Clean Power Plan Handbook

A Guide to the Final Rule for Consumer Advocates

Prepared for the National Association of State Utility Consumer Advocates

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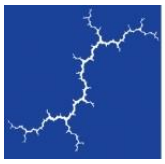
AUTHORS

Sarah Jackson
Nidhi R. Santen, PhD
Pat Knight
Spencer Fields
Bruce Biewald
Elizabeth A. Stanton, PhD



Synapse
Energy Economics, Inc.

485 Massachusetts Avenue, Suite 2
Cambridge, Massachusetts 02139

617.661.3248 | www.synapse-energy.com

PREFACE

This handbook has been prepared by Synapse Energy Economics (Synapse), pursuant to a grant from the Energy Foundation, to help prepare members of the National Association of State Utility Consumer Advocates (NASUCA) to participate most effectively in planning to address the final version of the U.S. Environmental Protection Agency's (EPA's) Clean Power Plan. Consumers ultimately shoulder most of the costs of new environmental initiatives. NASUCA's members are designated by the laws of their respective jurisdictions to represent the interests of utility consumers in their states. Preparing NASUCA members to be able to effectively participate in the decision-making processes, which inform ultimate compliance with EPA's Clean Power Plan is therefore essential. Such preparation can help assure that costs to consumers are not incurred unnecessarily and to assure that consumers receive the best possible value for money spent.

Recognizing that NASUCA members and other stakeholders have a wide range of reactions to EPA's Clean Power Plan, the intent of this handbook is not for NASUCA to take positions as to the Plan's substance or to comprehend every conceivable issue consumers in a particular state might face. Nor does the handbook in any way represent the distilled opinions of NASUCA's membership. Just as individual states will vary in their responses to the Plan, the intent of this handbook is to be a common resource to help all of NASUCA's members prepare to address Clean Power Plan issues, whatever their individual state's positions.

Editorial Note: *The analysis for this handbook was completed before the publication of the final Clean Power Plan in the Federal Register. The final publication contained the addition of technical documents previously unreleased, as well as new details related to compliance options. These changes are not reflected in this handbook, although citations have been updated to align with the Federal Register publication.*

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EXECUTIVE SUMMARY

On August 3, 2015, the United States Environmental Protection Agency (EPA) released the final version of its Clean Power Plan, a rule under Section 111(d) of the Clean Air Act that aims to reduce carbon dioxide (CO_2) pollution from existing fossil fuel power plants.[I]

Since the rule was first proposed in draft form in June 2014, Synapse has been providing outreach and materials to NASUCA members to assist state consumer advocates in addressing the rule in a manner that is most cost-effective and efficient from an electricity consumer perspective. In this handbook, we explain how the final rule will be implemented, summarize the changes from the proposed rule, and discuss key issues for consumer advocates to consider when working with other stakeholders to develop compliance plans.

What is the Clean Power Plan?

The Clean Power Plan is a complex rulemaking that ultimately aims to reduce CO_2 emissions from eligible sources 32 percent below 2005 levels by 2030. Eligible sources are existing fossil fuel-fired electric generating units (coal, gas, and oil) greater than 25 MW that sell most of their power to the grid.

To reduce CO_2 emissions from existing power plants, EPA established emission performance standards for two electric generating technology types—fossil steam (mainly coal) and stationary combustion turbines (mainly natural gas combined cycle plants)—based on the degree of emission reductions achievable through what is called the "best system of emission reduction," or BSER. BSER includes not only upgrades and operational changes to power plants but also measures such as increased renewable energy and shifting generation from higher-emitting resources such as coal to lower-emitting resources such as natural gas. These measures (called "building blocks") reduce emissions at fossil fuel power plants by increasing their efficiency or reducing their required output of electricity.

Target setting is the first in a series of steps in the Clean Power Plan that Synapse describes as "moments" (presented in Figure ES 1). This moment has already been completed by EPA.[2]

Figure ES 1. Schematic of Clean Power Plan moments

[I] EPA Final Clean Power Plan, 80 Fed. Reg. 64662 (October 23, 2015).

[2] EPA's rate- and mass-based emission limits for each state are available at http://www.epa.gov/airquality/cpp/tsd-cpp-emission-performance-rate-goal-computation-appendix-1-5.xlsx.

The next step in the process is for states to **develop compliance plans** to be submitted to EPA. Initial draft compliance plans or requests for extension with demonstrations of progress are due September 6, 2016, and final plans are due no later than September 6, 2018. During this moment, states may follow the approaches outlined by EPA during the target setting moment, or they may design their own strategies to comply with the targets. For most compliance options, states must demonstrate that their compliance plan achieves an emission rate (lbs/MWh) or mass (tons) equal to the targets set by EPA.

Finally, states will need to **demonstrate compliance** in the interim compliance periods (2022-2024, 2025-2027, and 2028-2029), in the final compliance period (2030-2031), and biennially thereafter. Depending on the compliance approach a state chooses, these demonstrations will be more or less complex.

Throughout the final Clean Power Plan, EPA has emphasized regional cooperation and coordinated planning as one of the key ways compliance can align with what the agency calls the "complex machine" that is our electric power system. As such, EPA has provided extensive guidance on the development and use of emission trading programs, concluding that the larger the region over which trading occurs, the more effective—and cost-effective—compliance will be. Many of the changes that were made from the proposed to the final Clean Power Plan support this emphasis on regional coordination.

Key differences from the proposed rule

EPA received over four million comments on its proposed Clean Power Plan and revised the rule significantly in response to many of those comments and concerns. In Table ES 1, we summarize a number of key ways the final rule differs from the proposal.

Table ES 1. Summary of differences between proposed and final Clean Power Plan

Timeline	• First year of compliance pushed back to 2022 • States get an extra two years to submit compliance plans • Establishes a "glide path" that gradually steps down states' compliance target over the course of three interim periods
Changes to baseline	• States with significant levels of hydro have baseline fossil generation adjusted to reflect a year more typical than 2012 • Minnesota's target was adjusted to account for the Sherburne County coal unit that was inoperable through most of 2012 • Other baseline values were adjusted to reflect fossil units that either began operation in 2012, or were under construction in 2012 or 2013 • Emission rates at certain units that have emission rates deemed to be "outliers" have been adjusted
New target calculations	• Based on performance rates established for two subcategories of emitters (fossil steam units and natural gas combined-cycle units) • Changes to calculation of heat rate improvements, natural gas re-dispatch, renewable energy potential

	• Energy efficiency and nuclear generation no longer included in target setting (but still viable options for compliance) • Target calculation performed at the interconnect level
Displacement	• Targets account for generation and emissions displaced by new renewable energy generation
Compliance options	• Changed from two options (rate- or mass-based) to seven potential compliance pathways
Emissions trading	• States meeting rate-based targets can trade a commodity called "Emissions Rate Credits" (ERCs) • States meeting mass-based targets can trade emission allowances measured in short tons
Banking credits	• Generation or emission reductions that occur over and above a state's target to be carried forward and applied to a future year
Reliability	• States must demonstrate they have considered reliability in developing plans • Included a "reliability safety valve" in case of emergencies
Incentives for early action	• Created the Clean Energy Incentive Program (CEIP) to encourage and reward early installers of certain clean energy measures
Community and environmental justice	• States must demonstrate how they are engaging traditionally vulnerable communities including low-income residents, communities of color, and tribal communities

Key issues for consumer advocates

To ensure that consumers reap the potential benefits of the Clean Power Plan, which include the potential to reduce energy bills in some states,[3] it is important for consumer advocates to coordinate with key state agencies and stakeholders early in the process and make the case for appropriate least-cost planning. We summarize in Table ES 2 the key issues and potential next steps for consumer advocates to consider as states begin planning for and implementing plans.

Table ES 2. Summary of key issues for consumer advocates

Issue	Action
Intrastate Coordination	Coordinate early with key agencies and stakeholders
Multi-State Coordination	Consider potential benefits of coordinating with other states, particularly around approaches to trading
Least-Cost Planning	Model costs of variety of options, including single- and multi-state compliance, as well as rate- and mass-based approaches
Wholesale Price of Energy	Research and model the price effect of shifting dispatch
Mass- versus Rate-Based	Consider potential benefits of each approach
Out-of-Rule Emissions	Consider whether inclusion of new fossil generating units in compliance approach might benefit consumer interests
Coal Retirement	Monitor opportunities for retirement of uneconomic units and how these retirements impact compliance
Enforceability	Consider whether state measures, which would not be federally enforceable, might be used for compliance under a state measures plan
Nuclear Challenges and Opportunities	Be aware of risks/opportunities around new nuclear generation and uprates at existing nuclear units
Efficiency Measurement	Communicate to EPA thoughts on standardization of efficiency measurement
Rate and Bill Impacts	Model impacts of energy efficiency for both participants and non-participants
Community and Environmental Justice Considerations	Consider participation in Clean Energy Incentive Program and ways to work with vulnerable communities to ensure they are not disproportionately impacted
Equity	Investigate ways to increase participation in renewable energy and energy efficiency programs to increase equity of allocation of costs

[3] Knight, P., S. Fields, P. Luckow, T. Vitolo, S. Jackson, B. Biewald, E. A. Stanton. 2015. *Bill Savings in a Clean Energy Future, Part 2: Clean Power Plan Final Rule Update*. Synapse Energy Economics. Available at: http://synapse-energy.com/sites/default/files/Bill-Savings-Part-Two.pdf.

1. INTRODUCTION

On August 3, 2015, the United States Environmental Protection Agency (EPA) released the final version of its Clean Power Plan. The Clean Power Plan is one of the signature initiatives of the Obama Administration's Climate Action Plan, which aims to significantly reduce greenhouse gas emissions from all sectors of the U.S. economy. Under the Clean Power Plan, the electric sector—which is the single largest producer of greenhouse gases—is expected to reduce carbon dioxide (CO_2) emissions from 2005 levels by about 32 percent nationwide by 2030. This overall goal reflects EPA's estimate of the effect of the 47 covered states all meeting their compliance targets as described in this handbook.

While reactions to the Clean Power Plan vary widely from state to state, consumer advocates in every part of the country share a common interest in ensuring that the rule is implemented in a way that is as cost-effective and fair to consumers as possible. To do that, they will need to navigate the complexities of a rule that was designed for flexibility rather than for simplicity. Synapse wrote this handbook to provide consumer advocates with a reference to guide them through some of the details of the rule so that they may more easily engage in the compliance planning process. It supplements the information we provided in our pre-rule handbook for consumer advocates entitled *Best Practices in Planning for Clean Power Plan Compliance*.[4] This new handbook delves into the aspects of the final rule that are the most pertinent to consumer advocates, and emphasizes notable differences between the final and proposed rules throughout.

In some ways, the Clean Power Plan compliance process is already well underway. EPA has determined state targets and defined a range of compliance options states may undertake. And some states—whether to take advantage of incentives for early action or to avoid having a federal compliance plan imposed on them—have already begun their planning process. Stakeholder input is a requirement of the state planning process outlined Section 5, and consumer advocates have a critical role to play.

It is also worth noting that a number of issues related to the Clean Power Plan remain unresolved and may change in the future. Some technical documents explaining EPA's thinking on certain aspects of the rule have yet to be released. We have highlighted several of these outstanding issues in this handbook.

For easy reference, Table 1 below summarizes the information available in this handbook. Sections 2 and 3 provide useful background on the Clean Power Plan and describe how it evolved into its present form, including changes from the proposed to the final rule that consumer advocates may find of interest.

[4] Wilson, R., M. Whited, S. Jackson, B. Biewald, E. A. Stanton. May 2015. *Best Practices in Planning for Clean Power Plan Compliance*. Synapse Energy Economics for the National Association of State Utility Consumer Advocates. Available at: http://synapse-energy.com/sites/default/files/NASUCA-Best-Practices-Report-15-025.pdf.

In Section 4, we describe how EPA determined the goals it deemed to be reasonably cost-effective and achievable using the "best system of emission reduction" (BSER). While EPA does not require states to implement these exact measures as part of compliance, BSER forms the basis of EPA's emissions reduction calculations and target setting. As such, some states may find that these measures represent a straightforward path to compliance plan approval.

Section 5 describes the different options available to states for compliance planning, and includes a detailed breakdown of EPA guidance on trading as a compliance option. The Clean Power Plan's inclusion of trading in either Emissions Rate Credits (ERCs) or emissions allowances stems from EPA's recognition that regional and multi-state cooperation allows for compliance planning that more accurately reflects the geographical makeup of U.S. power grids.

In Sections 6 and 7, we discuss how states will be expected to demonstrate compliance, as well as the expected costs and benefits of implementing the Clean Power Plan based on EPA research. Both of these sections relate to successful, cost-effective compliance planning.

Finally, we lay out key considerations of specific interest to consumer advocates in Section 8. Based on Synapse experience assisting consumer advocates on regulatory issues, these are the issues and questions that are likely to occur during the planning and compliance process. A summary of these consumer issues can be found in Table 17 on page 63.

Table 1. A key to the Clean Power Plan Handbook

Clean Power Plan Handbook: Section by Section	
Section 1:	Introduction
Section 2:	Evolution of the Clean Power Plan
Section 3:	Notable Changes to the Final Rule
Section 4:	Target Setting
Section 5:	State Compliance Planning
Section 6:	Demonstrating Compliance
Section 7:	EPA Estimates of Clean Power Plan Costs
Section 8:	Key Issues for Consumer Advocates

2. Evolution of the Clean Power Plan

As part of the Climate Action Plan, President Obama directed EPA to issue emission standards for new and existing fossil fuel-fired electricity generators using its authority under the Federal Clean Air Act. In March 2012, EPA proposed New Source Performance Standards (NSPS) aimed at reducing CO_2 from new

fossil fuel power plants under Section 111 of the federal Clean Air Act.[5] These New Source Performance Standards are based on EPA's assessment of available technologies and establish emission performance standards using the maximum allowable emissions of CO_2 per unit of electricity generated (i.e., lbs-CO_2/MWh) for all new fossil fuel power plants.

Under Section 111(d) of the federal Clean Air Act, EPA must also develop emissions performance guidelines for *existing* sources of non-criteria pollutants (i.e., any pollutant for which there is no national ambient air quality standard) and non-hazardous air pollutants (which are covered by Section 112 of the Act) whenever EPA promulgates a standard for a *new* source of such a pollutant. Each state must then develop its own plan to implement EPA's emissions performance guidelines. These 111(d) plans are subject to EPA review and approval.

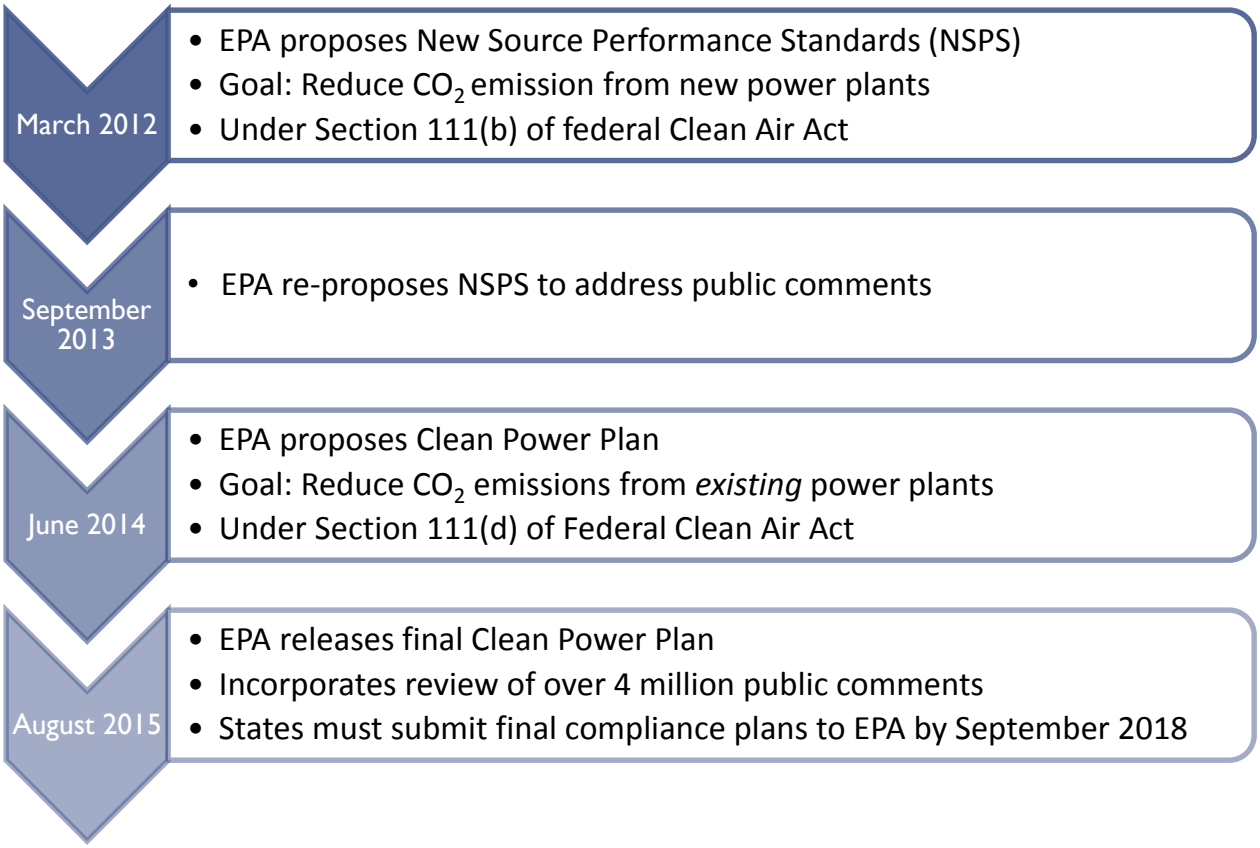
On June 2, 2014, EPA released its proposed emission performance guidelines for reducing CO_2 from existing fossil fuel power plants: the Clean Power Plan. The proposal set state-level targets aimed at reducing CO_2 emissions by approximately 30 percent from 2005 levels. Shortly after it was released, Synapse produced a series of reports for consumer advocates describing the likely impacts of the proposed rule and best practices for compliance planning.[6,7] Figure 1 summarizes the history of the development of the Clean Power Plan.

[5] The rule was later withdrawn and re-proposed in September 2013 following extensive public comment and new information, which caused the agency to substantially change the original proposal requirements.

[6] Stanton, E. A., S. Jackson, B. Biewald, M. Whited. Nov. 2014. *Final Report: Implications of EPA's Proposed "Clean Power Plan."* Synapse Energy Economics for the National Association of State Utility Consumer Advocates.

[7] Wilson et al. Best Practices in Planning for Clean Power Plan Compliance.

Figure 1. History of the Clean Power Plan



After receiving more than four million comments on its proposal, EPA has now released the final version of its Clean Power Plan, which EPA has calculated will reduce emissions from existing fossil fuel-fired generators by 32 percent below 2005 levels by 2030. The final rule differs from the proposed rule in a number of ways, which we describe in Section 3.

The final rule has been designed around three critical junctures at which emissions measurements are calculated. In our series of reports for NASUCA on the proposed Clean Power Plan, Synapse explained these three "moments" in which the calculation of rate (lbs per MWh) or mass (tons) limits has meaning: target setting, plan development, and demonstrating compliance (see Figure 2).

Figure 2. Schematic of Clean Power Plan moments

Understanding the differences between these three moments remains critical in the final rule:

- **Target setting** has already been completed by EPA. EPA rate and mass emission limits for each state are available at http://www.epa.gov/airquality/cpp/tsd-cpp-emission-performance-rate-goal-computation-appendix-1-5.xlsx. Section 4 describes the target setting moment.

- **Plan development** commences immediately, but EPA has given states more time to develop these plans. Initial draft compliance plans or requests for extension with demonstrations of progress are due September 6, 2016, and final plans are due no later than September 6, 2018. In developing their plans, states may follow the measures outlined by EPA in its target setting, or they may design their own strategies to comply with the targets. For most compliance options, states must demonstrate that their plan will achieve an emission rate (lbs/MWh) or mass (tons) equal to the targets set by EPA. Section 5 describes the plan development moment.

- **Compliance** is demonstrated by a retrospective evaluation of what emission rate or mass has actually been achieved and whether it is equal to or less than the targets set by EPA. States will need to demonstrate their compliance in the interim compliance periods (2022-2024, 2025-2027, and 2028-2029), in the final compliance period (2030-2031), and biennially thereafter. Section 6 describes the compliance moment.

3. Notable Changes to the Final Rule

The Clean Power Plan has changed in several key ways since it was first proposed in June 2014. EPA received substantial feedback on its proposed plan and has revised the rule significantly in response to many of those comments and concerns. Here, we summarize a number of key ways the final rule differs from the proposal. Table 2 provides a key to this section.

Table 2. A key to Section 3 on notable changes to the final rule

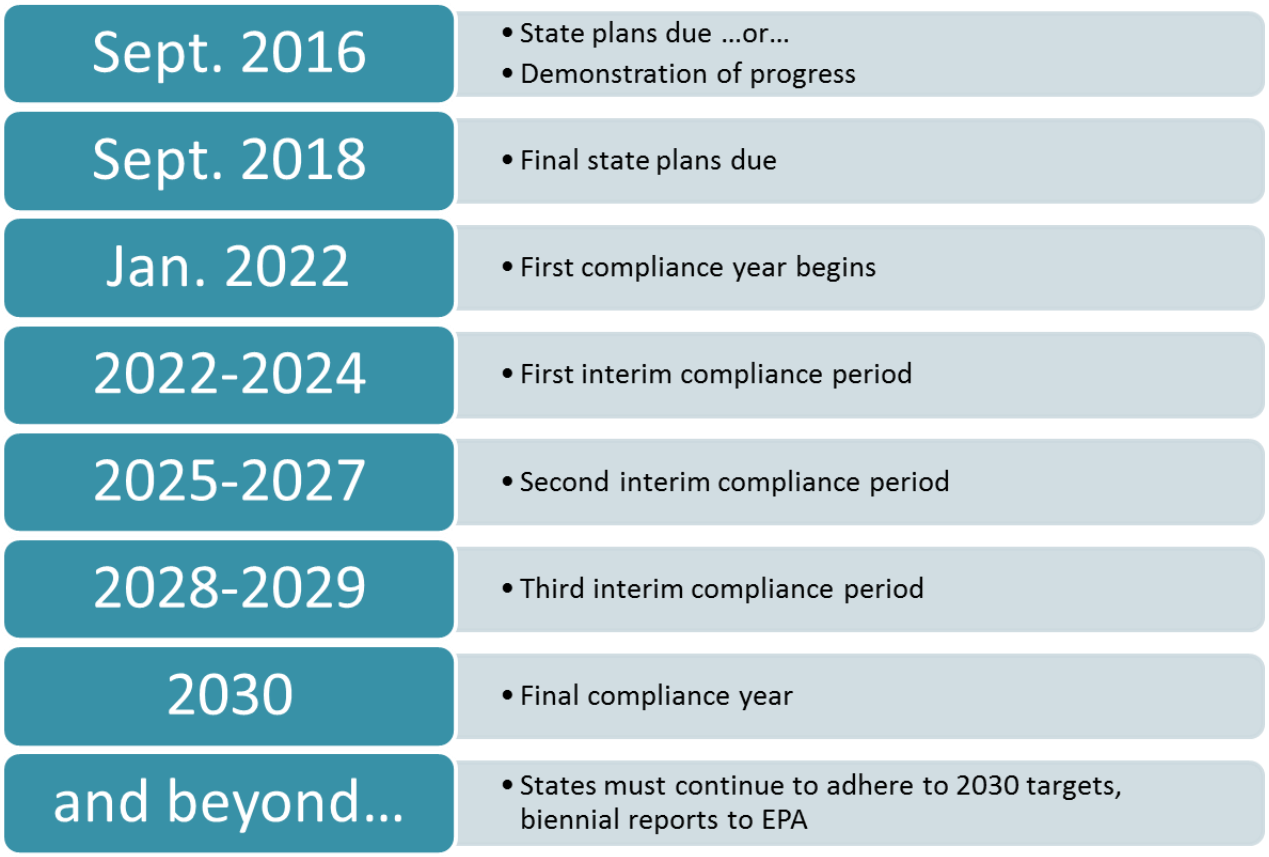
Changes from the proposed rule to the final rule outlined in Section 3	
Section 3.1	First date for compliance pushed back two years
Section 3.2	Glide path
Section 3.3	Changes to the 2012 baseline
Section 3.4	New target calculations
Section 3.5	Energy efficiency and nuclear generation are no longer considered in target setting
Section 3.6	Generation and emissions displaced by renewable energy are included in target setting
Section 3.7	New options for compliance
Section 3.8	Emissions trading is central to plan development and compliance
Section 3.9	Emission credits or allowances can be banked for future years
Section 3.10	Reliability safety valve
Section 3.11	Incentives for early action
Section 3.12	Community and environmental justice considerations

3.1. First date for compliance pushed back two years

Perhaps one of the most obvious changes in the final rule is an adjustment in timing. In the proposed rule, the first year in which states had compliance obligations was 2020. In the final rule, the start of the

compliance period has been pushed back two years to 2022. States are still expected to demonstrate progress during an interim period through 2029 and must still meet the final compliance targets by 2030. The timing for states to submit final plans has also been relaxed. Under the final Clean Power Plan, states have an additional two years to submit their final state compliance plans to EPA in 2018, provided they request and are granted an extension. Figure 3 presents a timeline for Clean Power Plan compliance.

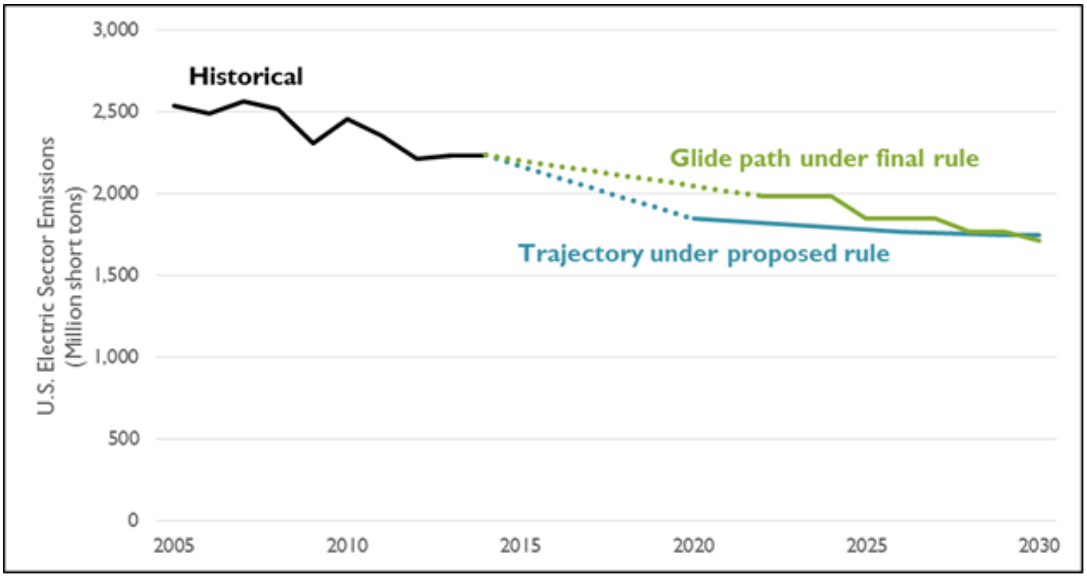
Figure 3. Timeline for Clean Power Plan compliance



3.2. Glide path

The final rule also establishes a "glide path" that gradually steps down each state's compliance target over the course of three interim compliance periods (2022-2024, 2025-2027, and 2028-2029). The glide path phases in re-dispatch to natural gas over the course of these compliance periods, helping to smooth out the so-called "compliance cliff" of concern in states that would have had to achieve significant reductions in the beginning of the compliance period. The trajectory for combined compliance targets for all states under the proposed rule as compared to the glide path established under the final rule is shown in Figure 4.

Figure 4. Combined compliance targets for all states



3.3. Changes to the 2012 baseline

In response to stakeholder comments on the proposed rule, EPA made a number of adjustments to the 2012 data used as a baseline in target setting. Changes include:

- States with significant levels of hydroelectric power now have baseline fossil generation adjusted to reflect a year more typical than 2012
- Minnesota's target was adjusted to account for the Sherburne County coal unit that was damaged and inoperable through most of 2012
- Other baseline values were adjusted to reflect fossil units that either began operation in 2012, or were under construction in 2012 or 2013
- Emission rates at certain units that have emission rates deemed to be "outliers" have been adjusted

3.4. New target calculations

The calculation of state targets in the final Clean Power Plan is very different from the proposed rule. They are now based on emission performance rates established for two subcategories of emitters: fossil steam units (e.g., coal and oil generators) and stationary combustion turbines (e.g., natural gas combined cycle units).

The level of these performance rates is still based on the application of building blocks, similar to the proposed rule; however, key changes have been made to:

- **Heat rate improvements** at coal units are lower and are applied differently according to where power plants are located.

- **Natural gas combined cycle (NGCC) re-dispatch**, or increased generation from natural gas combined-cycle units displacing generation from coal, has been modified. This is now calculated using a different basis (summer capacity), and an assumption that NGCC units can operate at a 75 percent capacity factor level, rather than at 70 percent.
- **Nuclear generation** from both at-risk and under-construction nuclear power plants have been removed from target setting.
- **Renewable energy** is now based on EPA's estimate of potential availability, rather than on regional renewable portfolio standards.
- **Energy efficiency** savings are no longer included in target setting.
- **Displacement** of fossil resources by renewables is now accounted for in state targets.
- **The target calculation itself** is now largely done at the interconnect level. EPA divides the contiguous 48 states into three regions: Eastern, Western, and ERCOT (primarily Texas). EPA then determines the level of heat rate adjustments to coal units and levels of incremental NGCC generation and renewable energy possible in each of these three regions, and calculates target rates for coal and NGCC units. The least stringent of these rates is then selected and applied to all states in all three interconnects. Target setting calculations are discussed in more detail in Section 4.

3.5. Energy efficiency and nuclear generation are no longer considered in target setting

In the proposed Clean Power Plan, savings from energy efficiency and at-risk and under-construction nuclear generation were included in EPA's calculation of state rate and mass targets. In the final rule, neither energy efficiency nor nuclear generation is considered in target setting.

However, energy efficiency is a viable option to use in the second and third moments of the Clean Power Plan: plan development and compliance. In rate-based scenarios, efficiency can be included as a reduction to both tons and megawatt-hours (MWh), but efficiency measures will require measurement and verification of the efficiency savings and trading mechanisms in order to generate credits. In mass-based scenarios, measurement and verification of the efficiency savings from specific programs is not necessary for demonstrating compliance.

Similarly, at-risk and under-construction nuclear generation is no longer included in each state's target calculation. However, states can still use new nuclear units (and uprates at existing nuclear units) as part of their compliance strategy.

3.6. Generation and emissions displaced by renewable energy are included in target setting

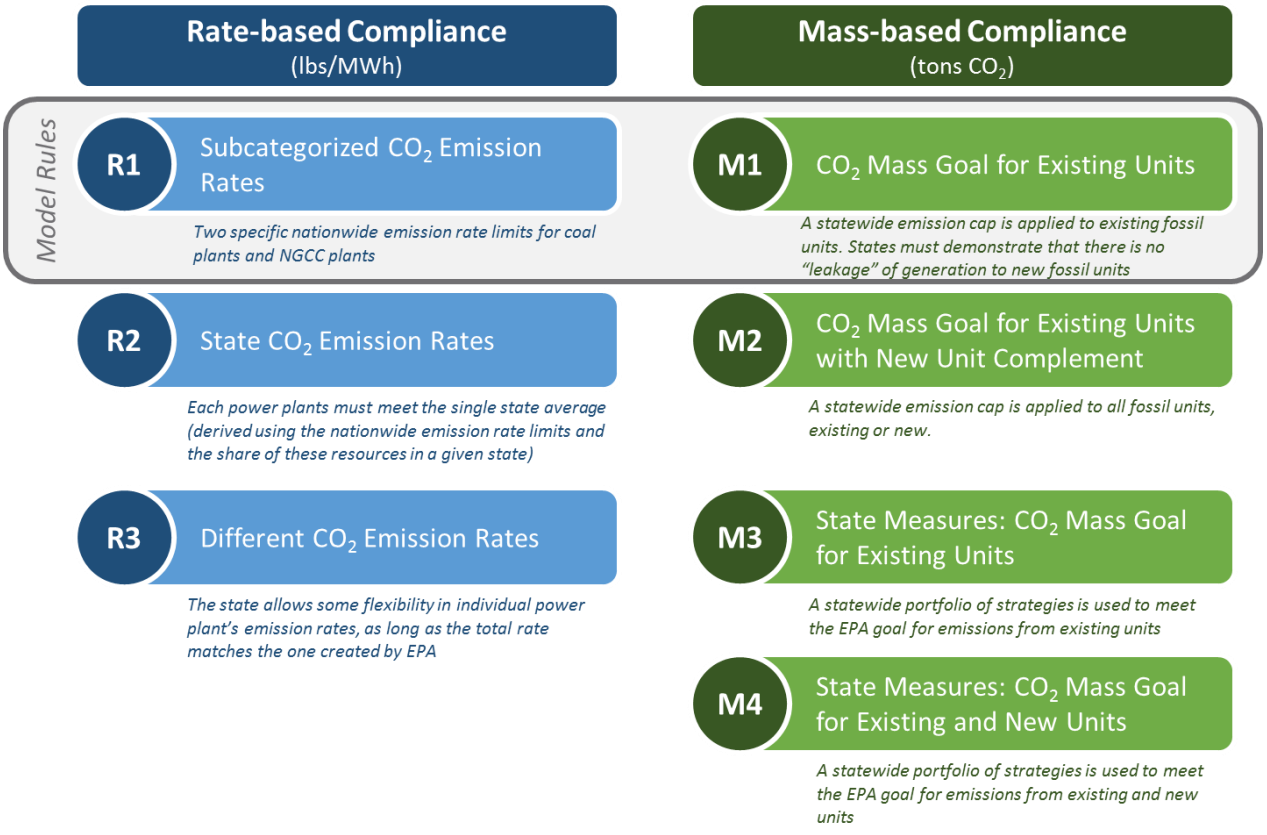
The final Clean Power Plan targets account for generation and emissions displaced by new renewable energy generation. This means that for every MWh produced by renewables, an equivalent amount of generation and associated emissions are subtracted from the calculation. In the proposed rule, this displacement was omitted from target setting.

This change more accurately reflects the actual operation of the electric system. In target setting, coal and NGCC generation are displaced according to their share of baseline generation. For example, if an interconnect has 100 MWh of renewables added to it, and the interconnect was made up of 75 percent coal generation and 25 percent NGCC generation in the baseline year, then 75 MWh of coal generation will be displaced along with 25 MWh of NGCC generation.

3.7. New options for compliance

The final Clean Power Plan still allows states to comply with either the rate- or mass-based form of the targets. However, in the final rule, EPA has identified a number of potential compliance pathways that states may choose under both rate- and mass-based compliance. Figure 5 presents the seven compliance pathways permitted in the final rule.

Figure 5. Clean Power Plan compliance pathways



Synapse's pathway designations (R1, R2, and R3 for rate-based pathways and M1, M2, M3, and M4 for mass-based pathways) are not EPA terms.

In the proposed rule, states could calculate their own rate-to-mass target conversion, with guidance from EPA. However, in the final rule, EPA has calculated the mass-based targets for each state. States have the option to create compliance plans that fall into one of these seven approaches, and meet the specific target developed for that state under that approach. EPA calls out the approaches labeled "R1" and "M1" in Figure 5 as "model rules." These two approaches are also proposed by EPA as potential federal compliance plans that the agency will enforce if states do not submit state plans or do not meet their selected approach. EPA is encouraging states to consider these approaches favorably.

3.8. Emissions trading is central to plan development and compliance

The proposed rule asked for comments about trading and called out the Northeast's Regional Greenhouse Gas Initiative (RGGI) as a potential example of regional collaboration in rule compliance, but it did not specify emissions trading mechanisms. The final rule defines two separate means of emissions trading for states meeting rate-based targets and for states meeting mass-based targets:

- In rate-based trading, the Clean Power Plan allows for a commodity called "Emissions Rate Credits" (ERCs) to be traded. These credits are measured in MWh and are added to the denominator of a generator's lbs-per-MWh performance rate calculation. ERCs can be produced by specified resources that came online in 2013 or later: energy efficiency, renewables, new nuclear generation, incremental capacity uprates at existing nuclear, and hydro. ERCs can also be produced by increasing NGCC generation and by other affected sources that over-comply with their target.
- In mass-based trading, the traded commodity is emission allowances measured in short tons. Allowances can be distributed via auction or free allocation, or some combination of these. EPA's proposed model trading rule includes a mass-based trading program that would allocate allowances based on historical generation minus certain set-asides for renewables, low-income energy efficiency, and existing NGCC units.

Note that rate-based states cannot trade with mass-based states. However, mass-based states can generate and sell ERCs to rate-based states if there is a contract in place in which the electricity from the resource located in the mass-based state is sold directly to a rate-based state (for example, if a wind farm is located directly across a state border, is directly tied to the rate-based state's grid, and the rate-based state has a power purchase agreement with the wind farm). Section 5 discusses trading in more detail.

3.9. Emission credits or allowances can be banked for future years

Under the final Clean Power Plan, EPA allows emission reductions that occur over and above a given state's target to be carried forward—or banked—and applied to a future year. These banked ERCs or allowances can be applied to any future year, without limitations. As a result, states that over-comply

with less stringent targets early in the compliance period may use banked credits to ease their path to meeting stricter future targets.

Furthermore, under its banking system, EPA will allow states to count certain ERCs or allowances generated in 2020 and 2021 toward compliance in 2022 and later years. This Clean Energy Incentive Program (CEIP), discussed in Sections 3.11, 5.2, and 8.12 below, gives bonus ERCs or allowances to states that invest in wind and solar as well as in energy efficiency implemented in low-income communities before the first compliance deadline. Under this program, each MWh of generation from wind and solar can earn one ERC (or equivalent allowance), while savings from low-income energy efficiency can earn two ERCs (or equivalent allowances) per MWh.

3.10. Reliability safety valve

In response to comments from stakeholders, EPA made a number of changes to address concerns about the potential impacts of the Clean Power Plan on electric system reliability. In addition to having more time and flexibility in implementing the final rule, states must demonstrate that they have considered reliability in developing their state plans. Further, EPA has included a reliability safety valve for individual sources in case catastrophic events occur that would impact reliability under a state compliance plan. There is no such safety valve proposed for the federal model rules, as EPA believes the inherent flexibility and trading schemes make such a mechanism unnecessary. This mechanism allows a source to emit at an alternate rate for up to 90 days—and for the excess emissions not to count toward the state's target—in the event that an unforeseen catastrophe required the use of the source to prevent reliability-related failure. The rule requires states to justify the need for the safety valve exception and to get written agreement from the grid operator or coordinator in their region.[8]

If conditions require a source to continue operating under the safety valve provisions beyond 90 days—for example, if a nuclear plant is forced out of commission for a lengthy period—the state will have to revise its compliance plan to make up for the excess carbon emissions.

3.11. Incentives for early action

In the final rule, EPA introduced the CEIP to encourage and reward early installers of certain types of renewable energy and energy efficiency measures. Under this program, wind and solar resources and low-income energy efficiency measures installed after a state has submitted its final compliance plan can earn ERCs (or an equivalent number of allowances) for zero-emission generation or energy savings that occur in 2020 and 2021. These "early action" credits can be sold to affected sources for use during the compliance period. Credits are awarded as follows:

[8] 80 Fed. Reg. at 64877-78.

- For every MWh of energy generated by wind and solar resources: The state awards 0.5 early action ERCs (or equivalent allowances) and EPA will award 0.5 matching ERCs (or equivalent allowances) from a pre-established pool.
- For every MWh of energy savings resulting from qualified low-income energy efficiency programs: The state will award one early action ERC (or equivalent allowances) and EPA will award one matching ERC (or equivalent allowances) from the CEIP pool.

EPA has capped the CEIP pool of matching credits at the equivalent of 300 million short tons, though the agency's description of how this would be translated to ERCs has been left to a future rulemaking action.[9]

3.12. Community and environmental justice considerations

During rule development, EPA engaged the public through an unprecedented number of public meetings and by providing multiple opportunities for interested parties to weigh in on how the final Clean Power Plan would look. EPA received numerous comments expressing concern about how the final Clean Power Plan would impact the most vulnerable—including low-income residents, communities of color, and tribal communities. EPA addressed these concerns using a series of strategies to create incentives for action in traditionally vulnerable communities and by requiring states to engage their citizens in state plan development. These are explained in more detail in Section 8.128.12.

4. TARGET SETTING

The development of the Clean Power Plan is one the most complicated rulemakings EPA has ever conducted. Composed of thousands of pages of regulatory and technical material, part of what makes the Clean Power Plan so complex is the degree of flexibility provided to states. States have a large number of options for implementing the final Clean Power Plan. From when to submit a plan to what kind of plan to submit to what types of sources are covered and how they can comply, states can tailor their compliance to their unique situations.

Understanding how the Clean Power Plan works is a first critical step in deciding which options a state should pursue for consumer advocates and all stakeholders. In this section, we explain how EPA set the Clean Power Plan targets. Table 3 presents a key to this section.

[9] 80 Fed. Reg. at 65026.

Table 3. A key to Section 4 on target setting

Factors in determining Clean Power Plan goals	
Section 4.1	The best system of emission reductions • Building Block 1: Heat rate improvements at coal plants • Building Block 2: Re-dispatch to lower-emitting natural gas • Building Block 3: Increase renewable energy
Section 4.2	Target setting • Calculating R1: Subcategorized CO_2 emissions rates • Calculating R2: State CO_2 emission rates • Calculating R3: Different CO_2 emission rates • Calculating M1: CO_2 mass goal for existing units • Calculating M2: CO_2 Mass goal for existing units with new unit complement • Calculating M3 and M4: State measures plans

4.1. The best system of emission reductions

Performance standards set under Section 111 of the Clean Air Act must reflect the degree of emission limitation achievable through the application of the "best system of emission reduction" (BSER). In determining what constitutes BSER, EPA generally conducts a technology review that identifies what systems for emission reductions exist and how much they reduce air pollution. This allows the agency to identify potential emission limits. EPA then evaluates each limit in terms of cost and technical feasibility, secondary air impacts from energy requirements, and non-air-quality health and environmental impacts (such as solid waste generation). EPA must also consider opportunities to promote the development and use of pollution control technology.

Under Section 111(d), EPA must establish emissions guidelines specifying standards of performance for the existing sources in a category. These emissions guidelines: (1) are binding on states, (2) set the goal that states must meet when developing standards of performance for existing sources, and (3) must reflect the degree of emission limitation achievable through BSER.

In its final Clean Power Plan, EPA defines the term "system" broadly to include measures that are "beyond the fence-line" of affected power plants. EPA has determined that the interconnected nature of the electric system lends itself to a much broader range of controls than what can be accomplished through measures at individual generating units. Here, EPA has determined that BSER includes not only upgrades and operational changes that could be made at the plant itself but also measures such as re-dispatch from higher-emitting resources like coal to lower-emitting resources like natural gas and the increased deployment of renewable energy. These measures reduce emissions at fossil fuel power plants by lowering their required output. Together, EPA says, these measures (called "building blocks") represent meaningful reductions in CO_2 at a reasonable cost:

- **Reduce Coal-Fired Emission Rate (Building Block 1):** heat rate improvements in the state's coal fleet

- **Re-Dispatch to Existing NGCCs (Building Block 2):** shifting generation from coal and oil to gas by raising each region's NGCCs to 75 percent of their summer capacity
- **More New Renewables (Building Block 3):** shifting generation from fossil fuel-fired resources to zero-emitting new renewable energy resources

These building blocks make up the set of tools that EPA has determined represents the "degree of emission limitation achievable through the application of the best system of emission reduction…adequately demonstrated."[10] They reflect neither the maximum emission reductions possible from these measures, nor the least-cost approach to achieving those reductions. They are simply used to establish what EPA has determined is achievable from the power plant sector at a reasonable cost.

The building blocks in the final rule do not include energy efficiency (formerly Building Block 4) nor does Building Block 3 include preservation of at-risk nuclear generation. Table 4 compares the proposed building blocks to those in the final Clean Power Plan.

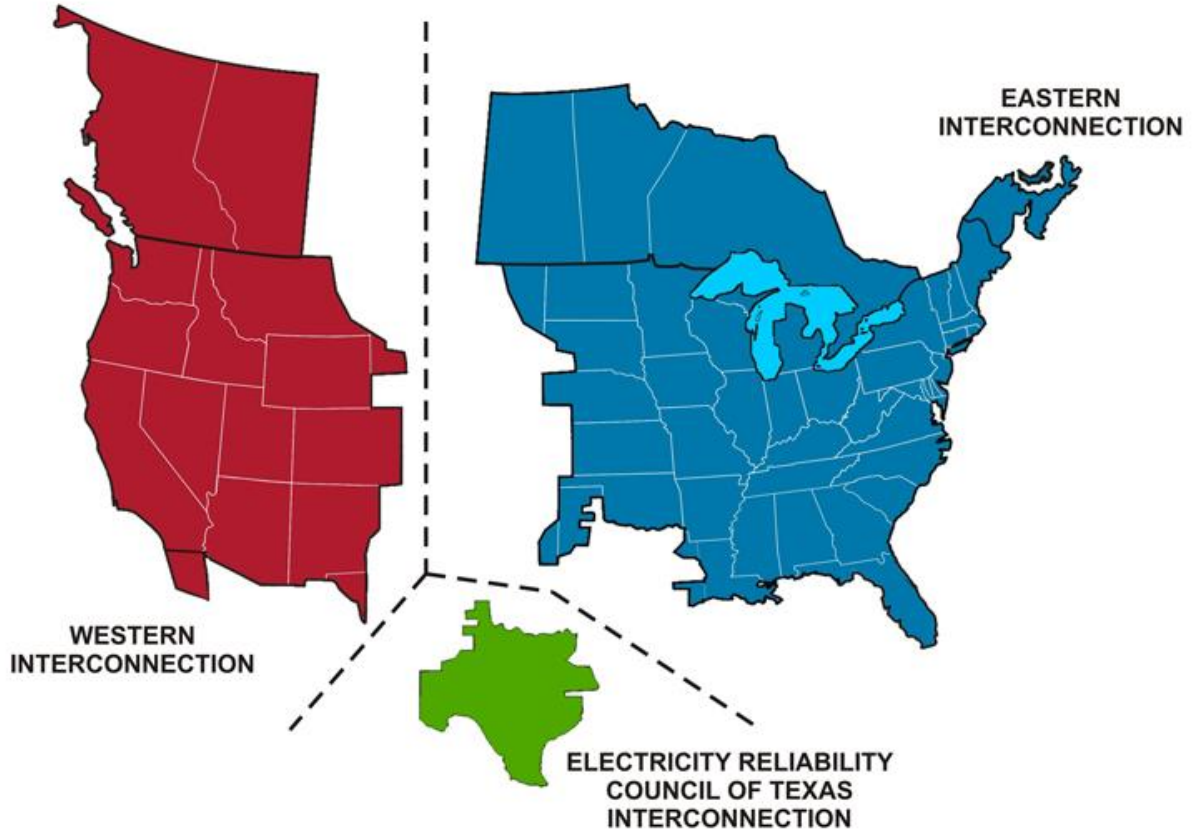
Table 4. Comparison of building blocks in proposed and final Clean Power Plan

Proposal	Final
Building Block 1 – Heat rate improvements	Building Block 1 – Heat rate improvements
Building Block 2 – Re-dispatch to lower-emitting NGCC units	Building Block 2 – Re-dispatch to lower-emitting NGCC units
Building Block 3 – Addition of renewable energy and preservation of existing nuclear generation	Building Block 3 – Addition of renewable energy
Building Block 4 – Ramp up energy efficiency	N/A

To better reflect the regional nature of the electric system, each building block is now determined based on the potential emission reductions that can be achieved in each of the three electrical interconnects, shown in Figure 6.

[10] 80 Fed. Reg. at 64840.

Figure 6. Electrical interconnects in the United States



Building Block 1: Heat rate improvements at coal plants

EPA's first building block measure involves reducing the carbon intensity of generation at individual coal plants through measures that improve the efficiency with which these units convert coal to electricity (i.e., heat rate improvements). In the original proposal, EPA determined that the nation's coal plants could achieve a 6 percent heat rate improvement on average.

In response to comments from states and utilities, EPA re-evaluated the potential for emission reductions from heat rate improvements at coal plants and determined that there are different opportunities in different regions of the country based on a combination of equipment upgrades and best practices.

As a result of this new analysis, EPA determined the percentage improvement that could be achieved in each interconnect, as presented in Table 5.

Table 5. Potential heat rate improvement by interconnect

Interconnect	Potential Heat Rate Improvement
Eastern	4.3%
Western	2.1%
ERCOT	2.3%

It is important to note that EPA's Building Block 1 does not account for what the agency calls the "rebound effect" in which increased efficiency (and any resultant decrease in variable operating costs) might lead a coal unit to experience improved competitiveness and, therefore, increased utilization. In this situation, the reduction in the unit's CO_2 emissions caused by the decrease in its heat rate could be partially offset by the increase in the unit's CO_2 emissions associated with the increase in generation. The extent of the offset would depend on the unit's generation before and after the heat rate improvements, as well as the CO_2 emission rates of the units whose generation would be displaced. As it did in the proposal, EPA assumes that the combination of approaches that make up the building blocks will encourage increases in generation to come from lower- or zero-emitting resources rather than coal units.[11]

Building Block 2: Re-dispatch to lower-emitting natural gas

Because NGCC units typically emit less than half as much CO_2 per MWh of generation as coal units, EPA's Building Block 2 involves shifting generation from coal- and oil-fired units to more efficient NGCC units. Under the proposed rule, EPA evaluated the emission reductions possible from shifting generation consistent with a target 70 percent capacity factor based on nameplate capacity for existing NGCCs. In response to comments suggesting that summer capacity ratings are a more appropriate basis for determining target utilization rates for NGCCs, EPA adjusted its calculation of this shift to express the target in terms of summer capacity ratings. The new target is adjusted to a 75 percent capacity factor. Based on our calculations, this has almost no impact on the stringency of Building Block 2.

In a departure from the proposed rule, Building Block 2 is now phased in over the course of the eight-year compliance period. In the proposal, the Building Block 2 shift was assumed to take place all at once at the start of the compliance period, which caused significant concern from some states about what has been called a "compliance cliff"—that is, an abrupt transition at the start of the compliance period to targets much more stringent that current rates. Indeed, in some states, Building Block 2 as proposed represented most of the reductions that would be required over the entire compliance period. This led to concerns about equity, technical feasibility, and system reliability.

EPA responded to these concerns by delaying the initial compliance date to 2022 and by adding a "glide path" to the implementation of Building Block 2. Now, the shift to NGCCs is phased in over the course of the interim period (2022-2029) based on historical growth rates in gas-fired generation.

[11] 80 Fed. Reg. at 64745.

Building Block 3: Increase renewable energy

Another change in the final rule is the calculation and application of Building Block 3: emission reductions from renewable energy. As EPA explains, given the interdependency of the grid, changes that occur across the system (such as a shifting resource mix) will impact existing sources.[12] For this reason, renewable energy is a component of BSER and may provide low-cost emission reductions as the economics of these technologies continue to improve. The final rule includes estimates of renewable energy potential across the country, and applies these values to the denominator of the emission rate calculation (presented below in Section 4.2). The steps that EPA takes to estimate renewable potential and calculate target rates has been modified from the rule proposed in June 2014.

In the final rule, EPA points out that a number of commenters made a case that renewable portfolio standards (RPS) are a poor basis on which to forecast renewable energy, as was the case in Building Block 3 of the proposed rule. For instance, the inconsistency across RPS policies in terms of eligibility of technologies makes cross-state comparison difficult and possibly misleading. How does Maine's 40 percent RPS target, which includes generation from hydro facilities, compare to Oregon's various RPS targets, which do not include hydropower, and which vary based on utility size? Further, RPS policies may not be designed with the intent of achieving emissions reductions.[13] As a result, a number of commenters suggested alternative methodologies for calculating renewable energy potential.

In response to these comments, EPA modified the basis for quantifying renewable energy generation included in the rule as Building Block 3. The final rule now only includes incremental generation from renewable energy built after 2012 from five sources—utility-scale solar, on-shore wind, concentrated solar power, geothermal, and hydropower—in target setting.[14] The estimates of future potential growth in these technologies are based on the growth of these industries over the last five years. Potential renewable energy is calculated across the entire interconnect, rather than at the state level, to account for the ability of out-of-state renewable generation to reduce in-state emissions.[15]

The final methodology used for calculating renewable energy for Building Block 3 consists of the following steps:[16]

1. EPA determined the average annual change in capacity for the five renewable technologies over the last five years.

[12] 80 Fed. Reg. at 64910.

[13] Ibid. at 64806.

[14] Ibid. at 64807.

[15] Ibid. at 64807.

[16] The level of incremental renewable generation is calculated using the GHG Mitigation TSD, available at http://epa.gov/airquality/cpp/tsd-cpp-ghg-mitigation-measures.pdf.

2. Using data from actual generators provided by the National Renewable Energy Laboratories (NREL), EPA analyzed capacity factors for each resource type, eventually determining a resource-wide value.

3. EPA calculated two different levels of potential future incremental generation from renewables (both by resource) using historical growth data: one by averaging the capacity changes over the 2010 to 2014 period, and one by identifying the maximum capacity addition over those five years (which occurred in 2014). EPA then multiplied these by the resource-specific capacity factor in order to develop generation estimates. The result is two growth rates for each resource type.

4. EPA assumes that some amount of renewable growth will occur independent of the Clean Power Plan between now and the beginning of the interim compliance period in 2022. EPA determined a value for nationwide growth in generation from renewable energy using its base case Integrated Planning Model (IPM) scenario modeling. EPA added this baseline value to the values developed in step three:

    a. To determine targets for the first two years of the interim compliance period (2022 and 2023), EPA used the trajectory that reflects the average growth in renewables over the five-year period (2010-2014).

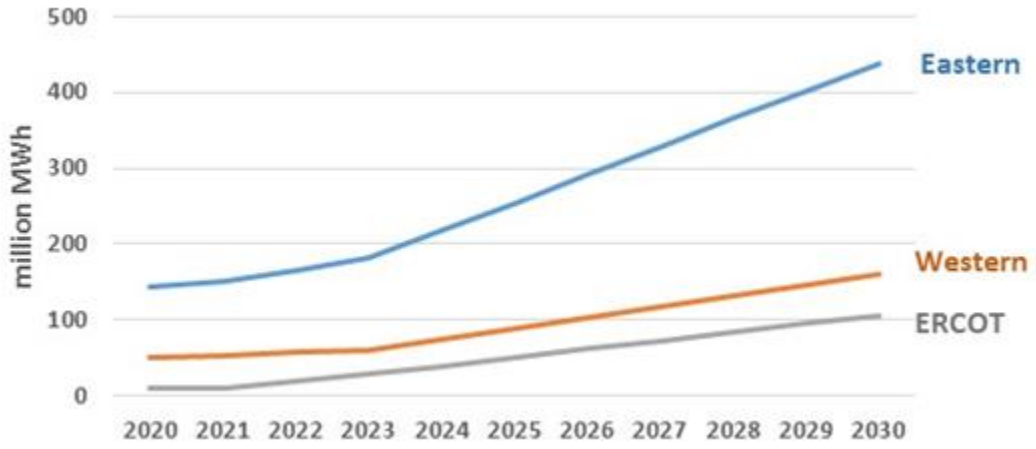
    b. To determine targets for the remaining seven years, EPA used the trajectory that reflects the maximum level of growth over that five-year period.

5. Finally, EPA modeled the resulting levels of renewable energy in IPM to ensure that reliability standards could be met at that level of variable generation, as well as to determine what portion of the renewable energy would be built in each of the three interconnects. EPA assigned regional emission rate targets to each of the interconnects based on this percentage.[17]

The amount of potential renewable energy EPA believes is available in each interconnect is illustrated in Figure 7.

[17] Ibid. at 64807-64808.

Figure 7. EPA estimates of renewable potential by interconnect



The incorporation of the renewable potential from Building Block 3 into target setting is different from the proposal in one very important way: the formula now accounts for displacement of fossil steam and natural gas generation by this added renewable energy. Where the proposed rule assumed that the combination of generation from affected sources would remain constant throughout the compliance period (i.e., additional renewable energy would only offset *new* generation), the final rule assumes that new generation from renewable energy actually replaces generation from affected sources. This change better reflects the way the electric system actually works.

4.2. Target setting calculations

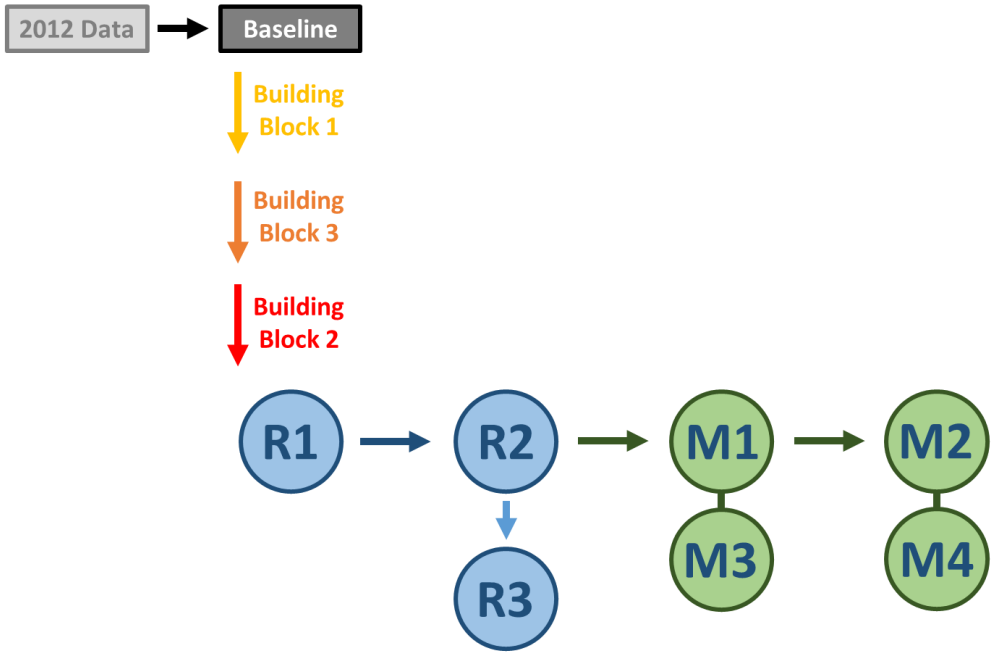
In the final Clean Power Plan, EPA made important changes to the way targets are set for states. Note that Vermont and the District of Columbia are excluded from the Clean Power Plan as they do not contain any power plants eligible to be regulated by section 111(d). At this time, EPA is working to set emission standards for three tribes with affected power plants: Navajo, Fort Mojave, and Ute (Uintah & Ouray). However, EPA is not currently setting CO_2 goals for Alaska and Hawaii, or Guam and Puerto Rico (the two U.S. territories with affected power plants), until it has collected better data to form the basis of standards for these states and territories.

In the final rule, states may choose among different forms of the targets that have been calculated by EPA. These include both rate-based and mass-based options, inclusion of just existing sources or existing and new source, and targets based on technology type (i.e., fossil steam vs. NGCC) or state averages (see Figure 5 above). This section summarizes these calculations.

In the final rule, EPA uses technology-specific CO_2 emission performance rates as the basis for the emission reductions that states must achieve through BSER. EPA calculates these performance standards by applying the building blocks to baseline data (with some adjustments) from 2012. Separate rate-based targets are set for two types of fossil generation technology—fossil steam (coal plus oil- and gas-fired steam) and NGCCs—in three distinct electric grids in the contiguous United States: the Eastern,

Western, and ERCOT interconnects (see Figure 6). These rate-based targets are then used as the basis for calculating targets for each potential pathway. Figure 8 presents a schematic of this process.

Figure 8. Schematic of target setting process



Establishing the baseline

EPA makes adjustments to the baseline for states in which the 2012 data do not adequately reflect a typical generation and emission pattern. For instance, 2012 was an unusually good year for hydro power. In these states, hydro power constituted more of the generation mix than is typical, so the states' fossil generation appears unusually low. Therefore, in states that experienced an anomalously high year for hydro generation in 2012, EPA used a multiplier to increase NGCC and fossil steam generation in the baseline.[18] This adjustment was made for Idaho, Maine, Montana, Oregon, South Dakota, and Washington.

In addition, a turbine explosion at Minnesota's Sherburne County power plant in November 2011 kept its Unit 3 offline for all of 2012. EPA increased Minnesota's coal generation in the baseline to reflect 5,492,640 MWh of estimated generation from the Sherburne County 3.

[18] A state is deemed to have had an anomalously high year for hydro in 2012 if (a) it is a hydro intensive state (more than 10 percent of the state's generation comes from hydro), (b) hydro generation was at least 5 percent greater than the 1990-2012 average, and (c) hydro generation at the 1990-2012 average would have caused more than a 5 percent increase in fossil generation (relative to the 2012 baseline for fossil generation). This calculation has not yet been made available by EPA.

Finally, 2012 data for coal and NGCC capacity are adjusted upward in the baseline to reflect generation from units that came online partway through 2012, and coal and NGCC units that were under construction as of January 8, 2014. These units are considered "existing" units that are covered by the Clean Power Plan. Under-construction coal and NGCCs were assumed to generate at a 60 percent and 55 percent capacity factor, respectively. A special exception applies to Mississippi, where under-construction coal capacity is given a capacity factor of 70 percent, reflecting forecasted operations at the 593 MW Kemper IGCC plant. Under-construction capacity is assumed to have the average emission rate by resource type and state, with the exception of coal in Mississippi, for which an adjusted CO_2 emission rate is used to reflect emissions from the under-construction Kemper IGCC unit (assuming a rate of 800 lbs per MWh).

Figure 9. Baseline emission rate calculations

$$\text{Fossil Steam Average Emission Rate Baseline} = \frac{\text{FS-Emissions}_{\text{Baseline}}(\text{lbs})}{\text{FS-Generation}_{\text{Baseline}}(\text{MWh})}$$

$$\text{NGCC Average Emission Rate Baseline} = \frac{\text{NGCC-Emissions}_{\text{Baseline}}(\text{lbs})}{\text{NGCC-Generation}_{\text{Baseline}}(\text{MWh})}$$

In each state or sub-state, each resource's baseline CO_2 emissions rate is used to calculate total CO_2 emissions from that resource.

Applying building blocks

EPA calculates its emission targets by adjusting the baseline for its three building block measures. EPA sums generation and emissions from fossil steam and NGCC resources for each of the three electrical interconnections—Eastern, Western, and ERCOT—for each year from 2022 through 2030 and calculates interconnect-wide average emission rates for the two resource types. Building block adjustments are made to the state or sub-state data to result in emission rate targets by interconnect.

Building Block 1—Heat rate improvements at coal plants

For each interconnect in each year, the potential change in emissions from improved heat rates are calculated for coal generation. EPA assumes 4.3 percent, 2.1 percent, and 2.3 percent improvements for the Eastern, Western, and ERCOT interconnects, respectively. Coal emissions in each interconnect are reduced by the corresponding percentage while coal generation is kept constant, as shown in Figure 10.

Figure 10. Post-Building Block 1 emission rate calculations

$$\text{Fossil Steam Average Emission Rate Post BB1} = \frac{\text{FS-Emissions}_{\text{PostBB1}}(\text{lbs})}{\text{FS-Generation}_{\text{Baseline}}(\text{MWh})} \qquad \text{NGCC Average Emission Rate Post BB1} = \frac{\text{NGCC-Emissions}_{\text{Baseline}}(\text{lbs})}{\text{NGCC-Generation}_{\text{Baseline}}(\text{MWh})}$$

Building Block 3— Increase renewable energy

EPA skips over Building Block 2 to apply Building Block 3 using the estimated potential for new renewable generation in every year of the compliance period discussed in Section 4.1. Building Block 3 is applied *before* Building Block 2—the switch to natural gas generation—to ensure that new renewable generation displaces both NGCCs and fossil steam in the target setting calculation.[19] In this step, fossil steam and NGCC generation are displaced by renewable energy in proportion to their share of generation. For example, in an interconnect with generation composed of 75 percent fossil steam and 25 percent NGCC:

- If 100 MWh of renewable generation is added
- Then 75 MWh of fossil steam generation will be displaced along with 25 MWh of NGCC generation.

The total displacement of fossil generation is equal to new generation from renewables, such that total generation remains constant, as illustrated in Figure 11.

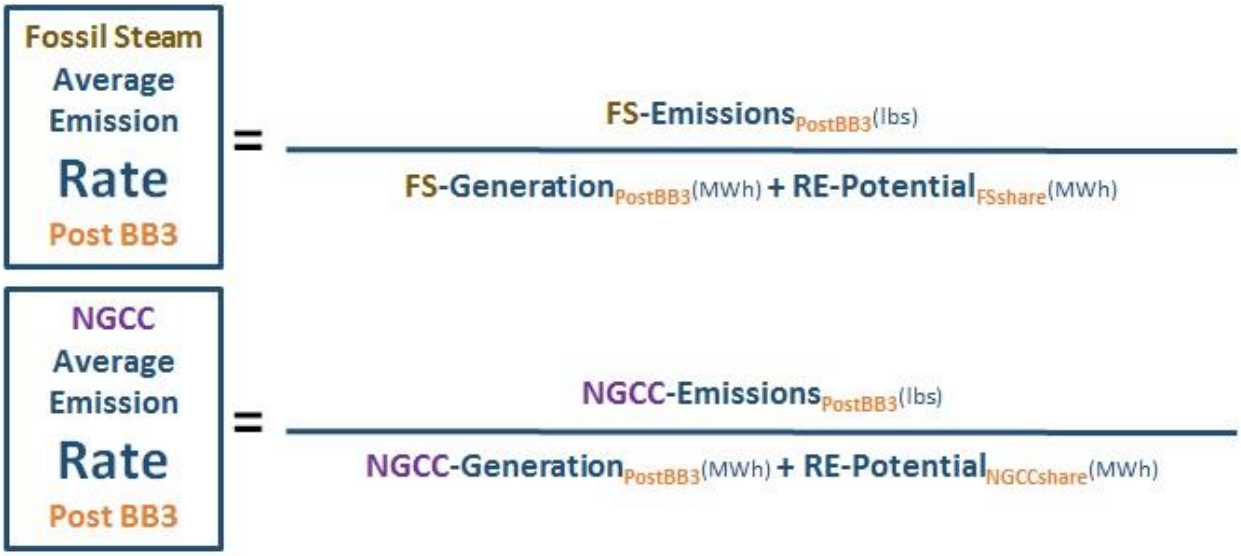
Figure 11. Post-Building Block 3 generation calculation

$$\text{FS-Generation}_{\text{PostBB3}}(\text{MWh}) = \text{FS-Generation}_{\text{PostBB1}}(\text{MWh}) + \text{RE-Potential}_{\text{FSshare}}(\text{MWh})$$

[19] 80 Fed. Reg. at 64819.

The equation for the adjusted emission rate looks like this:

Figure 12. Post-Building Block 3 emission rate calculation



Building Block 2— Re-dispatch to lower-emitting natural gas

The final adjustment accounts for increased utilization of NGCC capacity to further displace fossil steam generation. In each year, for each interconnect, EPA calculates a level of "maximum" NGCC generation by multiplying the adjusted baseline summer capacity by 75 percent (that is, by assuming a 75 percent capacity factor in future years).

In response to concerns about a "compliance cliff" from the full impact of this shift being required at the start of the compliance period, EPA has limited the pace at which natural gas is able to be re-dispatched in target setting calculations according to a "deployment rate."[20] For each year and for each interconnect, EPA calculates the difference between (1) deployment-rate-limited maximum NGCC generation and (2) the NGCC generation estimated by adjusting for displacement from renewables (Building Block 3). The difference is the incremental NGCC generation assumed possible for each year.

This incremental NGCC generation is then subtracted from the post-Building Block 2 fossil steam generation to reflect the displacement of fossil steam resources by the increased NGCC generation. The result is the projected fossil steam generation in a future where new renewables are in place and NGCC capacity factors are much higher. It is important to note that in this step, EPA does not allow fossil steam generation to drop below zero. If incremental NGCC generation exceeds post-Building Block 2 fossil

[20] EPA restricts the growth rate of NGCC generation in 2022 to 22 percent over 2012 adjusted baseline levels of generation. This growth rate is based on the change in gas generation observed between 2011 and 2012 (the largest annual increase in gas-fired generation observed since 1990). This value is reduced to 5 percent in each subsequent year per an EPA assumption.

steam generation, then fossil steam generation is reduced to zero, and NGCCs will only be partially re-dispatched (i.e., won't reach the 75 percent capacity factor ceiling).

Lastly, the final adjusted NGCC generation value is calculated for each interconnect and each year by adding the post-renewable NGCC generation to the increment gained by displacing fossil steam generation.

The numerator of the emission rate is the sum of two components:

1. The remaining fossil steam generation (after displacement from renewables and increased NGCC generation) multiplied by the post-Building Block 1 fossil steam emissions rate for the relevant interconnect.
2. The remaining NGCC generation (after displacement from renewables and increased NGCC generation) less the baseline NGCC generation, multiplied by the baseline NGCC emissions rate for the relevant interconnect. (Note that in this step, the resulting emissions have a floor of 0 lbs per MWh.)

This means that the fossil steam emission rate calculation includes generation and emissions from fossil steam units, as well as generation and emissions from the resources assumed to displace fossil steam generation (i.e., those resources that act as mitigation measures).[21]

The denominator is the sum of three components:

3. The remaining fossil steam generation (after displacement from renewables and increased NGCC generation)
4. The remaining NGCC generation (after displacement from renewables and increased NGCC generation) less the baseline NGCC generation
5. The generation from renewables assumed to displace fossil steam generation in Building Block 3

The equation looks like this:

Figure 13. Fossil steam post-Building Block 2 emission rate

$$\text{Fossil Steam Average Emission Rate Final} = \frac{\text{FS-Emissions}_{\text{PostBB2}}(\text{lbs}) + \text{Incremental NGCC-Emissions}}{\text{FS-Generation}_{\text{PostBB2}}(\text{MWh}) + \text{RE-Potential}_{\text{FSshare}}(\text{MWh}) + \text{Incremental NGCC Gen}}$$

[21] EPA explains that this was done to limit the number of ERCs available from NGCCs that produce at greater capacity factors in the future.

The NGCC emissions rate calculation includes generation and emissions from NGCC units, and also generation and emissions from the mitigation measures assumed to displace NGCC generation (i.e., for NGCCs, the emissions from mitigation measures all come from renewables and are thus zero).

The numerator is calculated as the remaining total NGCC generation (after displacement from renewables and increased NGCC generation) multiplied by the baseline NGCC emissions rate.

The denominator is the sum of two components:

6. The remaining, total NGCC generation (after displacement from renewables and increased NGCC generation)
7. The generation from renewables assumed to displace NGCC generation in Building Block 3

Note that the totals for NGCC generation and emissions include the incremental components for NGCCs, which are also included in the fossil steam emission rate calculation. Figure 14 illustrates this equation:

Figure 14. NGCC post-Building Block 2 emission rate

$$\text{NGCC Average Emission Rate Final} = \frac{\text{NGCC-Emissions}_{\text{PostBB2}}\,(\text{lbs})}{\text{NGCC-Generation}_{\text{PostBB2}}\,(\text{MWh}) + \text{RE-Potential}_{\text{NGCCshare}}\,(\text{MWh})}$$

Calculating R1: Subcategorized CO_2 emissions rates

R1 targets are the maximum emission rates from across the three interconnects (i.e., the *least* stringent) by resource type. The Eastern Interconnect has the least stringent emission rates for fossil steam generation. For NGCC generation, the "limiting" interconnect is ERCOT in 2022-2026 and Eastern Interconnect in 2027-2030. Figure 15 and Figure 16 illustrate the trajectories of the fossil steam and NGCC rates in each interconnect for each year of the compliance period.

Figure 15. Fossil steam trajectories for each interconnect

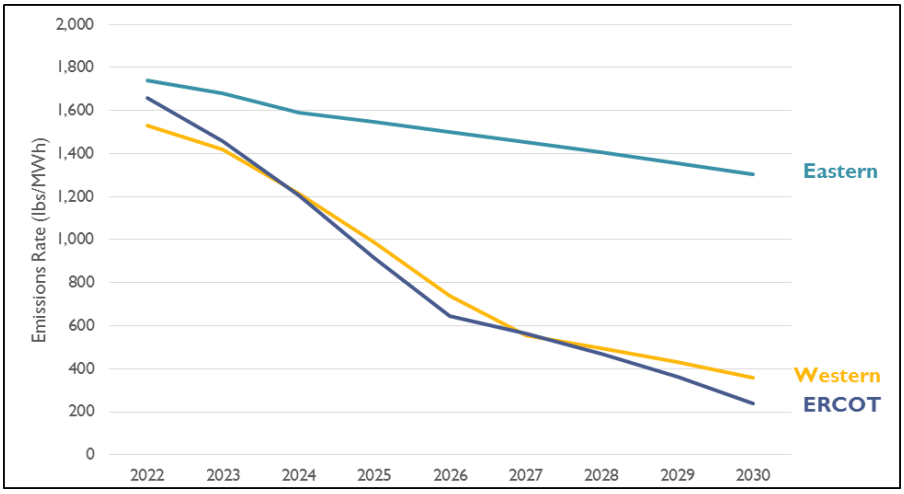
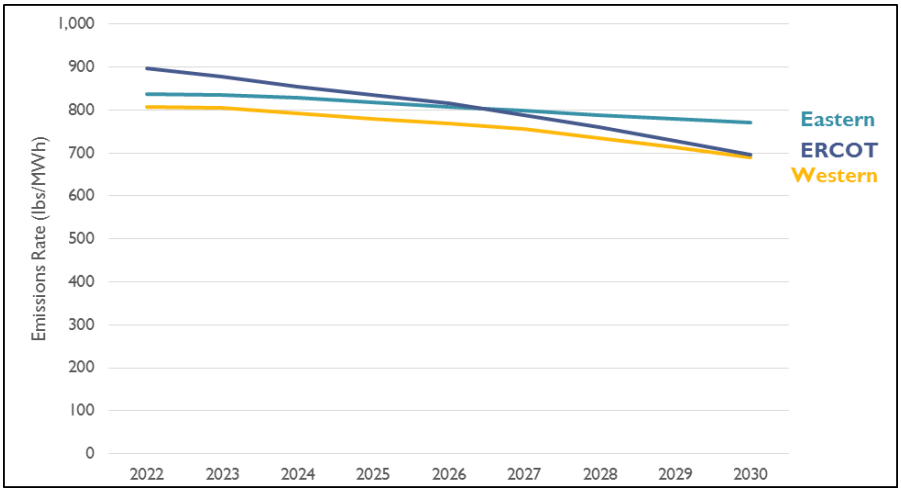


Figure 16. NGCC trajectories for each interconnect



The final unit-specific emission performance rate for 2030 is 1,305 lbs per MWh, and the final NGCC emission performance rate for 2030 is 771 lbs per MWh.

EPA also calculates interim rates and interim step rates that states must meet in order to demonstrate that they are making reasonable progress toward achieving final goals in 2030. Table 6 presents the glide path (for each of the three interim periods) and compliance goals (in 2030 and averaged across the interim periods) for fossil steam and NGCC. Figure 17 and Figure 18 show these emission rates graphically.

Table 6. Glide path and compliance period emission rate goals for fossil steam and NGCC (lbs/MWh)

	Non-Binding Goals			Binding Goals	
	2022-2024	2025-2027	2028-2029	2022-2029	2030 and after
Fossil Steam	1,671	1,500	1,380	1,534	1,305
NGCC	877	817	784	832	771

Figure 17. Glide path goals

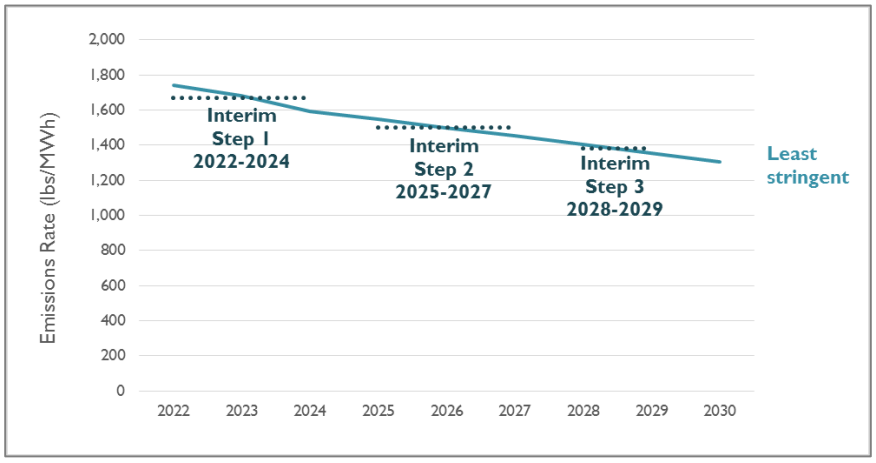
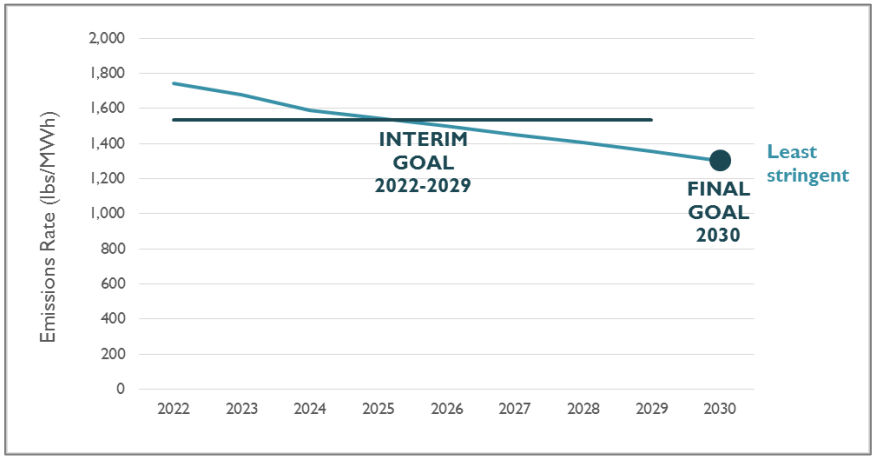


Figure 18. Compliance period goals



Calculating R2: State CO_2 emission rates

Calculating R2 emission rates for each state begins with the R1 rates by resource type and interconnect. State average emission rates are the average R1 fossil steam and NGCC rates weighted by 2012 fossil steam and NGCC generation (see Figure 19).

Figure 19. EPA equation for calculating state emission rates

$$\text{State Average Emission Rate} = \text{R1-Target}_{\text{FS-Year}}(\text{lbs/MWh}) \times \text{FS-Generation}_{\text{Baseline}}(\%) + \text{R1-Target}_{\text{NGCC-Year}}(\text{lbs/MWh}) \times \text{NGCC-Generation}_{\text{Baseline}}(\%)$$

Calculating R3: Different CO_2 emission rates

States also have the option to choose their own unit-specific emission rates based on technology types, unit vintage, or another feature. States can set whatever emission rates they choose as long as, when combined, the state average emission rates in each compliance period meet the state's R2 target established by EPA.

Calculating M1: CO_2 mass goal for existing units

To calculate the mass-based emission goals for each state, EPA translates the statewide rate-based goals into an equivalent mass-based target for existing units in each state. In general, this process involves solving for the maximum number of possible emissions if every existing unit were to meet the annual state average emissions rate. As an example, Table 7 demonstrates the emissions allowable from Alabama under this step.

Table 7. Rate-to-mass translation for Alabama

	2022	2023	2024	2025	2026	2027	2028	2029	2030	
R2. State Average Emissions Rate (lbs/MWh)	1,288	1,249	1,196	1,165	1,133	1,101	1,074	1,046	1,018	*(a)*
2012 Fossil Steam Generation (MWh)	46,059,840									*(b)*
2012 NGCC Generation (MWh)	53,492,096									*(c)*
2012 Total Generation (MWh)	99,551,936									*(d) = (b) + (c)*
Step 1: Allowable emissions from existing units (million short tons)	64	62	60	58	56	55	53	52	51	*(e) = (a) x (d) / 2,000*
Step 2: Allowable emissions from additional renewables (million short tons)	4	4	4	4	5	5	5	6	6	*(f)*
M1. Emissions cap for existing units (million short tons)	69	66	64	62	61	59	59	58	57	*(g) = (e) +(f)*

EPA first calculates the emissions that would be produced from each state's fossil steam and NGCC generators if they were to maintain their baseline levels of generation, while meeting the R2 emission targets.

Second, EPA allows for the fact that even more renewables could be built than were accounted for in target setting.[22] EPA reasons that, if these additional renewables were built, they would provide compliance credits that fossil-burning units could purchase. In this scenario, a fossil steam or NGCC unit could continue to supply high levels of generation and associated emissions but purchase these additional available credits and maintain the same emissions rate. Given the potential for an oversupply of compliance credits from renewables, "Step 2" in Table 7 shows the additional emissions that fossil units could produce while still meeting the Alabama state average emissions rate. The final row in Table 7 adds together allowable emissions from existing units and allowable emissions from additional renewables to calculate the M1 emissions cap for existing units.

Interim and final state mass goals are calculated by multiplying the annual goal by the number of years in each compliance period.

Calculating M2: CO_2 Mass goal for existing units with new unit complement

EPA received numerous comments requesting a way to include both existing and new sources in a mass-based compliance approach. This type of approach would make it easier for states that are already participating in mass-based trading programs (such as the Regional Greenhouse Gas Initiative in the Northeast) to comply through the existing program. In the final Clean Power Plan, EPA has calculated what it is calling "new source complements," which represent the estimated emissions from new sources associated with satisfying incremental demand growth from 2012. These new source complements can be added to the statewide mass-based goals for existing units to facilitate the development of compliance approaches that incorporate new sources as well as existing sources.

To calculate the new source complements for each state, EPA first estimates future load growth. EPA relies on the 2015 Annual Energy Outlook (AEO 2015) for forecasting future electric demand. AEO 2015 publishes electric demand by Electricity Market Module Region, resulting in forecasts for 22 regions comprising the lower 48 states. EPA assigns each of these regions to one of the three interconnects, then calculates a percent increase in demand over the baseline (2012) year for each interconnect for the compliance period (2022-2030). Table 8 shows the percent increase from 2012 for each year for each interconnection.

[22] Because EPA uses the least-stringent interconnect to set emission rates for *all* regions, this means that some renewables in the other interconnects are "left on the table." EPA assumes these additional renewables are distributed among all the states based on each state's share of the 2012 baseline generation.

Table 8. Percent increase in net energy for load from 2012 for each interconnection

Year	Eastern Interconnection	Western Interconnection	Texas Interconnection
2022	7.4%	6.2%	8.6%
2023	8.1%	7.1%	9.6%
2024	8.9%	8.2%	10.8%
2025	9.6%	9.2%	11.9%
2026	10.3%	10.1%	13.0%
2027	10.9%	11.0%	14.0%
2028	11.5%	11.9%	15.1%
2029	12.2%	12.8%	16.3%
2030	12.7%	13.6%	17.4%

Source: EPA New Source Complements to Mass Goals Technical Support Document for CPP Final Rule

In order to calculate the total generation required to support this future load growth, EPA first aggregates 2012 sales data for each state, grosses them up by 7.51 percent to reflect transmission and distribution losses, then aggregates the generation by interconnect. EPA then multiplies this 2012 value by the load growth percentages in Table 8 to estimate the generation required to meet future load growth during each year of the compliance period.

Next, EPA subtracts from this amount the MWh resulting from the growth in generation from renewable energy and existing sources, as well as from the operation of under-construction units, which were already included in the mass-based calculation. The remaining generation is what EPA calls the new source complement. Notably, EPA assumes this value can never be less than zero.

Finally, the new source complement for each interconnect is allocated across the states according to the 2012 share of generation in each state within the three interconnects (states that are in multiple interconnects are assigned to the interconnect that contains the majority of that state's territory). For each state, this generation is then multiplied by an emission rate of 1,033 lbs per MWh (the emission limit for new NGCC units under EPA's New Source Performance Standard) to calculate the M2 annual mass targets.

Calculating M3 and M4: State measures plans

The calculation for the mass-based limits in M3 and M4 are exactly the same as M1 and M2, respectively. The difference between these pathways is that states have more freedom to integrate strategies other than allowance allocation into their compliance approach in M3 and M4. These differences are explained in more detail below.

5. STATE COMPLIANCE PLANNING

Now that Clean Power Plan targets have been set and translated for use in several different compliance paths, states must begin developing compliance plans demonstrating how they will meet their chosen target. The Clean Power Plan is unusual in that it allows states to choose from a broad set of options to determine a compliance pathway. States can choose to comply on a rate basis—that is, by bringing the state's affected units, individually or on average, into compliance with the emission performance rates set by EPA. Or, states may comply with a mass-based target—by capping total emissions from the state's affected units. In addition to the rate-versus-mass distinction, each of the seven pathways also falls into an "emissions standards" or "state measures" category. The choice between emissions standards or state measures has implications for multi-state cooperation (discussed in Section 5.3), as well as for the requirements for demonstrating compliance (discussed in Section 6).

Here we discuss the wide variety of compliance planning approaches that states may choose from in developing a compliance strategy over the next 1-3 years.

Table 9. A key to Section 5 on state compliance planning

Considerations for compliance planning outlined in Section 5	
Section 5.1	Rate-based versus mass-based compliance
Section 5.2	Emphasis on trading for compliance
Section 5.3	Multi-state cooperation
Section 5.4	Understanding displacement
Section 5.5	Timeline for plan development, submission, and approval

5.1. Rate-based versus mass-based compliance

Rate-based compliance

The Clean Power Plan allows state regulators to choose from three approaches to rate-based compliance:

1. **R1 Subcategorized CO_2 emission performance rates**: States assign existing generators the applicable EPA-established emission performance rates for fossil steam and NGCC generators.

2. **R2 State-average CO_2 emission performance rates**: States assign existing generators the state-specific average emission performance rate developed by EPA based on the national emission performance rates and the state's mix of fossil generators.

3. **R3 Unit-specific CO_2 emission performance rates**: States assign individual existing units unique emission rates of their choosing, so long as the statewide average of the unique emission rates meets the state-specific average rate set by EPA.

States choosing the R1 approach would simply assign each existing fossil steam generator an emission performance rate equal to EPA's subcategorized rate for fossil steam and each existing NGCC generator an emission performance rate equal to EPA's NGCC rate. Under this type of plan, EPA permits a wide range of actions that would allow existing units to adjust their actual emission rate in order to meet the standard. While there are other options, the most likely path of compliance under this approach will involve affected units using ERCs to dilute their emission rate until it meets the EPA-established rate. These credits each represent one MWh of zero-emission energy and are added to the denominator of the source's emission performance rate calculation.

States choosing the R2 compliance pathway would require every existing unit, regardless of technology type, to meet the single statewide average emission standard. Units under this approach would have the same wide variety of options as units under an R1 pathway to reduce the intensity of their emission rates; however, as explained below, interstate trading options are limited under this approach to states that join together in a multi-state compliance plan.[23]

Under the R3 compliance pathway, states could assign unique emission rates to each existing unit so long as the weighted average of these individual units is less than or equal to the statewide average set by EPA. Units in R3 states cannot use interstate trading to reduce their emission rate, but they can use credits produced in-state.

Mass-based compliance

Alternatively, state regulators can choose mass-based compliance. Here, states choose from four different approaches:

1. **M1 Cap on Existing Sources**: There is a state cap on emission allowances for each compliance period. These allowances apply to existing units only.
2. **M2 Cap on Existing and New Sources:** There is a state cap on emission allowances for each compliance period. This cap applies to both existing and new units and uses EPA's new source complement to determine allowances available for new sources.
3. **M3 State Measures – Existing Sources**: States submit a plan containing a portfolio of strategies that show they will meet the M1 target. These strategies apply to existing units only.
4. **M4 State Measures – Existing and New Sources**: States submit a plan containing a portfolio of strategies that show they will meet the cap on existing sources plus the new source complements. These strategies apply to both existing units and new units.

[23] EPA explains that this helps assure that all the participating states are issuing ERCs using the same subcategorized performance rates and that the sources in each state have equivalent incentives for trading ERCs. *See* 80 Fed. Reg. at 64912.

In the first two mass-based pathways, states would most likely distribute allowances to units or make allowances available for purchase. Units must hold an allowance for each ton of CO_2 they wish to emit.

In the third and fourth mass-based pathways, states have more freedom to integrate strategies other than allowance allocation into their compliance approach. The R1, R2, R3, M1, and M2 pathways are all "emission standards" plans in which the state includes source-specific requirements on all affected units in order to meet the required emission performance rates or the state-specific rate-based or mass-based goals.

The M3 and M4 pathways are "state measures" plans, implemented using a mixture of measures implemented by the state—such as energy efficiency resource standards, renewable portfolio standards, or cap-and-trade programs that cover sources beyond those covered by the Clean Power Plan—that are not included in the federally enforceable components of the plan. States must submit plans demonstrating that emission reduction measures that are enforceable *by the state* will achieve the mass-based targets for existing sources (M3) or for existing sources plus the new source complement (M4). State measures compliance plans must include a backstop of federally enforceable emission standards on each unit covered by the Clean Power Plan in case the state measures fail to achieve the required reductions. States complying using M3 or M4 must still meet the same mass-based caps described in the first two mass-based pathways.

5.2. Emphasis on trading for compliance

Emissions trading programs are a long-established mechanism used by environmental regulators to reduce air pollution from the electric sector. The Title IV Acid Rain program, the NO_X Budget Trading Program, the Clean Air Interstate Rule, the Cross State Air Pollution Rule, the Regional Haze trading programs, the Regional Greenhouse Gas Initiative in the Northeast, and California's Cap and Trade Program under AB 32 all serve as examples of environmental regulations that allow compliance through trading—usually based on total tons of emissions reduced.

EPA has put significant emphasis on trading programs to allow states to pursue low-cost options for compliance with maximum flexibility. In the final Clean Power Plan, EPA provides an array of tools to help states utilize emissions trading programs to comply with the CO_2 reduction targets established in the rule. One of the most significant tools EPA provides is a set of proposed model trading rules for states to use, in whole or in part, for designing their own compliance plans.[24] The proposed model trading rules include a mass-based model trading rule (M1) and a rate-based model trading rule (R1). EPA explains that if a state were to adopt one of these model rules exactly as EPA has laid out, then the state's plan would be presumed to be approvable. These model rules offer states not only ready-made plan designs but also significant insight into what EPA's preferred approaches to compliance would entail. What's more, one of these model rules—either the rate-based or the mass-based rule—will become the federal compliance plan that EPA will implement on behalf of any state that fails to submit a

[24] EPA Proposed Model Trading Rule, 80 Fed. Reg. 64966 (October 23, 2015).

plan or has a plan disapproved. EPA is taking comments on all aspects of the proposed model trading rules and is expected to finalize them by the summer of 2016.

Mass-based trading

EPA allows states that have chosen a mass-based compliance approach to establish trading programs. Unlike the program for rate-based states that allows for trading of ERCs denominated in MWh, mass-based states have the opportunity to trade allowances in short tons of CO_2. EPA proposes a mass-based trading program as one of the proposed model trading rules for compliance with the Clean Power Plan and as one of the federal compliance plan options that states will have to meet if they fail to submit adequate compliance plans of their own.

The number of allowances made available must equal the state's M1 or M2 emission limit, and every generator subject to the Clean Power Plan must procure allowances equal to the quantity of CO_2 it emits during the compliance period. Allowances can be distributed through free allocation, by auction, or by some combination of the two. Free allocation of allowances can help compensate newly regulated sources for the cost of complying with the new regulations and may help reduce the risk for generators. EPA has designed its model mass-based trading program to use a free-allocation method of distributing allowances.[25]

Many existing mass-based trading programs, including RGGI in the Northeast, use an auction process to distribute allowances. Auctions have many potential benefits, including providing an incentive for early action, avoiding indirect subsidies that can prolong operation of uneconomic resources, and lowering policy costs through revenue recycling. Under the M1 and M2 pathways, a state can choose to distribute allowances through an auction process, provided its program allows for participation in EPA's CEIP program and demonstrates that it does not allow leakage to new sources not covered by the Clean Power Plan. EPA identifies three ways states can minimize leakage to new sources:

- Include new sources in the mass-based trading program by regulating these sources under state law and adopting the M2 target that includes the mass-based goal for existing units plus the new source complement;
- Adopt allocation methods (such as set-asides) that counteract incentives to shift generation to new sources; or
- Provide a demonstration that leakage is unlikely due to unique state characteristics or plan design meant to address leakage.

[25] EPA is avoiding establishing auctions itself, as federal law would require the proceeds to be deposited in the U.S. treasury. EPA is seeking comment on whether the model rule and proposed federal plan should include auctioning of some or all allowances, rather than free allocation, despite these requirements. 80 Fed. Reg. at 65018.

Mass-based model trading rule

Under the mass-based model trading rule, EPA proposes to freely allocate allowances to existing sources based on historical generation, minus certain set-asides designed to mitigate emissions leakage to new sources. The total number of allowances that are distributed—the emission budget—would be equal to a state's mass-based goal.

Before these allowances are distributed, three types of set-asides would be calculated:

1. **Clean Energy Incentive Program set-asides**. EPA will set aside a portion of allowances in each state from the first compliance period only to match early-action allowances awarded to renewable energy and low-income energy efficiency.

2. **Output-based allocation set-asides.** EPA will set aside a portion of allowances in each compliance period after the first period to existing NGCC units based on their increase in generation compared to the previous compliance period.

3. **Renewable energy set-asides.** EPA will set aside 5 percent of allowances in each state, in all compliance periods, for renewable energy projects.

We discuss each of these in further detail below.

Clean Energy Incentive Program set-asides

EPA established the CEIP program to encourage and reward early development and installation of renewable energy and low-income demand-side energy efficiency. For the first compliance period, EPA is proposing to set aside up to 300 million CO_2 allowances (100 million allowances per year from 2022-2024) for use as matching early action allowances under the CEIP. A portion of these set-asides would be reserved for wind and solar projects and a separate portion would be reserved for low-income energy efficiency (though the precise amount for each will not be determined until the model rule is finalized).

EPA will determine the allocation of these early-action set-asides based on each state's proportional share of the total reductions needed between 2012 and 2030 in order for the country to meet the final mass-based compliance goals. This means that states facing the greatest reduction obligations are also eligible for a larger proportion of the CEIP allowances.

EPA has calculated the number of CEIP allowances that each state would be eligible to receive, were every state to participate in the program. However, states are not required to participate in the CEIP unless they are under the federal plan. If a state chooses not to include the CEIP in its plan, its portion of CEIP allowances will be redistributed to participating states on the same pro-rata basis described above, or they will be deposited into a federal pool where they will be available to qualified projects on a first-come, first-served basis.

Any CEIP allowances that have not been awarded by the end of 2022 will be retired. Like other allowances, early action allowances can be banked for future use and traded freely among states with compatible trading programs.

Output-based allocation set-asides

The second type of set-aside in the mass-based model rule is a targeted allocation of a limited portion of allowances to existing NGCC units based on their increase in generation compared to the previous compliance period. This set-aside is available starting in the second interim compliance period (2025-2027). EPA states that the purpose of this set-aside is to align the incentives for existing units covered by the Clean Power Plan with new units that are not subject to the mass-based limits of the state plan.[26] This, EPA says, will help to avoid emission leakage to new units and to encourage the increased generation at existing NGCC units that is built into the targets under Building Block 2.

Under EPA's model rule, affected NGCC units that exceed a 50 percent capacity factor over the compliance period will receive allocations from this output-based set-aside for the portion of their generation that is above 50 percent.[27] Each NGCC is assessed based on its performance over the last compliance period (e.g., for the 2025-2027 compliance period, the average capacity factor over the 2022-2024 compliance period is used). Any MWh generated at or above a 50 percent capacity factor over this entire multi-year period becomes eligible generation for this set-aside. The number of available output-based allowances an NGCC unit can earn is calculated by multiplying the total eligible generation at the unit during the previous compliance period by the new source performance rate for NGCCs (1,030 lbs per MWh).

EPA has capped the total output-based set-aside at the number of allowances that each state would be eligible for if all existing NGCC units were to increase generation to a 60 percent capacity factor compared to their 2012 baseline. This cap is calculated once and is held constant throughout all compliance periods, which means as the mass goals decrease over the compliance period, the output-based set-asides would make up an increasingly larger share of available allowances. If, due to the cap, there is a shortage of allowances available to eligible NGCCs, the allowances will be distributed to each NGCC on a pro-rata basis. Any leftover allowances would be returned to the historical generation pool and distributed to all covered sources.

Renewable energy set-asides

The third type of set-aside in the proposed model trading rule earmarks 5 percent of a state's allowance pool to an account from which developers of qualified renewable projects could apply to receive allowances based on the projected generation from their projects. These allowances could then be traded or retired by the project developer. Eligible renewable energy generators are on-shore wind, solar, geothermal, tidal, or hydro units built on or after January 1, 2013.

Renewable energy set-aside allowances are allocated prior to each compliance period. The renewable project must be located in the mass-based state for which the set-aside has been designated and would not be eligible to produce ERCs in a rate-based state even if the project were electrically connected to

[26] 80 Fed. Reg. at 64889.

[27] In the final rule, NGCC capacity factors are determined using net summer capacity, not nameplate capacity.

the rate-based state. Allowances are distributed according to a pro-rata share of the projected MWh of each approved renewable generator. If fewer allowances are sought than are available, an approved generator would get the full number of allowances requested. After each year, renewable generators must submit their actual generation data to EPA. If a generator did not achieve the projected MWh, the unfulfilled MWh are subtracted from the available set-asides for the next generation year. Other harsher penalties exist for renewable generators that consistently over-predict their generation.

EPA created this set-aside to encourage early deployment of renewable energy projects by lowering the marginal cost of production of these resources within a state.[28] This set-aside is intended to help minimize leakage to new fossil generators by making renewable energy more competitive with these new sources. Moreover, the total number of allowances in the renewable energy set-aside pool will increase above the initial 5 percent over time as the allowances allocated to retiring units must ultimately be deposited into this pool (as explained below).

Distribution of allowances based on historical generation

After these three set-asides have been taken, the proposed model trading rule calls for allocating the remaining allowances in the state's emission budget to affected sources based on their generation over the 2010-2012 period.

First, the average annual generation during this period is determined for each unit. If a unit did not generate in one or more of these years, that year is thrown out of the average (i.e., only non-zero values are considered). If a unit was under construction during this period (or did not yet exist), the average generation is calculated based on the capacity factors used by EPA in target setting. Each unit's share of the state total average historical generation is then used to determine its allocation of the remaining allowances.

Allowances are distributed to affected units in December before the beginning of each of the three interim step compliance periods (2022-2024, 2025-2027, 2028-2029), before the final compliance period (2030-2031), and prior to each of the two-year maintenance periods following the final compliance period. For example, in December 2021, allowances will be distributed for the entire interim step one compliance period (2022-2024).

What happens if a unit retires?

If a unit retires or undergoes significant modifications to the point that it is no longer considered an existing unit covered by the Clean Power Plan, its owners will still receive allowances for a limited time. Based on the timing of the retirement (within the calendar year and the compliance period), owners of retired units may receive allowances for up to four years post-retirement. This approach is intended as a reasonable compromise between indirectly providing incentives for otherwise uneconomic units to keep operating by taking away allowances immediately upon retirement and giving away allowances to units

[28] 80 Fed. Reg. at 65022.

that are no longer emitting. After this limited period, allowances that would otherwise be allocated to retired units are instead added to the renewable energy set-aside allowance pool.

Flexibility for states

The distribution of allowances described here applies to EPA's proposed mass-based model rule. The final Clean Power Plan gives states the flexibility to develop their own process for distributing allowances, even if they are subject to the federal plan. States can design their own allowance distribution method with an eye toward supporting state policy goals, protecting low-income consumers, or supporting local industries, as long as the state's method addresses leakage concerns and includes participation in the CEIP program.

Rate-based trading

EPA's subcategorized emission performance rates are the foundation upon which each of the rate-based compliance pathways is built. However, because the BSER reflects impacts from shifting generation to zero- and lower-emitting resources, most existing units cannot meet these performance rates through operational changes alone. That is why EPA has designed each of the rate-based approaches to allow for emissions trading. In this section, we discuss how trading would work in a rate-based scenario, as detailed in the model trading rules.

Emission Rate Credits

Under rate-based compliance, fossil-fired resources would buy ERCs. With certain exceptions, one ERC represents one MWh of emissions-free generation or reduction in electric demand. Affected units purchase ERCs and add them to the denominator of their emission rate equation to determine their emission performance rate as in Figure 20:

Figure 20. EPA equation for adjusting emission performance rates for rate-based compliance

$$\text{Performance Rate} = \frac{\text{EGU Emissions (lbs of } CO_2\text{)}}{\text{EGU Generation (MWh)} + \text{Emission Rate Credits or "ERCs" (MWh)}}$$

Most existing units cannot meet their R1 rate-based targets through equipment upgrades and/or operational changes alone. In states that choose the R2 pathway, units may trade only with units in other states that have chosen R2 and have coordinated their targets in the form of a multi-state compliance plan. Units in states choosing the R3 compliance pathway may only purchase ERCs from within their state. In states that choose the R1 compliance pathway, units may purchase ERCs generated in any other state that has also chosen R1.

ERCs can be used by a fossil fuel-fired generator to demonstrate compliance with its assigned performance rate. EPA is proposing to allow unlimited banking of ERCs. This means that if a source has

more ERCs than it needs to meet its target, it can save the additional ERCs for use in any future compliance year. Borrowing against future ERCs to meet current compliance obligations is not allowed.

ERCs are produced in three distinct ways. Table 10 summarizes some of the important features of each ERC type: standard ERCs, gas-shift ERCs, and over-performing ERCs. We discuss each in more detail below.

Table 10. Summary of ERC characteristics

	Type 1: "Standard" ERCs	Type 2: "Gas Shift" ERCs	Type 3: "Over-performing" ERCs
What resources produce these?	New renewables, energy efficiency, new nuclear, biomass, other*	All existing NGCC units	All existing Fossil Steam and NGCC units performing better than their standard
Existing or new resources?	New *Defined as generating or saving electricity on or after January 1, 2013 or capacity upratings at qualified facilities*	Existing	Existing
How many ERCs get produced?	1 ERC= 1 MWh *Some resource types, like biomass or waste-to-energy, have ERCs pro-rated by their fuel's carbon content*	ERCs = GS ERC-Emission Factor X Incremental Generation Factor X Total NGCC Unit MWh	ERCs = Total Unit MWh X $(\frac{\text{Target Rate} - \text{Actual Rate}}{\text{Target Rate}})$
Any bonuses for early action?	Yes—Clean Energy Incentive Program *RE and low-income EE that is built on or after September 6, 2018 get ERCs for electricity generated or saved in 2020-2021* *RE: 1 MWh = 0.5 ERCs, 0.5 EPA "Matching" ERCs* *LI EE: 1 MWh = 1 ERC, 1 EPA "Matching" ERC* *Cap of ~400 million "Matching" ERCs from EPA*	No	No
Which resources can use these?	Fossil Steam and NGCC units	Fossil Steam units ONLY	Fossil Steam and NGCC units

** "Renewables" includes new wind, solar, hydro, wave, and tidal resources. In addition to regular program measures, "energy efficiency" includes utility programs, building codes, and appliance and equipment standards. "Other" includes volt/var optimization, waste-to-energy, DSM, CHP, and other resources.*

Standard ERCs

Standard ERCs are produced by new renewable, nuclear, energy efficiency, and biomass resources as well as certain other measures that can be shown to reduce electric-sector CO_2 emissions (such as transmission and distribution measures that reduce line losses, up-ratings at existing nuclear or hydro plants, or demand response measures).

Resources such as new NGCCs, energy storage, existing units not covered under the rule (e.g., simple-cycle gas turbines), capture of CO_2 from the ambient air, non-electric sector measures (e.g., agriculture and forestry), and avoided emissions as a result of vehicle electrification are explicitly *not* permitted to produce ERCs.

Generators or savings measures that were built or installed on or after January 1, 2013 can begin producing ***one ERC for every MWh of energy*** generated or saved starting on January 1, 2022, with these exceptions:

4. **Prorated ERCs***:* EPA allows biomass and waste-to-energy resources to produce ERCs, but prorates them based on their proportion of biogenic CO_2 compared to total CO_2.

- **CEIP ERCs**: The CEIP provides an incentive for early installers of certain types of renewable energy and energy efficiency measures. Under this program, wind and solar resources and low-income energy efficiency measures installed after submission of a state's final compliance plan can produce ERCs in the years 2020 and 2021 that can be banked for use during the compliance period. For every MWh of energy generated by wind and solar resources, the state awards 0.5 "early action" ERCs and EPA will award 0.5 matching ERCs from a pre-established pool of ERCs. Further, for every MWh of energy savings resulting from qualified low-income energy efficiency programs, the state awards one "early action" ERC and EPA will award one matching ERC from the CEIP ERC pool. EPA has capped the CEIP ERC pool at the equivalent of 300 million short tons, though how this will be translated to ERCs has not yet been explained.

Standard ERCs (including CEIP ERCs) can be used at both fossil steam and NGCC units to reduce their overall emission performance rate.

Gas-shift ERCs

Gas-shift ERCs are produced by existing NGCC units that increase their output, thereby displacing coal generation and emissions. These ERCs are meant to provide an incentive to shift from coal to NGCC generation as reflected in Building Block 2 of target setting. Gas-shift ERCs represent a partial credit to all NGCCs for the incremental generation needed to get all units generating to a 75 percent capacity factor, up from their 2012 generation levels. The number of ERCs each NGCC can produce in a given year is based on a complex combination of factors:

- The first is called the *GS ERC-Emission Factor*, which simply shows how much better the specific NGCC unit's emission rate is compared to the national fossil steam emission performance rate.

- The second factor is called the *Incremental Generation Factor*, which is an EPA-calculated value that varies from compliance period to compliance period and is based on calculations involving the projections of NGCC generation growth and renewable energy replacement. This factor distributes the anticipated collective incremental NGCC generation from Building Block 2 over all NGCC generation. EPA explains that the purpose of this factor is to allow NGCC units to generate gas-shift ERCs for all MWh of generation.

- The last factor is the total net energy output from the NGCC unit in the year that gas-shift ERCs are being calculated.

Figure 21. Calculation of Gas-Shift ERCs from existing NGCC units

Gas-Shift ERCs = GS ERC-Emission Factor X Incremental Generation Factor X Total NGCC Unit MWh

Essentially, EPA is giving credit to existing NGCCs for taking on some of the load (and displacing some of the accompanying emissions) of higher-emitting fossil generators, thereby reducing total emissions from the electric sector. As one way of trying to ensure that this shift actually happens, EPA specifies that only fossil steam units may use gas-shift ERCs to reduce their emission performance rates.

Over-performing ERCs

The last type of ERC is produced by existing fossil steam and NGCC units that "over-perform," that is, perform better than their target rate. The number of ERCs this type of unit can produce is determined by the total output from the unit in a given year multiplied by a factor representing how much better the unit performs compared to its target rate (i.e., the difference between the unit's target rate and its actual rate, divided by the target rate):

Figure 22. ERCs generated by highly efficient fossil units

$$\text{Over-Performing ERCs} = \text{Total Unit MWh} \times \left(\frac{\text{Target Rate} - \text{Actual rate}}{\text{Target Rate}} \right)$$

If the actual rate is lower than the target rate, this equation shows us the number of ERCs that the unit produces. ERCs produced in this way reward existing generators for performance above and beyond what the state has required. However, if the actual rate is greater than the target rate, then this equation tells us how many ERCs the resource needs to acquire to meet the target.

How ERCs are traded

Because generators under each of the compliance pathways could have a different assigned performance rate target, EPA limits interstate trading of ERCs to states that have approved plans under the same compliance pathway.[29] If two states both choose the R1 compliance approach—EPA's preferred approach and the basis for its model rule—resources in each state can trade ERCs freely. In fact, units in all states that choose the R1 compliance pathway can trade ERCs with each other without these states having to develop a joint compliance plan.

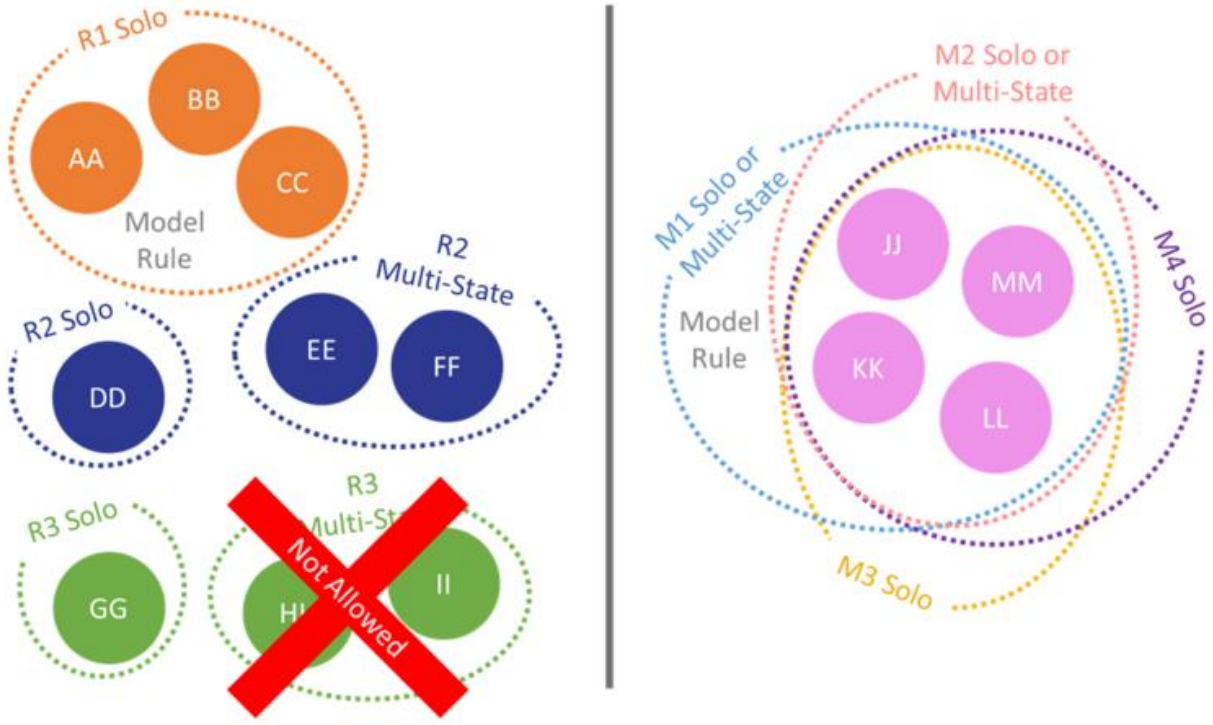
On the other hand, if two states each choose the R2 compliance approach, they may only trade ERCs if they submit a joint compliance plan and establish a common rate target that represents the weighted average of both states' fossil steam and combustion turbine generation.

Finally, units in a state choosing the R3 approach, in which that state's units are assigned unique performance rates, cannot trade ERCs with units in other states; however, these units can trade ERCs among themselves, on an intrastate basis.

[29] This is somewhat ambiguous in the Clean Power Plan text but seems to be EPA's intent.

Figure 23 below illustrates the potential trading interactions across states and compliance pathways. In this diagram, units in each single state (represented by "AA," "BB," etc.) may trade ERCs within each solid circle, representing trading between units in the same state. Beyond that, units can only trade with units in other states that are taking the same approach, or are working together to meet an agreed-upon approach, represented in this diagram by the dotted circles.

Figure 23. Potential interstate trading options in rate-based (left) and mass-based (right) scenarios



With one limited exception, ERCs can never be produced by resources or measures in a state that has opted for a mass-based compliance approach. The exception involves renewable energy resources that are physically located in a mass-based state but are electrically connected to a rate-based state. These resources must have a contract (such as a power purchase agreement) showing that the power from the renewable energy resource will serve customers in the rate-based state, thereby displacing generation in that state.

ERCs can, however, be produced by resources located in areas that are not covered by the Clean Power Plan, such as Vermont, Washington D.C., certain tribal lands, and even Canada or Mexico. Qualifying resources in these regions can produce ERCs as long as they are electrically connected to a rate-based state.

One final note on trading under a rate-based compliance approach: ERCs can come from any eligible generator or measure as long as they are electrically connected to the contiguous U.S. bulk power grid. That means an ERC produced by a wind turbine in northern Maine theoretically could be sold to a coal unit in Wyoming to reduce its emission performance rate. The fact that the resource being displaced by

the MWh of wind in Maine might be gas, while the resource that would have been displaced by the same MWh of wind in Wyoming is more likely coal, is not accounted for in EPA's ERC trading options.

5.3. Multi-state cooperation

One of the main flexibilities EPA maintains in the final rule is the ability for states to coordinate with each other towards compliance with their emission requirements. The agency acknowledges and supports the notion that explicit consideration of the regional interconnectedness of the power grid can lead to the development of emission reduction measures above and beyond those that could be developed by states working in isolation. Specifically, multi-state approaches "can lead to more efficient implementation, lower compliance costs for affected EGUs and lower impacts on electricity ratepayers."[30] EPA states that any potential reliability impacts can also be addressed in a more coordinated manner.

Formally, there are two main ways that EPA offers this flexibility: 1) states have the option to submit a multi-state compliance plan in which they work together to develop a single, federally enforceable plan for compliance with a coordinated target, and 2) states can retain individual state plans but form linkages with other states that would allow for interstate trading.

EPA also notes that there may be additional ways states may collaborate with each other to reach their emission goals and that these approaches will be considered so long as they collectively achieve the emission reduction goals of the affected states in aggregate.

Approaches to multi-state cooperation

Multi-state plans. Using the first approach, states would comply with their state emission rate- or mass-based goal through submitting a formal joint compliance plan with other states. In this case, states would forgo submitting individual state plans and submit a single, multi-state compliance plan instead. This multi-state plan would be bound to an aggregate emission limit (using a mass-based approach) or a joint emission rate (using a rate-based approach) that represents the original individual state requirements. The joint mass-based goal would be a sum of the individual state mass-based emission goal; the joint rate-based goal would be an average of the individual state emission rate goals (weighted by affected EGUs' 2012 generation). Once the multi-state plan was developed and compliance pathway set, the participating states would be jointly responsible for reaching their emission targets.

While multi-state plans can be developed using either an emissions standards approach or a state measures approach, states participating in a specific multi-state plan are required to choose a common compliance pathway (i.e., either an emission standards or state measures approach). However, states are allowed to participate in more than one multi-state plan (EPA acknowledges that this option could

[30] 80 Fed. Reg. at 64838.

be useful for states that contain affected units that participate in more than one ISO/RTO market). A subset of affected EGUs in a state may participate in a multi-state plan.[31]

Interstate trading programs. Using the second approach, states would submit individual state plans but would undergo a coordinated effort to link their emission trading programs to facilitate interstate trading of either ERCs or emission allowances. Trading programs are somewhat limited by choice of pathway, as described below; however, EPA's model rules for the mass- and rate-based compliance options would be considered ready for interstate trading if they were adopted as proposed.[32]

Interstate trading and interaction between plan types

Units in states using either a rate-based approach or a mass-based approach would be allowed to make out-of-state trades with each other, so long as they use a common approach (rate or mass approach). To trade ERCs across state lines, rate-based states must use the R1 compliance pathway. States submitting individual plans under R2 or R3 cannot trade ERCs across state lines. This requirement is a protective measure to prevent emissions leakage between individual EGUs across states with unique emission rates.

EPA notes that the larger the mass-based trading region, the more effective and affordable compliance will be.[33] Therefore, under the final Clean Power Plan, units in mass-based states can use allowances obtained from other mass-based states for compliance as long as the allowances are properly tracked and the states are "linked" in some way. States can accomplish this linkage by using a "ready-for-interstate-trading" plan, such as the one in the proposed model trading rule, or by separately identifying bilateral or multilateral links with other states in their state plans.

While EPA allows states to design mass-based trading programs that include different universes of sources (e.g., existing sources only, existing sources plus new sources, and even a broader set of sources), it is not entirely clear what restrictions EPA intends to apply to trading between mass-based states with different types of trading programs. In the final rule, EPA explains that the approvability of linked trading plans would differ based on the structure of the states' mass-based trading programs and that different criteria for approvability are necessary to ensure that states meet their individual CO_2 goals—but these criteria are not provided.[34] The final rule states repeatedly that each state's plan must demonstrate how the trading program, no matter what the design, will allow the state's existing sources to meet the state CO_2 goal.[35] Thus, it appears that some of the details of mass-based interstate trading will be determined by EPA during the plan approval process.

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[31] Ibid. at 64838.

[32] Ibid. at 64910.

[33] 80 Fed. Reg. at 64969.

[34] 80 Fed. Reg. at 64892.

[35] Ibid. at 64890.

If states are assigned the mass-based federal compliance plan, they will be able to trade allowances with other states under the federal plan. One simple, straightforward way states can broaden the scope of their interstate allowance trading program is to adopt EPA's model trading rule and link to the federal mass-based trading plan (explained in more detail in the next section). In the proposed model trading rule, EPA lays out the conditions a state plan would have to meet in order to link to states under the federal plan trading program:

- Must be approved by EPA as a "ready-for-interstate-trading" plan
- Must use the same form of compliance (here, mass-based) and the same compliance instrument (here, allowances representing short tons of CO_2) as the federal plan
- Must use an EPA-administered tracking system for tracking allowances

If these conditions are met, a state can link with the federal trading program and units in that state can use allowances from any other state that is under the federal plan or similarly linked to it.

5.4. Understanding displacement

A potential issue with the interstate ERC trading programs described above concerns the fact that ERC producers displace emissions from fossil-fired generation at different rates depending on their location. Since ERCs can be traded across state lines and between states in different regions, the value of an ERC for achieving the goals of the Clean Power Plan—i.e., reducing emissions from fossil-fired generation—may be lessened if it is procured by a state with a lower displaced emissions rate than the state from which it is procured.

ERC producers such as energy efficiency and renewable energy resources reduce carbon emissions that would otherwise be released from EGUs on the grid. This emissions displacement occurs as new zero-emitting energy efficiency or renewable energy resources eliminate or reduce the need for MWh of generation from fossil-fired units. Typically, energy efficiency and renewable energy displace generation from a mix of units burning coal, natural gas, and occasionally oil; once installed, energy efficiency and renewable energy resources are essentially free to operate so they are called on by electric system operators to run before fossil-fired units.

Beyond displacing generation and emissions on a given day, the addition of clean energy efficiency and renewable energy resources can reduce the need to expand or build new fossil-fired generation. Similarly, energy efficiency and renewable energy can result in earlier retirement of high-carbon emitting units. Overall, by reducing operations, avoiding capacity, or expediting retirements of fossil-fired units, new energy efficiency and renewable energy resources displace emissions.

The degree to which clean energy resources reduce emissions depends on a number of factors, primarily the type and amount of other generation resources displaced. In a recent report, Synapse notes that "the larger the proportion of higher carbon-emitting resources in a region's existing generation capacity

mix, the larger role energy efficiency and renewable energy can play in displacing CO_2 emissions."[36] Table 11 (excerpted from the report) highlights the regions with higher proportions of coal-fired resources in their generation mix, and their comparatively higher displaced emission rates.

Table 11. Displaced CO_2 emission rate (tons/MWh) in U.S. regions, based on modeling case studies

Region	Wind	Utility Solar PV	Portfolio energy efficiency	Base load energy efficiency
Northeast	0.46	0.49	0.49	0.48
Great Lakes / Mid-Atlantic	0.73	0.73	0.73	0.73
Southeast	0.63	0.64	0.64	0.64
Lower Midwest	0.72	0.69	0.70	0.71
Upper Midwest	0.83	0.80	0.81	0.82
Rocky Mountains	0.81	0.77	0.78	0.79
Texas	0.59	0.59	0.59	0.59
Southwest	0.58	0.54	0.54	0.56
Northwest	0.70	0.70	0.69	0.70
California	0.44	0.46	0.46	0.45

In the final Clean Power Plan, EPA explicitly accounts for the energy and CO_2 emission displacement effects of renewable energy in target setting. This is a change from the proposed rule. In the final rule, supplementing the MWh fossil generation in the denominator of the rate with the amount of new renewable energy that displaces fossil resources increases the stringency of target emission rates.

The nature of displaced emissions can ultimately place stress on Clean Power Plan's overall CO_2 emission reduction goals, particularly when it comes to rate-based options. Implicit in the specific values for the R1 targets—1,305 lb per MWh for fossil-steam units and 771 lb per MWh for NGCCs—is that affected units adjust their actual emission performance rates with ERC purchases. ERCs can be generated from many different types of clean energy resources, including energy efficiency and renewable energy, in many different locations.

The issue is that ERCs can be traded across state lines and even between states in different regions, provided that the states buying and selling ERCs are both using the same rate-based compliance option, or a producer in a mass-based state holds a power purchase agreement with the rate-based state. However, the existing literature and Synapse's own modeling indicate that the potential for

[36] Biewald, B., J. Daniel, J. Fisher, P. Luckow, A. Napoleon, N. R. Santen, K. Takahashi. 2015. *Air Emissions Displacement by Energy Efficiency and Renewable Energy*. Synapse Energy Economics. Available at: http://synapse-energy.com/sites/default/files/Air-Emissions-Displacement-by-Energy-Efficiency-and-Renewable-Energy_0.pdf.

CO_2 emission displacement varies considerably from region to region across the United States. As a result, the emissions displaced where an ERC is produced may differ substantially from where it is used.

On the other hand, a recent analysis by the U.S. Department of Energy and National Renewable Energy Laboratory report shows that if states are meeting their target rates and trading ERCs only with other states using the same compliance pathway, as the rule requires, then the total emission reduction goals can be met despite a difference in displacement rates across regions.[37] This finding highlights the need for well-designed, transparent trading programs to ensure the goals of the rule are met.

5.5. Timeline for plan development, submission, and approval

In the final rule, EPA has given states additional time to develop their compliance plans. Initial submissions must be made by September 6, 2016. At that time, states can either submit a complete plan or submit a demonstration of reasonable progress together with a request for an extension of up to two years. To qualify for an extension, states must address three required components:

1. Identification of final plan approach or approaches under consideration, including a description of progress made to date;
2. Explanation of why the state requires additional time to submit a final plan; and
3. Demonstration of how the state has been engaging with the public, including vulnerable communities, and description of how the state intends to meaningfully engage with community stakeholders on the development of the plan over the course of the extension.

States that receive two-year extensions have until September 6, 2018 to submit their final plans and must submit a 2017 update documenting the state's continued progress toward completing a final plan by September 6, 2018.

Once plans are submitted, EPA's regional offices will have 12 months to review and either approve or disapprove the plan. If a state does not submit a final plan by the applicable deadline or if the final plan is disapproved, EPA will implement one of its federal compliance plans (which were proposed concurrently with the final Clean Power Plan) on the state's behalf within one year. At any time before EPA implements its federal compliance plan, a state can remedy its absent or insufficient state plan by submitting a compliant plan and gaining EPA approval.

[37] Steinberg, D.C. and E. Boyd. 2015. "Energy Efficiency under Alternative Carbon Policies." NREL Technical Report NREL/TP-6A20-64390. Available at: http://www.nrel.gov/docs/fy15osti/64390.pdf.

6. DEMONSTRATING COMPLIANCE

Demonstrating compliance is the final "moment" in the Clean Power Plan. The final Clean Power Plan contains an updated timeline for compliance reporting to match the final rule's compliance periods, more precise language for plan submittal and reporting requirements specific to required compliance demonstration, and initial guidance on choosing a suitable methodology for projecting CO_2 performance. Because compliance demonstrations are tied to state compliance pathways, and the pathways have changed from the proposed rule, requirements for demonstrating compliance with state plans have shifted in a few meaningful ways. In the sections below, key differences between the proposed rule and final rule are highlighted alongside the compliance requirements states now face.

Ultimately, EPA requires states to demonstrate that each state plan is 1) quantifiable, 2) non-duplicative, 3) permanent, 4) verifiable, and 5) enforceable (see Table 12). While the application of this requirement is different from the proposed rule in the sense that the specific state plan options have changed, the fundamental requirement that states' compliance plans need to retain these five characteristics has not changed. Table 12 describes each characteristic.

Table 12. Five key characteristics a state plan must demonstrate

Characteristic	Description
Quantifiable	An emission standard or state measure is quantifiable if it can be reliably measured, using technically sound methods, in a manner that can be replicated.
Non-Duplicative	An emission standard or state measure is non-duplicative if it is not already incorporated in another state's Clean Power Plan compliance plan, except in instances where incorporated in another state as part of a multi-state plan. However, emissions reductions from Clean Power Plan standards or measures can be used to comply with other, non-111(d) regulations (e.g., Regional Haze, RPS).
Permanent	An emission standard or state measure is permanent if the standard must be met for each applicable compliance year or period, or replaced by another emission standard in a plan revision, or the state demonstrates in a plan revision that the emission standard is no longer necessary for the state to meet its required emission performance level for affected EGUs.
Verifiable	An emission standard or state measure is verifiable if adequate monitoring, recordkeeping, and reporting requirements are in place to enable the state and EPA to independently evaluate, measure, and verify compliance with it.
Enforceable	An emission standard or state measure is enforceable if (1) it represents a technically accurate limitation or requirement and the time period for the limitation or requirement is specified; (2) compliance requirements are clearly defined; and (3) the entities responsible for compliance and liable for violations can be identified. In addition, an enforceable *emission standard* is one where each compliance activity or measure is enforceable as a practical matter in accordance with EPA guidance on "practical enforceability" and EPA, state, and third parties all maintain the ability to enforce against affected units and secure corrective actions. An enforceable *state measure*, on the other hand, is one where each compliance activity is practically enforceable in accordance with EPA guidance on practical enforceability, but where the state maintains the ability to enforce against affected EGUs for violations and secure corrective actions (but not EPA and/or third parties).

6.1. Stages of compliance

States will need to demonstrate to EPA that their plans will meet their emission performance rates or mass-based emission goals in three main stages:

- Stage 1: State plan development and final submittal (2016-2018)
- Stage 2: State plan implementation (full interim period: 2022-2029, and interim step compliance periods: 2022-2024, 2025-2027, and 2028-2029)
- Stage 3: Ongoing compliance (2030 and beyond)

A key difference between the proposed and final rule governing compliance demonstration requirements is the change in compliance periods. By September 6, 2016—one year after finalization of the rule—states must submit plans to EPA demonstrating that they will comply with their state targets. States that request and receive a two-year extension must submit plans demonstrating compliance by September 6, 2018.

The interim compliance period has also moved back two years, beginning in 2022 rather than 2020, and new interim step compliance periods provide additional check-in points for compliance demonstrations (described more in Stage 2 below). Finally, in the proposed rule, states were to evaluate ongoing (post-2030) compliance of their affected sources on a three-year rolling basis, whereas in the final rule, ongoing compliance (Stage 3) will be demonstrated by states on a biennial basis beginning in 2031.

Stage 1: Requirements leading up to state final plan submittal (2016-2018)

The first compliance demonstration occurs during a state's submittal of its compliance plan—either on September 6, 2016 or on September 1, 2018 for states that have been granted a two-year extension. At this time, each state will need to demonstrate that its chosen compliance pathway will bring all affected sources into compliance with the state's emission performance targets. This demonstration must be shown through 2031, after which the emission standards and/or state measures must remain in place to maintain the final target levels.[38]

Stage 1 requirements

States must submit the following components to demonstrate compliance during Stage 1:

- 2021 status reports: By July 1, 2021, each state is required to demonstrate that it has met the programmatic milestones listed in its submitted state plan, and that it is on track to implement its approved state plan as of January 1, 2022 (the beginning of the interim compliance period).

- Alternate interim step goals: In the final rule, states are permitted to design their own interim step emission goals. Those that choose this option are required to demonstrate that their compliance plan will meet the emission performance rate or state mass-based goal for the 2022-2209 interim period. This demonstration will require a technically sound analytical process, and all methods, tools, and assumptions used to make this demonstration are required to be submitted with the final state plan for EPA to review.

- Trading ERCs and allowances: States using a rate-based emission standards approach with ERC trading must demonstrate that an appropriate ERC tracking infrastructure is in place that meets the requirements of the emission guidelines, and that the MWh for which ERCs are issued will be properly quantified and verified. States using a mass-based allowance trading program must describe implementation requirements that specify the emission budget, provisions for tracking of allowances, and compliance demonstration requirements of the affected units themselves.

- No leakage: States submitting a plan to meet a mass-based state emission target are required to demonstrate that emissions will not leak—that is, shift generation from affected sources to new, non-affected sources over time—to potential new sources. Sufficient demonstration could include adopting the mass-based state emission goal for

[38] If a state cannot show that its plan will meet state emission targets, or a state fails to submit a plan and/or demonstration altogether, EPA will initiate the federal plan process in which a federal compliance plan will be imposed upon the state.

existing and new sources (M2), adopting the precise allowance set-aside provisions that EPA lays out in its model rule to counteract shifting generation from affected to new sources, or providing a formal modeling analysis showing that emission leakage is unlikely to occur.

Additional requirement: CO_2 emissions projection

The compliance pathway a state chooses will govern whether the state plan is required to contain a projection of aggregate state CO_2 emissions through 2031 (summarized in Table 13 below).

Table 13. CO_2 performance projection requirements by state plan type

No CO_2 Performance Projection Required	
R1	**Subcategorized CO_2 Emission Performance Rates** *Each affected unit has a (permitted) emission rate at or below the sub-categorized CO_2 emission rate for coal and natural gas combined cycle plants*
R2	**State CO_2 Emission Performance Rates** *Each affected unit has the same (permitted) emission rate at or below the state's emission performance rate*
M1	**CO_2 Mass Goal for Existing Units** *All affected units have (permitted) emission limits that are cumulatively at or below the state's mass emission goal*
M2	**CO_2 Mass Goal for Existing Units with New Unit Complement** *All affected units, including new units, have (permitted) emission limits that are cumulatively at or below the state's mass emission goal plus the state's new source complement.*
CO_2 Performance Projection Required	
R3	**Unique CO_2 Emission Performance Rates** *One or more affected units have a (permitted) emission rate that is different than either the sub-categorized CO_2 emission rates or state emission performance rate. Note: A state is not allowed to combine state plan types.*
M3	**State Measures: CO_2 Mass Goal for Existing Units** *State measures approaches automatically trigger CO_2 performance projections*
M4	**State Measures: CO_2 Mass Goal for Existing and New Units** *State measures approaches automatically trigger CO_2 performance projections*

States complying using the R1, R2, M1, or M2 pathways do not need to submit CO_2 emission performance projections to show plan compliance. Note that compliance demonstration through reporting is still required for these pathways, as discussed in Stage 2 below.

States complying using the R3, M3, or M4 pathways need to submit a CO_2 emission performance projection representative of the state plan design, to demonstrate that the state plan will meet the state's emission performance target. (The components of a CO_2 performance projection are discussed further in Section 6.2 below.) Note that in the proposed rule, the distinction between which state plan types are obligated to demonstrate compliance through a formal CO_2 performance projection was not yet made. EPA chose this particular set of distinctions as a result of comments and to minimize modeling burdens on the states.

Stage 2: Requirements during implementation (2022-2029)

The second stage during which states must show that their plans are meeting their state's emission goals is during implementation. The key compliance reporting periods during implementation are the three interim step periods of 2022-2024, 2025-2027, and 2028-2029 and one full interim period of 2022-2029. A final compliance period begins in 2030, described as Stage 3 below.

"Emission standards" state plans: R1, R2, R3, M1, and M2

States using an emission standards approach, where each affected unit in a state is responsible for meeting a prescribed emission performance rate or cap, are required to submit compliance reports by July 1 following the end of each interim step compliance period (2022-2024, 2025-2027, and 2028-2029). These compliance reports must include the following items:

- Information about the status of implementation for emission standards for affected units
- Current aggregate and individual CO_2 emission performance by affected units (for the specific compliance period); this "performance check" will compare CO_2 emission performance levels designated in the state's plan and the actual CO_2 emission performance levels for the aggregate of all affected units
- Identification of whether affected units are on schedule to meet the state plan's CO_2 performance rate or emission goal during the performance and compliance periods indicated in the state plan
- A review of the administration of any applicable state rate-based emission trading programs
- For the third interim compliance reporting period only (2028-2029), the state is additionally required to submit a performance check for the full interim (2022-2029) period

"State measures" state plans: M3 and M4

States using a state measures approach, in which states place obligations on entities other than affected sources, have more frequent reporting requirements as a result of the flexibility inherent in this approach (and thus increased uncertainty in meeting state emission goals). These states are required to submit annual compliance reports on July 1 following the end of each calendar year during the interim period (2022-2029). The annual report is to consist of the following items:

- Status of implementation of all state measures and any federally enforceable emissions standards included in the plan
- A report on the periodic programmatic milestones to demonstrate progress in implementation of the programs specified in the state plan

In addition, states using a state measures plan must submit an emission performance check at the end of each interim step compliance period that compares the projected CO_2 performance level in the state plan to the actual CO_2 emission performance of affected units during that period. This includes a performance check for the full interim period (2022-2029) on July 1, 2030.

States will be out of compliance (and corrective measures will be triggered) if the emission performance levels (e.g., total emissions or emission performance rates) during any interim period exceed the specified level in the state plan by 10 percent.[39] States using a state measures approach must also show that their programmatic milestones are being met, in order to prevent applicable backstop measures from being triggered.

Stage 3: Ongoing compliance (2030 and beyond)

The third stage in which states will demonstrate CO_2 emissions compliance to EPA begins after the final compliance period in 2030. Beginning in 2032, states are required to submit a biennial state report that includes a CO_2 emission performance check to show the state is continuing to meet its final emission performance rate or state emission goal. This ongoing compliance demonstration requirement is the same for both emission standards and state measures state plans. The reports are to be submitted by July 1 following each two calendar year periods beginning January 1, 2030; the first biennial state report is due July 1, 2032.

6.2. CO_2 performance projection requirements

States complying under the R3, M3, and M4 pathways are required to submit a formal CO_2 performance projection along with their final state plans. These states will need to demonstrate that the emission standards and/or state measures included in their plans will lead to CO_2 emission rates or total emissions that are at or below the state's target. Under most circumstances, this demonstration will involve emission performance projections based on a technical analysis that appropriately links the effects of the standards and measures in a state plan to actual CO_2 emissions at affected units in the state.

The final rule provides guidance to states on appropriate methods and tools for CO_2 performance projections. It should be noted that EPA is very explicit about not requiring—or endorsing—the use of any particular method or tool by name. EPA has deemed that several methods—ranging from spreadsheet-based tools that look at historical generation and emissions along with future growth rates, to formal statistical analysis, to comprehensive electric energy system dispatch modeling—may be appropriately suited for these emission projections depending on the state's chosen compliance pathway and plan design, affected units in the state, and the state's underlying physical energy system.

[39] 80 Fed. Reg. at 64851.

Instead of recommending or requiring specific models, EPA has designated a set of features that a satisfactory CO_2 projection should embody, along with a list of specific projection requirements based on state compliance pathway. EPA will review and assess states' CO_2 projection methodologies for reasonableness, taking the following features into consideration:

- The projection must use technically sound methods that are reliable and replicable,
- The state plan submittal must explain how the projection method or tool works,
- The state plan submittal must explain *why* the projection method or tool is appropriate for the assessing the emission performance of the particular state plan in question, and
- Results of the projection must be reproducible using the assumptions documented by the state in the state plan's submittal.

Emission projections for R3 compliance

States following the R3 compliance pathway (with plans that have unique emission standards for affected units) must demonstrate that the state average CO_2 emission rate of affected units, when weighted by generation, will be equal to or less than the state's R2 rate-based CO_2 emission goal during the interim and final compliance periods.

Projections and their documentation must include, when applicable:

1. Federally enforceable emission targets for each affected EGU
2. A projection of leakage: how generation shifts between affected EGUs and non-affected EGUs over time
3. Assumptions about the availability and expected use of ERCs
4. The precise calculation or assumption used to determine how affected unit CO_2 emission rates are being adjusted using ERCs
5. Assumed ERC prices
6. Power purchase agreements and related documentation about the use of any renewable energy resources from mass-based states for adjusting the CO_2 emission rate of affected units
7. Any other applicable assumptions and documentation

Emission projections for M3 and M4 compliance

The use of the M3 or M4 state measures compliance pathways triggers the need for the state to submit a CO_2 emission performance projection. For these plans, states must demonstrate that the state measures, as well as any federally enforceable emission standards that may be part of the plans, will achieve the state's mass-based CO_2 goals for the interim and final compliance periods.

Projections and their documentation must include, when applicable,

1. Federally enforceable emission targets for each affected EGU
2. Individual state measures, including timing of their implementation and their impacts over time
3. All other applicable assumptions and documentation used, including but not limited to documentation about emission budget trading programs and associated flexibilities such as treatment of out-of-sector greenhouse gas offsets and cost-containment mechanisms

Although not yet released, EPA is planning to prepare additional guidance on different projection methods and tools to help states determine suitable modeling methodologies for their specific state plan designs. The final rule technical support document (TSD), "Incorporating RE and Demand-side Energy Efficiency Impacts into State Plan Demonstrations" provides guidance on quantifying the impact of eligible renewable energy and demand-side energy efficiency programs.[40]

7. EPA Estimates of Clean Power Plan Costs and Benefits

In finalizing the Clean Power Plan, EPA updated its analysis of the estimated costs and benefits to states of complying with the final emission guidelines. This section presents a summary of those costs and benefits; it does not represent an independent evaluation of EPA's estimates or assumptions.

7.1. EPA's cost-benefit analysis

EPA presents in its Regulatory Impact Analysis (RIA)[41] results from two illustrative scenarios with a range of estimated net benefits for 2020, 2025, and 2030 (the first year is 2020 to capture potential impacts of early state action). EPA used its Integrated Planning Model (IPM) to quantify emissions and costs, and a combination of social cost of carbon (SC-CO_2) estimates and epidemiological air pollutant-health effect analyses to quantify benefits. The first scenario models a future where all states comply through a rate-based approach, and together meet the state-level rate-based goals. The second scenario models a future where all states comply using a mass-based approach, and together meet the state-level mass-based goals. EPA acknowledges that these are "illustrative" scenarios only, as it is likely that states will choose a mix of rate-based and mass-based plans. However, modeling all the possible combinations of

[40] EPA. 2015. Incorporating RE and Demand-side Energy Efficiency Impacts into State Plan Demonstrations TSD. Available at: http://www3.epa.gov/airquality/cpp/tsd-cpp-incorporating-re-ee.pdf.

[41] EPA. 2015. Regulatory Impact Analysis for the Clean Power Plan. Available at: http://www2.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule-ria.pdf.

mass- and rate-base state plans across all Clean Power Plan-affected states would be unduly burdensome.

The compliance costs EPA includes represent the change in electric power generation costs between the base case and the scenario modeled, inclusive of the cost of demand-side energy efficiency and costs of monitoring, reporting, and recordkeeping (MR&R). The estimated costs presented in Table 14 include the incremental cost of electric utility generation above the base case, plus total (EGU-paid and customer-paid) demand-side energy efficiency costs and MR&R costs. It is important to note that the compliance costs EPA cites are not social costs—they are costs incurred by EGUs and states to comply with the requirements of the rule. Benefits, on the other hand, are social benefits.

Table 14. Incremental cost of CPP compliance in EPA's illustrative compliance scenarios (billions of 2011$)

	All Rate-based Approach	All Mass-based Approach
2020	$2.5	$1.4
2025	$1.0	$3.0
2030	$8.4	$5.1

EPA (2015) Regulatory Impact Analysis for the Clean Power Plan Final Rule, Table ES-5, p.ES-9.

In estimating benefits from Clean Power Plan compliance, EPA considered and monetized two sets of benefits—global climate benefits and national health co-benefits. EPA calculates climate benefits from CO_2 emissions reductions using SC-CO_2 values for marginal climate impacts reported in an updated July 2015 SC-CO_2 Technical Support Document.[42] Benefits from "ancillary" emission reductions of SO_2, NO_x, and directly emitted $PM_{2.5}$ are based on the associated reduction in ozone and $PM_{2.5}$ and subsequent mortality and morbidity. These health co-benefits are calculated using epidemiological concentration-response functions, and monetized using standard "value of statistical life" (VSL) estimates of $10 million.

Depending on the combination of discount rates used for climate and health co-benefits, and whether tail-event likelihoods are taken into consideration, the range of benefits EPA estimates for both the all rate-based and all mass-based approaches in 2030 is approximately $20 to $95 billion (2011$). Table 15 summarizes the total monetized benefits estimated for both illustrative scenarios.

The SC-CO_2 values EPA uses are based on established integrated assessment modeling (IAM) tools vetted by the energy and climate modeling community. However, due to data availability, the state of the science itself, inherent uncertainties, and the existence of non-quantifiable impacts, even these well-established tools lack a complete picture of the way emissions interact with the climate system, and the way the economy responds, causing some to argue that the calculated SC-CO_2 values are too

[42] Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Interagency Working Group on Social cost of Carbon (May 2013, Revised July 2015).

conservative.[43] To counterbalance this, EPA presents an additional "high end" estimate: the 95th percentile values for the 3 percent discount rate.

Table 15. 2030 Climate and health co-benefits from Clean Power Plan compliance in EPA's illustrative scenarios (billions of 2011$)

	All Rate-based Approach		All Mass-based Approach	
Discount Rate	3%	7%	3%	7%
5%	$21-$40	$19-$37	$18-$34	$17-$32
3%	$34-$54	$33-$51	$32-$48	$31-$46
2.5%	$43-$63	$42-$60	$41-$57	$40-$55
3% (95th percentile)	$75-$95	$74-$92	$72-$89	$71-$86

EPA (2015) Regulatory Impact Analysis for the Clean Power Plan Final Rule, Table ES-7 and ES-8, p.ES-20-21.

Overall, EPA estimates net benefits from the Clean Power Plan in 2030 between $25-$45 billion, depending on discount rate and compliance pathway. Focusing on the 2030 timeframe, the net benefits are similar in magnitude between the two illustrative approaches: the all rate-based approach yields net benefits between $25-$45 billion, while the all mass-based approach yields net benefits between $25-$43 billion (both in 2011$). Table 16 provides a simplified summary of EPA's key cost and benefit values, along with the net benefits cited above.

In addition to the monetized costs and benefits, EPA cites many non-monetized benefits to the climate, ambient NO_x and SO_2 exposure (reduction), mercury deposition (reduction), other ecosystem benefits, and visibility improvement. EPA says these non-monetized benefits only amplify the overall net benefit of the Clean Power Plan.

Table 16. Simplified summary of EPA's cost-benefit analysis, 2030 results (2011$)

	All Rate-based Approach	All Mass-based Approach
Costs (5% discount rate)	$8 billion	$5 billion
Climate Benefits (3% discount rate[44])	$20 billion (range from $6 to $61 billion)	$20 billion (range from $6 to $60 billion)
Health Co-Benefits (range represents 3% and 7% discount rates)	$13 to $34 billion	$11 to $28 billion
Net Benefit	$25 to $45 billion	$25 to $43 billion

Source: EPA (2015) Regulatory Impact Analysis for the Clean Power Plan Final Rule, Table ES-9 and ES-10, p.ES-22-23.

[43] IPCC. 2007. Fourth Assessment Report (AR4). Available at: https://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm.

[44] Note: EPA does not calculate climate benefits at the same discount rates as compliance costs. We present the results as EPA presents them in the RIA, with the costs shown at the 5 percent discount rate.

It should be noted that EPA is not obligated to prove a net benefit of the rule in order to determine whether to issue the regulation under the Clean Air Act, and it did not do so in the development of BSER and the finalized targets. However, Executive Order 12866 does require EPA to conduct benefit-cost studies for major Clean Air Act rules in order to help inform policy decisions "as permissible and appropriate under governing statutory provisions."[45]

7.2. EPA's cost reasonableness analysis

On the other hand, EPA *is* required to provide evidence of cost reasonableness to issue a new regulation under the Clean Air Act. EPA shows the cost reasonableness for the building blocks of the final Clean Power Plan using a three-pronged approach.

First, EPA cites the cost of environmental controls for other regulated EGU-released pollutants, and compares this cost against the per-MWh weighted average cost from the building blocks. Specifically, EPA uses the cost of installing and operating flue gas desulfurization (FGD) equipment (also called scrubbers) to reduce SO_2 emissions—a common control many coal-fired EGUs have had to consider for compliance with different environmental regulations. EPA cites a typical cost for this equipment at $14-$18 per MWh for "wet" scrubbers and $13-$16 per MWh for "dry" scrubbers.[46]

EPA's modeling shows that Building Block 1 costs $23 per ton CO_2 reduction, Building Block 2 costs $24 per ton, and Building Block 3 costs $37 per ton, with the weighted average of all building blocks combined costing $30 per ton (a conservatively high estimate according to EPA).[47] The per-MWh equivalent cost for a coal-fired EGU with a heat rate of 10,000 Btu per kWh is $11 per MWh. For steam EGUs, a general range is $8-$14 per MWh. As Building Block 3 is the only building block that applies to NGCC units, and the building block is estimated to cost $37 per ton, a typical NGCC unit with a heat rate of 7,800 Btu per kWh will incur a per-MWh cost equivalent to $3 per MWh.

Since the $8-$14 per MWh range for the Clean Power Plan building blocks at coal units are either less than or at the low-end of the range of scrubber costs identified above, and NGCC costs are well below this threshold, EPA finds that the costs associated with achieving BSER are reasonable.

Second, EPA uses evidence that owners of affected EGUs commonly consider "expected" or "assumed" costs of CO_2 regulation in their long-term integrated resource plans (IRPs) in the form of CO_2 prices. Citing a previous Synapse report that reviewed CO_2 price assumptions from 46 recent utility IRPs and shows the industry expects costs between 0 and $110 per ton for future CO_2 regulations,[48] EPA finds that a weighted average cost of $30 per ton for the building blocks is reasonable.

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[45] 80 Fed. Reg. at 64751.

[46] Ibid. at 64750.

[47] Ibid.

[48] Luckow, P., E. A. Stanton, S. Fields, B. Biewald, S. Jackson, J. Fisher, R. Wilson. 2015. *2015 Carbon Dioxide Price Forecast.* Synapse Energy Economics. Available at: http://www.synapse-energy.com/project/synapse-carbon-dioxide-price-forecast

The third piece of evidence EPA offers as proof of the building blocks' cost reasonableness is that their costs are very low as compared to other potential control measures that *could* be available under Section 111 of the Clean Air Act. For example, compared to using carbon capture and sequestration retrofits—which EPA *did* consider but ultimately rejected due to the costs being too high—EPA considers the $30 per ton weighted average costs to be wholly reasonable.

8. Key Issues for Consumer Advocates

In this section, we discuss critical issues for consumer advocates to consider as EPA and states begin the process of implementing the final Clean Power Plan (summarized in Table 17).

Table 17. Summary of key issues for consumer advocates

Issue	Action
Intrastate Coordination	Coordinate early with key agencies and stakeholders
Multi-State Coordination	Consider potential benefits of coordinating with other states, particularly around approaches to trading
Least-Cost Planning	Model costs of variety of options, including single- and multi-state compliance, as well as rate- and mass-based approaches
Wholesale Price of Energy	Research and model the price effect of shifting dispatch
Mass- versus Rate-Based	Consider potential benefits of each approach
Out-of-Rule Emissions	Consider whether inclusion of new fossil generating units in compliance approach might benefit consumer interests
Coal Retirement	Monitor opportunities for retirement of uneconomic units and how these retirements impact compliance
Enforceability	Consider whether state measures, which would not be federally enforceable, might be used for compliance under a state measures plan
Nuclear Challenges and Opportunities	Be aware of risks/opportunities around new nuclear generation and uprates at existing nuclear units
Efficiency Measurement	Communicate to EPA thoughts on standardization of efficiency measurement
Rate and Bill Impacts	Model impacts of energy efficiency for both participants and non-participants
Community and Environmental Justice Considerations	Consider participation in Clean Energy Incentive Program and ways to work with vulnerable communities to ensure they are not disproportionately impacted
Equity	Investigate ways to increase participation in renewable energy and energy efficiency programs to increase equity of allocation of costs

8.1. Intrastate coordination

The Clean Power Plan creates a unique situation in which state agencies that are not accustomed to working on environmental planning must now take on key roles in helping craft reasonable compliance plans to reduce CO_2 from the electric sector. Compliance with the Clean Power Plan will require participation from state departments of environmental protection, air quality agencies, state energy offices, public utility commissions, and consumer advocate offices. States will benefit from early and comprehensive internal coordination among these groups.

In the final Clean Power Plan, EPA envisions a robust stakeholder process leading to the development of a final state compliance plan.[49] Ideally, this would include numerous public meetings in which the state agency tasked with putting together the plan (generally the air quality division of the state environmental agency) would bring together other key state agencies (such as the state energy office, consumer advocates, and the public utility commission) and interested stakeholders to share information and solicit input on state plan approaches and plan development. The state must provide the public the opportunity to comment on the state's initial plan and must respond to significant comments received, including comments from vulnerable communities. The state must also hold at least one public hearing before finalizing its state plan and submitting it to EPA.

If the state abides by this process, there are many opportunities for consumer advocates to be involved, to access information and decision makers, and to highlight benefits and risks to consumers. In some states, this process is already underway, while others should be getting started soon in order to develop a plan (or decide whether to seek an extension) by September 6, 2016. Even states that are planning to litigate the Clean Power Plan should consider beginning the planning process and developing a compliance plan to avoid having a federal compliance plan imposed by EPA should the rule survive.

8.2. Multi-state coordination

In thinking through all the options for complying with the Clean Power Plan, states need to consider the benefits of coordinating with other states to maximize opportunities for low-cost compliance options. Designing compatible interstate trading programs will likely be a key aspect of this coordination, whether done through a multi-state plan or through individual ready-for-interstate-trading plans. States working together to exploit these opportunities may benefit from additional flexibility to achieve reductions at lower cost.

States should begin evaluating where the greatest opportunities for cost-effective emission reductions lie and which other states would be most beneficial to partner with to achieve these reductions, as planning approaches will have to be coordinated to some degree to ensure that these opportunities can be realized. This might include making sure partners both choose a mass-based compliance approach or,

[49] 80 Fed. Reg. at 64916.

if each state prefers the R2 pathway, that each state is prepared to develop a single, multi-state plan with a common rate-based target.

States that are part of a Regional Transmission Organization (RTO) should also be coordinating with those entities as they develop compliance strategies. RTOs, like MISO in the Midwest, PJM in the mid-Atlantic, and CAISO in California, are responsible for planning and operating the bulk transmission system and ensuring reliability across the region. Already, MISO, PJM, and SPP have conducted studies that show regional compliance with the Clean Power Plan will be significantly more cost-effective than going it alone. Most RTOs hold regular stakeholder meetings in which states and consumer advocates are welcome to participate.

8.3. Least-cost planning

It is important to note that EPA did not use least-cost planning in developing the state targets for the Clean Power Plan. As explained above, EPA determined the best measures for achieving reductions in carbon emissions and then modeled those measures to see whether the costs were "reasonable." States will need to undertake least-cost planning in order to determine the right combination of options for reducing electric sector CO_2 emissions. This should include consideration of interstate trading options.

8.4. Wholesale price of energy

Depending on its design, the price instrument necessary to shift dispatch from high-emitting coal and oil plants to lower-emitting gas plants can have either a strongly inflating effect or a neutral effect on the wholesale price of energy. Inflated wholesale market prices would mean more money for existing low-emission resources and higher costs to consumers. This is an important area for additional research and modeling, along with careful policy design, for all states. Looking to existing carbon markets, such as the Regional Greenhouse Gas Initiative (RGGI) in the Northeast and California's AB32 program, will provide useful insights into effective program design.

8.5. Mass- versus rate-based compliance

One decision states must make in the near term is whether to pursue a rate- or a mass-based approach to compliance. A rate-based approach would reduce the carbon intensity of each unit of power produced, while a mass-based approach would limit the total tons of carbon the power sector could emit each year.

The choice of mass- versus rate-based compliance can have an impact on states' compliance costs and states will need to evaluate which approach is right for them. The primary advantage to a rate-based approach is that it may more easily allow for economic development and growth in electricity demand, which could lead to increased CO_2 emissions. However, because EPA has now performed the rate-to-mass translation and has accounted for potential load growth in that translation process, the potential disincentive to use a mass-based approach for states who are anticipating significant load growth has been minimized. States adding significant amounts of new nuclear capacity may also consider a rate-

based approach, as the addition of this zero-emission generation would help reduce the carbon intensity of power generated in the state.

However, there may be significant pressure for states to move toward a mass-based approach. States like California and the Northeastern states involved in RGGI are likely to choose a mass-based approach. EPA's illustrative cost modeling (described in Section 7 above) found that a mass-based approach would be more cost-effective than a rate-based approach. Mass-based compliance approaches are simpler and easier to implement and are also more familiar to state air regulators, who are used to dealing with mass-based trading programs like RGGI, CSAPR, and others. Mass-based trading programs could also be linked with programs covering other sectors or in other countries at some point in the future. States looking to trade allowances are going to benefit from having the largest possible pool of trading partners. Finally, coal-heavy states will likely view mass-based approaches as more favorable as the retirement of older, inefficient plants, which are occurring regardless of the Clean Power Plan, can be counted toward compliance.

8.6. Inclusion of new sources

In the final Clean Power Plan, EPA provides the option of including new fossil generating units—those covered by Section 111(b) of the Clean Air Act—in mass-based compliance plans through the use of the EPA-calculated new source complement. There are a number of reasons why this approach may be beneficial for states. Using the final mass-based goal with the new source complement allows a state to include new sources in its compliance strategy, creating a single regulatory regime for a state's fossil generators. EPA has also said that a plan using this approach is a presumptively approvable way to address leakage of emissions from existing sources to new fossil sources, whereas a state choosing to address just existing sources in its plan would still have to demonstrate how such leakage would be minimized.[50]

8.7. Coal retirement

Retirement of high-emitting fossil resources, like coal, is expected to contribute significantly to compliance with Clean Power Plan targets. Consumer advocates should continue to monitor opportunities for retirement of uneconomic coal plants as a means of compliance with the Clean Power Plan. Ensuring that plants facing the greatest economic challenges in the future are considered for retirement first will help maximize the benefits such retirements will provide.

States should also evaluate under which approach—mass- or rate-based—such retirements would provide the most benefit. As mentioned in Section 8.5 above, a state facing significant coal retirements unrelated to the Clean Power Plan would likely benefit from a mass-based approach.

[50] 80 Fed. Reg. at 64888.

8.8. Enforceability

All measures included in any of the rate-based compliance planning approaches would become federally enforceable, which means EPA and others would be entitled to take enforcement action if an emission performance rate were not implemented in accordance with the plan. States that would like to include state measures to reduce emissions, such as energy efficiency resource standards or renewable portfolio standards, can avoid having their state policies become federally enforceable by choosing the "state measures plan" approach under a mass-based compliance pathway. While this gives some additional flexibility to states to figure it out as they go, states must also include backstop measures in the form of federally enforceable emission standards on individual units in case the state measures fail to accomplish the necessary reductions.

8.9. Nuclear challenges and opportunities

Nuclear generation has been dropped from the target setting process, but nuclear energy can still be used to comply with state targets. Consumer advocates should consider the risks and opportunities associated with construction of new nuclear facilities or uprates at existing nuclear generators. Nuclear generators can offer significant quantities of zero-carbon (as far as the Clean Power Plan is concerned) energy, but the risks of siting and building these facilities can be difficult to overcome.

8.10. Efficiency measurement

Energy efficiency is also no longer included in the target setting process, but as a low-cost option in most states, energy efficiency can still be a valuable compliance tool. The more standardized the rules for measuring and verifying efficiency measures are across the country, the easier it will be for states to coordinate for compliance purposes.

8.11. Rate and bill impacts

Synapse's analysis based on EPA data demonstrates that compliance with the Clean Power Plan will result in higher rates but lower bills for households participating in energy efficiency programs in many states.[51] Based on EPA expectations that energy efficiency will play a large role in compliance, the number of consumers participating in energy efficiency programs would need to grow substantially, meaning that more households would see the benefit of lower bills. On the other hand, customers not participating in efficiency programs will not share in these benefits and may face higher costs.

[51] Knight, P., S. Fields, P. Luckow, T. Vitolo, S. Jackson, B. Biewald, E. A. Stanton. 2015. *Bill Savings in a Clean Energy Future, Part 2.* Synapse Energy Economics. Available at: http://www.synapse-energy.com/sites/default/files/Bill-Savings-Part-Two.pdf.

8.12. Community and environmental justice considerations

In the final Clean Power Plan, EPA includes a lengthy and explicit discussion about various community and environmental justice considerations states are either required or in some cases encouraged to make during the development and submission of their state plans. The discussion also identifies a handful of technical resources and non-technical guidance documents EPA has either made available or plans to make available to states to support these considerations, as well as EPA's commitment to provide state outreach and training sessions regarding community engagement and environmental justice matters.[52]

Clean Energy Incentive Program

The CEIP contains one of the cornerstone community and environmental support mechanisms in the Clean Power Plan. The CEIP is designed to incentivize early investments (prior to 2022) in energy efficiency and renewable energy. According to the CEIP, energy efficiency and renewable energy programs initiated after final plans are submitted can generate ERCs or allowances in 2020 and 2021 that can be banked for later use. As explained above, EPA will provide matching ERCs (or equivalent allowances) up to a cap equivalent to 300 million tons. However, even stronger support is given to energy efficiency programs in low-income communities through a 1:1 matching program. This early-action ERC generating and matching program is intended to incentivize energy efficiency programs in communities that might otherwise not have the opportunity to adopt these energy saving measures.

The CEIP presents an opportunity for states to reward early actions that provide benefits to vulnerable consumer classes and that contribute to meeting the state's targets. Many states already have energy efficiency requirements or renewable energy mandates driving programs or projects that would likely be eligible for CEIP credits. Participation in the CEIP could help reduce the costs for implementing these programs and would encourage program developers not to hold off until the Clean Power Plan compliance period in order to receive compliance credits. These early actions will also help smooth the transition to the compliance period. However, the value of these early action credits depends, at least in part, on how much those credits are worth for compliance in future years. Consumer advocates in states considering participation in the CEIP should consider the cost-effectiveness of programs that would qualify for CEIP credits by evaluating the benefits and costs of these programs as well as the potential return on investment these early action credits might allow.

Environmental Justice Considerations

EPA also outlines a series of critical deadlines related to community and environmental justice issues during state plan development and final plan submittal.

- During the initial state plan submittal, states are required to provide information about community engagement and their plans to include vulnerable communities in finalization of the

[52] 80 Federal Register at 64827.

state plan. In addition to providing names of community groups and mechanisms for engaging them, EPA requires states to submit information about *how* states identified the communities and organizations they are engaging. This is meant to ensure that critical communities are not shut out or left behind in the state planning process.

- If a state wants to request a two-year extension to submit its plan to EPA, the state must demonstrate that it has been having meaningful engagement with vulnerable communities in a public participation process.
- During submittal of the final state plan, states must include an overview of the public hearings conducted and information about how the hearings they held were accessible to vulnerable communities (e.g., materials printed in multiple language, in-person translators).
- During the implementation phase of the rule, EPA plans to conduct its own assessments on emission reduction and potential negative localized impacts in the states. However, EPA encourages states to begin conducting their own community impact studies prior to implementation to uncover any immediate issues. EPA urges states to conduct their own analyses since states themselves have more local knowledge about their communities and the potential for disruption in them. The California Air Resources Board's (CARB) approaches to conducting assessments of the impacts of state energy activities on over-burdened communities are uniquely endorsed by EPA in the final rule as good examples for other states to follow.[53]

Finally, to support states in conducting their own community impacts analyses, and raise awareness about the overall challenges and opportunities to engage vulnerable communities in the state plan development process, EPA has put together a list of resources and guidance on the topic. Below is a summary list of some of the key support mechanisms EPA has made or plans to make available to the states and that are identified in the final rule. Possible opportunities for consumer advocates, with support from EPA, to engage in the state plan development process include:

- Proximity analysis of detailed demographic data close to power plants to help states locate vulnerable communities. Available at: http://www.epa.gov/airquality/cppcommunity/ejscreencpp.pdf.
- Interactive mapping tool for power plant locations. Available at: http://cleanpowerplanmaps.epa.gov/CleanPowerPlan.
- Catalog of current or recent state and local programs that have successfully helped communities adopt energy efficiency/renewable energy measures.
- Information on EJ SCREEN, a publicly available environmental justice screening and mapping tool.

[53] CARB. 2006. *First Update on the Climate Change Scoping Plan: Building on the Framework Pursuant to AB32: The California Global Warming Solutions Act of 2006.*

- Information on POWER Initiative, a program that targets communities affected by changes in the coal industry.
- Training to states on how to assess impacts of state plans on overburdened communities.

8.13. Equity

Finally, although we anticipate there will be opportunities for consumers to realize the benefits of lower bills due to increased energy efficiency, consumer advocates still need to ensure that the allocation of costs and benefits among different customer types is equitable and does not unfairly burden any one group of customers (such as low-income households). Wide participation in efficiency programs is an important consideration for equity. The final Clean Power Plan encourages programs targeting vulnerable customers through the CEIP, and states and consumer advocates should evaluate additional programs that could ensure that potential benefits are widely shared.