Choices in Air Pollution Regulation

A Review of Alternative Air Emissions Policy Structures for the Electric Sector

Report for the American Clean Skies Foundation

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I. Introduction

In his 2011 State of the Union address, President Obama left out all mention of climate change and the idea of a comprehensive, national energy and climate bill that he had fervently raised in his first major presidential address in 2009, and again in 2010. In its place he spoke of investment in clean technology and the need to pass a clean energy standard (CES) to put the electric generating fleet in the U.S. on a path toward lower emissions of all pollutants – not just carbon dioxide and other greenhouse gases. This omission tacitly confirmed what was witnessed the previous spring when it failed to come to a vote in the Senate: an economy-wide cap-and-trade system won't make it to the legislative agenda of the 112th Congress.

Even if the mechanism is lost, the intent remains in the form of isolated bipartisan support for the broad goal of reducing emissions from the electric sector. Standing ready to take the place of a national cap-and-trade program are a number of other policies, some just proposed and others that have been in force for years. Each offers a different solution to the same challenge: how to cut electric power sector emissions in a cost-effective, politically palatable way. These "alternative air emissions policy structures" include emissions performance standards (EPS), generation performance standards (GPS), clean energy standards (CES), renewable portfolio standards (RPS), new source performance standards (NSPS), renewable electricity standards (RES), the integrated resource planning (IRP) process and any derivative measures – all of which are variations on a theme in which regulation sets a standard, and electric sector entities invest in solutions to comply. Some favor certain fuels, while others are fuel-neutral; some lead to fuel-switching, while others foster energy efficiency and renewable energy; some emphasize technological solutions, while others use financial and economic levers. In each case the outcomes can be myriad, and so the design is critical.

This report, written in support of the Clean Energy Regulatory Forum – Road Off Coal workshops, sets the stage by discussing the building blocks of various policy choices, then focuses on recent efforts to adopt alternative policy structures as an alternative to pollution charges, technology-forcing standards, and general economy-wide cap-and-trade systems. The goal is to show where such alternative measures have been attempted, where they have been successful, what they have achieved, and where else they might work.

II. Building Blocks for Alternative Policy Structures

That the taxonomy of alternative market-based standards (and their corresponding three-letter acronyms) has such power to confound merely reflects the diversity of attempts to find the "right"

approach. This section highlights common distinctions within the numerous actual and proposed alternative control mechanisms and explains how they differ from other related policies.

All of the alternative measures share a common form: they set emission targets and timelines, establish which entities are covered by the standard, and outline rules for compliance. They also share common building blocks that are negotiated in the policy-making process and determine the shape and scale of the outcome.

Who's Responsible: Generator, Distributor, Fuel Supplier?

The compliance burden of a policy tool typically falls on either the electric generator or the electricity retailer, also known as the load-serving entity (LSE). In most cases, generation standards affect generators, and emission standards affect LSEs – although there is no hard rule for the terminology. Where generators are the responsible entities, the power they supply must be generated by units that meet the standard directly or after being averaged with cleaner generating units. Where LSEs are accountable, the power they distribute to electricity customers must meet an emissions standard based on the average emissions from their power suppliers. Because suppliers buy from multiple electricity wholesalers, this approach requires tracking and reporting the sources of each unit of power that they distribute, so that an average emissions level can be calculated.

What's the Standard: Volume, Efficiency; Input, Output?

All air policies key off of a standard that defines a limit on emissions, which for the electric sector typically will include one or more air pollutants: carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury. The most straightforward limits dictate an allowable volume of emissions over a certain time period. For example, the Regional Greenhouse Gas Initiative (RGGI) sets a limit of 188 million tons of CO_2 per year for all participating states until 2015. The limit is based on a target for reducing emissions below historical levels. Other limits are based on efficiency, or intensity – that is, the volume of emission per gross unit of energy generated. The Clean Air Act, for example, sets a New Source Performance Standard (NSPS)[1] for new units that limits NO_x emissions to 1.0 pounds per megawatt hour (MWh) of electricity generated. The total volume of emissions can increase or decrease but a facility must operate within this performance rate limit.

In addition to the question of volume vs. efficiency, emission standards are established on the basis of energy input or energy output. Input standards call for targets in terms of pounds per million British thermal units (MMBtu) of energy input; output standards set targets for pounds per MWh of electricity generated. Standards definitions specify whether to use lifecycle fuel emissions or just the on-site combustion emissions; the latter approach is most common. This factor will become increasingly

important as "cleaner" fuels come under scrutiny through efforts to understand their full environmental impacts.[2]

"Dynamic standards" adjust over time to accommodate changes in economic activity or to increase gradually the stringency of controls. The mechanism for adjusting standards may be automatic or it may require periodic review and consensual adjustment by a governing body and a group of stakeholders.

Finally there is the question of what is chosen as the baseline for a given standard. Historical emission levels are often used, but that requires the choice of a specific time period. Alternatively, projected emission levels could be used, but that leaves room for debate over what will happen in the future. The emission levels counted in the baseline usually correlate to the units under control, although this may vary. For example, a generation performance standard, based on a certain total electricity output, may be calculated on the basis of last year's fossil fuel-fired generation in a given region, but may be applied also to renewable energy generators. This provides an economic incentive for renewable energy development because renewables can easily beat the standard, and will be able to sell emission credits to generators that cannot otherwise meet the standard.

Where does the Standard Apply: Unit, Plant, Fleet, Region?

Emissions control policies may govern actions at an individual generating unit, a plant or facility, or within a certain region – or some combination thereof. Whether a rule calls for "portfolio" standards or "performance" standards usually indicates the scale of control and the flexibility that a responsible entity has in devising a compliance strategy. A *portfolio* approach seeks an average overall emissions level from a group of many emission sources. A portfolio approach might be used to govern a state or group of states, or multiple units at a single plant, or multiple plants owned by a single company. A *performance* approach typically means standards are enforced for individual pollution units, such as a given power plant or turbine. For example, RGGI, which created a trading system for greenhouse gases (GHGs) among a group of northeastern states, effectively allows a portfolio approach by setting an emission level for the entire area covered by the agreement.[3] Oregon's EPS, on the other hand, sets standards that must be met by individual power plants.[4] It is important not to focus too hard on the terminology, though, as "portfolio" and "performance" have been used interchangeably.

Within a single policy there may be multiple standards to govern different sources of pollution. A point of common debate is how new policies should treat existing sources. They may require retrofits, grant exceptions, or ignore them altogether. Often existing sources are grandfathered under legacy rules but are subject to review and compliance if certain changes are made. These provisions resemble the Clean Air Act (CAA) New Source Review (NSR) program, which applies to new or modified sources only. The

state EPS program in California, for one, applies to new plant construction, new or renewed power purchase agreements (PPAs) of 5 years or longer, purchase or increase of ownership interest in an existing plant, and capacity increases at existing plants.

What Region is Covered: Local, State, National?

Setting up any emission control policy can be a challenge, and while the net benefits increase as the control region gets bigger, so does the complexity of implementation and management. A system in theory could cover the entire U.S. or even the world, but in practice the U.S. has avoided signing on to global governance structures and has had only limited success at passing nationwide systems. This leaves the burden of action in the hands of the states where political feasibility is typically highest.

The trouble with a small (e.g. state-level) control region is that both electricity and emissions can cross borders, leading to a mismatch between the location of benefits and the point of control. In other words, emission limits on a power generator in New York whose pollution flows over the border to Connecticut will cause benefits to accrue to Connecticut, while some costs may be borne in New York. Similarly, if Massachusetts were to impose a standard on generators within the state, thereby pushing retail prices to rise, electricity suppliers may simply choose to buy electricity from out-of-state generators, to the extent that transmission capacity allows. Thus while it may be easier to align interests within a single state than between multiple states, history has shown that the risk of benefits and damages flowing across borders makes interstate collaboration a better approach in the long run.

What are the Compliance Options: Trading, Averaging, Command-and-Control?

All measures to implement an emissions standard outline acceptable compliance options. In the case of a striaghtforward command-and-control policy such as NSPS, entities have to comply with a uniform standard that, depending on the situation, may be a "numerical emission limit, a design standard, an equipment standard, or a work practice standard."[5]

Market-based compliance mechanisms are favored by economists because they are theoretically more efficient than command and control actions, but they are more complex to set up and administer. The mechanisms operate on the scarcity principle. By creating a system of pollution rights, and making those rights scarce, controlled entities assign an economic value to the right to pollute. They are then free (within the limitations of the compliance mechanism) to trade rights with other entities.

As the recent Congressional record illustrates, the trickiest part of establishing such a system is the decision of how to assign initial pollution rights, or "credits". Whether these credits are allocated to entities for free, or auctioned for a fee, a difficult negotiation is inevitable as entities jockey to start off

each compliance period with the greatest number of credits at the lowest cost. This applies to a national cap-and-trade program as well as it does to a regional portfolio standard.

What's the Status: Passed, Proposed, Potential?

Perhaps the most salient feature of any policy is whether it has been passed, and where. In this case, past successes may indicate the political dynamics that should shape future strategy.

Table 1 summarizes the most prevalent policies based on the building blocks introduced in this section.

Table 1: Summary of common air emission policy structures.

	Responsible Party	Standard	Standard Applies To…	Region	Compliance Options*	Status
Emissions Performance Standard	LSE	• lbs/MWh • any pollutant	LSE	State	• Capital improvement • New capacity • Capacity retirement	Active
Generation Performance Standard	Generator	• lbs/MWh • any pollutant	Unit or Plant	State	• Capital improvement • Tradable credit with pooling potential	Proposed
Clean Energy Standard	LSE or Generator	• % of sales from plants qualified based on lbs/MWh • any pollutant	Unit or Plant	National	• Capital improvement • New capacity • Tradable credit with pooling potential	Proposed
Renewable Portfolio Standard	LSE	• % of total sales	LSE	State	• Capital investment • Tradable credit	Active
New Source Performance Standard	Generator	• Varies; uniform standard	Unit or Plant	National	• Capital improvement	Active
Renewable Electricity Standard	LSE	• % of total sales	LSE	National	• Tradable credit • New capacity	Proposed
Cap & Trade	LSE	• tons	LSE	State, Regional or National	• Tradable credit • Capital improvement	Active
Integrated Resource Planning	LSE	• cost • reliability • emissions	LSE	State	• New capacity	Active

* Compliance options will vary widely depending on the provisions written into the enabling legislation. The table presents some of the most common arrangements.

Economic Considerations

Even though the recent debate around cap-and-trade has curbed its political appeal, from a purely economic point of view it remains the most efficient means of internalizing pollution costs while achieving a certain desired level of emission reductions.[6] The various decisions to implement other policy tools mentioned here have been taken for the sake of feasibility – either in political terms or ease of enforcement. The greatest source of political resistance is the specter of huge increases in energy prices. Difficulties with enforcement are most likely to arise when the policy requires data collection infrastructure and comes with a significant administrative burden. Secondary consequences also need to be considered.

Existing EPSs minimize the burden of data collection by zeroing in on long-term power purchases rather than spot purchases of electricity on the wholesale market. The degree to which power is transacted on a competitive wholesale market depends entirely on the market structure, which could range from tightly regulated (where all power will be transacted through long-term purchase agreements) to unregulated (where long-term purchases will be required to ensure reliability, but a significant share of electricity is procured through wholesale markets). EPSs triggered by long-term purchases should thus have greater reach in regulated markets. The fact remains, however, that the design of standards and compliance mechanisms plays an essential role in shaping the outcomes.

Ratepayer Impacts

The costs of complying with all air emission policies will most often be transferred to ratepayers through power prices, but the size of those costs and the way they are spread across ratepayers will vary widely depending on the emissions policy and the electricity market structure. Standards that force technology investment will lead to higher prices in regulated markets as generators apply for cost recovery of the capital investment. In deregulated markets, impacts on power prices will depend on the sources affected (where in the dispatch order) and the extent to which technology controls (e.g. scrubbers) affect operating costs. Capital-intensive compliance responses will have less impact on power prices in an unregulated environment.

Total abatement costs with market-based compliance mechanisms are expected to be lower than with a uniform tax or command-and-control standard because the system allows the electric sector to find the required emission reductions at the lowest marginal cost.[7] The costs of compliance are still passed on eventually to ratepayers as they are with a pollution tax, but the cost level is higher for the higher emitters and vice versa. Total compliance costs for cap-and-trade policies equate to the cost of all pollution allowances.[8] For performance standard policies, total compliance costs are often smaller, all else equal, since the emitter only needs allowances to cover the difference between its average emissions intensity and the performance standard.[9] This does, however, depend on the exact design of the allocation and compliance mechanisms.

Demand Growth, Substitution, and Leakage

Performance standards must specify a desired average emissions rate. In the case of California's CO_2-only EPS that rate was taken as an average of existing plants and the cleanest new plants that could be built. The resulting standard of 1,100 lbs CO_2/MWh has been referenced by subsequent performance-based policies. The average statewide CO_2 emissions rate for delivered electricity is already *lower* than the standard. Some utilities may need to realign their power supply agreements, but the standard is only likely to hurt the largest emitters on the margin, while creating an incentive for construction of cleaner

generating capacity and encouraging greater reliance on out-of-state generating capacity (for example, Arizona's substantial nuclear capacity), to the extent that it is cleaner than in-state alternatives.

California does not offer a tradable permit market for compliance but other regional systems have been proposed with such an option. For an EPS or GPS with a market-based compliance option, performance levels and allowances would likely be set according to the historical output of all generating units in the covered area. This number would be divided by the desired total annual emissions level, and the resulting allowances would be allocated or auctioned to the compliance entities – LSEs for an emissions standard, and generators for a generation standard.

So for example a region such as Nebraska with 32 TWh of generation and a target of 22 million tons of CO_2 (three million tons less than 2005 levels) would set a performance standard of 1,375 lbs/MWh (22 million tons ÷ 32 TWh) and distribute allowances among its utilities based on their historical sales. Each utility would then have to show that the average emissions from compliance-year sales were at or below the 1,375 lbs/MWh standard. Power sold below that level would create an additional credit; power sold above would require a credit. The system allows for trading between high- and low-emitting utilities, which should achieve the lowest marginal cost of compliance. But this allocation approach provides an incentive for higher levels of generation because it rewards utilities based on market share and emissions rate reduction. One MWh of electricity at the emissions standard has no shadow price for pollution, unlike a traditional cap-and-trade system wherein every ton of emissions has a shadow price, and therefore the utility has an incentive to reduce *both* average emissions intensity (through efficiency and controls) *and* total emissions (through substitution and demand-side management). The secondary consequence, therefore, is that a performance standard may lead to a smaller drop in overall consumption, and therefore prices. With higher total output than under a cap-and-trade system, the marginal cost of abatement would be higher.[10]

Depending on the policy structure, other consequences of a performance standard could include a market preference for certain fuel types. If a system excludes renewable energy sources, compliance by baseload entities will not encourage development of renewables to lower average emissions rates. On the other hand if a system is inclusive of all energy types, the incentives will flow to forms of generation with lower marginal emissions such as solar or wind.

Finally, regional "leakage" is a risk if utilities are allowed to procure power from within their load pool but outside the area covered by the policy. This might allow them to comply with standards without causing a net reduction in emissions, in the event they sign PPAs with cheaper, higher-emitting sources outside the region.

Electric System Dispatch

In theory, system operators dispatch electric generating units according to the merit order within the system. Because emission allowances are considered a variable cost of production, they will be factored into short-run marginal costs and have the potential to shift the merit order. Higher-emitting units would see proportionally higher increases in their variable costs and, assuming the cost increment is large enough, system operators would demote them, causing them to run less frequently. This scenario should play out whenever the compliance mechanism has a direct impact on the marginal costs of production.

Policies that mandate capital investment, for example through technology-forcing standards, would not have the same effect. Because capital costs are considered fixed, the operators would expect to recover them either through regulated cost recovery, or by earning a marginal profit on power sold into a deregulated wholesale market. The price signal from capital investment, therefore, would not be expected to show up in marginal pricing and affect the merit order.

III. Existing and Proposed Policies

Brief Review of Federal Legislative Efforts[11]

The CAA is responsible for the longest-standing air emission control programs, which date as far back as the 1970s. This includes the aforementioned NSPS, a central component of the Act, as well as several more recently enacted market-based systems to control SO_2 and NO_x. The 1990 amendments to the CAA established a cap-and-trade system for SO_2 that remains the first and arguably the most successful such program ever to have been deployed at a large scale. In the late 1990s the EPA promulgated a rule that came to be known as the NO_x SIP Call, which sought to address the problem of the interstate movement of airborne NO_x around the eastern half of the U.S. A hallmark of this action was the NO_x Budget Trading Program (NBP), which laid the groundwork for an emissions trading program that would help reduce NO_x emissions at the lowest possible cost. The NBP went live in 2003 and held in force until 2009, when it was superseded by a separate rule, the Clean Air Interstate Rule (CAIR), which combined the NO_x and SO_2 trading programs. CAIR was rejected by the D.C. Circuit Court but remains in effect until its replacement, known as the Transport Rule, becomes final in the summer of 2011 and takes effect in January 2012.

The time period from 1999-2010 saw numerous efforts at the federal level to address electric sector pollution. The political dynamics illustrate the challenges of getting alternative air policies through Congress. In 1999, Senators Moynihan, Schumer, and Lieberman introduced S. 172, the Acid Deposition and Control Act that sought to reduce NO_x by 70% over 1990 levels and SO_2 by 50% from the target

levels prescribed by the CAA. The bill would have established a NO_x cap-and-trade system and made certain modifications to the existing SO_2 trading program. It also called for a study on the environmental effects of mercury and the interstate effects of NO_x and SO_2 transport. The bill never made it out of committee.[12] The NBP, which would have been superseded by S. 172, continued under the rule-making authority of the EPA.

In 2003, President Bush introduced the Clear Skies Act, which would have established tonnage caps for NOx, SO2, and mercury. It was proposed in the Senate as S. 485 by Senators Voinovich (R-OH) and Inhofe (R-OK). The Clear Skies Act would have established pollution caps and market-based compliance mechanisms but the cap levels offered little to improve upon existing CAA programs. The bill did not address carbon dioxide. That same year a much more ambitious bill known as the Clean Air Planning Act (CAPA, or S. 843) was floated by Senators Carper (D-DE), Alexander (R-TN), Chafee (R-RI), and Gregg (R-NH) and sought to establish declining tonnage caps for NOx, SO2, mercury, and CO2. It would have also made some revisions to the CAA. The emission targets and timelines were tighter and earlier than S. 485. CAPA was re-introduced in 2005 by Senators Jeffords (D-VT), Collins (R-ME), and Lieberman (D-CT); in 2006 by Senators Carper, Alexander, Chafee, Dodd (D-CT), Feinstein (D-CA), Graham (R-SC), Gregg, and Landrieu (D-LA); and again in 2007 by Senators Dodd, Gregg, Feinstein, Lieberman, Lincoln (D-AK), and Sununu (R-NH). Each version of the bill contained slightly different provisions around the edges but shared a fundamental goal of addressing electric sector emissions through a "four pollutant" (4-P) approach and market-based compliance mechanisms, while streamlining certain provisions in the CAA.

The year 2007 also saw the first in a series of mostly Democratically-sponsored greenhouse-gas-focused measures. Some only covered the electric sector while others sought GHG caps for the entire economy. The first to pass either house of Congress was the American Clean Energy and Security Act of 2009. Its counterpart Senate bill never made it to the floor for a vote in the waning term of the 111th Congress.

State-Based Performance Standards

Around the same time that the EPA was designing the NBP and Congress was debating S. 172, several northeastern states began working in parallel to discuss the possibility of implementing a generation performance standard or an emissions performance standard. Legislatures in Connecticut, Massachusetts, and New Jersey gave their respective environmental agencies authority to establish an EPS for retail electricity suppliers.[13] The States of Connecticut and New York debated an output-based EPS and determined that acting alone would accomplish little. In order to pass such a measure they would require that neighboring states also adopt the same measure.[14] Efforts to implement a GPS there and in Connecticut were rolled into – and subsumed by – the negotiations that led up to the creation of

the RGGI Model Rule in 2006, which eventually led to the CO_2 trading program that was launched in 2009. New Jersey also decided that a performance standard would have to be made contingent on adoption by at least 40% of the total electricity usage in the PJM Interconnection.[15]

The Northeast was not the only mover. Other states around the country took the view that they could get ahead of inevitable tighter federal emissions standards by creating incentives to invest in efficient generation capacity. This would avoid utilities signing long-term purchase agreements with less efficient generators, thereby exposing customers to the future costs of efficiency upgrades. Five states eventually passed performance standards for the electric sector: California, New Mexico, Oregon, Massachusetts, and Washington. Illinois and Montana passed bills to foster the development of clean coal capacity. These programs are summarized below.

Aside from the forthcoming Transport Rule and its predecessors, a nationwide set of performance standards with a market-based compliance mechanism has remained elusive. The series of energy and climate change bills that were introduced during the decade from 2000-2010 would have achieved the same basic goals as a performance standard – emission reductions, market-based compliance mechanisms, equal accounting for the relative impacts of all fuels, incentives for renewable energy and generation efficiency – albeit with a broader scope and more direct incentives for clean energy. With the President's recent shift away from comprehensive energy and climate policy reform toward a more targeted Clean Energy Standard (CES), it appears that the discussion of performance-based policy structures will take center stage during the 112th Congress.[16] Politically speaking, a CES is a concession to proponents of traditional forms of energy, because the standard is fuel-neutral and can be written to include incentives for nuclear, natural gas, and "clean" coal in addition to renewables.

Successful State Legislative Efforts[17]

As noted above, five states have passed their own alternative air emission policies for the electric sector, and several others have created specialized incentives for clean energy. As is evident in the summary of each one, the standards, mechanisms, and overall structure of each policy is very clearly shaped around the electric sector dynamics and prevailing politics of each state.

California – Emissions Performance Standard – SB 1368[18]

Responsible Party	Load-serving entities (investor-owned utilities, electric service providers, or community choice aggregators) and publicly owned utilities.
Standard	1,100 lbs CO_2/MWh
Applies To…	Baseload electricity – power procured from plants designed to operate with an annual capacity factor of at least 60 percent.
Region	California
Compliance Mechanism	Procurement plans are reviewed to ensure that any baseload power plants that sign new long-term capital agreements meet the performance standard. The following events trigger the standard: New plant construction; New or renewed PPAs of 5-years or longer; Purchase or increase of ownership interest in an existing plant; and Capacity increases at existing plants. Compliance with the standard is based on net emissions. Therefore, CCS may be used to comply.
Status	Signed into law in September 2006. Active. The CPUC established EPS rules for investor-owned utilities in January 2007[19] and the CEC established rules for public utilities in June 2007.[20] Southern California Edison's investments in its Four Corners coal-fired generating plant made prior to 2012 have been granted a partial exemption from the EPS; [21] their recovery of the costs to make these modifications is currently being disputed by the Sierra Club on the grounds that they violate the EPS.[22]
Other details	Applies to out-of-state as well as in-state facilities. The California Public Utilities Commission reviews plans for investor-owned utilities, while the California Energy Commission has jurisdiction over publicly owned utilities. Exemptions for gas combined-cycle plants that were operational or had received a final permit from the CEC by June 2007, regardless of their emission rate; these plants also exempt for capacity increases of up to 50 MW. Solar thermal electric plants that receive up to 25 percent of their heat input from gas are exempt from standard, along with other renewable resources. SB 1368 directs the PUC to reevaluate the EPS at the time that a load-based GHG cap comes into effect in the state (currently planned for the beginning of 2012 with AB 32); after such reevaluation they can opt to continue, modify, or replace the EPS in consultation with the CEC and the California Air Resources Board.

Illinois – Tax Incentives for Clean Coal – SB 1987[23]

Responsible Party	Utility
Standard	5% of power must be purchased from proposed Taylorville clean coal facility by 2015. "Clean coal" defined as a plant that sequesters 50% of CO2 emissions (before 2016), 70% (2016-17), 90% (after 2017). State-wide goal of 25% of electricity from clean coal by 2025, and RPS of 25% by 2025, of which 75% to come from wind energy.
Applies To…	Plant
Region	Illinois
Compliance Mechanism	Electricity procurement target
Status	Passed January 2009. Taylorville facility failed to meet economic hurdles and was never undertaken.
Other details	Average annual customer cost increases to be below 0.5%

Massachusetts – Emissions Standards for Power Plants – 310 CMR 7.29[24]

Responsible Party	Plant owner, operator, or lessee.
Standard	The emission standards for covered plants were as follows: 2006 – 2008: average annual emissions from 1997 – 1999 or other representative 3-year period 2009: 1,800 lbs CO2/MWh (not enacted due to RGGI)
Applies To…	Plant – generally any facility that emitted 500 or more tons of SO2 and NOx in any calendar year from 1997 to 1999.
Region	Massachusetts
Compliance Mechanism	A covered entity was required to submit offset credits to account for emissions above the established rates. If the cost of creating offset credits was deemed too high, covered entities could make payments into a trust to fund emission reduction projects.
Status	Repealed. Superseded by RGGI.
Other details	The standards for SO_2, NOx, and mercury are still in effect. The regulations included several "triggers" to expand the geographical scope of allowable offsets or allow payment to the trust. The trigger price for allowing payments to the trust was initially set at $10 per ton, and scheduled to increase by 2 percent per year plus the rate of inflation. Offset credits created under this program were exchanged on a one-for-one basis with RGGI allowances.

Montana – Carbon Capture and Storage Requirement – HB 25[25]

Responsible Party	Utility
Standard	New (2007 and later) coal plants selling power to utilities must capture and store 50% of CO_2 generated; new natural gas plants must implement cost-effective carbon offsets

Applies To…	Plant
Region	Montana
Compliance Mechanism	Straight CCS requirement
Status	Passed May 2007. The CCS portion of the bill has not yet been tested, but the PSC order granting NorthWestern Energy's request to build a gas-fired power plant (Mill Creek) included approval of a carbon offset plan.[26]
Other details	Only applies to formerly restructured utilities – i.e., NorthWestern Energy

New Mexico – Greenhouse Gas Reduction Program – 20.2.100 NMAC[27]

Responsible Party	Plant owner.
Standard	3 percent annual reduction relative to 2010 baseline emissions levels starting in 2013.
Applies To…	Plant – any facility that emits 25,000 metric tons of CO_2 or more annually.
Region	New Mexico
Compliance Mechanism	Sources that do not meet their annual reduction requirements must cover their excess emissions using one or more of the following mechanisms: Credits or early action credits from excess reductions made at sources controlled by the same entity; Offsets approved by the New Mexico Environment Department; or Deferring ("borrowing") its reduction requirement for one year by adding 110 percent of the deferred requirement to its subsequent reduction requirement.
Status	Regulations approved in December 2010. Likely to be repealed prior to taking effect due to political opposition.
Other details	Sources may earn early action credits for actions taken between 2005 and 2011 that reduce CO_2 emissions. Credit trading is only allowed between sources controlled by the same entity. However, offsets may be transferred to any third party. The regulations establish a "compliance limit," which starts at $50 per ton of CO_2 and increases by $1 each year. If a source demonstrates that it has expended at least the compliance limit in an attempt to reduce emissions, but fails to achieve the necessary reductions, no further action is necessary for that year. If a source demonstrates that there are insufficient offsets or reduction opportunities or that compliance would hinder the continued operation of the source it is exempt from the reduction requirement for that year.

New Mexico – CCS Tax Incentive - SB 994[28]

Responsible Party	Plant owner.
Standard	To qualify for the incentive, a plant must limit CO_2 emissions to 1,100 lbs CO_2/MWh by 2017 through CCS. In addition, a plant must meet the lower of BACT or the following rates for other pollutants: SO_2 – 0.035 lbs/MMBtu; NOx – 0.025 lbs/MMBtu; PM – 0.01 lbs/MMBtu; and Mercury – 90 percent removal from fuel input levels.
Applies To…	Plant
Region	New Mexico
Compliance Mechanism	Optional tax credit for owners of clean energy facilities
Status	Passed April 2007. Active, but has not yet been used.
Other details	Plants must have a net capacity of less than 700 MW to qualify. Also directs the state PUC to create rules that allow cost recovery of investments in "advanced" clean energy projects

Oregon – Emissions Performance Standard – SB 101[29]

Responsible Party	Investor-owned utilities, electricity service providers, or publicly owned utilities
Standard	1,100 lbs CO_2/MWh
Applies To…	Baseload electricity – power procured from any plant that is designed to operate with an annual capacity factor of at least 60 percent.
Region	Oregon
Compliance Mechanism	A utility or electricity service provider may not enter into a long-term financial commitment for electricity from a baseload power plant that does not meet the performance standard. Long-term financial commitments include: Investment in new plant construction; Increased ownership interest in or upgrades to an existing facility; or new or renewed PPA of 5-years or longer. A plant is exempt from the standard if it has a plan in place to become a low-carbon resource (e.g. CCS) within seven years of commencing operation.
Status	Signed into law in July 2009. Active, but implementing rules have not yet been developed by the Oregon PUC.[30]
Other details	Applies to out-of-state as well as in-state facilities.

Oregon – Generation Performance Standards for New Gas Plants – HB 3283[31]

Responsible Party	Plant owner.
Standard	675 lbs CO_2/MWh – standard is approximately 17 percent below most efficient gas plant operating in the U.S.
Applies To…	New gas-fired power plants.
Region	Oregon
Compliance Mechanism	Plants can meet the performance standard through any of the following mechanisms: Using cogeneration to offset fossil fuel consumption; Developing or sponsoring other approved offset projects; or Making payments of $1.27 per short ton of excess CO_2 emissions to The Climate Trust.
Status	Signed into law in 1997. Active. Implementing rules were set up in March 1999. All facilities to date have chosen the "monetary path" option for compliance. As of June 2009, the Climate Trust had received $17.8 million in monetary path funds, and had a portfolio of offsets expected to reduce 2.3 million metric tons of CO_2 over their lifetimes.[32]
Other details	The law allows Oregon's Energy Facility Siting Council to establish separate performance standards for baseload and non-baseload power plants, but the Council set both standards at 0.675 lbs CO_2/MWh. The Council has the authority to establish performance standards for non-gas fired power plants, but has yet to do so. The Council can adjust the payment amount to The Climate Trust every two years, but may not increase or decrease the amount by more than 50 percent.

Washington – Emissions Performance Standard – SB 6001[33]

Responsible Party	Electric utilities, including investor-owned and publicly owned utilities.
Standard	1,100 lbs CO_2/MWh
Applies To…	Baseload electricity – power procured from any plant that is designed to operate with an annual capacity factor of at least 60 percent.
Region	Washington
Compliance Mechanism	A utility may not enter into a long-term financial commitment for electricity from a baseload power plant that does not meet the performance standard. Long-term financial commitments include: Investment in new plant construction; Increase ownership interest in or upgrades to an existing plant; or New or renewed PPA of 5-years or longer.
Status	Signed into law in May 2007. Active. The Department of Ecology adopted implementing rules in June 2008. In its order on Avista's 2009 rate case, the WUTC denied Avista's request to include a PPA in rates based partly on the fact that it had failed to demonstrate the PPA complied with the performance standard.[34]
Other details	Applies to out-of-state as well as in-state facilities.

Washington – Generation Offset Requirement – HB 3141[35]

Responsible Party	Plant owner.
Standard	Offset 20 percent of CO_2 emissions.
Applies To…	New fossil fuel-fired power plants.
Region	Washington
Compliance Mechanism	Proposed plants must include a CO_2 mitigation plan describing how the plant will meet the offset requirement through one of the following methods: Payment of the mitigation rate to a third-party mitigation provider; Purchase of certified offset credits; or Direct investment in mitigation projects, including cogeneration. Cogeneration plants earn credits for reduced fossil fuel consumption that counts against the offset requirement.
Status	Signed into law in 2004. Active. Both fossil-fueled generation plants under the jurisdiction of the Energy Facility Site Evaluation Council have CO_2 mitigation plans in their Certification Agreements.[36]
Other details	The current mitigation rate is $1.90 per metric ton of CO_2.

Emissions Tracking Systems

One of the challenges in implementing an alternative emissions performance standard – particularly one that requires compliance at the local distribution company level – is tracking the emissions attributes of electricity. While it is impossible to track the origin of a specific electron directly, tracking systems can create certificates that record attributes of electricity that is generated. Such certificates can then be traded separately from actual electricity. PJM-GATS, which serves the PJM interconnection, and NEPOOL-GIS, which serves ISO-New England, are both "all-generation" tracking systems. Every MWh generated in these regions is recorded in a system, creating a certificate that contains a comprehensive set of information about the generation source and its emissions. These certificates are then traded separately from the energy that is generated, and local distribution companies are obligated to obtain certificates to match the amount of load they serve. If they do not purchase certificates from a specific source, they are given certificates in a representative mix of the unpurchased credits from the system as a whole.

The other North American tracking systems –M-RETS, in the Midwest; W-REGIS, in the West; and state-specific systems in Texas, New York, North Carolina, and Michigan – currently track only renewable generation, and generate renewable energy certificates, used for compliance or voluntary offsets. Nonetheless, it would be relatively simple to extend these existing systems to incorporate non-renewable generation and emissions attributes. The infrastructure for the M-RETS, WREGIS, and the North Carolina and Michigan systems was all created by APX, Inc., which also created the all-generation NEPOOL-GIS and PJM-GATS systems. M-RETS notes on its website that it will consider tracking nonrenewable generation in the future. These tracking systems could then be used for compliance with an alternative emissions policy at either the generator or distributor level.

Integrated Resource Planning

While state energy regulators have for a long time required utilities to determine the resources they will use to meet projected energy needs, roughly thirty states have implemented a requirement for a more comprehensive approach known as "Integrated Resource Planning" (IRP). In the words of the Vermont state statutes, an IRP

> "is a plan for meeting the public's need for energy services, after safety concerns are addressed, at the lowest present value lifecycle cost, including environmental and economic costs, through a strategy combining investments and expenditures on energy supply, transmission, and distribution capacity, transmission, and distribution efficiency, and comprehensive energy efficiency programs."[37]

In the case of Vermont the provisions include consideration for the state's greenhouse gas inventory and progress meeting its GHG reduction goals. In other words, the IRP process provides a way to account for environmental costs that may not be incorporated anywhere else into the energy procurement decision.

While the IRP process initially arose as a way for utility commissions to gain a firmer grasp on the electric sector in their states, it has turned into a valuable lever for driving the adoption of energy efficiency and renewable energy sources. The exercise requires utilities to develop detailed long-term projections of demand and show how they will be able to meet it cost-effectively through a combination of energy generation and conservation. Each source must be identified and accounted for in the overall average cost calculation. Twin goals of reliability and cost-effectiveness guide the negotiation.

Even if the IRP does provide a way to build a systematic reliance on efficiency and renewables, the planning process is anything but formulaic. Public Utility Commissions are not told what pollution prices to use. Other key cost parameters such as the prices of fossil fuel inputs are often provided by utilities themselves. The process is interactive and involves stakeholder participation. Simply having an IRP process does not guarantee a positive environmental outcome, but the process provides a forum for influencing electricity procurement decisions and negotiating the assumptions around the costs and benefits of clean energy.

In order to support the addition of cleaner generating resources, the grid needs adequate transmission. This is not explicitly addressed by any of the policy structures discussed in this paper. Instead, transmission is left to a different process overseen by the Federal Energy Regulatory Commission (FERC). In 2010 FERC amended its policy on transmission planning (Order No. 890) by requiring utility commissions to participate in regional transmission planning and committing to nine principles: coordination, openness, transparency, information exchange, comparability, dispute resolution, regional participation, economic planning studies, and cost allocation for new projects. The objective was to ensure that new generating capacity would not be at a disadvantage due to constraints in transmission. Although it falls into a separate administrative process, this rule complements any emission policy structure that creates incentives for developing new, lower-emission generation.[38]

IV. Expanding the Use of Performance Standards

Wider adoption of policy alternatives to national energy and climate legislation has the potential to yield incremental improvements in the pollution intensity of the nation's electric power generators. This much can be confirmed through the track record of existing measures such as the CAA SO_2 cap-and-trade program and state-level RPS programs. Designing an alternative emissions policy that stands up to political opposition is far more of a challenge than designing one that will simply reduce emissions. In this section we explore two paths that could lead to wider use of performance standards in the multi-pollutant context: the adaptation of existing legislation, and the proliferation of new rules at the state or federal levels.

Clean Air Act: The First Last Resort

As mentioned earlier, the New Source Performance Standards (NSPS) provision of the CAA, section 111, requires EPA to list emission sources that cause or significantly contribute to air pollution. There is a long history of the NSPS program applying to electric sector emissions, but so far it has not applied to greenhouse gas emissions because they were excluded from the pollutants of interest – those reasonably anticipated to endanger public health or welfare.

This changed with the EPA's 2010 "endangerment finding," a court-led determination that the EPA should add GHGs to the list of pollutants covered by the CAA. Because of this addition, the EPA now has to set minimum performance standards for new sources in all sectors that emit GHGs. In addition, states must submit a plan to EPA that establishes a performance standard for existing sources. In December 2010 EPA announced that it will propose performance standards for new and modified fossil-fueled power plants by July 2011 and finalize them by May 2012, when it will also issue guidelines to states for regulating greenhouse gases from existing sources. The rule-making process includes five listening sessions in February 2011 and a call for written comments that closes March 18, 2011.

Alongside this collaborative rulemaking process runs an ongoing debate about whether the CAA is a legal and suitable device to regulate GHGs. Opponents of regulation challenge the legality and EPA's authority under the CAA, while proponents of GHG controls support EPA's efforts but many would prefer to see a more tailored legislative effort.

Performance Standards under the CAA

Section 111 calls for EPA to establish performance standards that are based on the "degree of emission limitation achievable through the application of the best system of emission reduction which…has been adequately demonstrated."[39] One of the simplest and most legally sound approaches is for EPA to develop an emissions- or heat rate-based performance standard (i.e., lbs/MWh or Btu/kWh). The standards may be based on historical data or could be designed to provide incremental improvements on a baseline heat rate for each unit. Stakeholders are discussing whether EPA has the authority to establish the point of control at the company level rather than the facility level, which would allow averaging across a company's units.

Regardless of how EPA establishes the standard, the language in section 111 provides EPA considerable discretion to determine the "best system of emission reduction" for the electric sector (i.e., the means of compliance with the standard). EPA may determine that under section 111(d), states have the authority to allow units to use trading to demonstrate compliance with a performance standard because it can achieve greater reductions at a lower cost. For example, EPA could establish a performance standard

(e.g., pounds CO_{2e} per MWh) for each source category. EPA could then establish a process whereby states submit their plans to allow a source to demonstrate compliance with the standard by (1) complying with the standard; (2) over-complying and accruing tradable allowances; or (3) under-complying and purchasing allowances or surrendering banked allowances.

However, the current politics around market-based programs – particularly around cap-and-trade – present a clear challenge to this approach. During a conference call briefing with stakeholders on the day EPA announced the settlement, Assistant Administrator for Air and Radiation, Gina McCarthy, stated expressly that EPA wanted to develop a flexible rule but was not looking to establish a cap-and-trade system. This statement reinforced the political challenge of federal trading systems and the concerns over market-based mechanisms in general. Whether EPA has the legal authority to establish a cap-and-trade program under section 111 has not yet been tested in court.[40]

One way to increase compliance flexibility *without* creating a federal trading program would be to develop a federal performance standard and allow existing state or regional trading programs to serve as compliance pathways. For example, EPA could set performance standard(s) for the sector and allow states to use state or regional programs (e.g., RGGI, Western Climate Initiative, or California's forthcoming cap-and-trade system) to demonstrate compliance through the SIP process. While this idea holds promise for increasing compliance flexibility and avoiding the legal concerns about EPA establishing a cap-and-trade system, details of such a regulatory pathway would need to be more fully examined and vetted by stakeholders.

In terms of whether NSPS could be extended to form a federal performance standard for the electric sector, it is important to note that any NSPS system for existing generator units is unlikely to address NO_x, SO_2, CO_2, and mercury comprehensively. NO_x, SO_2, mercury, and other emissions from the electric sector[41] are already regulated elsewhere by the CAA, so an NSPS for the electric sector under section 111(d) would *only* address greenhouse gases unless the CAA were substantially rewritten. Although EPA often evaluates how the Agency might implement a multi-pollutant strategy, the CAA creates several legal obligations that limit EPA's flexibility. In the end, the GHG NSPS that EPA is now working to develop is likely to be fairly conservative and remain within the clear authority of the Act given the current political dynamics. Any flexibility and measures to drive deeper reductions are likely to result from state-level actions that can be demonstrated to achieve equal or greater reductions than the federal performance standard.

New State Rules

States can take credit for most of the influential environmental standard-setting over the past decade. This may be due to greater political feasibility: state-level actions face scrutiny from a narrower set of interests. They also tend to be well-tailored to the regional energy mix. The California EPS has so far been the model for other states that choose to consider similar legislation. California is a large net importer of electricity and the country's second largest user of electricity, behind Texas, giving it great purchasing power (see Figure 2). Its solitary actions thus cause a much larger impact on both in-state and out-of-state generators than the actions of a state such as Connecticut, which uses roughly one-tenth as much electricity. Early indications from the California EPS are that developers of renewables and natural gas have seen strong interest from utilities, while conventional coal plants have been taken off the table or replaced with proposals that include CCS. The program offers regulatory certainty about the permanence of the state's low-emission strategy. The effect on generators is being felt as far away as coal-heavy Montana and Wyoming.

Yet as experience has shown in New Jersey, Connecticut, and New York, getting states to act on their own is difficult, particularly when most costs accrue to in-state entities but marginal benefits to shared air resources are much less state-specific. And indeed, state and federal support for new policy structures is proving mercurial, driven as much by political intent as by the vision of a more efficient electric sector.[42]

For the moment, Massachusetts appears to be one of the few states with its eye on a performance standard – and even there it's barely a glimmer on the horizon. As was the case in Connecticut and New Jersey, electric sector deregulation in Massachusetts included a provision that enabled the state Attorney General and energy regulators to adopt performance standards. The regulators never did so, citing lack of internal resources to manage the program.

In December 2010 the secretary of Energy and Environmental Affairs released the "Massachusetts Clean Energy and Climate Plan for 2020," which outlined a broad strategy for achieving emission reductions in all sectors.[43] The plan offers the suggestion that a market-based performance standard "is needed to provide a clear signal to the electricity market to improve upon the cleaner energy portfolios of the last few years and to encourage" infrastructure projects. The plan does not specify whether utilities or generators would be responsible for compliance. It does outline some challenges and the need to integrate the plan with the state's existing Renewable Portfolio Standard. It remains to be seen whether regulators will prioritize this policy effort in the coming months.

Opportunities and Limits to Adoption

The legislative emphasis at the federal level for 2011 appears to be centering on a Clean Energy Standard (CES). If passed, such a policy would standardize guidelines for the energy sector and eliminate the problems introduced by a patchwork system of state-level rules. Yet opponents of tighter emission controls are already decrying a CES as cap-and-trade in disguise.[44] Such is the inclusive nature of a CES that it invites widespread debate on which energy sources to accept as "clean" and which to exclude. Given the makeup of the House of Representatives in the 112th Congress, a probable policy outcome is either that the CES will be debated into the ground, or that it will be passed with performance standards so loose that they will bear little impact on electric sector emissions. Conceptually, a federal generation performance standard would look much like the CES, but with a more robust market-based compliance mechanism. Even though the standard would be based on emissions intensity, rather than tons of emissions, the mechanism is likely to be construed as a cap-and-trade system – the veritable death knell for any policy instrument.

Figure 1 shows the CO2 intensity of delivered electricity in all 50 states compared to a performance standard of 1,100 lbs/MWh, which was the level selected by California. Note that of the five states that have passed EPS legislation, four (CA, OR, WA, MA) already have average delivered electricity emission levels below the performance standard. These states did not take on a major liability by passing the legislation. Moreover, it seems unlikely that penetration will be limited to the states that are already near or below the standard. Thirteen states fall below the standard, and another five are within 10% above the standard.

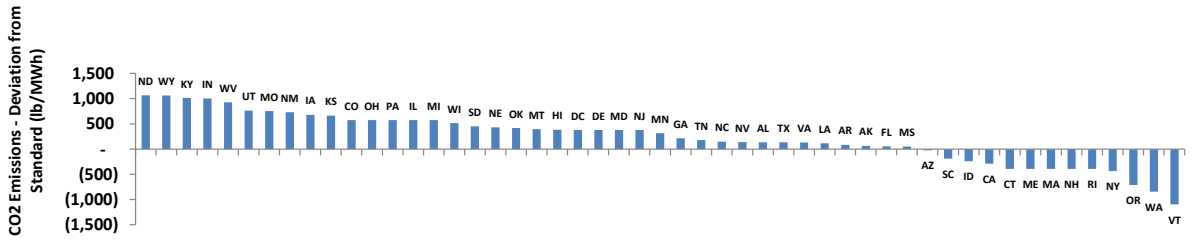

Figure 1: CO_2 intensity for delivered electricity in all 50 states, relative to an 1,100 lb/MWh standard. (Source: EIA 2008; MJB&A Analysis)

If the potential for greater EPS adoption is limited at the state level, the actions of those states that import electricity could influence investment decisions in neighboring states. Figure 2 shows import and export activity by state. The five largest importers of electricity are California, Virginia, Florida, New Jersey, and Maryland. While California has already flexed its muscle, Virginia and Florida have

not. Both could have a significant impact by using their buyer power, since they are situated in a region where many of the country's oldest and most polluting plants are located. Yet the politics in those states are unlikely to favor an EPS. And history has shown that New Jersey and Maryland, located in the deregulated PJM ISO, are likely to want to see commitment from others in the region. Moreover, efforts to adopt an EPS were already overshadowed by the states' decisions to participate in RGGI, which together with the CAA provisions covers all four pollutants that might be regulated by a performance standard.

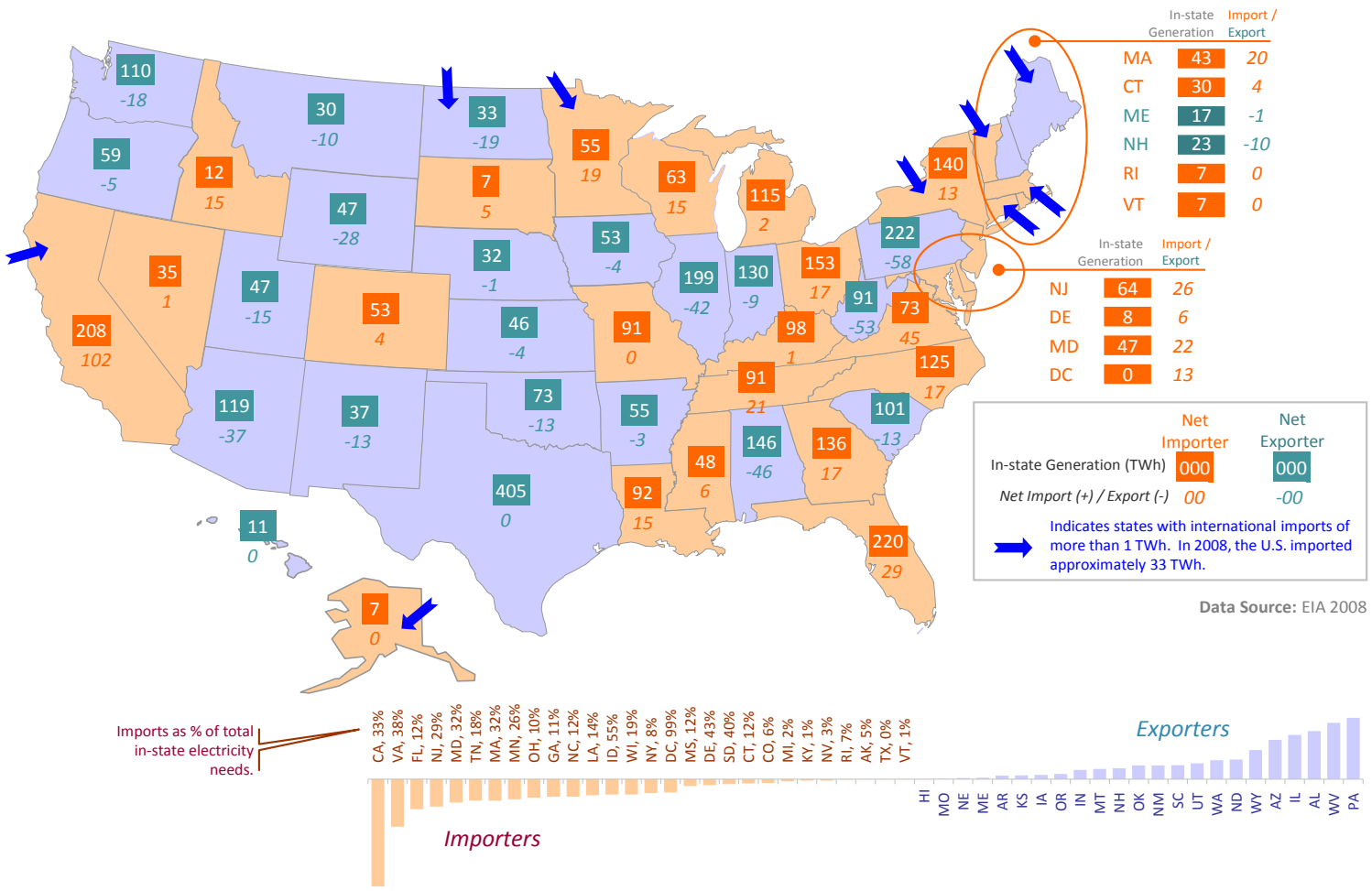

Figure 2: Imports and Exports of Electricity by State, 2008.

From this analysis emerge some conclusions about the potential for greater state-level adoption of alternative emission policies:

- State-level adoption will be idiosyncratic. Individual states will assess their own concerns about energy security and desire to stem the flow of capital toward fossil fuel imports. From this standpoint there are limited incentives for coal-heavy net-exporting states such as Alabama, Illinois, North Dakota, Pennsylvania, West Virginia, and Wyoming.
- Multi-pollutant regulations at the state level are complicated to implement and enforce. If implemented, performance standards to cover GHGs as well as criteria pollutants will need to be synchronized with Federal efforts either by making emissions allowances fungible between programs or by allowing state-level programs to supersede federal programs as long as they meet or exceed federal standards.
- RPSs are the most widely adopted state-level policies. Performance-based standards can coexist alongside an RPS as long as the interaction between the programs is anticipated and clearly understood.

Summary of Incentives

The table below summarizes the sectors that are likely to benefit from the different policy structures. This is based on the most common forms of policies either implemented or proposed. For standards that have only been proposed, not all possible outcomes are reflected since there remains uncertainty about the final design.

	Generation Efficiency	Demand-Side Efficiency	Renewable Energy	Nuclear / Clean Fossil
Emissions Performance Standard	✓	✓*	✓	✓
Generation Performance Standard	✓		✓	✓
Clean Energy Standard	✓	✓*	✓	✓
Renewable Portfolio Standard			✓	
New Source Performance Standard	✓			
Renewable Electricity Standard	✓	✓*	✓	
Cap & Trade	✓	✓*	✓	✓
Integrated Resource Planning	✓	✓	✓	✓

** May create demand-side efficiency incentive if the policy recognizes efficiency as a resource.*

Policy Conclusions

In the policy planning process there is a tradeoff between predictability and scope. It is easier to anticipate the impacts of more narrowly-targeted policies, but their outcomes will be more limited and the compliance options less dynamic than the more comprehensive policies. Performance standards-based policies lie somewhere in the middle: more expansive than an RPS, but with less coverage than an economy-wide cap-and-trade system.

As we have seen, the outcomes for an alternative air emission policy structure will depend on the standards, where they apply, the responsible entities, and the compliance mechanisms. These factors also determine political feasibility. Some policy conclusions follow.

1. *Expect any federal action to be narrow in scope.* Federal passage of energy and climate legislation, even through the most targeted programs such as a national RPS, seems unlikely in the current environment. If air pollution policies are going to drive the electric sector toward a cleaner generating fleet, they need to be written for and implemented at the state or regional level. The one exception is the EPA's ongoing work to write provisions for CO_2 into the CAA, although this effort faces an uphill road. There is little chance that EPA will be able to use the NSPS provision to create a cap and trade system in lieu of separate enabling legislation.
2. *Place utilities on the hook.* The proposed climate bills placed the compliance burden on load-serving entities. The same approach makes sense for a state or regional performance-based policy

structure because it helps ensure that the cost-bearing entities fall entirely within the governing jurisdiction. The alternative, a generation performance standard, subjects out-of-region ratepayers to the compliance costs of in-region generators.

3. *Choose ambitious but feasible standards.* The 1,100 lb/MWh standard implemented by several states does not improve upon current average emission intensities, even if it helps ensure that no new coal units without CCS are built.[45] No policy measures have yet established a single set of performance standards for efficiency (btu/kWh) and the four key pollutants (lbs/MWh).
4. *Apply the standards to the source, but leave flexibility.* It is not clear whether the EPA has the authority to choose whether NSPS standards can be applied to a unit, plant, or owner. A newly-created standard would be able to write this provision from scratch. Providing compliance entities the flexibility to average across sources could help overcome opposition.
5. *Use market-based compliance options if possible.* The economic case for market-based compliance options remains strong in spite of the current negative sentiment toward cap-and-trade programs. Recent EPS rules have left out market-based compliance options, but the total costs to ratepayers will be lower if tradable allowances can be built into the system.
6. *Consider the pollutant list.* Multi-pollutant measures have been under consideration in Congress for a decade or more but not all of them include CO_2. Writing a regional policy that excludes CO_2 is likely to overlap with existing CAA programs to control NO_x, SO_2, and mercury. On the other hand, passing a policy that *only* covers CO_2 appears to be a non-starter because of current lack of urgency around addressing climate change. A multi-pollutant performance standard would need to be integrated with existing CAA programs.
7. *Avoid interfering with complementary programs.* With RPS programs in force in two-thirds of U.S. states, significant inroads are being made toward expanding the country's reliance on renewable energy. This, in turn, is driving the discussion around the need for ample natural gas capacity to pair with intermittent renewables. A performance standard should dovetail with RPS programs and preserve the value of renewable energy certificates.

Endnotes

[1] A provision within the Clean Air Act, NSPS is a command-and-control mechanism that sets performance levels for new generating units or major updates to existing units.
[2] In late 2010 the EPA released preliminary revised estimates for the greenhouse gas emissions from petroleum and natural gas production. The new estimates were significantly higher than previous estimates, prompting questions about the relative environmental benefits of natural gas. At the time of this writing it is not yet obvious which EPA methodology is "correct"; the issue remains unresolved. The EPA's Technical Support Document is available at http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf
[3] For information on the RGGI treatment of the portfolio standard see http://www.rggi.org/docs/ghg_epsbackground.pdf
[4] Oregon's statute is available at http://www.leg.state.or.us/97reg/measures/hb3200.dir/hb3283.en.html
[5] U.S. EPA, accessed at http://www.epa.gov/apti/course422/apc4c.html
[6] Of course the economic debate is a complicated one, as cap-and-trade systems come with their own challenges such as deciding where to set the cap, and how to administer the program in a cost-efficient way.
[7] This issue is discussed at length in economics textbooks. See, for example, "The Choice of Regulatory Instruments in Environmental Policy," Nathaniel O. Keohane et al., Harvard Environmental Law Review, 22:313-367, 1998.
[8] Even if they are allocated for free, pollution allowances have an economic value that the bearer, by holding them, does not capture in the allowance trading market, and thus will seek to recover from ratepayers.
[9] See the comparison of cap-and-trade with a generation performance standard at "Power Plant Emission Reductions Using a Generation Performance Standard," Energy Information Administration, J. Alan Beamon et al., accessed at http://www.eia.doe.gov/oiaf/servicerpt/gps/pdf/gpsstudy.pdf
[10] Ibid.
[11] Information for this section is drawn from contemporary analysis performed by MJB&A.
[12] Full text of the bill is available at http://thomas.loc.gov/cgi-bin/t2GPO/http://www.gpo.gov/fdsys/pkg/BILLS-106s172is/pdf/BILLS-106s172is.pdf
[13] Cf. note 3.
[14] Filings from the State of Connecticut's Office of Legislative Research discuss the dynamics between New York and Connecticut. See for example http://www.cga.ct.gov/ps99/rpt/olr/htm/99-r-1099.htm and http://www.cga.ct.gov/ps99/rpt/olr/htm/99-r-1298.htm. The initial Connecticut provision is in the state code at Sec. 22a-174j.
[15] Cf. note 3.
[16] As of February 2011 President Obama has selected Sen. Jeff Bingaman (D-NM) to build support for a CES. Bingaman has been an active proponent of alternative air emission policies such as a Renewable Electricity Standard (RES). See, for example, "Obama Taps Bingaman to Build Bipartisan Consensus for Clean Energy Standard," accessed at http://www.reuters.com/article/2011/02/03/idUS219398574720110203
[17] Portions of this section adapted from "Emissions Performance Standards In Selected States," Chris Simpson et al., Research Brief, Regulatory Assistance Project, August 2010, accessed at www.raponline.org/docs/RAP_ResearchBrief_Simpson_EPS_Updated_2010_08_12(2).pdf
[18] California Senate Bill 1368: http://www.energy.ca.gov/emission_standards/documents/sb_1368_bill_20060929_chaptered.pdf
[19] Decision 07-01-039; http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/64072.PDF
[20] http://www.energy.ca.gov/emission_standards/regulations/index.html
[21] http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/125183.htm
[22] http://docs.cpuc.ca.gov/efile/MOTION/130382.pdf
[23] http://www.ilga.gov/legislation/publicacts/95/PDF/095-1027.pdf
[24] Massachusetts 310 CMR: http://www.mass.gov/dep/air/laws/regulati.htm
[25] http://data.opi.mt.gov/bills/2007/billhtml/HB0025.htm
[26] http://www.psc.mt.gov/eDocs/eDocuments/pdfFiles/D2008-8-95_6943a.pdf
[27] New Mexico Greenhouse Gas Reduction Program: http://www.nmcpr.state.nm.us/nmregister/xxii/xxii02/20.2.100new.htm
[28] http://www.nmlegis.gov/Sessions/07%20Regular/final/SB0994.pdf
[29] Oregon Emissions Performance Standard, SB 101: http://www.leg.state.or.us/09reg/measpdf/sb0100.dir/sb0101.en.pdf
[30] Regulatory Assistance Project Research Brief, August 2010: Emissions Performance Standards in Selected States http://www.raponline.org/docs/RAP_ResearchBrief_Simpson_EPS_Updated_2010_08_12%282%29.pdf

[31] Oregon Carbon Dioxide Emission Siting Standards: http://egov.oregon.gov/ENERGY/SITING/standards.shtml#Carbon_Dioxide_Emissions
[32] The Climate Trust, *Leading by Example: Developing quality offsets and the national carbon market* (Five year report to Oregon Energy Facility Siting Council). http://www.climatetrust.org/documents/LeadingbyExample_FNL_101409.pdf
[33] Washington SB 6001, Emissions Performance Standard: http://apps.leg.wa.gov/documents/billdocs/2007-08/Pdf/Bills/Session%20Law%202007/6001-S.SL.pdf
[34] http://wutc.wa.gov/webimage.nsf/0/3EFAF6B11BF855078825755800624911D
[35] Washington HB 3141, Carbon Dioxide Mitigation: http://apps.leg.wa.gov/rcw/default.aspx?cite=80.70
[36] http://www.efsec.wa.gov/satsop.shtml and http://www.efsec.wa.gov/cgf.shtml
[37] Vermont Statutes Title 30 § 218c, accessed at http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=30&Chapter=005&Section=00218c
[38] The FERC ruling can be accessed at http://www.ferc.gov/industries/electric/indus-act/oatt-reform.asp
[39] 42 U.S.C. § 7411(a)(1).
[40] EPA has recognized this ambiguity in the past when developing the trading program proposed for the Clean Air Mercury Rule (CAMR). The D.C. Circuit vacated the case over EPA's "delisting action" – the decision to remove mercury from the section 112 hazardous list – and never reached the question of whether trading was permitted under section 111. Given the important distinctions between GHGs, which do not pose localized emission issues, and other pollutants regulated under the CAA, stakeholders may support allowing trading for GHGs under section 111. Additionally, there is a large body of research demonstrating the cost-effectiveness of trading programs, which EPA has long recognized in cap-and-trade programs under section 110 (e.g., NO_x Budget Program, CAIR, and the proposed Transport Rule).
[41] In other words, this includes all pollutants classified as criteria air pollutants or hazardous air pollutants.
[42] As an illustration that the political pendulum swings not just at the federal level, the state legislature of New Hampshire, recently reformed with a Republican majority, held a hearing on February 11th, 2011 to discuss the possibility of withdrawing from RGGI. It is not clear what the net effect would be on ratepayers – lower electricity prices, but fewer customer benefits from RGGI auction revenues – but the legislature appears poised to terminate the state's participation in the coalition.
[43] The full plan is accessible at http://www.mass.gov/Eoeea/docs/eea/energy/2020-clean-energy-plan.pdf
[44] See, for example, "Cap and Trade Returns from the Grave," Kimberley Strassel, January 28, 2011, The Wall Street Journal.
[45] The DOE's current reference performance baseline is 1,768 lbs/MWh for supercritical pulverized coal and 804 lbs/MWh for combined cycle natural gas plants. See report DOE/NETL – 2010/1397, "Cost and Performance Baseline for Fossil Energy Plants," Exhibit ES-2 (p. 5), accessible at http://www.netl.doe.gov/energy-analyses/baseline_studies.html