Incentivizing and Providing Appropriate Credit for Energy Efficiency Improvement in Forthcoming CO_2 Emissions Standards for Existing Power Plants

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The **Midwest Energy Efficiency Alliance (MEEA)** is the leading source for energy efficiency information and action in the 13-state region. MEEA raises awareness, facilitates programs and strengthens policies to support and maximize energy savings through efficiency. For more information, visit www.mwalliance.org.

The **Northeast Energy Efficiency Partnerships (NEEP)** is a non-profit organization whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency in the building sector through public policy, program strategies and education. For more information, visit www.neep.org.

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The **Southeast Energy Efficiency Alliance (SEEA)** is a regional energy efficiency organization that serves 11 southeastern states and drives market transformation in the region's energy efficiency sector as a convener for collaborative public policy, thought leadership, programs and technical advice. For more information, visit www.seealliance.org.

The **Southwest Energy Efficiency Project (SWEEP)** is a public interest organization dedicated to advancing energy efficiency in Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming. For more information, visit www.swenergy.org.

Introduction

On June 25, 2013, President Obama issued a Presidential Memorandum directing the U.S. EPA to “issue carbon pollution standards, regulations, or guidelines, as appropriate, for modified, reconstructed and existing power plants.” Under the directive, the EPA must issue proposed standards or guidelines by June 1, 2014 and final standards or guidelines by June 1, 2015. The directive is based on the authority provided in Section 111(d) of the Clean Air Act. The Memorandum also directs the EPA to require that States submit plans for implementing the carbon emissions standards, and that the regulations require such plans be submitted no later than June 30, 2016. Furthermore, the Memorandum directs the EPA to engage with states and other stakeholders, tailor regulations and guidelines to reduce costs, develop approaches that allow regulatory flexibility, and support continued development and deployment of cleaner technologies and energy efficiency.

Assuming the EPA moves forward with issuing carbon emissions standards or guidelines that apply state-by-state and then trigger state plans, the question arises as to how the standards or guidelines can best support and give appropriate credit for efforts that utilities, states and other entities take to increase the efficiency of electricity use and thereby reduce future electricity consumption. This is important because it is widely recognized that energy efficiency improvement is the lowest cost utility resource, with utility energy efficiency programs typically costing two to three cents per kWh saved (utility cost only), compared to costs of six cents per kWh or greater for new sources of electricity supply whether fossil fuel-based, nuclear power or renewable energy resources.[1] In addition, increasing the efficiency of electricity use provides a wide range of environmental benefits, not just reduced carbon emissions. Energy efficiency improvements support job creation and economic growth, enhance the reliability of the electric grid, improve public health and reduce power sector risks.[2] Thus, it makes eminent good sense for EPA to strongly support and give appropriate credit for a wide range of cost-effective energy efficiency initiatives as part of the forthcoming carbon emissions standards.

Crosscutting Issues

One important issue that EPA has identified related to establishing CO_2 performance standards for existing power plants is the level of flexibility that states are given.[3] From the perspective of fully supporting cost-effective energy efficiency measures as well as other

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[1] M. Molina. 2013. “Still the First Fuel: National Review of EE Resource Costs.” Presentation at the National Energy Efficiency as a Resource Conference. American Council for an Energy-Efficient Economy, Washington, DC. Sept. K. Friedrich, et al. 2009. *Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs.* American Council for an Energy-Efficient Economy, Washington, DC. http://www.aceee.org/sites/default/files/publications/researchreports/U092.pdf

[2] J. Lazar and K. Colburn. 2013. *Recognizing the Full Value of Energy Efficiency*. Regulatory Assistance Project, Montpelier, VT. http://www.raponline.org/document/download/id/6739 Also, H. Geller, et al. 2012. *The $20 Billion Bonanza: Best Practice Electric Utility Energy Efficiency Programs and Their Benefits for the Southwest*. Southwest Energy Efficiency Project, Boulder, CO. http://www.swenergy.org/programs/utilities/20BBonanza.htm

[3] “Considerations in the Design of a Program to Reduce Carbon Pollution from Existing Power Plants.” U.S. Environmental Protection Agency. Washington, DC. Sept. 23, 2013.

strategies to reduce the cost of compliance with CO_2 emissions standards, it is important to provide broad flexibility by:

1) allowing compliance across affected power plants within a state,
2) allowing banking and trading of emissions reduction credits, and
3) allowing credit for emissions reductions from "outside the fence" measures such as end-use efficiency improvements or distributed generation technologies.[4]

The systems approach is far preferable to an approach that applies the standards plant by plant without allowing averaging, banking or trading, and will help to minimize compliance costs.

Second, it is important to support energy efficiency policies and programs that are implemented at either the state, utility, or local levels. This is necessary because some energy efficiency policies are adopted by states (e.g., statewide building energy codes, state appliance efficiency standards, or financial incentives such as state income tax credits for energy efficiency measures); some are implemented at the utility level (e.g., energy savings goals/standards and energy efficiency programs designed to achieve the goals/standards); and some are implemented at the local level (e.g., building energy codes in home rule states or local building retrofit ordinances). All such policies and programs can contribute to a "best system of emissions reduction" which is the language specified in Section 111(d) of the Clean Air Act for the purpose of establishing emissions reduction standards.

Third, another key issue is whether the performance standards that EPA sets are specified in terms of *maximum allowed tons* of carbon dioxide emissions that decline over time or in terms of *maximum allowed rates* of carbon dioxide emissions rates (pounds or tons per MWh) that decline over time. The former is the mass-based emissions reduction approach, the latter is the emissions rate reduction approach. As explained below, the mass-based emissions approach is preferable from the perspective of supporting and giving appropriate credit for any and all energy efficiency improvements.

The EPA has asked for feedback on a number of other issues including whether the performance standards should be uniform nationally one level for all of the the covered sources in a state or tailored to each subcategory of sources. These broader issues are beyond the scope of this paper.

Advantages of the Mass-based Emissions Reduction Approach

The mass-based emissions reduction approach presumably would establish CO_2 emissions requirements (tons) that would decline over time for existing power plants, by state. Important issues include how baseline emissions are determined for each state, the rate of decline in the statewide emissions allowances relative to the baseline, whether emissions allowances are

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[4] S. Hayes and G. Herndon. 2013. *Trailblazing Without Smog: Incorporating Energy Efficiency into Greenhouse Gas Limits for Existing Power Plants.* American Council for an Energy-Efficient Economy, Washington, DC. http://www.aceee.org/sites/default/files/publications/researchreports/e13i.pdf. Also, see *Structuring Power Plant Emissions Standards Under Section 111(d) of the Clean Air Act*. M.J. Bradley and Associates. Oct. 2013. http://www.mjbradley.com/sites/default/files/Options%20for%20Regulating%20Power%20Plants%20Under%20Section%20111%20Final.pdf

given out for free or auctioned off, length of compliance periods, treatment of electricity imports and exports, treatment of emissions from new power plants that replace older plants, and the availability (or not) of backstop allowance purchases. Most of these issues are beyond the scope of this paper, but some are addressed below.

If a state is required to or chooses to use a mass-based approach to meeting the standards or guidelines (assuming this approach is at least allowed by the EPA), the state would develop a plan for meeting the standards or guidelines in accordance with the complete set of rules established by the EPA. If broad flexibility is provided to states as suggested above, state plans would indicate how emissions allowances are allocated to the owners of different fossil fuel-based power plants, and other initiatives that a state is taking to meet the standards.

The mass-based reduction approach would support and give appropriate credit for any and all energy efficiency efforts. Anything a state, utility, local authority or other entity does to increase the efficiency of electricity use will reduce electricity consumption (relative to consumption without the energy efficiency initiative) and therefore reduce power plant operation and emissions (as long as fossil fuel-based plants operate on the margin at least part of the time).[5] This helps the state, and owners of power plants within the state, to achieve the specified CO_2 standard or guideline. An important caveat to this point is that displaced generation does not respect utility or state boundaries. Energy efficiency improvements as a result of utility energy efficiency programs, for example, could displace generation owned by a different utility or by an independent power producer. This issue is discussed further below.

There is a wide array of policies and programs that could be used to reduce emissions including (but not limited to):

- utility/ratepayer-funded energy efficiency programs
- state or local building energy codes
- state efficiency standards on products not regulated by the federal government
- pricing policies that reduce electricity use
- state participation in regional efforts to transform markets related to energy efficiency
- energy efficiency initiatives for the public sector
- policies or programs that promote adoption of combined heat and power (CHP) systems
- education and training programs that reduce electricity use
- energy efficiency financing or financial incentive programs at the state or local level.[6]

All such efforts would help a state, and the utilities within the state, comply with CO_2 emissions reduction requirements for existing power plants at lowest cost; i.e., avoiding implementation of

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[5] Energy efficiency efforts may reduce absolute electricity consumption in some states, or they may reduce the rate of growth of electricity consumption in other states. In either case, the same principles apply.

[6] The wide array of energy efficiency policies and programs implemented by states are described in detail in a database maintained by ACEEE, http://www.aceee.org/sector/state-policy. Also, see "An Energy Efficiency Primer for Governors." National Governors Association, Washington, DC. Sept. 2013. http://www.nga.org/cms/home/nga-center-for-best-practices/center-publications/page-eet-publications/col2-content/main-content-list/an-energy-efficiency-primer-for.html

other more costly emissions reduction measures and/or helping to suppress emissions allowance prices.

The mass-based emissions reduction approach also gives accurate and appropriate credit to all of these potential policies or programs in that each would directly reduce carbon dioxide emissions and help the state comply with its requirements. The amount of emissions reduction from each and every energy efficiency policy is uncertain (see discussion below), and does not need to be accurately known. If the policy or program is effective it will reduce emissions to some degree and there will be the right amount of credit; i.e., the amount of reduction actually occurring over time. Conversely if the policy or program is ineffective, there will be little or no emissions reductions. There is no need to evaluate the effectiveness of each policy and program in reducing CO_2 emissions, monitor how the reductions change over time, and then provide "credit" for the estimated reductions. If declining mass-based emissions requirements are adopted to limit CO_2 emissions from power plants, no additional emissions reduction credits for energy efficiency efforts are needed or appropriate. In fact, providing additional credits would be "double counting" of emissions reductions that are already captured through the direct reduction in emissions (see numerical example provided in the Appendix).

Returning to the issue of displaced generation not necessarily respecting utility or state boundaries, we have the following comments. Once again, energy efficiency policies and programs are implemented at either the state, local or utility level. In some cases multiple utilities collaborate in energy efficiency program implementation; e.g., rural electric cooperatives served by the same generation and transmission company. In the case of state and local energy efficiency initiatives, energy savings are likely to lead to in-state emissions reductions for the most part and thus help the state meet its CO_2 emissions standards or guidelines.[7] Regarding utility energy efficiency programs, in many cases the displaced generation will be primarily from power plants owned by the utility, at least in states with integrated utilities that are responsible for electricity generation, transmission and distribution.

In the case of utilities that engage in considerable power exchange or in states with deregulated wholesale power markets, two or more utilities could agree to comply with their emissions standards jointly, particularly if both rely upon end-use energy efficiency improvement as a major emissions reduction strategy. In the case where there is considerable interstate power exchange (as in New England, for example), two or more states could agree to comply with their emissions standards or guidelines jointly. In other words, there could be inter-utility or interstate trading of emissions reductions. We suggest that the EPA allow any of the above compliance strategies, as long as its overall performance standards or guidelines are met.

If there is no need to rigorously evaluate each and every energy efficiency policy or program to determine its contribution to actual observed CO_2 emissions reductions, how should a state include and promote energy efficiency improvement as a compliance strategy within its state plan? The Clean Air Act requires that traditional emissions reduction measures included in

[7] According to U.S. EIA data, nine states (CA, DE, ID, MD, MI, MN, NJ, TN and VA) import more than 20% of the electricity consumed in the state on a net basis. And only five states (DE, ID, MD, MA and VA) import more than 30% of the electricity consumed in the state. http://eia.gov/electricity/state/

State Implementation Plans (SIPs) under Section 110 of the Clean Air Act be real, surplus, permanent, quantifiable and enforceable.[8] The EPA issued a *Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans*.[9] The Roadmap describes four pathways that states and tribes can use to incorporate energy efficiency and renewable energy policies and programs into their implementation plans. However, the Roadmap is directed to SIPs that are required when an area is designated as nonattainment for a National Ambient Air Quality Standard (NAAQS). It is not clear or necessary that these requirements apply to state plans that will be developed after the EPA establishes CO_2 emissions performance standards and related rules under Section 111(d) of the Clean Air Act.

To encourage inclusion of a wide range of energy efficiency policies and programs in state plans to under a mass-based emissions allowance approach, the EPA should direct or at least encourage states to include cost-effective energy efficiency to the maximum degree feasible. This directive could apply to both demand-side and supply-side energy efficiency improvements, in order to reduce compliance costs while providing other associated economic and environmental benefits.

Each state plan should explicitly include energy efficiency initiatives within its overall efficiency "portfolio" with an estimate of the impact that these initiatives would have on electricity usage and CO_2 emissions over time (using EPA-approved models that translate energy savings to CO_2 emissions reductions, examples of which are mentioned below). While requiring states to estimate the impact of efficiency in state plans, the EPA should give states broad flexibility to implement efficiency initiatives to maximize impacts and economic benefits. This would enable states to readily integrate efficiency with other emissions reduction strategies such as increases in renewable energy generation or retirement of older, highly polluting power plants to the degree necessary to meet the CO_2 emissions standards or guidelines, and to do so at least cost given assumptions about population growth, economic growth, and other factors that affect the demand for electricity.[10]

As state compliance plans are implemented, the impacts of energy efficiency initiatives could be estimated using evaluation, measurement and verification (EM&V) procedures adopted by each state. This would inform state policymakers as to the actual role of efficiency policies and programs to reduce system-level CO_2 emissions, and help policy makers undertake actions necessary to ensure that compliance is achieved. To monitor the role of efficiency in reducing CO_2 emissions, the EPA would likewise benefit from periodic state reports of the contribution of efficiency portfolios to achieving CO2 emissions reduction requirements.

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[8] K.A. Colburn, B.K. Hausauer, and C.A. James. 2012. *State Implementation Plans: What Are They and Why Do They Matter?* Regulatory Assistance Project, Montpelier, VT. www.raponline.org/document/download/id/508

[9] Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans. U.S. EPA, Washington, DC. Oct. 12, 2012. http://epa.gov/airquality/eere/

[10] It should be noted that if a state chooses to implement a cap and trade approach, it is not necessary to specify the different strategies that will be employed to meet the cap nor estimate how much emissions reduction will result from each strategy. The cap and trade allowance system will ensure that the standards are met.

Although EM&V procedures vary across states, some states are interested in increasing standardized transparency and consistency in EM&V practices at the regional level; e.g., in northeast states[11] as well as the national level.[12] This should lead to better quality evaluations and improved comparability of estimated efficiency impacts from state to state. Transparent and consistent reporting of EM&V methods and results could also contribute to a clearer understanding of the contribution and cost-effectiveness of efficiency to reduce system-level CO_2 emissions across the country. However, because compliance under a mass-based emissions allowance approach would be based on actual observed CO_2 emissions, rigorous EM&V of the impacts of specific efficiency policies and programs would not be needed by the EPA to demonstrate compliance. As is described further below, this is an important difference compared to the emissions rate approach which would require rigorous measurement and documentation of energy savings impacts in order to calculate efficiency credits.

The EPA could also require that state compliance plans include contingencies should electricity demand increase faster (or slower) than assumed due to energy efficiency initiatives being less (or more) effective than assumed, modified over time, etc. In fact, a state plan should include such contingencies whether or not energy efficiency improvement is a major component of the plan, because other factors that influence future electricity demand growth (such as population and economic growth) are also uncertain. In effect, there could be an enforceable requirement on the state to remedy any emissions reduction shortfall, for whatever reason, if elements of its state plan are not adequate for complying with the emissions standards or guidelines issued by the EPA under Section 111(d) of the Clean Air Act.

The mass-based emissions reduction approach does have a disadvantage of discouraging electrification of certain technologies that, while increasing electricity use, provide greenhouse gas (GHG) reductions and other environmental benefits from the broader societal perspective. One such technology is electric vehicles (EVs).[13] EVs in general reduce overall GHG emissions while increasing consumption of electricity and thus pollutant emissions from power plants. Utilities or states that are facing declining CO_2 emissions requirements could be challenged to promote the adoption of EVs. This may not be a concern in the next five years when adoption of EVs is likely to remain relatively limited, but it could be a significant issue in the medium and long term. We suggest that the EPA consider provisions that promote adoption of technologies that result in a net reduction in GHG emissions without penalizing utilities or states with respect to the CO_2 emissions standards set under Section 111(d) of the Clean Air Act.

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[11] In the Northeast, the Regional EM&V Forum is steered by a committee of utility commissioners and air regulatory representatives from ten jurisdictions in the northeast and mid-Atlantic regions. The Forum was formed to support the development and use of consistent protocols to evaluate measure, verify, and report the savings, costs, and emission impacts of energy efficiency measures. http://www.neep.org/emv-forum/about-the-emv-forum/index

[12] See, for example, Energy Efficiency Program Impact Evaluation Guide. DOE/EE-0829. U.S. Department of Energy, Washington, DC. Dec. 2012. http://www1.eere.energy.gov/seeaction/pdfs/emv_ee_program_impact_guide.pdf and the U.S. DOE EE Savings Protocols at https://www1.eere.gov/office_eere/de_ump_protocols.html

[13] D. Anair and A. Mahmassani. 2012. *State of Charge: Electric Vehicles' Global Warming Emissions and Fuel-Cost Savings across the United States.* Union of Concerned Scientists, Cambridge, MA. http://www.ucsusa.org/assets/documents/clean_vehicles/electric-car-global-warming-emissions-report.pdf

In summary, incentivizing and giving appropriate credit for emissions reductions from energy efficiency policies and programs is relatively simple and easy under the mass-based emissions reduction approach, as long as the EPA is flexible with respect to how the overall performance standards or guidelines are met by each state and the affected power plant owners within the state. Whether emissions allowances are auctioned off or distributed for free, states and utilities will have an incentive to implement the lowest cost emissions reduction strategies first if emissions must decline over time and significant actions must be taken to comply with the performance standards.

Disadvantages of the Emissions Rate Approach

The emissions rate approach presumably would establish a baseline CO_2 emissions rate (pounds or tons per MWh) for existing fossil fuel-based power plants in a state and require that this rate decline over time. The same issues listed above for the mass-based emissions reduction approach need to be addressed in the standards if the emissions rate approach is adopted. Once again, states would need to develop a plan for how emissions rate reductions are allocated to the owners of different fossil fuel-based power plants assuming a state averaging approach is adopted.

The emissions rate approach would not directly support energy efficiency efforts. Energy efficiency improvements in aggregate reduce the operation of power plants on the margin; i.e., the last plant operated in the dispatch order at any point in time, and most of the time this means fossil fuel-based power plants.[14] Thus energy efficiency improvements reduce power plant emissions, but they also reduce electricity consumption and production.

Energy efficiency improvements do not necessarily reduce the average emissions rate for the fossil fuel plants owned by a particular utility or located in a state. In fact, if the energy efficiency improvements reduce the operation of cleaner-than-average plants, they would actually increase the average emissions rate of a utility or state (assuming the average is weighted according to power plant generation). And this is often the case in the real world since natural gas-fired plants operate on the margin much of the time throughout the nation, while dirtier coal-fired plants tend to be baseload plants.[15] (This point is explained further in the numerical example in the Appendix.)

To provide a real world example, an in-depth study quantifying the emissions benefits from energy efficiency programs in Wisconsin found that the avoided emissions from energy efficiency programs is 1,801 pounds of CO_2 per MWh of generation when considering emissions on the margin at the time when energy savings are occurring.[16] For comparison, the overall average CO_2 emissions rate in the state is 2,346 pounds of CO_2 per MWh generated. Thus, end-

[14] *Assessing the Multiple Benefits of Clean Energy: A Resource for States.* U.S. Environmental Protection Agency. Washington, DC. Feb. 2010. http://www.synapse-energy.com/Downloads/SynapseReport.2010-02.EPA.Clean-Energy-Benefits.06-057.pdf

[15] Ibid.

[16] D. Sumi, K. Swayne and C. Stemrich, 2013. “Quantifying Emissions Benefits for Wisconsin’s Focus on Energy Program.” *Proceedings of the 2013 International Energy Program Evaluation Conference.* Chicago, IL. Aug.

use energy savings cut CO_2 emissions on the margin 23% less than average emissions in the state, per MWh of power generation. Based on these values, reducing electricity use by say 5% would increase the average emissions rate in the state to 2,375 pounds of CO_2 per MWh generated.

In short, energy efficiency improvements would contribute to reduced emissions in a state, but at the same time move the state further from, rather than closer to, its emissions rate reduction target using an average emissions rate approach. Likewise, under the average emissions rate approach, utilities would have an incentive to increase electricity consumption if it leads to increased operation of cleaner-than-average power plants. Doing so would increase absolute emissions, while at the same time reducing the generation-weighted average emissions rate and moving the state (or utility) closer to its emissions rate reduction standard.

To address this perverse incentive, some environmental and energy efficiency advocates have proposed separate emissions reduction credits for quantifiable and permanent energy efficiency improvements. For example, the Natural Resources Defense Council (NRDC) has proposed that such credits be allowed under an emissions rate approach for energy savings from qualifying state and local regulator-approved energy efficiency programs or from improved building or appliance efficiency standards adopted at the state level.[17] Under the NRDC proposal, CO_2 emissions credits would be issued by the state air regulator after verification of energy savings. In addition, the CO_2 emissions credits would need to come from energy efficiency efforts that are additional to those during the baseline period. The state air regulator would then distribute these emissions credits to sources that need them in some manner (NRDC suggests auctioning them). Those entities obtaining credits would use them to help achieve compliance with the required emissions rate.

The NRDC proposal attempts to encourage energy efficiency efforts while ensuring that energy efficiency credits are real and verifiable. It does address the problem of energy efficiency increasing rather than decreasing the average emissions rate. However, this concept has some limitations. First, the proposal would only allow credits for a limited set of energy efficiency efforts, not the full range of efforts that states, utilities and local authorities can and do undertake to increase energy efficiency and help consumers save energy. For example, no credits would be allowed for pricing policies, tax credits or education efforts that reduce electricity consumption. This is an important consideration as state energy efficiency potential studies have found that while utility energy efficiency programs offer the single largest amount of electricity savings potential, other state and local energy efficiency policies and programs in combination offer more savings potential than do utility programs.[18]

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

[18] See H. Geller, et al. 2007. *Utah Energy Efficiency Strategy: Policy Options*. Southwest Energy Efficiency Project, Boulder, CO. Oct. http://www.swenergy.org/publications/documents/UT_Energy_Efficiency_Strategy.pdf. Also, H. Geller, et al. 2008. *New Mexico Energy Efficiency Strategy: Policy Options.* Southwest Energy Efficiency Project, Boulder, CO. Nov. http://www.swenergy.org/publications/documents/NM_Strategy-November_2008.pdf

Second, as noted above, different states and utilities currently use various methodologies to evaluate energy savings. These methodologies are often approved either explicitly or implicitly by state public utility commissions for ratepayer-funded energy efficiency programs. While there is vast experience in evaluating the energy savings from energy efficiency policies and programs using a range of methods (e.g., deemed savings values, field-based measurement and verification, and large scale billing analysis, or a combination thereof), the level of rigor and cost to measure and verify savings is driven by the relative need for certainty and precision. In general, the more certainty and precision needed, the more costly the EM&V.

Under the average emissions rate approach allowing tradable efficiency credits to help demonstrate CO_2 emissions reduction compliance, it would be appropriate for the EPA to require a higher level of accuracy and precision to "document" the energy savings associated with the energy efficiency credits. This could increase the complexity and cost of efficiency as a compliance strategy relative to the mass-based emission reduction approach. As a result, under the emission rate approach, states would likely narrow the range of efficiency programs and policies offered for efficiency credits, thereby reducing the role of efficiency as an overall CO_2 emission reduction strategy and increasing compliance costs as other more costly emissions reduction strategies are pursued.

Third, even if energy savings are precisely estimated, there are challenges in accurately assessing displaced power generation and thus avoided CO_2 emissions.[19] A number of tools have been or are being developed to assist in such estimation, such as EPA's eGRID tool and the Avoided Emissions and Generation Tool (AVERT).[20] However, the actual level of emissions reduction is affected by the timing (load shape) for the energy savings which may not be accurately known. There is a paucity of measured data on load shapes as well as the load profiles of energy savings from various energy efficiency measures.[21] Also, future CO_2 emissions reductions on the margin can change over time in ways that are difficult to predict. Field-based studies to provide the needed load shape data are expensive and take significant time to conduct.

Fourth, there are likely to be challenges in the implementation of energy efficiency credits under an average emissions rate reduction approach. In particular, utilities will have an incentive to overstate energy savings "on paper" as it would maximize the credits received, while maintaining as much electricity generation from cleaner than average power plants as possible as this will help to reduce the average emissions rate. To reduce the average emissions rate, some utilities may simply promote greater electricity use, for example by promoting inefficient technologies such as electric resistance heating. State agencies (or some other entity) will need to carefully monitor energy efficiency credits as well as broader utility compliance strategies in order to minimize these potential problems.

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[19] The NRDC approach, it should be noted, does not require assessing avoided CO_2 emissions from end-use efficiency improvements. Rather it assigns a CO_2 emissions avoidance value to a given level of energy savings based on the average emissions rate of the system.

[20] A. Diem, C. Quiroz and M. Salhotra. 2013. "Using EPA's eGRID to Estimate GHG Emissions Reductions from Energy Efficiency." *Proceedings of the 2013 International Energy Program Evaluation Conference*. Chicago, IL.

[21] Complicating the determination of avoided emissions is the fact that the load profile of the energy savings for some efficiency measures will differ from the load profile of the device itself; for example, a variable speed control applied to a pump, compressor, blower or other device with variable load will not reduce power consumption by the same percentage at all times.

In summary, the average emissions rate approach does not directly support or encourage energy efficiency improvements because efficiency improvements do not reduce the emissions rate of particular power plants, and in most cases will increase the average rate of all the plants operated by a utility or located in a state, even though energy efficiency improvements reduce absolute emissions. Providing energy efficiency credits as some groups have suggested would help, but this approach has limitations and would need to be carefully monitored to minimize unintended consequences.

Why This Matters

Energy efficiency improvement is widely seen as a key strategy for reducing GHG emissions in both the near term and the long term, and for achieving deep, long term emissions reductions as cost-effectively as possible.[22] Thus it is critical to design emissions reduction policies, such as CO_2 emissions standards on existing power plants, that foster and support all types energy efficiency improvements, rather than making it difficult for energy efficiency to contribute or even discouraging energy efficiency improvements.

The stakes are significant, as the NRDC study referenced above shows. NRDC found that strong pursuit of cost-effective energy efficiency policies and programs could greatly reduce the cost of meeting CO_2 emissions standards for existing power plants, specifically standards that result in a 22% reduction in power plant CO_2 emissions nationwide by 2020 and a 34% reduction by 2025.[23] According to this analysis, the net economic savings from widespread energy efficiency improvements would offset most of the costs of implementing the energy efficiency measures and other emissions reduction measures in the next decade and fully offset the costs by 2030. Furthermore, NRDC estimates that the public health benefits would exceed the net compliance costs by a factor of 6 to 15, when cost-effective energy efficiency measures are used as the principal compliance strategy.

Another study, performed for six southwestern states (AZ, CO, NV, NM, UT and WY) found implementation of best practice utility energy efficiency programs during 2010-2020 could reduce electricity use in the region in 2020 by 21%, compared to a reference scenario without any utility energy efficiency programs.[24] Implementing the best practice efficiency programs would result in about $20 billion in net economic benefits for households and businesses in the region, and would reduce CO_2 emissions in the region by 31.6 million metric tons in 2020. This is a 15.5% reduction relative to projected CO_2 emissions without the energy efficiency programs.

[22] See Hayes and Herndon, 2013. Also, J. Creyts, et. al. 2007. *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?* McKinsey & Company and G. Keith, et al. 2011. *Toward a Sustainable Future for the U.S. Power Sector: Beyond Business As Usual 2011*. Synapse Energy Economics, Inc., Cambridge, MA.
[23] See Lashof et. al., 2013.
[24] See Geller et. al., 2012.

Additional Considerations

The EPA must also address how the CO_2 emissions standards for existing power plants will interact with and affect standards already in place at the regional or state levels. In the Northeast and Mid-Atlantic regions, nine states have adopted an emissions allowance program known as the Regional Greenhouse Gas Initiative (RGGI) in order to reduce CO_2 emissions from existing fossil fuel-based power plants using a market-based system. The effort has been successful with energy efficiency policies and programs implemented by states and utilities in the region helping to reduce emissions as well as lower the cost of emissions allowances that are sold through an auction process.[25] In RGGI, there is no requirement to identify the specific emissions reductions from every energy efficiency initiative, nor is there any sort of crediting system related to energy efficiency policies, programs and measures.

RGGI has also dispersed 66% of total auction proceeds, $545 million through the end of 2011, to help fund energy efficiency programs within participating states. This in turn has boosted funding for energy efficiency programs implemented by utilities and other program administrators in Northeast and Mid-Atlantic states. RGGI estimates that households and businesses will save $1.1 billion over the lifetime of the energy efficiency measures implemented through the programs it has funded.[26] Based on this very positive experience, we suggest that the EPA encourage states to use an auction approach to distributing emissions allowances, with some of the proceeds used to help fund energy efficiency initiatives. These initiatives could include state and local efficiency programs, as well as utility programs. However, we think it would be reasonable for the EPA to allow states to distribute allowances for free if they so choose, or to use a hybrid approach involving some combination of free and auctioned allowances.[27] The goal should be to have states meet the emissions standards at lowest cost, not micromanage how states get there.

California is also implementing a greenhouse gas emissions allowance program for the largest emitters in the state, starting with electric utilities and large industrial facilities. The goal is to return to 1990 levels of greenhouse gas emissions by 2020. Enforceable compliance obligations began Jan. 1, 2013.[28] The state is distributing emissions allowances for free initially, with the number of allowances declining two percent per year in 2013-14 relative to the baseline, and three percent per year starting in 2015, with the intent to move to auctioned allowances later in the program. Trading and banking of allowances is allowed. Once again, strong energy efficiency policies and programs are helping utilities and other covered entities comply with the standards, without a requirement to identify the specific emissions reductions from each and every energy efficiency initiative and without any sort of energy efficiency crediting system.

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[25] For details, see the RGGI web site, www.rggi.org.

[26] *Regional Investment of RGGI CO2 Allowance Proceeds, 2011.* Regional Greenhouse Gas Initiative. Nov. 2012. http://www.rggi.org/docs/Documents/2011-Investment-Report.pdf

[27] The auction approach is more likely to be adopted by states that have relatively limited emissions reduction requirements, while free distribution is more likely in states that have more demanding emission reduction requirements.

[28] For details, see http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm

Conclusion and Recommendations

Energy efficiency improvements could play a large role in helping states and utilities meet the forthcoming CO_2 emissions standards or guidelines for existing power plants at least cost. But the degree to which this occurs depends on the nature of the standards or guidelines adopted by the EPA. The most critical issues are: 1) the stringency of the standards; 2) whether the standards apply plant by plant or more broadly to utility systems or entire states; 3) whether the standards are based on mass-based emissions reduction requirements or an average emissions rate approach, or allow states to choose between these options; and 4) the flexibility allowed within state plans.

The mass-based emissions reduction approach would support all types of energy efficiency policies and programs, thereby enabling more stringent standards and greater GHG reductions. It would provide appropriate credit for actual energy efficiency improvements without the need for a rigorous and possibly complex energy efficiency evaluation and crediting system. The mass-based approach—coupled with flexibility within state plans to use energy efficiency policies and programs without limitation, and to allow inter-utility or interstate compliance—would help to maximize the use of energy efficiency as a CO_2 emissions reduction strategy thereby providing a host of economic, environmental and other non-energy benefits. Furthermore, the suggested approach has worked well in the RGGI program, and is also the approach that California is using.

In summary, we provide the following recommendations to the EPA as it crafts the CO_2 emissions standards or guidelines for existing power plants:

1) Follow the lead of RGGI and California by allowing and encouraging a mass-based emissions reduction approach in setting the CO_2 emissions performance standards for each state. At a minimum, allow either a mass-based approach or an average emissions rate approach to be used by all states, (not just the RGGI states and California). And if both approaches are allowed, strongly encourage use of the mass-based approach for the reasons described above and the fact that this approach provides more certainty regarding the absolute level of CO_2 emissions reductions over time compared to the emissions rate approach.

2) Direct or encourage states to pursue cost-effective energy efficiency initiatives to the maximum degree feasible within their state plans in order to reduce costs of compliance and provide the other benefits offered by energy efficiency improvements. Provide states flexibility by allowing compliance across affected power plants owned by a particular entity, across multiple utilities or plant owners, or across multiple states.

3) Allow states complying under a mass-based approach to include a wide range of energy efficiency policies and programs in their state plans, including those implemented at either the state, utility or local level. Indicate that state plans and implementation reports should include some estimation of expected impacts but do not require in-depth measurement and evaluation of each and every energy efficiency policy, program or measure.

4) Allow inclusion of energy efficiency policies and programs without limitation, as long as there is a commitment to implement the policy or program, and an enforceable requirement on the state to remedy any emissions reduction shortfall. In addition, require states to include contingencies in their state plan that indicate what would be done if CO_2 emissions do not decline as rapidly as projected for any reason.

5) Take into account the potential for substantial, cost-effective CO_2 emissions reductions from energy efficiency policies, programs and measures when establishing the levels of emissions reduction called for by the standards.

Appendix: Emissions Rate Reductions from Energy Efficiency Measures – A Numerical Example

Consider a coal-intensive utility that has fossil fuel generation of three types (baseload coal-fired power plants, combined cycle natural gas plants (CC), and natural gas peaking combustions turbines (CT)) with the following CO_2 emissions rates (which are typical of the different plant types and operating characteristics, assuming the fossil plants in total generate one million MWh per year:

- Coal plants: 2,200 lbs/MWh; 700,000 MWh of generation per year
- CC gas plants: 1,000 lbs/MWh; 250,000 MWh of generation per year
- CT gas plants: 1,600 lbs/MWh; 50,000 MWh of generation per year

The total emissions of the fossil plants taken together is:

Total emissions = 700,000 x 2,200 + 250,000 x 1,000 + 50,000 x 1,600 = 1,870 million lbs

The average emissions rate is 1,870 lbs/MWh.

Now assume that energy efficiency measures result in 2% electricity savings with 95% of the electricity savings backing out generation by CC gas plants and 5% of the savings backing out generation by the CT gas plants.[29] The amount of reduced electricity generation is 20,000 MWh: 19,000 MWh by the CC gas plants and 1,000 MWh by the CTs. The new level of CO_2 emission is:

New total emissions = 700,000 x 2,200 + 231,000 x 1,000 + 49,000 x 1,600 = 1,849.4 million lbs

This is about a 1.1% reduction in emissions. The new average emissions rate is:

New emissions rate = 1,849.4 million lbs/980,000 MWh = 1,887.1 lbs/MWh

The average emissions rate goes up because of the reduced generation by cleaner than average plants, even though total emissions go down.

Now let's assume that emissions reduction credits are also provided to help stimulate use of energy efficiency improvements as a compliance strategy in a situation where the utility (or combination of power plants) are required to (or decide to) reduce their average emissions rate as the primary approach to meeting EPA's CO_2 emissions standards. The amount of

[29] This is not an unreasonable assumption about the type of generation that will be avoided by a utility that has a mix of coal-fired plants operating primarily as baseload plants, with combined cycle gas plants and gas-fired combustion turbines for meeting peak load. For the purpose of determining the avoided costs from its energy efficiency programs, Xcel Energy in Colorado assumed in its 2012-13 DSM Plan that 98% of total electricity savings results in reduced generation by combined cycle gas plants and that 2% of total electricity savings results in reduced generation by gas-fired combustion turbines. Xcel assumes there is no operation of coal-fired plants on the margin, even though coal plants account for the majority of electricity production by the utility's fossil-based plants, nor does it assume any operation of renewable energy facilities on the margin.

credit awarded could be equal to the estimated emissions reduction due to implementation of the efficiency measures, and are purchased by the coal plants.

Emissions credits = 19,000 MWh x 1,000 lbs/MWh + 1,000 MWh x 1,600 lbs/MWh = 20,600 lbs

The coal plants have a new effective emissions rate equal to:

(700,000 x 2,200 – 20,600)/700,000 MWh = 2,170.6 1bs/MWh (a 1.3% reduction from their actual rate)

The new average emissions rate for the fleet of plants, with the EE emissions credits, is:

Emissions rate = (1519.4 + 231 + 78.4) million lbs/980,000 MWh = 1,866.1 lbs/MWh

This rate is below the original average emissions rate of 1,870 lbs/MWh, thereby "solving the problem" of energy efficiency improvements raising, rather than lowering, the average emissions rate. But it is only a 0.2% reduction in the original emissions rate.

In the approach proposed by NRDC, the amount of credit awarded is based on the average emissions rate of the overall group of power plants. In this case:

Emissions credits = 20,000 MWh x 1,870 lbs/MWh = 37,400 lbs

The coal plants have a new effective emissions rate equal to:

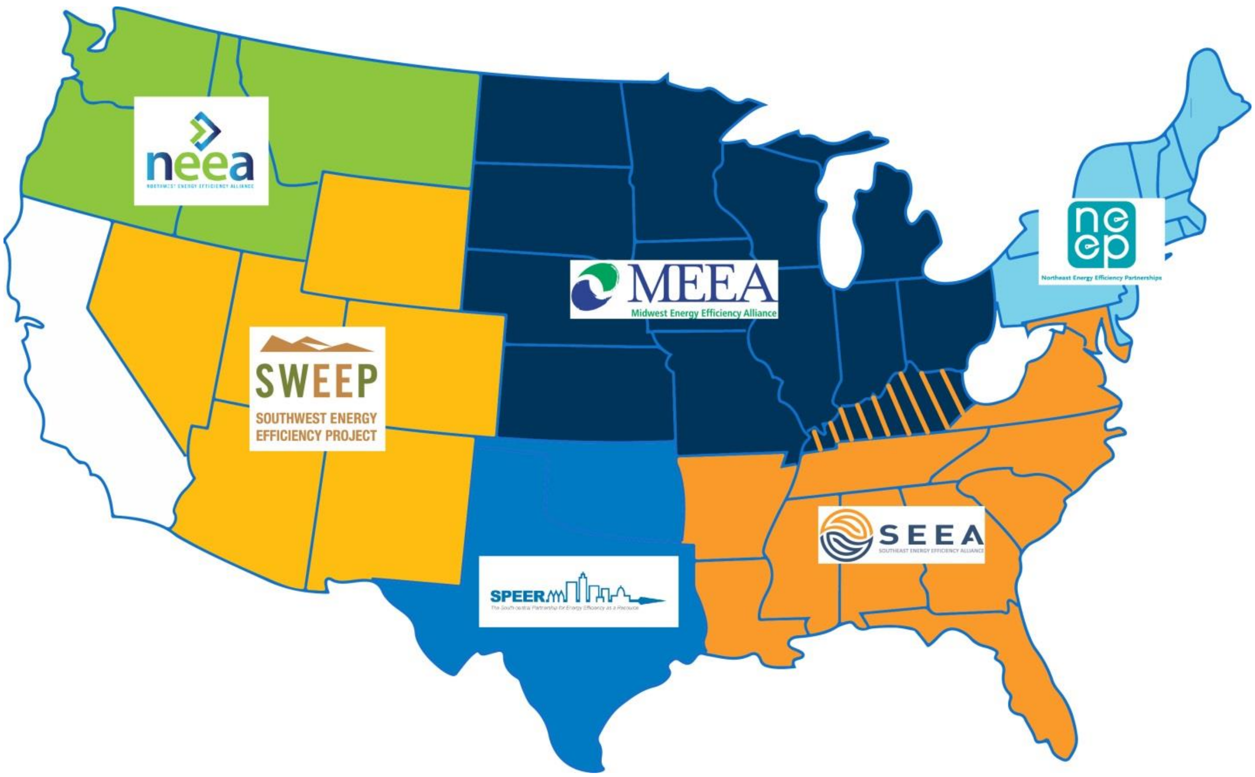
(700,000 x 2,200 – 37,400)/700,000 MWh = 2,146.6 1bs/MWh (a 2.4% reduction from their actual rate)

The new average emissions rate for the fleet of plants, with the EE emissions credits following the NRDC methodology, is:

Emissions rate = (1502.6 + 231 + 78.4) million lbs/980,000 MWh = 1,849.0 lbs/MWh

This is a 1.1% reduction in the original emissions rate of 1,870 lbs/MWh, equal in percentage terms to the absolute emissions reduction provided by the efficiency measures.

Regional Energy Efficiency Organizations:
Advancing Energy Efficiency Across the United States



The Regional Energy Efficiency Organizations (REEOs) work to advance more efficient energy use in 46 states as shown on the map above. All of the REEOs other than the Northwest Energy Efficiency Alliance (NEEA) are sponsors of this paper. NEEA is not included as a sponsor because it is not permitted to take policy positions.