The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Policymakers

Jonathan L. Ramseur
Specialist in Environmental Policy

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Summary

The Regional Greenhouse Gas Initiative (RGGI) is the nation's first mandatory cap-and-trade program for greenhouse gas (GHG) emissions. As of January 1, 2012, RGGI involves nine states—Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The RGGI cap-and-trade system applies only to carbon dioxide (CO_2) emissions from electric power plants with capacities to generate 25 megawatts or more—approximately 168 facilities. The RGGI emissions cap took effect January 1, 2009.

The initial results of the RGGI program may be instructive to policymakers. Several of RGGI's design elements generated considerable interest during the development and debate of federal proposals to address GHG emissions. In particular, the program's emission cap has received particular attention. Since the cap took effect in 2009, it has not compelled regulated entities to make internal emission reductions or purchase emission credits from other sources. Several factors led to this outcome: RGGI's cap design, an economic downturn, and a substantial shift to less carbon intensive fuels. In 2005, RGGI states generated 32% of their electricity from coal and petroleum, sources of energy with relatively high carbon intensity. In 2011, these sources generated 12% of RGGI's electricity.

To address the disparity between the cap and actual emissions, in February 2013, RGGI participants proposed to substantially reduce the existing cap. The proposed cap would take effect in 2014 and would be based on 2012 emission levels. However, RGGI state legislatures and/or agencies must alter relevant statutes and/or regulations before the proposed cap can take effect.

Although RGGI's emission cap has had limited impact on the region's power plant emissions, the program has had other effects. The cap's existence (coupled with unlimited emission allowance banking and an auction reserve price) attaches a price to the regulated entities' CO_2 emissions. Because the cap is currently non-binding, this price acts like an emissions fee or carbon tax.

RGGI states have sold 89% of their emission allowances through quarterly auctions. The auction proceeds—over $1.2 billion to date—have provided a new source of state revenue, which have been used to support various policy objectives. RGGI states (as a group) have contributed the majority of the emission allowance value (65%) to support energy efficiency, renewable energy, or other climate-related efforts. Several RGGI studies indicate that supporting energy efficiency provides multiple benefits: emission reduction, consumer savings via lower electricity bills, and job creation. However, RGGI states have demonstrated that revenue allocation strategies are subject to change. For example, after initially allotting auction proceeds to energy efficiency efforts, three states have transferred auction proceeds to address state budget deficits, drawing criticism from some environmental groups.

As a group, the nine RGGI states account for approximately 7% of U.S. CO_2 emissions (and 16% of U.S. Gross Domestic Product). RGGI's aggregate emissions rank in the top 20 among all nations. But from a practical standpoint, the RGGI program's contribution to *directly* reducing the global accumulation of GHG emissions in the atmosphere is arguably negligible. However, RGGI's activities may stimulate action in other states or at the federal level: when confronted with a growing patchwork of state/regional requirements, industry stakeholders may support a singular national policy.

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Introduction

A number of states and local governments have taken action to directly address greenhouse gas (GHG) emissions. These efforts cover a wide spectrum, from developing climate action plans to setting mandatory GHG emission standards.[1]

One of the most significant climate change developments at the state level is the Regional Greenhouse Gas Initiative (RGGI, pronounced "Reggie"), the nation's first mandatory cap-and-trade program (see text box, "What Is a Cap-and-Trade System?") for GHG emissions, which went into effect January 1, 2009.[2] RGGI involves nine states—Connecticut, Delaware, Maine, Maryland,[3] Massachusetts,[4] New Hampshire, New York, Rhode Island, and Vermont.[5]

Several of RGGI's design elements generated considerable interest during the development and debate of federal proposals to address GHG emissions. The initial results of the RGGI program may be instructive to policymakers, because RGGI may serve as a possible test case for a federal cap-and-trade program, providing insights into implementation complexities, the mechanics of various design elements, and lessons of potential design pitfalls.

The first section of this report provides an overview of the RGGI cap-and-trade program and the participating RGGI states. The second section discusses selected issues raised by RGGI that may be of interest to policymakers who are considering developing a federal program. The final section provides some final thoughts concerning the RGGI program.

[1] For example, California is implementing regulations that address GHG emissions on multiple fronts, including a cap-and-trade program that began in January 2013. For more information on the California cap-and-trade program, see the California Environmental Protection Agency and Air Resources Board website at http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

[2] Prior to the starting date of the emissions cap (January 1, 2009), RGGI held its first emission allowance auction on September 25, 2008.

[3] 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.

[4] 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. Massachusetts (different governor) and Rhode Island (same governor) joined RGGI as participants in January 2007.

[5] New Jersey participated in the program from 2009 through the end of 2011. For information on New Jersey's withdrawal from RGGI, see http://rggi.org/design/history/njparticipation.

What Is a Cap-and-Trade System?

A GHG cap-and-trade system creates an overall limit (i.e., a cap) on GHG emissions from the emission sources covered by the program. Cap-and-trade programs can vary by the sources covered. The covered sources, also referred to as covered or regulated entities, often include major emitting sectors (e.g., power plants and carbon-intensive industries), fuel producers/processors (e.g., coal mines or petroleum refineries), or some combination of both.

The emissions cap is partitioned into emission allowances. Typically, in a GHG cap-and-trade system, one emission allowance represents the authority to emit one (metric) ton of carbon dioxide-equivalent (tCO_2-e). This term of measure is used because GHGs vary by global warming potential (GWP)—an index of how much a GHG may contribute to global warming over a period of time, typically 100 years. GWPs are used to compare gases to CO_2, which has a GWP of 1. For example, methane's GWP is 25, because a ton of methane is 25 times more potent a GHG than a ton of CO_2.

Under an emissions cap, covered entities with relatively low emission-reduction costs have a financial incentive to make reductions beyond what is required, because these further reductions could be sold (i.e., traded) as emission credits to entities that face higher costs to reduce their facility emissions. At the end of each established compliance period (e.g., a calendar year or multiple years), covered sources surrender emission allowances (to an implementing agency) to cover the number of tons emitted. If a source did not provide enough allowances to cover its emissions, the source would be subject to penalties. Other mechanisms, such as banking or offsets, may be included to increase the flexibility of the program.

The emissions cap creates a new currency—the emission allowance. Policymakers may decide to distribute the emission allowances to covered entities at no cost (based on, for example, previous years' emissions), sell the allowances (e.g., through an auction), or use some combination of these strategies. The distribution of emission allowance value is typically a source of intense debate during a cap-and-trade's program development.

A cap-and-trade program is one policy tool for reducing GHG emissions. It is often described as a market-based mechanism, because it (like an emissions fee or carbon tax) allows the marketplace to determine the economically efficient solution for GHG emission reduction. Compared to more traditional approaches—requiring, for example, specific performance standards or technologies at particular facilities—market-based mechanisms are generally considered more cost effective. Perhaps the most successful market-based program in the environmental policy arena is the sulfur dioxide (SO_2) emissions trading system (also called the Acid Rain Program) established by the 1990 amendments to the Clean Air Act.

RGGI Overview

RGGI is sector-specific cap-and-trade system that only applies to carbon dioxide (CO_2) emissions from electric power plants[6] in RGGI states with capacities to generate 25 megawatts or more[7]—approximately 168 facilities.[8] RGGI designers expected the initial program to be a foundation for emissions trading and possibly expanded in future years by covering other emission sources/sectors, GHGs, or other states. The existing program addresses approximately 22% of all GHG emissions in RGGI states.[9]

[6] CO_2 emissions account for approximately 99% of all GHG emissions from power plants. In 2011, electricity power plants accounted for about 33% of all U.S. GHG emissions. EPA, *Draft 2012 U.S. Greenhouse Gas Inventory Report*, February 2013.

[7] Electricity generating units that consume on-site more than 10% of the electricity they generate (on an annual basis) are not subject to the emissions cap. This provision applies to facilities (e.g., some refineries) that may generate electricity for their own use.

[8] For more details, see RGGI's website at http://www.rggi.org/design/overview/regulated_sources.

[9] Based on 2009 data from World Resources Institute, Climate Analysis Indicators Tool (CAIT US) Version 5.0, 2012, at http://cait.wri.org.

Compared to recent federal proposals, the reductions required by RGGI's cap are relatively modest. As the cap indicates (see **Figure 1** and its surrounding discussion), the initial objective of RGGI was to stabilize CO_2 emissions for several years (2009-2014) at the expected 2009 levels (based on assumptions made in 2005), and then require gradual reductions, achieving a 10% decrease from the 2009 emission cap level by 2019. As discussed below, RGGI states have proposed to modify the existing cap and make additional changes to particular design elements.

RGGI's cap-and-trade program includes many of the design elements that have been proposed and debated in federal legislative proposals. Highlights include the following:

- **Three-year compliance periods.** At the end of a compliance period covered entities submit one emission allowance for each ton of CO_2 emissions generated. A three-year compliance period should mitigate potential emission allowance price swings brought on by short-term market volatility.
- **Emission allowance banking.** RGGI allows covered entities to bank an unlimited number of emission allowances for future use. The opportunity to bank emission allowances instills a substantial amount of flexibility into a trading program, effectively making annual emissions caps flexible over time, and reduces the absolute cost of compliance.
- **Offsets use.** An offset is a measurable reduction, avoidance, or sequestration of GHG emissions from a source not covered by an emission reduction program. To a limited degree (discussed below), covered entities may submit offsets in lieu of the emission allowances needed to satisfy compliance obligations.
- **Emission allowance auctions.** A substantial percentage (89%) of emission allowances have been distributed through quarterly auctions (discussed below). The auctions include a reserve price, which sets a price floor for emission allowances.
- **Consumer benefit allocation.** RGGI states agreed that at least 25% of the emission allowance value would be distributed "for a consumer benefit or strategic energy purpose."[10] Allowance value distributions from RGGI states have exceeded this minimum requirement (discussed below).
- **Safety-Valve.**[11] RGGI provides an additional year to demonstrate compliance if emission allowance prices reach a certain level. In addition, covered entities may cover a greater proportion of their emissions with offsets. However, RGGI states proposed to eliminate these features and replace them with a "cost containment reserve" (CCR) in 2014. The CCR would provide additional allowances—5 million in 2014 and 10 million each year thereafter—if certain price thresholds were met: $4/ton in 2014; $6/ton in 2015; $8/ton in 2016; and $10/ton in 2017, increasing 2.5% each year thereafter. Unlike other allowance reserve proposals,[12]

[10] RGGI Memorandum of Understanding (MOU), Section 2 (G)(1), December 5, 2005. Subsequent amendments were made to the MOU, but not to this section.

[11] Safety-valve is a term of art in cap-and-trade parlance, but it can have a variety of meanings. Generally triggered by an established price in the emission allowance market, safety-valves may include (1) a set price alternative to making reductions or buying allowances at the market price (often described as a price safety-valve), (2) a slowdown in tightening the emissions cap, and (3) lengthening of the time allowed for compliance.

[12] For example, H.R. 2454 in the 111th Congress included a "strategic reserve" of allowances borrowed from future (continued...)

allowances from CCR would not be borrowed from future years, thus effectively increasing the cap if triggered.

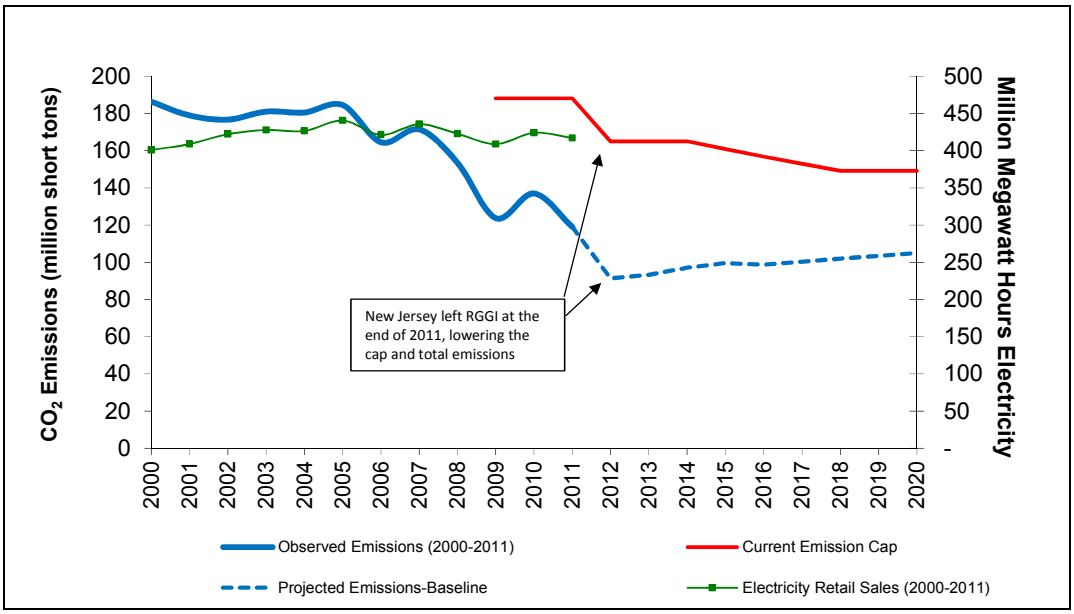
Selected Issues

The following selected RGGI issues may be of interest to policymakers seeking to develop a federal program that would reduce greenhouse gas emissions.

Emissions Cap

Although RGGI is one of the more aggressive state programs addressing climate change, the program's current emission cap has exceeded actual emissions since its inception (**Figure 1**). This means that since the cap took effect in 2009, the cap has not *compelled* regulated entities to make internal emission reductions or purchase emission credits (or offsets). As discussed below, the degree to which this has occurred was unexpected.

Figure 1. Observed and Projected RGGI Power Plant CO_2 Emissions Compared to RGGI Emissions Cap



Source: Prepared by CRS with data from the following: observed state emission data (2000-2011) provided by RGGI, at http://www.rggi.org/market/tracking/public_reporting; projected RGGI emissions from modeling results, available at http://www.rggi.org/design/program_review; electricity retail sales data from Energy Information Administration, at http://www.eia.gov/electricity/data.cfm.

Notes: The "Projected Emissions-Baseline" estimate assumes that the cap remains unchanged. Additional assumptions are available at http://www.rggi.org/design/program_review/materials-by-topic/modeling.

(...continued)

years. The reserve would be triggered at particular price points. California's cap-and-trade system has a similar mechanism. More information is available at http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

In February 2013, RGGI participants proposed to substantially reduce the existing cap.[13] However, RGGI state legislatures and/or agencies must alter relevant statutes and/or regulations before the proposed cap can take effect. This section includes a discussion of both the existing cap and the proposed cap.

Existing Cap

During RGGI's construction in 2005,[14] RGGI designers set the 2009 emissions cap about 4% above the average emission levels observed between 2000 and 2002. RGGI designers anticipated that power plant CO_2 emissions would gradually increase, so that actual levels would approximately match the cap set for 2009—188 million short tons of CO_2 ($mtCO_2$). Actual emissions did not meet these projections, but decreased substantially (**Figure 1**).

Studies that examined RGGI emissions and their underlying factors project that the region's CO_2 emissions will not return to 2005 levels in the near term, but will remain below the existing cap at least through 2020 (**Figure 1**).[15] These studies indicate that RGGI CO_2 emission decreases (2005-2011) were due (to some degree) to long-term, structural changes, such as changes in RGGI's electricity generation portfolio and energy efficiency improvements. A comparison between the emission decline and electricity use in the RGGI states supports this notion. As **Figure 1** indicates, RGGI electricity retail sales (a proxy for electricity use) decreased by 5% between 2005 and 2011, while CO_2 emissions from in-state electricity generation decreased by 36%. This disparity suggests that factors others than temporal economic conditions are the primary influence.

Figure 2 compares RGGI's electricity generation portfolio between 2005 and 2011. The figure depicts a substantial decline in carbon intensive electricity generation over that timeframe. Electricity is generated from a variety of energy sources, which vary significantly by their ratio of CO_2 emissions per unit of energy. For example, a coal-fired power plant emits almost twice as much CO_2 (per unit of energy) as a natural gas-fired facility.[16] Some energy sources (e.g., hydropower, nuclear, wind, or solar) are generally considered to be zero-emission sources. In 2005, RGGI states generated 32% of their electricity from coal and petroleum, sources of energy with relatively high carbon intensity. In 2011, these sources generated 12% of RGGI's electricity. During that time, sources with relatively lower carbon intensities—natural gas, nuclear, and hydroelectric—increased their contributions to RGGI's electricity portfolio.

[13] For related RGGI documentation, including the revised Model Rule, see http://www.rggi.org/design/program_review.

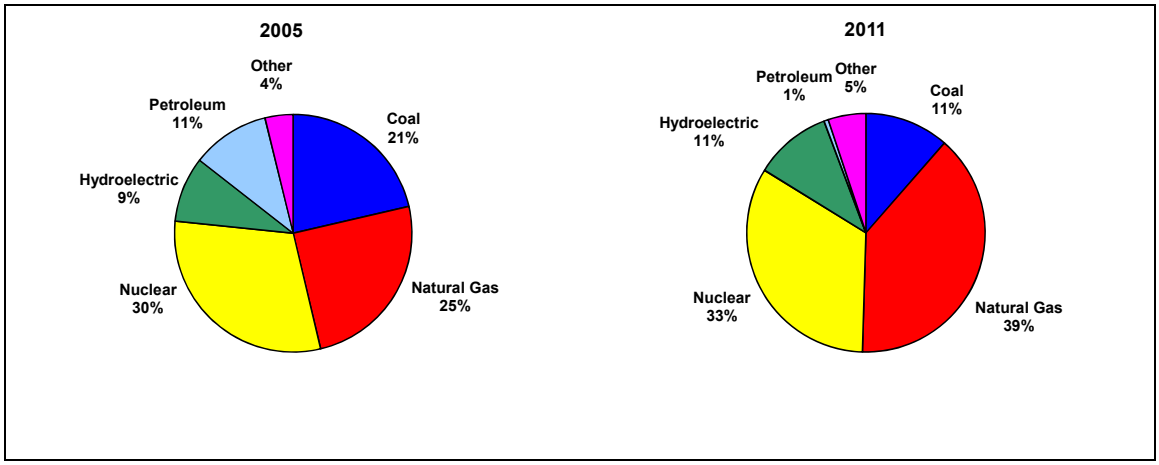
[14] States from the Northeast and Mid-Atlantic regions began to discuss a cooperative effort to reduce carbon dioxide emissions in 2003. Subsequent meetings and workshops culminated in a Memorandum of Understanding (MOU) that was signed by most RGGI state governors in December 2005.

[15] See RGGI modeling results and analysis at http://www.rggi.org/design/program_review/materials-by-topic/modeling; Environment Northeast, *RGGI's Past and Future: Emissions Trends and Potential Reforms*, 2012. Prior analyses include New York State Energy Research and Development Authority, *Relative Effects of Various Factors on RGGI Electricity Sector CO2 Emissions: 2009 Compared to 2005*, Draft White Paper, November 2010; and Environment Northeast, *RGGI Emissions Trends*, June 2010.

[16] The Energy Information Administration website provides a table listing the amount of CO_2 generated per unit of energy for different energy sources, at http://www.eia.doe.gov/oiaf/1605/coefficients.html.

Figure 2. RGGI Electricity Generation by Energy Source

2005 vs. 2011



Source: Prepared by CRS; data from Energy Information Administration, Electric Power Annual, historical data tables, at http://www.eia.gov/cneaf/electricity/epa/epa_sum.html.

Note: The "other" category includes wood and other biomass, wind, solar, and other gases.

Proposed Emissions Cap

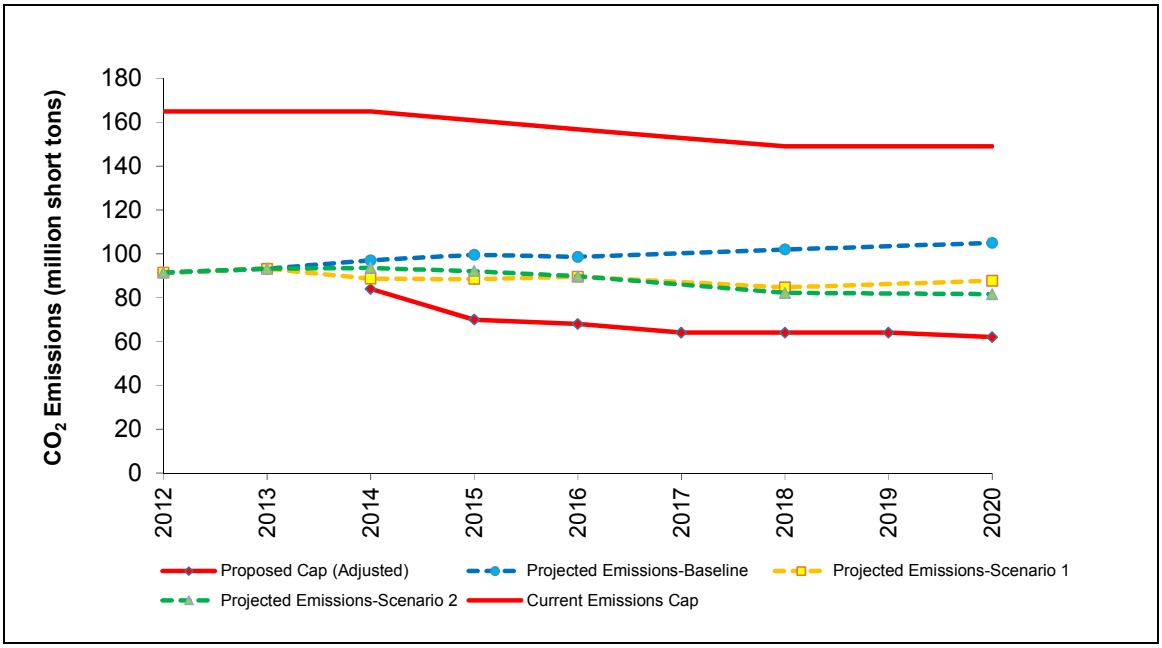
As part of its 2012 design review of the RGGI program,[17] participating states proposed to substantially reduce the emissions cap. Starting in 2014, the cap would decrease from 165 $mtCO_2$ to 91 $mtCO_2$. RGGI designers chose this level because it is expected to match 2012 emissions. Between 2015 and 2020, the cap will decline by 2.5% each year. In addition, RGGI states proposed to lower the cap further to account for the substantial amount of banked emission allowances held by RGGI entities.[18] RGGI designers estimate that banked emissions—purchased between 2009 and 2013—will total 115 $mtCO_2$. Thus, the cap adjustments are considerable. In some years, the adjustments lower the cap by 20 mtCO2, an almost 25% decrease.

Figure 3 illustrates (1) the adjusted cap, based on the RGGI estimate of banked emission allowances, (2) the existing emissions cap, and (3) three projections of CO_2 emissions from RGGI power plants. The figure indicates that under "baseline" conditions (i.e., the existing cap and other design elements remain intact), emissions would increase by approximately 15% between 2012 and 2020. If the proposed emissions cap and other design changes are finalized by the states, RGGI models estimate ("Scenario 1" and "Scenario 2" in **Figure 3**) that emissions in 2020 would be 3%-10% lower than in 2012. The range of reductions reflects different assumptions made in the two projection scenarios. **Figure 3** indicates that in both emission projection scenarios, the 2020 emissions are above the proposed cap.

[17] In its original Memorandum of Understanding (December 20, 2005), RGGI states agreed to conduct a "comprehensive review" of the RGGI program in 2012.

[18] Between 2009 and 2013, the emissions cap exceeded or will exceed actual emissions, providing an opportunity for entities to obtain more allowances than they need to meet current compliance obligations. These allowances can be purchased and held (i.e. banked) for future use.

Figure 3. RGGI Existing and Proposed Emission Caps and Projected Emissions



Source: Prepared by CRS; projected emission data from RGGI modeling results, available at http://www.rggi.org/design/program_review.

Notes: The proposed cap (adjusted) is based on RGGI model estimates of the number of emission allowances banked between 2009 and 2013 (115 mtCO_2). The baseline emission projection assumes that the existing emissions cap and other design elements remain unchanged. The other emission scenarios assume the proposed adjusted cap and other new elements, including the Cost Containment Reserve, take effect in 2014. The estimates from Scenario 1 and Scenario 2 are different because of varied assumptions in the underlying model. For further details about these estimates and the underlying assumptions, see http://www.rggi.org/design/program_review.

Emission Cap Impacts

Although RGGI's existing emission cap has not required emission reductions since its inception, the program still has impacts. First, the cap's existence attaches a price to the regulated entities' CO_2 emissions. The price is relatively low (as discussed below), because of the abundance of emission allowances. A 2010 analysis of the RGGI program found that the emission allowance price accounted for approximately 3.4% of the change in the price difference between natural gas and coal in the RGGI region between 2005 and 2009.[19]

Second, the cap's emission allowances are essentially a new form of currency. Their value can be used to support various policy objectives, including (as is the case with RGGI) energy efficiency and renewable energy investments. Some would argue that RGGI's greatest impact so far is to provide a relatively reliable funding source for such efforts. Several RGGI studies indicate that supporting energy efficiency provides multiple benefits: emission reduction, consumer savings via lower electricity bills, and regional job creation.[20] One of these studies argues this allowance

[19] New York State Energy Research and Development Authority (prepared for RGGI Inc.), *Relative Effects of Various Factors on RGGI Electricity Sector CO2 Emissions: 2009 Compared to 2005*, Draft White Paper, November 2010.

[20] See RGGI Inc., *Investment of Proceeds from RGGI CO_2 Allowances*, February 2011 and Environment Northeast, *Economy-wide Benefits of RGGI: Economic Growth through Energy Efficiency*, March 2011.

value distribution strategy (e.g., use of RGGI auction revenue) "creates wider benefit than any other use of allowance value."[21] As discussed below, such efforts play a role in determining the effectiveness of the program.

Emissions Leakage

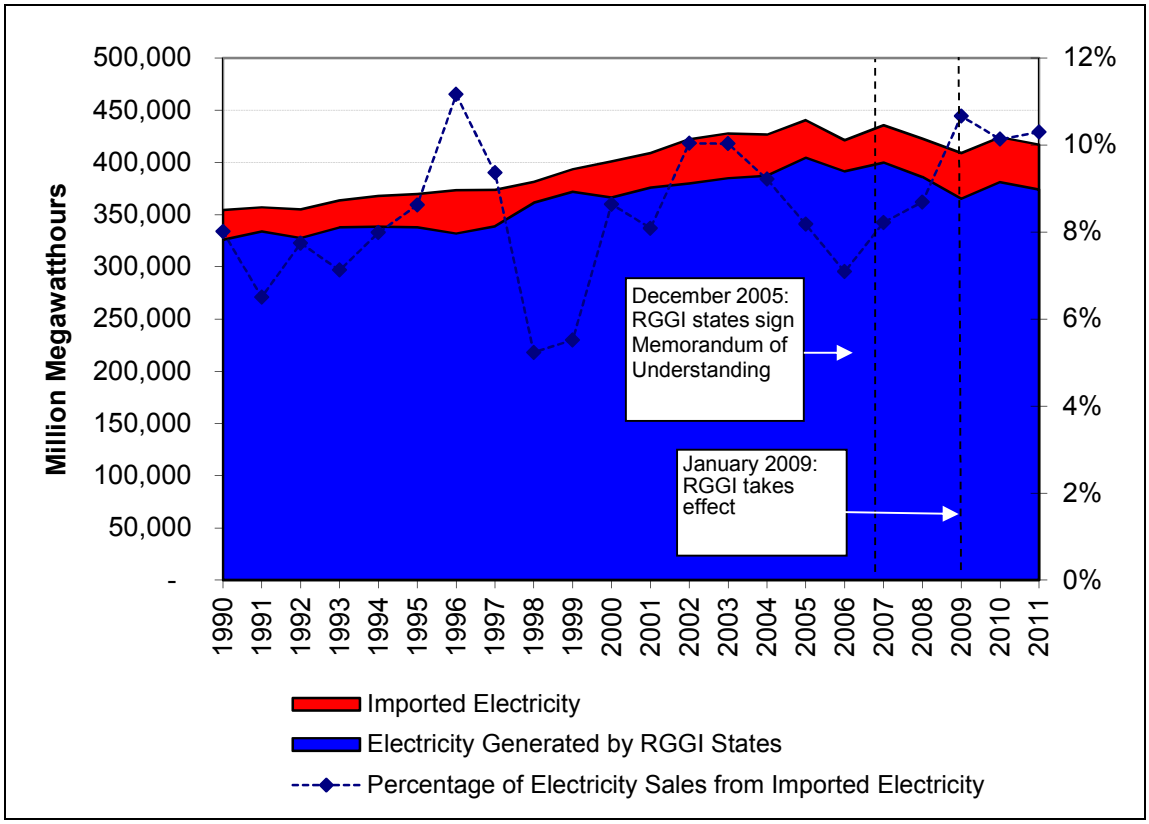
A critical design detail—electricity imports from non-RGGI states—remains unresolved. This presents an opportunity for "emissions leakage," which could undermine the effectiveness of the RGGI program. Leakage can occur when an emissions reduction program does not include all sources contributing to the environmental problem. Increases in emissions from uncovered sources may reduce emission achievements from covered sources.

This is a concern with the RGGI program, because the RGGI regime does not regulate emissions from electricity generated outside the region (e.g., in Pennsylvania) and then used within the region (i.e., "imported electricity"). As illustrated by **Figure 4**, over the past two decades the RGGI states (as a group) have imported between 5% and 11% of their annual electricity needs (measured in electricity sales). After several RGGI milestones—the December 2005 Memorandum of Agreement and the January 2009 start date of the emissions cap—the imported electricity has remained within this range. However, as discussed above the cap (so far) has had minimal effect on the relative price of different sources of electricity. The proposed emissions cap may increase emission allowance prices and increase the possibility of emissions leakage, but other factors (e.g., the relative price of natural gas) may counter this potential impact.

[21] Environment Northeast, *Economy-wide Benefits of RGGI: Economic Growth through Energy Efficiency*, March 2011.

Figure 4. Electricity Sales, Generation, and Imports in the RGGI States

1990-2011



Source: Prepared by CRS; data from Energy Information Administration.

Notes: Electricity imports calculated by subtracting total electricity generation from total electricity sales. Although the emissions cap became effective January 1, 2009, RGGI held its first emission allowance auction in September 2008.

Emissions leakage can occur if imported electricity replaces RGGI in-state electricity generation, because emissions from in-state electricity are regulated; emissions from imported electricity are not. In such a scenario, the quantity of leakage would depend on the sources of electricity generation involved in the tradeoff. For example, maximum leakage would occur if imported electricity from a coal-fired power plant replaced in-state electricity generated from a zero-emission source.

A RGGI working group issued a final report on leakage March 2008. Among the four recommendations, the working group concluded that states should monitor for emissions leakage and evaluate whether more direct measures should be considered at a later date.[22] After its 2012 Program Review, RGGI participants seemed to reach a similar conclusion, stating

> the states commit, over the course of the next year, to engage in a collaborative effort ... to identify and evaluate potential imports tracking tools, conduct further modeling to ascertain

[22] Possible measures included carbon adders, procurement emissions rates, or load-based caps. See RGGI Emissions Leakage Multi-State Staff Working Group to the RGGI Agency Heads, *Potential Emissions Leakage and the Regional Greenhouse Gas Initiative (RGGI),* (March 2008), at http://www.rggi.org/about/documents.

> energy and price implications of any potential policy on emissions associated with imported electricity, and pursue additional legal research necessary, leading to a workable, practicable, and legal mechanism to address emissions associated with imported electricity.[23]

Emission Allowance Value Distribution

When designing a cap-and-trade program, one of the more controversial and challenging questions for policymakers is how, to whom, and for what purpose to distribute the emission allowances. Individual RGGI states determine how their allowances are distributed. RGGI states have answered the "how question" by employing auctions to distribute the vast majority of allowances. During the first compliance period (2009-2011), states' percentages of auctioned allowances ranged from 57% to 99%, but as a group, the states auctioned 89% of all available allowances.[24] The remaining portion of allowances are distributed to various entities to support a variety of objectives. These distributions vary by state and are subject to change.[25] Perhaps the more important question for policymakers is what to do with the emission allowance value—in the case of RGGI, allowance value predominately means auction revenues.

Allowance Auctions

RGGI's auctions may be of particular interest to Congress, because this approach was part of several proposed cap-and-trade systems in recent years.[26] Each RGGI auction is conducted in one round with a sealed-bid, uniform price format.[27] Participants may submit multiple, confidential bids for a certain number of allowances at a specific price. The price paid by all bidders is the highest rejected bid (i.e., the second-highest bid). For example, consider a hypothetical auction, in which the supply of allowances is 20 units. The highest bidder offers $10 per allowance for 15 allowances. The second highest bidder offered $9 per allowance for 10 allowances. Under RGGI's auction structure, the highest bidder would receive 15 allowances at $9/allowance, and the second-highest bidder would receive 5 allowances at $9/allowance. The price paid by all successful bidders is known as the clearing price.

[23] RGGI, *RGGI 2012 Program Review: Summary of Recommendations to Accompany Model Rule Amendments,* February 2013, at http://www.rggi.org/design/program_review/materials-by-topic/program-elements.

[24] At least one of the RGGI states is scheduled to increase its percentage of allowances offered through auction. For details, see Environment Northeast, *RGGI Auction Tracker: State Allocations and Spending Plans*, September 2012.

[25] For more information, see RGGI Inc., *Investment of Proceeds from RGGU CO2 Allowances*, February 2011; and Environment Northeast, *RGGI Auction Tracker: State Allocations and Spending Plans*, March 2011.

[26] CRS Report R40556, *Market-Based Greenhouse Gas Control: Selected Proposals in the 111th Congress*, by Larry Parker, Brent D. Yacobucci, and Jonathan L. Ramseur.

[27] For information on other auction formats, see Charles Holt *et al*., *Auction Design for Selling CO2 Emission Allowances Under the Regional Greenhouse Gas Initiative*, 2007, prepared for RGGI Working Group staff.

In addition, RGGI auctions include a reserve price, below which the seller refuses to part with the item for sale (i.e., emission allowance). The reserve price started at $1.86 in 2009, increasing to $1.98 in 2013.[28] In a large volume, multi-unit auction that is expected to have substantial participation (i.e., high demand for emission allowances), a reserve price would all but guarantee a revenue stream. A reserve price may address certain logistical concerns, such as bidder collusion, that may be associated with auctions. In addition, a reserve price may provide assurance to parties making emission reductions that the reductions will have a minimal value in the allowance market.

Because the RGGI emissions cap has exceeded and is projected to exceed emissions (until the cap is adjusted in 2014), the reserve price acts like an emissions fee or carbon tax.[29] As discussed below, the revenue raised by the auctions may lead to emission reduction by supporting energy efficiency and renewable energy projects.

The RGGI program has held 19 auctions as of the date of this report. In general, many have viewed the auctions as successful in terms of price discovery,[30] transparency, transaction costs, and other logistical issues.

Another typical measure of auction success is revenue generation. After 19 auctions, the cumulative proceeds total over $1.2 billion. **Figure 5** illustrates the auctions' results. As the figure depicts, the clearing price equaled the reserve price in auctions conducted between June 2010 and December 2012, reflecting the abundance of emission allowances in the market. Moreover, during this time period, approximately 40% of the allowances offered for sale were not purchased. RGGI states retired the vast majority of these unsold allowances.[31]

In the most recent auction (March 2013), the clearing price exceeded the reserve price. This is likely related to the February 2013 proposal to substantially reduce the emissions cap in 2014.

[28] RGGI states proposed that the 2014 reserve price will be $2.00, increasing by 2.5% each year thereafter.

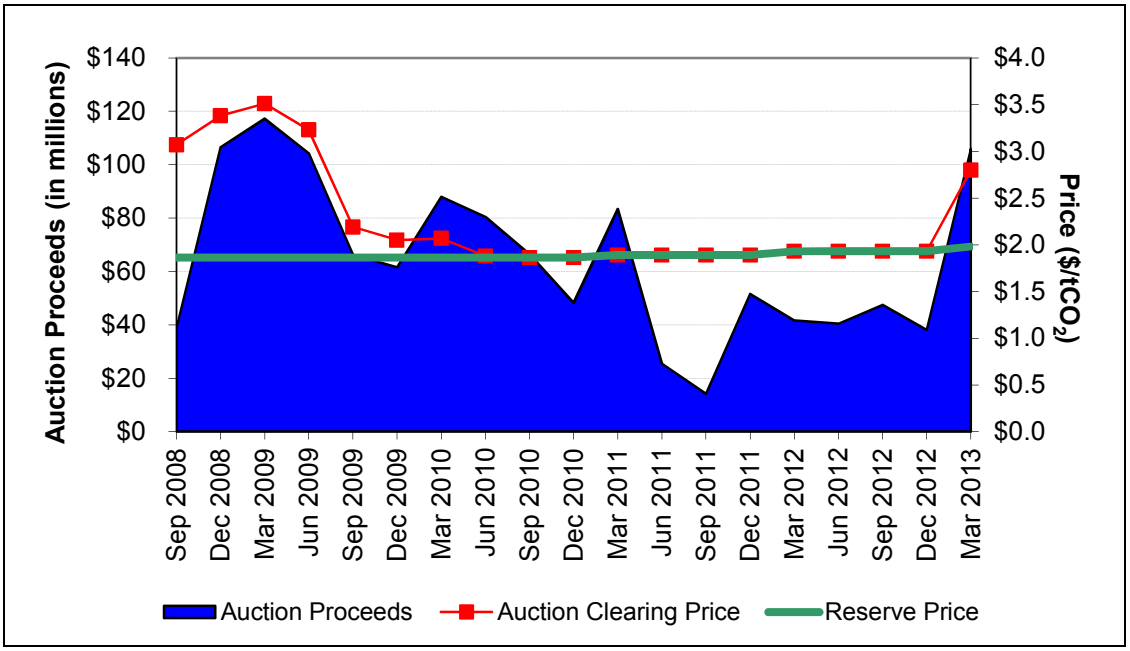
[29] CRS Report R42731, *Carbon Tax: Deficit Reduction and Other Considerations*, by Jonathan L. Ramseur, Jane A. Leggett, and Molly F. Sherlock.

[30] In a cost-effective emissions trading program, the allowance price should mirror (or closely follow) the marginal cost of emission reduction—that is, the cost of reducing the last, most expensive ton. An effective auction should help identify the allowance price that is near to the marginal cost of reduction. See, for example, Charles Holt et al., *Auction Design for Selling CO2 Emission Allowances Under the Regional Greenhouse Gas Initiative*, 2007, prepared for RGGI Working Group staff.

[31] See RGGI allowance allocation data, at http://www.rggi.org/market/co2_auctions/allowance_allocation.

Figure 5. RGGI Auctions: Proceeds and Clearing Prices

September 2008 – March 2013



Source: Prepared by CRS; data from RGGI Inc., at http://www.rggi.org/.

Note: The reserve price has risen from $1.86 in 2008 to $1.98 in 2013.

Emission Allowance Value Distribution

When deciding how to distribute the emission allowance value, policymakers face trade-offs that could have considerable consequences.[32] In both RGGI's 2005 Memorandum of Understanding and subsequent Model Rule,[33] states agreed that at least 25% of emission allowance value would be allocated for a "consumer benefit or strategic energy purpose."[34] As of September 2012, RGGI states (as a group) have more than doubled this minimum commitment. RGGI states have allocated more than 65% of the emission allowance value to support energy efficiency, renewable energy, and other emission reduction efforts.[35]

Allowance value includes revenues generated through allowance auctions or by giving the allowances away at no charge to either covered or non-covered entities. A covered entity recipient could use the allowances for compliance purposes, sell the allowances in the marketplace, or bank the allowances for future use. To realize the value of allowances received, a non-covered entity recipient would need to sell the allowances in the marketplace, either through a broker or directly to a covered entity.

[32] For more discussion of these issues, see CRS Report RL34502, *Emission Allowance Allocation in a Cap-and-Trade Program: Options and Considerations*, by Jonathan L. Ramseur.

[33] RGGI documents are available at http://www.rggi.org/.

[34] See RGGI Model Rule, issued August 15, 2006, p. 42; and RGGI Memorandum of Understanding, Section G(1), signed by participating state governors December 20, 2005.

[35] For details, see *Environment Northeast, RGGI Auction Tracker: State Allocations and Spending Plans*, September 2012.

Table 1 details emission allowance value distribution by state. Of the various objectives, RGGI states (as a group) have contributed the most—61% of allowance value—to support energy efficiency and renewable energy, but the allotments vary considerably by state (**Table 1**). Moreover, RGGI states have demonstrated that allowance value distribution decisions are subject to change. For example, after initially allotting auction proceeds to energy efficiency efforts, several states transferred auction proceeds to address state budget deficits. Environmental groups criticized the actions of these states, but the state policymakers argued that the transfers were necessary.

These developments highlight a cap-and-trade design issue for federal policymakers: how much flexibility (if any) should be built into a strategy to distribute emission allowance value. For example, should crafters include provisions that authorize modifying (without legislation) an enacted distribution approach, perhaps based on specific criteria?

Table 1. Distribution of Emission Allowance Value by State

Includes Auction Revenues and Set-Aside Allowance Value (as of September 2012)

State	Energy Efficiency and/or Renewable Energy	Other Climate Change-Related Efforts	Program Administration	State Budget Deficit Reduction	Free Allocation to Covered Entities	Allocation for Exemptions	Long-Term Power Agreements	Other Purposes
Connecticut	92%	0%	7%	0%	0%	0%	1%	0%
Delaware	46%	6%	6%	0%	27%	16%	0%	0%
Maine	95%	1%	4%	0%	0%	0%	0%	0%
Maryland	43%	8%	3%	0%	0%	9%	4%	32%
Massachusetts	97%	0%	2%	0%	0%	0%	0%	1%
New Hampshire	63%	0%	1%	6%	0%	0%	0%	30%
New Jersey	34%	7%	4%	46%	0%	1%	8%	0%
New York	56%	4%	11%	21%	0%	3%	2%	2%
Rhode Island	95%	0%	5%	0%	0%	0%	0%	0%
Vermont	98%	0%	2%	0%	0%	0%	0%	0%
RGGI Total	61%	4%	6%	13%	1%	3%	3%	9%

Source: Prepared by CRS; data from *Environment Northeast, RGGI Auction Tracker: State Allocations and Spending Plans*, September 2012.

Notes: New Jersey left the program at the end of 2011. The New Jersey data are included for comparison purposes.

The above table includes broad categories created by CRS. The Environment Northeast report provides a more detailed breakdown of emission allowance value distribution.

Offsets

Federal policymakers may be interested in RGGI's treatment of offsets. An offset is a measurable reduction, avoidance, or sequestration of GHG emissions from a source not covered by an emission reduction program.[36] RGGI limits offsets to 3.3% of a source's allowance submission, a relatively low percentage compared to some federal proposals.[37] Under the current framework, RGGI increases this percentage to 5% or 10% if the market price of an allowance exceeds $7 or $10 (in 2005 dollars, adjusted annually), respectively. However, as part of the design review in February 2013, RGGI states proposed to eliminate this provision, due to the proposed Cost Containment Reserve.

RGGI uses a standards approach—as opposed to performance-based system—for developing offsets: projects must satisfy a set of detailed requirements (specific to a project type) and be certified by a third party. In contrast to recent federal proposals, which often allow a wide array of project types, RGGI limits offset projects to five types, which must be located in RGGI states:

- landfill methane reduction;
- sulfur hexafluoride reductions from specific industrial activities;
- planting trees where none were previously growing (afforestation);[38]
- specific energy efficiency projects;
- avoided methane from manure management practices.

Some offset projects raise concerns, because they may not represent real emission reductions. For offsets to be credible, a ton of CO_2-equivalent emissions from an offset project should equate to a ton reduced from a RGGI power plant. If illegitimate offset credits flow into an emissions trading program, the program would fail to achieve its primary goal—emission reduction. In general, the project types allowed in RGGI are considered to be of higher quality in terms of their ability to represent real, verifiable, and permanent emission reductions.[39]

According to the RGGI offsets tracking database, no offset projects have been developed under the RGGI program.[40] This is likely related to the low emission allowance price and the non-constraining emissions cap.

[36] If allowed as a compliance option in a cap-and-trade system, offsets have the potential to provide considerable cost savings and other benefits. However, offsets have generated considerable controversy, primarily over the concern that illegitimate offsets could undermine the ultimate objective of a cap-and-trade program: emission reduction. For more discussion see CRS Report RL34436, *The Role of Offsets in a Greenhouse Gas Emissions Cap-and-Trade Program: Potential Benefits and Concerns*, by Jonathan L. Ramseur.

[37] For example, H.R. 2454 (Waxman-Markey) in the 111th Congress, would have allowed offsets to satisfy 27% of a facility's compliance obligation in 2016.

[38] RGGI states proposed to expand this offset project type to include "reforestation, improved forest management, or avoided conversion."

[39] See CRS Report RL34436, *The Role of Offsets in a Greenhouse Gas Emissions Cap-and-Trade Program: Potential Benefits and Concerns*, by Jonathan L. Ramseur.

[40] See http://www.rggi.org.

Interaction with Federal GHG Emission Regulations

As of the date of this report, EPA has proposed GHG emission regulations for new power plants but not existing power plants.[41] Environmental stakeholders are urging EPA to develop regulations that would apply to existing facilities, an action that would likely generate considerable interest and controversy among policymakers. An issue for both federal and state policymakers is how RGGI's emission program would interact with potential EPA regulations that apply to existing power plants.[42] For example, would RGGI requirements satisfy potential future obligations under federal rules?

Final Thoughts

As a group, the nine RGGI states account for approximately 7% of U.S. CO_2 emissions from energy consumption and 16% of the U.S. Gross Domestic Product (GDP).[43] **Table 2** indicates that RGGI's aggregate emissions rank in the top 20 among nations. But from a practical standpoint, the RGGI program's contribution to directly reducing the global accumulation of GHG emissions in the atmosphere is arguably negligible.

However, when business and industry have confronted a growing patchwork of state requirements, these sectors have historically preferred a national policy. RGGI and other state programs, particularly developments in California, may have some influence on federal policymakers. Note that the combination of RGGI and California CO_2 emissions would account for a substantial portion of U.S. CO_2 emissions (14%) and rank above Germany (**Table 2**).

In addition, RGGI's activities may create examples and/or models that will prove instructive for federal policymakers crafting more widespread applications. Moreover, the program has provided a training ground for personnel from multiple states and various professions to develop a specific expertise in emissions trading issues. This knowledge base would be useful if a federal system were developed.

[41] See CRS Report R41212, *EPA Regulation of Greenhouse Gases: Congressional Responses and Options*, by James E. McCarthy.

[42] See e.g., Franz Litz et al., *What's Ahead for Power Plants and Industry? Using the Clean Air Act to Reduce Greenhouse Gas Emissions, Building on Existing Regional Programs*, World Resources Institute, 2011.

[43] Calculated by CRS using 2011 data from the Bureau of Economic Analysis, at http://www.bea.gov.

Table 2. Top-Ranked Nations, U.S. States, and Selected Groups for CO_2 Emissions from Energy Consumption (2010 Data)

Country, State, or Group	CO_2 Emissions (million metric tons)	Country, State, or Group	CO_2 Emissions (million metric tons)
China	7,997	Canada	547
United States	5,637	United Kingdom	529
European Union	3,940	South Africa	473
Russian Federation	1,642	Saudi Arabia	469
India	1,601	Brazil	451
Japan	1,180	Mexico	432
Germany	793	Australia	424
Texas	653	RGGI (not including New Jersey)	418
South Korea	581	Italy	417
Iran	565	Indonesia	415

Source: Prepared by CRS with data from EIA, International Energy Statistics, Total CO_2 Emissions from the Consumption of Energy, at http://www.eia.gov.

Note: If New Jersey emissions from 2010 are included, the aggregate RGGI emissions are 553 mmtCO_2, approximately 10% of total U.S. CO_2 emissions.

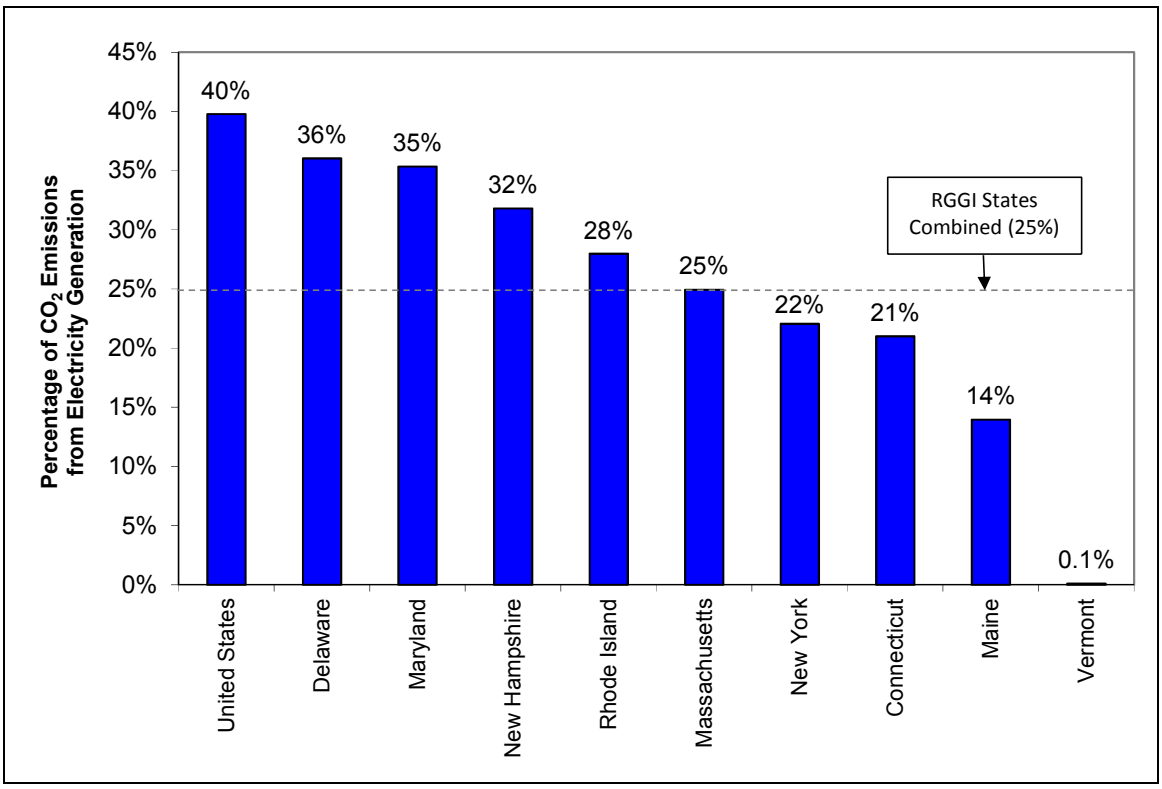
Although the overall economic impacts directly related to RGGI's emissions cap have likely been minimal (because it is currently non-binding), differences among the RGGI states may lead to different economic impacts. The RGGI states differ—in some cases dramatically—by their percentages of total GHG emissions from CO_2 emissions from electricity generation (**Figure 6**). A key factor in these differences is the variance in states' carbon contents of electricity generation. As discussed earlier, electricity comes from an array of energy sources that vary significantly by their ratio of CO_2 emissions per unit of energy produced. States that generate a high percentage of electricity from coal compared to lower carbon alternatives will have a relatively high value for carbon content of electricity. For example, Vermont, which relies almost exclusively on nuclear, hydroelectricity, and renewables for electricity, has a very low carbon content of electricity generation, resulting in minimal CO_2 emissions from electricity generation. In contrast, other states (e.g., Delaware and Maryland) generate more of their electricity through coal combustion. Thus, these states' carbon contents of electricity are substantially higher, leading to higher percentages in **Figure 6**. When the emission cap becomes binding, the price of electricity is likely to increase at a sharper rate in these states. On the other hand, if a state invested in less carbon-intensive energy sources years before RGGI's development, energy consumers in that state may have already encountered economic impacts associated with the transition.

Compared to the entire United States, the nine RGGI states (in aggregate) generate a smaller portion of their GHG emissions from electricity generation (**Figure 6**). Moreover, none of the individual RGGI states exceeds the national figure of 40% (**Figure 6**). This difference is due to several factors. First, RGGI states (as a group) are net importers of electricity. Thus, some of the electricity consumed (about 10%, see **Figure 4**) in RGGI states is generated outside of the region. This reiterates the challenge in addressing GHG emissions from power plants at the state or regional level.

Second, the electricity generation profile of RGGI states (as a group) is less carbon-intensive than the overall United States.[44] Because RGGI states' electricity is relatively low in its carbon intensity, other sector sources of GHG emissions—transportation, industrial, residential, commercial—contribute a relatively larger portion of the region's overall GHG emissions compared to other parts of the country.

Figure 6. Comparison of Percentages of CO_2 Emissions from Electricity Generation

2010 Data



Source: Prepared by CRS; data from EIA, State CO_2 Emissions, at http://www.eia.gov/environment/emissions/state/state_emissions.cfm.

Author Contact Information

Jonathan L. Ramseur
Specialist in Environmental Policy
jramseur@crs.loc.gov, 7-7919

[44] For example, 16% of RGGI's in-state electricity comes from coal and 35% comes from nuclear energy. In the United States as a whole, approximately 44% of electricity is generated from coal and 20% from nuclear energy. See Energy Information Administration data.