Untapped Potential

The Carbon Reductions Left Out of EPA's Clean Power Plan

By Alice Kaswan and Kirsten Engel

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Authors

Alice Kaswan is Professor at the University of San Francisco School of Law and a Board Member of the Center for Progressive Reform.

Kirsten Engel is Charles E. Ares Professor of Law at the James E. Rogers College of Law, University of Arizona and a Member Scholar of the Center for Progressive Reform.

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Executive Summary

The Environmental Protection Agency's Clean Power Plan[1] is the marquee achievement of President Obama's climate change agenda. It is intended to further transform the nation's power sector from carbon-intensive sources like coal-fired power to a low-carbon future comprised of renewable energy and natural gas. The power sector matters: It contributes 37 percent of the energy sector's greenhouse gas emissions and is a substantial contributor to persistent pollution jeopardizing public health.

Although the Clean Power Plan is a good start, our analysis reveals that EPA made critical methodological choices that reduced the rule's stringency. Whatever the merits of those choices, EPA's underlying data reveals that greater reductions from the power sector are available and that continued initiatives are necessary to take advantage of the opportunities that EPA identified but did not incorporate into the final rule's requirements.

In this report, we focus on the downstream effect of one methodological choice largely overlooked by commentators: EPA's decision to establish low-stringency uniform national performance rates for coal and natural gas plants that ignored the greater reduction opportunities EPA had identified in the western states. When developing the Plan, EPA had assessed achievable reductions and identified region-specific effective emission performance rates – measured by pounds of carbon dioxide per megawatt hour (MW/h) of electricity produced – for fossil steam power plants (usually coal-fired power plants) and natural-gas plants in the Eastern, Western, and Texas Interconnections of the nation's energy grid. The performance rates varied substantially, reflecting much greater reduction opportunities in the western states than in the eastern states.

Rather than utilizing these region-specific performance rates, EPA selected one set of regional rates, the least stringent eastern regional rates, as the uniform national performance rates for coal and natural gas plants. Specifically, the lenient eastern coal-fired power plant adjusted emissions performance rate is 1,305 lbs/MWh by 2030, more than three-and-a-half times the more demanding effective performance rate of 360 lbs/MWh that EPA had determined western state coal-fired power plants could achieve. The end result is that EPA set western state targets that are much weaker, and therefore much less stringent, and therefore much more easily achieved

by the western states, than the levels EPA had previously identified as achievable – a result with national consequences.

Whatever the legal and political viability of using regional performance rates might have been, EPA's analysis of regional potential has four significant implications for U.S. climate policy and the future of the U.S. electric power industry.

- Cumulatively, the Clean Power Plan will result in much less aggressive reductions from the electricity sector than are warranted by the achievable reduction opportunities EPA originally identified. Relying upon EPA's data and formulas, our analysis reveals that, had EPA applied the more stringent region-specific performance rates, the CPP would have achieved carbon reductions from existing sources of 52 percent below 2005 levels by 2030, rather than the 38-percent reduction anticipated from the final Plan. Put another way, under the final Plan, existing power plants could emit almost 400 million tons of carbon more per year into the atmosphere by 2030 than would have been allowed had EPA applied regionally tailored performance rates in the western states.

The Clean Power Plan's weak requirements mean that the Plan makes significantly less headway in incentivizing a transition to cleaner energy than the agency's own analysis claims is possible.

- The Clean Power Plan's weak requirements mean that the Plan makes significantly less headway in incentivizing a transition to cleaner energy than the agency's own analysis claims is possible. Because many reduction opportunities, including shifts to natural gas and renewables, were not incorporated into the requirements, the Plan's targets will not prompt investments in available opportunities to shift to clean energy.

- Claims by states and utilities regarding the onerous nature of the Clean Power Plan targets are likely overblown. Although the final plan does expect reductions from western states, the western state targets are much less stringent, and hence more easily achievable, than the targets that would have been imposed had EPA applied the regional performance rates EPA previously determined were achievable in Texas and the west. The light western targets could also have spillover effects in the east: If many states engage in national emissions trading, as EPA anticipates, and if western states respond to light targets by overcomplying, then western states are likely to generate additional credits available nationwide, easing compliance in all states.

- The Clean Power Plan provides a start, not a final resolution, to reducing power sector carbon emissions. The data make clear that the Plan locks in place a significant and telling gap between what EPA determined could be done and what EPA is actually requiring.

Federal, state, and local policymakers should continue efforts to tap the achievable and much greater reductions EPA identified in its region-specific analyses.

In the United States and around the world, heat waves, more intense storms, droughts, ecosystem disruptions, and more mark the relentless rise in greenhouse gas emissions. The existing energy infrastructure in industrialized nations, including the United States, is not sustainable. Looking ahead, it is critical for policy leaders to recognize that, although the Clean Power Plan marks a major step forward in U.S. climate policy, it is only one step on a long path.

The data make clear that the Plan locks in place a significant and telling gap between what EPA determined could be done and what EPA is actually requiring.

The Clean Power Plan's Performance Rates and State Targets

Since the early days of the Obama administration, the president and EPA have made clear that addressing climate change is a top priority. The president's stated preference has been for legislation specifically tailored to the problem, but he maintained from the outset that if necessary, existing Clean Air Act authority was sufficient to act – a view that was consistent with the leading Supreme Court case on the subject, *Massachusetts v. EPA.*[2] As a legislative solution failed to materialize, EPA set about the business of devising the Clean Power Plan, relying on section 111(d) of the Clean Air Act, a backstop provision for addressing pollutants from existing sources not covered under the law's programs for "criteria" or hazardous air pollutants.[3]

Under section 111(d), EPA determines the "best system of emission reduction" (BSER) for the pollutant in question and then develops "emissions guidelines" that reflect the reductions that can be achieved using that system.[4] Once EPA has developed its guidelines under the provision, the states must then develop state implementation plans that impose standards of performance at least as stringent as EPA's emission guidelines.[5]

EPA's Initial Regional Analysis of Emission Reduction Opportunities: Large Differences Among Regions

EPA recognized that the "best system" of emission reduction for existing fossil steam generation plants (usually coal-fired power plants[6]) and natural gas combustion turbine facilities includes a range of measures both inside and outside the fenceline of fossil fuel-fired electrical generating plants. In light of the uniquely integrated nature of electricity generation facilities, EPA took an original approach to developing Section 111(d) federal guidelines: The agency determined emission performance rates based upon the power industry's ability to exploit a wide range of emission reduction opportunities, opportunities the agency categorized into several discrete "building blocks." In its final rule, EPA settled on three building blocks:[7]

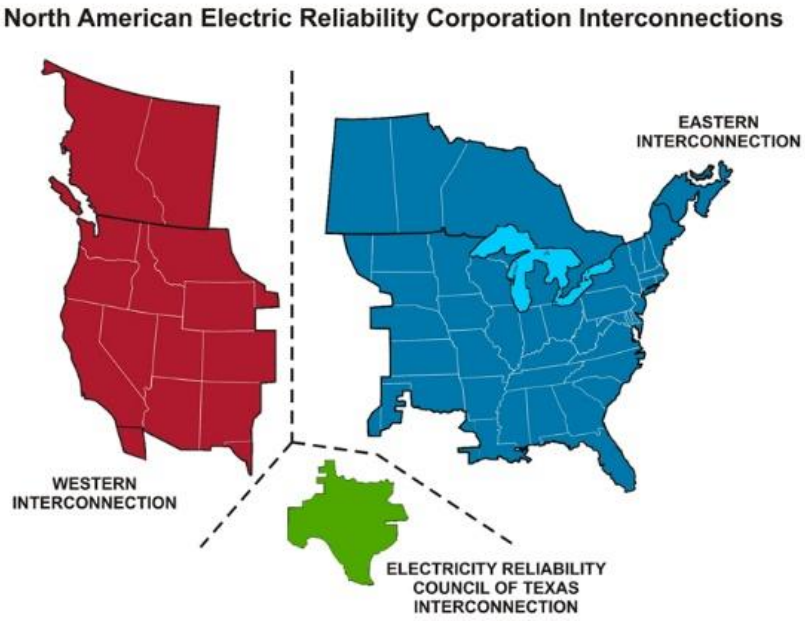
1. **Improving power plant efficiency:** For coal-fired plants, operators can invest in on-site heat-rate improvements to reduce the plants' direct emissions.[8]

2. **Shifting from coal to natural gas:** Switching electricity generation from coal plants to existing but underutilized natural gas plants takes advantage of the fact that burning natural gas emits half the carbon per unit of energy produced than burning coal.

3. **Shifting from fossil fuels to renewables:** For both coal and natural gas facilities, developing zero-emission sources, like renewable energy, can reduce reliance on and emissions from existing power plants.[9]

Building blocks 2 and 3 consider reductions outside the fenceline of a given fossil fuel plant. Thus EPA had to determine how far beyond the fenceline a plant is expected to go to achieve emissions reductions. In other words, in analyzing the best "system" of emission reductions, what is the appropriate geographic scale for defining the scope of the "system"? In its final rule, EPA concluded that, given the increasingly regional nature of electricity generation and distribution, the nation's three electricity interconnections – the Eastern, Western, and Texas Interconnections — provided the appropriate scale of analysis for determining such outside-the-fenceline opportunities.[10]

Figure 1: U.S. Electricity Interconnections



Source: Department of Energy

For coal-fired power plants, the interconnections offered strikingly different reduction opportunities.

EPA then analyzed the opportunities under each building block within each interconnection.[11] To reflect the effect of outside-the-fenceline measures on emissions from coal and natural gas facilities, EPA translated the anticipated reductions into region-specific effective emission performance rates.[12] The respective performance rates developed by EPA for coal and natural gas plants thus incorporate not only on-site reductions, but also off-site emission reduction opportunities.

For coal-fired power plants, the interconnections offered strikingly different reduction opportunities, leading to associated differences in the resulting regional emission performance rates. As indicated in Table 1, the 2030 emission performance rate for fossil steam plants – which are mostly coal

plants – was 360 lbs/MWh in the Western Interconnection and 237 lbs/MWh in the Texas Interconnection.[13] In comparison, in the Eastern Interconnection, the emission performance rate was 1,305 lbs/MWh, reflecting significantly fewer reduction opportunities.[14]

For natural gas plants, the differences among the regions are much smaller; the adjusted emissions performance rates for natural gas plants in the Western and Texas Interconnections were 690 and 697 lbs/MWh, respectively, reflecting only slightly greater reductions than in the Eastern Interconnection, where EPA determined plants could achieve 771 lbs/MWh.[15]

Table 1: Adjusted 2030 Emission Performance Rates (in lbs/MWh)[16]

Region – Interconnection	*Fossil Steam (primarily coal-fired generation)*	*NGCC (natural gas)*
Eastern	*1,305*	*771*
Western	*360*	*690*
Texas	*237*	*697*

The large difference in the regional coal performance rates reflects significant regional differences in the ability to shift coal-fired generation to natural gas and renewables, lowering the effective emissions rate for coal plants. Western states have more natural gas capacity in relation to coal, and so a greater proportion of coal plant generation could shift to natural gas. By 2030, in the western states, incremental potential natural gas capacity could account for over 50 percent of baseline coal generation,[17] whereas, in the Eastern Interconnection, incremental potential natural gas capacity is only slightly more than 20 percent of coal generation.[18] Renewables potential, relative to baseline generation, is also higher in the western states. In the western states, by 2030, renewables could replace close to 40 percent of baseline fossil fuel generation, compared with just over 20 percent in the eastern states.[19]

Although EPA used the renewables potential to reduce the effective emissions rates for both natural gas and coal-fired power plants in proportion to their generation, the reductions attributed to natural gas indirectly affect EPA's assessment of coal plant emissions. EPA first calculated building block 3, assessing the impact of renewables, and, in doing so, freed up additional capacity in natural gas plants. That freed-up capacity could in turn be available to replace coal generation. When EPA then applied building block 2, it took into account not only currently unutilized capacity, but the additional capacity created by increased renewables. The greater renewables potential in the western states could

thus not only directly replace coal generation, but free up capacity in the western states' natural gas plants to allow higher shifts from coal to natural gas than are possible for the Eastern Interconnection.

Because western utilities have such extensive opportunities to switch from coal to renewables and natural gas, the effective emission performance rate for coal-fired power plants in Texas and the western states is, strikingly, *more* demanding than for natural gas plants. The coal plants themselves remain more carbon-intensive, but their effective emission performance rates reflect the opportunities coal plants have to reduce emissions by shifting generation to less carbon-intensive sources "outside the fenceline."

In the western states and Texas, the applicable performance rates reflect the more restricted circumstances in the Eastern Interconnection, not the greater region-specific opportunities available in the west.

EPA Chooses a Uniform Approach over a Region-Specific Approach

Although EPA evaluated opportunities and determined emission performance rates based on each regional interconnection's unique circumstances, the agency ultimately chose not to apply the different emission performance rates to the three regions. Instead, the agency promulgated uniform performance rates based on the rates developed in a single region, the Eastern Interconnection, the one with the least stringent performance rates of the three.[20] Thus, in the western states and Texas, the applicable performance rates reflect the more restricted circumstances in the Eastern Interconnection, not the greater region-specific opportunities available in the west.

It is important to recognize that using uniform emission performance rates could lead to significant variations in *de facto* stringency among the regions. Because EPA determined that the western states could achieve much greater reductions than the eastern states, using the eastern standards to set the western states' obligations renders the western obligations much less stringent, at least on paper, than the eastern obligations.[21]

EPA explained that it adopted uniform standards to be more consistent with past practice under Clean Air Act § 111(d), to "create greater parity among the emission reduction goals established for states," and to facilitate coordination and trading among states.[22] EPA explained that it chose the least stringent rates as the uniform rates to maximize the rule's achievability and flexibility.[23] No doubt, the agency also sought to at least limit, if not eliminate, political controversy. Whatever the explicit and implicit justifications for EPA's approach, we accept EPA's arguments as given for now[24] and focus on how EPA's regional data casts light on the relative achievability and stringency of EPA's plan.

Exploring the Road Not Taken: State Targets Under a Regional Versus Uniform Approach

Under the Clean Power Plan, individual states are responsible for implementation. EPA sought to maximize state flexibility so, in addition to establishing source-category-specific performance rates, it translated the rates into state-specific targets that states could meet in a variety of ways, including but not limited to imposing EPA's performance rates directly on sources.[25] To develop these targets, EPA applied the emission performance rates for coal and natural gas facilities in each state, creating an overall statewide emissions rate that reflected each state's proportion of coal and natural gas generation.[26]

Had EPA applied regionally tailored rates in the western states, the western state targets would have been dramatically more stringent.

Comparing state targets under the final plan – based on the Eastern Interconnection's lenient emissions performance rates – with the targets that would have resulted had EPA used region-specific emissions performance rates reveals a significant gap. Had EPA applied regionally tailored rates in the western states, the western state targets would have been dramatically more stringent than targets based upon EPA's low-stringency uniform approach.

Comparing the State Targets

To conduct this analysis, we derived comparative data as follows: For states in the Western Interconnection, we used the region-specific emission performance rates for coal (360 lbs/MWh) and natural gas (690 lbs/MWh) to derive each state's target, rather than the Eastern Interconnection rates (1,305 lbs/MWh for coal and 771 lbs/MWh for natural gas).[27] For Texas, we used the Texas Interconnection rates (237 lbs/MWh for coal and 697 lbs/MWh for natural gas). Our methodology is explained in more detail in Appendix I.

The tables below divide the states by carbon-intensive states (Table 2) versus non-carbon intensive (Table 3). Carbon-intensive states rely more on coal-fired power, which has twice the carbon emissions of natural gas, while less carbon-intensive states rely more on natural gas and renewables. As elaborated below, EPA's uniform low-stringency approach significantly eased the targets for western carbon-intensive states relative to a regional rate approach.

Table 2: Western and Texas Interconnection
2030 State Targets for Carbon-Intensive States

	Final (with eastern rates) [28] *(lbs/MWh)*	*With regional rates*[29] *(lbs/MWh)*
Arizona	*1,031*	*529*
Colorado	*1,174*	*441*
Montana	*1,305*	*360*
New Mexico	*1,146*	*458*
Utah	*1,179*	*438*
Wyoming	*1,299*	*364*
Texas [30]	*1,042*	*464*

As Table 2 makes evident, the region-specific performance rates generate much more stringent state targets than the uniform (eastern) rates applied in the final rule. Montana is a useful case study. Its target, based on 2012 emissions, reflects that, in 2012, the state relied solely on coal-fired power. Under the final rule's uniform approach, Montana's state target matched the uniform 1,305 lbs/MWh performance rate for coal. Had EPA used a western state performance rate instead of a uniform rate, Montana's target would have been much more stringent; it would have matched the 360 lbs/MWh regional performance rate derived for the western states. The more a western state relies upon coal, for which the regional performance rates vary dramatically, the greater the divergence between applying the uniform (eastern) rate rather than the more tailored regional rates.

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By the same token, the less a state relies upon coal, the less the divergence between applying the uniform (eastern) rate rather than the more tailored regional rates. Table 3 compares the final rule's state targets for the less-carbon intensive western states with targets derived from region-specific performance rates. It reveals that application of the regional rates would have generated somewhat more demanding state targets, but the effect is less dramatic than in the coal-dependent states because coal-fired power plays a smaller role in these states' energy mix. In these states, applying the

slightly more demanding regional natural gas performance rate also contributed to somewhat more demanding state targets under a regional approach.

Table 3: Western State 2030 Targets for Less Carbon-Intensive States

	Final (with eastern rates) (lbs/MWh)[31]	*With regional rates (lbs/MWh)*[32]
California	*828*	*655*
Idaho	*771*	*690*
Nevada	*855*	*638*
Oregon	*871*	*628*
Washington	*983*	*559*

Comparing state targets for carbon-intensive and non-carbon intensive states, it is also evident that applying region-specific performance rates would have resulted in the carbon-intensive states having *stricter* state targets than the less-carbon-intensive states. The state targets in Table 2, for carbon-intensive states, are all more demanding than the state targets in Table 3, for less-carbon-intensive states. This results from the underlying performance rates: As discussed above, the western states' and Texas' performance rates for coal-fired power plants are more demanding than their regional performance rates for natural gas plants because western coal-fired power plants have greater opportunities to replace generation with renewables and natural gas. So, the greater a state's reliance on coal-fired power, the greater its capacity to take advantage of the western states' regionally available opportunities and drastically reduce reliance on coal-fired power.

Given the huge difference a regional approach would have had on the western state targets, there is no question that western carbon-intensive states would have reacted strongly had EPA based the state targets on regional performance rates. Although EPA's approach gives states considerable flexibility, the targets would have required these states to fundamentally and radically shift business as usual away from existing in-state resources. High-carbon states would have had to invest in energy efficiency, in in-state renewables, or would have had to shift to greater reliance on out-of-state resources, whether purchasing power generated out-of-state or purchasing allowances to allow continued operation of high-carbon in-state sources.

Our focus in this report, however, is not whether EPA should have used regional rates, a complex inquiry that raises a host of legal and policy questions we address in separate scholarship. Instead, our focus is pragmatic: we assess what the gap between the uniform rates and the regional rates means for Clean Power Plan implementation. The regional analysis provides valuable information about available national emission reduction opportunities. However demanding regional rates might have been for some states, EPA analyzed the achievability and feasibility of each of the building blocks and determined that they met the criteria for the "best system of emission reduction." (We discuss EPA's analysis of the building block's achievability and costs in Appendix II.) While EPA's analysis does not take into account the widely divergent challenges the states within the regions might have faced, EPA's regional analysis was grounded in the agency's assessment of achievable reductions within our nation's regional grids. As such, the analysis provides key insights into what the Clean Power Plan does and does not accomplish.

Much of the western states' reduction potential was not incorporated into the uniform performance rates and associated final state targets.

The Implications of Less Stringent State Targets in the Western States

Because the uniform performance rates are much less stringent than the rates EPA determined were achievable in the western states, much of the western states' reduction potential was not incorporated into the uniform performance rates and associated final state targets. As stated in the Plan Preamble, "there is substantial building block 2 potential in the Western Interconnection and Texas Interconnection that is not actually captured in the [steam] source category performance rates,"[33] a consequence of applying the much less stringent eastern rate in these interconnections. In addition, EPA observes that using the least stringent eastern performance rates means that the renewables potential EPA identified is "unnecessary to achieving the interim and final CO_2 emission rates."[34] In other words, there are many more renewables opportunities in the western states than are reflected in their state targets.

The western states therefore appear to have the capacity to achieve much greater reductions than required by the Clean Power Plan's state targets. It is unclear how states will respond. We identify three alternatives: (1) meet the lenient state targets and do nothing more; (2) reduce below the state target, but refrain from trading extra allowances in order to preserve the increased climate benefits associated with achieving greater in-state reductions, and (3) exceed the lenient state targets and trade excess emissions credits or allowances to facilities or utilities in other states. We explore each of these options in turn.

Some coal-intensive states may choose to meet but not exceed the Plan's comparatively lenient targets, notwithstanding available regional opportunities for additional reductions, because these states do not, by virtue of their coal-intensive generation mix, have substantial existing in-

state low-emission capacity. Reductions beyond the targets would require them to shift generation to out-of-state resources or to invest in in-state renewable energy and energy efficiency. Political and economic variables could dampen states' willingness to shift generation out of state or invest in renewables, and so these states might choose to meet the lenient targets and go no further. If states take this approach, opportunities identified in the Clean Power Plan analysis but not incorporated into the performance rates would not be realized.

Other states, likely driven by internal state climate policies, may choose to exceed the final plan's lenient targets and take advantage of significant regional reduction opportunities. Assuming national allowance or credit trading, as EPA envisioned, states that "overcomply" would potentially generate allowances or credits. However, they might limit out-of-state trading to preserve their higher standards and avoid shifting emissions elsewhere. For example, California's state climate program is expected to generate substantially greater emission reductions than required by the Clean Power Plan.[35] But the state might choose to restrict out-of-state trades of "excess" Clean Power Plan reductions if those trades lead to additional emissions elsewhere that would undermine California's own climate goals. If states take this approach, then they would achieve the reductions EPA identified as possible without increasing emissions elsewhere.

States' taking advantage of additional reduction opportunities – beyond those expected by the rule – would lead to higher emissions elsewhere.

Lastly, western states could take advantage of extensive opportunities and exceed the final plan's lenient targets, and then trade allowances or credits generated by their overcompliance. Selling the excess credits or allowances could help them recoup some of the renewables' investment costs or mitigate the impact of shifting generation to natural gas. If they take this approach, states' taking advantage of additional reduction opportunities – beyond those expected by the rule – would lead to higher emissions elsewhere; these states' extra efforts would not lower national emissions.

The Implications of Less Stringent Western State Targets in the Eastern States

In theory, it is possible that western state leniency will have national interstate trading effects, although the actual results are unpredictable. If, as seems likely, some of the western states take the third approach discussed above and generate excess reductions and sell them to the eastern states, that would ease compliance and reduce costs in the eastern states. EPA anticipated this result; in the CPP's Preamble, EPA noted that "affected EGUs [electricity-generating units] in the interconnections that do not set the nationwide level [the Western and Texas Interconnections] have more opportunities to invest in the building blocks…."[36] In other words, they have greater reduction opportunities because their targets are less stringent relative to their opportunities.

EPA then goes on to state that the "affected EGUs in the interconnection that does set the nationwide level [the Eastern Interconnection] may in

effect invest in the opportunities in the other interconnections through trading."[37] In other words, the eastern states were expected to buy allowances generated in the western states. Thus, the lenient western targets could not only ease compliance in the western states; the ability to trade credits and allowances means that the lenient western targets could also lighten compliance in the eastern states.

At this point, however, the trading implications are unclear. Current data suggest that the eastern targets are, in fact, quite lenient in light of current emissions trends,[38] so eastern states may easily achieve their targets without needing to rely on excess western credits. It thus appears that *both* the western and eastern targets are lenient relative to available opportunities. If so, then the divergence between western and eastern stringency may not be as great as it appears, and so will be less likely to affect national trading dynamics than EPA anticipated. In any case, lenient western state targets are likely to generate at least some additional allowances or credits, further easing eastern compliance if national trading emerges.

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The Implications of Less Stringent State Targets: Fewer Cumulative National Emissions Reductions

EPA's decision to apply low-stringency uniform performance rates nationally, rather than applying regional performance rates, significantly reduced the Plan's cumulative reductions. Had EPA used region-specific performance rates rather than the eastern rates, our calculations suggest that the Plan would have achieved a 52-percent reduction in carbon emissions from 2005 levels by 2030.[39] In contrast, the final plan contemplates only a 38-percent reduction in existing source emissions relative to 2005 levels.[40] The difference is almost 400 million tons of carbon per year: 1,670 million tons under the Plan, versus the considerably lower 1,283 tons per year derived from regional performance rates. (EPA's Regulatory Impact Analysis refers to a 32-percent reduction from 2005 levels, but that calculation is based on modeling that covers the entire power sector, including new sources built between now and 2030.[41] Because EPA did not model the effect of targets based on regional rates on the power sector as a whole, we have compared the regional approach with the parallel data for the final rule: the impact on existing source emissions.) Our methodology is explained in more detail in Appendix III.

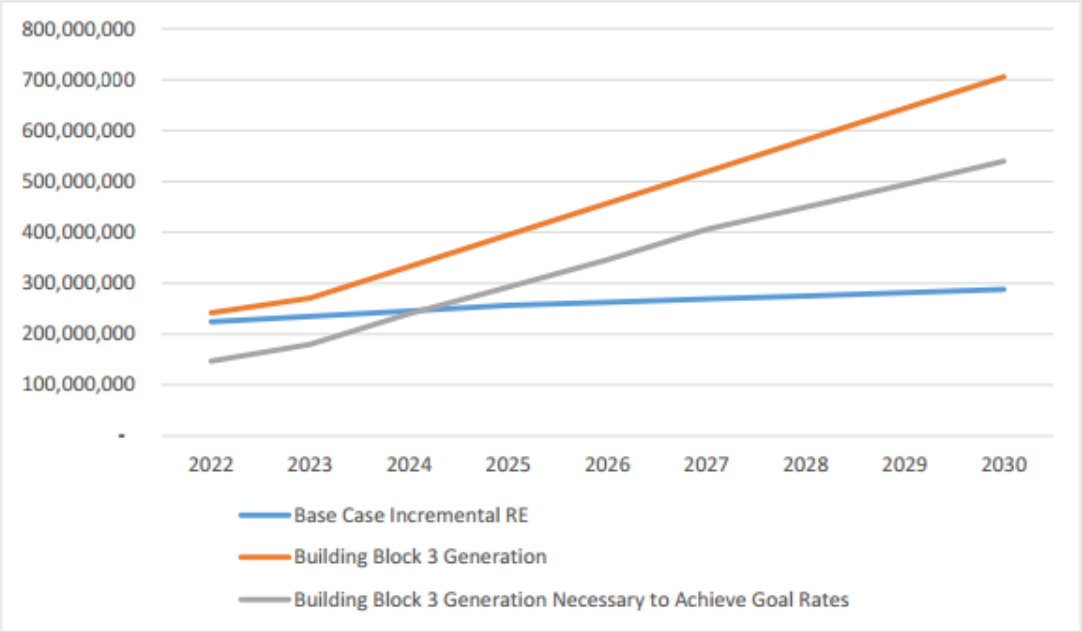
Table 4: Cumulative 2030 Reductions Relative to 2005 Baseline

	CO2 (million tons)	*% Reduction from 2005 Baseline*
2005 Baseline	*2,683*[42]	*n/a*
Final EPA Rule		
From TSD App. V (existing sources)	*1,670*[43]	*38%*
From RIA (including new sources)	*1,814*[44]	*32%*
Based on Regional Rates (existing sources)	*1,283*[45]	*52%*

It should be noted that EPA's approach kept the overall cumulative reduction to a level similar to that achieved by the *proposed* rule,[46] even though EPA's analysis of available opportunities increased considerably between the proposed and final rules. Under building block 2, EPA's regional approach in the final rule eliminated the proposed rule's artificial state-based constraint on shifting generation from coal to natural gas plants, expanding the range of available opportunities to the regional level.[47] Although these new opportunities were reflected in the Eastern Interconnection rates and targets, the much greater opportunities to shift generation to natural gas in the west were not reflected in the final rates.

The uniform low-stringency approach also muted the impact of EPA's new approach to determining renewable energy opportunities under building block 3. Focusing on economically achievable renewable opportunities within each region, EPA identified much greater potential than it had in the proposed rule, doubling the achievable reductions identified in the final rule relative to its estimates in the proposed rule.[48] Figure 4-1, below, from EPA's Technical Support Document,[49] demonstrates the gap between what the final rule expects – the middle line in 2030 – and the opportunities EPA identified – the top line in 2030.

Figure 2: Building Block 3 Generation Levels, Relative to Base Case Incremental RE (MWh)



Source: Environmental Protection Agency

EPA's uniform approach, based on the eastern states' rates, prevented the regional opportunities for shifting to natural gas and increasing the utilization of renewable energy from being fully incorporated into the final rule's rates and targets. EPA's approach undoubtedly avoided the intense controversy that would have ensued had EPA's use of regional rates increased cumulative reductions to the 52 percent achievable through regional rates. However, by taking a low-stringency uniform approach that kept the final rule's cumulative reductions largely consistent with those anticipated in the proposed rule, EPA virtually negated the Plan's ability to realize the benefits of EPA's newly identified opportunities to use regional natural gas sources and develop renewable energy.

EPA virtually negated the Plan's ability to realize the benefits of EPA's newly identified opportunities to use regional natural gas sources and develop renewable energy.

Lessons and Directions for the Future

A New Perspective on Claims that the Plan's Targets Are Too Tough

Numerous states have argued that the Clean Power Plan's targets are too demanding and will jeopardize reliability and significantly increase energy costs.[50] Although many factors are relevant to determining reliability and

cost impacts, especially in particular states and localities, our analysis reveals that the western and Texas targets are much less demanding than EPA determined was achievable.

As noted above, if EPA determined that western coal-fired power plants could meet an effective performance rate of 360 lbs/MWh, then it seems unlikely that they would be unable to meet an effective performance rate that allows three-and-a-half times the emissions, 1,305 lbs/MWh, or that their states would be unable to meet targets predicated on those much less stringent performance rates. Even if a particular utility encounters specific grid or other limitations on its access to natural gas or renewables options, the Plan's trading opportunities mean that states can meet their targets through allowance or credit purchases if necessary.

Because the western state targets were set at a level that is much less demanding than EPA determined could be achieved, the Plan appears more achievable than its critics contend.

Claims from eastern and Midwestern states that the Clean Power Plan is too onerous[51] are likewise unconvincing, although the implications of the Plan for these states is less certain. As noted above, not only are western states likely to generate excess reductions upon which eastern states could potentially rely, the eastern states appear to be on track to meet their targets with little difficulty.[52]

EPA anticipated that applying the low-stringency eastern performance rates would reduce costs to a level even lower than the costs the agency had deemed acceptable. In its BSER analysis of the building blocks, EPA took cost into account and deemed the costs acceptable. Because the final performance rates do not fully implement the building blocks – since they are not fully realized in the Western and Texas Interconnections – the final performance rates will be less expensive than the costs associated with full building block implementation.[53] In fact, recent modelling predicts that costs will increase only 0.1 percent to 1.0 percent,[54] suggesting the ease of meeting the final plan's targets.

That is not to say that the Clean Power Plan will not require any changes to affected utilities and states. The purpose of the rule is to reduce emissions from existing sources, and the Plan will lead to generation shifts and investments that further that result. The Plan presents utilities with new challenges and adds new considerations to utility planning. Moreover, as discussed above, the Plan focuses on regional and national potential, not state-specific potential, and creates greater challenges and costs for some states than others, even under the least stringent uniform approach. Nonetheless, because the western state targets were set at a level that is much less demanding than EPA determined could be achieved, the Plan appears more achievable than its critics contend.

The Need for Additional Climate Change Initiatives

Ultimately, by setting targets that did not reflect actual regional opportunities, the Clean Power Plan left achievable reductions on the table.

EPA's analysis demonstrated that shifts within the nation's existing fossil fuel infrastructure and the deployment of economically viable renewables could allow us to achieve a 52-percent reduction in existing source emissions from 2005 levels by 2030, but the Plan itself expects only a 38-percent reduction.

As discussed above, the performance rates and targets do not fully realize the building blocks: they do not encourage the achievable shift to natural gas, and they rely upon only a portion of the renewables EPA determined could be developed. To the degree some states do fully exploit opportunities, they may simply generate allowances that allow other states to continue operating heavily polluting coal-fired power. As a result, further state and federal efforts will be necessary to encourage sustainable investments and exploit available opportunities to reduce existing emissions.

The performance rates and targets do not fully realize the building blocks: they do not encourage the achievable shift to natural gas, and they rely upon only a portion of the renewables EPA determined could be developed.

Indeed, even the 52-percent calculation likely understates achievable reductions. In the final rule's BSER, EPA did not include an important mechanism for reducing emissions from existing power plants: reducing consumer demand through energy efficiency. In the proposed rule, EPA had anticipated that, with a 1.5 percent rate of electricity savings, the states would reduce annual electricity sales by approximately 10 percent,[55] suggesting that another 10-percent reduction in emissions is possible but not incorporated into the final rule's expected reductions.

Insufficient stringency and cheap allowances will retard the degree of transformational change that the Plan could have made toward a more sustainable energy infrastructure. If allowances are readily available and inexpensive, utilities could purchase allowances to maintain coal generation that is unnecessary in light of other, lower-emission, options. And to the degree weaker requirements encourage states to shift to existing natural gas plants and/or build new natural gas plants, rather than investing in zero-emission options like renewables, states will fail to invest in the more sustainable infrastructure necessary to avert catastrophic climate change. Shifts to natural gas could suffice to meet the targets but would continue to generate substantial carbon emissions (albeit lower than coal) and could cause a host of additional environmental problems. The lenient targets – potentially weak for both the western and eastern states – are unlikely to drive necessary change.

Of course, states implementing the Clean Power Plan could achieve even more meaningful reductions than the Plan requires. For example, the western states could contribute to achieving greater cumulative results by reducing emissions by more than their lenient state targets require and then forgoing the sale of extra allowances. At a minimum, states with their own greenhouse gas reduction targets could allow utilities that have reduced emissions below the Clean Power Plan requirements to trade only those credits that are also in excess of the state's more stringent goals.[56] Such

Continued federal, state, and local climate initiatives are needed to encourage and require the additional reductions EPA's data suggest are readily achievable.

state-driven limitations would allow the Clean Power Plan to accomplish greater reductions while preserving the integrity of state climate programs by preventing in-state reductions to achieve state goals from "leaking" out of state. Although it could somewhat decrease the national supply of credits and allowances, it is unlikely to choke off these supplies.

More broadly, continued federal, state, and local climate initiatives are needed to encourage and require the additional reductions EPA's data suggest are readily achievable. Although the Clean Power Plan is an important start, it should not lead to complacence in addressing energy sector carbon emissions.

Conclusion

The question of whether EPA should have applied regional or uniform performance rates is a complex inquiry, raising important legal, political, and practical questions that will be the subject of future scholarship. In the meantime, the gap between the final rule's targets, based on uniform rates, and targets based upon regionally achievable reductions provides important insights. The data call into question some states' claims that the targets are unachievable. Given the imminent threats posed by climate change and the critical role of the power sector in contributing to greenhouse gas emissions, continued efforts at all levels of government remain necessary.

Appendix I: 2030 State Targets in Final Rule Compared with Targets Based on Regional Rates

Table A1-1 compares the Clean Power Plan's state targets with targets derived from regional performance rates.

The Eastern Interconnection rates remain the same since they reflect EPA's eastern regional analysis.

To determine the region-based targets for the states in the Western Interconnection, we used the same formula as EPA, but used the Western Interconnection emissions performance rates instead of the Eastern Interconnection rates used by EPA. In other words, we multiplied the state's lbs/MWh of carbon generated by each type of power (using the 2012 baseline) times the region-specific emissions performance rates for each type of power (360 lbs/MWh for fossil steam and 690 lbs/MWh for NGCC). We then added the permissible MWh from each generation type together and divided by the total 2012 emissions to determine the state's overall permissible emissions rate.

$$\frac{\left(\textbf{state fossil steam emissions x } 360\,\frac{\textbf{lbs}}{\textbf{MWh}}\right) + \left(\textbf{state NGCC emissions x } 690\,\frac{\textbf{lbs}}{\textbf{MWh}}\right)}{\textbf{state fossil steam emissions} + \textbf{state NGCC emissions}}$$

To determine the region-based targets for the Texas Interconnection, we used the same approach as for the Western Interconnection states, except we used the emission performance rates calculated for Texas: 237 lbs/MWh for fossil steam generation and 697 lbs/MWh for NGCC generation.

Table A1-1: Comparison of State Targets in the Final Clean Power Plan with Targets Based upon Region-Specific Performance Rates

	Final CPP (lbs/MWh)[57]	*With regional rates (lbs/MWh)*
Alabama	*1,018*	*1,018*
Arizona	*1,031*	*529*
Arkansas	*1,130*	*1,130*
California	*828*	*655*
Colorado	*1,174*	*441*
Connecticut	*786*	*786*
Delaware	*916*	*916*
Florida	*919*	*919*
Georgia	*1,049*	*1,049*
Idaho	*771*	*771*
Illinois	*1,245*	*1,245*
Indiana	*1,242*	*1,242*
Iowa	*1,283*	*1,283*
Kansas	*1,293*	*1,293*
Kentucky	*1,286*	*1,286*
Louisiana	*1,121*	*1,121*
Maine	*779*	*779*
Maryland	*1,287*	*1,287*
Massachusetts	*824*	*824*
Michigan	*1,169*	*1,169*
Minnesota	*1,213*	*1,213*
Mississippi	*945*	*945*
Missouri	*1,272*	*1,272*
Montana	*1,305*	*360*
Nebraska	*1,296*	*1,296*
Nevada	*855*	*638*
New Hampshire	*858*	*858*
New Jersey	*812*	*812*
New Mexico	*1,146*	*458*
New York	*918*	*918*
North Carolina	*1,136*	*1,136*
North Dakota	*1,305*	*1,305*
Ohio	*1,190*	*1,190*
Oklahoma	*1,068*	*1,068*
Oregon	*871*	*628*
Pennsylvania	*1,095*	*1,095*

Table A1-1: Cont'd

	Final CPP (lbs/MWh)	*With regional rates (lbs/MWh)*
Rhode Island	*771*	*771*
South Carolina	*1,156*	*1,156*
South Dakota	*1,167*	*1,167*
Tennessee	*1,211*	*1,211*
Texas	*1,042*	*464*
Utah	*1,179*	*438*
Virginia	*934*	*934*
Washington	*983*	*559*
West Virginia	*1,305*	*1,305*
Wisconsin	*1,176*	*1,176*
Wyoming	*1,299*	*364*

Appendix II: EPA's Assessment of the Building Blocks' Feasibility

Although we do not claim that EPA necessarily should have adopted the regional rates, our comparison between the final rule and the application of the regional rates rests on the assumption that regional rates were achievable. EPA's regional rates were premised on full application of the building blocks within each region, and so EPA's feasibility assessment of the building blocks casts light on the feasibility of the regional performance rates.

Pursuant to the statutory requirement, EPA based the regional performance rates on the "best system of emission reduction … adequately demonstrated."[58] They were thus based on demonstrated and implementable mechanisms, mechanisms that took feasibility and cost into consideration. In building block 1, EPA included only cost-effective and available efficiency-maximizing mechanisms and excluded numerous mechanisms based on cost.[59] Under building block 2, EPA stated that increasing natural gas electricity production capacity to 75 percent was feasible given evidence that many plants could run at even higher capacities.[60] Through its Integrated Planning Model (IPM), EPA analyzed natural gas supplies, projected gas costs and transmission, as well as operational constraints like existing limitations to meet air quality standards, and concluded that the proposed generation shifts were feasible.[61] In addition, EPA noted that, although some of the underutilized natural gas plants were built as "peaker" plants to back up renewable generation, some plants could simultaneously serve as backup and increase baseload generation. Moreover, where constraints might be experienced, EPA concluded that the 75-percent-capacity expectation overall is lenient enough to allow some facilities to continue to back up renewables while others increase generation. [62]

Under building block 3, which contemplates renewables resources replacing fossil fuels, EPA analyzed historic national renewable trends and assumed their continuation.[63] EPA then ran these projections through its IPM model to see how and where renewables could be developed and integrated into the grid. The IPM model evaluated multiple potential constraints, including land use, interconnection, and transmission issues, as well other potential impediments that could restrict the actual development of renewable resources.[64] The IPM model allowed EPA to apportion the identified renewables potential to each of the interconnections, where that potential was then integrated into the region-specific emissions performance rates.[65] EPA noted that its estimates were relatively conservative[66] and that many external reports and studies suggest that renewables could feasibly be developed at the same or higher rates.[67]

EPA's cost assessment, in its BSER analysis, focused on the building blocks' costs assuming regional application. EPA determined that the overall costs of the BSER were reasonable. EPA calculated average national costs for each ton of carbon reductions: for building block 1: $23/ton; for building block 2: $24/ton; for building block 3: $37/ton.[68] The average for all three building blocks, weighted by the cumulative reductions under each block over the compliance time period, is estimated at $30/ton,[69] which translates into $11 per megawatt-hour.[70] EPA asserts that that compares favorably with the cost of other pollution control mechanisms in other regulations[71] and that the costs are reasonable in light of the environmental significance of electricity sector carbon emissions.[72]

That said, EPA analyzed feasibility and costs at the regional and national levels, not achievability and feasibility for individual states. Federal technology-based standards are generally assessed this way, and EPA has no obligation to assure that every plant and every state faces the same conditions. Nonetheless, these differences are of critical importance to the impacted states, and it is important to recognize that, if EPA had used the regional performance rates to set state targets, individual states (and sources) would have experienced dramatically different opportunities and challenges than they do under EPA's uniform-rate approach.[73]

Although the Plan offers substantial flexibility and states could take advantage of the regional nature of the grid, some states would likely have experienced greater challenges and costs than others. And more demanding performance rates could have generated complex interstate dynamics. The states with underutilized natural gas capacity would have experienced pressure to increase utilization, and the states without such capacity could have become dependent upon out-of-state generation. [74]

Nonetheless, our goal here is not to determine if regional rates should have been adopted, but to determine whether the rule accurately reflects available and achievable reduction opportunities. At least on a national and regional level, the regional performance rates help us identify achievable reductions, notwithstanding complex interstate impacts.

Appendix III: Aggregate Reductions If State Goals Were Based on Region-Specific Performance Rates

To determine the aggregate reductions that would have been achieved if EPA had used performance rates based on region-specific analysis, we used an adjusted version of EPA's methodology for determining mass-based goals from emission-rate goals, and then summed the resulting mass-based targets.

EPA's methodology for determining mass-based equivalents required multiplying the 2012 emissions baseline by the state's overall emissions rate target to determine the overall permissible tons of permissible carbon. To determine each state's mass-based target, we followed this same approach, but, for states in the Western and Texas Interconnections, we used the statewide emissions rates determined by the region-specific emissions performance rates (as noted in Appendix I) rather than the statewide emissions rates determined by applying the Eastern Interconnection performance rates uniformly.

Because EPA used the Eastern Interconnection emissions rates to compute state targets in the Western and Texas Interconnections, EPA had to make additional adjustments to determine the mass-based goals, adjustments that are unnecessary if the region-specific emissions rates are used. EPA recognized that, by using the more lenient Eastern Interconnection standard, over 166 million MWh of renewable capacity would be available but not accounted for in the 2030 state targets.[75] EPA further recognized that, if states proceeded to bring this additional zero-emitting generation capacity on-line, states could meet their emission targets and still maintain higher emissions-intensity sources. That is, for each MWh of zero-emission generation, the state could emit twice that level (per MWh) from existing sources and still meet its target. To determine mass-based targets, EPA therefore accounted for the possibility that, if the states invest in renewables beyond the level considered in setting their targets, the state could emit at higher rates, and hence higher absolute levels, from existing sources. EPA's calculation of mass-based targets therefore takes into account the potential for greater use of high-emission sources.[76]

By contrast, if region-specific performance rates were applied in each region, then each region's renewable potential would be integrated into the states' targets and would not be available to cover high emissions intensity from existing sources. Therefore, if region-specific performance rates are applied, no adjustment to the emissions rate to account for the effect of "extra" renewables is required to determine the mass-based equivalent. The formula is simply (2012 fossil steam emissions (MWh)) + (2012 NGCC emissions (MWh) x state emissions performance rate target (using regional

rates, in lbs/MWh). We then convert the pounds-based mass totals into million tons-based totals.

Table A3-1 indicates each state's mass-based equivalent to regional rate-based performance targets. Table 1 then sums the states' mass-based equivalents to derive the national cumulative absolute emissions that would have resulted from region-specific rates (approximately 1,283 million tons).

Table A3-1: Mass-based Targets Derived from Region-Specific Emission Performance Rates[77]

State	*Baseline Fossil Steam (MWh)*[78]	*Baseline NGCC (MWh)*[79]	*2030 Rate-Based Target (based on regional rates)*[80]	*Mass of CO2 (million tons)*
Alabama	*46059840*	*53492096*	*1018*	*50.7*
Arkansas	*32154992*	*15651185*	*1130*	*27.0*
Arizona	*25370640*	*26783421*	*529*	*13.8*
California	*11112636*	*93068612*	*655*	*34.1*
Colorado	*34248809*	*11131370*	*441*	*10.0*
Connecticut	*438650*	*15299704*	*786*	*6.2*
Delaware	*2491497*	*6672111*	*916*	*4.2*
Florida	*56452021*	*147327444*	*919*	*93.6*
Lands of the Fort Mojave Tribe	*0*	*1360093*	*690*	*0.5*
Georgia	*40990604*	*37728636*	*1049*	*41.3*
Iowa	*33314157*	*1430248*	*1283*	*22.3*
Idaho	*0*	*3450055*	*690*	*1.2*
Illinois	*84487750*	*10627106*	*1245*	*59.2*
Indiana	*96338455*	*12839309*	*1242*	*67.8*
Kansas	*29631845*	*666706*	*1293*	*19.6*
Kentucky	*84364121*	*3091968*	*1286*	*56.2*
Louisiana	*36937785*	*19352269*	*1121*	*31.6*
Massachusetts	*2611409*	*23554517*	*824*	*10.8*
Maryland	*19190189*	*676556*	*1287*	*12.8*
Maine	*68163*	*4677598*	*779*	*1.8*
Michigan	*53985652*	*18499951*	*1169*	*42.4*
Minnesota	*27587742*	*5715510*	*1213*	*20.2*
Missouri	*72859571*	*4854569*	*1272*	*49.4*
Mississippi	*15557042*	*32147488*	*945*	*22.5*
Montana	*15432987*	*0*	*360*	*2.8*

Table A3-1: Cont'd

State	Baseline Fossil Steam (MWh)	Baseline NGCC (MWh)	2030 Rate-Based Target (based on regional rates)	Mass of CO2 (million tons)
Lands of the Navajo Nation	29629453	0	360	5.3
North Carolina	54920452	25519802	1136	45.7
North Dakota	28513456	0	1305	18.6
Nebraska	24698865	423638	1296	16.3
New Hampshire	1353955	6946869	858	3.6
New Jersey	2775579	33664782	812	14.8
New Mexico	13561988	5730957	458	4.4
Nevada	4413515	23783256	638	9.0
New York	16661795	44035434	918	27.8
Ohio	86729105	23687009	1190	65.7
Oklahoma	37590918	29943376	1068	36.1
Oregon	3116931	13486830	871	7.2
Pennsylvania	88716925	57420455	1095	80.0
Rhode Island	0	8140017	771	3.1
South Carolina	28875797	11209394	1156	23.2
South Dakota	4004975	1401048	1167	3.2
Tennessee	34373696	7333244	1211	25.3
Texas	164311070	160034168	464	75.2
Lands of the Uintah and Ouray Reservation	3090433	0	360	0.6
Utah	27452488	8486187	438	7.9
Virginia	16015084	36291895	934	24.4
Washington	7733957	11728154	559	5.4
Wisconsin	32160389	10244273	1176	24.9
West Virginia	70078373	0	1305	45.7
Wyoming	42907427	483120	364	7.9
TOTAL				1283.4

Table A3-2, below, compares the cumulative total from the final rule with the cumulative total using region-specific performance rates. The *CO_2 Emission Performance Rate Technical Support Document,* Appendix 5, includes data on the mass-based state 2030 targets, which add up to 1,670 million tons CO_2.[81] That represents the expected emissions from existing sources by 2030. In comparison, had region-specific performance rates been adopted, the mass-based equivalent would have been 1,283 million tons CO_2 from existing sources.[82]

We then compute the respective reductions from the 2005 baseline of 2683 million tons of CO_2 from the power sector. Based on the sum of the mass-based targets for existing sources, the final plan's 1670 million tons of CO2 constitutes a 38-percent reduction from 2005 existing source emissions, in comparison with the 52-percent reduction that would have been achieved had region-specific rates lowered emissions to 1,283 million tons.

Our analysis of cumulative emission reductions focuses on reductions from existing sources, the data available in the final rule. The relevant comparison with the final rule is its projected 38-percent reduction in existing source emissions, a figure derived from EPA's Technical Support Document computation of the existing source mass-based targets.[83] The 38 percent figure differs from the 32-percent cumulative reduction EPA publicized in the final rule Preamble and the Regulatory Impact Analysis. The 32-percent reduction is based on full power sector modeling, and thus represents not only existing source emissions, but potential future new fossil fuel sources that could lead to cumulative emissions of roughly 1,814 million tons by 2030. EPA did not appear to model the impact of regionally based targets on the full power sector, and so we do not have data on the impact of regionally based targets on the power sector as a whole. Thus, the relevant comparison for our purposes is the impact of the two approaches on existing source emissions, a comparison that can be derived by the published data.

Table A3-2: Cumulative 2030 Reductions and Reductions Relative to 2005 Baseline

	CO2 (million tons)	*% Reduction from 2005 Baseline*
2005 Baseline	*2,68384*	*n/a*
Final EPA Rule		
From App. V (existing sources only)	*1,67085*	*38%*
From RIA (includes new sources)	*1,81486*	*32%*
Based on Regional BSER (existing sources only)	*1,28387*	*52%*

End Notes

[1] *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule*, 80 FED. REG. 64661 (Oct. 23, 2015) [hereinafter *Final CPP*]. The Supreme Court stayed the Clean Power Plan in February 2016. Robert Barnes & Steven Mufson, *High Court Halts Obama's Clean Power Plan for Now,* WASH. POST A2 (Feb. 10, 2016). The stay does not forecast the Plan's fate, and EPA and many states are voluntarily implementing the Plan even though it is not currently legally enforceable. Elizabeth Harball and Emily Holder, *After the Stay: Where all 50 States Stand,* ClimateWire (Feb. 22, 2016).

[2] 549 U.S. 497 (2007).

[3] 42 U.S.C. § 7411(d)(1)(A)(i).

[4] 40 C.F.R. § 60.22(b)(5).

[5] 42 U.S.C. § 7411(d)(1).

[6] The performance rate was established for "fossil steam" generating plants, most of which are coal-fired, but some of which are fired by oil or gas. Because most are coal-fired, and because EPA's BSER analysis primarily focused on opportunities at coal-fired fossil steam plants, this essay will use "coal-fired power plants" as short-hand for the fossil-steam category.

[7] The final rule excluded a fourth building block – demand-side energy efficiency – which had been included in the agency's proposed rule. *Final CPP, supra* note 1, at 64673.

[8] EPA determined that direct emission reduction measures at oil- and gas-fired steam plants, as well as at natural gas combined cycle plants, were either too expensive or too small to qualify as BSER and so did not include on-site reductions in its BSER for these types of plants. *Final CPP, supra* note 1, at 64728.

[9] *Final CPP, supra* note 1, at 64667.

[10] *Final CPP, supra* note 1, at 64739-41. In contrast, in the proposed rule, EPA assessed opportunities under the building blocks at a variety of scales, while ultimately framing its rule in terms of state-specific BSER determinations. *Id.* at 64738.

[11] The table below is drawn from EPA's Technical Support Document. EPA, CO_2 Emission Performance Rate and Goal Computation Technical Support Document for CPP Final Rule 3 (2015) (Table 1: 2030 Building Block Potential Identified for Each Region), hereinafter *Emission Performance Rate TSD*, *available at* http://www.epa.gov/sites/production/files/2015-11/documents/tsd-cpp-emission-performance-rate-goal-computation.pdf. It portrays the 2030 reduction potential under each of the building blocks.

Interconnection	*Building Block 1 (%age reduction)*	*Building Block 2 (in TWh)*	*Building Block 3 (in TWh)*
Eastern	*4.3*	*253*	*438*
Western	*2.1*	*108*	*161*
Texas	*2.3*	*66*	*107*

It should be noted that the actual building block 2 potential used in the BSER calculations was higher than indicated in the table, because the data above appear to present building block 2 potential prior to considering the degree to which increased renewables would decrease natural gas use and increase its potential to accommodate shifts from coal. As discussed supra, pages 6-7, in generating

the regional performance rates, EPA first applied building block 3 and assumed it reduced natural gas use. EPA then took this additional freed-up capacity into account in assessing the potential to shift from coal to gas. In the Eastern Interconnection, for example, renewables under EPA building block 3 freed up an additional 158 TWh of natural gas potential, and so the available natural gas potential was 411 TWh, not 253 TWh. *Emission Performance Rate TSD, supra*, at 13-15. (The TSD provides the data only for the Eastern Interconnection.) It should also be noted that the potential reductions in the Eastern Interconnection do not represent proportionately greater opportunities; instead, they are larger because the Eastern Interconnection is much larger than the Western and Texas Interconnections.

[12] *See Emission Performance Rate TSD, supra* note 11, at 12-17. The emission performance rates constitute the "emission guidelines" contemplated under EPA's 111(d) regulations.

[13] *Id.* at 18.

[14] *Id.*

[15] *Id.*

[16] *Id.*

[17] In the Western Interconnection, the available natural gas capacity in 2030 is approximately 108,000,000 MWh, *Emission Performance Rate TSD*, *supra* note 11, at 3 (Table 1), which is 53 percent of baseline coal generation of 203,976,918 MWh. *Id.* at Appendix 4. In Texas, available natural gas capacity in 2030 is approximately 66,000,000, *id.* at 3 (Table 1), MWh, which is 57.4percent of baseline coal emissions. *Id.* at Appendix 4.

[18] In the Eastern Interconnection, the available natural gas capacity is 253,000,000 MWh, *id.* at 3 (Table 1),which is 20.6 percent of baseline coal generation of 1,230,447,795 MWh. *Id.*at Appendix 4.

[19] According to EPA's Emission Performance Rate TSD, building block 3 (renewables) potential in the Eastern Interconnection is 438,444,700 MWh, which is 21.5 percent of the interconnection's total baseline fossil fuel generation of 2,039,223,754 MWh. *See Emission Performance Rate TSD*, *supra* note 11, Appendix 4. In the Western Interconnection, renewables potential is 160,974,866, which is 38.7 percent of the interconnection's total baseline fossil fuel generation of 415,677,481 MWh. In Texas, renewables potential is 106,610,547, which is 40.9 percent of the state's baseline fossil fuel generation of 260,564,375 MWh.

[20] *Emission Performance Rate TSD*, *supra* note 11, at 18.

[21] *See Final CPP, supra* note 1, at 64811 (observing that the performance rates are is less stringent in the western and Texas regions). As CPP implementation unfolds, however, it appears possible that EPA's BSER analysis underestimated reduction opportunities in the Eastern Interconnection. Bipartisan Policy Center modeling projects very low allowance prices in the eastern states, generally lower than in the western states (assuming intraregional but not interregional emissions trading). Jennifer Macedonia, Blair Beasley & Erin Smith, Bipartisan Energy Center, *Modeling the Evolving Power Sector and Impacts of the Final Clean Power Plan* 33, 34 (June 2016). Low prices suggest that the eastern performance rates are, in fact, more lenient than EPA anticipated. Although applying the eastern rates to the western states appears to impose more lenient expectations on the western states (relative to available opportunities), the actual divergence in stringency may prove to be less than the BSER analysis suggests.

[22] *Final CPP*, *supra* note 1, at 64742.

[23] *Id.*

[24] Future scholarship will probe the multiple practical and policy issues associated with determining the appropriate scope of "systemwide" opportunities.

[25] Although states could directly impose standards of performance that reflect the subcategory-specific emission performance rates on in-state facilities, EPA increased state compliance flexibility by calculating overarching rate-based and mass-based state targets that allow states to impose requirements as they choose, so long as the state implementation plans demonstrate achievement of the overall state targets. *See Final CPP, supra* note 1, at 64820.

[26] *See Final CPP, supra* note 1, at 64667 . In addition, EPA calculated a mass-based equivalent that states can use as their targets. *Id.*

[27] The formula for the western states is:

$$\frac{\left(\text{state 2012 fossil steam emissions x } 360\,\frac{\text{lbs}}{\text{MWh}}\right) + \left(\text{state NGCC emissions x } 690\,\frac{\text{lbs}}{\text{MWh}}\right)}{\text{state 2012 fossil steam emissions} + \text{state 2012 NGCC emissions}}$$

[28] *See Final CPP, supra* note 1, at 64824 (listing state targets in the final rule).

[29] *See Emission Performance Rate TSD*, *supra* note 11, at *Appendix 5* (providing state-specific baseline generation data for calculating targets using regional performance rates). The methodology for determining state targets based on regional performance rates is further explained in Appendix I of this paper.

[30] The formula for Texas is:

$$\frac{\left(\text{Texas 2012 fossil steam emissions x } 237\,\frac{\text{lbs}}{\text{MWh}}\right) + \left(\text{Texas NGCC emissions x } 697\,\frac{\text{lbs}}{\text{MWh}}\right)}{\text{Texas 2012 fossil steam emissions} + \text{Texas 2012 NGCC emissions}}$$

[31] *See Final CPP, supra* note 1, at 64824 (listing state targets in the final rule).

[32] *See Emission Performance Rate TSD*, *supra* note 11, Appendix 5 (providing state-specific baseline generation data for calculating targets using regional performance rates). The methodology for determining state targets based on regional performance rates is further explained in Appendix I of this paper.

[33] *Final CPP, supra* note 1, at 64802.

[34] *Id.* at 64811. The final plan states: "EPA has calculated that in excess of 160,000,000 MWh of building block 3 potential is not required to achieve the final CO_2 emission rates in 2030." *Id.*

[35] Translated into a mass-based goal, California's 2030 state target is around 50 million short tons (MST) of carbon. Based on recent projections, California anticipates, under a "mid-case" projection of future energy demand, reducing electricity sector carbon emissions to 33.6 MST by 2030, leaving almost 20 MST "extra." *See* California Air Resources Board, *California's Proposed Compliance Plan for the Federal Clean Power Plan* 43 (Aug. 5, 2016), *available at* http://www.arb.ca.gov/cc/powerplants/meetings/09222016/proposedplan.pdf. If California were to allow utilities to sell the "extra" 20 MST as allowances in interstate trading, that would undercut the integrity of California's emission reduction goals. For further discussion of the challenge of maintaining state climate goals in multistate trading programs, see Alice Kaswan, *Decentralizing Cap-and-Trade? The Question of State Stringency*, 1 SAN DIEGO J. OF CLIMATE & ENERGY L. 103 (2009).

[36] *Final CPP, supra* note 1, at 64742.

[37] *Id.*

[38] *See supra* note 21.

[39] To determine the cumulative emissions if EPA had applied regional rather than uniform performance rates, we converted the state targets based on the regional emission rates to their mass-based equivalent. We followed EPA's basic methodology, multiplying each state's emissions-rate

target by the state's 2012 baseline emissions to determine the overall mass-based objective. We then added up the resulting sums to determine the cumulative mass-based emissions, and computed the reduction from the 2005 emissions baseline. The methodology is further described in Appendix III.

[40] The 52-percent reduction we identify is based upon summing the mass-based targets associated with the use of regional rates. The parallel, in EPA's analysis, is obtained by summing the mass-based targets associated with the use of the eastern performance rates. Our methodology is explained in more detail in Appendix III.

[41] EPA, Regulatory Impact Analysis for the Clean Power Plan Final Rule ES-8 (August 2015) (Table ES-4: Projected CO_2 Emission Reductions, Relative to 2005), *hereinafter Regulatory Impact Analysis*, *available at* https://www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-regulatory-impact-analysis.

[42] *Id.*

[43] *Emission Performance Rate TSD, supra* note 11, Appendix 5.

[44] *Regulatory Impact Analysis, supra* note 41, at ES-7 (Table ES-3: Climate and Air Pollution Emission Reductions for the Mass-Based Illustrative Approach).

[45] *See infra*, Appendix I, Table 1.

[46] Based on full power sector modeling, EPA predicted that the proposed rule would lead to a 30-percent reduction from 2005 levels by 2030. *See* EPA, CARBON POLLUTION EMISSION GUIDELINES FOR EXISTING STATIONARY SOURCES: ELECTRICITY GENERATING UNITS; PROPOSED RULE, 79 FED. REG. 34830, 34832 (2014), *hereinafter Proposed CPP*. The final rule, also considering full power sector modeling, contemplates a 32-percent reduction from 2005 levels by 2030. *See Final CPP, supra* note 1, at 64736 note 384 (comparing final cumulative target with proposed target).

[47] *Final CPP, supra* note 1, at 64738.

[48] *See* EPA, Greenhouse Gas Mitigation Measures Technical Support Document 4-11 (2015), *available at https://www.epa.gov/sites/production/files/2015-11/documents/tsd-cpp-ghg-mitigation-measures.pdf, hereinafter Mitigation Measures TSD* (showing that the cumulative level of achievable generation from renewables, 706,030 GWh, was 370,660 GWh more than in the proposed rule). In fact, EPA had to account for the impact of unrealized renewable potential in calculating its mass-based emission targets, because EPA recognized that if states invested in available renewables opportunities that had not been factored into the targets, that could give states the emissions leeway to simultaneously continue to operate heavily-polluting facilities. *Emission Performance Rate TSD*, *supra* note 1, at 23-25.

[49] *Mitigation Measures TSD, supra* note 48, at 4-10.

[50] *See* E&E Publishing, Power Plan Hub, *Wyoming* (describing Wyoming officials' prediction that compliance will be difficult), *available at* http://www.eenews.net/interactive/clean_power_plan/states/wyoming; E&E Publishing, Power Plan Hub, *Montana* (describing Montana official's concerns about the Plan), *available at* http://www.eenews.net/interactive/clean_power_plan/states/montana.

[51] *See, e.g.,* Ellen M. Gilmer, *Opponents Push to Block Rule While Defenders Prep for Battle*, ENERGYWIRE (Oct. 26, 2015).

[52] *See supra* note 21and accompanying text.

[53] Under building block 2, EPA observed that its cost estimates of $24 per ton of emissions reduction were premised on natural gas plants reaching 75 percent utilization, but that, because the full potential to shift to natural gas in the Western and Texas Interconnections was not reflected in the emissions performance rate, the performance rate does not, in fact, rest on a shift to 75%, and should, as a consequence, be cheaper to achieve than predicted. *Final CPP, supra* note 1, at 64802. Similarly, in assessing costs in its regional BSER analysis for renewables, EPA determined that the $37 per ton of emissions reduction was an acceptable cost, but noted that the actual costs were likely to be lower because the uniform rate did not reflect a significant proportion of the identified opportunities. *Id.* at

64811. EPA noted that "in excess of 160,000,000 megawatt-hours of building block 3 potential is not required to achieve the final CO_2 emission rates in 2030." *Id.*

It should be noted that the cost analysis in the BSER calculations and in the Regulatory Impact Analysis RIA) were quite different. In the BSER analysis, EPA analyzed the cost of applying each of the building blocks within each region. In contrast, the Regulatory Impact Analysis analyzed the cost of the final rule, which imposed less stringent requirements than were analyzed in the BSER calculations. In addition, the RIA considered a wider range of compliance options than were considered in the BSER. Most importantly, the RIA assumed that demand-side energy efficiency would be a low-cost compliance option, an option that was not considered a part of the BSER. *Regulatory Impact Analysis*, *supra* note 41, at ES-4, ES-8.

[54] *See* Martin T. Ross, David Hoppock, and Brian C. Murray, *Ongoing Evolution of the Electricity Industry: Effects of Market Conditions and the Clean Power Plan on States* 1 (Working Paper, July 2016), *available at* https://nicholasinstitute.duke.edu/climate/publications/ongoing-evolution-electricity-industry-effects-market-conditions-and-clean-power-plan.

[55] *See Proposed CPP, supra* note 46, at 34871-34875 (describing end-use energy efficiency building block) and 34873-74 (Table 7, showing expected state reductions in annual sales, with most hovering around a 10-percent reduction by 2029).

[56] *See supra* note 35 and accompanying text.

[57] *See Final CPP, supra* note 1, at 64824.

[58] 42 U.S.C. § 7411(a)(1).

[59] For example, EPA did not include carbon capture and storage or co-firing natural gas in coal steam plants in the BSER for existing sources because it believed shifting generation to NGCC facilities would be a more cost-effective mechanism. *See Final CPP, supra* note 1, at 64727-28.

[60] Nationally, the average annual capacity factor is 46 percent. The Energy Information Agency assumes that NGCC facilities can operate at 87 percent capacity, and data indicate that many could operate at 92 percent capacity. EPA, *Mitigation Measures TSD, supra* note 48, at 3-5 to 3-6.

[61] *See Final CPP, supra* note 1, at 64800-01. *See also Mitigation Measures TSD, supra* note 48, at 3-20. EPA noted that the inability of some plants to increase due to operational limits did not undermine the achievability of the emission performance rates overall, especially in light of the flexibility EPA gave the states for meeting the emission guidelines. *See Final CPP, supra*, note 1, at 64803.

[62] *Final CPP, supra* note 1, at 64803.

[63] *See Final CPP, supra* note 1, at 64808.

[64] EPA assumed that the grid could absorb only 20 percent renewables, when a larger penetration is likely possible. In addition, EPA considered only utility-scale renewables, not distributed generation. *See Final CPP, supra* note 1, at 64810.

[65] *See Final CPP, supra* note 1, at 64808-09.

[66] EPA assumed that the grid could not absorb more than 20 percent renewables, when a greater proportion is likely possible, and EPA considered only utility-scale renewables, not distributed generation. *See Final CPP, supra* note 1, at 64810.

[67] *See Mitigation Measures TSD, supra* note 48, at 4-20.

[68] *Final CPP, supra* note 1, at 64749.

[69] *Id.*

[70] *Id.* at 64750.

[71] EPA compares the Plan's costs with the $13-18/MWh cost of installing scrubbers at coal-fired plants, which some utilities have opted to do. *Id.* at 64750.

[72] *Id.* at 64750-51.

[73] Implementation analyses of the final Plan indicate that the Plan's requirements will impact states quite differently. *See, e.g,* Ross *et al., supra* note 54. These differences would have been even greater had EPA applied the regional performance rates.

[74] Data from Harvard's Environmental Policy Initiative indicates that unused natural gas capacity in the western states is concentrated primarily in California and Arizona. (Data on file with author.) Had regional performance rates been applied, these states would have experienced strong pressure to increase generation and coal-dependent states would have experienced pressure to import from these states.

[75] *Emission Performance Rate TSD*, *supra* note 11, at 23.

[76] *Id.* at 24-25.

[77] The baseline generation emission data come from the *Emission Performance Rate TSD, supra* note 11, Appendix 5. The region-specific emission rate targets are documented *supra*, Appendix I. This appendix describes the methodology for deriving the associated mass-based targets.

[78] *Emission Performance Rate TSD, supra* note 11, Appendix 5.

[79] *Id.*

[80] *See infra,* Appendix I.

[81] *See Emission Performance Rate TSD, supra* note 11, Appendix 5.

[82] *See supra,* Appendix III, Table A3-1.

[83] *Emission Performance Rate TSD, supra* note 11, Appendix 5.

[84] *Regulatory Impact Analysis, supra* note 41, at ES-8 (Table ES-4: Projected CO_2 Emission Reductions, Relative to 2005).

[85] *Emission Performance Rate TSD, supra* note 11, Appendix 5.

[86] *Regulatory Impact Analysis, supra* note 41, at ES-7 (Table ES-3: Climate and Air Pollution Emission Reductions for the Mass-Based Illustrative Approach).

[87] *See infra,* Appendix I, Table 1.