The Opportunity for Energy Efficiency with Clean Air Regulations

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ABSTRACT

Four air quality requirements from the U.S. Environmental Protection Agency (EPA) include the: (1) National Ambient Air Quality Standards (NAAQS), (2) Cross-State Air Pollution Rule (CSAPR), (3) Mercury and Air Toxics Standards (MATS), and (4) Boiler MACT. The NAAQS specify maximum ambient concentrations of six air pollutants, while CSAPR and MATS require significant reductions in pollution from certain electric generating units (EGUs) – the country's largest sources of SO_2 and of mercury emissions, and the largest stationary sources of NO_X emissions. Boiler MACT sets emissions limits and other requirements on industrial, commercial, and institutional boilers. Each of these regulations offers an important opportunity to expand the use of well-known, proven, and cost-effective energy efficiency[1]. With the NAAQS, states can use efficiency as a direct strategy to achieve emissions reductions necessary for meeting the standard. Under CSAPR, a market-based emissions trading program, power plants that improve their generating efficiency will correspondingly reduce the tons of SO_2 and NO_X they emit, thereby reducing the number of CSAPR allowances required to surrender for compliance[2]. MATS includes alternative output-based standards for existing sources and primary emission standards for new sources, including provisions for combined heat and power (CHP), or cogeneration units. In addition to opportunities for new-source efficiency improvements within the MATS rule, recent EPA power-sector modeling illustrates the important complementary benefits of state policies to support demand-side efficiency improvements. These benefits include lowering total compliance costs for MATS, reducing ratepayer bills over the long term, and in some cases, delaying or avoiding the need for equipment upgrades or new construction of generating facilities and emissions controls. The Boiler MACT[3] also includes alternative output-based standards that recognize improvements in boiler efficiency (including use of CHP), as well as a provision for boiler tune-ups and facility-wide energy assessments in affected facilities. The purposes of this paper are to: briefly describe these regulations; document the opportunity with each regulation to employ efficiency; and describe the steps EPA is taking to help state and municipal governments plan for and use energy efficiency as a strategy to reduce emissions and improve air quality. The paper concludes with several no-regrets options that these jurisdictions can consider.

[1] For the purposes of this paper, "energy efficiency" includes end-use efficiency implemented throughout the economy by a "program administrator," as well as on-site improvements in efficiency at power plants and other facilities affected by EPA requirements.

[2] ***This rule is under a court stay at the time of this writing. Information presented here may be outdated at the time of publication. For current information, see http://www.epa.gov/airtransport.***

[3] ***All information regarding Boiler MACT is subject to change, based upon the release of the final re-considered rule following this writing.***

Introduction

In recent years, many power plants have installed modern pollution controls. These investments reduced overall emissions and improved air quality in U.S. At the same time, many other power plants have delayed investments in pollution control technologies that have been available for years. Well over a third of the coal capacity in the U.S. has yet to apply SO_2 scrubbers that have been on the market for several decades (NEEDS 2006). These facilities – many are which are small and uncontrolled units built before the Clean Air Act was enacted – cause smog and fine particle pollution, acid rain, and exposure to mercury and other toxic pollutants, which contribute significantly to a wide variety of public health and environmental problems.

As a result, power plants and industrial boilers remain the significant sources of mercury and other heavy metals, hydrogen chloride and other acid gases, sulfur dioxide (SO_2), and nitrogen oxide (NO_X) emissions. At recent air-pollution levels, exposure to fine particles from all sources, including power plants, is believed to cause between 130,000 and 320,000 premature deaths each year. Smog exposure prematurely ends the lives of an additional 4,700 Americans. This means that approximately 1 in 20 deaths in the U.S. occurs prematurely due to harmful air pollution. Each year, smog and soot also cause 2.5 million cases of aggravated asthma among children, about 150,000 hospital admissions for respiratory and cardiovascular illness, and nearly 200,000 non-fatal heart attacks (US EPA 2011b).

To address these issues, EPA has recently finalized a number of regulations that will significantly reduce air pollution and improve public health. These rules include the: (1) National Ambient Air Quality Standards (NAAQS), (2) Cross-State Air Pollution Rule (CSAPR), (3) Mercury and Air Toxics Standards (MATS), and (4) Boiler MACT. EPA analysis shows that these rules:

- *Will improve public health.* Required emissions reductions will result in health benefits that substantially outweigh the costs. For example, the annual public health benefits from MATS are estimated to be $37 to $90 billion in 2016 alone, compared to an annualized cost of an estimated $9.6 billion (US EPA, 2011a). EPA estimates the annual public health benefits from Boiler MACT to be $12 to $30 for every dollar spent to meet the standards (Federal Register 2011c). These benefits will continue to accrue each year after the control equipment is in place. In addition, there are many health effects associated with toxic air pollution (like mercury, chromium, nickel and arsenic) that EPA is unable to quantify.
- *Rely upon existing, proven, widely available, and cost-effective emissions control technologies.* The emissions control technologies (e.g., scrubbers, bag houses, and selective catalytic reduction) required to meet the reductions necessary for compliance with MATS, CSAPR, and Boiler MACT are already widely used and effective, and reduce emissions at costs much less than the associated public health benefits (NEEDS 2006).

- *Are affordable.* For example, EPA's modeling shows that after MATS and CSAPR implementation, electricity rates are projected to stay well within the range of normal historical fluctuations and below levels seen as recently as 2009 (Federal Register 2011a).

Each of these regulations also offers an important opportunity to employ and expand energy efficiency. With the NAAQS, states can directly use demand-side efficiency as an "attainment" strategy. Under CSAPR, a modified emissions trading program, power plants that improve their generating efficiency will correspondingly reduce the tons of SO_2 and NO_X they emit, thereby reducing the number of CSAPR allowances required to surrender for compliance. MATS includes output-based standards as a compliance option, thereby relating emissions to the productive output of the energy-consuming process (i.e., electricity) and encouraging energy efficiency at individual facilities. The Boiler MACT likewise recognizes both improvements in on-site boiler efficiency (including use of CHP) and impacts from efficiency measures installed throughout affected facilities.

EPA's inclusion of efficiency as a key component of these air-quality regulations reflects several trends in the marketplace. These include significant growth in the number of state and local demand-side efficiency programs and policies, resulting decreases in electricity-system demand, and the potential for emissions reductions. For example, in 2010 alone, ratepayer-funded energy efficiency programs avoided the need to generate over 13 billion kilowatt hours (kWh) of electricity, saving customers $1.3 billion in electricity bills[4] (Sciortino et al 2011). These investments are likely to continue to accrue significant benefits into the future. For example, a recent EPA modeling scenario for the MATS rule predicts that moderate levels of energy-demand reduction – equivalent to the continuation of current policies – will lower total compliance costs, reduce ratepayer bills over the long term, and in some cases, delay or avoid the need for equipment upgrades or new construction of generating facilities and emissions controls. This energy-demand reduction is also likely to reduce emissions of air pollutants on high electricity demand days when air quality can be especially harmful (Federal Register 2011a). Compared to the "moderate" scenario modeled for MATS – that assumes a continuation of currently-adopted policies – the efficiency resource is in fact expected to expand in coming years as states adopt *new* policies and programs (e.g., existing efficiency resource standards, public benefits funding, building energy codes).

EPA Air Regulations and Opportunities for EE

This paper describes four key EPA air quality regulations. For each regulation, basic information is provided, followed by a description of the opportunity for energy efficiency. Table 1 briefly summarizes the regulations, and Table 2 captures the efficiency opportunities with each.

National Ambient Air Quality Standards (NAAQS)

[4] These are annual incremental savings (new savings from measures implemented in the reporting year) from electric energy-efficiency programs.

The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six primary pollutants – called "criteria" pollutants – that can be harmful to public health and environment. The criteria pollutants include: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). The Clean Air Act identifies two types of national ambient air quality standards. *Primary standards* provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. *Secondary standards* provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. EPA periodically reviews the NAAQS and updates them based on the most recent science.

After the NAAQS are promulgated, state Departments of Environmental Protection (DEPs) compare the NAAQS with their monitoring data. If air-concentration values violate the NAAQS, U.S. EPA designates the county a "nonattainment area." Soon thereafter, the state Department of Environmental Protection develops a State Implementation Plan (SIP) to document the measures that will be taken to attain the NAAQS for a specific area within a given timeframe.

Opportunity for energy efficiency. As states develop their SIPs, energy efficiency policies and programs can play an important role in meeting the ozone, SO_2, and PM NAAQS by reducing emissions from large sources of criteria air pollutants such as power plants. EPA is encouraging states and municipalities to consider the emissions impacts of energy-efficiency policies and programs as an option in attainment plans. In a recently released document, *Roadmap for Incorporating Energy Efficiency and Renewable Energy Policies and Programs in State and Tribal Implementation Plans*, EPA outlines four distinct SIP pathways that states can follow to account for the expected emission reductions from EE policies and programs. These include the**:**

- Control strategy pathway
- Emerging/voluntary measures pathway
- Weight of evidence (WOE) determination pathway
- Baseline emission projections pathway

Each SIP pathway is appropriate for a specific set of circumstances, with its own requirements for documentation and analysis. For example, emissions reductions from new or revised EE policies can be captured in the "control strategy pathway." With this pathway, emissions reductions from energy efficiency are subtracted from the state's completed emissions forecasts (versus accounting for them within the baseline forecast). A second approach – the "emerging/voluntary measures pathway" is appropriate where these new or revised EE policies are difficult to quantify or enforce against. The "WOE pathway" is recommended for new or revised EE policies and programs with the potential to affect air quality in the attainment year, but where air-quality modeling is either too resource intensive or not feasible for other reasons.[5]

The "baseline emissions projection pathway" is appropriate for existing state EE policies and programs not already accounted for in the energy modeling embedded in the state's baseline

[5] The WOE pathway is a supplemental analysis to an attainment demonstration in cases where a jurisdiction is marginally close to, but not predicted to attain an air quality standard based on air quality modeling.

emissions forecast. A key benefit of the "baseline" pathway is that including efficiency-policy impacts directly into the forecast of electricity-demand and power-sector emissions can save the state time and effort. To help states capture these emission benefits in the baseline emission projections, EPA has estimated the energy impacts of existing state EE policies that aren't explicitly captured in the U.S. Energy Information Agency (EIA) Annual Energy Outlook 2010[6] (US EIA 2010). The existing state EE policies include:

- Energy Efficiency Resource Standard (EERS) policies
- Public Benefit Funding for EE programs
- Regional Greenhouse Gas Initiative funding for EE Programs

EPA offers guidance and other resources that states with nonattainment areas can consult as they decide whether and how to account for the emission impacts of EE policies and programs in their SIP. For more information, visit: http://www.epa.gov/airquality/eere.html

Table 1. Basic Information on Four EPA Air-Quality Regulations

	How it Works	**Requirements for State and Local Governments**	**Requirements for Covered Emission Sources**	**Timeframe**
NAAQS See: http://epa.gov/air/criteria.html	EPA sets NAAQS for 6 criteria pollutants (e.g., CO, Pb, NO2, O3, PM, SO2). EPA designates areas as meeting (attainment) or not meeting (nonattainment) the standards. States develop plans to attain the standards for each designated 'nonattainment' area.	Each state is responsible for attaining and maintaining the NAAQS[7]; Local and state environment departments collaborate to identify emission reduction measures to include in SIPs for each pollutant in a given nonattainment area	State plans contain enforceable emission reduction measures that, in combination with federal emissions standards for certain sources, will achieve and maintain national ambient air quality standards. These measures can regulate diverse sources (e.g., EGU's, industrial facilities, transportation, area sources).	SIP attainment dates vary by pollutant and ozone nonattainment classification. See: http://www.epa.gov/air/urbanair/sipstatus/index.html

[6] Estimated energy impacts of efficiency policies can be found online at: http://www.epa.gov/statelocalclimate/state/statepolicies.html

[7] Areas currently designated as 'nonattainment' for one or more of the NAAQS are listed here: http://www.epa.gov/oaqps001/greenbk/

	How it Works	Requirements for State and Local Governments	Requirements for Covered Emission Sources	Timeframe
CASPR See: http://www.epa.gov/airtransport/	The Cross-State Rule limits emissions that cross state lines and contribute to O3 and PM in other states. The rule establishes federal implementation plans that control power plant emissions to achieve the required reductions, using flexible emission budget trading programs.	Emissions reductions are required in 23 states for annual SO2 and annual NOx, and in 25 states for O3- season NOx. States may submit a State Implementation Plan meeting specified requirements to replace the state's Federal Implementation Plan.	Covered emissions sources are EGU's, which are required to surrender allowances equal to their actual covered emissions. To comply, sources can reduce emissions through any method – e.g.,, improve efficiency at existing sources, improve performance of existing SO2 and NOX pollution control equipment, use previously planned or constructed clean generating sources, load shift to existing cleaner units, use lower sulfur coal, switch fuels, install or upgrade pollution control equipment – and/or purchase allowances.	1st compliance phase begins 1/1/12 for SO2 and annual NOX reductions and 5/1/12 for ozone season NOX reductions; 2nd phase of SO2 reductions begins 1/1/14[8]
MATS See: http://www.epa.gov/mats/	MATS sets emissions standards for Hg and other hazardous air pollutants (HAPs); Power plants[9] must achieve emissions limitations – for all HAPs emitted by coal- and oil-fired power plants.	These requirements are added to facility permits overseen by state air agencies.	Individual coal and oil-fired power plants over 25 MW must comply with the MATS; Affected EGUs are expected to adopt widely available and economically feasible technologies, practices and compliance strategies to meet the emission limits (e.g., scrubbers, dry sorbent injection systems, activated carbon injection systems, and fabric filters).	Existing sources have up to until 2016 to comply (3 years plus an additional year if granted by the permitting authority); There is also a pathway for certain units to obtain up to 1 additional year (5th year)
Boiler MACT See: http://www.epa.gov/airquality/combustion/indexhtmls	missions limits and other requirements (e.g., boiler tune-ups and energy assessments) are placed on boilers at both large and small industrial, commercial, and institutional facilities to reduce toxic air emissions	These requirements are added to facility permits overseen by state air agencies.	Affected facilities must comply with requirements of the rules to meet emissions limits, as well as other specified requirements such as work-practice standards like annual tune-ups.	Existing sources have up to 3 years to comply, while new sources must comply at start-up.

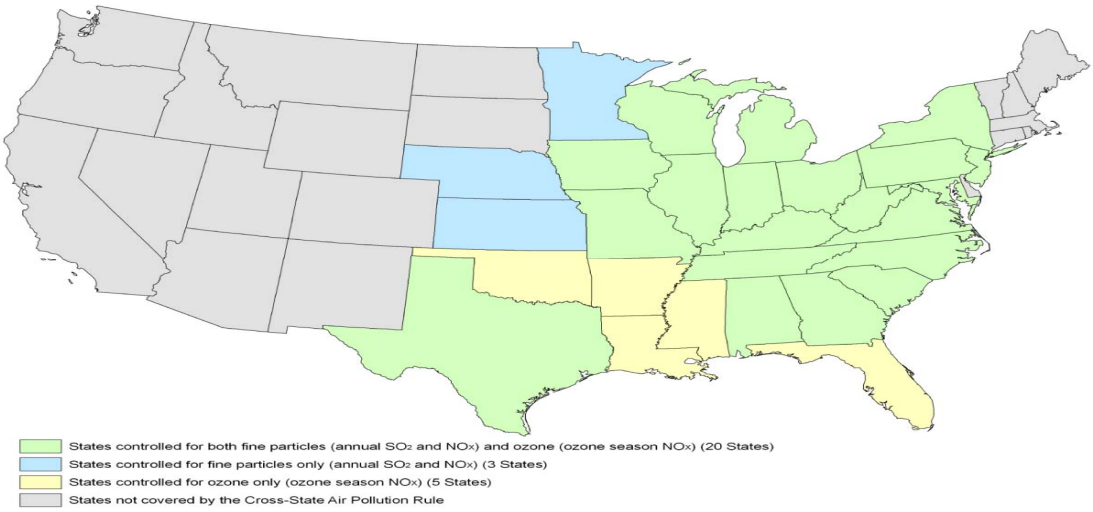
[8] The timing indicated here is a place holder, pending the CSAPR court stay.
[9] Affected power plants are documented here: http://www.epa.gov/mats/pdfs/20111221facilitiesmap.pdf

Cross-State Air Pollution Rule (CSAPR)

[*This rule is under a court stay at the time of this writing. Information presented here may be outdated at the time of publication. For current information, readers should see http://www.epa.gov/airtransport.*] The Cross-State Air Pollution Rule (CSAPR)[10], finalized on July 6, 2011 and expanded December 15, 2011, requires significant pollution reductions in 28 states in the eastern half of the United States (see graphic). CSAPR will result in air quality improvements by reducing power-plant emissions that cross state lines and contribute to ground-level ozone and fine particle pollution in other states. The rule defines what portion of an upwind state's emissions "significantly contribute[11]" ozone or PM2.5 pollution to nonattainment or maintenance areas in downwind states. Once these obligations are determined, the rule requires states to eliminate the portion of their emissions defined as their "significant contribution" by setting an emission budget for each covered state. The rule allows air-quality-assured allowance trading among covered sources, utilizing an allowance market infrastructure based on existing, successful allowance trading programs.

The final Cross-State Air Pollution Rule allows sources to trade emissions allowances with other sources within the same program (e.g., ozone season NO_X) within the same state or in other states included in that program, while firmly constraining any emissions shifting that may occur by requiring a strict emission ceiling in each state (the budget plus variability limit).

Figure 1.



The first phase of compliance would have begun January 1, 2012 for SO_2 and annual NO_X reductions and May 1, 2012 for ozone season NO_X reductions. However, a Court stay is in effect pending a Court decision on litigation that is expected in the summer of 2012. The second phase of SO_2 reductions would begin January 1, 2014. By 2014, the Cross-State Air Pollution

[10] CSAPR replaces EPA's 2005 Clean Air Interstate Rule (CAIR). A December 2008 court decision found flaws in CAIR, but kept CAIR requirements in place temporarily while directing EPA to issue a replacement rule. In order to replace CAIR as quickly as possible, addressing the problem of air pollution that is transported across state boundaries, EPA adopted federal implementation plans, or FIPs, for each of the states covered by CSAPR. States may replace the FIPs with State Implementation Plans (SIPs).

[11] This definition is based on a multifactor analysis that consider the magnitude of a state's contribution, the air quality benefits of reductions, and the cost of controlling pollution from upwind sources.

Rule and other final state and EPA actions will reduce power plant SO_2 emissions by 73 percent from 2005 levels. Power plant NO_X emissions will drop by 54 percent. For more information, visit: http://www.epa.gov/airtransport/.

State clean energy set-asides in CSAPR SIPs. Under CSAPR, EPA established state budgets equivalent to the total amount of allowable emissions under the program. To administer the program, EPA issues (or "allocates") allowances to sources within each state equivalent in sum to that state's budget. States have the ability to submit a CSAPR State Implementation Plan (SIP) to make the state's own determination of how the CSAPR allowances should be distributed, whether by auction or by allocation to various recipients. One option states may consider is a clean energy (CE) set-aside, which is a pool of allowances (e.g., 5% of a state budget) that a state reserves for encouraging adoption of clean energy or to reduce electricity generation. States have established emission allowance set-asides under several past and current emissions trading programs, including the NO_X Budget Trading Program, the Clean Air Interstate Rule (CAIR), and the Regional Greenhouse Gas Initiative (RGGI). States utilize the allowance value in the set-aside (i.e., the allowances themselves, or revenue from auctioning those allowances) to incentivize CE projects (or aggregations of such projects) and/or to expand funding for CE programs. Well-designed set-aside programs may lower the compliance costs of emission rules and provide additional environmental benefit (e.g., GHG emission reduction)[12]. EPA provided technical guidance to states on establishing CE set-asides as a part of implementing the NOX Budget Trading Program (EPA 1999, 2000, 2007) and produced a report that reviews state experience with CE set-asides under the program[13] (EPA 2005).

The CSAPR offers a new opportunity for states to establish CE set-asides as a part of full or abbreviated CSAPR SIPs – used to demonstrate compliance with the rule – starting in 2014. In the final CSAPR, EPA made clear that it supports such state actions. For perspective, EPA's modeling for the CSAPR using IPM[14] estimates the total allowance value of the CSAPR-established budgets[15] (i.e., two regional SO_2 markets, annual NO_X, and ozone-season NO_X) at $4.5 billion in 2012 and $3.7 billion in 2014. Based on this modeling, a CE set-aside of 5%-10% across the CSAPR region[16] could make available approximately $190-$450 million annually in funding for CE programs or projects.

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[12] This could occur if the set-aside, by providing funding for well-targeted CE deployment programs, helped address market and/or behavioral failures that constrain adoption of cost-effective CE technology (see Gillingham et al 2009 on the economics of energy efficiency). For more information on justifications for a CE set-aside, see EPA 1999.

[13] (EPA 2005b) covers experience in IN, MD, MA, MO, NJ, NY, & OH.

[14] We utilize projected allowance prices from the IPM modeling run of the final CSAPR (called "TR Remedy Final"), available at: http://www.epa.gov/airmarkt/progsregs/epa-ipm/transport.html

[15] On February 21, 2012, EPA published revisions to 2012 and 2014 state budgets in Arkansas, Georgia, Indiana, Kansas, Louisiana, Mississippi, Missouri, New York, Nebraska, Ohio, Oklahoma, South Carolina and Texas (77 FR 10342 and 77 FR 10350). Some of these CSAPR revisions were published in a final rule, whereas others were published in a direct final rule with a parallel proposal. EPA subsequently received public comments and intends to withdraw the direct final rule. While EPA is withdrawing the direct final rule, the Agency issued a parallel proposal along with the direct final rule proposing the same revisions, and will take final action on that proposal expeditiously. For the purposes of this analysis, we have evaluated the allowance value inclusive of the full suite of CSAPR revisions as presented in all CSAPR actions published in February to yield the resource estimates presented herein.

[16] The numbers presented here are for illustrative purposes only; the size of any CE set-asides under CSAPR SIPs will depend on individual state decisions.

Mercury and Air Toxics Standards (MATS)

The Mercury and Air Toxics Standards (MATS), signed on December 16, 2011, will reduce mercury and more than 60 other toxic pollutants from coal- and oil-fired power plants. Specifically, MATS reduces emissions of heavy metals, including mercury, arsenic, and chromium, and acid gases, including hydrogen chloride and hydrogen fluoride, from new and existing coal- and oil-fired electric utility steam generating units (EGUs). These toxic air pollutants are known or suspected to cause cancer and other serious health effects.

Power plants will have to limit their toxic emissions to levels that will ultimately prevent 90 percent of the mercury in coal burned at power plants from being emitted into the air. Emissions limits are expressed as either heat-input based (e.g. lbs per million BTU) or output based (e.g. lbs per MWh) standards. MATS applies to EGUs larger than 25 megawatts (MW) that burn coal or oil for the purpose of generating electricity for sale and distribution through the national electric grid to the public. These include investor-owned units, as well as units owned by the federal government, municipalities and cooperatives that provide electricity for commercial, industrial, and residential uses. EPA estimates that there are approximately 1,400 units affected by MATS – approximately 1,100 existing coal-fired units and 300 oil-fired units at about 600 plants. MATS identifies subcategories of both coal- and oil-fired EGUs based on the design, utilization, and/or location of various types of boilers at different power plants and includes emission standards and/or other requirements for each subcategory.

For EGUs subject to emissions standards, a range of widely employed and economically feasible technologies, practices and compliance strategies are available to power plants to meet the emission limits, including scrubbers, dry sorbent injection systems, activated carbon injection systems, and fabric filters. Existing sources generally will have up to 4 years if needed to comply with MATS (3 years plus an additional year if granted by the permitting authority for the installation of controls). EPA is providing a pathway for reliability-critical units to obtain a schedule with up to an additional year to achieve compliance, but believes there will be few, if any situations, in which this will be needed (Federal Register 2011a).

Energy efficiency as a strategy for reducing compliance costs. In the Mercury and Air Toxics Standards (MATS) EPA finalized both input-based standards for existing sources (i.e., amount of pollutant emitted per unit of heat input into the system – for example, lb/MMBtu) and alternative output-based (i.e., amount of pollutant emitted per unit of gross electrical output) standards for existing sources and primary emission standards for new sources. This includes, in both cases, provisions for combined heat and power (CHP), or cogeneration units.

Maximizing the efficiency of energy generation in this way represents a key opportunity to further pollution prevention. This is because output-based standards encourage unit efficiency by relating emissions to the amount of useful-energy generated, not the amount of fuel burned. By relating emission limitations to the productive output of the process, any increase in overall energy efficiency results in a lower emissions rate. This approach also provides owners/operators of regulated sources with an additional compliance option (i.e., increased efficiency in producing useful output) that can result in both reduced compliance costs and lower emissions. Using more efficient generating technologies has the effect of reducing fossil fuel use, which in turn leads to multi-media reductions in environmental impacts both on-site and off-site.

In addition to the efficiency provisions within MATS, EPA included an "Illustrative Energy Efficiency Scenario" in the March 2011 MATS proposed rule (Federal Register 2011a). This analysis examined the impacts of integrating demand-side energy efficiency policies – including ratepayer-funded programs – into compliance strategies. The results show how demand-side efficiency can lower total compliance costs for MATS, reduce ratepayer bills over the long term, and in some cases, delay or avoid the need for equipment upgrades or new construction of generating facilities and emissions controls. The analysis also documented additional environmental benefits such as reduced emissions of Hg, CO2, NOx, and SO_2.

National Emissions Standards for Hazardous Air Pollutants (NESHAPs) from Industrial, Commercial, and Institutional (ICI) Boilers – "The Boiler MACT[17]"

[All information regarding Boiler MACT is subject to change, based upon the release of the final re-considered rule following this writing.] As of May 2012, EPA is considering proposed changes to previously released rules setting air toxic standards for boilers, process heaters, and certain solid waste incinerators (CIWSI) incinerators[18]. EPA initially issued final rules for these units in March 2011, setting standards intended to cut emissions of hazardous air pollutants (HAPs) such as mercury, dioxin and lead. These pollutants can cause a range of dangerous health effects – from developmental disabilities in children, to cancer, heart attacks and premature death. EPA estimates that less than one percent of the boilers in the United States will need to meet emissions limits under the newly finalized rules. Of the 1.5 million boilers located at small sources of air emissions such as hotels, hospitals and commercial buildings, about 187,000 would be covered by the area source boiler rule. Of these, 98 percent would need to follow work-practice rules such as annual tune-ups. The remaining two percent (about 3,700 units) would have to meet specific emissions limits. EPA estimates that there are about 14,000 boilers at large sources of air emissions including refineries, chemical plants, and some institutional facilities such as universities that would be covered by the major source boiler rule. Eighty-eight percent of these would need to follow work-practice standards such as annual tune-ups. Twelve percent – equivalent to about 1,750 boilers primarily fired by coal, oil and biomass – will need to meet specific emissions limits (Federal Register 2011c).

Integration of energy efficiency into boiler MACT. The final rules incorporate several features that recognize the emissions benefits of energy efficiency and encourage the evaluation and implementation of energy efficiency improvements in boilers as well as facility-wide operations. These features are:

- Alternative output-based emissions limits. For the subset of facilities with boilers subject to emissions limits, alternative output-based emissions limits are provided in both the area and major source rules. Output-based emissions limits account for the emissions benefits of higher efficiency boilers or CHP systems. Importantly, the output-based emissions limits include an approach for accounting for the multiple outputs (electrical and thermal energy forms) of CHP systems.

[17] MACT stands for Maximum Achievable Control Technology
[18] This paper does not address the CIWSI rule. Current information on the rules can be found at http://www.epa.gov/airquality/combustion/.

- Boiler tune-ups and facility-wide energy assessments. One time or periodic boiler tune-ups and/or facility-wide energy assessments are required for certain sources under the rules. These requirements help facilities identify improvements that can improve energy efficiency. These requirements will either assist facilities in meeting required emissions limits or are in lieu of emissions limits (Federal Register 2011c).
- Credit for efficiency measures. A mechanism is provided in the rules that credits documented implementation of efficiency measures that reduce demand for thermal output (e.g., steam or hot water) from boiler or CHP systems. This provides an incentive for implementing energy efficiency measures identified in facility-wide energy assessments that are required for some affected facilities under the rules.

In addition to these features, DOE is working in coordination with EPA to provide assistance to major sources burning coal or oil on cost-effective clean energy strategies for compliance with Boiler MACT[19]. Through their Clean Energy Application Centers, DOE is providing site-specific technical and cost information to these sources on strategies for compliance including combined heat and power. Information on potential funding and financing sources for compliance (particularly through CHP) is also being provided.

Table 2. Efficiency Opportunities with Four EPA Air-Quality Regulations

	Opportunity for EE	**Key Observations**	**Steps for States**	**More info**
NAAQS	With the NAAQS, nonattainment areas for O3, PM or SO_2 can directly account for emission reductions resulting from *EE* policies and programs; States capture these reductions in State Implementation Plans (SIPs) using 1 of 4 pathways; For more information, see: http://www.epa.gov/airquality/eere.html	- New EPA guidance offers states/locals flexibility in how EE is incorporated in SIPs - States/locals start by accounting for emission impacts of existing EE policies and programs - States can examine how new/expanded EE policies and programs can improve AQ in nonattainment areas	- Ensure that environment officials know what EE policies are "on the books," and the associated energy impacts - Analyze the emissions impacts of expanded EE policies and programs in nonattainment areas - Provide real-world examples of how EE can be documented under each of the 4 pathways	http://www.epa.gov/airquality/eere.html

[19] For more information about DOE's Boiler MACT Technical Assistance: http://www1.eere.energy.gov/manufacturing/distributedenergy/boilermact.html.

	Opportunity for EE	Key Observations	Steps for States	More info
CSAPR	With CSAPR, end-use *EE* does not directly contribute to state emissions-reduction requirements; Instead, states can develop EE emission allowance set-asides in CSAPRS SIPs to expand funding for EE programs and/or incentivize EE projects.	- In the past, the structure of CE set-asides has imposed high administrative costs relative to the EE set-aside value have limited the success of some past programs - A new EPA whitepaper (forthcoming) documents how aggregation- and auction-based approaches show promise for reducing these costs and improving the effectiveness of EE set-asides	- Consider adopting EE allowance set-asides in CSAPR SIPs - Understand and consider the benefits of aggregation and auction-based approaches	http://www.epa.gov/statelocalclimate/state, search for set-asides. Also see: http://www.epa.gov/airtransport/ /
MATS	MATS includes alternative output-based (i.e., amount of pollutant emitted per unit of gross electrical output) standards for existing sources and primary emission standards for new sources. This includes provisions for combined heat and power (CHP), or cogeneration units. Also, EE complements MATS by lowering overall compliance costs, ratepayer bills, and air pollution.	- EPA's 'EE sensitivity' conducted for the MATS proposed rule shows significant economic, health, and environmental benefits to society	- Understand and consider the magnitude of complementary benefits to a state under current and expanded levels of EE policy	http://aceee.org/files/pdf/conferences/eer/2011/BS3D_Bryson.pdf
Boiler MACT	The rules recognize both improvements in boiler efficiency (including use of CHP) and impacts from energy efficiency measures adopted throughout the facility.	- The features that recognize EE benefits in the rules may not be sufficient to lead to significant costs savings from reduced need for end-of-pipe emissions controls	- Be aware of the EE features in the rules and support consideration of CHP and other EE measures at facilities	http://www1.eere.energy.gov/manufacturing/distributedenergy/boilermact.html

EPA is Helping State & Local Air Officials Take Advantage of Efficiency

EPA is taking steps to help states and municipalities understand and use EE to reduce emissions and improve air quality. These steps include:

- Define, demonstrate, and communicate the specific opportunities for energy efficiency in air-quality regulations. For example, EPA recently released a Web site that aggregates basic information on the regulations and documents the key issues involved in leveraging efficiency policies and programs.

- Increase state air regulators' understanding of opportunities to employ efficiency to reduce emissions and improve air quality. For example, EPA Region 6 recently convened state energy and environmental regulators to share information about strategies and barriers to use clean energy resources in air-quality planning.
- Make it easier for states and locals to account for the emission benefits of efficiency policies and programs in State Implementation Plans (SIPs). For example, EPA recently released a "Roadmap" that defines four pathways states can use to include efficiency policies and programs in state SIPs (see above for more information).
- Convene state air and energy regulators to encourage strategic cooperation and identify opportunities to utilize existing energy-efficiency resources. For example, EPA is hosting webinars and other events to bring together air regulators, state utility regulators, and energy offices (in collaboration with their associations: NACAA, NARUC and NASEO) to identify respective priorities for efficiency and air quality, and to build local capacity.

- Support comprehensive air-regulatory compliance planning that employs energy efficiency. For example, EPA is assisting the State of Minnesota on a pilot project to develop an integrated compliance plan for current and future EPA power-sector rules. The Minnesota stakeholder group has been meeting since August 2011, and has worked with EPA to gain a better understanding of the costs and benefits of key regulations.
- Offer tools and guidance to help state and local governments employ energy efficiency as a strategy to achieve multiple benefits. For example, EPA recently released a guide to understanding and calculating the "multiple benefits" (i.e., non-energy benefits) of clean energy investments[20].

Additional Steps That Affected State & Local Governments Can Take

States and municipalities that are affected by EPA regulations and are interested in leveraging their efficiency policies can take several steps. One is to ensure that state and local agencies have accurate information on the regulations describe above, including the specific opportunities for on-site efficiency improvements and/or expanded ratepayer-funded, demand-side policies and programs. Another step is conducting a forecast the energy impacts from jurisdiction-specific efficiency policies and programs. This can be an important input to a stakeholder process that engages key stakeholders – such as state agencies, power companies, and regional grid operators – early in utility-sector planning to ensure orderly and affordable compliance, including consideration of the contribution that energy efficiency can make. States can also review current policies and programs that support cost-effective energy efficiency and explore opportunities to achieve even deeper energy savings. This can include updating state or regional estimates of "avoided costs" to reflect the impacts of new EPA power plant regulations.

As states and municipalities gain experience implementing air-quality regulations and taking advantage of associated opportunities with energy efficiency, an important next step will be sharing their findings and lessons-learned with peers in other jurisdictions.

[20] See: http://www.epa.gov/statelocalclimate/resources/benefits.html

Conclusions

Four recently finalized and forthcoming EPA regulations offer important opportunities to employ and expand the use of well-known, proven, and cost-effective efficiency policies. With the NAAQS, states can use efficiency as a direct strategy to achieve emissions reductions necessary for meeting the standard. Under CSAPR, a market-based emissions trading program, power plants that improve their generating efficiency will correspondingly reduce the tons of SO_2 and NOx they emit, thereby reducing the number of CSAPR allowances required to surrender for compliance. MATS includes alternative output-based standards (i.e., amount of pollutant emitted per unit of gross electrical output) for existing sources and primary emission standards for new sources, including provisions for combined heat and power (CHP), or cogeneration units. In addition to opportunities for new-source efficiency improvements within the MATS rule, recent EPA power-sector modeling illustrates the important complementary benefits of state policies to support demand-side efficiency improvements. These benefits include lowering total compliance costs for MATS, reducing ratepayer bills over the long term, and in some cases, delaying or avoiding the need for equipment upgrades or new construction of generating facilities and emissions controls. The Boiler MACT likewise includes alternative output-based standards that recognize improvements in boiler efficiency (including use of CHP), as well as a provision for boiler tune-ups and facility-wide energy assessments in affected facilities. States and municipalities that are affected by these regulations and interested in using efficiency for these purposes can use this paper to: (1) make sure key stakeholders have basic information about these regulations and understand the specific role that energy-efficiency can play with each, per above, (2) identify and use the information offered by EPA, including guidance documents, modeling and data resources, and peer-to-peer information exchange, and (3) serve as a point of comparison for documenting their implementation experience, with the intention of identifying lessons learned and relaying them to colleagues in other jurisdictions.

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