Trailblazing Without the Smog: Incorporating Energy Efficiency into Greenhouse Gas Limits for Existing Power Plants

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Executive Summary

On June 25, 2013, President Obama called on the U.S. Environmental Protection Agency (EPA) to propose a rule to regulate greenhouse gases from existing power plants by June 2014. What will be included in the rule is determined largely by Section 111(d) of the Clean Air Act; however, the flexibility that might be allowed under Section 111(d) is somewhat uncertain.

End-use energy efficiency measures can achieve low-cost greenhouse gas reductions from the power sector and are readily deployable on a large scale. This report outlines some key policy decisions that a 111(d) rulemaking can address to ensure that the final rule incorporates the benefits of end-use energy efficiency, ensuring meaningful emission reductions at the lowest possible cost. This report makes the following recommendations for the treatment of end-use energy efficiency:

- **Setting an emission limit**—The "best system of emission reduction" should be defined based on what can be achieved by the power sector as a whole (as opposed to a plant-by-plant, supply-side approach limited to regulated sources), including what can be achieved through the use of end-use energy efficiency and renewable generation.
- **Including end-use energy efficiency as a compliance mechanism—**In determining what activities can be counted towards compliance with a performance standard, emission reductions from the power sector as a whole should be allowed, including reductions from end-use energy efficiency.
- **Establishing a baseline**—End-use energy efficiency policies that require future-year savings should not be included in the calculation of a baseline for purposes of 111(d). In contrast, measures that have been put in place in the baseline year or earlier, such as building upgrades, should be included in a baseline, and those savings should not count for purposes of crediting emissions reductions.
- **Determining the types of energy efficiency programs and measures to credit**—The rule should provide flexibility in the energy efficiency programs and measures that can qualify for credit under 111(d) because states differ in their economic structure, strengths, and past experience. Flexibility in what programs and measures can be included in a state's portfolio will allow states to identify the lower-cost greenhouse gas reductions and employ new technological improvements as they become available in future years.
- **Identifying an approach to evaluation, measurement, and verification (EM&V)**—EPA should issue model guidance on EM&V structured as a sort of "menu" of acceptable approaches based on state experience. This guidance could be modified over time to improve consistency across all states.

Some of the most important considerations that will need to be addressed in a 111(d) rulemaking will shape the role end-use energy efficiency plays in the nation's strategy to address greenhouse gas emissions from the power sector. In order to achieve meaningful emission reductions we should leverage the low-cost, clean energy resources at our disposal, starting with end-use energy efficiency.

Introduction

On June 25, 2013 President Obama called on the U.S. Environmental Protection Agency (EPA) to propose a rule to regulate greenhouse gases from existing power plants by June 2014 (Executive Office of the President 2013). Section 111(d) of the Clean Air Act is likely to be the authority upon which EPA relies to draft the rule.[1] Regulators interpreting this provision face broad statutory language and limited precedent from past applications. This situation provides an opportunity for EPA to consider flexible compliance strategies to reduce these emissions. One of the most promising opportunities is inclusion of end-use energy efficiency. Consideration of end-use energy efficiency when determining the amount of emission reductions that might be achieved will help to ensure that the rule achieves meaningful emission reductions from the power sector. Further, allowing end-use energy efficiency to function as a compliance mechanism in a 111(d) rulemaking will help ensure that the power sector is able to leverage the lowest-cost approaches to realizing those reductions. Regardless of the clear benefits that end-use energy efficiency could provide in this context, there is a degree of legal uncertainty regarding how a court would interpret the limits of EPA's flexibility under 111(d).[2]

While there is some uncertainty surrounding how Section 111(d) might be implemented, it is still important to identify desirable outcomes and the policy mechanisms that might best achieve those outcomes. Although ACEEE makes no claims as to the legality of one policy option over another, we hope this paper generates a dialogue and helps frame the way someone might think about the implications of these policy options as a rule is shaped. For these reasons we consider this document to be a "working paper."

There are many considerations that must be addressed in the development of this important rule, but in this paper we address just five specific elements. These elements are discussed as they relate directly to the potential role of end-use energy efficiency in a Section 111(d) rule:

- Setting an emission limit;
- Including end-use energy efficiency as a compliance mechanism;
- Establishing a baseline;
- Determining the types of energy efficiency programs and measures to credit; and
- Identifying an approach to evaluation, measurement, and verification (EM&V).

Each of these topics is explained and discussed below. When possible, recommendations have been included detailing what we consider the most appropriate policy path going forward. Additional resources have been provided at the end of each section that may be useful as parties consider the best options for a successful and influential rule.

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[1] In its presentation entitled *Clean Air Act and Upcoming Carbon Pollution Guidelines for Existing Power Plants*, EPA discussed the potential for the regulation of greenhouse gases from existing sources through 111(d) and how this would play out (EPA 2013a).

[2] For a discussion of some of the legal issues surrounding 111(d), see *Energy Efficiency and Greenhouse Gas Limits for Existing Power Plants: Learning from EPA Precedent* (Tarr et al. 2013), available online here: http://aceee.org/research-report/e13c.

Setting an Emission Limit

Section 111(d) requires that the EPA identify the best system of emission reduction (BSER) for the covered pollutant (in this case, carbon dioxide) and an emission limitation achievable through the BSER (40 C.F.R. § 60.22). The BSER must maximize emission reductions while considering cost, energy requirements, and environmental impacts (U.S.C. 42 § 7411 (a) (1)). Each state must then respond by developing a plan that implements standards of performance at least as stringent as the those achieved by the BSER (U.S.C. 42 § 7411). As it has in the past, many people anticipate that EPA may develop a "model rule" for states to assist them in the design of their plans.[3]

While there are many ways in which EPA could approach determination of the best system of emission reduction, a preliminary question that must be answered with regard to end-use energy efficiency is whether efficiency resources will be considered as part of the system of potential emission reductions.[4] If EPA takes a limited view of the flexibility it is allowed in defining the best "system," it may conclude that the system must be based only on emission reductions that can be achieved through changes in the way the regulated sources[5] operate. This could include installation of a control technology, but since cost is a consideration under 111(d), this approach may result in an approach based on efficiency upgrades that can be achieved at existing plants. The potential for these improvements is very limited and by some estimates might be an improvement of only about 5%[6] sector-wide. If EPA does take this limited approach, the emissions reductions achieved due to the rule would also be limited. Redispatching or fuel switching at existing plants (e.g., coal to natural gas) is another method that could result in significant emissions reductions, though it is not clear whether a requirement that existing coal plants switch to burning natural gas would be permissible under 111(d) and this approach would undoubtedly be controversial. Even if not included as part of the BSER, some argue that end-use energy efficiency could still potentially be included by states as a compliance mechanism to reduce the cost of compliance, but the emission reduction goals of the rule would be only a small fraction of what could be cost-effectively achieved.

Alternatively, if EPA identifies a best system of emission reduction that could be achieved by the power sector as a whole (as opposed to a plant-by-plant, supply-side approach limited to regulated sources), the required emission reductions could be based on what can be achieved

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[3] Many experts have speculated on the likelihood of a model rule. For example, see the Center for Climate and Energy Solutions webpage: "Q&A: EPA Regulation of Greenhouse Gas Emissions from Existing Power Plants." (C2ES 2013a). See also *President Obama's Climate Action Plan: What It Could Mean for the Power Sector* (Fine and MacCracken 2013).

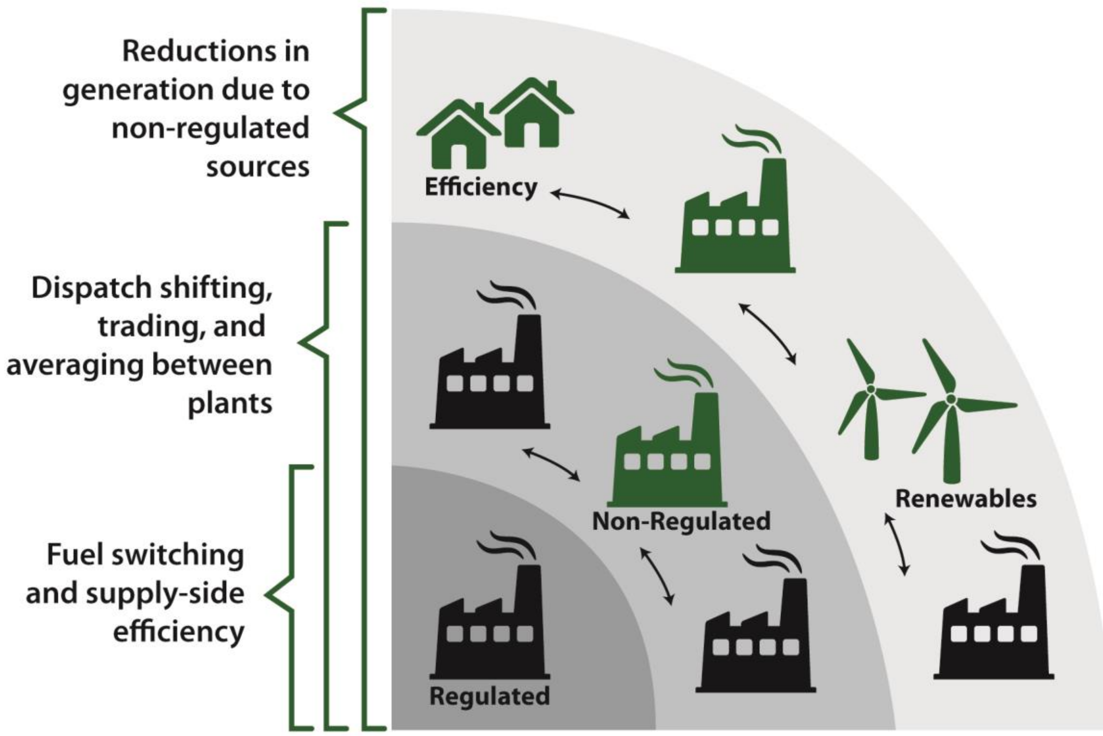
[4] See proposal from the Natural Resource Defense Council (Lashof et al. 2013) addressing this issue. Additionally, this question is discussed in the July 2013 RFF report *Technology Flexibility and Stringency for Greenhouse Gas Regulations* (Burtraw and Woerman 2013).

[5] Regulated sources are sources of pollution that fall under the scope EPA regulation with regard to a specific rule. In the case of 111(d) and greenhouse gas regulation, at the moment EPA has only been instructed by the President to regulate existing coal- and natural gas-fired power plants, standards will presumably be promulgated for other major sources (e.g., industrial/manufacturing) of greenhouse gas in the future as the Clean Air Act requires. New sources, and sources undergoing significant modifications are regulated under new source performance standards (EPA 2013b).

[6] This is a very rough estimate in the middle of a range of possible supply-side upgrades that could be made to existing power plants. For a more detailed discussion of specific improvements and associated costs, see Sargent & Lundy 2009.

through the use of end-use energy efficiency and renewable generation. Figure 1 illustrates some of the different emission reduction opportunities EPA may consider when defining the best system of emission reductions. The smallest part of the wedge represents a system that includes only actions that are within the control of an individual regulated power plant. Those actions may include fuel switching and supply-side efficiency. The slightly larger wedge represents a system that includes the actions of individual power plants, but also actions that could be averaged among plants such as shifting of dispatch among regulated plants (i.e., operating coal-fired plants less and gas-fired plants more). The largest wedge encompasses these opportunities as well as a system that considers emission reductions that could be achieved in the power sector by including non-regulated resources such as renewable generation and end-use energy efficiency.

Figure 1. Possibilities for Defining the Best System of Emission Reductions



There are clear policy advantages to including end-use efficiency and renewable resources when setting the achievable emission reductions of the BSER. Resources for the Future (RFF) recently released an analysis concluding that the inclusion of renewable generation could achieve greenhouse gas reductions that would bring the United States to 15% below 2005 levels at a cost of just 1.3% in increased electricity prices (Burtraw and Woerman 2013). The RFF study did not include an end-use efficiency scenario, but a Natural Resource Defense Council (NRDC) analysis looked at potential scenarios under 111(d) and found that when end-use efficiency is included as a compliance option, there is so much available and at such a low-cost that it becomes the primary mechanism by which emission reductions are achieved (Lashof et al. 2013). Table 1 lists some estimates of the potential emissions reductions achievable under different approaches to setting the emission limit.

Table 1. Estimates of Energy Savings and Emission Reductions Achievable Under Different Approaches to Rulemaking

Approach	Source of Reductions	CO_2 Reductions	Cost	Citation
Supply-Side Energy Efficiency Improvements	4% improvement in emission rate of coal plants	93 million tons reduced in 2020	$1.4 billion total societal costs in 2020; $2.3 billion in fleet investments	Burtraw and Woerman 2013[7]
All Fossil-Fired Generators	25% of reductions due to supply side investments and 75% due to fuel switching	340 million tons reduced in 2020	$7.5 billion total societal costs in 2020	Burtraw and Woerman 2013
All Fossil-Fired and Renewable Generation	22% of reductions due to supply-side investments remaining from fuel switching and renewable generation	379 million tons reduced in 2020	$9.7 billion total societal costs in 2020	Burtraw and Woerman 2013
ACEEE End-Use Energy Efficiency Estimate*	15% reduction in demand by 2020 due to end-use energy efficiency	463 million tons reduced in 2020	NA	ACEEE estimate based on state-specific analyses.
Natural Resource Defense Council Trading Proposal	Primarily end-use energy efficiency, though renewables and fuel switching are possible	693 million tons *below 2005 levels* by 2020.	$4 billion in annualized costs in 2020	Lashof et al. 2013

~From Resources for the Future: Coal Scenario (Burtraw and Woerman 2013), which selected from a Sargent and Lundy (2009) report a range of possible savings due to supply-side efficiency upgrades with varying costs. Some estimate this range to be approximately 2-10%.

*Rough energy savings estimate based on a review of ACEEE's State Clean Energy Resource Project (http://aceee.org/sector/state-policy/scerp). Actual potential varies by state. See individual studies for a more complete range of potential. EIA AEO 2013 forecast of electricity consumption in 2020 (http://www.eia.gov/forecasts/aeo/index.cfm) and national CO_2 emissions factor of 7.0555 x 10-4 metric tons of CO_2 per kWh (http://www.epa.gov/cleanenergy/energy-resources/refs.html) used to estimate emissions reductions. ACEEE is developing an estimate of the costs of major energy efficiency policies that could play a role in 111(d) compliance for each of the 50 states.

These analyses indicate that inclusion of end-use energy efficiency and renewable generation in a rulemaking would result in much deeper emissions reductions and at a lower cost than alternatives. The potential for end-use energy efficiency and cost savings are discussed further in the following section.

[7] RFF evaluates a number of possible regulatory schemes relative to a business-as-usual baseline. The scenarios listed in the chart are referred to as "Fossil-MC" and "AllGen-MC," respectively. The coal scenario looks at supply-side efficiency improvements. The fossil scenario represents a regulatory scheme of a tradable emissions rate standard across *all* emitting sources that yields a marginal cost of CO_2 emissions equivalent to the marginal cost (or credit price) that results from the *coal* scenario, 33.2 $ per ton. The AllGen scenario entails a tradable CO_2 emissions rate standard that includes existing fossil-fired power plants and incremental generation from nonemitting generators. RFF's report is available here: http://rff.org/RFF/Documents/RFF-DP-13-24.pdf.

Additional Resources:

An examination of the regulatory issues surrounding end-use energy efficiency and greenhouse gas regulation can be found in a joint paper published by the Nicholas Institute of Duke University and ACEEE entitled *Energy Efficiency and Greenhouse Gas Limits for Existing Power Plants: Learning from EPA Precedent*. This report is available here: http://www.aceee.org/research-report/e13c.

For more information on RFF's modeling scenarios, see their report *Technology Flexibility and Stringency for Greenhouse Gas Regulations* (July 2013), available here: http://rff.org/RFF/Documents/RFF-DP-13-24.pdf.

In 2009 Sargent & Lundy examined the potential for supply-side efficiency improvements in coal-fired power plants. This research is available here: http://www.epa.gov/airmarkets/resource/docs/coalfired.pdf.

For more information on ACEEE's various State Clean Energy Resource Projects, visit: http://aceee.org/sector/state-policy/scerp.

For more information on NRDC's proposal for a regulatory system to curb greenhouse gas emissions, see the report *Closing the Power Plant Carbon Pollution Loophole: Smart Ways the Clean Air Act Can Clean Up America's Biggest Climate Polluters* (March 2013), available here: http://www.nrdc.org/air/pollution-standards/files/pollution-standards-report.pdf.

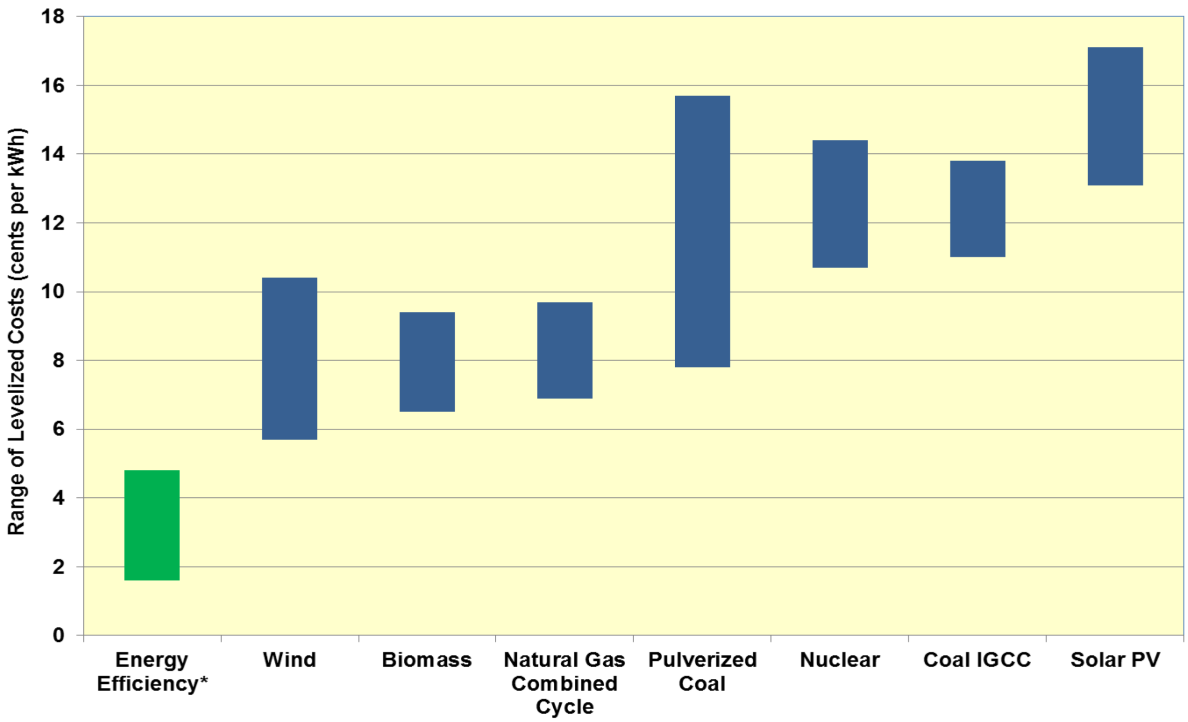
Including End-Use Energy Efficiency as a Compliance Mechanism

In addition to its substantial potential for emission reductions, end-use energy efficiency can significantly reduce the cost to the power sector of achieving greenhouse gas reduction goals. End-use energy efficiency is not only less expensive than other emissions control technologies, it often pays for itself by avoiding energy costs. This is because the costs of meeting electricity demand through other generation resources is significantly more expensive than meeting demand with energy efficiency (see Figure 2 on the next page).

In addition to providing significant, cost-effective emissions reductions, allowing end-use energy efficiency to be used as a compliance mechanism in a 111(d) rulemaking would provide other benefits that can be difficult to quantify. The vast majority of states already implement at least some end-use energy efficiency programs. The leadership these states have already shown should be recognized and rewarded, avoiding the need to impose an entirely new set of administrative requirements for states. Further, investments in energy efficiency can mitigate the costs associated with delivering electricity, such as maintaining and upgrading the transmission and distribution system, as well as grid resilience and reliability (Neme and Sedano 2012; Raynolds and Cowart 2000).

On June 25, 2013, President Obama gave a speech at the University of Georgetown where he outlined his new Climate Action Plan and spoke to the multiple benefits of energy efficiency with regards to greenhouse gas emission reductions, stating: "…[efficiency] upgrades don't just cut that pollution; they put people to work—manufacturing and installing smarter lights and windows and sensors and appliances."(Obama 2013).

Figure 2. Levelized Cost of Various Energy Resources



*Notes: Energy efficiency average program portfolio data from Molina 2013 (ACEEE, preliminary research); all other data from Lazard 2012. High-end range of advanced pulverized coal includes 90% carbon capture and compression.

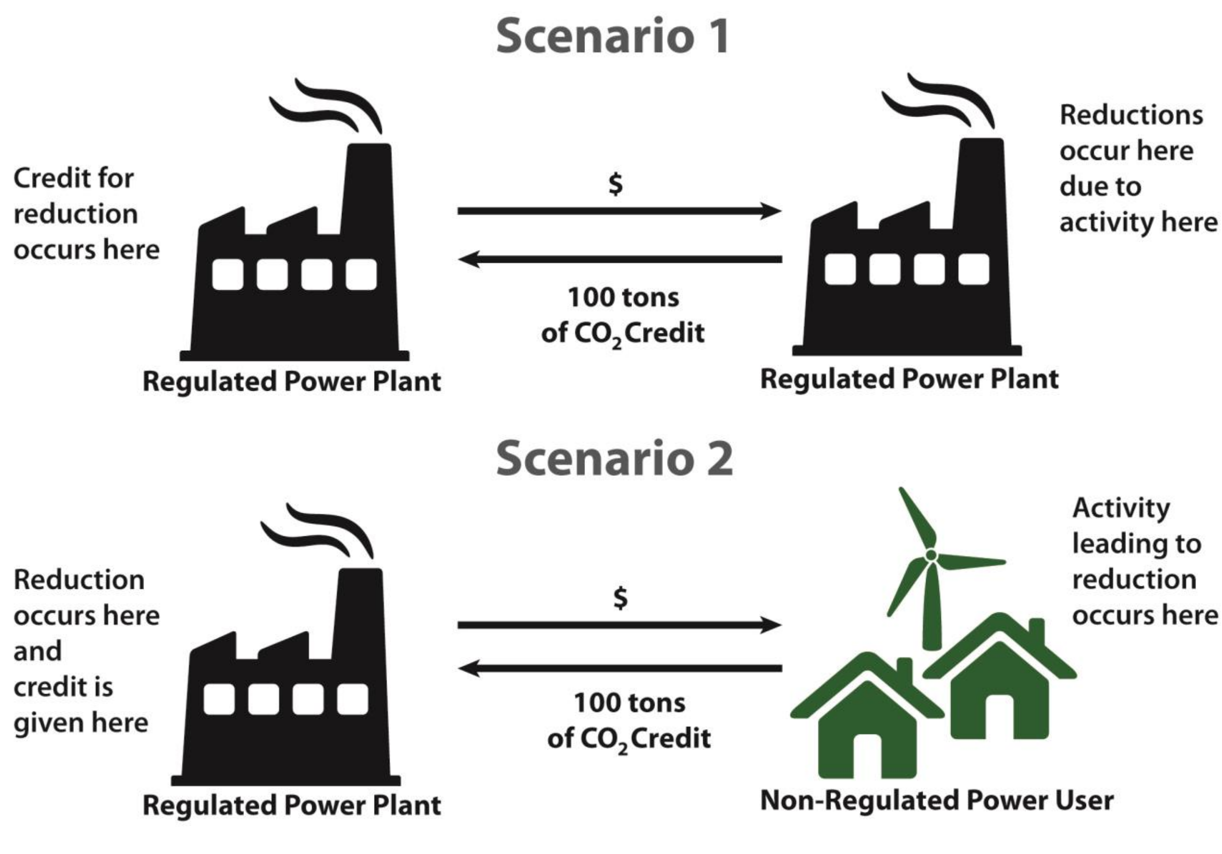
Additionally, a 2013 memorandum issued by the Executive Office of the President specifically directs the EPA to "work with the Department of Energy and other Federal and State agencies to promote the reliable and affordable provision of electric power through the continued development and deployment of cleaner technologies and by increasing energy efficiency, including through stronger appliance efficiency standards and other measures."

The President has sent a clear message that energy efficiency should be part of a strategy to reduce greenhouse gases. Allowing end-use energy efficiency to count as a mechanism for complying with a 111(d) rule makes sense practically and from a policy standpoint. However, there is some legal uncertainty about how much compliance flexibility regulated sources may be granted. One question that EPA must consider is whether emissions reductions need to be attributed directly to individual sources, to the regulated sources as a group (power plants that meet specific criteria), or to the power sector more broadly. There is precedent indicating that averaging and trading among regulated sources is acceptable under 111(d).[8] While the 111(d) rule allowing averaging and trading among municipal waste combustors has not been

[8] See "Emission Guidelines for Municipal Waste Combustor Metals, Acid Gases, Organics, and Nitrogen Oxides," 40 C.F.R. §60.33b (d). See also "Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam-Generating Units (Clean Air Mercury Rule)," 70 *Fed. Reg*. 28606 (July 18, 2005). Trading was permitted but challenged by petitioners; however, the D.C. Circuit Court overturned the rule on other grounds and did not address the question of emissions trading under Section 111(d) in this context.

challenged in court, it has been in place for nearly two decades. This precedent suggests that emission reductions need not occur within the facility boundaries at each regulated source, but a source could instead pay for reductions to occur at a different location and take credit for those reductions in order to comply with the rule. Assuming that the existing rule for municipal waste combustors is legal, some believe the question then turns to whether emission reductions need to occur due to activities that reduce emissions within the group of regulated sources or whether activities that take place elsewhere (such as end-use energy efficiency and renewable generation), but reduce emissions from these sources, can be counted. Figure 3 illustrates the distinction between these two scenarios. In both cases the regulated entity complying with the rule is represented on the far left. In the first scenario the regulated entity pays another regulated entity to reduce its emissions. This scenario is representative of a trading approach where the reductions occur due to activity at another regulated facility. The second scenario represents a regulated entity that complies by investing (either directly or by buying "credits" from a third party that has made investments) in end-use efficiency and renewable generation. In this scenario the emission reductions resulting from those investments occur at a regulated source, but the activity causing those reductions takes place outside the geographic boundaries of regulated entities.

Figure 3. Comparison of Potential 111(d) Crediting Scenarios



In both scenarios above, activity that occurs at a different location needs to be "credited" to the source that will be using the reductions to comply with a 111(d) rule. In scenario 1, the exact location of the emission reductions is known and the credit is transferred to a facility at another location. In scenario 2, the emission reductions occur in the regulated sector and are attributed to the source that paid for the activity leading to the reductions. In both scenarios, emission reductions are credited to an entity that didn't perform the activity leading to the emission reductions. The precedent allowing averaging and trading seems to indicate this may be permissible under 111(d). Further, if EPA wanted to link emission reductions due to end-use energy efficiency directly to a specific power plant, it could do so through the use of dispatch algorithms. Some stakeholders are investigating the possibility of dispatch modifications (such as shifting away from coal-burning plants and increasing the use of natural gas plants) as a way to reduce greenhouse gas emissions from power plants (C2ES 2013b). End-use energy efficiency could be factored into such a system.

In addition, the New Source Review (NSR) program[9] in the Clean Air Act may offer some precedent to inform an approach where emission reductions due to energy efficiency can be attributed to a specific power plant. Power plants that wish to avoid requirements imposed through NSR may instead implement artificial limitations on their potential to emit through permits that limit the total number of hours a facility may operate in a year. These commitments are incorporated into the power plant's Title V operating permit. A similar approach under 111(d) may be possible if regulated sources accept operational limitations reflective of an amount of generation that is offset by the energy efficiency programs run by the facility. For example, if a coal-fired power plant must reduce its emissions under 111(d) and it wishes to use energy efficiency to achieve that goal, it could subsidize an energy efficiency program that saves 1,000 MWh of electricity. To demonstrate that the reduced demand translates into emission reductions at that unit, the power plant could then agree to a reduction of 1,000 MWh of generation relative to a baseline period.[10] This would ensure that the efficiency savings were realized by that specific facility. It would also enable regulators to determine the amount of pollution reduced with a great deal of accuracy. Using this approach, the reduction in generation that is created by the energy efficiency program would be linked directly to a specific source.[11]

A somewhat broader reading of the flexibility permitted under Section 111(d) is to assume that emission reductions from the power sector as a whole can be considered when determining compliance with the performance standard. Under this approach, reductions from end-use energy efficiency do not necessarily need to be tied to a particular power plant. This view would potentially allow for greater flexibility and trading of emissions reductions, allowing the lowest-cost emission reductions to be used for compliance (Lashof et al. 2013).This approach could also allow for the inclusion of activities that reduce emissions from the sector as a

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[9] New Source Review (NSR) is a preconstruction permitting system intended to ensure new or modified stationary sources of pollution did not significantly degrade air quality. NSR requirements set limitations on emissions and, once finalized, are then incorporated into Title V operating permits, which are issued by states.

[10] Electricity losses through transmission and distribution will need to be factored into these calculations in order to assure realized emissions reductions equate to proposed artificial reductions in electricity generation.

[11] There are many more issues that would need to be resolved if this approach were to be adopted. For example, a regulator may want to avoid crediting reductions in operation that might have occurred anyway or occurred for reasons other than savings from end-use energy efficiency. ACEEE believes these issues could be addressed in the context of a rulemaking to avoid "gaming" of the system, largely through reliable EM&V and establishment of a comprehensive system for crediting and compliance.

whole—such as end-use energy efficiency. In addition to lowering the costs, this approach also makes more sense from an environmental standpoint as greenhouse gases don't have localized impacts, but rather the environmental and health harms that regulation is intended to address are global in nature. Therefore, linking the emission reductions to a geographic location may add an administrative burden with little or no benefit and therefore should only be done if EPA and the courts determine that adding such tracking is needed to comport with the law. Absent such tracking, there are many policy approaches that could work.[12]

Additional Resources:

The National Resources Defense Council's (NRDC) proposal for regulating greenhouse gas emissions from existing power plants can be found here: http://www.nrdc.org/air/pollution-standards/files/pollution-standards-report.pdf.

For information on the Regional Greenhouse Gas Initiative, an interstate, market-based, regulatory program that employs energy efficiency, as well as other measures, to reduce greenhouse gas emissions in the northeast United States, see: http://www.rggi.org/.

For information on the program design of the Western Climate Initiative (WCI), a market-based program similar to RGGI composed of states and Canadian provinces in western North America, visit: http://www.westernclimateinitiative.org/the-wci-cap-and-trade-program/program-design.

Establishing a Baseline

A "baseline" can mean many things in the context of end-use efficiency and air quality. Here we are specifically addressing which of the savings from energy efficiency policies and efforts should count as "new" and which, if any, should be included in a baseline. The difference between new savings and baseline savings is (generally) the amount of savings that should be counted as achieving emissions reductions for purposes of a Section 111(d) rule. We are recommending that baseline savings as we define them here should *not* count toward compliance with the new rule, but rather would be calculated as part of the baseline against which future activity is compared once a rule goes into effect.

Most states have some experience with energy efficiency policies. In addition to individual utility-run programs, 25 states have mandatory energy savings targets also known as Energy Efficiency Resource Standards (EERS) (ACEEE 2013a). Some states have been implementing energy efficiency programs for decades while others have only just begun to undertake energy efficiency in earnest.[13] This difference in experience means that some states have already implemented policies that achieve some of the largest opportunities for cost-effective energy efficiency, while others have only begun to tap the well. It also means that states with more experience will have a wealth of experts and knowledge upon which to tackle issues that arise in the adoption of energy efficiency policies, whereas states with little or no experience are just

[12] One of the most prominent proposals being discussed has been put forth by NRDC (Lashof et al. 2013).
[13] For example, California has required utilities to meet an energy efficiency resource standard since 2004 (ACEEE 2013a) while Mississippi's Public Services Commission just issued rules in 2013 that will establish long-term energy efficiency targets (ACEEE 2013b).

beginning to build that workforce and expertise. In addition to these important differences, past implementation of policies and measures will influence future savings and must be addressed in the establishment of a baseline. For example, a state that implements a policy in the year 2000 requiring energy savings of 1% per year may include a ramp-up period where the annual savings goal increases gradually, allowing time for programs to be put in place. At some future year (say 2005), the 1% annual goal is achieved and the state will continue to save an additional 1% per year from 2005 forward. This example demonstrates some facets of timing involved with implementing a *policy*.

In contrast is the timing of *measures* used to implement a policy. In 2005 the same state would have implemented energy efficiency measures to achieve its 1% savings goal for that year. The exact measures may vary, but most will continue to accrue savings in future years. For example, if a building is upgraded with insulation and air sealing, that building is likely to continue being used for decades to come. The benefits of the energy efficiency upgrades installed in 2005 will also exist in 2006, 2007, and onward. Typically these future year benefits would not count towards a state's annual savings goal in future years. This means that the improvements to a building in 2005 can count towards the savings goal in that year, but those improvements would not count towards achieving the 2006 goal, even though the benefits of the improvements are still accruing in 2006.

In the context of a 111(d) rulemaking it is important to be aware of the distinction between measures that have already been implemented and policies that have been adopted. A state that has already adopted an annual savings target has not yet taken action to achieve those reductions in future years and could revise its goals or change its laws. *Therefore, policies that require future-year savings should not be included in the calculation of a baseline for purposes of 111(d). In contrast, ACEEE recommends that measures that have been put in place in the baseline year or earlier, such as building upgrades, should be included in a baseline, and savings from earlier measures should not count for purposes of crediting emissions reductions.* See Table 2 below for examples of how this would work.

Table 2. Recommended Treatment of End-Use Efficiency Policies and Measures with Regard to a Baseline

Energy Efficiency Policy or Measure	111(d) Program Start Year	Treat Energy Savings as Baseline or New Savings?
An EERS is adopted in 2010 and measures are installed in 2011	2013	Baseline
An EERS is adopted in 2010 with an annual savings goal in 2014. Measures are installed in 2014 to achieve that goal.		New Savings -Savings begin in 2014 and continue for life of installed measures.
Energy efficiency measures are installed in 2010 and continue to accrue savings through 2020.		Baseline
Energy Efficiency measures are installed in 2014 and continue to accrue savings through 2024.		New Savings -Savings begin in 2014 and continue through 2024.

We recognize that views on the treatment of measures already implemented may diverge from ACEEE's recommended approach. Some parties may view early investments made by states as deserving of recognition. This may be particularly contentious when considering the treatment of capital-intensive renewable energy resources that have been constructed to comply with an existing renewable portfolio standard. There are some compelling arguments for crediting early investments such as these toward compliance with the rule. One argument is that 111(d) is a performance standard for sources. Unlike an ambient standard, one might argue, a performance standard is achieved when a certain ratio of emissions released relative to the amount of electricity generated is met (e.g., tons per MWh). Given this, sources could be meeting the performance standard before it is even set and the question of when the renewable generation or energy efficiency began isn't very important. It remains somewhat unclear how early activities such as end-use energy efficiency or renewable generation might be treated. For example, a regulatory system may be proposed that aggressively seeks to require additionality,[14] or rather, to only award emission reduction credit to projects that would not have been initiated in a business-as-usual scenario. A regulatory scheme such as this may only count emissions-reducing measures enacted after a 111(d) rule is put in place. If additionality requirements are too complex or burdensome, they may discourage the use of energy efficiency and other cost-effective compliance strategies and therefore we recommend keeping them simple, such as the baseline approach discussed above.

Once a rule is drafted and a start date is specified, it is very likely the rule may be challenged in court. A court challenge could delay the rule by years. In the meantime, states and utilities may delay making investments in energy efficiency and renewable generation for fear that those investments would be counted in the baseline rather than towards compliance with the rule. To address this concern, the rule can specify a year in which reductions begin to count. While a court could throw out such a provision, it may provide improved certainty as to a start date and/or baseline.

The idea of a baseline as described above can be thought of as a starting place. The following sections discuss methods to define, identify, and measure "new" savings that occur beyond the baseline.

Determining the Types of Energy Efficiency Programs and Measures to Credit

As discussed earlier, the pool of untapped energy efficiency is massive. It may be, however, that only a subset of the potential savings are appropriate for crediting towards compliance with 111(d). Though it is somewhat unclear what criteria might be required if energy efficiency is to be credited under 111(d), past treatment of this issue by EPA might inform an approach under this rulemaking. Specifically, minimum requirements outlined by EPA in the context of state implementation plans (SIPs) used to comply with National Ambient Air Quality Standards (NAAQS) may be relevant here. In the NAAQS context, activities must be:[15]

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[14] In many EPA rules, the condition of "additionality" must be met. Additionality essentially means that the compliance activity is beyond what would have happened anyway in a business-as-usual scenario.

[15] See a brief description of each beginning on page 11 here: http://www.aceee.org/research-report/e122. A more detailed discussion of these elements as they relate to energy efficiency can be found starting on page 6 of appendix F of the EPA Roadmap available here: http://www.epa.gov/airquality/eere/pdfs/appendixF.pdf.

- Quantifiable—the measure must have a quantifiable effect on emissions.
- Surplus—the emissions reductions attributable to the measure must be in surplus of any other reductions (no double counting).
- Enforceable—the measure must be legally enforceable.
- Permanent—the measure must be permanent, meaning the emissions reductions from the measure must continue through the future attainment year, unless it is replaced by another control strategy or no longer needed (EPA 2012).

Guidance issued in 2012 by EPA outlines how energy efficiency policies and programs can be designed to meet these elements (EPA 2012). Fortunately, some of the largest end-use efficiency opportunities can be structured to meet these elements. While these major policies can help states obtain significant emission reductions, flexibility in programs and measures that can qualify is key because states differ in their economic structure, strengths, and past experience. End-use energy efficiency opportunities often become available due to innovation and new technologies. Flexibility in what programs and measures can be included in a state's portfolio will allow states to identify the lower-cost greenhouse gas reductions and employ new technological improvements as they become available in future years.

Additional Resources:

For more information on current EPA guidance on incorporating energy efficiency into state implementation plans, see the EPA's 2012 Roadmap on the subject, available here: http://www.epa.gov/airquality/eere/manual.html.

For additional information on the current potential of energy efficiency in meeting air quality standards, see ACEEE's paper *The Slip Switch to a New Track Toward Compliance with Federal Air Regulations* (2012), available here: http://aceee.org/research-report/e122.

Identifying an Approach to Evaluation, Measurement, and Verification

Evaluation, measurement, and verification is a process that demonstrates the amount of energy saved with end-use energy efficiency programs by providing accurate, transparent, and consistent assessments of performance. Calculating savings allows states to report the effects of individual measures and entire programs. One central objective is to determine how much savings to attribute to an energy efficiency program as opposed to other factors (such as weather). Rigorous EM&V of the energy efficiency program savings is vital to demonstrate and document that these programs accomplish their goals.

While there is currently no national EM&V standard approach, most states have developed approaches of their own or adopted approaches used in other states. Some stakeholders may fear that the lack of a national standard means there is no reliable method for measuring and verifying energy savings resulting from efficiency measures. To the contrary, the lack of a national standard for EM&V has left states to develop their own protocols. These efforts have resulted in a well-developed and rich source of experience and information that can inform the development of national standards. Most states have some form of EM&V to evaluate savings from utility-run programs. Currently more than half of all U.S. states have statewide efficiency targets and are measuring their progress towards achieving those goals in a uniform way across utilities. States and utilities have been demonstrating energy savings resulting from efficiency measures for decades. In many cases, a utility's authority to collect revenues is based on its ability to verify, with substantial certainty, the amount of savings that occurred. This has caused utilities to invest significant resources into solid EM&V methods that stand up to the scrutiny of regulators and ratepayer advocates. These methods provide a good foundation for measuring the effect of energy efficiency investments in the context of 111(d).

While there are still some variations among states, in recent years a variety of national and regional efforts have promoted increased uniformity across states. The State and Local Energy Efficiency Action Network and DOE's "Uniform Methods Project," as well as important regional (e.g., NEEP) and state (e.g., California) activities, are all aimed at increasing consistency and uniformity in EM&V (see Additional Resources at end of this section).

In the context of 111(d) there may be a tension, however, between the need to develop an approach to assure reductions attributed to end-use energy efficiency are meaningful in each and every state as well as fungible so that credits can be traded across states, if trading is permitted as part of the rule. This goal of consistency must be balanced against the fact that some states have decades of experience and have invested significant sums of money and staff resources to establish a workable approach to EM&V as well as a workforce of experts who understand the approach. Further, Section 111(d) allows flexibility for states and EPA has shown a propensity to allow states flexibility in the area of EM&V.[16]

We recommend continued work on national and regional guidelines and methods for EM&V. Given the value of flexibility under 111(d), the importance of maintaining a level playing field across states, and the need to ensure the valuation and equivalence of an activity, ACEEE recommends that as part of a 111(d) rulemaking EPA issue some guidance on minimum standards for EM&V. Guidelines should require that states document their approach to EM&V, be transparent, and include a public process for accountability from all stakeholders (including ratepayer advocates, etc.). This guidance should draw upon existing state and regional experience and allow flexibility for states to apply approaches they have already developed as long as those approaches meet credible minimum standards and emission reductions are rigorously verified and quantified. In identifying the minimum standards, EPA should be conscious that layering additional administrative burdens can cause the cost of end-use energy efficiency to increase and may cause states and utilities to shy away from its use.[17] Some aspects of EM&V that EPA should consider establishing minimum standards for include:

- Establishment of some guidance on what activities might be credible, such as defining minimum standards for new construction and equipment replacement, so savings for credible activities can be assessed relative to noncreditable new construction or equipment replacement;
- When and how often deemed savings assumptions need to be verified and revised;

[16] EPA has issued multiple forms of guidance on this topic; however, it has often chosen to defer to state governments to devise tailored EM&V protocols. In the case of NAAQS, EPA has issued comprehensive guidance on EM&V, yet still allows individual states some discretion in devising EM&V approaches.

[17] The administrative cost of utility energy efficiency programs are often passed on to consumers through adjustments to electricity rates. Additionally, some states may not have room in their budgets to implement costly administrative structures to satisfy potential EPA requirements. By ensuring low costs of administration, programs are more likely to be effective and more widely adoptable.

- Whether and how third-party verifiers need to be engaged;
- How to treat gross versus net savings,[18] and
- The appropriate measure life[19] of common measures.

These are just a few important considerations. Table 3 below lists some of the most common approaches to different aspects of EM&V currently in use in states.

Table 3. Most Common State Approaches to Key Aspects of EM&V

Aspect of EM&V	Most Common Approach	Percent of Respondents Using this Approach	Number of States Responding
Parties conducting evaluation of program savings	Consultants/contractors	79%	43
Legal authority for evaluation of programs	Mandated by legislation Regulatory order	45% 45%	44
Process for evaluation	Rules in writing No rules in writing	56% 44%	43
Life of measure values	Most states use a combination of measure life that varies by program or measure from 3-35 years.	77%	37
Determination of measure life	In most states the measure life is developed by the utility, but in many this determination is based on a savings database.	50% and 40%, respectively	40
Top down vs. bottom up savings	Most states use a bottom up or per measure approach to measuring, though many use a combination of approaches.	60% and 37%, respectively	38
Gross vs. net savings	Net savings or some combination of both net and gross are the most common approaches.	71% combined total	42
Deemed savings	Most states use deemed savings values.	86%	42
Sources for deemed savings	Most values are taken from databases or sources in other states.	70%	37
Treatment of deemed savings	Most states make adjustments to deemed savings based on the results of evaluations in their states.	80%	35

Source: Kushler et al. 2012

Model guidance from EPA on EM&V could initially be structured as a sort of "menu" of acceptable approaches based on state experience and could be modified over time to improve consistency across all states. The information in Table 3 and additional available resources can be used to help develop a menu of acceptable approaches. One example of an approach that

[18] Gross savings are the total amount of savings achieved through program-promoted actions, without taking into account other causal factors for these actions, such as self-motivation. The concept of net savings accounts for these factors and eliminates free-riders and energy savings which would have occurred under business-as-usual conditions.

[19] Measure life is the length of time one action will yield energy savings before requiring replacement.

should be considered has been proposed by, the Regulatory Assistance Project (RAP), whereby savings from the measures implemented within a policy or program would be aggregated in order to minimize the administrative burden of measuring and quantifying energy savings (Shenot 2013). This approach could help to resolve some of the challenges that may arise as air regulators grapple with accounting for energy efficiency in the context of 111(d) rulemaking.

Additional Resources:

The most recent revision of the Model Energy Efficiency Program Impact Evaluation Guide, a document published by DOE, is available through the SEE Action Network here: http://www1.eere.energy.gov/seeaction/pdfs/emv_ee_program_impact_guide.pdf.

The State and Local Energy Efficiency Action Network (SEEAction) is maintained by the U.S. Department of Energy and offers multiple resources through its EM&V Portal, available here: http://www1.eere.energy.gov/seeaction/emv_resource_portal.html.

In April of 2013, DOE published the first set of protocols for its Uniform Methods Project. These can be found here: https://www1.eere.energy.gov/office_eere/de_ump.html.

The International Performance Measurement and Verification Protocol (IPMVP) is an internationally used resource offering information on best practices for EM&V, as well as serving as a framework facility operators can use to assess performance. It is available here: http://www.evo-world.org/index.php?option=com_content&view=article&id=272&Itemid=379&lang=en.

For information on EM&V efforts in the Northwest, visit the Regional Technical Forum, an advisory committee that develops regional EM&V standards to evaluate energy savings. It is available at http://rtf.nwcouncil.org/.

For information on EM&V efforts in the Northeast, visit NEEP's EM&V Forum, available here: http://neep.org/emv-forum/.

For more information on common evaluation and measurement in states, see the ACEEE report entitled *National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs,* available here: http://aceee.org/research-report/u122.

The State of California maintains its own EM&V protocol. Information on the California method can be found in a California Public Utilities Commission report from 2006, available here: http://www.calmac.org/events/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf,

Conclusion

The President has called on EPA to propose a rule regulating greenhouse gases from existing power plants with a year. The language of Section 111(d) appears to give EPA a great deal of flexibility in how it defines the best system of emissions reduction and on what guidance it provides to states. If EPA is to establish a rule that achieves meaningful reductions in carbon dioxide emissions at the lowest cost possible, it should include end-use energy efficiency when determining what is achievable and allow it to be used as a means to comply with those goals. Because this is largely new territory, there are many aspects of how end-use energy efficiency should be treated that must be resolved. Fortunately, many states in the United States have decades of experience developing and implementing best practices that can serve as a guide for how a federal rulemaking should work. By drawing from state experience, as well as EPA precedent when handling similar regulatory processes, a comprehensive regulatory structure can be drafted that provides for flexibility among state approaches and acknowledges the potential of end-use energy efficiency to reduce greenhouse gas emissions.

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