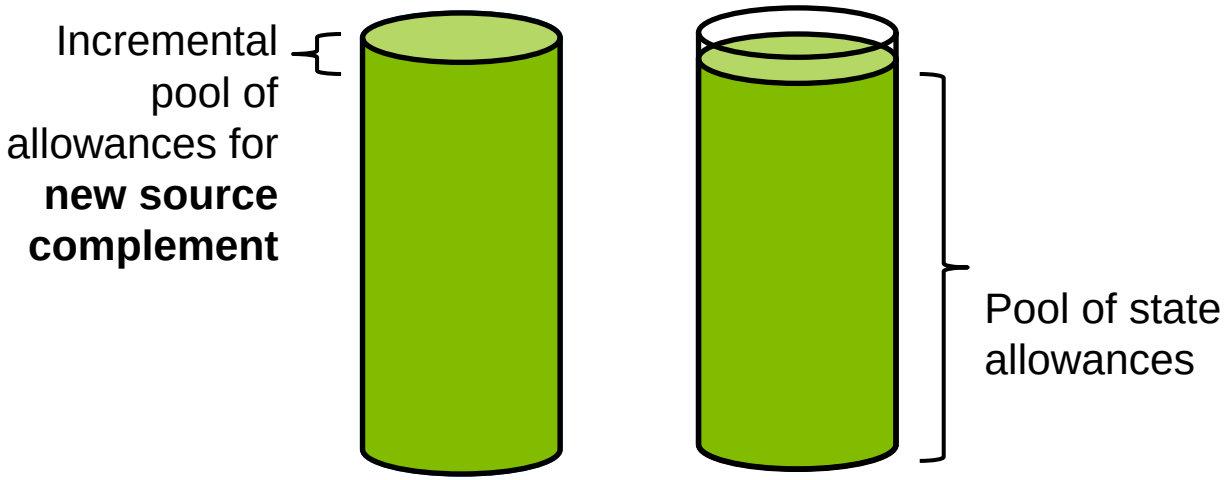
- All measures must have been installed/uprated/implemented by 1/1/13 or later to qualify for allowance allocation—with the exception of affected EGUs (installed prior to Jan. 8, 2014)
- Additional measures may be approved by the EPA
- States formulating and submitting their own plans have latitude to determine allowance distribution—with respect to who gets allowances and how many they get.
- ▭ indicates measures that can be allocated allowances under the Federal Plan

The fine print: *All measures must result in CO_2 emissions reduction for a grid-connected facility.*

** The EPA may deem additional measures eligible to receive allowances*

In the final rule, the EPA established state-by-state allowance pools

- States can determine the allocation of the allowances in their pool but cannot alter the size of the pool*

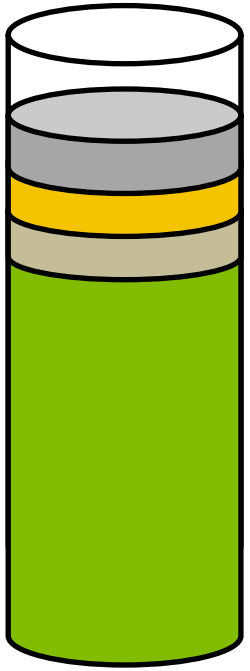


- If a state elects a mass-based compliance path, it can opt for an annual, incremental allocation of allowances per the new source complement (NSC).
- The Federal Plan and model trading rules do not include the NSC.

The EPA also proposed three allowance "set-asides" in the Federal Plan

- These programs set-aside allowances, from the overall allowance pool that the EPA has established, to incentivize certain behaviors and to prevent leakage

Clean Energy Incentive Program (CEIP)
300 million allowances set-aside for "early action" RE and EE **R, M**
Renewable energy set-aside (RE)
5% of total allowances per state set-aside for eligible RE resources **M**
Output-based NGCC set-aside
Incentivizes increased dispatch of existing NGCCs **M**



Incremental pool of allowances for **new source complement**

Pool of state allowances **w/out new source complement;** green portion is remainder after set-asides have been applied

R = set-aside program is for rate- and mass-plans
M = set-aside program for mass-based plans

States have the option to incorporate set-asides into their compliance plans

	Mass			Rate		
	Final Rule	**Federal Plan**	**Model Rule**	**Final Rule**	**Federal Plan**	**Model Rule**
RE	Optional	Included	Included	N/A	N/A	N/A
CEIP	Optional	Included	Optional	Optional	Included	Optional
Output-based NGCC	Optional	Included	Included	N/A	N/A	N/A

Set-asides are prescribed in certain iterations of the Federal Plan and the model trading rules.

See "Set-Asides for Renewable Energy Projects" on p65022 and "Allocation of renewable energy set-aside allowances" on p65069 of the Federal Plan.

The renewable energy set-aside reserves 5% of a state's allowances for renewable energy

The following measures, if installed/uprated by 1/1/13 or later, are eligible to receive renewable energy set-aside allowances under the mass-based Federal Plan and model trading rule.				
Wind	Solar	Geothermal	Hydro	Other*

- The RE set-aside is one of several measures to address leakage under a mass-based plan.
- RE set-aside allocations are based on projected RE generation in 2022 and beyond (i.e. this set-aside applies to all compliance periods).
- Allowances are distributed on December 1st of the year prior to the year of generation (e.g. on Dec. 1st, 2023 for RE generation in 2024)
- States may tailor the RE set-aside to their individual needs in a state-designed compliance plan.

The fine print: " *Other " = *The EPA may deem additional measures eligible to receive allowances under the RE set-aside. All measures must result in CO_2 emissions reduction for a grid-connected facility.*

See "Set-Asides for Renewable Energy Projects" on p65022 and "Allocation of renewable energy set-aside allowances" on p65069 of the Federal Plan.

The Clean Energy Incentive Program (CEIP) rewards "early action" RE and EE

- **Enables states to award early action emission rate credits (ERCs) and allowances to eligible renewable energy (RE) or demand-side energy efficiency (EE) projects**
- **Eligibility:**
  - Resources located in/benefitting a state that has submitted a final state plan that includes requirements establishing its participation in the CEIP
  - Generates metered MWh from any type of wind or solar resources
  - Results in quantified and verified electricity savings (MWh) through demand-side EE implemented in low-income communities

See "Provisions to Encourage Early Action" on p65025 of the Federal Plan
See "What is the Clean Energy Incentive Program and how do I participate? on p64943 of the final rule

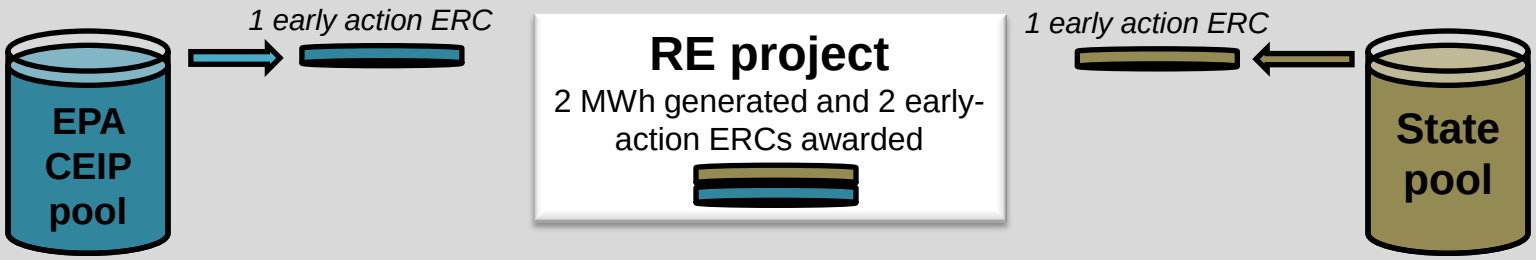
What constitutes “early action” under the CEIP?

- **In states submitting their own plan:**
  - Measures that commenced construction (RE) or commenced operation (EE) after a state submits its final compliance plan
- **In states under the Federal Plan:**
  - Measures that have commenced construction (RE) or commenced operation (EE) after the final deadline for state plan submittal (Sept. 6, 2018)
- **In all cases:**
  - ERCs or allowances are awarded for generation (RE) or energy savings (EE) that occurs on 2020 - 2021.

See “Provisions to Encourage Early Action” on p65025 of the Federal Plan
See “What is the Clean Energy Incentive Program and how do I participate? on p64943 of the final rule

The basics of ERC/allowance allocation under the CEIP

The EPA will "match" state-issued ERCs and allowances



- **RE:** For every 2 MWh generated by an eligible RE project, 1 early action ERC would be issued by the state and the EPA would match it with 1 ERC from the CEIP pool.
- **EE:** For every 2 MWh of energy savings, 2 early action ERCs will be issued by the state and the EPA would match them with 2 ERCs from the CEIP pool.
- The equivalent number of early action allowances would be issued and matched in a mass-based state.

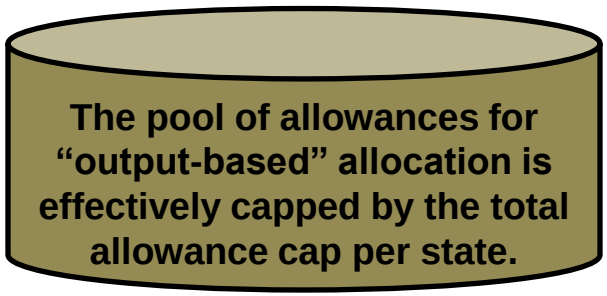
The EPA's total pool of matching ERCs/allowances is equivalent to 300 million short tons of CO_2 emitted.

See "Provisions to Encourage Early Action" on p65025-6 of the Federal Plan
"Provisions to Encourage Early Action" on p64829 of the final rule
See "What is the Clean Energy Incentive Program and how do I participate?" on p64943 of the final rule

The “output-based” set-aside incentivizes increased dispatch of existing NGCCs

- **The “output-based” set-aside is designed to mitigate leakage**
  - Allowances are earned by incremental increases in generation from affected NGCCs
  - Allocation is based on EPA targets for increased dispatch, individual unit capacity and generation in the previous compliance period
  - Begins in the 2nd interim compliance period
  - Only units exceeding a 50% capacity factor on a net basis over the compliance period are eligible (and only for the portion of their generation exceeding the 50% mark)

Each MWh of eligible generation from an existing NGCC would earn allowances equal to the level of emissions permitted per MWh under the 111(b) new source standard (i.e. 1,030 lbs/ MWh)



See “Set-Asides for Output-Based Allocation” on p65020 of the Federal Plan.

Trading

Trading of allowances and ERCs underlies the EPA's proposed paths to compliance

- **There are a few basic rules for trading:**
  - Mass trades with mass
  - Rate trades with rate
  - No trading between mass and rate
- **Both the Federal Plan and the model rules are "trading ready"**
  - They are designed to ensure that ERCs within the rate-based trading pool are equivalent; likewise for allowances within the mass-based trading pool.
- **Trading between states that are not under the Federal Plan or using the model rule as written, requires *linkage*.**

Linkage for rate-based compliance approaches

Linkage must be established between/amongst states that wish to participate in interstate trading of ERCs/allowances via one of the following….

"Ready-for-interstate-trading" plans	Specified bilateral linkage	Joint ERC issuance
• State recognizes ERCs issued by any state with an EPA-approved plan • Must use EPA-approved or administered tracking systems	• State recognizes ERCs issued by specific partner states • States use joint, interoperable or EPA-administered tracking systems	• States implement consistent rate-based emission trading program regulations • States share a tracking system • State coordinate submission and issuance of ERCs

In all three options, each state will submit an individual plan.

See "Multi-State Coordination: Rate-Based Emission Trading Programs" on p64910 of the final rule.

Linkage for mass-based compliance approaches

Linkage must be established between/amongst states that wish to participate in interstate trading of ERCs/allowances via one of the following….

"Ready-for-interstate-trading" plans	Specified bilateral linkage
• State recognizes allowances from any state with an EPA-approved plan • Must use EPA-approved or administered tracking systems	• State recognizes allowances from specific partner states • States use joint, interoperable or EPA-administered tracking systems

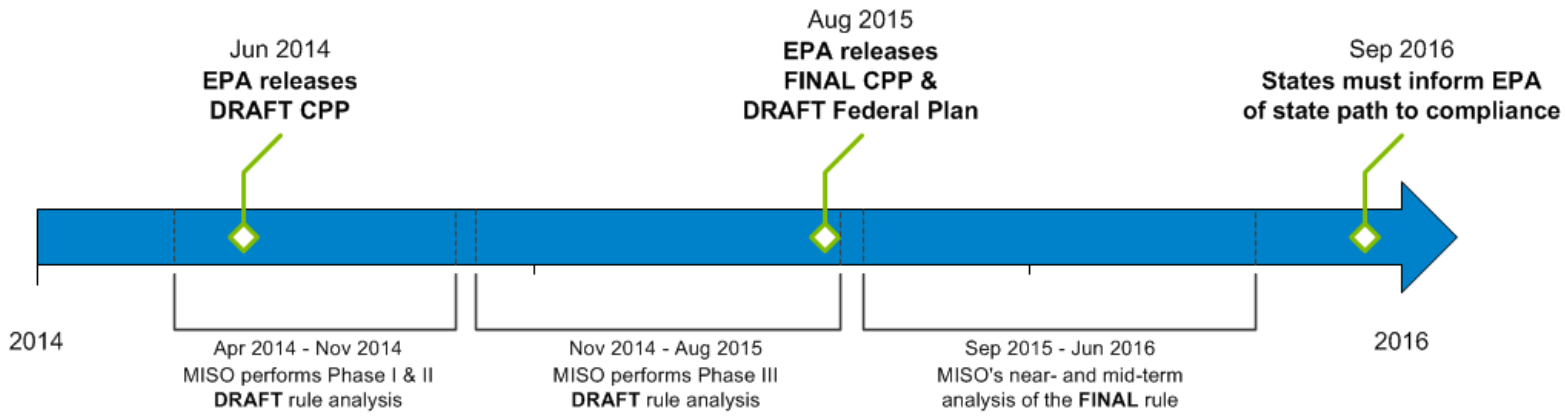
In both options, each state will submit an individual plan.

See "Multi-State Coordination: Mass-Based Emission Trading Programs" on p64892 of the final rule.

MISO's Proposed Final Rule Analysis Study Scope & Timeline

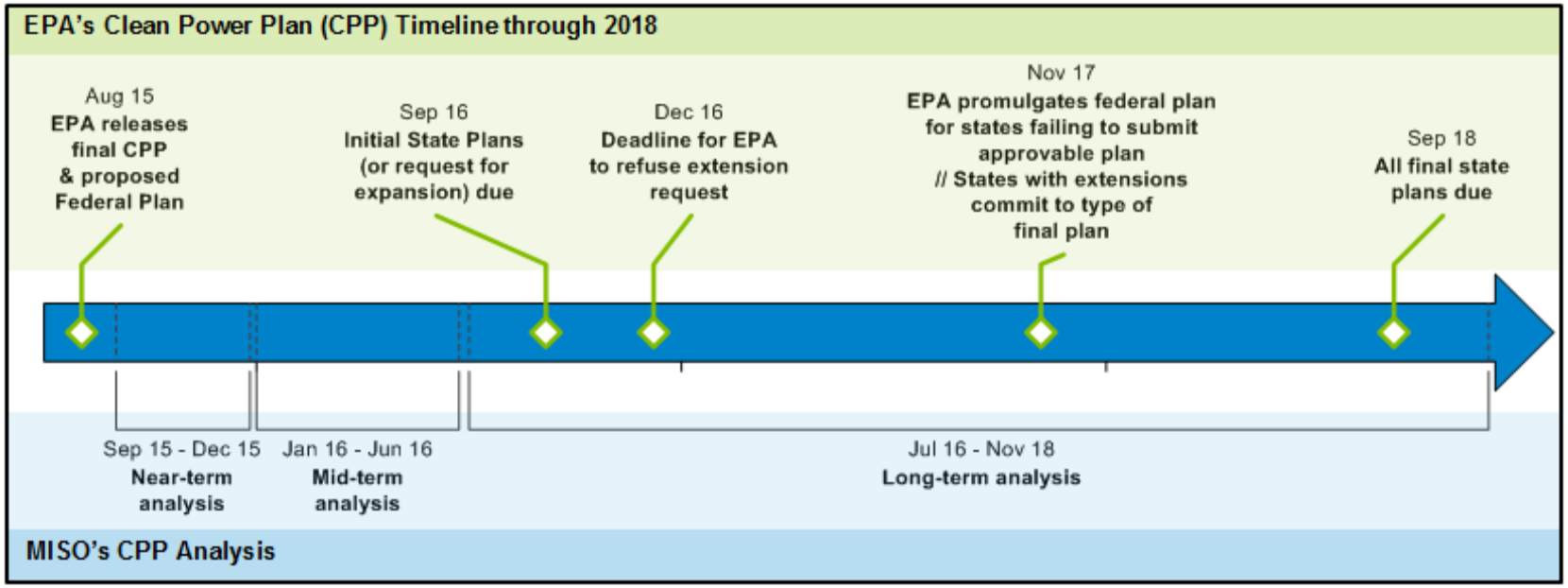
Background on MISO's CPP study efforts

- Over the past ~1.5 years, MISO has modeled the potential impacts of the **draft** Clean Power Plan
- Analysis continues with the release of the **final** CPP



CPP final rule modeling goals and scope

- 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



MISO's CPP study efforts over the next 2-3 years will create a bridge between the uncertainty and complexity that exists today and the modeling certainty needed for effective transmission overlay design.

The final rule study will evaluate CPP compliance pathways and inform the transmission planning process

Near-Term Modeling (Understanding compliance options & their implications)	Mid-Term Modeling (Preparing for transmission overlay development)	Long-Term Modeling (Developing transmission overlay)
• Rate vs. mass comparison • Rate and mass interactions • State vs. regional compliance • Trading options • Federal plan • Range of compliance sensitivities • Compliance costs	• Potential generation retirements • Optimal resource expansion • Wind/solar zones • Renewables penetration/mix • Renewables siting • Thermal siting with new ozone rule	• Will be informed by state compliance plans • Will use futures formulated through MTEP17 process • Updates to assumptions as needed over MTEP18 and '19 cycles
Using Existing PLEXOS and EGEAS models*	Using new EGEAS models* and external research	Using new EGEAS, PLEXOS and PROMOD models

**Existing draft rule models will be updated with final rule parameters.*

**Evaluated using three proposed CPP futures.*

Timeline for final rule analysis

Sept. – Nov. 2015	• Develop scope of work for final rule analysis • Update existing models with final CPP parameters • Conduct CPP informational workshop
Dec. - Feb. 2015	• Conduct near-term analysis • Present preliminary and final results incrementally as they are ready
Jan. – Apr. 2016	• Conduct mid-term analysis • Build EGEAS models • Complete external research
Mar. – May. 2016	• Follow-up modeling, as needed, based on feedback from stakeholders
May. – June. 2016	• Complete draft report to share with stakeholders for feedback • Publish final report

Three futures for the mid-term analysis represent a broad view of potential CPP outcomes

Clean Power Plan (CPP)

- CO_2 emissions reduction targets are modeled.

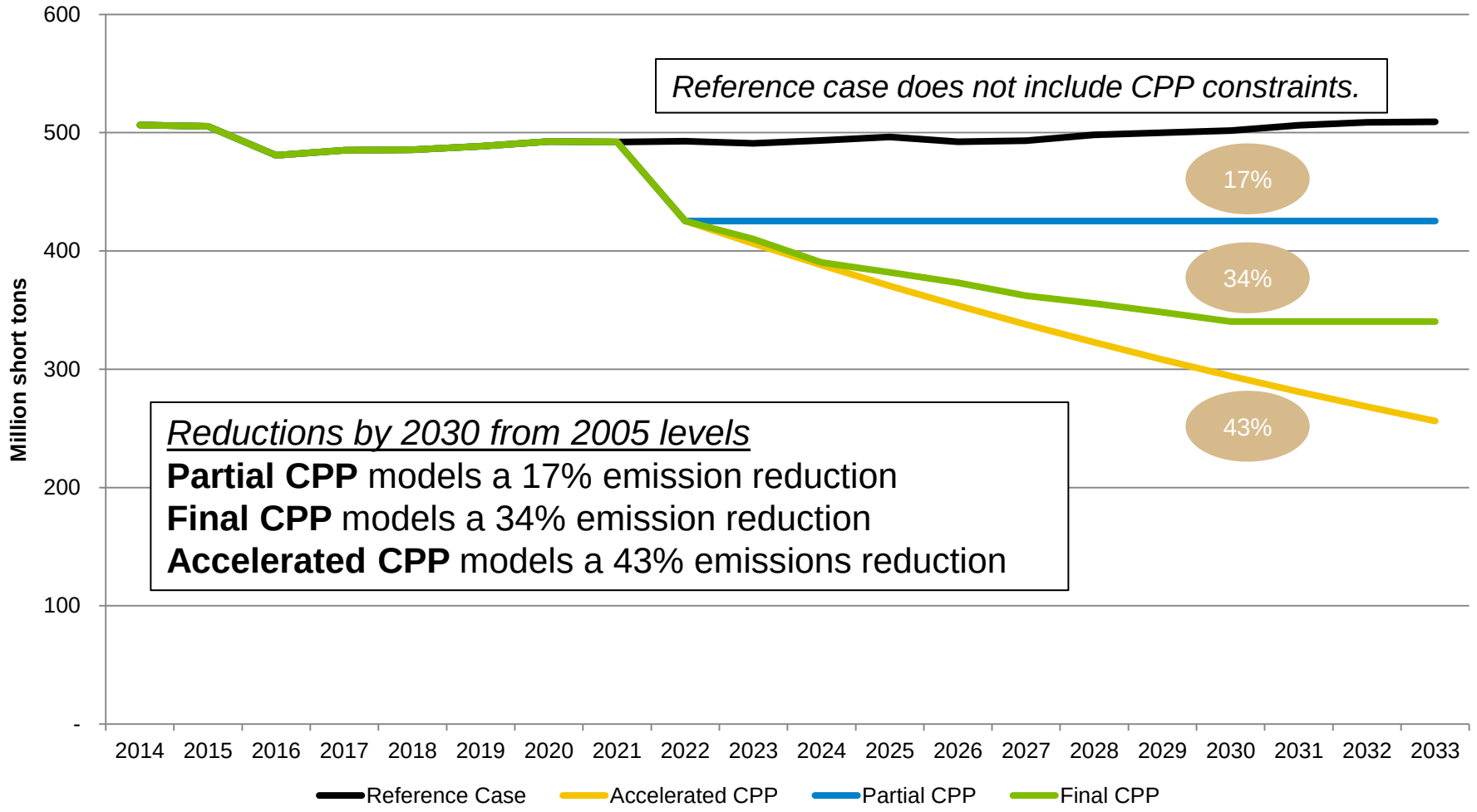
Accelerated CPP Future (ACF)

- Accelerated economic maturity of renewables and demand-side resources driven by technological advancements and public policy, along with sustained competitive gas prices
- CO_2 emissions reduction targets are far exceeded.

Partial CPP Future (PCF)

- Legal challenges to the rule slow or halt compliance, resulting in partial CPP implementation.
- Early CO_2 emissions reduction targets are achieved but further reduction is not pursued.

Comparison of CO_2 emission reduction targets for the MISO footprint per future



Thank you!

- For more information on MISO's CPP analysis, please participate in MISO's Planning Advisory Committee (PAC) meetings.
- The next meeting of the PAC is scheduled for Nov. 11th, 2015.
- See https://www.misoenergy.org/Events/Pages/PAC20151111.aspx for more details and to register for the Nov 11th PAC meeting.

Appendix

Evaluation, Measurement & Verification Plan (EM&V Plan)

What is an EM&V plan?	• Set of procedures, methods, and analytic approaches used to quantify and verify MWh from RE, EE, and other measures submitted at the initiation of the eligible measure
Who is Included to submit one to the state?	• RE, demand-side EE, other resources eligible to generate ERCs
What do all plans need to contain?	• Identification of the eligible resource • How requirements to quantify and verify generation and savings produced will be carried out during the compliance period • Requirement of periodic submittal of M&V reports
What do demand-side EE EM&V plans need to contain?	• Baseline of what would have happened absent EE • Effects of changes in independent factors affecting energy consumption • Length of time EE is expected to provide savings

See "EM&V Requirements for RE, Demand-side EE and Other Measures Used to Adjust a CO_2 Rate" on p64908 in the Final Rule

Monitoring & Verification Report (M&V Report)

What is an M&V report?	• Report that provides updates on the implementation of an EM&V plan to verify generation/savings from an eligible resource submitted periodically
Who is Included to submit one to the state?	• RE, demand-side EE, other resources eligible to generate ERCs
What does the first M&V report need to contain?	• Verification that the planned-for measure was installed/implemented consistent with the eligibility application
What do subsequent M&V reports need to contain?	• Time period covered by the report • Description of how EM&V requirements were applied • Ex-post energy generation/savings (MWh) for the eligible resource • Documentation of any change in generation/savings ability

See "EM&V Requirements for RE, Demand-side EE and Other Measures Used to Adjust a CO_2 Rate" on p64908 in the Final Rule

Q & A on the RE set-aside

Q - Does a state submitting a mass-based plan have to include an RE set-aside?
A – No, so long as the state can show it is addressing leakage through other measures.
Q - If a state submitting a mass-based plan elects to include an RE set-aside, does it have to use the RE set-aside as laid out in the Federal Plan?
A - No. States can determine the size and qualifications for their own set-aside programs (which can include RE and/or demand-side EE), so long as the programs meet eligibility requirements (e.g. they address leakage and do not prevent the state from meeting compliance targets).
Q - Can the same RE receive both allowances and ERCs?
A - No. Neither the final rule nor the Federal Plan (or model trading rules) allow for double counting.
Q – Can an RE project in State A be awarded RE set-aside allowances by State B?
A – No. Resources must be located in the state from which RE set-aside allowances are awarded.

See "Allowance set-asides to address leakage to new sources" on p65019 and "Allocation of renewable energy set-aside allowances" on p65069 and of the Federal Plan.
See p64890 of "Requirement for emission budget trading programs to address potential leakage" in the final rule.

RE set-aside application, allocation and true-up

Application
• RE developers apply to receive RE set-aside allowances by **June 1st** of the year prior to the year of generation (e.g. application submitted by June 1st, 2023 for projected generation in 2024)
Allocation
• If approved, allowances will be distributed on **Dec 1st** prior to the year of generation (e.g. allowances distributed on Dec 1st, 2023 for projected generation in 2024) • Allowances will be distributed pro-rata (number of allowances per RE generator based on % of total approved RE MWh per state)
True-up
• The delta between projected and actual MWh will be subtracted from the RE provider's set-aside in the next generation year (next years, if the deficit exceeds projections for the upcoming year).

See "Set-Asides for Renewable Energy Projects" on p65022 of the Federal Plan.

Change in rate goals over time for MISO states