CARBON POLLUTION STANDARDS FOR EXISTING POWER PLANTS: ISSUES AND OPTIONS

CENTER FOR CLIMATE AND ENERGY SOLUTIONS

Kyle Aarons
Center for Climate and Energy Solutions
March 19, 2014

The U.S. Environmental Protection Agency (EPA) is developing regulations to reduce carbon dioxide emissions from existing power plants. These rules will guide states as they develop their own regulations. This is relatively novel territory for EPA and it must settle several major policy issues, in coordination with states, as the regulatory process moves forward.

This policy brief explains EPA's authority to regulate carbon dioxide from existing power plants, the roles of EPA and the states, and the major policy issues they face. The brief also discusses the types of measures regulated power plants may be allowed to take to comply with the applicable standard, including the potential role of tradable emission allowances.

INTRODUCTION

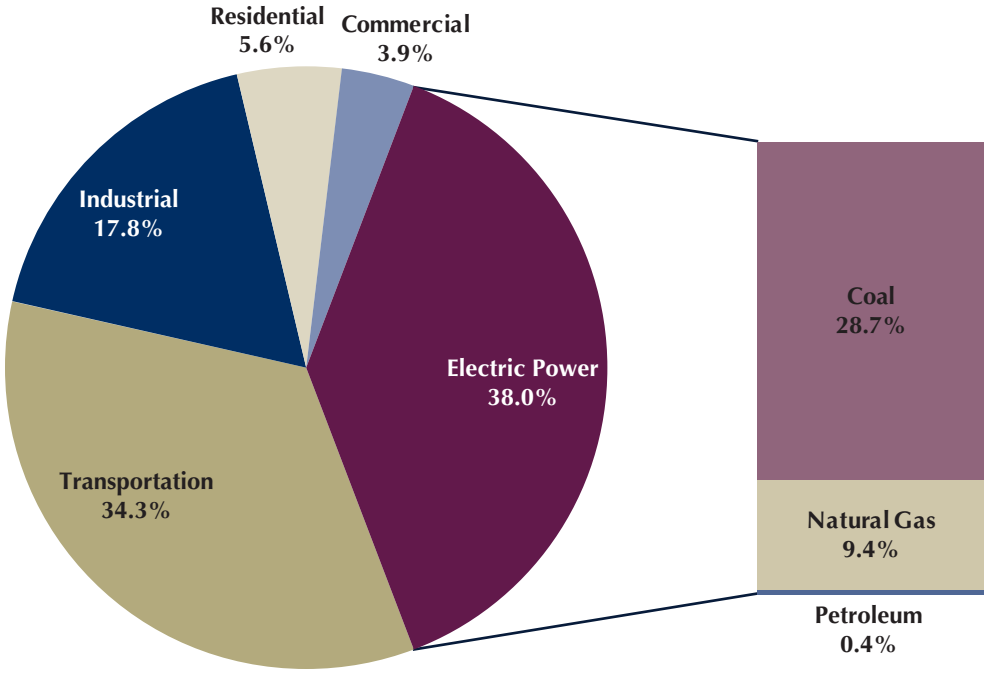
As required by the Clean Air Act,[1] the U.S. Environmental Protection Agency (EPA) is developing regulations to reduce carbon dioxide (CO_2) emissions from existing power plants, which are responsible for about 40 percent of U.S. emissions (see **Figure 1**).[2] President Obama, as part of his June 2013 Climate Action Plan, directed EPA to propose regulations by June 2014 and finalize them a year later.[3] (As directed by the president, EPA proposed regulations for new power plants in September 2013.)[4]

The new rules will be among the major factors influencing the cost, reliability, and environmental impact of U.S. electricity in the years ahead. Cutting emissions from the power sector is critical if the United States is to cut emissions 17 percent between 2005 and 2020, as the president has committed.[5,6]

EPA has already established standards to significantly reduce greenhouse gas emissions from cars and light trucks, largely through gradual improvements in fuel economy.[7] Regulating power plant emissions, however, is more complex. First, the existing fleet of fossil-fuel power plants is diverse in fuel type (generally natural gas[8] or coal[9]), and the type of plant used to convert the fuel into electricity (varying in age, technology, and frequency of use).[10] Second, EPA is proceeding under a provision of the Clean Air Act, Section 111(d),[11] that has only been used a handful of times.[12] This means EPA has relatively little precedent to rely on.

In crafting its approach per the mandate of Section 111(d), EPA must seek to strike a balance that is environmentally effective, affordable, not detrimental to grid reliability, and able to withstand legal challenge. This policy brief outlines some of the key issues the agency must address.

FIGURE 1: 2012 U.S. CO_2 Emissions



Source: U.S. Environmental Protection Agency, "Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012" (Washington, DC: U.S. Environmental Protection Agency, 2014), http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

KEY ISSUES

Federalism is the primary approach used for environmental regulation in the United States. Under the Clean Air Act, rules are developed by EPA, and are generally implemented and enforced with a certain amount of flexibility by the states. Section 111(d) of the Clean Air Act appears to allow EPA to give the states even more flexibility than usual.

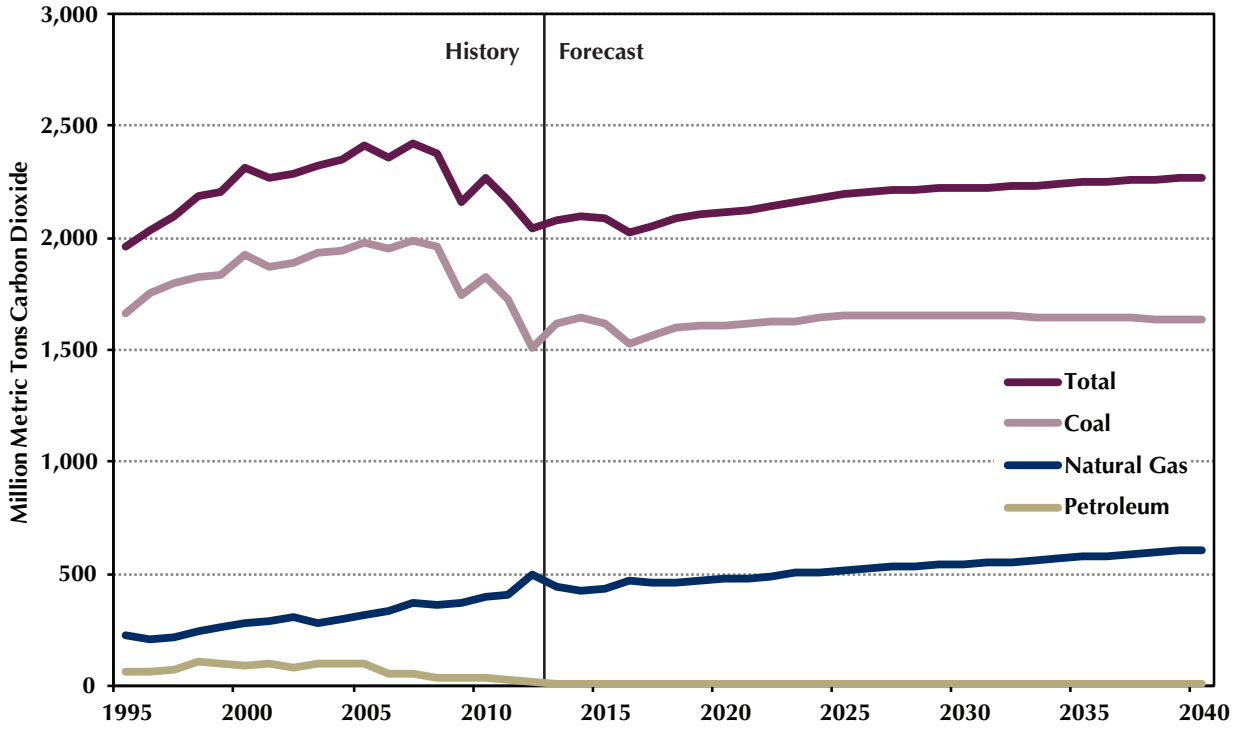
In the case of new power plants (regulated under Section 111(b) of the Act), EPA has proposed a Carbon Pollution Standard for New Power Plants[13] (measured as tons of greenhouse gas emissions per megawatt-hour of electricity produced) that states would be required to apply at each regulated plant. States could choose to adopt and enforce more stringent standards,[14] but otherwise would have little flexibility in implementing the EPA rules.

With existing power plants, on the other hand, EPA will establish "guidelines" that states must follow in developing their own State Implementation Plans (SIPs). Within these SIPs, states will set their own performance standards,[15] though EPA's guidelines will presumably include minimum performance standards that SIPs must achieve.[16] EPA is also likely to develop a "model rule" that a state could choose to adopt as a means to implement the standard in its SIP. If a state instead implements its own approach, it would need to demonstrate that, in the aggregate, its plan achieves reductions equivalent to those delivered by EPA's performance standards in order for EPA to approve its SIP. If a state does not submit an adequate SIP, the Clean Air Act dictates that EPA establish a Federal Implementation Plan (FIP) applying the performance standard to that state. If EPA develops a model rule for its guidelines, this may also be the basis for any FIPs it has to establish.

In developing greenhouse gas performance standards for existing power plants, EPA will have to address questions that fall into two broad categories:

Establishing the scope for the standards. This includes the basis for the standards (e.g., whether to set them based strictly on what EPA finds to be achievable at the plant level, or take into account reduction measures occurring beyond the "fence line" of the plant, discussed further below) and categories of standards (e.g., whether

FIGURE 2: Electric Power Sector CO_2 Emissions



Source: U.S. Energy Information Administration, "Annual Energy Outlook 2014, Early Release Overview" (Washington, DC: U.S. Energy Information Administration, 2013), http://www.eia.gov/forecasts/aeo/er/index.cfm.

to set different standards for different fuel sources and different plant types).

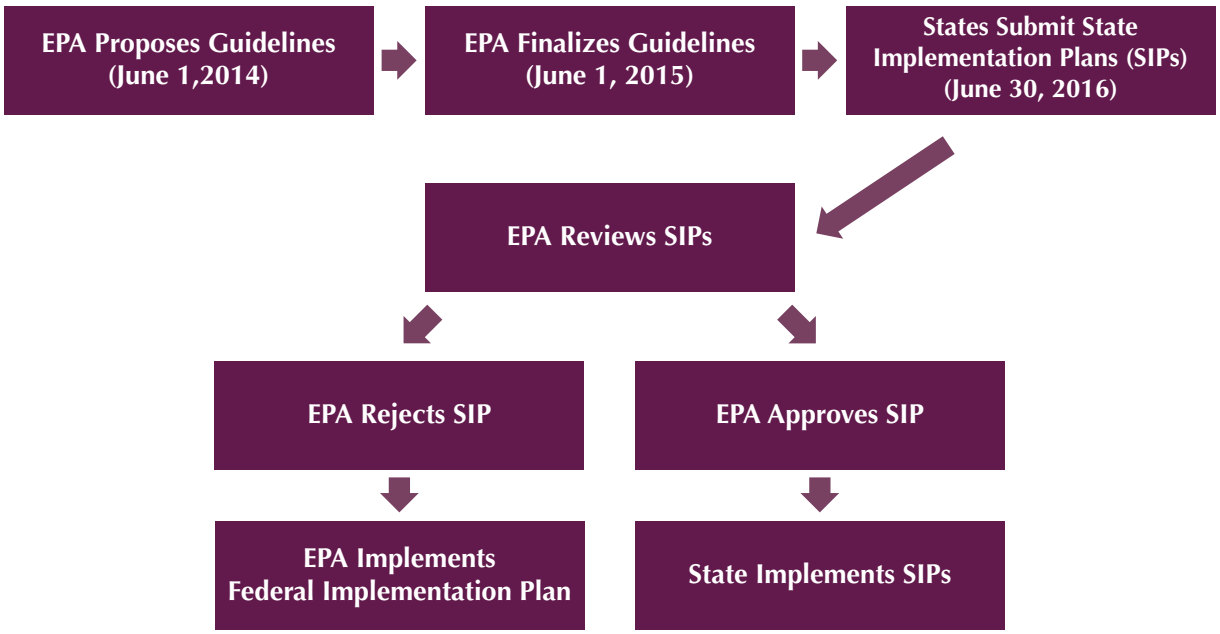
Establishing how emitters can comply. This includes specifying which types of actions will count toward compliance (e.g., whether demand-side efficiency measures will be a compliance pathway) and the regulatory programs states may use (e.g., market-based approaches such as trading).

A key question running through both sets of issues is whether EPA should look only "inside the fence line" (at the plant itself), or whether it should consider actions or options "outside the fence line" (e.g. demand-side energy efficiency) that might allow a more stringent and/or cost-effective approach. EPA may choose to draw that line differently when it comes to standard-setting and to compliance. For example, it may allow going outside the fence line for compliance purposes to minimize the cost of meeting the standards, even if the standard is set based only on practices and measures inside the fence line. The environmental and economic outcomes of this rule depend on EPA's responses to these questions.

SETTING THE STANDARD

By law, EPA must base its performance standard for existing power plants on "the best system of emission reduction which ... [EPA] has determined has been adequately demonstrated" for the types of facilities subject to the regulation.[17] The brevity and lack of specificity of the language in Section 111(d) give EPA some latitude in defining what "best system of emission reduction" (BSER) means for each regulated sector, but it is not clear to what degree, and every option is vulnerable to a legal challenge.

FIGURE 3: Regulatory Sequence for Carbon Pollution Standards for Existing Power Plants



The figure above shows a scheduled timeline for regulating greenhouse gas emissions of existing power plants outlined by the Presidential Memorandum on Power Sector Carbon Pollution Standards, along with subsequent steps included in the Clean Air Act.

Source: Presidential Memorandum -- Power Sector Carbon Pollution Standard, Compilation of Presidential Documents, DCPD-201300457 (June 25, 2013); 42 U.S.C. § 7410 (2012).

LIKELY BSER OPTIONS

A very narrow approach to BSER would define it as a specific control technology applied at the plant level. At the other end of the spectrum, EPA could define BSER much more broadly, taking into account emission reduction possibilities throughout the electricity system, from generator to end user. Generally speaking, broader approaches that look outside the fence line make greater emission reductions achievable, but require EPA to move further from its wealth of experience in traditional plant-level standard-setting. The basic options, summarized in **Table 1**, include:

BSER defined at plant-level without the use of different fuels

EPA would set a performance standard based on what is possible through efficiency improvements at the plant or other technology changes implemented at the plant. This would not include replacing some or all of the plant's high-carbon fuels, such as coal, with low-carbon fuels, such as natural gas or biomass. This option would achieve the most modest levels of emission reductions due to the limited breadth of measures included. This approach mirrors what has been done for past applications of Section 111(d), making it the most familiar definition of BSER. Since this approach ignores many ways to reduce emissions in the power sector, it may be susceptible to the legal argument that EPA is shirking its responsibility to craft a meaningful rule and is essentially disregarding the "best" in BSER.

BSER defined at plant-level, including use of different fuels

EPA would set a performance standard based on what is possible through plant-level technologies or efficiency improvements, along with co-firing of biomass or biogas where possible, and switching from coal to gas where possible. The inclusion of co-firing and fuel-switching increases the magnitude of possible emission cuts. Historically, EPA has not based standards on fuel-switching when applying Section 111(d), nor has fuel-switching been required for stricter Clean Air Act provisions, known as Best Available Control Technology (BACT). The means that this approach may be vulnerable to a legal argument that the Clean Air Act does not authorize EPA to require fuel-switching.

TABLE 1: Summary of Likely BSER Options

BSER DEFINITION	MEASURES INCLUDED	STRINGENCY	LEGALITY
Plant level / single fuel	Efficiency improvements at the power plant	Minimum	Precedent exists, but vulnerable for being too weak
Plant level / fuel switching	Measures above plus fuel-switching and co-firing	Broad range possible	Legally unprecedented
Fleet level	Measures above plus changes in power plant dispatch order	Broad range possible	Legally unprecedented
System level	Measures above plus demand reduction through renewable generation and/or demand-side efficiency	Maximum	Legally unprecedented

BSER defined at power plant fleet

In the above two approaches, the "system" of BSER is inside the fence lines of individual power plants. In this approach, the system is the entire fleet of power plants or some subset thereof, such as the fleet within each state, or the fleet of each operator. EPA would set a standard based on what emission reductions are available by pushing low-emission gas plants to operate more often than they currently do and high-emission coal plants to operate less, in addition to making plant-level improvements. Since the system in this case encompasses many power plants, the emissions standard would not be set at the power plant level. Instead, a standard would be set at the fleet level, though plant-level standards could be derived and assigned to individual plants. While this approach could drive significant, cost-effective emission reductions due to the difference in emissions between coal and gas plants, EPA has not previously used a fleet-wide approach in Section 111(d) rules. This approach may be challenged in court with the argument that 111(d) requires standards to be set for emission sources, as in individual power plants, rather than systems of emission sources, as in fleets of power plants. The Clean Air Task Force has proposed a framework that takes this tack.[18]

BSER defined at electricity sector

An even broader approach than those above would be to treat the entire electricity system, including electricity consumers, as the system. EPA would consider not only what emission reductions are feasible through actions taken at power plants, but also what reductions could be achieved by reducing demand for fossil-generated electricity. Measures to reduce demand would include consumer-side efficiency improvements and increased generation from renewable, nuclear, and other zero- and low-carbon sources. For example, improvements in industrial, building, and appliance efficiency could yield significant emission reductions at relatively low costs. Since the system in this approach encompasses the entire power sector, the emissions standard would not necessarily be set at the power plant level. Instead, a standard could be set at the sector level. That is, the entire power sector of a state would have to achieve a certain annual emissions rate. This state-wide limit could be imposed in the form of plant-level standards for individual plants. Of the four possible approaches discussed here, this has the potential to drive maximum reductions due to the number of emission reduction measures EPA could consider when setting the standard. As with the fleet-wide approach, this system-wide approach would be unprecedented. This type of rule may be challenged with an argument similar to that against a fleet-wide rule: A standard has to be set that is achievable by power plants and cannot force action by unregulated entities such as renewable generators. The Natural Resources Defense Council has developed an approach that follows this model.[19]

STANDARD CATEGORIZATION

In addition to establishing the scope of BSER, EPA must decide whether to apply the same standard to all plants, or to establish categories of power plants, each with a unique standard. Historically, EPA generally crafts different regulations for different categories of facility, depending on the type of fuel used. The basic options include:

One standard

At one extreme, every power plant would have to meet a given emissions standard, regardless of fuel type or power plant structure. A standard that would be ambitious but achievable for coal plants would require virtually no reductions at gas plants. However, combined with a broad trading program (if allowed by EPA), described further below, a more stringent single standard could drive reductions in both coal and gas plants. As gas plants would be able to sell allowances to coal plants, they would have an incentive to cut emissions even if already below the standard. In 2012, EPA proposed a single standard for new power plants regardless of fuel under Section 111(b), but withdrew this in 2013 in favor of a proposed standard for coal and two for gas, depending on plant size.

One standard for each fuel

EPA could alternatively set one standard for gas-fueled plants and another for plants fueled by coal. (Other possible categories include oil and biomass.) Since coal plants inherently emit much more carbon dioxide than gas plants, developing separate standards could require emission reductions at both types. Similarly, EPA could set separate standards for plants using different types of coal (e.g. bituminous, sub-bituminous, lignite).

Subcategorization according to factors other than fuel

EPA could alternatively choose to divide plants into categories narrower than those based on fuel alone. These might include plant technology, age, or location. This approach could allow for greater total cuts because reductions would be driven at each type of plant. In its proposed carbon dioxide performance standard for new power plants, EPA is proposing separate standards for smaller gas plants, which generally use less efficient simple-cycle technology, and larger gas plants, which generally use combined-cycle technology.

STATE IMPLEMENTATION PATHWAYS

A state will likely have two major pathways to implement EPA's guidelines: following the EPA model rule or developing its own program and demonstrating its "equivalency." States already implementing measures to reduce power plant emissions will likely seek to have them deemed equivalent.

MODEL RULE

The EPA guidelines will very likely include a model rule, which states can choose to adopt directly. That is, states will have the option to implement a program designed by EPA to reduce greenhouse gas emissions from existing power plants. Since Section 111(d) and its associated regulations are written in broad terms, and since there is little precedent for EPA to follow, EPA appears to have relatively broad latitude in what it can consider as compliance options. As discussed in the previous section, the model rule could impose a specific performance standard on each individual plant, or it could allow compliance flexibility through an emissions averaging program, through which a state's fleet could comply by achieving the performance standard on an aggregate basis.

STATE-DEVELOPED RULE

States desiring to forgo EPA's model rule and utilize a new or existing program would need to demonstrate that the emission reductions that would be achieved through its implementation plan would be equivalent, at a statewide level, to those mandated by EPA guidelines. States choosing to develop their own plans would likely be allowed a broader array of implementation options than those available under EPA's model rule. Regardless of the approach a state chooses, compliance options would have to include at least the reduction technologies and strate-

gies on which the performance standard would be based. For example, if EPA sets the performance standard based on what is achievable with fuel-switching, power plants will at least be allowed to employ fuel-switching to meet the standard.

One likely option for states developing their own plans is a mass-based approach, wherein the plan would be based on the total mass of greenhouse gases the state emits each year. The state would multiply its annual fossil fuel-fired generation[20] by EPA's performance standard to calculate a budget for annual power sector emissions. The state would then develop policies and programs, within bounds set by EPA in its guidelines, to achieve this level of statewide emissions. The state could take advantage of existing programs for this purpose. For example, California or the states in the Northeast's Regional Greenhouse Gas Initiative (RGGI) might use their emissions reduction programs to demonstrate that they are already achieving an equivalent level of reductions, and would therefore not have to impose additional regulations. States might also choose to leverage existing power plant standards,[21] renewable portfolio standards (RPS),[22] energy efficiency resource standards,[23] a carbon tax, and other policies[24] to demonstrate equivalency.

The least flexible option for a state developing its SIP would be to require each plant to demonstrate that its greenhouse gas emissions rate is at or below the standard, forcing plants in non-compliance to employ efficiency improvements or fuel-switching to achieve this target, or to shut down. To add flexibility, a state may be allowed to include an averaging program, in which a single power plant operator would be able to average the emissions of its entire fleet to meet the standard. For maximum flexibility, a state may be authorized to implement an allowance trading program, in which plant operators could leverage opportunities outside the fence line such as customer-side efficiency and generation from zero-carbon sources such as renewables or nuclear. Under this scenario, these types of projects could generate credits or allowances that a regulated power plant could purchase as an alternative to reducing its own emissions.

ALLOWANCE TRADING

There are different types of allowance trading programs a state might choose to implement, such as a baseline-credit system, similar to the program EPA uses for vehicular greenhouse gas emission standards, or a cap-and-trade system, such as that used in RGGI. The flexibility inherent in these market mechanisms tends to make them more cost effective than command-and-control measures.[25]

Under the baseline-credit system, plants that operate below the performance standard would earn credits based on how many units of electricity are generated and the difference between the standard and the actual emissions rate. These credits could then be sold to plants that are emitting above the performance standard so that all plants involved meet the standard on average. Under this approach, the total number of credits in the system would not be limited, meaning total emissions would be allowed to increase if electricity generation increased. States could choose to credit projects that reduce greenhouse gas emissions in the power sector, such as energy efficiency or zero-carbon generation from nuclear or renewables.

A cap-and-trade system also involves tradable credits (generally called allowances in this context), but would limit total greenhouse gas emissions from the power sector. Under this system, each plant could be allocated emission allowances annually based on a calculation that includes the established performance standard and some measure of electricity production.[26] A plant would then have to surrender an allowance for each ton (or other denomination) of greenhouse gas it emitted during the year. Unlike the baseline-credit system, plants operating below the standard would not generate new credits, but instead would have excess allowances to sell to plants whose annual emissions exceed their allowances.

A trading program for power plant emission credits or allowances may feature restrictions on the extent of trading, each with its own legal and economic implications:

- **Intra-plant trading:** Multi-unit plants could comply as a single entity, with trading among units within the plant allowed. A program like this might also be referred to as "unit averaging;"
- **Intra-operator trading:** A power plant operator could trade among the power plants within its control. This could or could not also be limited by state borders. A program like this might also be referred to as "plant averaging;"
- **Intra-state trading:** Separate operators could be allowed to trade with each other, provided that the trades occurred among power plants located in a single state; or
- **Interstate trading:** Separate operators could trade with each other, including across state borders.

For any inter-plant trading program, a state would also have to determine whether trading would be allowed among different source categories. Cross-state trading would depend on the development and implementation of regional or national systems that monitor, verify, and account for allowances in a consistent manner. States might be given the option to join an existing program, such as RGGI or the Western Climate Initiative (WCI), or to create a new program.

ADDITIONAL OPTIONS

Under the trading systems discussed above, it would be relatively straightforward for a state to include emission reductions achieved through programs that operate outside of the fence line. For example, if a state has an RPS, it could fold that into its 111(d) SIP by allowing renewable generators to earn tradable credits, which fossil fuel power plants could purchase to demonstrate compliance with required emission cuts. Alternatively, a state could seek to demonstrate to EPA that the emission reductions from its RPS meet EPA guidelines without creating a credit system. A state might do this by calculating the amount of statewide emissions avoided by the generation of zero-carbon electricity without apportioning these savings to individual power plants in any way. However, it is legally uncertain whether states can implement 111(d) guidelines without setting enforceable limits or credit requirements for power plants.

It might also be possible for implementation to be guided by independent system operators (ISOs), which manage regional electricity systems across the country. ISOs typically choose which generation sources will be deployed to meet demand based on cost alone. To reduce system-wide emissions, ISOs could develop a pricing mechanism that adds a premium to account for the relative carbon dioxide emissions of each source. That is, high-carbon sources such as coal would become much more expensive, lower-carbon sources such as gas would become slightly more expensive, and zero-carbon sources such as nuclear would not be directly affected. The premiums collected by the ISO could then be returned to electricity consumers to mitigate the increase in the rates they pay. Such an approach would be contingent on EPA allowing states within a regional power market to meet regional targets rather than state-specific targets.[27]

In the situations described above where compliance is achieved through any measures outside the fence line, EPA may face a challenge in verifying emission reductions. All large power plants are already required to monitor their greenhouse gas emissions, meaning measures inside the fence line will be relatively easy for state and EPA regulators to verify.[28] However, if a state chooses to use demand-side efficiency measures as a compliance tool, the state may have to implement a monitoring methodology to ensure reductions in electricity demand are actually occurring due to these measures. Alternatively, EPA may allow states to rely solely on direct power plant monitoring regardless of the measures implemented to reduce emissions. A successful demand-side efficiency program should reduce power plant emissions regardless of whether the demand reductions are directly verified.

CONCLUSION

With little guidance available from the Clean Air Act language or past rules, it is difficult to predict what EPA might include in its proposed performance standard for greenhouse gas emissions from existing power plants. There are strong legal and policy arguments on all sides of each issue addressed in this brief, and EPA's final rule will likely be challenged for being too lax or too stringent – and it is possible that EPA will be sued from both sides at once. That said, a better understanding of the options and implications EPA faces as it sets the performance standard and determines what implementation options will be available to states will help state policymakers and members of the public engage in the rulemaking process.

TABLE 2: Key EPA Decisions for 111(d) Guideline Development

DECISION	OPTIONS	PREREQUISITES
Basis for performance standard / Definition of "Best System of Emission Reduction"	Plant-level efficiency improvements	Separate standards for different fuels and/or allowance trading
	Efficiency improvements and fuel switching	Separate standards for different fuels and/or allowance trading
	Fleet-level changes	Allowance trading
	Electric system changes	Allowance trading
Type of standard	Rate-based	None
	Mass-based	None
Format of standard (if rate-based)	Pounds CO_2 / MWh	Separate standard for different fuels and/or allowance trading
	Percentage reduction	None
Categorization	Single standard for all plants	Allowance trading and/or percentage reduction requirement
	Single standard per fuel	None
	Separate standards for different technologies	None
Compliance options	Plant-level efficiency improvements	None
	Efficiency improvements and fuel switching	None
	Fleet-level changes	Allowance trading infrastructure
	Electric system changes	Monitoring and verification infrastructure to quantify reductions outside of generation; allowance trading infrastructure
Allowance trading: Basics	Not allowed	More than a single standard and/or a percentage reduction standard
	Allowed among units at a single plant	More than a single standard and/or a percentage reduction standard
	Allowed among plants controlled by a single operator	More than a single standard and/or a percentage reduction standard
	Allowed between operators	Allowance trading infrastructure
Allowance trading: Fuels	Trading across fuels not allowed	More than one performance standard and/or standard in the form of percentage reduction
	Trading across fuels allowed	Allowance trading allowed
Allowance trading: Geographical	Trading across state lines not allowed	None
	Trading across state lines allowed	Allowance trading allowed; interstate system created (or existing systems expanded) to regulate trading

ENDNOTES

1 The application of the Clean Air Act to greenhouse gases was confirmed in the Supreme Court case *Massachusetts v. EPA* in 2007, see Center for Climate and Energy Solutions, "Clean Air Cases," last accessed March 11, 2014, http://www.c2es.org/federal/courts/clean-air-act-cases#MassvEPA. This and subsequent EPA actions are described in the Center for Climate and Energy Solutions, *Events Leading to Regulation of Greenhouse Gases under the Clean Air Act* (Arlington, VA: Center for Climate and Energy Solutions, 2012), http://www.c2es.org/publications/sequence-events-leading-regulation-greenhouse-gases-through-epa.

2 Center for Climate and Energy Solutions, "Q&A: EPA Regulation of Greenhouse Gas Emissions from Existing Power Plants," last accessed March 11, 2014, http://www.c2es.org/federal/executive/epa/q-a-regulation-greenhouse-gases-existing-power.

3 Presidential Memorandum -- Power Sector Carbon Pollution Standard, *Compilation of Presidential Documents*, DCPD-201300457 (June 25, 2013). http://www.gpo.gov/fdsys/pkg/DCPD-201300457/pdf/DCPD-201300457.pdf.

4 Center for Climate and Energy Solutions, "EPA Regulation of Greenhouse Gas Emissions from New Power Plants," last accessed March 11, 2014, http://www.c2es.org/federal/executive/epa/ghg-standards-for-new-power-plants.

5 Doug Vine, "Stronger Action Needed to Meet U.S. Climate Pledge," *Climate Compass* (blog), Center for Climate and Energy Solutions, January 13, 2014, http://www.c2es.org/blog/vined/stronger-action-needed-meet-us-climate-pledge.

6 Center for Climate and Energy Solutions, "Q&A: EPA Regulation of Greenhouse Gas Emissions from Existing Power Plants." For more information about the electric power sector, see Center for Climate and Energy Solutions "Electricity Overview, last accessed March 11, 2014, http://www.c2es.org/technology/overview/electricity.

7 Center for Climate and Energy Solutions, "Federal Vehicle Standards," last accessed March 11, 2014, http://www.c2es.org/federal/executive/vehicle-standards.

8 Center for Climate and Energy Solutions, "Natural Gas," last accessed March 11, 2014, http://www.c2es.org/energy/source/natural-gas.

9 Center for Climate and Energy Solutions, "Coal," last accessed March 11, 2014, http://www.c2es.org/energy/source/coal.

10 Some plants, known as baseload generators, are designed to run more or less continuously. Others, known as peaker plants, are designed to be turned on and off as demand for electricity changes.

11 Clean Air Act of 1970, 42 U.S.C. § 7411(d) (2012).

12 EPA has issued 12 total rules under Clean Air Act Section 111(d). These include guidelines for large municipal waste combusters (40 C.F.R. §§ 60.30b-60.39b (2013)), municipal solid waste landfills (40 C.F.R. §§ 60.30c-60.36c (2013)), sulfuric acid production units (40 C.F.R. §§ 60.30d-60.32d (2013)), primary aluminum reduction plants (40 C.F.R. §§ 60.190-60.195 (2013)), and kraft pulp mills (40 C.F.R. §§ 60.280-60.285 (2013)). Most of these consist of straightforward rate-based limits. For example, sulfuric acid production units are limited to an emissions rate of 0.25 grams sulfuric acid mist per kilogram of sulfuric acid produced (40 C.F.R. § 60.31d (2013)). However, some of these guidelines include provisions that may be relevant as EPA sets guidelines for power plants. For example, the guidelines for existing commercial and industrial solid waste incineration units include a requirement for a "waste management plan" intended to reduce the amount of waste arriving at the incinerator (40 C.F.R. §§ 60.2500-60.2875 (2013); although existing solid waste incinerators are covered separately by Clean Air Act Section 129, this section directs EPA to craft guidelines using Section 111(d) and contains no additional provisions to address waste outside the incinerator fence line). Additionally, the guidelines for existing large municipal waste combusters allow for facility operators to trade nitrogen oxide emission allowances among units within the facility (40 C.F.R. 60.33b (2013)).

13 U.S. Environmental Protection Agency, "2013 Proposed Carbon Pollution Standard for New Power Plants," last modified February 26, 2014, http://www2.epa.gov/carbon-pollution-standards/2013-proposed-carbon-pollution-standard-new-power-plants.

14 Clean Air Act, 42 U.S.C. § 7416 (2012).

15 It is not yet clear whether EPA guidelines will require a single standard that would apply to all power plants, or separate standards for different fuels or generation technologies. State performance standards do not necessarily have to be rate-based. Nor do they necessarily have to apply to individual plants. According to current EPA interpretation, states could also use an "allowance system," (such as cap and trade), or "equipment specifications" when implementing EPA's 111(d) guidelines. (40 C.F.R. § 60.21(f) (2013)).

16 In previous rules set under 111(d), EPA has included a rate-based standard for states to impose. For example, EPA's standards of performance for existing, large municipal waste combustors include numerical, rate-based limits for dioxin, cadmium, and other pollutants. U.S. Environmental Protection Agency, "Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Large Municipal Waste Combustors," 71 Fed. Reg. 27324 (May 10, 2006).

17 42 U.S.C. § 7411(a) (2012); 40 C.F.R. § 60.21 (2013).

18 Conrad Schneider, *Power Switch: An Effective, Affordable Approach to Reducing Carbon Pollution from Existing Fossil-Fueled Power Plants* (Boston, MA: Clean Air Task Force, 2014), http://www.catf.us/resources/publications/files/Power_Switch.pdf.

19 Daniel A. Lashof et al., *Closing the Power Plant Carbon Pollution Loophole: Smart Ways the Clean Air Act Can Clean Up America's Biggest Climate Polluters* (Washington, DC: Natural Resources Defense Council, 2013), http://www.nrdc.org/air/pollution-standards/files/pollution-standards-report.pdf.

20 Though the performance standard would have to explicitly focus on electricity generation, complications will arise since electricity is not necessarily generated and consumed in the same state. For example, EPA will have to determine which state to credit for emission reductions that are made at a power plant located in Nevada that primarily sells electricity to California. Relatedly, EPA will have to determine how to credit demand reduction programs focused in California that have an effect of reducing demand of fossil fired generation in Nevada.

21 Center for Climate and Energy Solutions, "Standards and Caps for Electricity GHG Emissions," last accessed March 11, 2014, http://www.c2es.org/us-states-regions/policy-maps/electricity-emissions-caps.

22 Center for Climate and Energy Solutions, "Renewable and Alternative Energy Portfolio Standards," last accessed March 11, 2014, http://www.c2es.org/us-states-regions/policy-maps/renewable-energy-standards.

23 Center for Climate and Energy Solutions, "Energy Efficiency Standards and Targets," last accessed March 11, 2014, http://www.c2es.org/us-states-regions/policy-maps/energy-efficiency-standards.

24 Center for Climate and Energy Solutions, "U.S. Climate Policy Maps," last accessed March 11, 2014, http://www.c2es.org/us-states-regions/policy-maps.

25 Center for Climate and Energy Solutions, *Market Mechanisms: Understanding the Options* (Arlington, VA: Center for Climate and Energy Solutions, 2012), http://www.c2es.org/publications/market-mechanisms-understanding-options.

26 Allowance auctions could be a viable alternative to free allowance allocation.

27 This ISO-based approach is explained further by The Brattle Group, see "Great River Energy and The Brattle Group Present Innovative Approach for Compliance with EPA Greenhouse Gas Regulations," last modified February 5, 2014, http://www.brattle.com/news-and-knowledge/news/616.

28 40 C.F.R. pt. 98 (2013).

CENTER FOR CLIMATE
AND ENERGY SOLUTIONS

The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.

2101 WILSON BLVD. SUITE 550 ARLINGTON, VA 22201 703-516-4146 **C2ES.ORG**