

**The Effects of Interactions between Federal and State Climate Policies:  
Implications for Federal Climate Policy Design**

by

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Submitted to the Engineering Systems Division  
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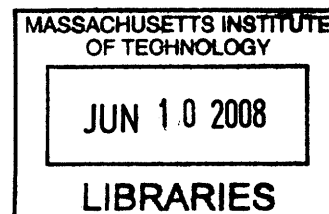


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## **Abstract**

In the absence of a federal policy to cap greenhouse gas (GHG) emissions many states are moving forward with their own initiatives, which currently range from announcements of commitments to reduce greenhouse gases to a regional multi-state cap-and-trade program slated to begin in 2009. As development of federal climate policy moves forward, federal policymakers must address how legislation or regulation capping GHG emissions will define the relationship between a federal cap and any existing state programs, particularly when state programs involve cap-and-trade. This thesis attempts to inform the policy debate on treatment of state programs under a federal cap-and-trade program through analysis of the economic, environmental, and distributional impacts of potential relationships between federal and state climate programs. Using economic theory, it considers the impacts and resulting implications for federal program design of four possible scenarios relating state and federal cap-and-trade programs: coexistence of state and federal programs resulting in separate but overlapping allowance markets; express federal preemption of state cap-and-trade programs; separate existence of state and federal programs via a 'carve-out' of the state program; and linkage between the federal program and carved-out state programs.

This thesis demonstrates that the impacts of potential state and federal program interactions depend on the relative stringency of the federal and state program and overlap in source coverage. Common design elements of cap-and-trade programs, such as cost containment provisions, affect this interaction through their impact on relative stringency. Where state programs are both duplicative of and more demanding than the federal cap, the effect is redistributive of costs and emissions; in-state sources face higher marginal abatement costs, leading to a loss of economic efficiency. These effects are avoided under either federal preemption of duplicative state programs or a 'carve-out' of state programs from the federal cap with linkage to the federal allowance market. While preemption is administratively straightforward for the federal government, it may come at a high political cost. On the other hand, the carve-out with linkage, while likely more politically feasible, may carry a high administrative burden. Policymakers determined to avoid the inefficiencies of overlapping programs will need to consider the tradeoffs between these two options.

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## List of Acronyms

AB	Assembly Bill
ANPR	Advanced Notice of Proposed Rulemaking
CAFÉ	Corporate Average Fuel Economy
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CARB	California Air Resources Board
CCS	Carbon capture and storage
CO <sub>2</sub>	Carbon dioxide
DOT	Department of Transportation
EERS	Energy Efficiency Resource Standard
EPA	Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
GHG	Greenhouse gas
KWh	Kilowatt-hour
LEED	Leadership in Energy and Environmental Design
LNG	Liquefied natural gas
MAC	Marginal abatement cost
MGGRA	Midwestern Greenhouse Gas Reduction Accord
MWh	Megawatt-hour
NAAQS	National Ambient Air Quality Standards
NO <sub>x</sub>	Nitrogen oxides
NSPS	New Source Performance Standard
OTC	Ozone Transport Commission
PSNH	Public Service of New Hampshire
PUC	Public Utility Commission
REC	Renewable Energy Credit
RGGI	Regional Greenhouse Gas Initiative
ROC	Rest-of-country
RPS	Renewable portfolio standard
SIP	State Implementation Plan
SO <sub>2</sub>	Sulfur dioxide
WCI	Western Climate Initiative



## 1. Introduction

Despite a strong scientific consensus on the existence of human-induced climate change and a growing sense of urgency among climate scientists and segments of the general public, progress toward the development of a national cap on greenhouse gas (GHG) emissions has been slow. Attempting to fill the void left at the federal level, many states and localities have begun to move forward with their own policy initiatives to reduce these emissions. In some states, activity thus far is limited to climate action plans and official GHG targets that have yet to be transformed into actual regulatory requirements. At the more developed end of the spectrum, however, is the Regional Greenhouse Gas Initiative (RGGI) a 10-state cap-and-trade program covering CO<sub>2</sub> emissions from the electric power sector scheduled to begin at the start of 2009, as well as other state regulations implementing emission rate requirements on individual sources. In addition, states in the Midwest and West are currently engaged in regional processes that would implement two other sub-federal cap-and-trade programs, and California continues to move forward with development of its own statewide regulations to cap GHG emissions.

As development of federal climate policy moves forward, federal policymakers must address how legislation or regulation capping GHG emissions will define the relationship between a federal cap and any existing state programs, particularly when state programs involve cap-and-trade. While U.S. policy on emissions control from stationary sources has traditionally retained state authority to impose requirements more stringent than those contained in federal regulation or legislation, opponents of retaining state cap-and-trade programs under a federal GHG emissions cap note the administrative burden of an additional compliance requirement, the requirement for sources to ‘pay twice’ for each ton of emissions, and the lack of additional or local environmental benefits.<sup>1</sup>

The relationship between federal and state programs has implications for economic efficiency and the overall cost of achieving a given national cap. To the extent that any such relationship creates disparities in marginal abatement costs among sources

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<sup>1</sup> These concerns are summarized in Illinois CCAG (2007).

in different states, economic efficiency is sacrificed and the cost of achieving a given national cap is increased. Beyond basic economic considerations, federal policymakers must consider a host of environmental and distributional implications in defining a relationship with state programs, such as whether there is potential for states to achieve emission reductions that are additional to, or less costly than, those achieved under the federal program; how or whether to reward states and sources that have been ‘early actors’; and potential impacts on state and federal allowance auction revenue streams.

Currently, the appropriate relationship between federal and state climate policies appears to be a potential point of contention both between and within the two chambers of Congress. In its current form, the leading Senate bill retains state authority to regulate GHG emissions provided these regulations are at least as stringent as the federal cap, and thus would allow state cap-and-trade programs meeting this requirement to coexist with the federal program, potentially resulting in overlapping allowance markets. Leaders in the House of Representatives, however, are expected to push for federal preemption of state cap-and-trade programs (Point Carbon 2008a), though three members have recently established a series of principles for federal legislation that include retention of state authority.<sup>2</sup> Congressional staff have called for state input into this discussion, though most states moving forward with sub-federal cap-and-trade programs do not appear to have taken a clear position on the fate of these programs under a federal cap.<sup>3</sup>

## 1.1 Overview of Thesis

This thesis attempts to inform the policy debate on treatment of state programs under a federal cap-and-trade program through analysis of the economic, environmental, and distributional impacts of potential relationships between the two, using insights from economic theory. It assumes that the decision of treatment of state programs applies only to state cap-and-trade programs, and that other state programs that reduce GHG emissions such as source-specific standards or demand-side measures will coexist with

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<sup>2</sup> These principles call for federal legislation that will “preserve states’ authorities to protect their citizens.” See Select Committee on Energy Independence and Global Warming (2008).

<sup>3</sup> For example, David McIntosh, Senator Lieberman’s counsel for energy and the environment, requesting state input on the treatment of state programs, asked, “...is it your position that a company in your state should have to buy an allowance both from your state and the federal government? If that’s the case, we in the federal government need to know that. The answer to that question is going to be very influential here in Congress” (Point Carbon 2008a).

the federal program. It then considers the impacts and resulting implications for federal program design of four possible scenarios relating federal and state cap-and-trade programs:

- Coexistence of state and federal programs resulting in separate but overlapping allowance markets
- Express federal preemption of state cap-and-trade programs
- Separate existence of state and federal programs via a ‘carve-out’ of the state program
- Linkage between the federal program and ‘carved-out’ state programs

These four relationships are characterized in terms of their impacts on aggregate state and federal marginal abatement cost (MAC) curves. Once these impacts are understood, it is possible to derive changes in allowance prices and emissions and their consequent aggregate and distributional effects.

This thesis is organized into 5 chapters. Chapter 2 provides a detailed overview of recent legislative and judicial developments related to the development of a federal cap-and-trade program for GHG emissions, as well as the treatment of state programs under existing federal programs to control emissions of other pollutants. These examples are used to derive the four potential relationships considered in this research. Chapter 3 provides an overview of the range of state climate policy developments, with a focus on program design and implementation, in order to further inform the characteristics of state programs considered in analysis. Chapter 4 analyzes the economic, environmental, and distributional impacts of the potential relationships between federal and state climate policies. Finally, chapter 5 considers the implications of this analysis for design and implementation of a federal program, and puts forth recommendations for federal policy and future research.

## **1.2 Summary of Findings**

This thesis demonstrates that where state and federal climate programs coexist, the effect of their interaction is largely determined by their relative stringency and the extent to which they cover the same sources. Common design elements of cap-and-trade programs, such as cost containment provisions, affect this interaction through their

impact on relative stringency. To the extent that a state or regional program is duplicative of the federal program yet more demanding of in-state sources, the effect is to redistribute emissions and costs; emissions shift away from in-state sources, and costs shift toward them. A more stringent state program will lead to disparities in marginal abatement cost among states, and thus a loss of economic efficiency and higher cost of achieving the national cap. A potential exception to this rule is a state program that leads to low- or negative-cost reductions that would be overlooked under the federal cap alone. A state program that is less demanding of in-state sources than the federal program will have no effect. Further, while duplicative state programs do not provide an additional environmental benefit, state programs that affect sources outside of the federal program will generally result in additional emission reductions. Finally, the addition of a federal cap will reduce the value of allowances under a state cap-and-trade program – and therefore, auction revenues – possibly to zero.

Federal preemption of state cap-and-trade programs or permitting a carved-out state program to link to the federal allowance market would avoid the efficiency loss that results when a federal cap-and-trade program coexists with a more stringent state program. While there is a compelling economic argument for federal preemption of state cap-and-trade programs, discussion of preemption may engender significant political opposition from states and environmental groups, depending on the degree to which states are determined to retain existing programs. In addition, under preemption, federal policymakers must address the transition of banked state-program allowances into the federal program. On the other hand, a carve-out with linkage provides a model for a more decentralized federal program that can avoid the need for direct preemption while also avoiding the efficiency loss that results from overlapping programs. However, such a program brings with it a number of implementation challenges, and will likely be least disruptive of the federal allowance market when harmonization of key program elements is required. Ultimately, if the federal government is determined to avoid the inefficiencies that result from overlapping allowance markets, it must weigh the political and administrative tradeoffs that result under these two options.

Finally, whatever the approach chosen by the federal government, allocation of some quantity of federal allowances directly to states can serve a number of important

purposes that could increase state support of the federal program and assist in a possible transition from state programs. These include compensating states for lost auction revenue, providing states the opportunity to be more stringent through federal allowance retirement, and maintaining the value of banked state program allowances. In considering the quantity of allowances to allocate to states, however, federal policymakers must weigh the loss of federal allowance revenue and the impacts of possible downward revision of the federal cap through state retirement of federal allowances.

## **2. The Path to a Federal Cap on GHG Emissions**

As Chapter 1 suggests, the evolution of climate policy at the federal level has lagged behind that of leading states. Proposals to cap CO<sub>2</sub> emissions to varying degrees have been considered by the last four Congresses. While an economy-wide cap passed out of the Senate Environment and Public Works Committee in December 2007, its prospects remain uncertain. At the same time, in the wake of *Massachusetts v. EPA* ((127 S. Ct. 1438 (2007))), EPA is facing considerable pressure to regulate GHG emissions under the existing Clean Air Act, and faces additional litigation and petitions to this end. This chapter considers the prospective development of a comprehensive cap on GHG emissions under both a legislative and regulatory approach, and the potential implications of each for the treatment of state programs. It also considers the treatment of state programs under relevant existing federal programs for emissions control, as well as the role of existing legal doctrine in determining the relationship between federal and state programs should federal legislation not clearly define it. Finally, based on this analysis, it defines the four primary scenarios for the relationship between federal and state programs to be considered in Chapter 4.

### **2.1 Legislative Development**

Federal climate policy in the U.S. to date has largely been a two-pronged effort focused around voluntary actions and investment in the development of new technology. Since the 107th Congress, however, there have been a number of bills introduced to cap CO<sub>2</sub> emissions on various portions of the economy. The first set of bills included federal CO<sub>2</sub> caps focused on the electricity sector, as part of broader multipollutant legislation that also addressed NO<sub>x</sub>, SO<sub>2</sub>, and mercury emissions. As an alternative to these bills, in early 2002 the Bush Administration introduced its Clear Skies proposal, which capped NO<sub>x</sub>, SO<sub>2</sub> and mercury, but not CO<sub>2</sub> emissions, and was opposed by environmental groups on other grounds as well.<sup>4</sup> The first economy-wide cap on greenhouse gases – the Climate Stewardship Act of 2003 – was proposed by Senators Lieberman and McCain

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<sup>4</sup> These included proposed reforms to the Clean Air Act's New Source Review program, and the proposal to allow cap-and-trade for mercury, a toxic pollutant.

during the 108<sup>th</sup> Congress. Efforts to pass multipollutant legislation reached an impasse during the 109<sup>th</sup> Congress in March 2005, and EPA finalized a regulatory approximation of the cap-and-trade programs that had been proposed in Clear Skies, in the form of the Clean Air Mercury and Clean Air Interstate Rules, which are discussed later in this chapter. Since then, amidst increasing pressure for a national cap on GHG emissions from both environmentalists and a growing portion of industry, focus has shifted to bills that would cap GHG emissions across the U.S. economy.

Within the 110th congress, there are five Senate bills and two House bills that would impose an economy-wide cap on GHG emissions. The Pew Center on Global Climate Change (2008) provides a detailed summary of these bills.<sup>5</sup> Two Senate bills have emerged as the front-running proposals: S. 1766, the Low Carbon Economy Act of 2007 (hereafter Bingaman-Specter), introduced in July 2007; and S. 2191, the American Climate Security Act of 2007 (hereafter Lieberman-Warner), introduced in October 2007, and passed out of the Senate Committee on Environment and Public Works in December 2007.

The major provisions of these two bills are summarized in Table 2.1. Notably, in its current form, Lieberman-Warner retains state authority to enact GHG caps and standards that are more stringent than the federal cap, and allocates additional allowances to these states.<sup>6</sup> The most recent version of Bingaman-Specter is silent on the treatment of state programs. As noted in Chapter 1, however, any companion bill coming out of the House of Representatives is likely to contain some sort of provision for preemption of state programs.<sup>7</sup>

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<sup>5</sup> Not all proposed bills are economy-wide. For example, the Electric Utility Cap and Trade Act of 2007 (S. 317, introduced by Senators Feinstein and Carper) would apply only to electric generating units.

<sup>6</sup> See S. 2191, sections 9004 and 3402.

<sup>7</sup> House Committee on Energy and Commerce Chair John Dingell (D-MI) is expected to push for the inclusion of preemption provisions in legislation scheduled to be drafted by summer 2008 (Point Carbon 2008a).

**Table 2.1. Summary of Major Provisions in the Bingaman-Specter and Lieberman-Warner Bills**

	<b>Bingaman-Specter (S. 1766, 110<sup>th</sup> Congress)</b>	<b>Lieberman-Warner (S. 2191, 110<sup>th</sup> Congress)</b>
Cap	Declines annually to achieve 2006 emission levels by 2020; 1990 levels by 2030.	Declines annually to 19% below 2005 levels by 2020; 71% below 2005 levels by 2030. Hydrofluorocarbons covered in separate cap.
Applicability	Coal-fired power plants (gas and oil plants covered upstream), petroleum refineries, natural gas processing plants, LNG facilities, importers of liquid fossil fuels and non-CO <sub>2</sub> GHGs, and other industrial facilities consuming > 5000 tons of coal. Covers about 88% of national emissions.	Coal-fired power plants (gas and oil plants covered upstream), petroleum refineries, fossil-fuel importers, natural gas processing plants, LNG facilities, industrial facilities, producers or importers of non-fuel chemicals. Exempts small business-owned facilities and facilities or importers responsible for emissions < 10,000 tons CO <sub>2</sub> eq/year. Covers about 87% of national emissions.
Cost containment	Unlimited banking; safety valve (Technology Accelerator Payment) set at \$12 per ton, increasing by 5% above inflation annually thereafter.	Unlimited banking; up to 15% of annual compliance obligation can be borrowed from the Administrator, and repaid with an interest penalty. Borrowing limit may be increased if early allowance prices are higher than projections from analysis.
Offset use	No limit on domestic offset use. Categories to be determined by regulation, but including: landfill methane use projects; animal waste or municipal wastewater methane use projects; SF <sub>6</sub> reductions from transformers; and coal mine methane use projects. President may allow use of international emission allowances up to 10% of compliance obligation.	Use limited to 15% of compliance obligation per year. Specific categories of offsets to be determined by regulation, but include agricultural, forestry, and other land-use related projects. An additional 15% of compliance obligation can be met by international emission allowances.
Allowance allocation	53% gratis to affected sources, generally based on proportional share of baseline emissions; declines by 2% each year starting in 2017. 9% allocated to states. 12% auctioned, increasing by 1% annually starting in 2017.	40% gratis to affected sources, generally based on proportional share of baseline emissions, declines by 2% annually beginning in 2017; allocations to early actors and for CCS; 30.5% to states, load-serving entities, farms and forests, coal mines, others; 26.5% auction beginning in 2012 (including early auction provision); base auction increases by 3% annually to 69.5% in 2031.

Source: S. 1766, S. 2191 and Pew Center on Global Climate Change (2008).



The key points to keep in mind for the subsequent discussion of the interaction with state or regional programs are that 1) both proposals are comprehensive in including both mobile sources (through upstream coverage of petroleum refineries) and stationary sources; 2) both employ mixed auctioning and free allocation with the share of the latter declining over time, 3) both would allocate some allowances directly to states for auctioning to fund specified programs, and 4) Bingaman-Specter contains a safety valve that would probably cause it to be less constraining than the projected cap trajectory.

## **2.2 A Push for Federal Regulation through the Courts**

Absent federal legislation, a number of states and environmental groups have attempted to utilize the judicial system to require federal action on GHG emissions. In *Massachusetts v. EPA*, twelve states, as well as several cities and environmental organizations, challenged EPA's denial of a petition to regulate GHG emissions from new motor vehicles under section 202(a)(1) of the Clean Air Act.<sup>8</sup> This section of the Act requires EPA to promulgate emissions standards for new motor vehicles for any pollutants that, in the Administrator's judgment, "cause or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Thus, regulation is conditional on EPA making what is commonly referred to as an 'endangerment' finding. EPA's denial of the petition argued that the Agency does not have the authority to regulate CO<sub>2</sub> emissions under the Clean Air Act, and that even if it did, it would be "unwise to do so at this time," given remaining uncertainty regarding the anthropogenic contribution to climate change as well as the likelihood that such a regulation would conflict with both other climate policy efforts by the President and the Department of Transportation's (DOT) authority to regulate fuel economy under the Energy Policy and Conservation Act (EPCA).

The Court held that CO<sub>2</sub> does fall within the definition of pollutant under the Clean Air Act, such that EPA has the authority to regulate CO<sub>2</sub> if in the Administrator's judgment there is reason to make an endangerment finding under section 202(a)(1). In addition, the Court noted that EPA must justify a decision to not make a finding one way or the other, and suggested that the sole permissible justification for such a decision is a

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<sup>8</sup> See 42 USC 7521.

determination that there is insufficient information to determine whether CO<sub>2</sub> endangers human health and welfare. Further, the Court held that EPA regulation of vehicle emissions and DOT regulation of fuel economy were not inherently in conflict.

More recently, in April 2006, 10 states and a group of environmental organizations filed a petition for review in the U.S. Court of Appeals for the D.C. Circuit, challenging revisions to New Source Performance Standards (NSPS) for power plants issued under section 111 of the Clean Air Act because they fail to regulate CO<sub>2</sub> emissions.<sup>9</sup> EPA argued in the final NSPS rule that it did not have the authority to regulate CO<sub>2</sub> emissions under the Clean Air Act, though this argument was rejected in *Massachusetts v. EPA*. In addition, environmental groups have also petitioned recent EPA stationary source permitting decisions, arguing that new or modified sources in attainment areas should be subject to best available control technology requirements in accordance with section 165 of the Clean Air Act.<sup>10</sup>

### **2.3 Possible Approaches to Regulation under the Existing Clean Air Act**

In the wake of *Massachusetts v. EPA*, the Agency has announced its intent to release an Advanced Notice of Proposed Rulemaking (ANPR) this year, considering potential strategies to regulate CO<sub>2</sub> emissions under the existing Clean Air Act and soliciting public comment (EPA 2008). In discussing the rationale for the ANPR, EPA Administrator Stephen Johnson notes that, "...as the Act is structured, any regulation of greenhouse gases – even from mobile sources – could extend to small sources including many not previously regulated under the Clean Air Act." In addition, he notes that the ANPR will address "the complexity and interconnections within the various sections of the Clean Air Act" relevant to regulating greenhouse gases. It is important to consider that under an economy-wide federal cap-and-trade program implemented by new legislation, rather than regulation, it is likely that many of the small sources alluded to by the Administrator would be covered by the cap further upstream, reducing some of the potential implementation challenges.

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<sup>9</sup> The pending case is *New York v. EPA*, No. 06-1148, U.S. Court of Appeals for the District of Columbia Circuit (2006).

<sup>10</sup> See, for example, *In re Deseret Power Electric Cooperative* (EAB Appeal No. PSD 07-03, Oct. 1, 2007).

Nordhaus (2007) discusses many of the challenges inherent in regulating CO<sub>2</sub> under the existing Act. He considers whether EPA could develop a climate program that is both comprehensive and cost-effective under the existing Act, evaluating three possible avenues for doing so: regulating CO<sub>2</sub> as a criteria pollutant under sections 108, 109, and 110 of the Act; regulating CO<sub>2</sub> emissions from new and existing stationary sources under section 111 of the Act; and regulating vehicle CO<sub>2</sub> emissions under section 202 of the Act.

To regulate CO<sub>2</sub> emissions as a criteria pollutant, EPA would first designate CO<sub>2</sub> a criteria pollutant under section 108(a) of the Clean Air Act.<sup>11</sup> Pursuant to section 109(a) and (b) of the Act, EPA would then promulgate national ambient air quality standards (NAAQS) for CO<sub>2</sub>, specified as a concentration of CO<sub>2</sub> in the atmosphere, which allows an “ample margin of safety...requisite to protect the public health.” Once a standard has been set by EPA, states are given the primary authority for their attainment, but must submit a State Implementation Plan (SIP) to EPA for approval under section 110(a), demonstrating that state policy measures will lead to attainment of the standards.

As Nordhaus points out, the criteria pollutant framework was created to address localized concentrations of pollution that states could effectively reduce through local controls, and has proven inadequate for dealing with interstate transport of criteria pollutants. Reducing CO<sub>2</sub> concentrations poses an even larger challenge. Because of both the long residence time of CO<sub>2</sub> in the atmosphere, as well as the fact that the majority of the world’s CO<sub>2</sub> emissions come from outside of the U.S., individual SIPs would be ineffective. Nordhaus notes, “...it is unclear how a state could ever make the required showing that its plan...is adequate ‘to attain or maintain’ the CO<sub>2</sub> standard as provided in section 110(k)(5)” (p. 62). As a result, he notes, the criteria pollutant framework is not workable for establishing mandatory federal controls on CO<sub>2</sub>.

Nordhaus suggests that EPA might be able to use sections 111(b) and (d) of the act to regulate CO<sub>2</sub> emissions from large stationary sources.<sup>12</sup> Section 111(b) of the act requires EPA to set NSPSs for categories of new large stationary sources that cause or contribute to air pollution that “may reasonably be anticipated to endanger public health

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<sup>11</sup> For Clean Air Act sections 108-110, see 42 USC 7408-7410.

<sup>12</sup> See 42 USC 7411.

or welfare.” Section 111(d) allows EPA to set emission standards from existing stationary sources. Section 111(d) parallels the SIP submission process under 110(a) of the Act, requiring states to submit ‘state plans’ demonstrating how the standards will be achieved. In addition, Nordhaus considers the possibility that EPA might be able to use section 111(d) to implement a national cap-and-trade program for large stationary sources. EPA attempted to use this authority to implement a cap-and-trade program for mercury emissions under the Clean Air Mercury Rule (CAMR), which was vacated by the DC Circuit in February 2008, and is discussed further in the following section.<sup>13</sup> While petitioners challenged EPA’s authority to implement a cap-and-trade program under section 111(d), the court did not rule upon this issue, vacating the rule on other grounds.<sup>14</sup>

Finally, Nordhaus addresses the potential limitations of regulating vehicle emissions under section 202(a) of the Clean Air Act. In particular, any standard under section 202(a) would likely be in the form of a vehicle emission rate, rather than a cap on vehicle emissions. Further, he notes that there is not an apparent means under the Act for integrating any vehicle emission control strategy under section 202 with a stationary source program that might be implemented under section 111. Thus, it appears unlikely the EPA could utilize the existing Act to implement a national cap on CO<sub>2</sub> emissions that covers most of the economy.

Nordhaus concludes that regulating CO<sub>2</sub> under section 111 of the Clean Air Act could lead to coverage of about 50% of U.S., emissions, possibly under a cap-and-trade program. He suggests that vehicle standards under section 202(a) might cover an additional 20% of U.S. emissions, once the entire U.S. motor vehicle fleet has been replaced.

## **2.4 Treatment of State Regulations under Existing Programs**

The potential relationships between a comprehensive federal cap-and-trade program and state regulations can be informed by existing federal programs to control emissions from stationary and mobile sources. The Clean Air Act treats these two types

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<sup>13</sup> See 70 FR 28606.

<sup>14</sup> The rule was vacated on the grounds that EPA did not present sufficient analysis to justify delisting mercury, a toxic air pollutant, from the list of pollutants that the Agency must regulate from electricity generating units using a maximum achievable control technology (MACT) standard under Section 112 of the CAA. (*State of New Jersey et al. v. EPA* No. 05-1097 (DC Cir.Feb. 8, 2008)).

of sources very differently. Section 116 of the Act retains state authority to implement regulations of stationary sources, though requiring that state emission standards be at least as stringent as federal standards, a relationship known as floor or partial preemption. On the other hand, section 209(b)(1) of the Clean Air Act preempts states from implementing state vehicle emission standards, though it includes a special provision for California. Similarly, under EPCA, states are prohibited from issuing regulations ‘related to’ fuel economy for vehicles covered by corporate average fuel economy (CAFÉ) standards under the Act.

The relationships established by existing regulations are important for two reasons. First, they represent established policy precedent in the realm of emissions control. While the concerns over local pollution control that most warrant retention of state authority are irrelevant in the context of GHG emissions, a proposal to alter the basic framework established under the Clean Air Act would likely generate strong opposition from states and environmental groups. Second, in the event that federal climate policy is implemented under the existing Clean Air Act, sections 116 and 209 would govern the relationship between the federal program and stationary sources and motor vehicles, respectively.

#### *Precedent under Federal Cap-and-Trade Programs*

Existing cap-and-trade programs implemented by EPA are limited to stationary sources, and largely, the power sector. Three cap-and-trade programs under the Act – the Acid Rain Program for SO<sub>2</sub> emissions, the NO<sub>x</sub> Budget Trading Program, and the recently vacated CAMR – provide distinct examples of how federal and state governments might interact in the context of a national cap on GHG emissions, all of which retain state authority to be more stringent.

First, the Acid Rain Program provides an example of federal legislation establishing a new cap-and-trade program without preemption of state regulation of emissions that contribute to acid rain. This program, established by Title IV of the Clean Air Act Amendments of 1990, imposes a nationwide cap on SO<sub>2</sub> emissions from the

power sector.<sup>15</sup> The statute provides for direct regulation of sources by the EPA and codifies source-level allowance allocations. While Title IV sets a minimum level of control of electricity sector SO<sub>2</sub> emissions, it does not preempt state authority to impose more stringent controls on these emissions.<sup>16</sup> Prior to the start of the federal program on January 1, 1995, several states, notably, Massachusetts, New York and Wisconsin, had already implemented state programs that imposed specific emission rate limits on SO<sub>2</sub> emissions that contribute to acid rain, and those programs continued in force after the federal program went into effect.

EPA's second stationary-source cap-and-trade program, the NO<sub>x</sub> Budget Trading Program, provides a different model in that it was established under the Agency's existing regulatory authority under section 110 of the Clean Air Act instead of by specific congressional legislation. This program started as a regional program implemented, with the cooperation of the federal EPA, by the nine member states of the Ozone Transport Commission (OTC), an interstate compact authorized by the Clean Air Act Amendments of 1990 to facilitate the adoption of interstate measures to address attainment of the NAAQS for ozone in the northeastern U.S. The OTC adopted a three-phase program that consisted of an initial uniform annual NO<sub>x</sub> emission limit requiring beginning in 1995. This first phase was followed by a progressively more demanding two-phase regional cap-and-trade program with phases beginning in 1999 and 2003, which applied to NO<sub>x</sub> emissions during the May to September ozone season. In 1998, EPA exercised its existing authority under the Clean Air Act in response to a tightening of the ozone NAAQS to issue the "NO<sub>x</sub> SIP call,"<sup>17</sup> a rulemaking that expanded the OTC cap-and-trade program to include 19 states and the District of Columbia effective in 2003.<sup>18</sup> More

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<sup>15</sup> Title IV also sets NO<sub>x</sub> emissions rate requirements for affected sources and allows "averaging" or trading among sources under common ownership.

<sup>16</sup> This precedent is arguably more germane to climate legislation in that the justification concerns a problem that transcends state boundaries in contrast to the local attainment of the NAAQS for SO<sub>2</sub> and for particulate matter of which SO<sub>2</sub> is a precursor. The latter are primarily within-state concerns for which the Clean Air Act grants states the authority to impose controls of whatever stringency required to meet the national NAAQS.

<sup>17</sup> See 63 FR 57356

<sup>18</sup> The pre-existing OTC program was folded into this more geographically extensive cap-and-trade program, which was of equivalent stringency to the final 2003 OTC program, and which became the NO<sub>x</sub> Budget Program.

recently, EPA's Clean Air Interstate Rule (CAIR),<sup>19</sup> which becomes effective in 2009, followed this precedent in expanding the program to 28 states and adding an annual cap on NOx emissions while maintaining the ozone season cap.<sup>20</sup>

Both the NOx SIP call and CAIR used EPA's existing regulatory authority under sections 110 the Clean Air Act to assign states NOx emission budgets, which are effectively state-level caps, and to require them to submit SIPs laying out the state rules that would achieve the emission reductions required by their respective budgets. In what was a radical innovation, the NOx SIP Call also provided states the option of achieving their state budgets by joining an EPA-administered cap-and-trade program for NO<sub>x</sub>, an approach continued in CAIR. While all affected states under both the NOx SIP call and CAIR have chosen to participate in the NOx Budget Trading Program, participation in the program was voluntary. An affected state could opt to achieve its NOx budget by implementing conventional prescriptive regulations that would exist separately from the federal trading program. Finally, under the NOx SIP Call and CAIR, states retain the authority granted by the Clean Air Act to implement requirements more stringent than federal requirements.

Third, the recently vacated CAMR relied upon a regulatory framework to establish a cap-and-trade program under section 111(d) of the Clean Air Act that is analogous to that used for the NOx Budget Trading Program. Under CAMR, however, states that opposed using cap-and-trade to control mercury emissions or which wished to implement targets more stringent than those put forth by the federal program could and did opt-out and adopt equivalent or more stringent programs that would have remained separate from the federal cap-and-trade program. In addition, states wishing to participate in the federal program but withhold some portion of their state budget, effectively lowering the federal cap, had the option to do so.<sup>21</sup>

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<sup>19</sup> See 70 FR 25162

<sup>20</sup> CAIR also increases the allowance retirement ratio for sources under the Acid Rain Program, in order to promote additional SO<sub>2</sub> reductions and compliance with the NAAQS for PM 2.5.

<sup>21</sup> In response to state requests to do so, EPA released a statement noting that this approach was permissible under the rule, but cautioning states to consider cost, feasibility, and uncertainty before permanently retiring allowances. See: EPA (2007).

### *Precedent under Vehicle Emissions and Corporate Average Fuel Economy Regulations*

While the Clean Air Act generally preserves state authority to regulate emissions from stationary sources to levels more stringent than required by federal rules, it explicitly limits state authority to do so in the transportation sector in order to avoid exposing vehicle manufacturers to an array of varying state standards. Because it preceded the federal government in regulating vehicle emissions for pollution control purposes, California is allowed, under section 209(b)(1) of the Clean Air Act,<sup>22</sup> to petition the Environmental Protection Agency for a waiver allowing the state to implement motor vehicle emission standards that are more stringent than those at the federal level. Other states are permitted to adopt California's standards under section 177 of the Act,<sup>23</sup> but are precluded from developing a different state standard. California's current effort to obtain a waiver to regulate GHG emissions from new motor vehicles is discussed in chapter 3. In contrast to conventionally regulated emissions, such as particulates, reduction of a vehicle's GHG emission rate implies an improvement in fuel economy. As a result, the line between these vehicle emissions standards and fuel economy standards is blurred.<sup>24</sup> For this reason, vehicle manufacturers have argued – thus far unsuccessfully – that state GHG emissions standards for vehicles are not allowed under section 32919(a) of EPCA,<sup>25</sup> which preempts states from setting regulations “related to” fuel economy standards for vehicles covered by fuel economy standards under the Act.<sup>26</sup>

### **2.5 The Role of Existing Legal Doctrine in Determining the Federal-State Relationship**

While express preemption or retention of state authority in a federal statute would provide the greatest certainty in terms of the interaction between federal and state climate programs, existing constitutional doctrine suggests that courts could hold that an individual state cap-and-trade program (or other regulatory measure addressing climate

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<sup>22</sup> See 42 USC 7543.

<sup>23</sup> See 42 USC 7507.

<sup>24</sup> To clarify this distinction, motor vehicle emission standards are specified as grams of pollutant emitted per mile, and fuel economy standards are specified in terms of miles achieved per gallon of fuel.

<sup>25</sup> *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie*, No. 05-00302 (D. VT, September 12, 2007); and *Central Valley Chrysler-Jeep v. Goldstone* No. CV F 04-6663 (E.D. Cal., Dec. 12, 2007).

<sup>26</sup> See 49 USC § 32919(a).



change) is preempted on constitutional grounds. As Huffman and Weisgall (2008) note, while the Constitution defines the boundaries of federal government power, it also creates both implied and explicit limits on states' powers. First, under the Supremacy Clause, laws made by the federal government pursuant to the Constitution are "the Supreme Law of the land." (U.S. Const, Art. VI, cl. 2). In interpreting the Supremacy Clause of the Constitution, courts have held that, even in the absence of express preemption, a state rule is preempted if a federal law is deemed sufficiently comprehensive so as to imply preemption (field preemption), or if the state rule is found to conflict with or frustrate implementation of the federal law (conflict preemption) (Pidot 2006).

In addition, while not specifically questions of preemption, state climate programs could face additional legal challenges to their constitutional validity (Wiener 2007; Huffman and Weisgall 2008). First, state or regional climate policies could be found to be in violation of the Dormant Commerce Clause to the extent that they are held to facially discriminate against out-of-state businesses or transactions, or, if not discriminatory, they are found to excessively burden interstate commerce.<sup>27</sup> Efforts that attempt to reduce the leakage of emissions from state or regional programs to sources outside of the covered region may be at the greatest risk of such a violation.<sup>28</sup> Second, climate programs constructed as regional agreements could face legal challenges under the Compact Clause, which prohibits interstate agreements absent congressional consent.<sup>29</sup> In general, an interstate agreement could be deemed a compact by the courts if it creates an organization to govern the agreement, states are not free to remove themselves from the agreement, and there is 'reciprocity of the regional limitation' (Huffman and Weisgall 2008).<sup>30</sup> Huffman and Weisgall suggest that courts would be unlikely to hold that RGGI is a compact in its current form, because of the ability of individual states to withdraw from the agreement.

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<sup>27</sup> Huffman and Weisgall (2008) also note that state GHG emission performance standards that effectively restrict long-term contracts will providers of coal-fired generation, such as California's (discussed in Chapter 3), could also face Dormant Commerce Clause challenges.

<sup>28</sup> This is because in order to prevent emission leakage, a state may have to implement measures that will remove the cost advantage provided to sources outside of the cap, effectively making output from these out-of-state sources more costly.

<sup>29</sup> See U.S. Constitution, Article I, Section 10, cl. 3.

<sup>30</sup> This phrase implies that individual parties within the agreement agree to the reach of its coverage.

## **2.6 Possible Relationships between a Federal Cap-and-Trade Program and State Programs**

Based on the discussion in this section, four distinct characterizations of the potential relationship between a federal cap-and-trade program and state programs emerge, and these will be the subject of analysis in Chapter 4. First, a federal-cap-and-trade program might choose to retain state authority to implement a state cap-and-trade program that overlaps with the federal program. Under this relationship, where states decide to retain GHG cap-and-trade programs, sources subject to both a state and federal program would have to surrender both a state and federal allowance for each ton of emissions. The specific nature of this relationship could vary, depending on the respective coverage of the state and federal programs. For example, in a comprehensive national cap that continued to preempt state regulation of vehicle GHG emissions, states might retain a cap-and-trade program addressing emissions only from large stationary sources, such that the coverage of the federal program is more comprehensive.

Second, a federal program might preempt existing state cap-and-trade programs, leading to one federal allowance market. While existing discussion on Capitol Hill suggests that federal preemption is possible with respect to state cap-and-trade programs or, as is currently the case, vehicle emissions standards, it is less likely that such preemption would extend to other state climate policies, such as demand-side management and renewable energy requirements. Such policies represent concerns that are more local in nature, such as a desire to avoid investment in new fossil fuel capacity amidst both pollution concerns and transmission constraints, or to develop local clean energy industries. The authority to implement such programs has been traditionally granted to the states and it is widely exercised by them. Because most discussion of preemption in the context of federal climate policy has focused on state cap-and-trade programs, preemption is considered only in that context.

Third, states could be allowed to implement cap-and-trade programs or other limitations on emissions separately from and in lieu of the federal cap-and-trade program, provided that they can demonstrate the state program is at least as stringent as the federal program. Such a program would be similar to either CAIR or CAMR, which gave states the option of either participating in a federally administered cap-and-trade program, or

achieving their portion of the aggregate cap through their own state program. Where states choose to ‘carve out’ of the federal program and are implementing cap-and-trade programs, individual state allowance markets will exist separately from the remaining federal allowance market.

Fourth, under the above scenario, states could be given the option to link their equally or more stringent ‘carved-out’ cap-and-trade programs to the federal program. In terms of effect, such an approach would resemble what would likely have occurred under CAMR, where some states planned to participate in the national program but retire a portion of their state budget.<sup>31</sup> Such an approach will also result in a single federal allowance market, though with a potentially more stringent aggregate cap. As chapter 5 discusses, where central provisions of the cap-and-trade programs vary, such linkage becomes complicated. Therefore, this approach creates a number of harmonization concerns that have implications for how a federal program should be designed.

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<sup>31</sup> CAMR required that states opting to participate in the national trading program adopt provisions identical to EPA’s model rule in order to ensure harmonization. Therefore, ‘linkage’ essentially occurred by default for these states.

### **3. Overview of State GHG Regulatory Development**

The economic and environmental implications state and federal program interaction will depend not only on how the relationship between the two programs is defined, but on the specific policies implemented at each level of government. This chapter provides an overview of the type of state actions that have been taken to date. While inventories of state climate actions are maintained by a number of organizations,<sup>32</sup> this chapter attempts to extend those inventories by evaluating the extent to which state actions are sufficiently developed to mandate or incentivize actual GHG reductions, and by highlighting variation in design elements within certain categories of state action. As Chapter 4 will demonstrate, an understanding of design elements is particularly important where state programs implement cap-and-trade.

This chapter begins with a discussion of the motivating forces behind state climate policy development. It then provides an overview of state climate action plans and GHG emission targets. Third, it provides an overview of the four significant policy developments in regional and state-level emissions trading: the Regional Greenhouse Gas Initiative (RGGI), the Western Climate Initiative (WCI), the Midwestern Greenhouse Gas Reduction Accord (MGGRA), and California's Assembly Bill (AB) 32. Fourth, it describes other state regulatory requirements that directly affect emissions sources, such as power plant performance standards and AB 1493, California's vehicle emission standard. Finally, it provides an overview of state renewable portfolio standards (RPS), energy efficiency resource standards, and demand side measures that may affect state GHG emissions.

#### **3.1 Rationale for State Climate Action**

Given the global nature of the climate problem, the growing prevalence of state action in this area runs counter to the suggestions of basic economic theory. While states will internalize the majority of the costs of any GHG emission reduction program that they implement, any environmental benefits of such action – which will likely be small,

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<sup>32</sup> See, for example, the Pew Center on Global Climate Change [http://www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_states/](http://www.pewclimate.org/what_s_being_done/in_the_states/), and US EPA <http://www.epa.gov/climatechange/wycd/stateandlocalgov/index.html>.

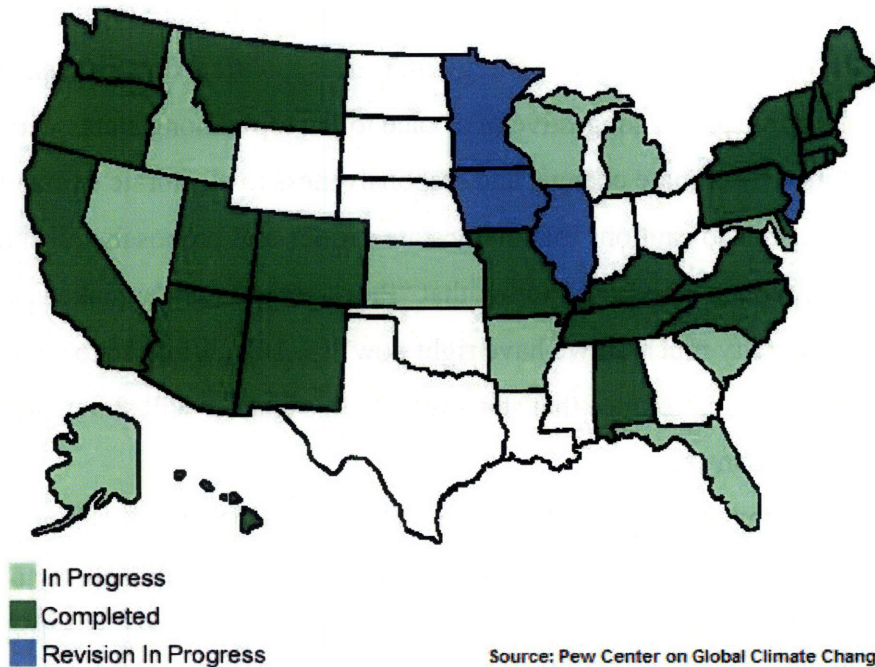
given both the share of global emissions represented by any U.S. state or region and the likelihood of emissions leakage – will be shared worldwide. Though a federal or international regime would make greater economic sense, a number of potential rationales suggest why states might act to fill the void left by federal policy. Engel (2006) summarizes some of these, which include the desire to capture local economic benefits from the development of clean energy industries, political opportunism by state leaders, interstate competition suggestive of a ‘race to the top’ among states with resources threatened by climate change, and responsiveness to electorate demand for climate action. Engel also cautions that many state actions and proposals fall short of actual mandates to reduce emissions, noting that “Promises are easy to make and for some states, that is pretty much all we have right now” (p. 10). While state actions have evolved in the twenty months since that statement, as this chapter will show, it remains an apt description in many cases.

State action may also have strategic motivations related to the development of federal climate policy. DeShazo and Freeman (2007) note the potential ability of states to create industry demand for a harmonized federal program by creating regulatory heterogeneity and uncertainty as a result of independent or regional actions. Finally, states that are ‘early actors’ are likely to influence in national policy development (Aulisi et al. 2007). States may develop knowledge or experience that informs national policy design, and are likely to use any resulting bargaining power to advocate for a policy that rewards in-state sources. In fact, this specific goal is discussed in the memorandum of understanding initiating RGGI (RGGI 2005).

### **3.2 State Climate Action Plans and Greenhouse Gas Emissions Targets**

The most common state response to concern about climate change is the development of a state climate action plan. A climate action plan typically evaluates trends in GHG emissions growth in the state by economic sector, and analyzes the impacts of a potential array of policies to directly or indirectly reduce such emissions. In some cases, state action plans include recommendations of a specific GHG target for the state, and which policy mechanisms should be used to achieve that target. Currently, 38 states have a climate action plan either developed or in progress, shown in Figure 3.1.

The creation of a climate action plan does not by itself mandate or guarantee actual emission reductions by the state because it does not impose any specific requirements on sources of emissions.



**Figure 3.1. States with Climate Action Plans Completed or in Progress as of April 21, 2008**

Some of these states have specified economy-wide GHG emission targets as part of their climate action plans, or have otherwise formalized such targets via an official announcement, executive order, or legislation. These targets, currently present in 18 states, are generally articulated as a percent reduction in emissions relative to a prior year. While representing a ‘commitment’ to reduce GHG emissions, they lack enforceability absent implementing regulations, and thus do not guarantee the achievement of actual emission reductions. In most states with GHG targets, implementing regulations have yet to be developed.

Given the ability of cap-and-trade to generate substantial, cost-effective reductions using a single policy instrument, cap-and-trade programs are likely to be an important tool for meeting these targets. In fact, as is shown in Table 3.1, all but three of the states with formalized economy-wide emission targets are participating in development of a regional cap and trade program, though not all states that are part of

**regional initiatives have independently existing targets: RGGI includes Delaware and Maryland; WCI includes Montana and Utah; and MGGRA includes Kansas, Iowa, and Wisconsin.**

**Table 3.1. State Emission Reduction Targets and the Role of Emissions Trading**

<b>State (Form)</b>	<b>Statewide Target</b>	<b>Role of Emissions Trading in Achieving Target</b>
AZ (EO)	2000 levels by 2020 50% below 2000 by 2040	Western Climate Initiative participant
CA (EO/LE)	2000 levels by 2010 1990 levels by 2020 80% below 1990 by 2050	1. AB 32 requires 1990 levels by 2020 via economy-wide emissions limit (regulatory approach in development) 2. Western climate initiative participant
CT (AP/LE)	1990 levels by 2010 10% below 1990 by 2020 75-85% below 2001 in long-term	RGGI participant
FL (EO)	2000 levels by 2017 1990 levels by 2025 80% below 1990 by 2050	Rulemaking to cap electric utility CO2 emissions in early stages
HI (LE)	1990 levels by 2020	Uncertain. Requires rule adoption by December 31, 2011.
IL (AN)	1990 levels by 2020 60% below 1990 levels by 2050	Midwestern Greenhouse Gas Reduction Accord participant
ME (LE)	1990 levels by 2010 10% below 1990 levels by 2020 70% to 80% below 2003 in long term	RGGI participant
MA (AP)	1990 levels by 2010 10% below 1990 levels by 2020 75-85% below 2001 long term	RGGI participant
MN (LE)	15% below 2005 by 2015 30% below 2005 by 2025 80% below 2005 by 2050	Midwestern Greenhouse Gas Reduction Accord participant
NH (AP)	1990 levels by 2010 10% below 1990 levels by 2020 75-85% below 2001 long term	RGGI participant
NJ (LE)	1990 levels by 2020 80% below 2006 by 2050	RGGI participant
NM (EO)	2000 levels by 2012 10% below 2000 by 2020 75% below 2000 by 2050	Western Climate Initiative participant
NY (AP)	5% below 1990 by 2010 10% below 1990 by 2020	RGGI participant
OR (LE)	Stabilize by 2010 10% below 1990 by 2020 75% below 1990 by 2050	Western Climate Initiative participant
RI (AP)	1990 levels by 2010 10% below 1990 by 2020 75-85% below 2001 long term	RGGI participant
VT (AP)	1990 levels by 2010 10% below 1990 by 2020 75-85% below 2001 in long-term	RGGI participant
VA (EO)	30% reduction from BAU by 2025	Uncertain
WA (EO)	1990 levels by 2020 25% below 1990 by 2035 50% below 1990 by 2050	Western Climate Initiative participant

EO=Executive Order, LE=Legislation, AP= Action Plan, AN=Announcement

Source: Pew Center on Global Climate Change



### **3.3 Overview of Regional and State Emissions Trading Initiatives**

Of the four major efforts among states to develop cap-and-trade programs for reducing GHG emissions, RGGI is by far the most developed, with the initial phase of the program scheduled to start on January 1, 2009. Emulating the RGGI process, states in the Western Climate Initiative and Midwestern Greenhouse Gas Reduction Accord have embarked upon the initial stages of cap and model rule development. Finally, while California is a participant in the Western Climate Initiative, it also provides an example of a single state's effort to move forward with development of a cap-and-trade program through the state's requirements under AB 32.

#### *Regional Greenhouse Gas Initiative*

RGGI is the result of a process involving stakeholders and state regulatory staff that was initiated by the governors of a number of Northeastern states in 2003. This process resulted in the issuance of a Memorandum of Understanding, which was originally signed by seven state governors in December, 2005, and now includes ten signatory states in the Northeast (RGGI 2005)<sup>33</sup> It establishes a cap-and-trade program for CO<sub>2</sub> emissions from the power sector in these states, implementing an annual cap that stabilizes emissions at current levels over the years 2009-2014, and declines by 2.5% annually between 2014 and 2018. States participating in RGGI and their state CO<sub>2</sub> budgets for the years 2009 and 2018 are shown in Table 3.2.

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<sup>33</sup> The RGGI states include CT, DE, MA, MD, ME, NH NY, NJ, RI,, and VT. Although Massachusetts and Rhode Island participated in the RGGI process, their governors did not sign the original MOU, but they have since done so, as has Maryland.

**Table 3.2. CO<sub>2</sub> Emissions Budgets for RGGI States, 2009 and 2018**

<b>State</b>	<b>2009 Budget (short tons)</b>	<b>2018 Budget (short tons)</b>
CT	10,695,036	9,625,532
DE	7,559,787	6,803,808
ME	5,948,902	5,354,012
MD	37,503,983	33,753,585
MA	26,660,204	23,994,184
NH	8,620,460	7,758,414
NJ	22,892,730	20,603,457
NY	64,310,805	57,879,725
RI	2,659,239	2,393,315
VT	1,225,830	1,103,247
<b>Total</b>	<b>177,381,940</b>	<b>169,269,279</b>

Source: RGGI MOU and individual state rules.

Because the regional agreement must be implemented under the authority of each individual state, the RGGI stakeholder process released a model rule in August, 2006, which RGGI states are currently using as a basis for drafting and promulgating their individual regulations (RGGI 2007). Key provisions of the RGGI model rule are presented in Table 3.3. Two areas of the model rule provide for individual state discretion. The first is the option to exempt sources whose output to the grid is restricted by permitting conditions. The second is allowance allocation, where the model rule requires only that at least 25% of allowances be allocated for a “consumer benefit or strategic energy purpose” (RGGI 2007, p. 44).

**Table 3.3. Overview of Key Design Elements in the RGGI Model Rule**

<b>Design Element</b>	<b>Approach taken in RGGI</b>
Applicability	Existing (operational before 1/1/05) electricity generating units $\geq 25$ MW with $> 50\%$ of heat input from fossil fuels. New electricity generating units $\geq 25$ MW with $> 5\%$ of heat input from fossil fuels. States can choose to exempt units that sell less than 10% of their electricity output to the grid.
Length of compliance period	3 years, extended to 4 if offset price exceeds \$10 threshold.
Allowance allocation	At states' discretion, though at least 25% must be to 'consumer benefit or strategic energy purpose.'
Allowable offsets	Landfill methane capture and destruction; sulfur hexafluoride emissions reductions; afforestation; avoided CO <sub>2</sub> emissions from natural gas, oil, or propane through energy efficiency; and avoided agricultural methane emissions
Offset use	Limited to 3.3% of total compliance allowances; increased to 5% if allowance price exceeds \$7 per ton, and 10% if allowance price exceeds \$10 per ton, for the duration of the compliance period. <sup>a</sup>
Banking	Unlimited
Borrowing	None
Safety valve	Provided via relaxation of offset limit
Early Reduction Credits	May be awarded for reductions occurring in 2006, 2007, and 2008

a. Prices are adjusted annually for inflation.

The cap and trade program under RGGI is scheduled to begin on January 1, 2009. The first auction of RGGI allowances is currently planned for September of 2008 (Point Carbon 2008b). Accordingly, RGGI states are moving forward with the development of legislation and regulation that will allow them to implement the program, the status of which are summarized in Table 3.4. Currently, only Massachusetts and Maine have finalized the necessary legislation and regulations to implement a CO<sub>2</sub> trading program under RGGI, with other RGGI states at varied levels of completion of their own processes. The significant deviation from the model rule that has emerged in proposed legislation and regulation is the intention of all but one RGGI state to auction close to 100 percent of state emission allowances, with some reserving small set-asides for combined

heat and power (CHP) facilities, allowance retirement for voluntary renewable energy purchases, or other policy goals.<sup>34</sup>

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<sup>34</sup> To date, only Delaware has not completed a legislative or regulatory proposal indicating the share of allowances to be auctioned. Legislation is expected to be introduced in mid-May, 2008. The Delaware Department of Natural Resources and Environmental Control has recommended that the state auction 60 percent of the state's allowances (Point Carbon 2008d).

**Table 3.4. Status of State RGGI Implementation and Approaches to Optional Model Rule Provisions**

<b>State</b>	<b>Status of Implementation Efforts</b>	<b>Approach to Optional Model Rule Provisions</b>
CT	Proposed regulation, January 2008 (Sections 22a-174-31 and 31(a)).	<b>Exemption:</b> None <b>Allocation:</b> 91% auctioned; set asides for voluntary renewable energy purchase, consumer-side distributed resources, and combined heat and power (CHP)
DE	Legislation (SCR 28, June 2007) convenes workgroup to draft RGGI legislation. Proposed legislation expected May 2008.	
MD	Proposed regulation, December 2007 (COMAR 26.09).	<b>Exemption:</b> sources selling less than 10% of output to grid. <b>Allocation:</b> Up to 100% auction; set asides for industrial exemption, long-term contracts, and voluntary renewable energy purchase.
ME	Legislation authorizing RGGI signed June 18, 2007. (LD 1851) Final regulation, December 2007 (CMR Chapter 156).	<b>Exemption:</b> sources selling less than 10% of output to grid. <b>Allocation:</b> 100% auction, minus set asides determined annually for CHP and integrated manufacturing facilities.
MA	Final regulation January, 2008 (310 CMR 7.70) Auction rule proposed: (225 CMR 13.00)	<b>Exemption:</b> None <b>Allocation:</b> 100% auction minus TBD set-asides for GHG credit conversion and voluntary renewable energy purchase.
NH	HB-1434 authorizing RGGI regulations and setting basic provisions (passed out of NH House in March, 2008).	<b>Allocation:</b> Allows for 100% auction, and a set aside for voluntary renewable energy purchase of up to 1%. Also requires conversion of allowances under existing NH cap.
NJ	Legislation authorizing RGGI (A4559) signed January, 2008; implementing regulations in development.	<b>Allocation:</b> Allows for 100% auction.
NY	Proposed regulation, October 2007 (6 NYCRR 242).	<b>Exemption:</b> sources selling less than 10% of output to grid. <b>Allocation:</b> 100% auction minus set asides for voluntary renewable energy purchase and economic hardship from long-term contracts.
RI	Legislation authorizing RGGI (H5577) signed July 2007; implementing regulations in development.	<b>Allocation:</b> Allows for 100% auction minus "de minimis" set aside for voluntary renewable energy purchases.
VT	Legislation authorizing RGGI signed May, 2006(Bill 0860). Proposed regulation, October 2007 (Ch. 22, Air Pollution Control Division)	<b>Exemption:</b> None <b>Allocation:</b> 100% auction.

Source: Individual state rules.

Finally, the RGGI MOU, while not legally enforceable, does express the RGGI member states' intent with respect to interaction with a federal cap and trade program. The MOU notes that RGGI states will "advocate for a federal program that rewards states that are first movers," and that they will "transition into" a federal program that is deemed "comparable" to RGGI, though it does not put forth a mechanism for doing so. (RGGI 2005, p. 10). Among RGGI state rulemakings there are two examples of states withdrawing existing state rules in order to eliminate overlapping requirements on state sources subject to RGGI. Massachusetts, in its RGGI regulation, and New Hampshire, in its proposed legislation, include provisions that would allow RGGI to supersede their respective existing state regulations for CO<sub>2</sub> emissions from the power sector.

#### *Western Climate Initiative*

The governors of Arizona, California, New Mexico, Oregon, and Washington established the WCI in February 2007.<sup>35</sup> Utah, Montana and the Canadian provinces of British Columbia, Manitoba and Quebec have since joined the initiative.<sup>36</sup> Participating states and provinces have set a collective GHG emissions goal in August 2007 of 15% below 2005 levels by 2020. This goal represents an aggregate reduction that was calculated based on the individual GHG emission targets of participating states and provinces. WCI participants are scheduled to complete recommendations for the design of a regional cap-and-trade program, including consideration of multiple sector participation and coverage of multiple GHGs, by August, 2008. The governors' agreement does not comment on how programs under the WCI should relate to an eventual federal cap

#### *Midwest Regional Greenhouse Gas Reduction Accord*

On November 15, 2007, governors from the six Midwestern states of Wisconsin, Minnesota, Illinois, Iowa, Michigan, Kansas, as well as the premier of the Canadian province of Manitoba signed an accord agreeing to develop regional greenhouse gas emission reduction targets and a multi-sector cap-and-trade program to enable the

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<sup>35</sup> See <http://www.westernclimateinitiative.org/>.

<sup>36</sup> Alaska, Colorado, Idaho, Kansas, Nevada, and Wyoming, are participating as observers, as are the Canadian provinces of Ontario and Saskatchewan, and six Mexican states.

achievement of these targets.<sup>37</sup> Indiana, Ohio, and South Dakota are participating in the process as observers. Participants have agreed to develop GHG reduction targets and timelines consistent with their individual jurisdictional goals within eight months of the date of the accord. Further, participants intend to propose a cap-and-trade program and to complete a model rule within twelve months of the date of the accord, that is, by November 2008. Finally, the accord specifies that the resulting cap-and-trade program should address interaction or integration with an eventual federal program.

### *Assembly Bill 32*

AB 32 was signed into law in California on September 27, 2006.<sup>38</sup> This bill requires that California's GHG emissions be reduced to 1990 levels by 2020, through regulations developed by the California Air Resources Board (CARB). In compliance with AB 32, CARB approved a GHG emissions inventory for 1990 and a 2020 emissions limit on December 6, 2007 of 427 million metric tons of CO<sub>2</sub> equivalent (CARB 2007).

AB 32 requires that CARB adopt regulations to achieve that target by January 1, 2011, and notes that these regulations may include market-based mechanisms and declining emissions caps.<sup>39</sup> CARB is currently in the process of developing a scoping plan to evaluate policy options and make recommendations, a process that AB 32 requires be completed by January 1, 2009. While a cap-and-trade program is expected to be the primary regulation driving emissions reductions in California, the form that such a program will take remains uncertain. The California Public Utilities Commission and the California Energy Commission have jointly recommended a cap-and-trade program for electricity generators that would place the regulatory obligation to surrender allowances on the deliverer of power to the California grid (CPUC 2008). The term "deliverer" is used instead of the emitting source, as is usual in cap-and-trade programs, in an attempt to prevent emissions leakage by including emissions from imported power under the cap. However, opponents of such a system, which include investor-owned utilities, argue that it would complicate emissions accounting, be vulnerable to manipulation by load-serving

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<sup>37</sup> See <http://www.midwesterngovernors.org/resolutions/GHGAccord.pdf>.

<sup>38</sup> The text of AB 32 is available online: <http://www.arb.ca.gov/cc/docs/ab32text.pdf>.

<sup>39</sup> See AB 32, section 38562(c).

entities, and be complicated to integrate with other federal or regional programs, which would likely be entirely source-based (Point Carbon 2007).

### **3.4 State Regulation of Emissions Sources**

A number of states have adopted legislation or regulation imposing direct emission requirements, thus far targeting power plants and vehicles. Power plant standards include emission caps, emission rate requirements, and sequestration requirements for new facilities. State vehicle standards are based on the California's AB 1493, the implementation status of which remains uncertain subject to resolution of litigation at the Federal level.

#### *Power Sector*

Six states have existing legislation or regulations that impose restrictions on power plant emissions of CO<sub>2</sub>, most of which are currently being implemented. These requirements vary significantly in the extent of their applicability and chosen regulatory instrument. They are summarized below in Table 3.5.



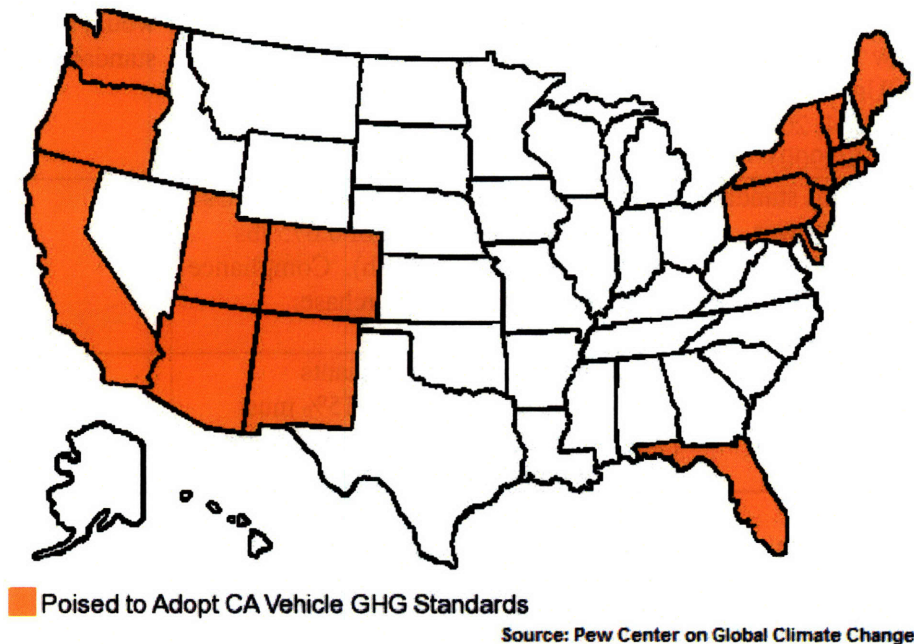
**Table 3.5. Summary of State GHG Emissions Requirements for Power Plants**

State	Type of Standard	Major Provisions	Comments
CA	Emissions performance standard (SB 1368, 2006)	Prohibits new long-term (more than 5 years) financial commitments for, or new ownership interests in, baseload generation with plants that exceed 1100 lbs/megawatt-hour (MWh) of CO <sub>2</sub> . Does not allow for offsets.	Requires CPUC and CEC to reevaluate standard when enforceable cap is established.
MA	Emissions cap and standard. (310 CMR 7.29, 2001)	Affected facilities to meet annual CO <sub>2</sub> emissions cap standards beginning January 1, 2006, and an annual CO <sub>2</sub> rate standard of 1,800 pounds CO <sub>2</sub> per MWh beginning January 1, 2008. Off-site reductions permissible.	To be superseded by RGGI beginning January 1, 2009.
MT	Technology standard and offset requirement (HB 25, 2007)	Prohibits state PUC from approving coal-fired electricity generating units (EGUs) after January 1, 2007 unless at least 50% of CO <sub>2</sub> is captured and sequestered. Also requires “cost-effective” offsets for new (post 1/1/07) gas/syngas units (rule to be adopted by 3-31-08).	
NH	Emissions cap on Public Service of New Hampshire EGUs. (HB 284, 2002; Env-A-2900)	Cap achieves 1990 levels by 2006. Affects 6 fossil-fuel fired EGUs. Trading, banking.	Pending legislation would replace standard with RGGI.
OR	Emissions standard for new power plants. (Division 24, OAR 345-024-0500, 1997)	New baseload and non-baseload EGUs must meet rate standard of 0.675 lbs CO <sub>2</sub> /kilowatt-hour (KWh). Compliance can be through offset purchase.	
WA	GHG Mitigation Rule (WAC Ch. 173-407, 2004)	New plants and existing plants increasing emissions by >15% must develop CO <sub>2</sub> mitigation plan to offset 20% of emissions over 30 years.	
WA	Emissions performance standard (Substitute Senate Bill 6001, 2007).	Beginning July 1, 2008, requires all new long-term financial commitments for baseload generation be with plants that do not exceed 1100 lbs/MWh of CO <sub>2</sub> . Verifiable emissions reductions allowed if sequestration plan cannot be implemented.	

Source: Pew Center on Global Climate Change and individual state rules.

### *Transportation Sector*

California has attempted to utilize its waiver provision under section 209 of the Clean Air Act in order to implement AB 1493, the Clean Car Law, which was signed into law in July 2002 and followed by standard-setting regulations in December 2004. The regulations under this law implement declining CO<sub>2</sub>-equivalent emission rate standards for new passenger cars and light duty trucks beginning in 2009. The rates are calculated on a fleet average, and allow for the banking and trading of emission rate reduction credits. These rules are projected to result in a 22% reduction in GHG emissions from new cars by 2012 relative to the 2002 fleet, and a 30% reduction by 2016 (CARB 2004). Currently, as shown in figure 3.2, sixteen other states have moved forward with statutory and regulatory processes to implement Clean Car laws, planning on using the authority provided under section 177 of the Clean Air Act to implement standards identical to California's.



**Figure 3.2. States planning to implement California's vehicle emission standard as of April 23, 2008**

However, as chapter 2 suggests, the legal authority of states to implement these rules remains uncertain. The rules were challenged by the automobile industry in federal courts in Vermont and California partly on the grounds that, even if a waiver is granted to

California by EPA, they would be preempted under EPCA.<sup>40</sup> While the courts held that this is not the case, these rulings are being appealed. Further, in December of 2007 EPA denied California's petition for a waiver that would allow it (and ultimately other states) to move forward with the standards set under AB1493. In a letter to Governor Schwarzenegger, EPA Administrator Johnson argued that because of both the global nature of climate change and improvements in fuel economy that will result from the recent Energy Independence and Security Act,<sup>41</sup> California does not have a "need to meet compelling and extraordinary conditions," which section 209(b)(1) of the Clean Air Act requires before such a waiver can be granted to the state (EPA 2007). This action is currently being appealed by California and a number of other states.

### **3.5 State Actions Indirectly Affecting GHG Emissions**

#### *Renewable Portfolio Standards*

At present, 26 states and the District of Columbia have promulgated renewable portfolio standards (RPS), which require that some percentage of electricity sold within the state come from renewable electricity generating sources. Most states allow that the standard be met through the submission of tradable renewable energy credits (RECs).<sup>42</sup> In some cases where multi-state power pools exist, the Independent System Operator has adopted an accounting system that allows interstate trading of RECs. As is demonstrated in Table 3.6, RPSs vary across states in their definition of what counts as renewable generation – often to coincide with resources that state governments wish to promote or develop – as well as stringency and timing. The differing RPS targets also reflect the existing base of hydro power, which can vary from none to a significant share of generation. Thus, the impacts of RPSs on GHG emissions are expected to vary by state as well, depending on the extent to which fossil fuel generation is displaced or avoided.

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<sup>40</sup> See *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie* and *Central Valley Chrysler-Jeep v. Goldstone*, *supra* note 25.

<sup>41</sup> The Energy Independence and Security Act (P.L. 110-140) includes updated CAFÉ standards which will reduce GHG emissions from new vehicles.

<sup>42</sup> An REC typically represents 1 MWh of generation from a renewable source, and characteristics such as location and emissions (if any).

**Table 3.6. Summary of State Renewable Portfolio Standards**

<b>State</b>	<b>Target at Full Implementation</b>
AZ	15% by 2025
CA	20% by 2010
CO	20% by 2020 for large investor-owned utilities, with 4% from solar. 10% by 2020 for municipal utilities and rural providers.
CT	27% by 2020
DC	11% by 2022
DE	2% solar PV by 2019; 18% other renewable by 2019
HI	20% by 2020
IA	105 MW
IL	25% by 2025
MA	4% new renewables by 2009, increasing by 1% annually thereafter.
MD	2% solar by 2022 7.5% other renewable by 2022
ME	30% by 2000; increase new (post 10/05) renewable capacity by 10% by 2017
MN	25% by 2025; Xcel Energy must produce 30% by 2020
MO	11% by 2020
MT	15% by 2015
NC	Public utilities: 12.5% by 2021 Municipalities and Cooperatives: 10% by 2018
NH	25% by 2025
NJ	22.5% by 2021, at least 2% solar
NM	20% by 2020
NV	20% by 2015, at least 5% solar
NY	25% by 2013
OH	25% by 2025; at least half renewable; remainder from 'alternative energy' including efficiency, new nuclear, clean coal.
OR	25% by 2025
PA	18.5% by 2020
RI	16% by 2020
TX	5,880 MW by 2015
VA	12% of 2007 sales by 2022
VT	Equal to the % load growth between 2005 and 2012
WA	15% by 2020 for major utilities
WI	10% by 2015

Source: Pew Center on Global Climate Change.

[http://www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_states/rps.cfm](http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm)

### *Energy Sector Demand Reduction Measures*

Many states have implemented measures designed to reduce electricity demand and delay investment in new capacity. Such measures include system benefits charges to fund investment in energy efficiency, energy efficiency resource standards, increased building code stringency, and appliance efficiency standards. These programs would be expected to reduce electricity and heating fuel demand growth, and thus GHG emissions, relative to a counterfactual without such measures. The range of existing programs found in individual states is discussed below.

#### Energy Efficiency Resource Standards.

Energy efficiency resource standards (EERS) set an energy savings target for a state's electric and sometimes gas utilities, and typically allow for trading and banking of energy efficiency gains. Permissible compliance options may include end-use efficiency, supply side efficiency, and the use of combined heat and power. These standards vary across states both in requirements and manner of implementation. In some states, such as Connecticut, EERS are implemented as part of an RPS. In such a scenario, the EERS will provide some level of GHG reductions that are captured within the total quantity of GHG reductions achieved by the RPS. Existing EERS standards are summarized in Table 3.7, below.

**Table 3.7. Summary of State Energy Efficiency Resource Standards**

<b>State</b>	<b>Description</b>
CT (Public Act 05-01, 2005)	Incorporated into RPS. Requirement for energy efficiency and CHP increases from 1% to 4% of requirement over 2007-2010
HI (Act 95 SLH 2004)	Energy efficiency qualifies under state RPS
IL (PA 095-0481, 2007)	Increasing electricity savings requirement: 0.2% in 2008 to 2.0% in 2015 and thereafter. Dept. of Commerce and Economic Opportunity to provide assistance to utilities.
MN (SF 145, 2007)	Annual savings of electricity and gas equal to 1.5% in retail sales, at least 1% of which must be from energy efficiency.
NC (SB 3, 2007)	Included in RPS. Energy efficiency can be up to 25% of requirement through 2018, and 40% thereafter.
NJ	In development. Board of Public Utilities authorized to adopt EERS with goals up to 20% savings by 2020.
NM (HB 305, 2008)	Energy-efficiency savings of at least 5% of 2005 sales by 2014, and 10% of 2005 sales by 2020.
NY	In development. In 2007, Gov. Spitzer called for 15% of total forecasted sales by 2015.
PA (Act 213, 2004)	Energy efficiency qualifies as a resource under state Alternative Energy Portfolio Standard
TX (HB 3693, 2007)	Requires utilities to offset 20% of load growth through energy efficiency
VA (HB 3068, 2007)	Statutory target of 10% energy savings target for utilities by 2022
VT (30 VSA § 209)	Authorized Public Service Board to establish Efficiency Vermont, a state-run energy efficiency utility
WA (CR 102, 2006)	Draft regulation; utility efficiency targets not yet set.

Source: Pew Center on Global Climate Change and individual state rules

### System benefits charges

System benefits charges, also called “public benefit funds” have been implemented in roughly half of the states, typically as part of the process of electricity deregulation. Funds are supported by a surcharge on customers’ electric bills, and are designated for investment in end-use energy efficiency, renewable energy development, or low-income assistance. Some states, such as MN, require a minimum rate of

investment in energy efficiency.<sup>43</sup> It is important to note that, to the extent that a state with a system benefits charge has either an RPS that allows energy efficiency as a resource or a separate energy efficiency resource standard, the system benefit charge will not provide additional GHG emission reductions unless it drives energy efficiency resource development in excess of what is required by those standards.

### Building code upgrades

State building codes can be modified to increase or establish minimum energy efficiency requirements for new residential or commercial buildings. Many states have included updating building codes to increase energy efficiency requirements as part of their climate action plans, and a few have moved forward with legislation to adopt such measures. Many states appear to be basing building code updates on the International Energy Conservation Code standards, which are updated every three years.<sup>44</sup> In addition, a number of states have set green building standards requiring new or renovated government buildings to obtain LEED certification.<sup>45</sup>

### Appliance Efficiency Standards

States are preempted from establishing efficiency standards for appliances for which a federal standard exists under the 1987 National Appliance Energy Conservation Act.<sup>46</sup> However, states may establish standards for appliances for which a federal standard does not exist. A number of states on the west coast and in the northeast have enacted energy efficiency standards for an assortment of appliances such as commercial freezers, refrigerators, and ice machines. California's standards, for example, currently cover energy use from twenty-two categories of appliances not regulated at the federal level (CEC 2007).

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<sup>43</sup> See MN Statutes 216B.241, online: [http://www.revisor.leg.state.mn.us/bin/getpub.php?pubtype=STAT\\_CHAP&year=current&chapter=216B#stat.216B.241.0](http://www.revisor.leg.state.mn.us/bin/getpub.php?pubtype=STAT_CHAP&year=current&chapter=216B#stat.216B.241.0).

<sup>44</sup> See, for example, <http://www.massclimateaction.net/Legislation>.

<sup>45</sup> LEED stands for Leadership in Energy and Environmental Design, and is a nationwide benchmark for 'high-performance' green buildings.

<sup>46</sup> The Energy Independence and Security Act of 2007 (PL 110-140) updates a number of federal appliance efficiency standards and allows the Department of Energy to establish standards that vary regionally for heating and air conditioning equipment.

#### **4. Analysis of Potential Relationships between Federal and State Programs**

As discussed in chapter 1, analysis of the potential interactions between federal and state cap-and-trade programs has been limited. In February 2008, the House Committee on Energy and Commerce released a white paper addressing the implications of a federal cap coexisting with state or regional programs to reduce GHG emissions (House Committee on Energy and Commerce 2008). The Committee staff paper examines the impact of state programs on federal allowance price and aggregate emissions under coexistence with a range of state programs, in order to inform discussion of the appropriate distribution of regulatory authority between the federal and state or local governments under federal climate legislation. The Committee staff analysis finds that where a state and federal program coexist, additional reductions will be achieved under the state program only where it covers emissions not included under the federal cap. In addition, implications for total costs will depend on whether the state program results in lower-cost emission reductions than would be achieved under the cap-and-trade program alone, as could be the case if there are market barriers to emissions reductions from energy efficiency improvements. While the paper does not explicitly recommend any particular policy approach, it notes that in addition to potentially increasing the costs of a national cap, state policies to reduce GHG emissions may adversely impact interstate commerce and impose economic burdens on other states.<sup>47</sup>

Also, Monast (2008) evaluates four options for federal treatment of existing state cap-and-trade programs, focusing on the impacts of the incentives created by each. These include: allowing state and federal allowance markets to coexist, federal preemption of state programs, allocating federal allowances to states with existing carbon markets to allow them to provide for transition, and accepting banked state allowances under the federal program. Monast does not ultimately advocate for any one of these options, but concludes that federal policymakers must make a tradeoff between

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<sup>47</sup> The paper specifically notes the views of the Committee chair, Representative John Dingell (D-MI), who opposes state-level (e.g. CA and others) GHG vehicle emission standards, and particularly their coexistence with a federal program because of potentially inefficiencies and burdens on interstate commerce.



preemption and duplicative requirements that rewards early actors without punishing states without carbon markets.

Most recently, McGuinness and Ellerman (2008) provide an analysis of the interactions of a hypothetical federal cap and a range of state and regional programs, with particular emphasis on state and regional cap-and-trade programs. While adopting a similar framework to the House Energy and Commerce staff paper, it provides a more detailed analysis of the economic and distributional impacts of potential interactions on both the state and federal allowance markets, and considers the roles of various design elements. In addition, the paper develops a mathematical model for the simple case of coexisting state and federal cap-and-trade programs with perfect overlap.

This chapter provides an overview of the mathematical framework describing that basic case, and extends it to the variations of the basic case of coexistence with perfect overlap, including cases of imperfect overlap, the addition of common cap-and-trade design features, and state retirement of federal program allowances. Second, it considers the impact of coexistence of a federal cap-and-trade program with non-cap-and-trade state regulations. It then considers three other potential relationships between federal and state cap-and-trade programs: federal preemption or state withdrawal of the state cap-and-trade program, a ‘carve-out’ where the state program exists separately from the federal cap-and-trade program, and a carve-out with linkage to the federal program, where allowances between the two programs can be exchanged freely.

#### **4.1 Coexistence of a Federal Cap-and-Trade Program with State or Regional Cap-and-Trade Programs**

##### *Programs with Perfectly Overlapping Coverage*

The nature of the interaction between the federal and state programs will depend principally on the relative stringency of the two programs from the perspective of emission sources in the state and the extent of overlap in coverage between the federal and state programs.<sup>48</sup> The mathematical representation of programs with perfectly

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<sup>48</sup> The stringency of an emissions cap is reflected in the level of emissions and the marginal cost of abatement or the price of an emission allowance. The more stringent program – and thus the one that will drive behavior at the margin – within the state can be understood as the program that would result in lower emissions, and a higher marginal abatement cost and allowance price absent the other program.

overlapping coverage developed in McGuinness and Ellerman (2008) is summarized below. This analysis assumes simplified, hypothetical federal and state or regional<sup>49</sup> cap-and-trade programs, in order to highlight the primary efficiency and distributional consequences of their interaction, beginning with a basic case where the coverage of the state and federal programs is identical and allowances are distributed entirely through auctions.

When sources in a given state are subject to both federal and state cap-and-trade programs, these sources will face two compliance obligations for the same emissions: obtaining and surrendering both federal and state allowances. Where the state program is more demanding of state sources than the federal program, the prices of both federal and state allowances are influenced by the requirements of the other program. For instance, the lower emissions under the federal program from sources covered by the state program will reduce demand in the federal auction and lead to a lower federal allowance price. At the same time, when faced with the requirement of complying with the federal program, in-state sources will reduce emissions to the extent justified by the federal allowance price.

The individual marginal abatement cost (MAC) curves for the set of sources under the state cap, and the set of sources (including those subject to the state program) under the federal cap can be expressed as follows.

$$1) \quad \begin{aligned} \bar{p}_s &= \alpha - \beta_s \bar{e}_s = mc_s \\ \bar{p}_f &= \alpha - \beta_f \bar{e}_f = mc_f \end{aligned}$$

where the state and federal program are denoted by  $s$  and  $f$ , respectively;  $\bar{p}$  represents the equilibrium price of allowances under the cap;  $mc$ , the marginal abatement cost of the set of installations covered by program;  $\alpha$ , the cost of the last unit of emission reduction, which we assume to be equal under both programs;  $\beta$ , the rate at which the marginal cost of emission reduction increases, and  $\bar{e}$ , the emissions cap level.

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<sup>49</sup> To avoid the repetition of “state or regional,” all subsequent references to “state” should be understood to include multi-state, regional programs unless specifically stated otherwise.

Because the federal program includes all sources in the state program and other sources nationwide, it follows that  $\beta_f < \beta_s$ . Under a binding cap, the allowance price under either program will be positive and emissions will be reduced below business-as-usual levels. Based on equation 1, the level of emissions in the state under the federal cap only, denoted by  $\tilde{e}_s$ , is determined by:

$$2) \quad \tilde{e}_s = \frac{\alpha - \bar{p}_f}{\beta_s} = \frac{\beta_f}{\beta_s} \bar{e}_f < e_s^0,$$

where  $e_s^0$  represents business-as-usual emissions within the state. When a federal cap-and-trade program coexists with a state cap-and-trade program, sources that are subject to both programs will have to surrender both one state and one federal allowance for each ton of emissions. Therefore, the marginal cost paid by such sources will be:

$$3) \quad mc_s = \bar{p}'_s + \bar{p}'_f,$$

where  $\bar{p}'_s$  denotes the state allowance price in the presence of the federal program, and  $\bar{p}'_f$  denotes the federal allowance price in the presence of the state program. Determining these allowance prices requires defining the relationship between the marginal cost presented in equation 3 and the marginal cost that sources in the state would face under either the state or federal program alone. This requires determining the extent to which the state program reduces the demand for allowances under the federal program, and the extent to which the federal program reduces the demand for state allowances under the state program.

To determine the effect of the state program on the federal allowance price, it is necessary to determine the difference between what state emissions would be under the federal program alone and what they would be under the state cap alone. This can be expressed as:

$$4) \quad \Delta e_s = \bar{e}_s - \tilde{e}_s = \bar{e}_s - \frac{\beta_f}{\beta_s} \bar{e}_f.$$

When the federal program results in emission reductions at state sources equal to or greater than the state program when the two are considered independently, such that  $\Delta e_s \geq 0$ , the state program will be slack, and there is no adjustment in the federal allowance price. In this scenario, in-state sources would still be subject to an allowance surrender requirement for both programs. However, the demand for allowances under the state auction would be less than the supply, such that in the absence of a reservation price, the cost of a state allowance would be zero or nearly so.<sup>50</sup> The marginal cost borne by in-state sources would be more or less the same as those borne by sources in other states and the distribution of emissions among states in the federal program would be largely the same as if the state program did not exist.

However, when  $\Delta e_s < 0$ , the state program is more demanding of state sources than the federal program. In this case, the state program will put downward pressure on the federal allowance price, because the more stringent state cap will reduce the demand for federal allowances from in-state sources. As a result, the federal MAC curve will be shifted down, with the vertical intercept  $\alpha$  reduced by  $\beta_f \Delta e_s$ . The adjusted federal price is thus:

$$5) \quad \begin{aligned} \text{If } \Delta e_s < 0, \quad \bar{p}'_f &= \alpha + \beta_f \Delta e_s - \beta_f \bar{e}_f = \bar{p}_f + \beta_f \Delta e_s \\ \text{If } \Delta e_s \geq 0, \quad \bar{p}'_f &= \bar{p}_f \end{aligned}$$

The magnitude of the state program's impact on the federal allowance price and the shifting of emissions and costs depends not only on the relative stringency of the two programs but also on the state's proportion of GHG emissions covered by the national cap. For example, a binding state cap in Texas, which contributes the largest share of U.S. CO<sub>2</sub> emissions annually, would have a larger impact than a state cap of equivalent stringency in Vermont, which contributes the smallest share. To provide a sense of the potential impact a regional program, the power sector emissions subject to RGGI represent approximately 3% of total U.S. CO<sub>2</sub> emissions.<sup>51</sup> This share would likely

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<sup>50</sup> The allowances might still retain some *de minimis* value if trading would have to occur in order for allowances to be reallocated amongst sources for compliance with the state program.

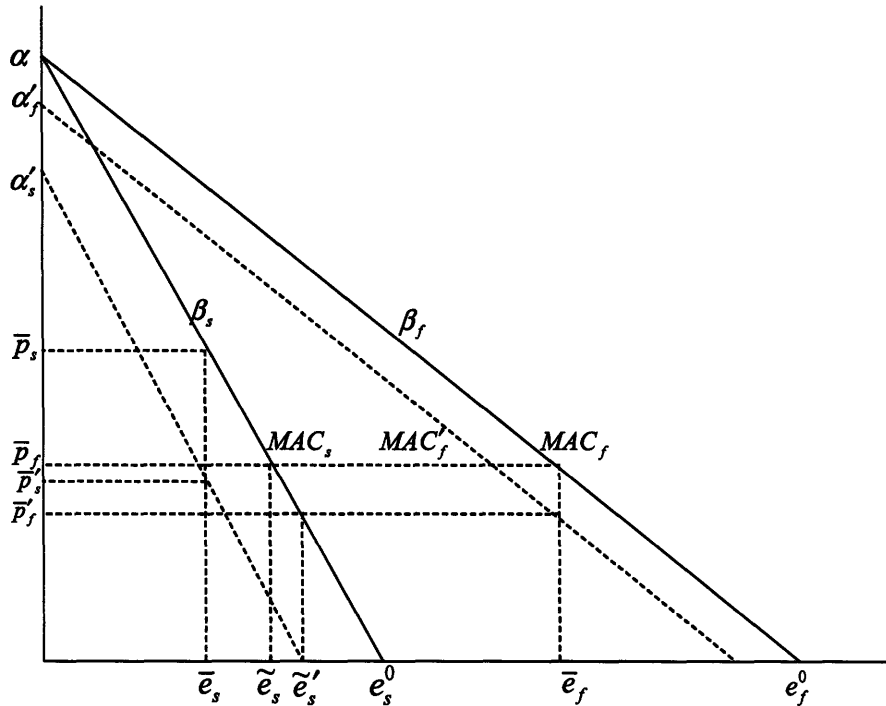
<sup>51</sup> Own calculations based on initial RGGI state budgets and EIA (2007).

increase slightly under a national cap, which would presumably be unable to cover all U.S. emissions.

It is unlikely that any state or regional program will be sufficiently large or stringent to reduce the federal allowance price to zero. Thus, while the state program may affect the federal allowance price, a federal program will always impact the state allowance price when the two programs overlap. The shift in the state MAC curve will depend on the difference between what state emissions would be in response to the federal allowance price that results under overlapping programs,  $\tilde{e}'_s$ , and what they would be in a business as usual scenario,  $e_s^0$ . The adjusted state allowance price is therefore:

$$6) \quad \bar{p}'_s = \alpha + \beta_s (\tilde{e}'_s - e_s^0) - \beta_s \bar{e}_s = \alpha - \beta_s \bar{e}_s + \beta_s \left( \frac{\alpha - \bar{p}'_f}{\beta_s} - \frac{\alpha}{\beta_s} \right) = \bar{p}_s - \bar{p}'_f$$

Figure 4.1 demonstrates the impact on the federal and state MAC curves where the state program is more demanding of state sources than the federal program, in accordance with the interactions described above. Because the state program reduces the demand for federal allowances, the intercept of the federal MAC curve shifts from  $\alpha$  to  $\alpha'_f$ , based on equation 5, such that  $\bar{p}_f$  is reduced to  $\bar{p}'_f$ . Concurrently, because the federal program reduces the demand for state allowances, the state MAC curve shifts from  $\alpha$  to  $\alpha'_s$ , based on equation 6. The original state price  $\bar{p}_s$  is reduced to  $\bar{p}'_s$ , which as equation 6 demonstrates, is the difference between  $\bar{p}_s$  and  $\bar{p}'_f$ .



**Figure 4.1. Marginal abatement cost curve shifts and implications for emissions and allowance prices under overlapping federal and state cap-and-trade programs.**

In summary, the marginal cost paid by in-state sources will depend on whether the state or federal program is more demanding for in state sources. If the federal program is more stringent than the state program, the state allowance price will fall to zero and the marginal cost paid by in state sources will be equal to what the federal allowance price would be absent coexistence with a state program. If the state program is more stringent than the federal program, the source will face adjusted state and federal allowance prices, the sum of which is equal to what the state allowance price would be absent coexistence with a federal program. Thus:

$$\begin{aligned}
 7) \quad & \text{If } \Delta e_s \geq 0, \quad mc = \bar{p}_f \\
 & \text{If } \Delta e_s < 0, \quad mc = \bar{p}_s
 \end{aligned}$$

As the above analysis suggests, when the state program is more demanding of state sources than the federal program, the result is that sources in the state face a higher marginal abatement cost than sources outside of the state that are subject to only the federal program. Costs are redistributed from out-of-state sources to in-state sources. Since marginal costs are not equated among all sources under the federal program,

economic efficiency is sacrificed, and the total cost of achieving the level of emissions reductions required by the national cap is greater than it would be absent the state program. In addition, because both the state and federal allowance prices are reduced under coexistence relative to the programs existing independently, auction revenues will be reduced under each program as a result of coexistence. As is demonstrated in equation 8, the revenue loss for the state program per allowance will always be greater than that of the federal program.

$$8) \quad \frac{|\Delta \bar{p}_s|}{|\Delta \bar{p}_f|} = \frac{|\bar{p}'_s - \bar{p}_s|}{|\bar{p}'_f - \bar{p}_f|} = \frac{|-\bar{p}'_f|}{|\beta_f \Delta e_s|} = \frac{\bar{p}_f + \beta_f \Delta e_s}{\beta_f \Delta e_s} = 1 + \frac{\bar{p}_f}{\beta_f \Delta e_s} > 1$$

Further, the more demanding state program has no additional impact on national GHG emissions, which are determined by the national cap. Rather, the effect on emissions is redistributive. While the higher marginal abatement cost under combined federal and state programs causes sources subject to both to reduce emissions by more than they would under the federal program alone, this additional reduction is offset by less reduction in other states subject only to the national program.

Finally, when the federal cap is more demanding of in-state sources than the state program, the impact of the state program is limited to the administrative and transaction costs of acquiring and surrendering the valueless state program allowances. While federal auction revenues would remain virtually unchanged relative to the absence of a state program, state revenues would approach zero absent the use of a reservation price. The state program would not result in any further emission reductions in the state relative to the federal program, and marginal costs would be equated across sources subject to the federal program, avoiding the economic efficiency loss that results when the state program is more demanding.

### *Imperfectly Overlapping Programs*

It is more likely that any federal program that is developed will not have perfect overlap with existing state programs, unless prospective state programs are designed to replicate the applicability provisions of proposed federal legislation. Given restraints on

states' authority to regulate vehicle emissions, as well as the potential for state programs to face Dormant Commerce Clause challenges, a federal cap that is more comprehensive in coverage than a state cap is more likely than the reverse.

#### The Federal Program is More Comprehensive

If the federal program is more comprehensive than the state program and includes all sources subject to the state program, the effects of the interactions between the two programs are identical to those described for the case of perfect overlap. Where the state program is more stringent, as demonstrated in the previous section, in-state sources subject to both programs will face a total marginal abatement cost equal to  $\bar{p}_s$ . Sources subject only to the federal cap, whether they are in- or out-of-state sources, will pay only the adjusted federal allowance price,  $\bar{p}'_f$ . This can be considered by assuming that sources are divided into two sectors, represented within the state by  $s1$  and  $s2$ . Sources in sector 1 are subject to both the state and federal program, while sources in sector 2 are subject only to the more comprehensive federal program. Thus, the total emissions by state sources under the state cap and the more comprehensive federal cap can be represented as follows:

$$9) \quad e_s = \frac{\alpha - \bar{p}_s}{\beta_{s1}} + \frac{\alpha - \bar{p}'_f}{\beta_{s2}},$$

As is the case under perfect overlap, the state program does not lead to an additional reduction in emissions beyond the federal cap, but rather, to the extent that the state program is binding, redistributes emissions and costs. When the state program is more stringent than the federal program, in-state sources subject to only the federal program and sources outside of the state benefit from the lower federal allowance price. When the state program is less demanding of in-state sources, the state program will have no effect aside from the administrative costs that it imposes.

#### The State Program is More Comprehensive

A less likely, but more complicated scenario is where the state cap covers additional sources in the state beyond those included in the federal program. Here, sector



1 state sources, denoted  $s1$ , are subject to both the state and federal cap, and sector 2 state sources, denoted  $s2$ , are subject to the more comprehensive state cap only.

Aggregating the individual marginal cost curves for the two subcategories of state sources results in the following aggregate marginal cost curve for sources in the state, at the state cap level  $\bar{e}_s$  :

$$10) \quad \bar{p}_s = \alpha - \frac{1}{\left(\frac{1}{\beta_{s1}} + \frac{1}{\beta_{s2}}\right)} \bar{e}_s = \alpha - \beta_s \bar{e}_s$$

Because only a subset of state sources are subject to the federal program, the difference between emissions under the federal cap alone and under the state cap alone is  $\Delta e_{s1}$ :

$$11) \quad \Delta e_{s1} = \dot{e}_{s1} - \tilde{e}_{s1} = \dot{e}_{s1} - \frac{\beta_{f1}}{\beta_{s1}} \bar{e}_{f1} < e_{s1}^0,$$

where  $\dot{e}_{s1}$  represents the level of emissions that would obtain at sources in sector  $s1$  under the unadjusted state allowance price,  $\bar{p}_s$ , and subscript  $f1$  denotes sources subject to the federal program, which is limited to sector 1. The magnitude of this difference relative to a case where both the state and federal programs were limited to sector 1 will depend on whether  $\bar{p}_s$  would remain the same under a contracted state program. If the price would remain the same, this difference would not change. Using equation 5, the adjusted federal price will be:

$$12) \quad \bar{p}'_{f1} = \alpha + \beta_{f1} \Delta e_{s1} - \beta_{f1} \bar{e}_{f1} = \bar{p}_{f1} + \beta_{f1} \Delta e_{s1}$$

As is the case under perfectly overlapping state and federal programs, if the state program is less or equally demanding of sources subject to both programs than the federal program such that  $\Delta e_{s1} \geq 0$ , the state program will have no impact on the federal allowance price, and  $\bar{p}'_f = \bar{p}_f$ . However, because the state program extends beyond those sources covered by the federal program, the state program may retain a positive allowance price, as will be discussed later in this section.

As occurs under perfectly overlapping programs, the state allowance price will adjust in response to reductions that occur at sources subject to the federal program in response to the federal price. However, in this case the state allowance price does not adjust by the full value of the adjusted federal allowance price. The adjusted state MAC curve is:

$$13) \quad \bar{p}'_s = \alpha + \beta_s(\bar{e}'_{s1} - e^0_{s1}) - \beta_s \bar{e}_s = \alpha - \beta_s \bar{e}_s + \frac{1}{\left(\frac{1}{\beta_{s1}} + \frac{1}{\beta_{s2}}\right)} \left( \frac{\alpha - \bar{p}'_{f1}}{\beta_{s1}} - \frac{\alpha}{\beta_{s1}} \right) = \bar{p}_s - \frac{\beta_{s2} \bar{p}'_{f1}}{\beta_{s1} + \beta_{s2}}$$

Using equation 10, this can be further simplified to:

$$14) \quad \bar{p}'_s = \bar{p}_s - \frac{\beta_s}{\beta_{s1}} \bar{p}'_f$$

Because  $\frac{\beta_s}{\beta_{s1}} < 1$ , the shift in the state marginal cost curve will be less than the adjusted federal allowance price  $\bar{p}'_f$ . Thus, the total marginal abatement cost faced by state sources in sectors 1 and 2 will be:

$$15) \quad \begin{aligned} mc_{s1} &= \bar{p}'_{s1} + \bar{p}'_{f1} > \bar{p}_{s1} \\ mc_{s2} &= \bar{p}'_{s1} < \bar{p}_{s1} \end{aligned}$$

As demonstrated above, the coexistence of a federal cap and a more binding state cap that is more comprehensive in coverage will result in a marginal abatement cost for sources affected by both that is to some degree higher than the state price that would obtain absent the federal program. As a result, sources subject to both the state and federal program will reduce emissions more than they would under the state program alone.

Sector 1 emissions under the combined state and federal cap are as follows:

$$16) \quad \dot{e}'_{s1} = \frac{\alpha - (\bar{p}_{f1} + \bar{p}'_{s1})}{\beta_{s1}} = \frac{1}{\beta_{s1}} \left[ \alpha - \bar{p}_{f1} - \bar{p}_s + \frac{\beta_s}{\beta_{s1}} \bar{p}_{f1} \right] = \dot{e}_{s1} - \frac{\bar{p}_{f1}}{\beta_{s1}} \left( 1 - \frac{\beta_s}{\beta_{s1}} \right)$$

Using equation 10, this can be further simplified to:

$$17) \quad \dot{e}'_{s1} = \dot{e}_{s1} - \frac{\bar{p}'_{f1}}{\beta_{s1} + \beta_{s2}} < \dot{e}_{s1}$$

The result is to free up additional allowances both for sources out of state that are covered by only the federal cap as well as sources within the state that are part of sector 2, and thus only subject to the state cap. Although sector 2 state sources will reduce emissions less than they would in the absence of the federal program, they will reduce emissions so long as they continue to face a positive cost for their emissions, as follows:

$$18) \quad \dot{e}'_{s2} = \frac{\alpha - \bar{p}'_s}{\beta_{s2}} = \dot{e}_{s2} + \frac{\bar{p}'_{f1}}{\beta_{s1} + \beta_{s2}} > \dot{e}_{s2}$$

Thus, a state program that is both more comprehensive in its coverage and more demanding than the federal program will accomplish additional emission reductions and lead to lower national emissions. The additional reductions achieved by sector 1 under the combined state and federal cap are offset by an equal decrease in emission reductions under sector 2, such that total emissions from state sources in sectors 1 and 2 equal the state cap

If the state cap is both more comprehensive than the federal program and less demanding of the sources subject to both, the state program may still retain a positive allowance price. For the state allowance price to be driven to zero, the federal program must cause sector 1 emissions to be reduced to the point where the state cap is achieved without any reductions from sector 2. The condition for a zero state allowance price is expressed as follows:

$$19) \quad \dot{e}_{s1} - \tilde{e}_{s1} \geq e_{s2}^0 - \dot{e}_{s2} \quad \text{or} \quad \tilde{e}_{s1} \leq \bar{e}_s - e_{s2}^0$$

This can be restated as:

$$20) \quad \bar{p}'_s > 0 \quad \text{iff} \quad \bar{p}_s \geq \frac{\beta_s}{\beta_{s1}} \bar{p}_{f1}$$

As equation 20 demonstrates, whether the state allowance price remains positive will depend on the relative stringency of the federal and state caps and the distribution of emissions and abatement costs between sectors 1 and 2. If the federal cap reduces

demand for state allowances from sector 1 by more than the demand for state allowances from sector 2, it will create a surplus of state allowances. Thus, the state allowance price will be zero or nearly so and there will be very little if any emission reduction attributable to the state program. However, if the demand for state allowances from sector 2 is greater than the reduction of demand from sector 1, the price of state allowances will remain positive despite the more stringent federal program. In this case, sources in sector 1 will reduce emissions more than they would absent the state cap, and there would be consequent redistribution of emissions and allowances within both the federal program and the more comprehensive state program. As long as the state allowance price remains positive, some additional emission reduction can be expected from the sources subject only to the state program.

### *The Impact of Other Design Features*

Cap-and-trade programs often include a number of design features that complicate analysis of the interaction between federal and state programs presented above. Among these design features are safety valves, reservation prices, offset provisions, banking, borrowing, and the method used to allocate allowances. These features will affect the relationship between federal and state programs to the extent that they affect the relative stringency of the two programs.

#### Safety Valve

A safety valve provides cost containment and limits the impact of allowance price volatility by providing an upper limit on allowance prices. The impact of a safety valve will depend upon the extent to which it is triggered.<sup>52</sup> The higher the safety valve price is set relative to expected allowance prices, the less likely it is that the safety valve trigger price will be reached. Under a federal program with a safety valve price  $\bar{p}_{fsv}$ , the safety valve is triggered when  $\bar{p}_f \geq \bar{p}_{fsv}$ . If the safety valve is triggered in a federal program that perfectly overlaps with a state program, thereby holding the federal allowance price artificially low, the effect of the federal program on state emissions becomes smaller,

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<sup>52</sup> EIA (2008) finds that under the Bingaman-Specter bill, the safety valve would be triggered for at least some years in all scenarios examined.

such that  $\Delta e_s$  becomes less negative than it would be absent the safety valve, as equation 21 demonstrates.

$$21) \quad \Delta e_s = \bar{e}_s - \tilde{e}_s = \bar{e}_s - \beta_f \frac{\bar{p}_f - \bar{p}_{fsv}}{\beta_s}$$

However, the federal MAC curve will not shift unless the reduction in demand for federal allowances is of sufficient magnitude to bring the federal allowance price below the safety valve level. If this is not the case, then  $\bar{p}'_f = \bar{p}_{fsv}$ . Therefore, so long as the federal safety valve price is triggered, a more demanding state program will have no effect on the federal allowance price. Rather, the impact of the state program will be a reduction in the demand for federal safety valve allowances.

Further, because the artificially low federal safety valve price results in less emission reduction within the state relative to the basic case, the shift of the state MAC curve is smaller. Where  $\bar{p}'_f = \bar{p}_{fsv}$ , using equation 6, the state MAC curve will be equal to:

$$22) \quad \bar{p}'_s = \alpha + \beta_s (\tilde{e}'_s - e_s^0) - \beta_s \bar{e}_s = \alpha - \beta_s \bar{e}_s + \beta_s \left( \frac{\alpha - \bar{p}_{fsv}}{\beta_s} - \frac{\alpha}{\beta_s} \right) = \bar{p}_s - \bar{p}_{fsv}$$

Based on this result and equation 3 the total marginal cost for sources subject to both programs, where the federal safety valve is triggered and a binding state program exists is:

$$23) \quad mc = \bar{p}'_s + \bar{p}'_{fsv} = \bar{p}_s$$

Thus, under this scenario the total cost per ton for sources subject to both programs will not change. Rather, to the extent that the federal safety valve is triggered, the state component of this cost will be larger and the value of state allowances will be greater than in the absence of a safety valve. Where the state program is less demanding of state sources than the federal program, the adjusted state allowance price will be zero, and sources in the state will face only the federal safety valve price. Therefore, in the presence of the federal safety valve:

$$24) \quad \begin{aligned} \text{If } \Delta e_s \geq 0, \quad mc &= \bar{p}_{fsv} \\ \text{If } \Delta e_s < 0, \quad mc &= \bar{p}_s \end{aligned}$$

An analogous result would be observed in the case where perfectly overlapping state and federal programs exist and the state program safety valve is triggered. A safety valve in the state program will serve to limit the state component of the total cost incurred by in-state sources, and therefore the effect on federal allowance value, again to the extent that the state safety valve is triggered.

Finally, while coexistence with a binding state program reduces the likelihood of either safety valve price being triggered, this reduction is greater in state programs because of the larger effect on state allowance prices from coexistence demonstrated in equation 8.

### Reservation Price

A reservation price sets a minimum price level for allowances purchased in auctions, ensuring some investment in abatement and generation of revenue when a cap might otherwise not be binding.<sup>53</sup> Generally, state cap-and-trade programs that have set modest emission reductions targets and are auctioning allowances are most likely to consider using a reservation price.<sup>54</sup> If the state program is less demanding of in-state sources than the federal program and allowances are auctioned, a reservation price will ensure some additional abatement by in-state sources. As a result, the state program will result in a shift in the federal MAC curve. When a state and federal program coexist and the state program reservation price has been triggered, the effect of the state reservation price is equivalent to a state allowance price equaling the sum of the federal price,  $\bar{p}_f$ , and the state reservation price,  $\bar{p}_{sres}$ . Equation 6 can be rewritten as:

$$25) \quad \Delta e_s = \bar{e}_s - \tilde{e}_s = \frac{\alpha - \bar{p}_f}{\beta_s} - \frac{\alpha - (\bar{p}_f + \bar{p}_{sres})}{\beta_s} = -\frac{\bar{p}_{sres}}{\beta_s}$$

The federal MAC curve will then shift based on  $\Delta e_s$  according to equation 5, to:

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<sup>53</sup> Alternatively, the reservation price could be implemented by government purchase of allowances when needed to keep the allowance price above  $p_{res}$ .

<sup>54</sup> For example, in response to concerns of over-allocation, RGGI will be incorporating a reservation price of \$1.86 per ton in the September 2008 auction, adjusted in response to the CPI or market prices thereafter (Point Carbon 2008c).

$$26) \quad \bar{p}'_f = \alpha + \beta_f \Delta e_s - \beta_f \bar{e}_f = \bar{p}_f - \beta_f \frac{\bar{p}_{sres}}{\beta_s}$$

The state MAC curve will not shift if the state allowance price would otherwise be equal to or below the reservation price level. Instead of the effect of the federal program being expressed through a change in the state allowance prices, it is expressed as a reduction in the number of state allowances purchased at the reservation price. This result parallels that of the safety valve example, where the effect of the state program was to reduce the purchase of federal safety valve allowances.

Sources subject to both the state and federal programs will pay a total marginal cost equal to:

$$27) \quad mc = \bar{p}_{sres} + \bar{p}'_f > \bar{p}_f$$

As a result of the reservation price maintaining an artificially high state allowance price, sources subject to both the state and federal program will face a higher marginal cost than sources subject only to the federal program, resulting in a redistribution of costs and emissions. The reservation price implies that the state program will always have a redistributive impact, even if the state cap would otherwise not be binding. In addition, because the state reservation price leads to a reduction of the federal allowance price, there will also be a reduction in the value of federal auction revenue. Finally, when the coverage of the state program is more comprehensive than the federal program, a reservation price will always ensure some additional emission reduction on the national level since in-state sources not covered by the federal program would still face a price for emissions.

### Offset Provisions

Where low-cost emission reduction opportunities exist outside of sectors or geographic areas covered by the cap-and-trade program, offsets provide a mechanism for reducing the marginal cost of abatement by enabling facilities to receive credit for verifiable emissions reductions outside of the cap. By making these low-cost abatement opportunities available for compliance, offsets effectively shift the MAC curve of

affected sources inward. The potential impact of offset provisions on allowance price depends upon the prevalence of low-cost emission reductions outside of the sector, the range of offset projects allowed, the ease of securing offset project approval, and whether the program limits the quantity of offset credits that may be used for compliance. Thus, for a given cap level, the main effect of offset provisions is to reduce the allowance price and, consequently, the stringency of the program. The presence of relatively liberal offset provisions in either the federal or state program might make that program less stringent than the other with the consequences explored earlier in this chapter.

Further, because offset provisions generally require proof of additionality, the ability to use offsets from the same source under both a federal and state cap-and-trade program will not eliminate the additive marginal cost aspect of overlapping programs. As is the case with allowances, sources will have to purchase two tons of offset reductions for every ton of emissions in order to ensure compliance with both the state and federal program. Of course, in the case of overlapping federal and state programs where the state program is more demanding, a source will be comparing the price of offsets against the lower federal and state allowance prices  $\bar{p}'_f$  and  $\bar{p}'_s$ . Thus, in both cases, the quantity of offsets purchased under each individual program will likely be lower than if the programs had existed independently. Finally, if the state's program is not binding as a result of the federal program, sources in the state need only compare the offset price against the federal allowance price and other abatement efforts.

### Banking and Borrowing

Banking and borrowing provisions provide cost containment by providing emission sources the ability to smooth their marginal cost curve over time. Banking provisions could have a powerful effect in determining the stringency of a given program when initial caps are relatively lax and later caps more demanding. For instance, if both state and federal programs have relatively equivalent and undemanding initial caps, but the federal program had significantly lower later caps and allowed banking, the demand for early abatement to generate bankable allowances will cause the federal program to be the more stringent in the near term, rendering state allowances worthless. Borrowing, on the other hand can make a program less stringent in the near term, similarly to a safety



valve, by allowing sources to reduce their marginal costs in the near term. However, the requirement to pay back allowances – possibly with an interest penalty, as has been proposed in the Lieberman-Warner bill – implies higher future marginal costs. A further effect of banking and borrowing provisions will be to stabilize the relationship between the two programs since these features tend to establish a floor and a ceiling, respectively, on variations in the allowance prices that signal the relative stringency of the two programs.

### Allowance Allocation

Economic theory suggests that the method of distributing emission allowances, i.e., through grandfathering or auctioning, will not affect an individual source's output decisions or emissions.<sup>55</sup> The primary reason for this is the opportunity cost associated with each allowance that is used for compliance. So long as a freely allocated allowance can be sold in the market, the use of this allowance to cover emissions implies the foregone opportunity of selling the allowance at the market price. Hence a source will consider that cost in making abatement decisions. Further, where sources are subject to both state and federal caps, the total opportunity cost will be the sum of the individual opportunity costs associated with state and federal allowances.

The main effect of freely allocating allowances instead of auctioning them is to shift the beneficiary of the scarcity rent created by the cap from the government to the recipients of the freely allocated allowances. Thus, freely allocating allowances will make a significant difference to recipients in their net costs of program compliance, but it will not have any effect on the interaction of state and federal programs.

For example, when both the federal and state programs freely allocate all allowances to the owners of the installations subject to the two programs and the state program is more demanding, the overall demand for federal allowances will be less with consequent effects on allowance prices and the distribution of costs and emissions, just as it would be with auctioning. The only difference is that, with free allocation, sources in

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<sup>55</sup> This simple result also requires that certain conditions be met, namely, no transaction costs, perfect markets and information, and the absence of cost regulation. While departures from these conditions may cause emissions and output to be different under free allocation from what would be the case with auctioning, opportunity cost will be the dominating difference. The case of cost-regulated electric utilities will be specifically discussed later in the text.

the state either sell federal allowances to out-of-state sources or purchase fewer allowances from them, while, with an auction, in-state sources are not bidding for as many allowances in the federal auction. The effects on federal and state allowance prices will be the same as in the auctioning case, including the shifting of costs and emissions. The impacts of the interaction between the two programs on government auction revenues are transferred to the recipients of the free allocation. The value of each allowance endowment, and the opportunity cost associated with each type of allowance, is less than it would be for either allowance if the other program did not exist.

The absence of any effect on the state-federal interaction obtains regardless of whether one program freely allocates all allowances while the other program auctions all allowances, or whether there is a mixed distribution, whereby one or both programs freely allocate some allowances and auction the rest. The effect is only to change the value of the federal and state allowance endowments and the recipients of that value, depending on the share of grandfathered and auctioned allowances under each program.

Finally, if the state program is less stringent than the federal program, the allocation method again does not impact the federal-state interaction. State allowances will be worthless and therefore the allocation method is irrelevant. State allowances would still be submitted for compliance with the state program, but the surplus of state allowances created by the federal program would drive their value to zero. In this case, only the federal allowances would impact costs and emissions. Of course, the owners of in-state sources would be better off if the federal allowances were grandfathered since that would make them, rather than the federal government, the recipients of the newly created scarcity rents.

In contrast to the analysis presented above, there is one important exception when the impacts under free allocation could vary from those observed under auctions. This is when the output prices of sources subject to both programs are not determined by the market but instead by a regulatory rate determination based on incurred costs, as is the case for electric utilities in many parts of the country. With auctioning, regulatory treatment is irrelevant since every ton incurs a cost that will be recovered, in theory, either through the market or by an appropriate regulatory determination. However, cost-based price regulation typically does not consider opportunity costs. Consequently, when

free allocation interacts with conventional electric utility regulation, the only costs that are recovered are those actually incurred for abatement or the net purchase of allowances. In effect, under free allocation, the scarcity value of the allowances is passed on to consumers in lower output prices or electricity rates relative to if allowances had been auctioned. As a result, abatement in the state will be less than under an auction to the extent that higher output prices would reduce demand, though total emissions remain determined by the federal emissions cap. Therefore, the disparity in marginal cost between in-state and out-of-state sources would be less, as would be the redistribution of costs and emissions between in-state and out-of-state sources.

### *State Retirement of Federal Allowances*

While state cap-and-trade programs coexisting with a federal cap-and-trade program will not result in additional reductions unless the state program is more comprehensive, state retirement of federal allowances provides a potential mechanism for states to guarantee additional emission reductions beyond the federal cap. In addition, retirement of federal allowances reduces the redistributive effects that result when a more demanding state program coexists with a federal cap.

Retirement of federal allowances imposes a cost on the state. States could potentially implement retirement of federal allowances by using state auction revenues to purchase and retire federal allowances, thereby transferring auction revenue to the federal government. Or, states could retire some percentage of any federal allowances that are directly allocated to states, forgoing potential auction revenue.<sup>56</sup> Despite this cost, however, states may find it desirable to retire allowances if they believe that the federal cap has been set too low, or to justify maintaining an existing state program by ensuring additional reductions. State retirement of federal allowances is an option regardless of whether a state is maintaining its own state program alongside the federal program.

Retirement of federal allowances is equivalent to the reduction of the federal cap by  $r_f$ , which represents the quantity of federal allowances retired in a given state. Therefore, using equation 2, and assuming a more demanding state cap and perfect

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<sup>56</sup> States might also implement the retirement of federal allowances by requiring in-state sources to purchase and retire them. However, such a requirement would likely face political as well as legal challenges.

overlap in coverage of state sources, the quantity of state emissions under the federal cap is:

$$28) \quad \tilde{e}_s = \frac{\alpha - \bar{p}_f}{\beta_s} = \frac{\beta_f}{\beta_s} (\bar{e}_f - r_f) < e_s^0$$

Using equation 4,  $\Delta e_s$  can be expressed as follows:

$$29) \quad \Delta e_s = \bar{e}_s - \tilde{e}_s = \bar{e}_s - \frac{\beta_f}{\beta_s} (\bar{e}_f - r_f) < e_s^0$$

The retirement of allowances will lead to a countervailing outward shift in the federal MAC curve relative to the basic case, and thus a higher federal allowance price. If the state were to retire federal allowances equal to the additional reductions in state emissions from the state cap alone relative to state emissions under the federal cap alone, the federal MAC curve would shift to its initial position as described in the basic case such that the federal allowance price would be effectively unchanged.

Retirement of federal allowances will also have implications for the state allowance price under a coexisting state and federal program. Based on equation 6, the state price will adjust based on the difference between state emissions under absent regulation and under the adjusted federal price, specifically, by  $\beta_s (\tilde{e}'_s - e_s^0)$ . Because the adjusted federal allowance price is higher than under the basic case, and could return to  $\bar{p}_f$ , state emissions resulting from the federal cap alone are lower. As a result, the adjustment of the state MAC curve is larger than under the basic case. In fact, equation 6 indicates that the increase in the adjusted federal allowance price from the basic case will be exactly offset by the decrease in the adjusted state allowance price. As a result, state sources subject to both the federal and state programs will still face a total marginal cost that is equal to  $\bar{p}_s$ .

While the aggregate cost to state sources is the same as in the basic case, the federal portion of the marginal cost is higher, and emission reductions additional to the national cap are achieved. Because the state allowance portion of the total marginal abatement cost is less than in the basic case, the disparity in marginal abatement costs between in- and out-of-state sources is reduced, leading to less loss of economic efficiency and a smaller redistributive effect. If retirement is sufficient to drive the state

allowance price to zero, the disparity in marginal costs and consequent efficiency and redistributive impacts are eliminated. However, given the limited ability of the state program to effect the federal price (relative to the reverse), it is unlikely that an individual state would retire sufficient federal allowances to achieve this result.

#### **4.2 Coexistence of a Federal Cap-and-Trade Program and Other State Climate Programs**

Beyond the ongoing development of state cap-and-trade programs, many states have implemented, or intend to implement, other more prescriptive forms of regulation that either directly or indirectly impact GHG emissions. The analysis presented in the previous section can also be applied to other state-level programs that directly or indirectly reduce GHG emissions. As is the case with state cap-and-trade programs, the impacts of the coexistence of these programs and a federal cap-and-trade program will depend on relative program stringency and overlap in coverage. Because the model generally applies in the same way across the range of state regulations discussed in this section, I discuss it in detail in the context of power sector emission standards, and for the remainder of this section, provide an overview of considerations that are specific to each type of state regulation. Beyond power sector emission standards, this section considers renewable electricity generation portfolio standards, vehicle emission standards, and end-use efficiency measures.

##### *Power Sector Emission Standards*

As discussed in chapter 3, a number of individual states have implemented emission standards for greenhouse gases from power plants. Where all of the sources subject to the federal cap are also subject to the state emission standard, the federal cap will control overall nationwide emissions and the addition of an in-state standard will not provide additional reductions. However, a state emission standard that is more demanding of the state power sector than the federal cap will have implications for the distribution of GHG emissions and costs as discussed in the previous section.

Where the state program is more demanding, the federal MAC curve will adjust in response to the difference between what emissions in the state power sector would be

under the federal cap alone and under the state emission standard alone,  $\Delta e_s$ , as determined by equation 4. In this case,  $\bar{e}_s$  represents the aggregate emissions that would occur in the state at the set of cost-minimizing power plants affected by state emission standard, rather than an explicit state cap. Therefore,  $\Delta e_s$  represents the difference between this cost-minimizing emission level and the cost-minimizing emissions level at these same sources under the federal cap absent the state regulation. The federal allowance price is reduced by  $\beta_f \Delta e_s$ , as indicated by equation 5.

Thus, as is the case with a state cap, other forms of state-level regulation can result in the redistributive effects and efficiency loss discussed in the previous section. Where  $\Delta e_s$  is zero or negative, there is no effect from the state programs on emissions or the federal allowance price, and no efficiency loss or redistributive effect occurs. The MAC curve for the power plants affected by the emission standard will also shift as a result of the federal cap, according to equation 6. This will reduce the incremental cost of the state emission standard.

Finally, where the state emission standard affects sources that are not subject to the state cap, it can lead to reductions that are additional to what is achieved by the national cap, provided that emissions leakage to similar sources outside of the state that are also exempt from the national cap does not offset these reductions.<sup>57</sup>

### *Vehicle Emission Standards*

The nature of the interaction between vehicle emissions standards and the cap-and-trade program depends upon whether motor vehicle fuel is included under the federal cap. Currently, both the Lieberman-Warner and Bingaman-Specter bills include motor vehicle fuel through upstream regulation of petroleum refineries. In these cases, vehicle emission standards such as those pending in California and the sixteen states following suit would have no impact on aggregate GHG emissions, because they are determined by the national cap. Rather, the implementation of a binding state-level vehicle emission standards will result in a reduction in transportation sector demand for federal allowances

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<sup>57</sup> If the allowance price under the federal cap results in increased utilization of sources exempt from the cap but subject to the emissions rate, some of these additional reductions could be offset by emissions leakage.

as new vehicles enter the fleet, thus lowering the federal allowance price relative to the absence of the vehicle standards. Emissions will be shifted away from the transportation sector toward other sectors, and compliance costs are shifted away from other sectors toward the transportation sector. The transportation sector will face a higher marginal cost of abatement than other sectors and the total cost of compliance with the federal cap will increase.<sup>58</sup> Finally, if the national cap-and-trade program does not include the transportation sector,<sup>59</sup> any emissions reductions generated by state vehicle emission standards would be additional.

### *Renewable Portfolio Standards*

For a given national cap level, the presence of a binding renewable portfolio standard in a given state will reduce the incremental cost of the federal program for all states to the extent that fossil-fuel fired generation is displaced by renewable energy, thus reducing the demand for federal allowances.<sup>60</sup> Although the cost of the federal program would be lower for in-state sources, the combined cost of the federal program and the RPS would be greater for in-state sources and customers. The incidence would depend on the form of regulation and how the costs of the RPS are recovered.<sup>61</sup>

### *End-use Efficiency Measures*

Chapter 3 discussed a number of policy measures being implemented in the states to improve end-use energy efficiency, and thus reduce demand growth and the need to invest in new generating capacity. These include updating building energy codes, energy efficiency portfolio standards, system benefits charges for energy efficiency, and appliance efficiency standards. Under a comprehensive federal cap-and-trade program,

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<sup>58</sup> Despite this potential inefficiency, the Lieberman-Warner bill requires that the Administrator of EPA conduct a review of the sector prior to the start of the program in order to determine if additional policies are need to reduce GHG emissions from the sector. See Lieberman-Warner, section 7002.

<sup>59</sup> It is difficult to see, for example, how a cap-and-trade program under the existing Clean Air Act could be structured to include the transportation sector. See Nordhaus (2007).

<sup>60</sup> This statement assumes that any fossil generation displaced or avoided as a result of the RPS would have been subject to the federal cap.

<sup>61</sup> Beyond this effect, the existence of a cap-and-trade program may eliminate the value of 'green' attributes of RECs because under a cap they can no longer be associated with a reduction in emissions. In order to preserve the value of emission reductions held by RECs, some states within RGGI (CT, NH, NY, RI), have included provisions to retire allowances equal to estimated emissions reductions associated with voluntary REC purchases through state programs.

these measures will reduce the demand for emission allowances from electricity generation and, in the case of building code upgrades, heating fuels, to the extent that the actions called for by these measures would not occur in response to the federal cap-and-trade program. As a result, allowance prices will be lower than they would be absent these programs, resulting in a redistribution of emissions.<sup>62</sup> In addition, these programs will impact the distribution of abatement costs, transferring the cost of abatement from electricity generators and fuel providers to other sectors. In the case of building codes, building developers may face additional materials and construction costs associated with meeting the codes, which they may be able to pass on to building purchasers. Under system benefits charges and energy efficiency resource standards, costs will be shifted toward electricity consumers and utilities. In the case of appliance efficiency standards, costs will be shifted toward appliance manufacturers, and would likely be passed on to consumers.

In considering the implications of measures that improve energy efficiency, it is important to consider whether these measures take advantage of low-cost abatement opportunities that would not be achieved under a cap-and-trade program alone because of existing market failures.<sup>63</sup> Such market failures may prevent consumers from responding efficiently to the price incentives created by a cap-and-trade program. If these low-cost abatement opportunities would otherwise go untapped under the federal cap-and-trade program, such that reductions under the cap would come from higher-cost abatement opportunities, end-use efficiency measures could actually lower the total cost of achieving the national cap.

### **4.3 Preemption or Withdrawal of State Cap-and-Trade Programs**

Express federal preemption of state programs remains a possible component of federal climate legislation. Federal legislation might, for example, prohibit states or groups of states from operating parallel emission markets that would result in two allowance submission obligations. As discussed in chapter 2, it is less clear that federal

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<sup>62</sup> This effect may be tempered somewhat by a rebound effect, which will occur to some degree as electricity or heat use becomes less expensive.

<sup>63</sup> See, for example, Jaffe and Stavins (1994). They differentiate between market failures and non-market failures in their discussion of the 'energy efficiency gap,' and suggest that, generally, socially desirable policy intervention will target the former.



legislation would preempt state regulations that do not implement allowance markets,<sup>64</sup> and for that reason, this section considers preemption only with respect to state cap-and-trade programs.<sup>65</sup> Also, it is possible that states will voluntarily sunset state cap-and-trade programs in order to ease the administrative and compliance burden on their sources, the effects of which will be similar to preemption.

Whether federal legislation preempts state cap-and-trade programs or a state chooses to voluntarily withdraw its cap-and-trade program in response to a federal program, there will be two effects. The first is a transition problem created by termination of the state allowance market, and the second is the impact of preemption on emissions and costs once the state program has ended and the federal program has begun.

#### *Transition into the Federal Program*

Federal legislation must consider, either in the context of preemption or under the expectation that state policymakers will choose to sunset state programs, the economic impacts on state sources of transitioning from the state program to the federal program. If a bank of allowances has been generated under the state program and the state program is terminated, the value of the banked allowances will fall to zero if they are not somehow transitioned into the federal program. This price decline could begin to occur well before the federal program is finalized as expectations about preemption or state program withdrawal become stronger. In addition, as allowances lose value, sources under the state program would be expected to increase emissions and exhaust the bank to the extent that such behavior is consistent with cost-minimization. If sources have been unable to bank allowances, allowances through the vintage of the final compliance year before preemption will retain value, though allowances from future vintages will be valueless.

When a bank of state allowances exists, a federal program could retain the value of existing state allowances and avoid increasing statewide emissions in the short term by providing for the transfer of state allowances into the federal program. If the federal

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<sup>64</sup> Further, as noted in chapter 2, it is unclear that preemption of state programs would be possible if EPA attempts to implement a cap on stationary sources under the existing Clean Air Act.

<sup>65</sup> In the House, however, Chairman Dingell has advocated for preemption of any state GHG vehicle emission standard, should appeals courts uphold the legality of such standards (House Energy and Commerce Committee 2008).

program allows for the exchange of state allowances for federal allowances at full value within the federal cap, there will be no impact on the federal allowance price from incorporating state allowances; however, federal allowances in like number would have to be subtracted from the auction or free allocations to other sources. If federal program allowances are provided for banked state allowances *on top of* the cap as early reduction credits, the cap is effectively expanded, and the federal allowance price will be lower than it would have been absent the exchange of state allowances.

An example of the former approach exists in New Hampshire's current bill for implementing RGGI, which contains provisions that provide for the conversion of banked Public Service of New Hampshire (PSNH) CO<sub>2</sub> allowances into RGGI allowances.<sup>66</sup> This provision provides sources with one RGGI allowance for each banked PSNH allowance held, and then subtracts the total allowances awarded from the pool of allowances to be auctioned.<sup>67</sup> In this case, the value of PSNH allowances going forward will be the allowance price under RGGI.

Finally, investments in emissions offsets projects for compliance with the state program could lose value if their lifetime exceeds the remaining duration of the state program. The value of these projects could be retained if the federal program recognizes the state offset categories and determines that the remaining post-state program lifetime of such projects will count as 'additional' in the context of the federal program. Absent such recognition, offset investments are likely to decline as the state program draws to a close.

### *Post-transition Effects*

If a state program is preempted or terminated, sources within the state will be subject to only the federal emission price  $\bar{p}_f$ , and this price will drive emission reductions in the state. As a result, the redistributive effects and efficiency loss present

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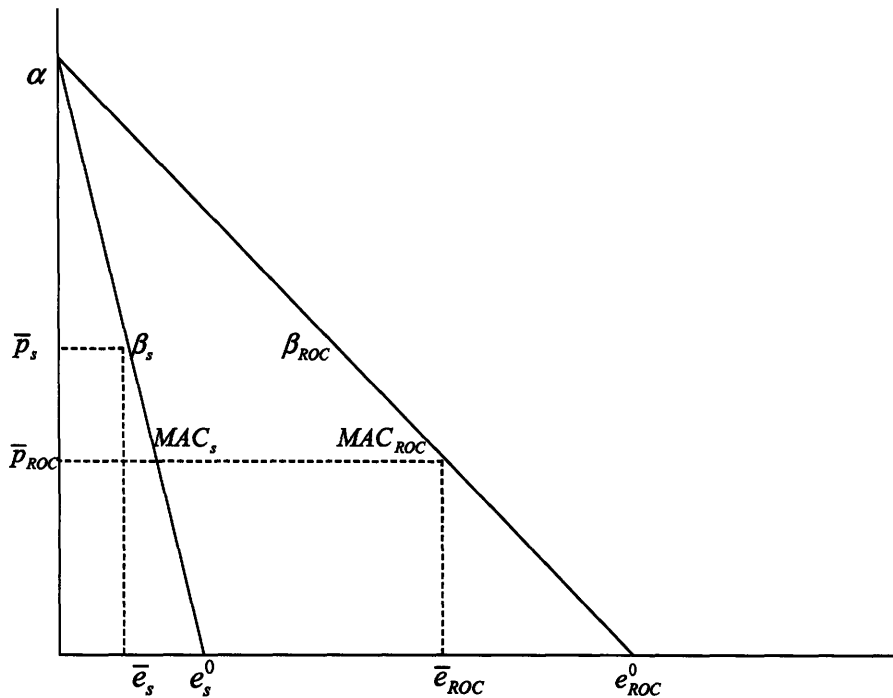
<sup>66</sup> This type of provision occurred in the European Union's CO<sub>2</sub> Emissions Trading Scheme. In the trial period extending from 2005 through 2007, member states were given the option of allowing banked trial period allowances to be carried over into the subsequent 2008-12 trading period. France and Poland opted to allow such banking; however, the European Commission's guidance for allocation in the second trading period required that any banked allowances be taken from the cap. As a result, neither France nor Poland chose to honor the banked allowances since it would have required an equal number of allowances to be taken from what would otherwise have been allocated to sources.

<sup>67</sup> See New Hampshire House Bill 1434 (2008).

with coexisting state programs are avoided. However, the state program may continue to affect the pattern of emissions reductions under the federal program if it led to irreversible investments in abatement that would not have occurred under the federal program absent the prior state program. This result is likely only if the state allowance price had been higher than  $\bar{p}_f$ . In this case, investment in energy efficiency or renewable energy may have been greater than it would be under the federal program. Because these investments are typically sunk costs and tend to be irreversible with near-zero ongoing marginal costs, they would remain economical to operate under the federal cap.

#### **4.4 ‘Carve-Out’ of State Cap-and-Trade Programs**

It is possible, particularly if a federal GHG cap is implemented through a regulatory approach under the existing Clean Air Act, that a federal program may allow a state to implement its own cap-and-trade program instead of the federal program, provided that it is at least as stringent as the federal program. A federal cap-and-trade program under this scenario would resemble the NOx Budget Trading Program or the trading program that would have been established under the Clean Air Mercury Rule. In this situation, sources in a state choosing to implement its own cap-and-trade program will be subject only to that state cap, while sources choosing not to implement or retain their own state programs will be subject only to the federal cap. Figure 4.2 depicts this scenario. An individual state program, denoted by subscript  $s$ , will have its own cap and an allowance price that is determined by that cap and the individual state’s MAC curve. The rest of the country, denoted  $ROC$ , will be subject to the federal program cap, which would be adjusted to reflect the separate program of state  $s$ . This program will also have an independent allowance price determined by the aggregate  $ROC$  MAC curve and emission cap on the states remaining in the federal program. If a number of states elected to implement individual state programs, allowance prices could vary widely across the country. As in the basic case, economic efficiency is sacrificed to the extent that marginal abatement costs are not equalized across the country. While a carve-out provides the opportunity for states to achieve emission reductions beyond the federal cap, the total cost of emission reductions nationwide would be higher than under an equivalent federal cap.



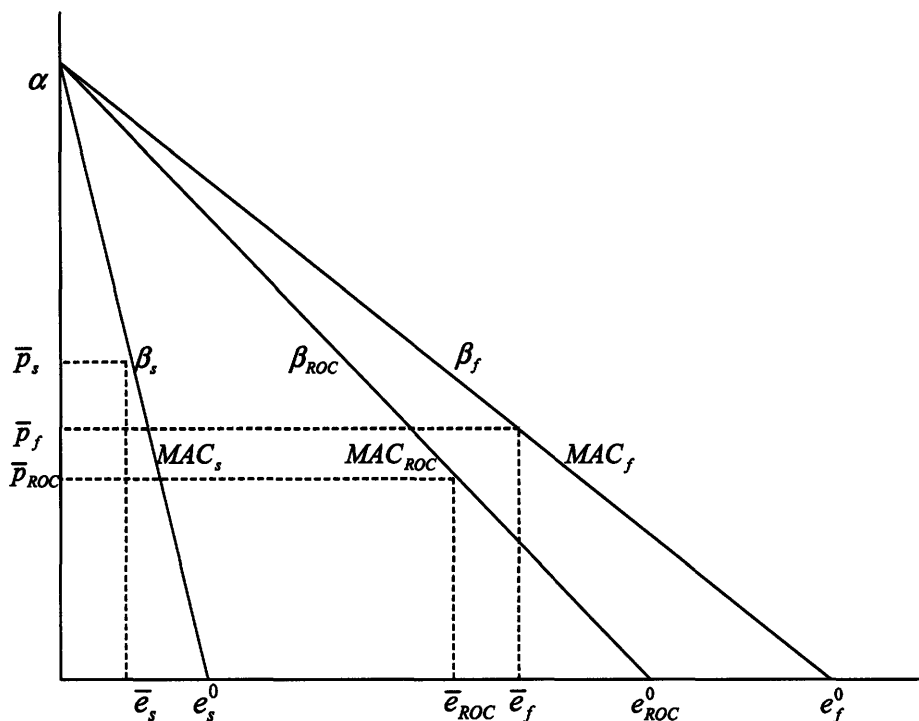
**Figure 4.2. Emissions and allowance prices under a 'carved out' state program and remaining federal program.**

The economic rationale for states independently implementing a cap-and-trade program when a federal program is available is unclear. States with relatively high abatement costs should have a strong incentive to join the federal program in order to lower compliance costs for their sources. States with relatively low abatement costs may be able to benefit by being net sellers of allowances or improving their competitive positions. In addition, a federal program, with thousands of sources under the cap and a wide distribution of abatement costs, should provide a larger, more liquid allowance market than could be achieved in an individual state program.

*'Carve-Out' with Linkage to the Federal Program*

However, a carve-out option that allowed for linkage to the federal program would likely be more attractive to individual states that wish to implement a more stringent state-run cap-and-trade program. Linkage would allow for the full exchange of federal and state program allowances resulting in a uniform allowance price nationwide. As demonstrated in figure 4.3, linkage will result in allowance price and emission levels determined in accordance with the aggregate federal MAC curve. The result will be a

lower allowance price than in the independent state program, but a higher allowance price than under the federal program limited to *ROC*, because of the increased stringency of the state program. Thus, linkage with a more stringent state program results in lower national emissions and a higher federal allowance price.



**Figure 4.3. Emissions and allowances under a ‘carved-out’ state program with linkage to the federal program.**

Once linkage is established, marginal abatement costs can be equated at all sources subject to the linked programs, eliminating the efficiency loss from the unlinked carve-out scenario. The total federal cap is equal to the sum of the state and ROC caps, and emissions under the federal cap are determined by:

$$30) \quad \bar{p}_f = \alpha - \beta_f (\bar{e}_s + \bar{e}_{ROC}), \text{ where:}$$

$$31) \quad \beta_f = \frac{1}{\left[ \frac{1}{\beta_s} + \frac{1}{\beta_{ROC}} \right]}.$$

This result presents an interesting contrast to what occurs when a more stringent state cap coexists with a federal program. In that case, the individual state bears the cost of its more aggressive emissions reductions, lowering the cost of the national program for sources in other states, while sources within the state experience a marginal cost per ton comprised of the state and federal allowance price. In this scenario, however, the state can distribute the cost of its more aggressive reductions among all states in the federal program, raising the federal allowance price for all sources. In effect, in-state sources would be paying cheaper out-of-state sources to effect part of the state's extra emission reductions on their behalf. The beneficiaries would be the initial holders of the federal allowances, either the federal auction or grandfathered allowance recipients. The value of state allowances would of course be equal to that of federal allowances and that state value would be intermediate between what it would be if the state program existed alone and what it would be with coexisting, overlapping state and federal programs. As chapter 5 will discuss, a number of implementation challenges exist with the implementation of both a carve-out and linkage, which pose important considerations for federal program design.

## **5. Conclusion: Key Findings and Policy Considerations for Federal Program Design**

The analysis in chapter 4 suggests that in the presence of a federal cap on GHG emissions, there is little economic rationale for states to advocate for retention of a state cap-and-trade program that is duplicative of the federal program, particularly in the absence of localized environmental impacts. Duplicative state programs will result only in a redistribution of costs and emissions, and the federal cap will reduce the value of state allowances and therefore auction revenues, possibly to zero. While a loss of economic efficiency will result from the disparities in marginal cost, it is difficult to gauge how large such efficiency losses might be in comparison to the cost of achieving the total national cap. Although federal policymakers have asked for states' perspectives on how a federal program should treat existing state cap-and-trade programs, most states do not appear to have taken a clear position on this issue. From the perspective of federal policymakers, the preferred approach for addressing the treatment of state cap-and-trade programs will depend upon the extent to which states exert pressure on the federal government to retain these programs. This, in turn, will likely depend on states' expectations on the level of the aggregate national cap, and how this level compares to their own state targets for emission reduction.

This thesis finds that two approaches exist for eliminating the potential inefficiencies caused by coexisting state and federal cap-and-trade programs: federal preemption of such programs and allowing a 'carved-out' state program to link to the federal allowance market. This chapter discusses policy considerations and potential implementation challenges associated with each. It concludes with relevant policy recommendations for federal program design and suggestions for further research.

### **5.1 Federal Preemption**

Preemption of duplicative state cap-and-trade programs would avoid the disparity in marginal costs and resulting efficiency loss that may arise under coexisting state and federal programs, thereby preventing the increase in overall cost of the federal cap. While the economic argument for federal preemption is compelling, a number of

potential sources of political opposition must be considered. First, in most areas of emission control, states have retained the authority to implement requirements on sources that are more stringent than those at the federal level. Further, should California's vehicle emission standards ultimately be upheld in appeal, preemption of this standard in California and the many states committed to following its rule would likely generate significant political opposition. In addition, the political symbolism of preempting state efforts that many view as leading national policy may generate resistance. Thus, under some conditions, opposition to federal preemption may be strong, especially if the proposed federal cap is viewed as being too weak, even though the environmental benefits at the state level from retention of state programs may be nil.

Federal policymakers might assuage such opposition somewhat by making clear that states will retain authority to both impose requirements outside of the scope of the cap and continue to implement non cap-and-trade programs that impact GHG emissions. Further, distribution of federal allowances to states that had preexisting state programs might be used to compensate states to some degree for state allowance auction revenue that is foregone as a result of preemption. In addition, transfer of federal allowances to states in this manner would provide states the option of retiring some portion of these allowances in order to achieve reductions that are additional to the federal program. However, if a number of states believe that the federal cap has been set at a level that is too high, retirement of federal allowances could provide a mechanism for states to assert control over the national cap level by removing federal allowances from the market. Finally, federal policymakers might consider whether the need to implement express preemption can be avoided because states would find it in their interest to drop duplicative programs. This last outcome may be most likely if states determine that the federal program is consistent with their own GHG emission targets, or if state policymakers are facing significant pressure to withdraw state programs from in-state sources.

#### *Addressing the Transition Problem*

Whether state programs are preempted or voluntarily withdrawn, a federal program must address the transition problem created by the existence of banked state



program allowances. Sources in individual states may have made significant investments in abatement or offset projects in order to comply with existing state programs, based on the expectation that allowances banked as a result would retain value. Providing a transition mechanism that exchanges banked state allowances for federal allowances will retain the value of these investments, as well as forward progress in emission reductions by preventing short term emission spikes. However, policymakers must determine how such a mechanism would be implemented. Federal policymakers could directly provide for the exchange of state allowances or early reduction credits. Or, if the federal program allocates allowances to states, they could be given the responsibility of managing this transition. This is largely a question of resource use and administrative cost, as well as which level of government could manage the process most efficiently.

In addition, policymakers will have to determine the appropriate rate of exchange between state and federal allowances. State sources have the potential to gain windfall profits if the state allowances that they possess are worth less than the federal program allowances that they receive, raising possible equity concerns. Likewise, federal policymakers will have to determine whether offsets in individual state programs are transferable into the federal program for the remainder of the projects' lifetimes. They might provide some certainty in this area by indicating up front which state program offset criteria will be deemed consistent with those of any proposed federal program.

## **5.2 Carve-out with Linkage**

Beyond preemption or voluntary withdrawal of state programs, a federal program that provides a 'carved-out' state program the option to link to the federal program will avoid both the added allowance surrender requirement and – assuming all states with state programs avail themselves of this option – the efficiency loss that results under coexistence. In addition, this option could avoid the political challenges of preemption while potentially retaining existing state programs. However, two major implementation challenges arise for integration of state and federal programs in this manner: determination of the criteria that a state program must meet in order to be eligible to carve-out from the federal program, and integration of two separate cap-and-trade programs with potentially significant design differences.

### *Carve-out Criteria*

A federal program will have to define criteria by which to determine whether a given state program is sufficiently stringent to be granted this option. At a minimum, state programs would likely have to have coverage defined to be at least as expansive as the federal program, and analysis would likely be needed to demonstrate that the state program meets some equivalency criterion, such as allowance prices equal to those expected for the federal program, or an equal percentage reduction from baseline emissions. Given the numerous ways that almost every element of a cap-and-trade program can be defined, from applicability, to cost-containment, to offset provisions, such determinations are likely to be resource-intensive and subject to significant uncertainty.

Alternatively, the federal program could make such a determination by apportioning the federal cap into state GHG ‘budgets’ analogous to what EPA has done in the context of the NO<sub>x</sub> Budget Trading Program. The linkage scenario with a more stringent state program would be equivalent to a state opting to participate in the federal program but retiring, rather than allocating, some portion of its emission budget. Still, this process requires a policy determination regarding how state budgets should be calculated. While EPA has utilized historic emissions in determining NO<sub>x</sub> budgets, variation in growth, abatement costs, and abatement opportunities across states suggest that such an approach would not lead to carved out programs that are equally stringent from a marginal abatement cost perspective. In addition, the use of emission budgets in this manner would be most easily implemented if the federal program required that any state program allowed to carve-out of the federal program contain identical applicability to the federal program.

### *Integration Challenges*

A further challenge to federal policy design if the carve-out with linkage option is pursued is the integration of state programs that may have different points of regulation or cost containment provisions than the federal program. The first integration problem arises when a ton of carbon is covered upstream in the federal program, and potentially again further downstream by the carved-out state program. This difficulty is most likely

to arise if state cap-and-trade programs have a cap that covers multiple sectors, but, based on proposed federal legislation, could arise even if a state wishes to maintain and carve-out an existing cap on fossil fuel-fired power plants. For example, in their current form, both the Lieberman-Warner and Bingaman-Specter bills regulate emissions from coal-fired electricity at the plant level, but regulate gas-fired power plants upstream through regulatory requirements on natural gas processing plants and importers. Where programs like RGGI and the current proposal for AB 32 would regulate gas plants downstream, they would potentially be imposing a duplicative regulatory requirement on some GHG emissions, while a single requirement would remain on others where the point of regulation is the same as the federal program. Under state programs covering a larger share of the economy, this problem would likely be amplified. Given state concerns about Dormant Commerce Clause violations, states opting to implement multi-sector programs would likely choose points of regulation that are also downstream from where the federal program would regulate, in order to minimize impacts on interstate commerce. As such, any option for a carve-out in federal legislation would likely have to require that a state cede any part of its cap-and-trade program that has a point of regulation that is further downstream than that in the federal program.

Second, for integration to be successful, harmonization between federal and state cost containment provisions will be necessary. For example, a lower safety valve under the state program would ultimately replace the federal safety valve if federal linkage did not require harmonization, because additional allowances from the state would be released into the larger federal allowance market once that safety valve price is reached. Similarly, to the extent that state offset provisions are less stringent than federal offset provisions, there remains some question about whether federal and state allowances are equivalent and whether state allowances banked as a result of such offsets should be viable for federal program compliance.

Ultimately, the complexities of state-program sufficiency demonstration and integration with the federal program seem to advise against federal linkage to state programs without efforts at the state level to harmonize key elements with the federal program. Given this, to the extent the carve-out with linkage option is desirable, a model analogous to the NOx Budget Trading Program, which requires states to adopt key

elements of a federal model rule to participate in the national trading program and permits them to implement programs independently, would provide a more efficient means of implementing this option. This model is less of a pure ‘carve-out’ with linkage as first defined, and more of a decentralized federal program with required program elements for participation, conceptually similar to the European Union Emission Trading Scheme for CO<sub>2</sub> or RGGI. In addition, by allowing states to build upon existing state rules to meet the model rule requirements, a federal program could avoid the need for preemption of existing state programs. A decentralized federal program that requires consistency in certain key design elements for federal program consideration may lead states to voluntarily modify or withdraw existing state programs, in order to ensure eligibility to participate in the larger, more liquid federal allowance market. Further, by providing states with an allowance budget to allocate, it could allow states to manage the transition problem of exchanging state and federal allowances, and provide states the option to be more stringent than the federal program by retiring allowances. However, it is important to consider that if states opt not to participate in the federal allowance market, disparities in marginal cost and consequent efficiency losses will result.

### **5.3 Policy Recommendations**

From this discussion, a number of generalizable policy recommendations emerge, as do areas where further knowledge is needed. First, to better consider the merits of federal preemption of state programs, policymakers should seek information on the relative stringency of proposed state and federal programs, and the magnitude of potential efficiency losses that result from coexistence. In addition, discussion of the impacts of program coexistence should emphasize this efficiency loss, the likely absence of additional or local environmental benefits, and the impact on state auction revenues.

Further, regardless of whether the state program is preempted, there appears to be an important role for allocation of federal program allowances directly to states. At one end of the spectrum, even if state cap-and-trade programs are retained, such allocations could allow states to compensate for lost revenues, or to retire these allowances in order to effect additional reductions from state programs. These two benefits would also result in the event of preemption or voluntary withdrawal, as would the ability to compensate

sources with banked state allowances for transition into the federal program. Finally, both the retirement and transition benefits would also apply in the carve-out with linkage case, though in this case a state would presumably be allocated its entire share of the federal allowance budget. In considering the level of allocations to the state, the federal government must consider the loss of federal auction revenue that occurs with allowance transfer to the state, as well as the potential of states to impact the level of the final state cap through allowance retirement, and any potential uncertainty for affected sources or inconsistency with federal policy objectives that may result.

Finally, if the federal government is determined to avoid the inefficiencies of overlapping programs, it must weigh both the political and administrative costs of the two options for doing so. While direct preemption is administratively simple for the federal government, it may come at a high political cost. On the other hand, the carve-out with linkage model, while likely politically easier, carries a potentially high administrative burden, given that the federal government must approve state rules to ensure that basic consistency requirements are met.

#### **5.4 Future Research**

As the previous section suggests, modeling of state and federal programs that captures their specific provisions and effects would provide important insights into the magnitude of potential efficiency losses from state and federal program coexistence or the carve-out of state programs absent linkage. Analysis of the administrative costs of duplicative state program requirements would also inform the policy debate on the appropriate treatment of such programs under a federal cap. Finally, analysis of the impact of uncertainty or allowance market imperfections on the interactions between state and federal allowance markets could also add valuable insights to this discussion.

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