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Greenhouse Gas Reductions: California Action and the Regional Greenhouse Gas Initiative

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Greenhouse Gas Reductions: California Action and the Regional Greenhouse Gas Initiative

Summary

In the absence of a federal program requiring greenhouse gas reductions, a growing group of U.S. states are taking action in this arena. Significant actions have been undertaken in California and by a coalition of states from the Northeast and Mid-Atlantic regions.

California has undertaken several initiatives that seek to reduce greenhouse gas emissions. In 2004, the state issued regulations to reduce greenhouse gases from motor vehicles. At least 12 other states have indicated that they plan to implement California's new vehicle requirements. In 2006, California passed two climate change statutes. The first would establish a statewide cap on greenhouse gases. The second would effectively limit the use of coal-generated electricity in California. The state has also taken action to reduce the carbon intensity in its transportation fuels.

The Regional Greenhouse Gas Initiative (RGGI), a partnership of nine Northeast and Mid-Atlantic states, would set up a cap-and-trade system aimed at limiting carbon dioxide emissions from power plants. The cap is scheduled to take effect in January 2009 and cap carbon dioxide emissions at 121 million metric tons through the end of 2014. In 2015, the cap would begin to decrease, so that by 2018, emissions would be capped at 10% below the initial level. Because some observers see RGGI as a possible model for a federal cap-and-trade program, several of RGGI's design elements are generating interest and debate.

Predicting the precise consequences of these state-led climate change actions is difficult. The actions may affect energy markets to some degree by encouraging the use of fewer carbon-intensive fuels. Many observers suggest that the range of state actions will catalyze federal activity. Industry stakeholders are especially concerned that the states will create a patchwork of climate change regulations across the nation. This prospect is causing some industry leaders to call for a federal climate change program. If Congress seeks to establish a federal program, the experiences and lessons learned in the states may be instructive.

The RGGI and climate change activities in California are aggressive, but the resulting emission reductions may be offset by increased emissions in states without such requirements. This is a primary limitation of state climate change programs. Legal challenges to the state actions, particularly those that may affect interstate commerce, represent another obstacle.

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Introduction

The connection between greenhouse gases in the atmosphere and climate change has motivated efforts to achieve reductions of greenhouse gas emissions.[1] In 1992, the United States ratified the United Nations' Framework Convention on Climate Change (UNFCCC), which called on industrialized countries to initiate greenhouse gas reduction. However, in early 2001, President George W. Bush rejected the UNFCCC 1997 Kyoto Protocol, which called for legally binding commitments by developed countries to reduce their greenhouse gas emissions.

In the absence of a federal program requiring greenhouse gas reductions, a growing number of U.S. states are taking action in this arena. Although a majority of states have addressed climate change to some degree (e.g., by creating greenhouse gas inventories or state action plans[2]), the most aggressive actions have come from a smaller group of states, including California and a coalition of states from the Northeast and Mid-Atlantic regions.

California recently enacted several laws that seek to reduce greenhouse gas emissions. The first section of this report discusses the activity in California. The second section focuses on the Regional Greenhouse Gas Initiative (RGGI), a cooperative effort of nine states in the Northeast and Mid-Atlantic regions to reduce carbon dioxide emissions from power plants. The report's final section considers these state-led actions from a federal policymaking perspective, examining the potential effects, limitations, and legal challenges of state-led climate change actions.

Climate Change Actions in California

In the environmental policy domain, California is generally on the more proactive side of the regulatory spectrum. The state's recent climate change actions continue this pattern. California has enacted several significant pieces of climate change legislation, each addressing greenhouse gas emissions in different ways. A

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[1] This report does not address the debates associated with the climate change science, nor the role of human activity. See CRS Report RL33849, *Climate Change: Science and Policy Implications*, by Jane A. Leggett.

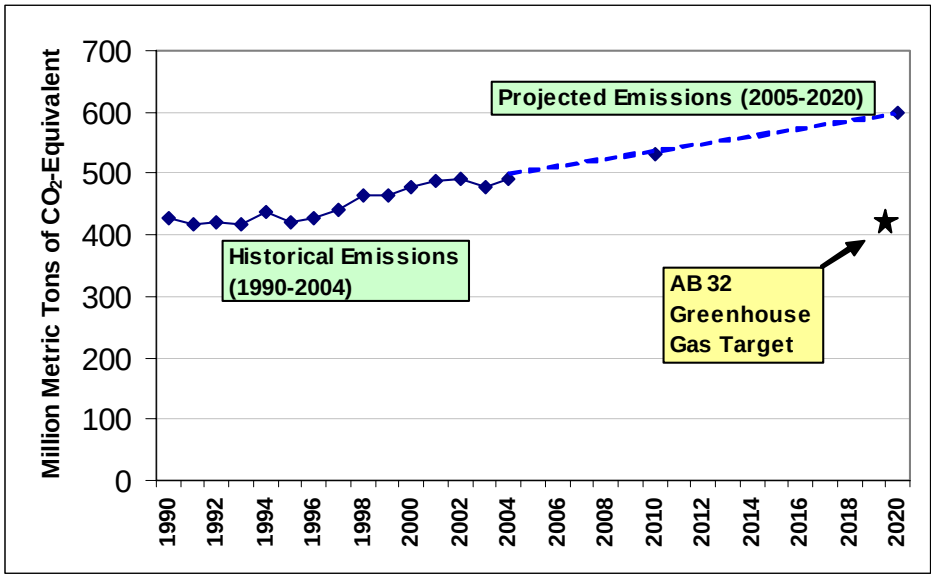
[2] For a discussion of these actions, see CRS Report RL33812, *Climate Change: Action by States To Address Greenhouse Gas Emissions*, by Jonathan L. Ramseur.

recent executive order from the governor supplements the state's climate change statutes. This section discusses the actions California has taken to decrease its greenhouse gas emissions.

Statewide Emission Reduction Program

California enacted legislation in September 2006 establishing a comprehensive greenhouse gas reduction regime. The legislation — AB 32, The Global Warming Solutions Act — directs the California Air Resources Board (CARB) to develop and implement a statewide program that would reduce the state's greenhouse gas emissions to 1990 levels by 2020. Recent emission levels (based on 2004 data) are approximately 15% higher than emission levels in 1990.[3] However, assuming a business-as-usual trend (i.e., without accounting for any greenhouse gas reduction requirements either underway or under development), greenhouse gas emissions are projected to increase (**Figure 1**).

Figure 1. California Greenhouse Gas Emissions, Historical and Projected Levels Compared with 2020 Target



Source: Prepared by the Congressional Research Service based on data from California Energy Commission (CEC), *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 — Final Staff Report*, Dec. 22, 2006, Figure 12 and Appendix F.

Note: The California CEC describes the projections as "rough estimates." The estimates assume no new emissions reduction strategies beyond those currently in place (i.e., following a business-as-usual trend).

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[3] In 2004, California generated 492 million metric tons of carbon dioxide-equivalent (MMTCO2E) greenhouse gases. This amount includes emissions from imported electricity but excludes combustion of international fuels, as well as carbon sinks. The most recent report estimated that an analogous value in 1990 was 427 MMTCO2E. See California Energy Commission, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 — Final Staff Report*, December 22, 2006, Table 6, p. 25.

Implementation. Although AB 32 is far-reaching in principle, the law's text does not include many crucial details. Instead, the statute grants considerable authority to CARB, which is charged with establishing the framework and applicability of the program. For example, the law does not specifically require the use of a market-based system, such as a cap-and-trade program, to reduce greenhouse gases. Instead, AB 32 authorizes CARB to develop regulations to "achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions...." Moreover, the statute does not include a list of regulated emission sources or categories, but instructs CARB to determine which sources should be controlled to meet the statewide target. These decisions, which will likely affect the entire California economy to some degree, entrust CARB with significant responsibility.

Although the law grants considerable discretion to CARB, the statute does dictate a schedule for various agency deadlines. The following dates highlight significant milestones of the mandatory schedule:

- June 30, 2007: CARB must identify the early reduction options, which can be implemented prior to the mandatory program, and for which a facility will receive emissions credit.

- January 1, 2008: CARB must establish the 1990 baseline, which becomes the 2020 emissions cap.[4]

- January 1, 2008: CARB must develop a mandatory reporting scheme for sources affected by the cap. Sources report emissions for four years in order to establish accurate facility baselines.

- January 1, 2011: CARB must finalize regulations, including possible market-based programs, that will implement the statewide emissions cap.

- January 1, 2012: CARB begins to implement and enforce the mandatory emission reduction program created in 2011.

Emissions Leakage. When setting up an emissions control program, AB 32 requires that emissions "leakage" be addressed. The Environmental Protection Agency (EPA) states that emissions leakage

> occurs when economic activity is shifted as a result of the emission control regulation and, as a result, emission abatement achieved in one location that is

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[4] Note that the 1990 greenhouse gas emissions baseline (and thus the 2020 cap) is based on estimates from multiple economic sectors and is difficult to quantify precisely. For example, past estimates of 1990 levels range from a low of 425 million metric tons of carbon dioxide equivalent (MMTCO2E) to a high of 468 MMTCO2E. This is a 10% variance between low and high estimates. See California Energy Commission, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 — Final Staff Report*, December 22, 2006, p. 4.

> subject to emission control regulation is offset by increased emissions in unregulated locations.[5]

In recognition of emissions "leakage," the statute requires regulators to account for greenhouse gas emissions created by any source of electricity that is consumed in California. CARB must develop a structure that will count emissions connected with electricity that is generated from outside the state. Without this provision, California utilities might have a financial incentive to import more electricity from out-of-state generators, who are not subject to the cap. In such a scenario, California emissions would decrease, but the benefit would be negated by increased (uncounted) emissions, or leakage, in neighboring states.

Linkage with Other Emissions Trading Programs. When developing the emission reduction program in California, AB 32 instructs CARB to consider other greenhouse gas reduction regimes, including the Regional Greenhouse Gas Initiative (discussed below) and the European Union's emission trading program. This instruction might open the door for future emissions trading between California and other states. To catalyze this trading relationship, California Governor Schwarzenegger issued an executive order[6] just a few weeks after signing AB 32, calling for CARB and other state agencies to create a "market-based compliance program with the goal of creating a program that permits trading with the European Union, the Regional Greenhouse Gas Initiative and other jurisdictions."[7]

Along similar lines, Governor Schwarzenegger signed an initiative February 26, 2007, with the governors of Oregon, Washington, Arizona, and New Mexico. The premier of British Columbia committed his province to the initiative April 20, 2007.[8] The Western Regional Climate Action Initiative directs the participating state/province agencies to develop a "market-based multi-sector mechanism, such as a load-based cap and trade program" that will seek to reduce greenhouse gases in the region.[9] The initiative calls for the participants to develop a mechanism (within 18 months), but it is uncertain how a mechanism would be implemented and how many states (or provinces) might participate. Without further action, it is perhaps too early to assess the significance of this partnership.

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[5] See Environmental Protection Agency (EPA), Office of Air and Radiation, 2003, *Tools of the Trade: A Guide To Designing and Operating a Cap and Trade Program For Pollution Control*, Glossary.

[6] Executive Order S-17-06 (signed October 16, 2006).

[7] The proposed trading relationships may raise constitutional issues. For example, the U.S. Constitution states that "No State shall, without the Consent of Congress, ... enter into any Agreement or Compact with another State, or with a foreign Power.... (Article I, Section 10, Clause 3).

[8] Press Release from the Office of the Premier of British Columbia (April 24, 2007), at [http://www.mediaroom.gov.bc.ca/].

[9] The text of the agreement is available through the California Climate Change Portal at [http://www.climatechange.ca.gov/documents/2007-02-26_WesternClimateAgreement Final.pdf].

Greenhouse Gas Performance Standard

California recently developed a greenhouse gas performance standard for the electricity sector that aims to influence investment in long-term power generation. Although not directly requiring emission reductions or offsets from specific facilities or sources, the standard should influence future greenhouse gas emission levels by affecting which energy sources (coal, oil, natural gas, etc.) are used to generate electricity for consumers.

The greenhouse gas performance standard, pursuant to legislation enacted in September 2006 (SB 1368), forbids electricity producers — "load-serving entities"[10] — from entering into new "long-term financial commitments"[11] with power plants unless the plant's greenhouse gas emissions are as low or lower than those of a new, combined-cycle natural gas facility. This emissions performance standard will apply to both in-state power plants and out-of-state facilities that seek to export electricity to California. The law directs the California Public Utilities Commission (PUC) to issue standards for investor-owned facilities, which in 2003 accounted for 68% of the electricity consumed in California.[12] The PUC issued interim performance standards January 25, 2007. To address the electricity consumption from publicly owned utilities,[13] the statute directs the California Energy Commission to issue comparable regulations by June 30, 2007.

The new performance standards complement the statewide greenhouse gas reduction program. The implementation of AB 32 is several years away (irrespective of legal challenges). The performance standards act as a stop-gap measure, preventing further utility investment in carbon-intensive fuels while the state is crafting an economy-wide reduction regime.

As previous power commitments expire and are exchanged with contracts that meet the new greenhouse gas performance standard, California's portfolio of energy sources will change. The statute and its accompanying regulations, once in full effect, would appear to prohibit California consumers from using electricity generated by conventional coal-fired power plants. Compared with a combined-cycle natural gas plant, a conventional coal-fired power plant emits more than twice the

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[10] Defined as "every electrical corporation, electric service provider, or community choice aggregator serving end-use customers in the state." SB 1368 (codified in Public Utilities Code, Section 8340(h)).

[11] Defined as a "new ownership investment in baseload generation or a new or renewed contract with a term of five or more years, which includes procurement of baseload generation." SB 1368 (codified in Public Utilities Code, Section 8340(j)).

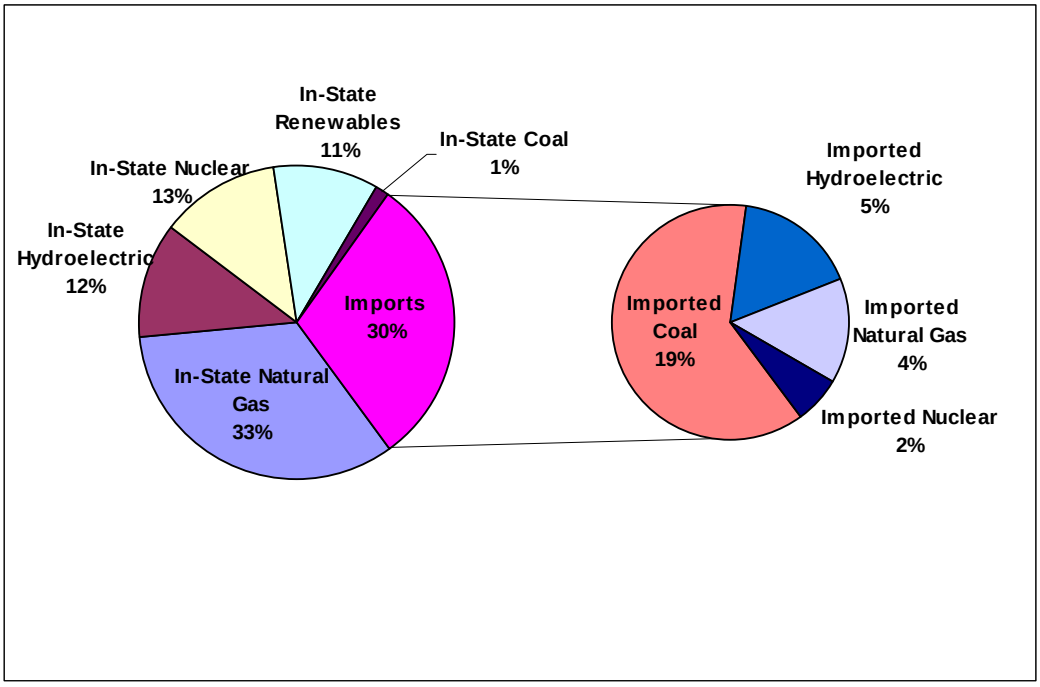
[12] See California Energy Commission, Electricity Consumption by Utility Type, at [http://www.energy.ca.gov/electricity].

[13] Publicly owned utilities accounted for 27% of California's electricity consumption in 2003. Self-generation units made up the remaining percentage (about 5%). See California Energy Commission, Electricity Consumption by Utility Type.

amount of carbon dioxide per kilowatt-hour. Using current technologies, coal-fired generators would fail to meet the new emissions standard.[14]

From 2002 through 2005, approximately 20% of California's electricity was generated from coal (**Figure 2**).[15] As the law takes effect, California will likely need to reduce/conserve a comparable amount of energy or replace the coal-generated electricity with alternative sources of power.

Figure 2. Sources of California Electricity, by Fuel Type and Location of Generation (based on 2005 data)



Source: Prepared by Congressional Research Service with data from California Energy Commission (CEC), 2005 Gross System Electricity Production, at [http://www.energy.ca.gov].

Note: The CEC counts two geographically out-of-state facilities as in-state coal generation, because these facilities are owned by California utilities. However, the above pie chart counts these out-of-state facilities' generation as imported electricity. Because one of these facilities (Mohave) is at this time closed, the percentage of coal-generated electricity imported to California, and thus consumed in California, should decrease.

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[14] As technology advances, coal-fired plants might be able to reduce greenhouse gas emissions through carbon capture and sequestration (CCS). However, this remains a future prospect: "There is relatively little experience in combining CO_2 capture, transport and storage into a fully integrated CCS system. The utilization of CCS for large-scale power plants (the potential application of major interest) still remains to be implemented." Intergovernmental Panel on Climate Change (IPCC), 2005, *IPCC Special Report Carbon Dioxide Capture and Storage, Summary for Policymakers*, p. 8. See CRS Report RL33801, *Direct Carbon Sequestration: Capturing and Storing CO_2*, by Peter Folger.

[15] The percentage of California's electricity generated from coal should decrease, because a large coal-fired plant (Mohave facility) was shut down at the end of 2005. California Energy Commission, Gross System Electricity Production, at [http://www.energy.ca.gov/electricity].

The new performance standards will affect not only California, but also other states in the West. Although California's electricity imports generally fall between 22% and 32% of the state's total electricity consumption, its imports are responsible for 39% to 57% of the total greenhouse gas emissions linked with its electricity.[16] This is because most of California's in-state electricity is produced from sources other than coal, whereas most of the state's imported electricity is generated through coal combustion (**Figure 2**). Once the standard takes effect (and former power contracts expire), the coal-fired plants in neighboring states, which previously provided electricity to California, will need to look elsewhere for customers. The same goes for coal-fired power plants still in development in western states, which may have been designed, at least in part, to serve California consumers.[17] Arguably, the greenhouse gas performance standards disproportionately affect the neighboring states that have historically exported coal-generated electricity to California consumers. This possible consequence may raise legal issues, such as a state's general inability to regulate interstate commerce. These issues are discussed at the end of this report.

Motor Vehicle Emissions

The U.S. transportation sector accounts for a substantial percentage — 28% in 2004[18] — of the nation's greenhouse gas emissions. Automobiles and light-duty trucks (fueled by gasoline or diesel) generate the majority — 63% in 2004 — of the nation's transportation-related greenhouse gas emissions.[19] The transportation sector is the single largest source of the primary greenhouse gas, carbon dioxide, in 14 states.[20]

California's transportation sector, in particular, generates almost 41% of the state's annual greenhouse emissions.[21] Regarding the regulation of air emissions from motor vehicles, California is in a unique position. California is the only state with conditional authority — the state needs to obtain a waiver from the EPA — to develop motor vehicle pollution standards that are as stringent or more stringent than

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[16] California Energy Commission, 2006, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*, p. 12.

[17] See Memorandum from Michael Easley, Chairman of Wyoming Infrastructure Authority, to California Energy Commission (October 5, 2005); Chris Holly, "California PUC Issues IOU Greenhouse Rules; Muni Nixes Coal Deal," *The Energy Daily*, December 15, 2006.

[18] EPA, 2006, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004, Executive Summary*, p. ES-13, at [http://epa.gov/climatechange/emissions/usinventoryreport.html].

[19] The transportation sector also includes emissions (in descending order) from heavy-duty trucks, aircraft, boats, and trains. EPA, 2006, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2004*, pp. 3-8, at [http://epa.gov/climatechange/emissions/usinventory report.html].

[20] Based on 2003 data. EPA, Energy CO2 Emissions by State, at [http://epa.gov/climatechange/emissions/state_energyco2inv.html].

[21] California Energy Commission, 2006, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*, p. 8.

federal requirements.[22] The law permits other states to choose between federal standards or California's more stringent provisions.[23]

In 2002, California enacted the first state law (AB 1493) requiring greenhouse gas limits from motor vehicles.[24] As directed by the statute, the California Air Resources Board (CARB) issued regulations in September 2004 limiting the "fleet average greenhouse gas exhaust mass emission values from passenger cars, light-duty trucks, and medium-duty passenger vehicles."[25] The fleet average caps first apply to model year 2009 vehicles. The caps become more stringent annually, so that by 2016, the fleet average would be 30% below the 2009 level.

At least 12 states have formally adopted the California regulation. In order for the states to implement this standard, California must receive a waiver from the EPA. California requested a waiver (as required by Section 209 of the Clean Air Act) in December 2005, but the EPA has yet to respond. Although the EPA has approved every California waiver request since 1975, it has displayed a reluctance to use the Clean Air Act to control greenhouse gases, arguing in federal court that the Clean Air Act does not authorize the EPA to regulate greenhouse gases for the purpose of addressing climate change.[26]

However, an April 2, 2007, Supreme Court decision (*Massachusetts v. EPA*)[27] provided clarification on this issue. The Court found no doubt that the Clean Air Act gives EPA the authority to regulate greenhouse gases (in this case, from new motor vehicles). Although the specifics of such regulation might be subject to agency discretion, the decision should at least improve the possibility that the EPA will grant a waiver to California. Some observers have suggested that the Clean Air Act waiver may be the most direct impact of the decision.

Transportation Fuels

To complement California's statewide greenhouse gas reduction program, the governor issued an executive order (signed January 18, 2007) establishing a low carbon fuel standard (LCFS). The LCFS aims to reduce the carbon intensity of California's transportation fuels by 10% by 2020. California currently relies on petroleum-based fuels for 96% of its transportation needs.[28] Achieving the carbon intensity reduction is expected to replace 20% of the state's gasoline consumption

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[22] Other states are preempted from doing so. See Clean Air Act Section § 209, codified at 42 U.S.C. § 7543.

[23] Clean Air Act § 177, codified at 42 U.S.C. § 7507.

[24] AB 1493 (or the California Vehicle Global Warming Law) was signed into law by Governor Gray Davis on July 22, 2002.

[25] Title 13, California Code of Regulations § 1961.1.

[26] For a historical discussion of these issues, see CRS Report RL32764, *Global Warming: The Litigation Heats Up*, by Robert Meltz.

[27] The ruling is available at [http://www.supremecourtus.gov/opinions/06pdf/05-1120.pdf].

[28] Executive Order S-01-07, signed January 18, 2007.

with less carbon-intensive fuels.[29] The LCFS would apply to all refiners, blenders, producers, and importers of transport fuels.

The order states that transportation fuels shall be measured on a full fuel cycle basis. Thus, regulators must factor in all of the energy used and potential greenhouse gases emitted during the fuel's development (extraction or production), delivery (via vehicle or pipeline), and final use (combustion). Corn-based ethanol, for example, is expected to play a role in meeting California's LCFS. To comply with the full fuel cycle assessment, regulators must consider the energy needed to produce fertilizers, operate farm equipment, transport corn, convert corn to ethanol, and distribute the final product. For more information on these issues, see CRS Report RL33290, *Fuel Ethanol: Background and Public Policy Issues*, by Brent Yacobucci.

The LCFS executive order enhances alternative fuel legislation (AB 1007) that California passed in 2005.[30] AB 1007 requires the California Energy Commission (CEC), in partnership with other agencies, including CARB, to develop and adopt a State Alternative Fuels Plan by June 20, 2007. The executive order directs CEC to supplement this plan with a compliance schedule for meeting the 2020 LCFS target.

The Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a market-based effort by eight states — Connecticut, Delaware, Maine, Maryland,[31] Massachusetts,[32] New Hampshire, New Jersey, New York, and Vermont — to reduce carbon dioxide emissions from power plants. RGGI has been under development since 2003, when states from the Northeast and Mid-Atlantic regions began to discuss setting up a cooperative effort to reduce carbon dioxide emissions. Subsequent meetings and workshops culminated in a Memorandum of Understanding (MOU) that was signed in December 2005. A primary strategy of RGGI is to create a program with flexibility, so that in the future other emission sources/sectors, greenhouse gases, and states could be included. Rhode Island is expected to join RGGI in 2007.[33]

The initiative would set up the nation's first mandatory cap-and-trade program for carbon dioxide. Starting in January 2009, RGGI states have agreed to implement

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[29] California Office of the Governor, *The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting Our Economy*, January 18, 2007.

[30] The governor signed AB 1007 September 29, 2005.

[31] Maryland Governor O'Malley signed RGGI's Memorandum of Understanding on April 20, 2007, making Maryland the first state that was not an original RGGI participant to join the regional initiative.

[32] Massachusetts and Rhode Island were involved in RGGI's development from the beginning. However, both states' governors declined to sign the Memorandum of Understanding in 2005, citing costs as their primary rationale for not participating. Under a new governor, Massachusetts joined RGGI as a participant in January 2007.

[33] Rhode Island Governor Donald Carcieri announced (January 30, 2007) that his state plans to join the initiative.

a cap of 121 million tons on carbon dioxide emissions from power plants. The cap would remain constant through the end of 2014. In 2015 and each subsequent year, the emissions cap would be lowered incrementally, so that by 2018, the cap would be 10% below the initial level.[34]

In a cap-and-trade system, regulators set a cap (or limit) on the overall emissions of a given gas from a specified group of sources, such as power plants. The emissions allowed under the new cap are then allocated in the form of credits (or permits) to individual sources. Sources that emit more than their allowance must buy credits from those who emit less than their allowance, thus creating a financial incentive for sources to reduce their own emissions.

The RGGI cap-and-trade program is to be implemented by the individual states. Each RGGI state will need to establish its own law and/or regulation to administer and enforce the emissions reduction program. However, each state will base its law/regulation on a detailed model rule that was developed by the participant states. To facilitate administration of the trading program, the MOU calls for the states to create a non-profit, regional organization. This organization is to provide technical assistance to the RGGI states and help maintain consistent implementation across state lines.

Depending on various design details, cap-and-trade systems can vary significantly. The cap level and cap applicability (i.e., when the cap takes effect and which sources are affected) are perhaps the primary variables regarding the impact of the program. Other details, such as emission allocation and whether to include a safety valve, can further alter the character of a cap-and-trade program. Some observers consider RGGI to be a model for a possible federal cap-and-trade program, and thus several of RGGI's design elements are generating interest and debate. These issues are discussed below.

Emission Allocation

One specific feature of RGGI — the emission allocation scheme — is drawing both praise and criticism. In both RGGI's Memorandum of Understanding and its Model Rule, states agreed that at least 25% of emission allowances will be allocated for a "consumer benefit or strategic energy purpose." This action would require power plants to purchase the set-aside allowances, most likely through an auction, instead of receiving them at no charge. Several states[35] have indicated that they intend to allocate 100% of their states' allowances through an auction process. In other emission trading programs, auctions have been used, but to a much lesser extent.[36]

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[34] RGGI Memorandum of Understanding, signed by participating state governors on December 20, 2005, and further amended August 8, 2006; both versions are available at [http://www.rggi.org/modelrule.htm].

[35] Vermont, New York, and Massachusetts, for example.

[36] For example, in the U.S. sulfur dioxide trading system, the EPA sets aside 2.8% of its (continued...)

Stakeholders have raised various issues regarding this format. For example, power companies may not be able to share part of the allowance costs with their customer base if the companies have a long-term, fixed-price contract.[37] On the other hand, if utilities are able to pass along the additional costs, consumers worry that their electricity bills may increase. Policymakers have some flexibility to address these issues, because they can decide how best to use the revenues generated from the allowance auction. For instance, states could use the auction revenues to provide tax cuts to the affected industries, or to assist low-income families with paying for increases in energy bills. Largely due to this flexibility, the auction approach is considered more cost-effective than distributing allowances (for free) based on past or predicted emission rates.[38] For more discussion regarding these issues, see CRS Report RL33799, *Climate Change: Design Approaches for a Greenhouse Gas Reduction Program*, by Larry Parker.

Safety Valve

In a cap-and-trade system a safety valve allows policymakers to control the costs of complying with the emissions reduction program. A traditional safety valve would allow affected sources (e.g., power plants) to purchase credits at a fixed price ($X/ton of carbon dioxide) instead of reducing emissions. The price cap could be set high enough above market value so that facilities would consider it only during extreme circumstances or unforeseen events. Thus, the incentive to reduce emissions would remain, but the price cap (or safety valve) would assure the industry that it will not have runaway compliance costs.[39] The main disadvantage of a safety valve is that its inclusion may limit the desired emission reductions, especially if the safety valve is set too close to market value. In addition, a price cap may keep costs low enough that this would reduce the economic incentive to invest in new technologies.

RGGI does not have a safety valve in this traditional sense. However, RGGI does allow for compliance flexibility if the carbon dioxide allowance price reaches a certain level. For example, if certain price thresholds are breached,[40] facilities receive an additional year to demonstrate emissions reductions. Also, in these cases, companies may cover a greater proportion of their emissions by purchasing credits

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[36] (...continued)
annual allowances to be sold at auction. The European Union's Emission Trading System (EU ETS) allows nation states to withhold 5% of their nation's allowances for auction. Although only 4 of the 27 EU member states have chosen to auction a portion of their allowances, the amount available for auction will increase to 10% in 2008.

[37] Dallas Burtraw and Karen Palmer, *Summary of the Workshop to Support Implementing the Minimum 25 Percent Public Benefit Allocation in the Regional Greenhouse Gas Initiative*, Resources for the Future Discussion Paper, September 2006.

[38] Dallas Burtraw et al., 2001, *The Effect of Allowance Allocation on the Cost of Carbon Emission Trading*, Resources for the Future Discussion Paper 01-30.

[39] For more background on safety valves, see CRS Report RL33799, *Climate Change: Design Approaches for a Greenhouse Gas Reduction Program*, by Larry Parker.

[40] RGGI has two price thresholds: $7/ton (2005$) and $10/ton (2005$).

from other facilities or other recognized emission offsets, instead of reducing emissions internally.

If a national cap-and-trade regime were adopted, a traditional safety valve might become an important bargaining chip. Reportedly, the lack of a price cap, which could control costs to industry and consumers, was a central factor behind former Massachusetts Governor Romney's decision to withdraw his state from RGGI participation in 2005.[41]

Emissions Cap

The level and timing of the emissions cap in a cap-and-trade program are important considerations for policymakers. In general, a carbon dioxide cap level and start date represent a balance between the benefits of climate change mitigation and the economic burden imposed on the affected sources.[42] Political feasibility is often a factor when setting an emissions cap.[43] The RGGI 2009 cap was not based entirely on past emission levels (or expected levels), but was developed through a negotiation among the states.[44]

One emissions cap strategy is to establish a cap that would take effect relatively quickly but only require stabilization or modest reduction in emissions. The RGGI cap resembles this approach. An advantage to this strategy is that it allows market forces to affect behavior at an earlier date — for example, encouraging technological development or influencing investment decisions in less carbon-intensive energy sources.

There is some uncertainty as to whether RGGI's initial cap — 121.3 million short tons of carbon dioxide — will be higher than actual emissions when it takes effect in 2009 (**Figure 3**). If this is the case, it could reduce the effectiveness of the RGGI program, at least until the cap requires emission stabilization or reduction. Although RGGI documents have described the initial cap as equivalent to "current"[45] levels, the 2009 cap is 5% higher than emissions levels from 2004, the most recent year for which data are available. If recent increases continue (2002-2004, as shown

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[41] See, for example, Robert Stavins (2006), "A Utility Safety Valve for Cutting CO2," *The Environmental Forum*, vol. 23, no. 2, March/April, 2006, p. 14. Note that Massachusetts rejoined RGGI in January 2007.

[42] Although some may contend that this is not an either/or choice, most economic studies find that reducing carbon dioxide emissions will entail economic costs. That debate is beyond the scope of this report.

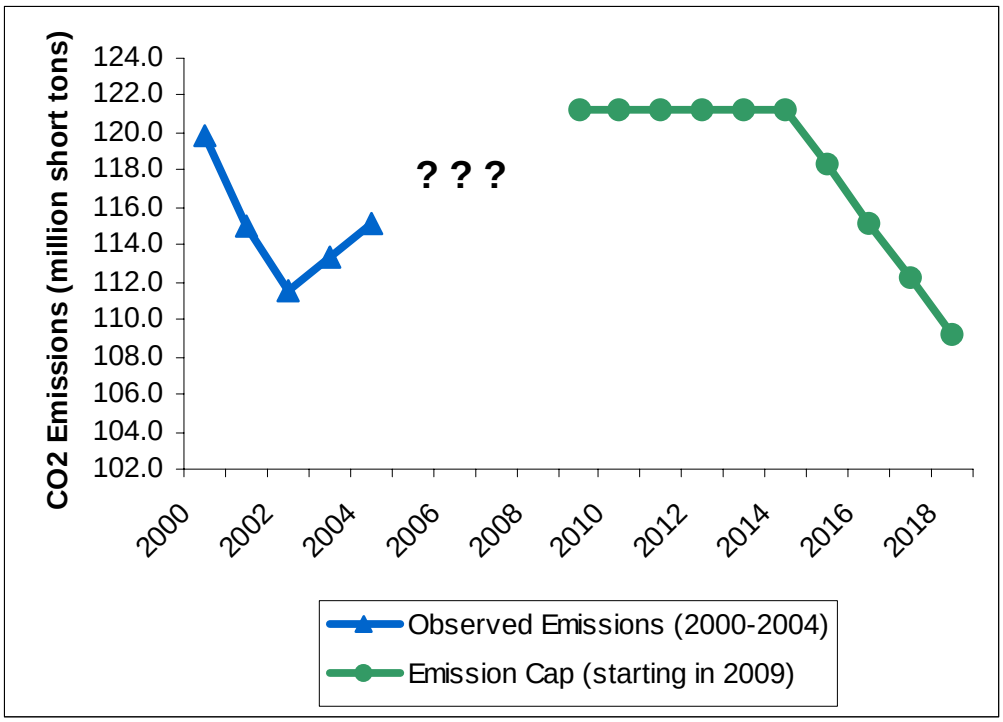
[43] See EPA, Office of Air and Radiation, 2003, *Tools of the Trade: A Guide To Designing and Operating a Cap and Trade Program For Pollution Control*, pp. 3-9.

[44] Per conversations with RGGI stakeholders.

[45] See Regional Greenhouse Gas Initiative, Memorandum of Understanding in Brief. Another RGGI document states that "the initial cap is approximately equivalent to 1990 emissions." See Regional Greenhouse Gas Initiative, "RGGI Overview," both at [http://www.rggi.org/agreement.htm].

in **Figure 3**),[46] the emission levels will be on par with the cap by the time the cap is applicable (2009). More recent data are needed to assess the significance of this concern.

Figure 3. Comparison of Observed Emissions in RGGI States to RGGI Emissions Cap



Source: Prepared by CRS with state emission data from RGGI website, available at [http://www.rggi.org/draftdata.htm].

Note: The emissions data and cap include only the seven original participating RGGI states. Including additional states' emissions would increase both observed emissions and the emissions cap in equal proportions.

Emissions Leakage

A critical design detail — electricity imports from non-RGGI states — remains unresolved. RGGI faces the same "leakage" challenge as California. For example, if an RGGI state lowers its emissions by importing more power from a non-RGGI state, the emissions reductions in the RGGI state would likely be negated by an emission increase (or leakage) in the exporting state. The opportunities for leakage are partially related to the price difference between high-carbon fuels and low-carbon fuels. For instance, if the price of natural gas rises in comparison to coal, there will be more of an incentive to import the cheaper electricity from non-RGGI states. RGGI states have established a working group to examine how best to address this issue. The group plans to submit a report to state agency leaders by December 2007.

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[46] Early figures from 2005 indicate continued increases. Per conversation with RGGI state agency official.

Issues for Congress

The Regional Greenhouse Gas Initiative (RGGI) and the climate change developments in California raise several issues that may be of interest to Congress. This section discusses some of the potential effects of these actions by states, the limitations of these actions, and legal challenges that may hinder or halt implementation of the emission reduction programs.

Potential Effects of State Actions

From a international perspective, many U.S. states generate significant emissions of greenhouse gases. If individual U.S. states were classified as sovereign nations, 21 states would rank in the top 60 for nations that annually emit the most carbon dioxide.[47] Compared with other nations, the combined RGGI states and California rank as top carbon dioxide emitters (**Table 1**).[48] California and the RGGI participants account for almost 20% of U.S. carbon dioxide emissions.

Table 1. Top Carbon Dioxide Emissions by Nation and Selected U.S. States (2001 data)

Country, State, or Group	CO_2 Emissions (million metric tons)	Country, State, or Group	CO_2 Emissions (million metric tons)
United States	5,728	RGGI states	606
European Union	3,928	United Kingdom	562
China	3,452	Canada	522
Russian Federation	1,544	South Korea	473
Japan	1,221	Italy	448
India	1,068	France	389
Germany	884	Mexico	388
Texas	768	California	386

Source: Prepared by CRS with data from World Resources Institute, Climate Analysis Indicators Tool, at [http://cait.wri.org/]. Note that the carbon dioxide data include only emissions, but exclude land use changes.

Note: RGGI states include Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, and Vermont. Maryland and Rhode Island have announced they will soon join, and their emissions are included above.

States as Policy Laboratories. A primary argument in support of individual or cooperative state climate change action is that states can serve as laboratories for policymaking. States can test different ideas and policies on a smaller scale, and help determine which climate change solutions are most

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[47] Based on 2001 data from the World Resources Institute, Climate Analysis Indicators Tool, at [http://cait.wri.org/].

[48] Table 1 includes all nations and U.S. states that emit more carbon dioxide than California (the last entry in Table 1).

appropriate. Many of the RGGI states and California have acted as pioneers in other environmental policy venues — for example, automobile emissions standards in California and acid rain provisions in New England states. Such programs often act as precursors or even models to federal environmental regimes.

Most federal legislative proposals that seek to control greenhouse gases would employ a cap-and-trade emissions regime.[49] There has been some debate regarding how a cap-and-trade program might work on a national level. Although the federal acid rain program, which involves sulfur dioxide emissions trading, is generally considered a success, some emissions trading programs have encountered problems during implementation.[50] State programs, such as RGGI, may offer the opportunity to iron out logistical details that would be crucial in a national cap-and-trade system:

- Which sources to regulate.
- How to allocate emissions allowances.
- How high to set the emissions cap.
- When to allow offsets instead of actual reductions.
- Whether to include a safety valve, and if so, how high to set it.

State programs can inform federal policymakers in other ways. The political process by which states create climate change policy can be enlightening and perhaps adaptable on the federal level. For instance, by examining the development and passage of state legislation, federal policymakers may better understand the motivations of different stakeholders and learn how best to frame the issues.

Possible Economic Impacts. The mandatory emission reduction programs in California and RGGI will likely have economic effects on consumers, businesses and manufacturers, and possibly interstate commerce.[51] The most immediate effects of the emissions programs (at least the ones furthest along in development) will be on the automotive manufacturing and electricity generation sectors.

For automotive manufacturers, the California motor vehicle regulations — which at least 12 states plan to implement — will likely have the effect of dividing the market, potentially requiring the manufacture of a different class of cars to meet the new standards (scheduled to apply in 2009). For automotive companies, this

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[49] See CRS Report RL33846, *Climate Change: Greenhouse Gas Reduction Bills in the 110th Congress*, by Larry Parker, and Brent D. Yacobucci.

[50] For example, the Southern California's Regional Clean Air Incentives Market (RECLAIM), which was implemented in 1994 to reduce emissions of nitrogen oxides (NOx) and sulfur dioxide (SO_2), saw a 50-fold increase in NOx allowance prices during the 2000-2001 California energy crisis. The European Union's greenhouse gas trading system has also experienced drastic swings in allowance prices during its start-up years, making planning and decision making difficult for participating entities. For additional information on the EU trading system, see CRS Report RL33581, *Climate Change: The European Union's Emissions Trading System (EU-ETS)*, by Larry Parker.

[51] The question of whether and in what circumstances states can regulate interstate commerce may raise legal questions, which are discussed below.

raises the issues of the technical means of meeting the standard, marketing, ensuring compliance, and pricing. Depending on how the emission limits are to be met, they may also influence fueling infrastructure. State governments will need resources to enforce the standards. Consumers in regulated states may face higher prices for vehicles.

For the electric generating sector, the California and RGGI requirements will likely promote generation from low carbon-intensive fuels, while curtailing generation from high carbon-intensive fuels, such as coal. California's greenhouse gas performance standards will reach into neighboring states as well, effectively barring electricity imports generated by conventional coal-fired power plants. As coal-fired plants tend to produce lower-cost electricity, the result of these requirements may be to increase electricity prices within the states that limit emissions, and possibly lower prices in states without such emission standards.

If the greenhouse gas limitations on motor vehicles and electricity increase prices in the regulated states, businesses and manufacturers may factor this cost into location decisions. There is some concern that regulated industries will have a financial incentive to move (and thus transfer jobs) to states (or nations, such as Mexico or Canada) that do not limit greenhouse gas emissions.[52] Others fear that emission limits will raise the cost of living and doing business within those states, although in theory such effects can be at least partially addressed through the design of the emissions reduction program.[53]

Patchwork of Regulations. One concern shared by many observers, particularly industry stakeholders, is that state climate change programs (in the absence of a federal program) will create a patchwork of regulations nationwide. It is claimed that a patchwork system of standards may hinder a company's efficiency and possibly create economic burdens for firms that operate in multiple states. The prospect of regulations that vary from state to state is moving some companies to support a federal climate change program with comparable requirements across the entire United States.[54]

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[52] This is also a central argument against having federal emission limits without cooperation with other large economies (e.g., China and India).

[53] A cap-and-trade program with an auction system (as discussed above), for instance, would generate revenues that could be funneled to parties who bear an unfair percentage of the program's costs. See, for example, National Commission on Energy Policy, 2007, *Allocating Allowances in a Greenhouse Gas Trading System.*

[54] For example, the newly created United States Climate Action Partnership (USCAP), an alliance of major businesses and leading climate and environmental groups, calls on the federal government to enact legislation requiring significant reductions of greenhouse gas emissions. See [http://us-cap.org].

Limitations of State Actions

Climate change has been described as the "ultimate global commons problem."[55] The global warming and climate impacts associated with increased greenhouse gases in the atmosphere cannot be linked with specific emission sources. Unlike localized reductions in other air pollutants (e.g., sulfur dioxide, particulate matter), when an emissions source reduces its carbon dioxide emissions, it does not generate a corresponding local climate change benefit unless there are similar widespread reductions around the world.

From a practical standpoint, the actions of one or a small group of states cannot by themselves significantly affect the global accumulation of greenhouse gases in the atmosphere. However, as discussed above, actions now underway in California and states in the Northeast and Mid-Atlantic regions may create examples and/or models that will prove instructive in more widespread applications. Moreover, when business and industry have confronted a growing patchwork of state requirements, these sectors have historically begun to favor a national policy — as has begun to happen in the case of state-level actions on climate change. However, the lack of a national program or a truly global approach to greenhouse gas emissions reductions does limit what individual states can accomplish in actually reducing greenhouse gas emissions and accumulations.

Legal Challenges to State Actions

Legal challenges may halt or hinder state action. The possibility of legal challenges creates considerable uncertainty regarding the future of state climate change actions, particularly the more aggressive programs. There are already several lawsuits against state actions that seek to regulate greenhouse gas emissions from motor vehicles. Car dealers and trade associations have filed suits in California, Vermont, and Rhode Island seeking to halt the regulations on various grounds. For example, the plaintiffs contend that California's regulations are preempted by the Energy Policy and Conservation Act (P.L. 94-163), which directs states not to regulate fuel economy standards. It in uncertain what role the *Massachusetts* decision may play in these proceedings, because some of the arguments in these cases (e.g., the relationship between conflicting federal and state policing concerning climate change) were not addressed in the *Massachusetts* case.

Further litigation confronting the more recent state actions is anticipated. Many expect a legal challenge to the RGGI program when the first state's rule is officially issued.[56] In addition, some observers question whether California's recently enacted

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[55] Robert Stavins, 2006, "A Utility Safety Valve for Cutting CO2," *The Environmental Forum*, vol. 23, no. 2, March/April, 2006, p. 14.

[56] New York state is expected to be the first state to issue its rule implementing RGGI, according to statements made from state officials at a climate change workshop: Pew Center on Climate Change, *Innovative Approaches to Climate Change: A State and Regional Workshop*, Washington, DC, October 10-11, 2006.

greenhouse gas performance standards are constitutional.[57] They argue that the performance standards disproportionately affect the neighboring states that have historically exported coal-generated electricity to California consumers, raising the question of whether the California standard, in effect, regulates interstate commerce.

The degree to which a state can influence interstate commerce is central to the debate regarding state-led climate change activities. The U.S. Constitution grants Congress the power to regulate interstate commerce.[58] U.S. courts interpret this as a limitation on the states' ability to regulate interstate commerce.[59]

The legal arguments in these cases (and expected cases) are complicated and beyond the scope of this report. Moreover, many of the legal and constitutional issues chart new ground. For these reasons, many observers have concluded that it is difficult to predict how the courts will interpret and decide these issues. Regardless of the ultimate strength and outcome of the legal arguments opposing state-led climate change policies, affected stakeholders will almost certainly challenge the implementation of emission reduction programs. It is uncertain how long these anticipated legal challenges might delay greenhouse gas reductions in the states.

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[57] See Brian Potts, 2006, "Regulating Greenhouse Gas Leakage: How California Can Evade the Impending Constitutional Attacks," *Electricity Journal*, vol. 19, issue 5, June 2006.

[58] Article I, Section 8, Clause 3.

[59] For more discussion of these issues, see CRS Report RL30315, *Federalism, State Sovereignty, and the Constitution: Basis and Limits of Congressional Power*, by Kenneth R. Thomas.