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# The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Policy Makers

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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. 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<sub>2</sub>) 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, based on an agreement signed by RGGI governors in 2005.

The results of the RGGI program may be instructive to policy makers. 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. For instance, in 2005, RGGI states generated 33% of their electricity from coal and petroleum, sources of energy with relatively high carbon intensity. In 2013, these sources generated 10% of RGGI's electricity.

To address the disparity between the cap and actual emissions, RGGI states agreed (in 2013) to reduce the existing cap (by 45%) so that the cap level would match actual emissions. The revised cap took effect in January 2014. RGGI's new, more-binding cap may have vastly different effects than its predecessor. It is uncertain how this new development may impact electricity use and prices in the RGGI region and, in turn, the perception and support for the program.

Although actual emissions were ultimately well below the original emissions cap, the cap's existence attached a price to the regulated entities' CO<sub>2</sub> emissions. Because the cap was nonbinding, the allowance price acted like an emissions fee or carbon tax. Although the cap likely had limited *direct* impact on the region's power plant emissions, the revenues generated from the emission allowance sales likely had some impact on emission levels in the region.

Through 2013, RGGI states, as a group, have sold 91% of their emission allowances through quarterly auctions. The auction proceeds—over \$1.8 billion to date—have provided a new source of revenue, which have been used to support various policy objectives. RGGI states (as a group) have contributed the vast majority of the emission allowance value (80%) to support energy efficiency, renewable energy, other climate-related efforts, or electricity consumer assistance. Several RGGI studies indicate that supporting energy efficiency provides multiple benefits: emission reduction, consumer savings via lower electricity bills, and job creation.

As a group, the nine RGGI states account for approximately 7% of U.S. CO<sub>2</sub> 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. To that end, experiences in RGGI may be instructive for policy makers seeking to craft a national program.

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## Introduction

A number of states and local governments have taken actions to address greenhouse gas (GHG) emissions. These efforts cover a wide spectrum, from developing climate action plans to setting mandatory GHG emission standards.<sup>1</sup> One of the most significant climate change developments at the state level is the Regional Greenhouse Gas Initiative (RGGI, pronounced “Reggie”), which is based on an agreement signed by RGGI governors in 2005. RGGI is 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.<sup>2</sup> RGGI currently involves nine states—Connecticut, Delaware, Maine, Maryland,<sup>3</sup> Massachusetts,<sup>4</sup> New Hampshire, New York, Rhode Island, and Vermont.<sup>5</sup>

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 policy makers, 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 subsequent sections discuss selected issues raised by RGGI that may be of interest to policy makers. The final section provides some final observations that may be instructive to policy makers.

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<sup>1</sup> 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>.

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

<sup>3</sup> 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.

<sup>4</sup> 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.

<sup>5</sup> 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<sub>2</sub>-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<sub>2</sub>, 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<sub>2</sub>.

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. Policy makers 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 significant 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<sub>2</sub>) emissions trading system (known as the Acid Rain Program) established by the 1990 amendments to the Clean Air Act.

## RGGI Overview

RGGI is a sector-specific cap-and-trade system that applies to carbon dioxide (CO<sub>2</sub>) emissions from electric power plants<sup>6</sup> with capacities to generate 25 megawatts or more<sup>7</sup>—168 facilities in the 9 RGGI states.<sup>8</sup> 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 CO<sub>2</sub> emissions from covered entities in the RGGI states account for approximately 20% of all GHG emissions in the RGGI states.<sup>9</sup> The vast majority of the remaining GHG emissions comes from fossil fuel combustion in the industrial, commercial, residential, and transportation sectors.

<sup>6</sup> CO<sub>2</sub> emissions account for approximately 99% of all GHG emissions from power plants. In 2012, electricity power plants accounted for 31% of all U.S. GHG emissions. EPA, *2014 U.S. Greenhouse Gas Inventory Report*, April 2014.

<sup>7</sup> 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.

<sup>8</sup> For more details, see RGGI's website at [http://www.rggi.org/design/overview/regulated\\_sources](http://www.rggi.org/design/overview/regulated_sources).

<sup>9</sup> Based on 2011 CO<sub>2</sub> emissions data from RGGI (<http://rggi.org/>), excluding emissions from New Jersey, and 2011 GHG data from the World Resources Institute, Climate Analysis Indicators Tool (CAIT US), at <http://cait2.wri.org>.

RGGI's cap-and-trade program includes many of the design elements that were 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<sub>2</sub> 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.** With some variance among the states, particularly in the early years, a substantial percentage (91%) 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.”<sup>10</sup> Allowance value distributions from RGGI states have exceeded this minimum requirement (discussed below).
- **Cost Containment.** In 2014, RGGI states established a “cost containment reserve” (CCR),<sup>11</sup> which provides additional allowances to be sold at auction if certain price thresholds are met.

## Emissions Cap

Although RGGI is one of the more aggressive state programs addressing GHG emissions, the program's first emission cap exceeded actual emissions since its inception in 2009. As discussed below, this result was unintentional. The first cap never *compelled* regulated entities to make internal emission reductions or purchase emission credits (or offsets).

After a program review in 2012, RGGI states agreed to lower the emissions cap by 45%. This change took effect in January 2014. This section includes a discussion of both the initial emissions cap and the revised emissions cap.

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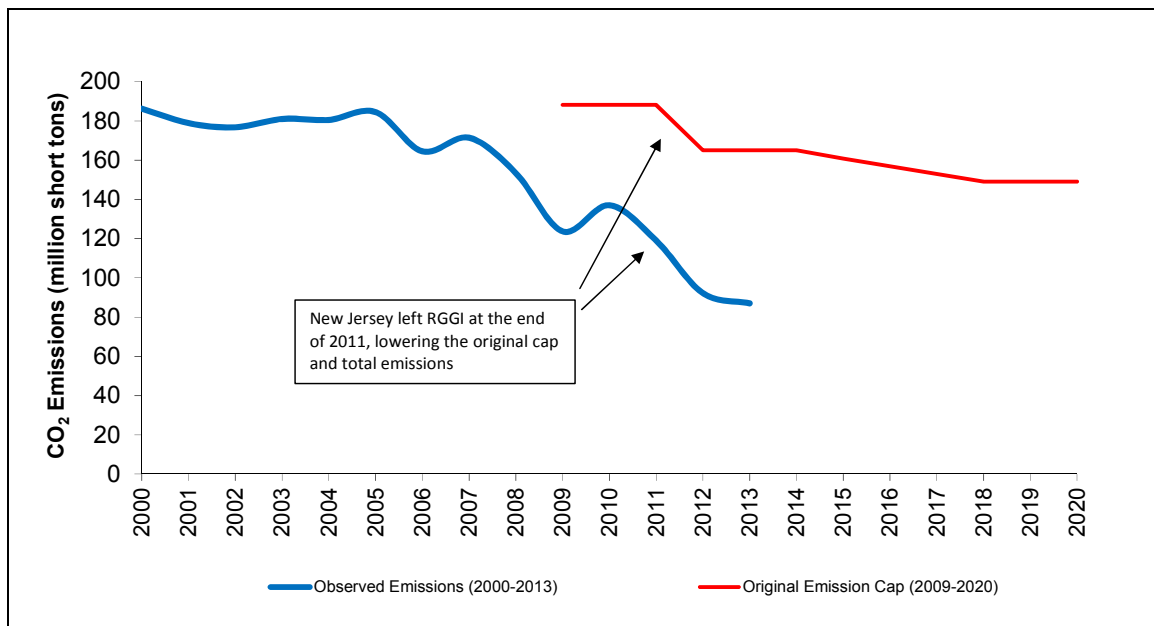
<sup>10</sup> RGGI Memorandum of Understanding (MOU), Section 2 (G)(1), December 5, 2005. Subsequent amendments were made to the MOU, but not to this section.

<sup>11</sup> The CCR replaced other cost containment mechanisms: initially, RGGI provided an additional year to demonstrate compliance if emission allowance prices reach a certain level, and covered entities were able to cover a greater proportion of their emissions with offsets.

## First Emissions Cap: 2009-2013

When the RGGI states crafted the first emissions cap, the initial objective of the cap was to stabilize CO<sub>2</sub> 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. During the emissions cap construction in 2005,<sup>12</sup> 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<sub>2</sub> emissions would gradually increase, so that actual levels would approximately match the cap set for 2009—188 million short tons of CO<sub>2</sub> (mtCO<sub>2</sub>). As illustrated in **Figure 1**, actual emissions did not meet these projections, but decreased substantially.

**Figure 1. Observed Emissions Compared to the Original Emission Cap**



**Source:** Prepared by CRS with data from the following: observed state emission data (2000-2013) provided by RGGI, at <http://www.rggi.org>.

## RGGI Emissions and Electricity Generation

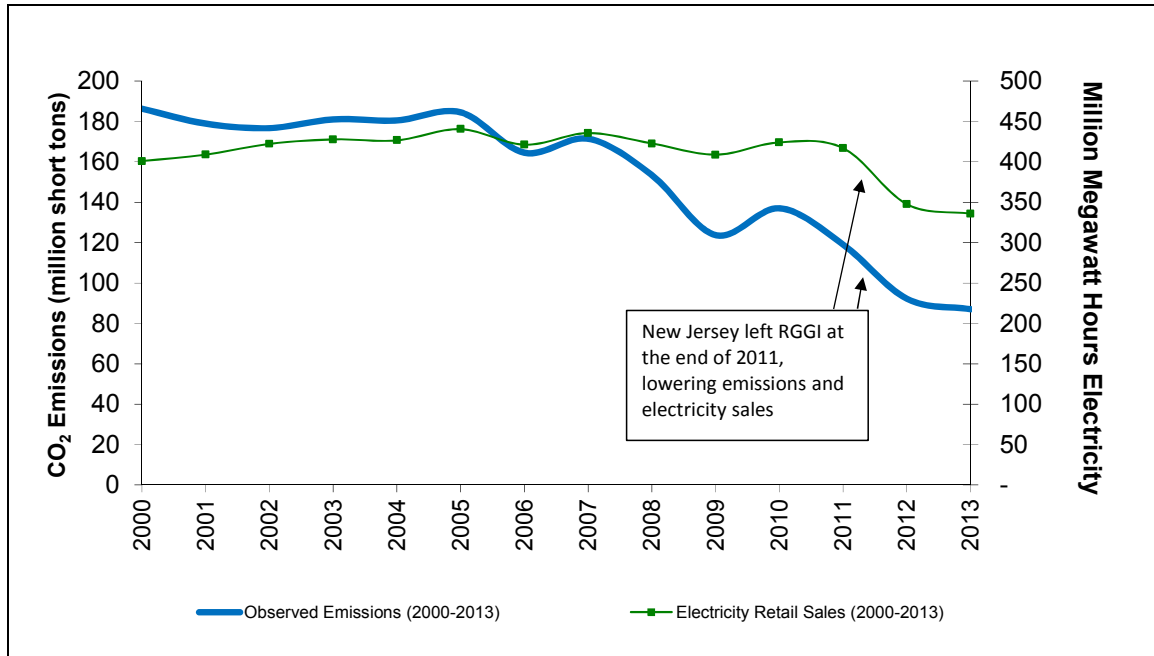
Several studies indicated that the RGGI CO<sub>2</sub> emission decreases (2005-2011) were due (to some degree) to long-term, structural changes, such as changes in RGGI's electricity generation portfolio and energy efficiency improvements.<sup>13</sup> A comparison between the emission decline and

<sup>12</sup> 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.

<sup>13</sup> See RGGI modeling results and analysis at [http://www.rggi.org/design/program\\_review/materials-by-topic/modeling](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 CO<sub>2</sub> Emissions: 2009 Compared to 2005*, Draft White Paper, November 2010; and Environment Northeast, *RGGI Emissions Trends*, June 2010.

electricity use in the RGGI states supports this notion. As **Figure 2** indicates, RGGI electricity retail sales (a proxy for electricity use) decreased by 5% between 2005 and 2011, while CO<sub>2</sub> emissions from in-state electricity generation decreased by 36% during the same period. This disparity suggests that factors others than temporal economic conditions were the primary influence for the CO<sub>2</sub> emissions decrease.<sup>14</sup>

**Figure 2. RGGI Emissions Compared with Electricity Sales**



**Source:** Prepared by CRS with data from the following: observed state emission data (2000-2013) provided by RGGI at <http://www.rggi.org>; electricity sales from Energy Information Administration, Retail Sales of Electricity.

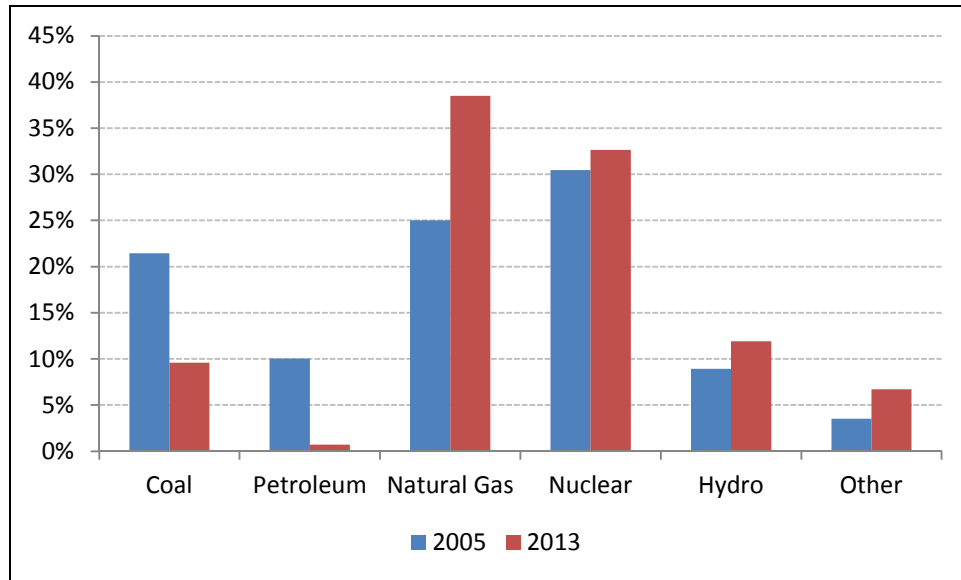
**Figure 3** compares RGGI’s electricity generation portfolio between 2005 and 2013. The figure depicts a substantial decline in carbon intensive electricity generation over that time frame. Electricity is generated from a variety of energy sources, which vary significantly by their ratio of CO<sub>2</sub> emissions per unit of energy. For example, a coal-fired power plant emits almost twice as much CO<sub>2</sub> (per unit of energy) as a natural gas-fired facility.<sup>15</sup> Some energy sources (e.g., hydropower, nuclear, wind, or solar) are generally considered to be zero-emission sources. In 2005, RGGI states generated 33% of their electricity from coal and petroleum, sources of energy with relatively high carbon intensity. In 2013, these sources generated 10% 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. In particular, electricity generation from natural gas increased from 25% to 39% over that time frame.

<sup>14</sup> A comparison using the most recent data (i.e., 2005 vs. 2013) is more complicated because New Jersey left RGGI at the end of 2011. Regardless, such a comparison indicates a similar trend: electricity sales decreased by 24%, while emissions decreased by 53%.

<sup>15</sup> The Energy Information Administration website provides a table listing the amount of CO<sub>2</sub> generated per unit of energy for different energy sources, at <http://www.eia.doe.gov/oiaf/1605/coefficients.html>.



**Figure 3. RGGI States Electricity Generation by Energy Source**  
2005 Compared to 2013



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

**Notes:** The “other” category includes wood and other biomass, wind, solar, and other gases.

The 2005 percentages include New Jersey electricity, but the 2013 percentages do not.

### Impacts of the Original Emissions Cap

Although RGGI’s original emission cap did not *directly* require emission reductions (due to unexpected emission levels, discussed above), the cap still had impacts. First, the cap’s existence attached a price to the regulated entities’ CO<sub>2</sub> emissions. The price was 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.<sup>16</sup>

Second, the cap’s emission allowances were (and continue to be) a new form of currency. The emission allowance 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.<sup>17</sup> One of these studies argues this allowance value distribution strategy (e.g., use of RGGI auction revenue) “creates wider benefit than any other use of allowance value.”<sup>18</sup> As discussed below, such efforts play a role in determining the effectiveness of the program.

<sup>16</sup> New York State Energy Research and Development Authority (prepared for RGGI Inc.), *Relative Effects of Various Factors on RGGI Electricity Sector CO<sub>2</sub> Emissions: 2009 Compared to 2005*, Draft White Paper, November 2010.

<sup>17</sup> See RGGI Inc., *Investment of Proceeds from RGGI CO<sub>2</sub> Allowances*, February 2011 and Environment Northeast, *Economy-wide Benefits of RGGI: Economic Growth through Energy Efficiency*, March 2011.

<sup>18</sup> Environment Northeast, *Economy-wide Benefits of RGGI: Economic Growth through Energy Efficiency*, March (continued...)

## Revised Emissions Cap (2014-2020)

Following a 2012 design review of the RGGI program,<sup>19</sup> the RGGI states agreed to substantially reduce the emissions cap from 165 mtCO<sub>2</sub> to 91 mtCO<sub>2</sub>. RGGI designers based the new cap level (91 mtCO<sub>2</sub>) on their projection of 2012 emissions. The emission projection was fairly accurate, as actual 2012 emissions were 92 mtCO<sub>2</sub>.

The revised cap took effect in January 2014. The emissions cap will decrease each year by 2.5% between 2015 and 2020. RGGI states have not established a cap beyond 2020.

In addition, RGGI states decided to adjust the new cap further to account for the substantial amount of banked emission allowances held by RGGI entities between 2009 and 2013.<sup>20</sup> In 2014, RGGI designers determined that these banked emissions accounted for 140 mtCO<sub>2</sub>, a considerable amount when compared to the 91 mtCO<sub>2</sub> emission cap of 2014. Thus, the cap adjustments, which are applied each year between 2014 and 2020, are considerable. In some years, the adjustments lower the cap more than 20 mtCO<sub>2</sub>, equating to 28% decrease.

**Figure 4** illustrates (1) the observed emissions between 2000 and 2013; (2) the original emissions cap (2009-2013); and (3) the revised emissions cap (2014-2020), which includes the 2014 adjustments. The figure suggests that the revised (and adjusted) emissions cap will likely have a different impact on the RGGI states than the original emissions cap. For example, the more stringent cap has led to substantially higher emission allowance prices, as discussed below.

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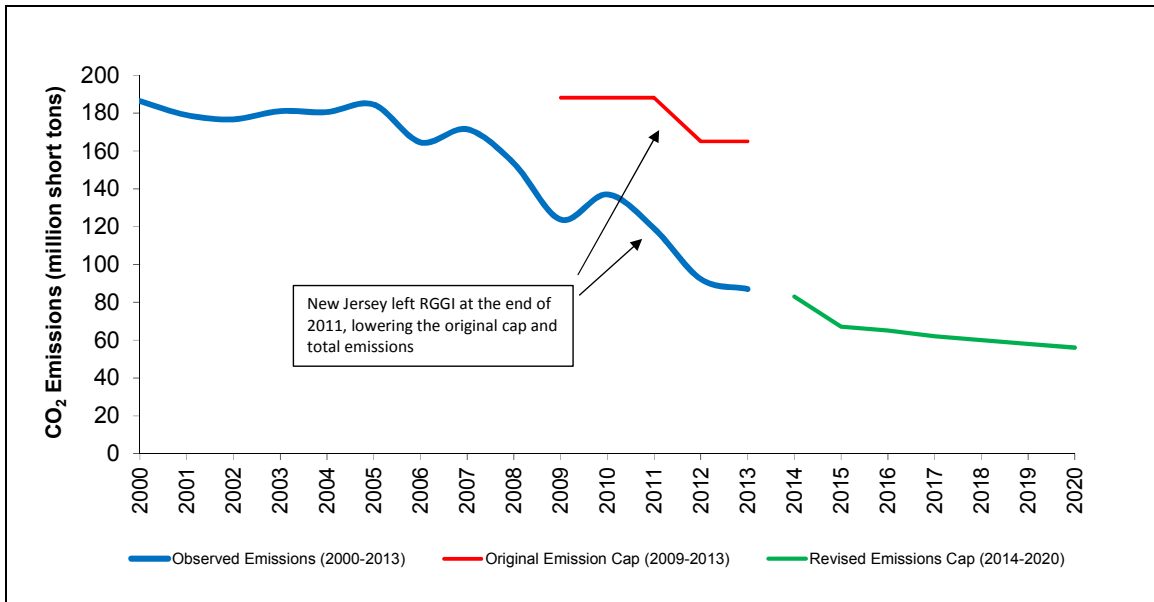
(...continued)

2011.

<sup>19</sup> In its original Memorandum of Understanding (December 20, 2005), RGGI states agreed to conduct a “comprehensive review” of the RGGI program in 2012.

<sup>20</sup> Between 2009 and 2013, the emissions cap exceeded 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 4. Observed Emissions Compared to the Original and Revised Emission Caps**



**Source:** Prepared by CRS; projected emission data from RGGI modeling results, available at [http://www.rggi.org/design/program\\_review](http://www.rggi.org/design/program_review).

## Emission Allowance Value Distribution

When designing a cap-and-trade program, one of the more controversial and challenging questions for policy makers is how, to whom, and for what purpose to distribute the emission allowances. In general, RGGI states have answered the “how question” by employing auctions to distribute the vast majority of allowances.<sup>21</sup> Perhaps the more important question for policy makers is what to do with the emission allowance value—in the case of RGGI, allowance value predominately means auction revenues.

Allowance value includes revenues generated through allowance auctions or by giving the allowances away at no charge to either covered or noncovered 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 noncovered entity recipient would need to sell the allowances in the marketplace, either through a broker or directly to a covered entity.

### Allowance Auctions

As a group, the RGGI states offered 91% of their budgeted emission allowances at auction between 2008 and 2013. Some of the offered allowances were not sold and were subsequently

<sup>21</sup> The percentage of allowances sold at auction has varied by state, particularly in the early years when some states chose to provide a proportion of free allowances to covered entities.

retired. Other allowances were sold at fixed prices or distributed to various entities to support a variety of objectives.<sup>22</sup>

RGGI's auctions may be of particular interest to Congress, because this approach was part of several proposed cap-and-trade systems from former Congresses.<sup>23</sup> Each RGGI auction is conducted in one round with a sealed-bid, uniform price format.<sup>24</sup> 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.

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 2008, increasing to \$2.00 in 2014.<sup>25</sup> 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.

The RGGI program has held 25 auctions as of the date of this report. In general, many have viewed the auctions as successful in terms of price discovery,<sup>26</sup> transparency, transaction costs, and other logistical issues.

Another typical measure of auction success is revenue generation. After 25 auctions, the cumulative proceeds total over \$1.8 billion. **Figure 5** illustrates the auctions' results. As the figure indicates, 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.<sup>27</sup> During this period, the reserve price acted like an emissions fee or carbon tax.<sup>28</sup> As discussed below, the revenue

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<sup>22</sup> See RGGI "Allowance Allocation" at <http://rggi.org/market/tracking/allowance-allocation>.

<sup>23</sup> See, e.g., CRS Report R40556, *Market-Based Greenhouse Gas Control: Selected Proposals in the 111<sup>th</sup> Congress*, by Larry Parker, Brent D. Yacobucci, and Jonathan L. Ramseur.

<sup>24</sup> For information on other auction formats, see Charles Holt *et al.*, *Auction Design for Selling CO<sub>2</sub> Emission Allowances Under the Regional Greenhouse Gas Initiative*, 2007, prepared for RGGI Working Group staff.

<sup>25</sup> The reserve price is scheduled to increase by 2.5% each year after 2014.

<sup>26</sup> 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 CO<sub>2</sub> Emission Allowances Under the Regional Greenhouse Gas Initiative*, 2007, prepared for RGGI Working Group staff.

<sup>27</sup> See RGGI allowance allocation data, at [http://www.rggi.org/market/co2\\_auctions/allowance\\_allocation](http://www.rggi.org/market/co2_auctions/allowance_allocation).

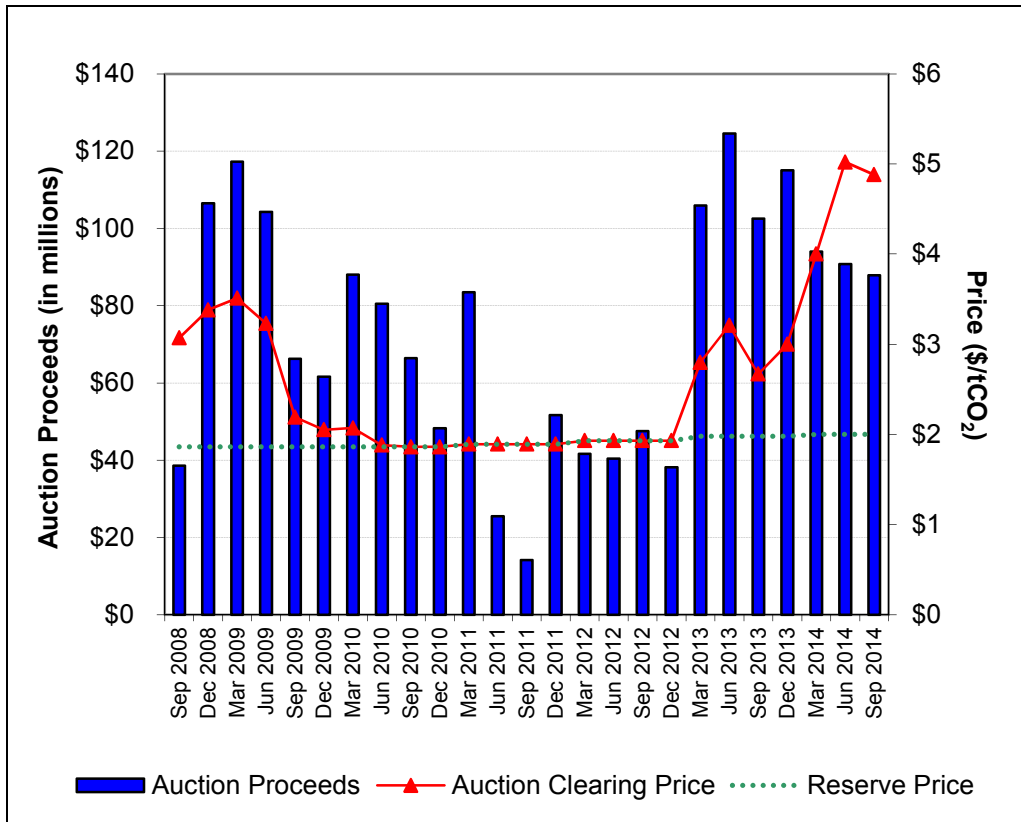
<sup>28</sup> CRS Report R42731, *Carbon Tax: Deficit Reduction and Other Considerations*, by Jonathan L. Ramseur, Jane A. Leggett, and Molly F. Sherlock.

raised by the auctions may lead to emission reduction by supporting energy efficiency and renewable energy projects.

However, in 2013, the auction results changed dramatically, reflecting upcoming changes in the RGGI program. Following the February 2013 proposal to substantially reduce the emissions cap in 2014, the clearing prices began to exceed the reserve prices (**Figure 5**). The past two auctions have resulted in clearing prices of approximately \$5/ton, a dramatic increase from prices in 2012.

**Figure 5. RGGI Auctions: Proceeds and Clearing Prices**

September 2008-September 2014



**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 \$2.00 in 2014.

## Allowance Value Distribution

When deciding to whom or for what purpose to distribute the emission allowance value, policy makers face trade-offs that could have considerable consequences.<sup>29</sup> In both RGGI’s 2005 Memorandum of Understanding and subsequent Model Rule,<sup>30</sup> states agreed that at least 25% of emission allowance value would be allocated for a “consumer benefit or strategic energy

<sup>29</sup> 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.

<sup>30</sup> RGGI documents are available at <http://www.rggi.org/>.

purpose.”<sup>31</sup> As of June 2013, estimates indicate that RGGI states (as a group) have more than doubled this minimum commitment, allocating more than 70% of the emission allowance value to support energy efficiency, renewable energy, energy consumer assistance, and other climate change efforts.<sup>32</sup>

**Table 1** provides estimates of auction revenue value distribution by state from Auction 1 (September 2008) through Auction 20 (June 2013). As mentioned above, RGGI auction revenues have accounted for approximately 90% of emission allowance value. As the table indicates, 50% of the revenues have been (or will be) allocated to support energy efficiency activities or renewable energy; 14% to support other climate change-related activities; and 16% to provide assistance to energy consumers.

The figures in the table also demonstrate that allowance value distribution decisions are subject to change. For example, after initially allotting auction proceeds to energy efficiency efforts, several states (New Jersey and New York) transferred auction proceeds to address state budget deficits. Environmental groups criticized the actions of these states, but the state policy makers argued that the transfers were necessary.

These developments highlight a cap-and-trade design issue for federal policy makers: 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?

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<sup>31</sup> 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.

<sup>32</sup> Based on the percentage of allowances sold at auction (RGGI allowance allocation data, at [http://www.rggi.org/market/co2\\_auctions/allowance\\_allocation](http://www.rggi.org/market/co2_auctions/allowance_allocation)) and estimates of state allocation of auction revenues (*Environment Northeast, RGGI Auction Tracker: State Allocations and Spending Plans*, June 2013).

**Table I. Estimated Allocation of Auction Proceeds by Category**

Auction 1 – Auction 20 (June 2013), Millions of Dollars

State	Energy Efficiency and/or Renewable Energy	Other Climate Change-Related Efforts	Consumer Assistance	Program Administration	State Budget Deficit Reduction	Other Purposes
Connecticut	74			6		
Delaware	31	4		4		
Maine	40	0.2		1.6		
Maryland	67	21	181	9		
Massachusetts	171		43	4		
New Hampshire	49			1	3	
New Jersey	44	10		5	65	
New York	179	160		64	90	7
Rhode Island	20			0.7		
Vermont	10			0.2		
<b>Total</b>	<b>685</b>	<b>195</b>	<b>224</b>	<b>96</b>	<b>158</b>	<b>7</b>
<b>Percentage of total revenues</b>	<b>50%</b>	<b>14%</b>	<b>16%</b>	<b>7%</b>	<b>12%</b>	<b>1%</b>

**Source:** Prepared by CRS; data from *Environment Northeast, RGGI Auction Tracker: State Allocations and Spending Plans*, June 2013.

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

New York’s \$64 million in “program administration” includes state government activities, RGGI administrative costs, and RGGI program evaluation. In 2009, New York transferred \$90 million in RGGI auction proceeds to the General Fund “to improve New York’s long-term fiscal health.” See New York State Energy Research and Development Authority, “Use of Auction Proceeds,” at <http://www.nyserda.ny.gov/Energy-and-the-Environment/Regional-Greenhouse-Gas-Initiative/Auction-Proceeds.aspx>.

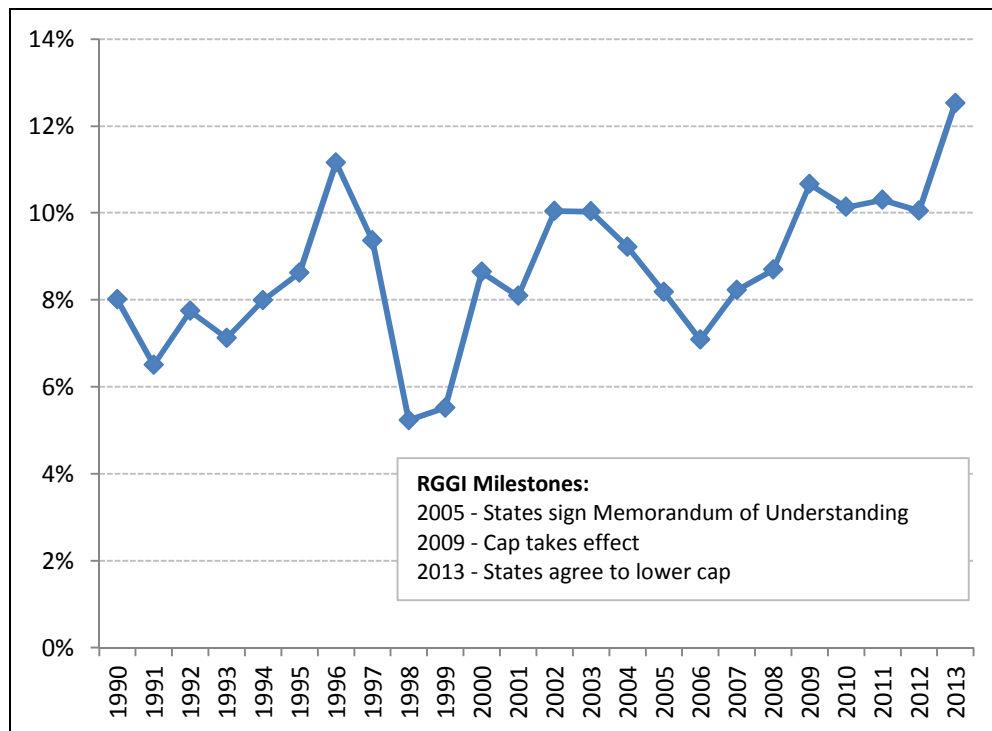
New Jersey left the program at the end of 2011. The New Jersey data are included for comparison purposes.

## Emissions Leakage

A critical design detail—electricity imports from non-RGGI states—remains unresolved, presenting an opportunity for “emissions leakage.” Emissions leakage 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 in **Figure 6**, the percentage of electricity imported (compared to electricity sales) in the RGGI states has fluctuated over time. Between 1990 and 2005, the percentage of imported electricity ranged from 5% to 11%. Over the past five years, the percentage of imported electricity has remained on the high end of this range. In 2013, the percentage increased to 13%, the highest observed to date. This recent increase correlates with the increase in emission allowance prices in RGGI auctions (**Figure 5**).

**Figure 6. Imported Electricity as a Percentage of Electricity Sales in RGGI States 1990-2013**



**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.

New Jersey data are included between 1990 and 2011, but excluded in 2012 and 2013.



Emissions leakage can occur if imported electricity replaces RGGI in-state electricity generation, because emissions from in-state electricity are covered under the cap; 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 in 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.<sup>33</sup> After its 2012 Program Review, RGGI participants seemed to reach a similar conclusion, stating that

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 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.<sup>34</sup>

With the onset of the revised emissions cap in 2014, emissions leakage may receive further attention in the near future, especially if the percentage of imported electricity remains relatively high, compared to historical levels.

## Offsets

Federal policy makers 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.<sup>35</sup> RGGI limits offsets to 3.3% of a source's allowance submission, a relatively low percentage compared California's cap-and-trade system<sup>36</sup> and some federal proposals.<sup>37</sup> Under RGGI's original Model Rule (2009-2013), the offset ceiling percentage could increase 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 replaced this provision with the new Cost Containment Reserve, discussed below.

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

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<sup>33</sup> 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>.

<sup>34</sup> RGGI, *RGGI 2012 Program Review: Summary of Recommendations to Accompany Model Rule Amendments*, February 2013, at <http://www.rggi.org/design/program-review>.

<sup>35</sup> 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.

<sup>36</sup> California's cap-and-trade program allows entities to use offsets to cover up to 8% of their allowance submission (Section 95854 of California's cap-and-trade regulations, at <http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm>).

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

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;
- forest sequestration projects,<sup>38</sup> including afforestation,<sup>39</sup> reforestation,<sup>40</sup> improved forest management, and avoided forest conversion;
- specific energy efficiency projects; and
- 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<sub>2</sub>-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.

Regardless, according to the RGGI offsets tracking database, no offset projects have been developed under the RGGI program.<sup>41</sup> This is likely related to the low emission allowance price and the nonconstraining emissions cap.

## Cost Containment

As part of the 2012 design review, RGGI states decided to alter the cost containment provisions in the RGGI program. Under the original Model Rule (2009-2013), potential cost concerns were addressed by allowing for the use of additional offsets if emission allowance prices reached specific levels. The revised Model Rule, which took effect in 2014, eliminated this approach and added a cost containment reserve (CCR) to the cap-and-trade system. The CCR provides additional allowances—5 million in 2014 and 10 million each year thereafter—if certain price thresholds are met during one of the quarterly allowance auctions:

- \$4/ton in 2014;
- \$6/ton in 2015;
- \$8/ton in 2016; and
- \$10/ton in 2017, increasing 2.5% each year thereafter.

The March 2014 auction triggered (**Figure 5**), for the first time, RGGI's cost containment reserve, which allowed for the sale of an additional 5 million allowances, all of which were purchased. Unlike some allowance reserve systems in other programs and proposals,<sup>42</sup> allowances from CCR are not borrowed from future years, thus effectively increasing the cap if triggered.

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<sup>38</sup> Under the original Model Rule, only afforestation projects were allowable.

<sup>39</sup> In general, this activity refers to planting trees where none were previously growing.

<sup>40</sup> In general, this activity refers to planting trees on former forest sites that were recently cleared.

<sup>41</sup> See <http://www.rggi.org>.

<sup>42</sup> For example, H.R. 2454 (“Waxman-Markey”) in the 111<sup>th</sup> Congress included a “strategic reserve” of allowances borrowed from future years. The reserve would be triggered at particular price points. California’s cap-and-trade (continued...)

## Interaction with Federal GHG Emission Regulations

An issue for both federal and state policy makers is how RGGI's emission program would interact with EPA proposed regulations that apply to existing power plants. On June 18, 2014, the Environmental Protection Agency (EPA) published in the *Federal Register* a proposed rulemaking<sup>43</sup> under Section 111(d) of the Clean Air Act.<sup>44</sup> The proposal would establish CO<sub>2</sub> emission guidelines for states to use when developing plans that address CO<sub>2</sub> emissions from existing fossil fuel-fired electric generating units.<sup>45</sup>

Although EPA's proposed rule measures state compliance in terms of a CO<sub>2</sub> emissions rate, EPA allows states considerable flexibility in terms of meeting its emissions rate goals. For example, EPA's new regulations would allow states to meet their CO<sub>2</sub> emissions rate goals using mass-based reduction programs such as cap-and-trade systems. Moreover, states can meet their goals individually or collaborate with other states to create (or use existing) multistate plans. EPA provides states with additional time to prepare multistate plans.

Regardless, it is uncertain whether the scope and stringency of the RGGI program would be sufficient to meet the targets in EPA's proposed rule. First, RGGI's existing emission cap stops at 2020. Second, the new CCR has the potential to provide up to 10 million tons of additional allowances each year, making an analysis more challenging.

## Final Observations

The nature of the RGGI program changed significantly in 2014. Comparing the first five years of RGGI (2009-2013) to the existing program is an apples-to-oranges exercise. The RGGI states significantly altered their emissions cap in 2014, and this new cap may have vastly different effects than the original emissions cap. Note, for example, the most recent emission allowance auction clearing prices cited above. It is uncertain how this new development may impact electricity use and prices in the RGGI region and, in turn, the perception and support for the program.

As a group, the nine RGGI states account for approximately 7% of U.S. CO<sub>2</sub> emissions from energy consumption and 16% of the U.S. Gross Domestic Product (GDP).<sup>46</sup> **Table 2** indicates that RGGI's aggregate emissions rank in the top 20 among nations. But from a practical standpoint,

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(...continued)

system has a similar mechanism. More information is available at <http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm>.

<sup>43</sup> 79 *Federal Register* 34830, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units," June 18, 2014.

<sup>44</sup> 42 U.S.C. §7411(d).

<sup>45</sup> For more background on the statutory authority, history, and legal and administrative processes involving this rulemaking, see CRS Report R43572, *EPA's Proposed Greenhouse Gas Regulations for Existing Power Plants: Frequently Asked Questions*, by James E. McCarthy et al.

<sup>46</sup> Calculated by CRS using 2013 data from the Bureau of Economic Analysis, at [http://www.bea.gov/newsreleases/regional/gdp\\_state/gsp\\_newsrelease.htm](http://www.bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm).

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 policy makers. Note that the combination of RGGI and California CO<sub>2</sub> emissions (729 million metric tons) would account for a substantial portion of U.S. CO<sub>2</sub> emissions (14%) and rank above South Korea (**Table 2**).

In addition, RGGI's activities may create examples and/or models that will prove instructive for federal policy makers 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.

**Table 2. Top-Ranked Nations, U.S. States, and Selected Groups for CO<sub>2</sub> Emissions from Energy Consumption (2011 Data)**

Country, State, or Group	CO <sub>2</sub> Emissions (million metric tons)	Country, State, or Group	CO <sub>2</sub> Emissions (million metric tons)
China	8,127	Canada	552
United States	5,483	Saudi Arabia	551
Europe	4,348	United Kingdom	488
India	1,753	Brazil	477
Russian Federation	1,710	South Africa	472
Japan	1,200	Indonesia	450
Germany	784	Mexico	446
Texas	656	Australia	426
South Korea	650	Italy	412
Iran	594	9 RGGI states	383

**Source:** Prepared by CRS with data from EIA, International Energy Statistics, Total CO<sub>2</sub> Emissions from the Consumption of Energy, and State CO<sub>2</sub> Emissions, at <http://www.eia.gov>.

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