

A Pioneering Approach to Carbon Markets

How the Northeast States Redefined Cap and Trade for the Benefit of Consumers



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Acknowledgements

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This report reflects the analysis and judgment of the authors only and does not necessarily reflect the views of the foundations, Ms. Burt, or any of the reviewers. This report and companion video are available at www.mjbradley.com.

M.J. Bradley & Associates

MJB&A, founded in 1994, is a strategic consulting firm focused on energy and environmental issues. The firm includes a multi-disciplinary team of experts with backgrounds in economics, law, engineering, and policy. The company works with private companies, public agencies, and non-profit organizations to understand and evaluate environmental regulations and policy, facilitate multi-stakeholder initiatives, shape business strategies, and deploy clean energy technologies.

Foreword

It was almost 15 years ago now that George Pataki, Governor of New York, invited his colleagues in the Northeast to develop a cooperative, regional strategy to reduce carbon dioxide emissions from power plants. His goal: (1) increase the region's energy security by reducing dependence on imported fuels; (2) improve local air quality; and (3) stem the growth of greenhouse gas emissions. The letter was short and to the point, launching a collaborative public policy debate and a multi-year stakeholder process, involving both energy and environmental regulators, alike.

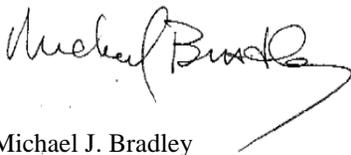
Cooperative efforts among states are by no means new. States have often been at the forefront of public policy development in the United States, taking on new challenges and testing new ideas, but the Regional Greenhouse Gas Initiative or "RGGI", as it would later be known, stands apart as a unique example of successful, bipartisan cooperation.

Consistent with the Governor's initial call to action, the RGGI program is market-based, allowing flexible compliance options and allowance trading, similar to prior air pollution control programs. But what truly sets the RGGI program apart, was the decision by the participating states to auction emission allowances and dedicate the bulk of the allowance value to consumer benefit programs. This was groundbreaking. RGGI was breaking tradition with every prior emissions trading program, both in the U.S. and Europe. So how and why did the states arrive at this decision?

This report, *A Pioneering Approach to Carbon Markets*, and the interviews captured in the companion video, examine the history of the RGGI development process and the innovative design choices adopted by the states. The paper is based on an extensive review of archived RGGI program design materials, and interviews with key stakeholders and policymakers involved in the formative years of the RGGI program. The video interviews capture first-hand accounts of the thinking that went into the RGGI program design.

There were strong skeptics of the program, when the auction was first proposed. However, the fairness and transparency of the program, along with the local economic benefits that the investment of the auction proceeds deliver every year, has won over many if not all of the skeptics. As a program that continues to influence the region's energy choices, we felt it was important to capture and document this history.

Given the passage of time, many state leaders have inherited the RGGI program without having participated in these formative debates. We hope that this report, and the companion video, will shed light on the thinking that shaped the original program design. Others, outside of the Northeast, might also draw lessons from the RGGI experience.



Michael J. Bradley
President of M.J. Bradley & Associates LLC

Executive Summary

In 2009, ten Northeast states launched the Regional Greenhouse Gas Initiative (known as “RGGI”), to reduce emissions of carbon dioxide (“CO₂”) from existing and new power plants. RGGI was a groundbreaking effort on multiple fronts.

RGGI is a pragmatic, market-based approach launched by a group of states to tackle carbon emissions and accelerate investment in energy efficiency and clean energy.

The cap-and-trade approach had been used to control other air pollutants, but RGGI was the first cap-and-trade program in the United States to limit CO₂ emissions from power plants. What was innovative and groundbreaking about RGGI was that the states opted to sell carbon allowances through an auction, rather than give them to industry for free.¹ That way they could invest the auction proceeds directly back into the states to benefit consumers.

Since the program’s inception, the RGGI states have sold nearly all emission allowances on a quarterly schedule through a regional auction platform administered by a third party. Each state has developed its own custom plan to invest the bulk of auction proceeds into the following areas: energy efficiency, renewable energy, bill assistance, and other consumer benefit programs.

These programs are spurring innovation in the clean energy economy, reducing CO₂ emissions, and creating employment opportunities in the RGGI states. After more than six years of RGGI implementation, retrospective analysis suggests that the RGGI states have achieved significant economic benefits from the investment of auction proceeds. Across the RGGI region, GDP increased by eight percent as emissions fell by 45 percent.

The decision by a bipartisan coalition of states to auction allowances was aimed at maximizing benefits for Northeast residents, businesses and consumers.

The novel choice by the states to auction allowances in RGGI was motivated by a number of factors. Chief among them was the recognition that the program created a new commodity in the form of emissions allowances with substantial financial value. The decision the RGGI states faced was who would receive the allowance value—the affected generators *or* electricity ratepayers.

Given the restructured electricity markets in the RGGI region, generators would include the value of the allowance in their market bid prices (increasing wholesale electricity prices) regardless of whether allowances were initially distributed at no cost or auctioned.² Furthermore, evidence was offered suggesting that if states used the allowance value for consumer benefit through investments in energy efficiency, this would reduce demand for electricity, reduce emissions, and reduce customer bill impacts.

¹ Under the RGGI program, allowances are permits that allow the release of one ton of CO₂ to the atmosphere. The number of allowances in circulation is limited under a cap-and-trade program to enforce the emissions cap.

² This is a common point of confusion in understanding the economics of a cap-and-trade program. In a competitive power market, fossil-fired power plants will reflect the cost of allowances in their market bid prices even if they receive them for free because of their “opportunity cost”. This is rational economic behavior. An economist explaining the concept of opportunity cost, might ask would you give away a bar of gold simply because you received it for free. For the power plant operator, to not reflect the cost of allowances in their market bid price (i.e., in the wholesale price of electricity) would be to give them away for free.

As auction proceeds are invested by the states in energy efficiency, renewables, and consumer benefit programs, these investments reduce overall energy demand and reduce emissions while lowering consumer and business electricity bills -- propelling a cycle of ongoing benefits.

Ultimately, the auction decision came from extensive input from diverse stakeholders (state leaders, advocates, industry, and consumers) and collaboration on the best way to implement RGGI and benefit the most people. Program development was based on multi-year negotiations among energy and environmental regulators on program design, a robust stakeholder process, and targeted economic analyses on the impacts of allowance allocation on electric generating companies, electricity markets, prices and ultimately consumers.

RGGI has won over even skeptics and the auction decision has been recognized by experts as the most important and innovative design choice the states made.

While neither the RGGI states nor stakeholders had an expectation at the outset that there would be a substantial allowance auction, all of the states have come to embrace the approach to capture the allowance value for consumers who pay the bulk of program costs through their electricity rates. In addition, many have come to see the auction approach as the most efficient method of releasing allowances into the market without picking winners and losers.

As the RGGI program moves forward, the auction has evolved into a widely accepted approach even among affected electric generating companies and other market participants. Stakeholders, across the spectrum, view the RGGI allowance auctions as a transparent and fair process. In addition, a robust secondary market for allowances has also emerged, providing market participants with opportunities to buy and sell allowances.

RGGI has now held four quarterly auctions every year since 2009 that have generated over \$2.6 billion in revenue for the states to invest in their jurisdictions. Strategic expenditures in energy efficiency, renewable energy, other greenhouse gas reduction programs and education/worker training also result in broad economic benefits throughout the region. Comprehensive program reviews conclude that several energy efficiency and renewable energy programs in the RGGI states show \$3-\$4 in benefits for every \$1 invested.³

This report details the chronology, historical context, stakeholder process, and analysis that influenced the decision-making processes of those involved in the development of the multi-state RGGI program and the all-important decision to auction rather than allocate allowances.

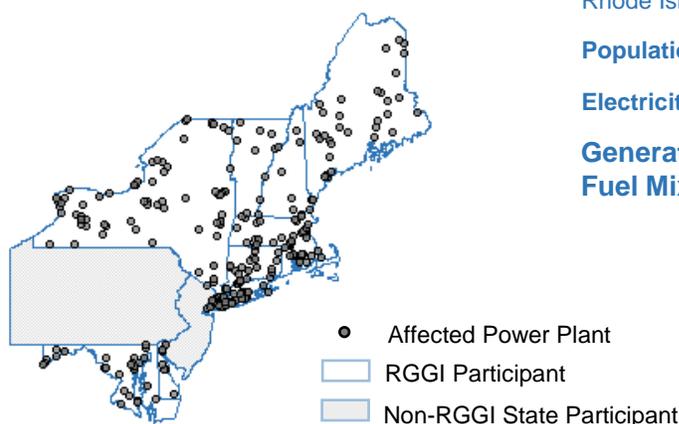
³ Hibbard P. et. al., The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States. Review of the Use of RGGI Auction Proceeds from the First, Three-Year Compliance Period, November 15, 2011.

RGGI Background

The RGGI program regulates emissions from fossil fuel-fired power plants with a capacity of 25 megawatts (MW) or greater located within the RGGI States (CO₂ budget sources). The RGGI Program's first compliance period started January 1, 2009.⁴ CO₂ budget sources are required to surrender CO₂ allowances equal to their CO₂ emissions. The participating states established the overall regional cap and individual state budgets at the outset of the program and each state determines their preferred approach for distributing allowances.⁵

Figure 1 The RGGI Program and Region

Regional Greenhouse Gas Initiative Participating States



Source: RGGI Inc., MJB&A Analysis

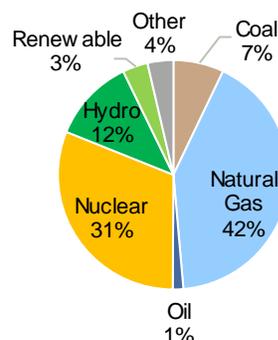
Key Statistics

Participating States: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont

Population: 41.5 million

Electricity Sales: 342 terawatt-hours

Generation Fuel Mix: 2015

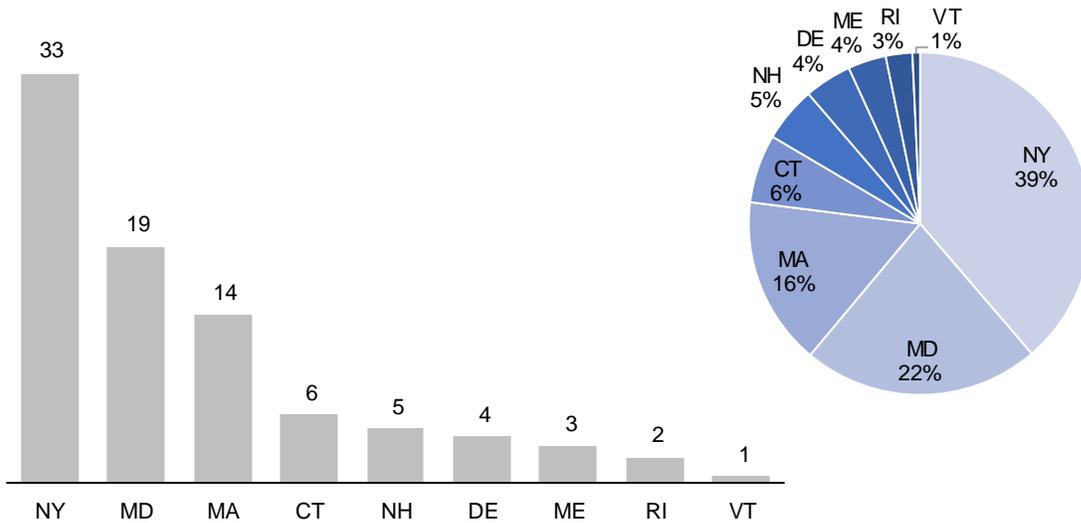


⁴ The first RGGI CO₂ allowance auctions were held in September 2008, in advance of the start of the first compliance period.

⁵ RGGI states include Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. New Jersey was a participant in RGGI from 2009-2011 but exited the program beginning in 2012.

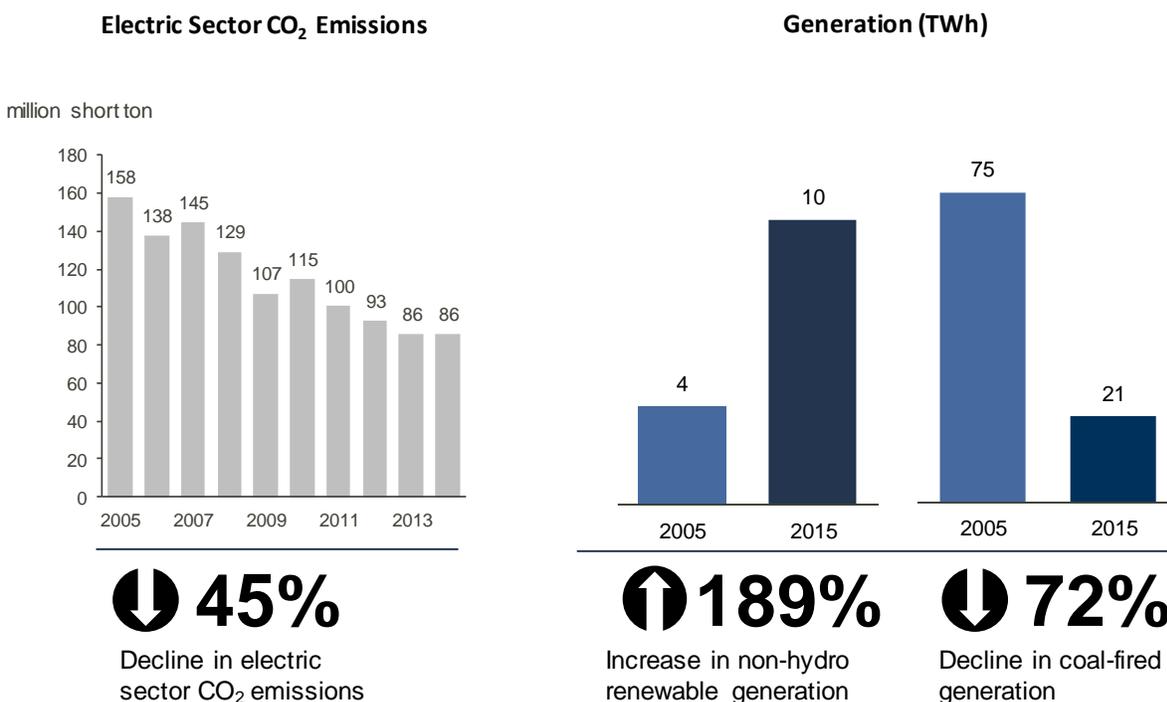
See Figure 2 for the 2016 RGGI state allowance budgets. Regulated entities can use allowances issued by any state, and most allowances are distributed through a central regional allowance auction. In this way, the program is a single integrated market for CO₂ allowances with a transparent market price.

Figure 2 2016 Allowance Budgets by State (million allowances, % of total annual allowances)



Following a comprehensive 2012 Program Review, the nine RGGI states implemented a new 2014 RGGI cap of 91 million short tons. The RGGI cap then declines 2.5 percent each year from 2015 to 2020 equaling 78 million short tons in 2020. RGGI states are currently in the midst of the 2016 program review, discussing the possibility of reducing the CO₂ cap further post 2020, among other potential design element changes.

Figure 3 Electric Sector CO₂ Emission Reductions: Historic Trends and Changes in Fuel Mix



In the RGGI states, CO₂ emissions from the electric power sector have declined by 45 percent since 2005. In addition to the RGGI cap-and-trade program, additional factors have contributed to this trend including economic factors, fossil fuel prices, decreased energy demand and increased supplies of zero and low carbon emitting resources.

Source: EIA, MJB&A Analysis

Under each state’s CO₂ Budget Trading Program, regulated power plants are required to have a monitoring system in place to collect, record and report CO₂ emissions which they submit to EPA. The RGGI states also established the RGGI CO₂ Allowance Tracking System (“RGGI COATS”), the platform that records and tracks emissions and allowance data for the program. RGGI COATS also facilitates market participation by enabling the allocation, award, and transfer of CO₂ allowances. Regulated entities have three years (called “control periods”) to amass allowances in an amount equal to their cumulative emissions over that period.⁶ Entities can also bank allowances indefinitely, though no borrowing of allowances from future years is allowed.

In addition to allowances, a power plant can also use offsets (reduction of GHG emissions outside the electric sector), created through five protocols, to cover up to 3.3 percent of its total compliance

⁶ Sources are required to surrender allowances to cover 50 percent of emissions from the first two calendar years of each three-year control period (called “interim control periods”). The final compliance true-up at the end of the three-year control period requires sources to hold allowances to cover the remaining balance of emissions from the first two calendar years and 100 percent of the emissions for the third year of the compliance period.

obligation; however, to date, no offsets have been issued.⁷ Finally, in 2014, RGGI introduced a cost containment reserve (CCR); an added supply of allowances that are made available to the market through the auctions if allowance prices exceed pre-set price levels (increasing in price from \$4 to \$11 between 2014 and 2020).

RGGI states distribute a majority of allowances through regional quarterly auctions that are open to all parties, including compliance entities, non-profits, corporations, and individuals. The revenues from these auctions are returned to states (in proportion to their individual allowance budgets) and invested in “strategic energy and consumer programs.” These include renewable energy, energy efficiency, greenhouse gas abatement, and customer bill assistance. A small portion of the funds are used to fund the regional entity - Regional Greenhouse Gas Initiative, Inc. (RGGI, Inc.).⁸ In addition, a small fraction of allowances are placed in state-run set-asides.



⁷ Current offset protocols are: (1) landfill methane (CH₄) capture and destruction; (2) sulfur hexafluoride (SF₆) emissions reduction from power transmission; (3) CO₂ sequestration from afforestation projects per U.S. Forest Projects Offset Protocol; (4) CO₂ reductions from end-use energy efficiency; and (5) CH₄ abatement from agricultural manure management operations.

⁸ RGGI, Inc. is a 501(c)(3) non-profit corporation. RGGI, Inc.'s exclusive purpose is to provide administrative and technical services to support the development and implementation of each RGGI State's CO₂ Budget Trading Program.

RGGI Program Development

In April 2003, New York Governor George Pataki invited nine other northeast states to develop a regional CO₂ cap-and-trade program for power plants. Governors from Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont agreed to collaborate directly while the Governors from Pennsylvania and Maryland agreed to participate as observers to the process. Representatives from the region's environmental and energy regulatory agencies began monthly meetings in September 2003 to discuss, research and analyze information and potential program design recommendations.

April 24, 2003

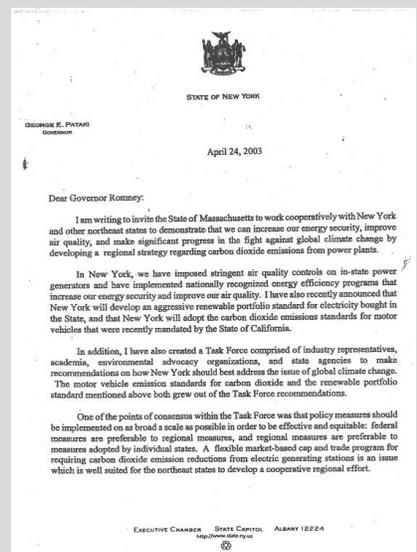
Dear Governor Romney:

"I am writing to invite the State of Massachusetts to work cooperative with New York and other northeast states to demonstrate that we can increase our energy security, improve air quality, and make significant progress in the fight against global climate change by developing a regional strategy regarding carbon dioxide emissions from power plants.

I am hopeful that you will agree that a regional approach presents an effective and equitable means to begin control carbon pollution from power plants. It is therefore suggested that we make it our mutual objective over the next two years to develop a cooperative program which will achieve meaningful reductions in carbon dioxide from power plants."

Very truly yours,

George Pataki



An excerpt from the letter former New York Governor George Pataki wrote to former Massachusetts Governor Mitt Romney inviting him to join with New York and other Northeast states to form a regional program to reduce carbon emissions.

The starting point for states in approaching the design of RGGI were the existing cap-and-trade programs: the federal Acid Rain Program and NOx Budget Trading Programs. The Acid Rain Program was established under Title IV of the 1990 Clean Air Act (CAA) Amendments and required reductions of sulfur dioxide (SO₂) and nitrogen oxides (NOx), the primary precursors of acid rain, from the power sector. The NOx Budget Trading Program was a cap-and-trade program that began in 2003 to reduce the regional transport of NOx emissions from power plants and other large combustion sources in the eastern United States.⁹ The program reduced NOx emissions during the summer months, contributing significantly to improvements in ozone air quality. States, electric generating companies and NGOs were very familiar with these programs, and the programs had a successful track record.

In both the Acid Rain and NOx Budget Programs, EPA distributed virtually all of the allowances to power plant operators at no cost. Allowances were distributed among companies based on their historic

⁹ The NOx Budget Program, under the NOx SIP Call, replaced the Ozone Transport Commission (OTC) NOx Budget Program which was implemented from 1999 to 2002.

emissions or share of electricity generation. In addition, there was experience with small allowance set asides to incentivize energy efficiency and renewable energy projects that avoided emissions from the capped sources. However, there was no precedent for a substantial allowance auction in either program.¹⁰

Stakeholder Process

In January of 2004, the states launched a multi-year stakeholder process that sought input from power companies, electricity consumers, and environmental advocates throughout the RGGI region. The objective of the regional stakeholder process was to present analysis undertaken by the states and their contractors, and obtain feedback and input on program design issues. In addition, several states carried out individual state stakeholder processes to discuss the RGGI program design.

The whole process was overseen by public utility commission and environmental agency commissioners. This approach was unique in that it was the first time environmental and energy regulators collaborated on the design of a cap-and-trade program. The involvement of utility commissioners and their staff was extremely valuable given the relatively recent utility restructuring and move towards competitive electric generating markets in the RGGI region. Staff from the state energy and environmental agencies led the stakeholder process and shaped the analytical work.

“When the governors got us all in the room to work on this we discovered we really liked working with one another and can solve a lot of problems if you want to solve them...even if they’re tough.” – David Littell, Regulatory Assistance Project

Energy Modeling

To assist the RGGI states in their decision-making process, an outside consultant conducted economic modeling using a dispatch model known as the Integrated Planning Model (IPM®). IPM® is widely used for policy and regulatory analysis and integrated resource planning.¹¹ The IPM model runs consisted of a reference case, several policy cases and sensitivity scenarios including alternative demand forecasts, fuel prices, and other key parameters. This energy modeling effort provided a projection of the region’s future fuel mix, energy prices, emissions and allowance prices through 2020 under different CO₂ cap scenarios and emission trajectories.¹² This process assisted both the RGGI states and stakeholders in selecting a cap level and cost containment mechanisms. It also helped the RGGI states to understand the potential market impacts of the program.

¹⁰ The Acid Rain SO₂ trading program includes a small annual auction (for price discovery purposes), but the majority of allowances have been allocated at no cost. Virginia and Kentucky both auctioned NO_x budget set-aside allowances.

¹¹ IPM® provides integration of wholesale power, system reliability, environmental constraints, fuel choice, transmission, capacity expansion, and all key operational elements of generators on the power grid in a linear optimization framework. Versions of IPM® have been used to support the U.S. Environmental Protection Agency's (EPA) analyses of utility air emissions, and the Federal Energy Regulatory Commission (FERC) benefit-cost analysis of regional transmission organizations (RTO).

¹² RGGI IPM Modeling runs are available on the RGGI website <http://www.rggi.org/design/history/modeling>

One of the most important design questions in an emissions trading program is how to initially distribute the emissions allowances. Three approaches have been typically considered: (1) distribute allowances at no cost based on historic metrics such as emissions or fuel use (i.e., grandfathering); (2) distribute allowances at no cost based on current, updating metrics such as electricity generation, emissions, or heat input (i.e., updating allocation); and (3) sell allowances through an auction.

Economic Studies on Allowance Allocation

In deciding how to distribute the RGGI allowances, researchers from Resources for the Future (RFF) conducted several modeling and economic studies on the allowance allocation options available to the states.¹³ These studies were instrumental in educating state leaders, policymakers, non-governmental organizations (NGOs), and industry on allowance allocation issues. In their research, RFF used a detailed simulation model of the electricity sector to evaluate historic, updating and auction approaches to allowance allocation. RFF examined the social cost of the RGGI program and the effects of different approaches on the net present value of generation assets inside and outside the RGGI region. The analysis found that initial distribution of allowances has an effect on electricity price, consumption, and the mix of technologies used to generate electricity.

Several key conclusions and takeaways resonated with stakeholders and the states as they weighed alternative approaches to allowance allocation. **First, the CO₂ allowances created by the program have a substantial value, many times greater than the costs of compliance. Second, due to electricity deregulation in the Northeast, allowance costs would be reflected in the wholesale electric market prices bid in by electric generators regardless of whether they were auctioned or distributed at no cost. Third, electric generators would see an increase in revenue with a price on carbon and in the aggregate would be better off than in the absence of the program.** As a result, every generator in the RGGI region will benefit from the increase in wholesale electricity market clearing prices due to the price of CO₂ allowances. According to the RFF analysis, “depending on a firm’s power plant portfolio of emitting and non-emitting sources, some firms will see an increase in revenue associated with the RGGI cap-and-trade program. A free allocation will only add to these gains.”¹⁴

Workshop Learning Sessions

NGOs and think tanks hosted workshop learning sessions on key topics including electricity markets, allowance allocation and apportionment of emissions budgets.¹⁵ The workshops consisted of

¹³ Resources for the Future studies included: CO₂ Allowance Allocation in the Regional Greenhouse Gas Initiative and the Effect on Electricity Investors, Dallas Burtraw, Karen L. Palmer, and Daniel B. Kahn, January 31, 2006. Available at <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-05-55.pdf>

Simple Rules for Targeting CO₂ Allowance Allocations to Compensate Firms: Dallas Burtraw, Karen L. Palmer, and Daniel B. Kahn, June 6, 2006. Available at <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-06-28.pdf>

¹⁴ Ibid

¹⁵ Sponsoring organizations of these learning sessions included Pew Center on Global Climate Change, Resources for the Future, World Resources Institute, Regulatory Assistance Project, ISO New England, New York ISO, and PJM. More information on the workshops is available on the RGGI website http://rggi.org/design/history/topical_workshops

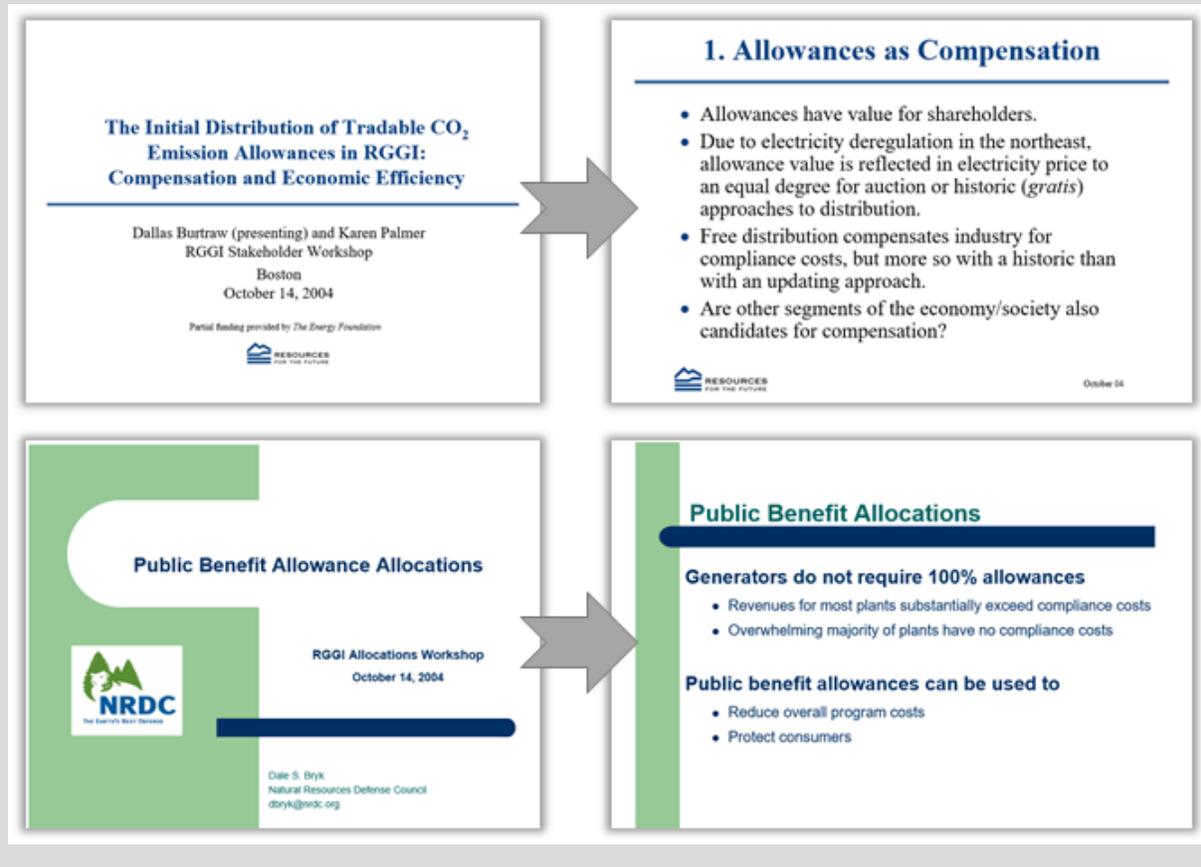
presentations by experts followed by questions and discussions and were invaluable to the states and stakeholders alike. Two key workshops occurred in Fall 2004, the Workshop on Allocations & Apportionment of State Emissions Budgets and the Workshop on Electricity Markets, Reliability & Planning. An additional RFF workshop on allowance auctions took place in summer of 2006 (see below).

During the RFF workshop, economists presented the results of their modeling research and recommended two criteria for evaluating alternative allocation schemes: (1) economic efficiency (i.e., minimizing compliance costs and avoiding price distortions); and (2) distributional equity (i.e., who pays the costs of the program). Based on their modeling, RFF ranked the auction approach highest in terms of economic efficiency. A direct, fixed allocation was ranked slightly lower while an updating, all source allocation was ranked lowest in terms of economic efficiency. This outcome is driven by the model's predicted effect on electricity prices. An auction and fixed allocation were predicted to have the same effect on electricity prices (i.e., a 4% increase). An updating allocation would yield a lower price increase, according to RFF's model (i.e., a 1.4% increase). RFF found similar increases in non-RGGI state CO₂ emissions under the three allocation alternatives. Their modeling found that for every 100 tons of CO₂ reductions within the RGGI region, there are 37 tons of CO₂ emissions increases in neighboring states, a dynamic known as "leakage".¹⁶

It was at this allocation workshop that the Natural Resources Defense Council (NRDC) suggested that RGGI states establish a Public Benefit Allocation to fund consumer rebates, energy efficiency programs, and low income protection programs. Like an auction, CO₂ allowances would be sold to the electric generating sector, in this case by a third party entity in a position to deliver the public benefit programs (e.g., NYSERDA or Load Serving Entities). NRDC suggested that electric generators do not require 100% of allowances because revenues for most plants will substantially exceed compliance costs and an overwhelming majority of plants have no compliance costs.

¹⁶ The Initial Distribution of Tradable CO₂ Emission Allowances in RGGI: Compensation and Economic Efficiency, Dallas Burtraw and Karen Palmer. RFF's presentation is available here http://rggi.org/docs/burtraw_pres_10_14_04.pdf

At the RGGI Workshop on Allocations & Apportionment of State Emissions Budgets, RFF economists shared the results of their economic analysis and NRDC began making the case for a “public benefit” allowance allocation.



REMI Macroeconomic Modeling

The stakeholder process also included an examination of the economic impacts of various RGGI policy options. Using the Regional Economic Model or REMI, researchers projected that RGGI would have small positive impacts on the region’s economy—generally within two-hundredths of 1 percent change in economic indicators. The modeling also evaluated the retail price impacts of the program based on the conversion of IPM[®] wholesale price changes. The projected direct electricity cost impacts due to RGGI were estimated to range from 0.3 percent to 0.6 percent in 2015, resulting in a bill increase in the range of \$3-\$16 per average household annually in 2015.¹⁷ The modeling indicated that investment in end-use energy efficiency would produce an overall positive economic impact across the RGGI region—on the order of two- to three-hundredths of 1 percent for Gross Regional Product (GRP), Personal Income, and Employment.¹⁸

¹⁷ REMI RGGI modeling results are available here http://rggi.org/docs/remi_stakeholder_presentation_11_17_05-final.ppt

¹⁸ Ibid

RGGI Memorandum of Understanding and Model Rule

Following less than two years of stakeholder meetings (January 2004 - December 2005), energy and economic modeling, and independent studies, the Governors signed a Memorandum of Understanding (MOU) in December 2005.¹⁹ The MOU provides the outlines of RGGI, including the framework for a cap-and-trade model rule. The MOU did not actually call for an auction of allowances. Rather, the MOU contained language stipulating that 25 percent of each state’s allowances would be allocated for “consumer benefit or strategic energy purposes”.

*Consumer benefit or strategic energy purpose includes the use of allowances to “promote energy efficiency, to directly mitigate electricity ratepayer impacts, to promote renewable or non-carbon-emitting energy technologies, to stimulate or reward investment in the development of innovative carbon emissions abatement technologies with significant carbon reduction potential, and/or to fund administration of this Program.”*²⁰

The MOU otherwise left the allowance allocation decision to the states. However, the states began to discuss approaches for the “consumer benefit allocation” simultaneously as they worked to develop the RGGI Model Rule in 2006. The Model Rule provided a model set of regulations detailing the proposed program, as outlined in the MOU.²¹

In July 2006, RFF convened a stakeholder workshop to provide technical assistance to the RGGI states as they evaluated approaches to allocate the strategic energy purposes and consumer benefit allocation. The workshop consisted of RGGI stakeholders, state officials and auction experts.²² Auction experts presented an overview of auction theory and design, and representatives from the Federal Communication Commission (FCC), Ireland’s Environmental Protection Agency, and the Commonwealth of Virginia presented on their experiences and lessons learned with auctions.^{23, 24, 25} It also provided the opportunity for industry stakeholders to voice concerns with an auction approach including alignment with electricity

¹⁹ The MOU led to the development of the RGGI program. Until the signing of the MOU, there was no commitment from the states to launch the program. The original RGGI MOU was signed by Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont. Massachusetts, Rhode Island and Maryland signed at later dates. The original RGGI MOU, and subsequent amendments, are available here <http://rggi.org/design/history/mou>

²⁰ RGGI MOU.

²¹ The RGGI Model Rule, and subsequent amendments, are available here http://rggi.org/design/history/model_rule

²² All workshop presentations are available on the RGGI website here http://rggi.org/design/history/topical_workshops

²³ Presentation of Evan Kwerel, Federal Communications Commission, is available here http://rggi.org/docs/kwerel_presentation_7_20_06.ppt

²⁴ Presentation of Ken Macken, Ireland EPA, is available here http://rggi.org/docs/macken_presentation_7_20_06.ppt

²⁵ Presentation of Dr. William Shobe, UVA, is available here http://rggi.org/docs/shobe_presentation_7_20_06.ppt

markets. The workshop concluded with insights on how best to proceed in designing a CO₂ allowance auction in RGGI, should the states choose to use auctions to allocate the public benefit set-aside.²⁶

“This was an opportunity to show that state government could partner with markets on a solution. Even more important, we could show that we could do it as a region.” – Former Massachusetts Governor Deval Patrick

By August 2006, the states had developed the RGGI Model Rule which translated the MOU into model regulatory language for state adoption through legislative and regulatory means as necessary. The Model Rule did not specify allowance auction provisions. Rather, it notes that “allocation provisions will vary from state to state, provided at least 25 percent of the allocations will go to a consumer benefit or strategic energy purpose”.²⁷

Allowance Auction Decision Process

Once states agreed to devote a minimum share of the allowances for “strategic energy purposes and consumer benefit,” they quickly progressed, in most states, to an allowance auction as the most efficient way to monetize the allowances. In addition, due to effective advocacy efforts, support for the auction from large electricity consumers in the region, as well as several leading electric utilities, states moved beyond the minimum allocation towards a 100 percent allowance auction in most cases.²⁸ **Perhaps the most compelling argument in favor of the auction was the opportunity to invest the proceeds in energy efficiency programs to mitigate the overall costs of the program to consumers.**

Stakeholder Viewpoints

Leading environmental organizations, including the Natural Resources Defense Council, Environment Northeast (now Acadia Center), and Pace Energy and Climate Center were strong supporters of the establishment of a “public benefit allocation”. This position was largely based on the assumption that the electric generating sector in the Northeast will enjoy “windfall profits” as a result of the CO₂ cap and receiving allowances for free. In addition, they advocated for investment of the auction proceeds in energy efficiency and low carbon technologies as a means to reduce the electricity price impacts on consumers, reduce GHG emissions and create clean energy jobs. The organizations stressed that the restructured electricity markets created a new dynamic that did not exist in prior cap-and-trade programs, which was further justification for a different approach to allowance allocation under RGGI for the benefit of consumers. Leveraging RFF’s research, they impressed upon the states three core themes: allocated for free or sold at auction – generators would pass the costs of the program on to consumers through wholesale power prices; the value of the allowances should be provided to consumers since they bear the brunt of the costs; and re-investment of the auction proceeds in energy efficiency and renewable

²⁶ Summary of the Workshop to Support Implementing the Minimum 25 Percent Public Benefit Allocation in the Regional Greenhouse Gas Initiative, Dallas Burtraw and Karen Palmer, September 2006. The summary is available here <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-06-45.pdf>

²⁷ Ibid

²⁸ Several states phased in the allowance auction or included set asides and direct allocation to address specific circumstances in their states.

energy will reduce demand for electricity, reduce emissions and reduce the price impacts of the program on consumers.

Power plant owners were generally opposed to substantial allowance auction, or comparable mechanisms. Industry was familiar with prior cap-and-trade programs for NOx and SO₂. They understood how to manage their allowances holdings, leveraging them to finance pollution control equipment and fuel switching for compliance. There was concern that establishing a CO₂ cap while neighboring states remain unregulated created competitive concerns for power generators, especially because the RGGI region spans multiple power markets, including PJM. Power plant owners contended that an auction or large set-aside of allowances would only aggravate these concerns, creating further economic disadvantages for power companies in the RGGI region. Furthermore, industry was highly skeptical that any “windfall” would be generated if allowances were allocated at no cost. Industry was also concerned of other auction market participants that could exert market power in the allowance market. In addition, power plant owners were skeptical that state governments would invest the auction proceeds as intended given competing economic and political dynamics at the time. Alternatively, industry advocated for an allocation at no cost – similar to past cap and trade programs.

Large energy consumers supported an allowance auction approach. This was a crucial stakeholder group in the RGGI states. For example, Multiple Intervenors, an unincorporated association of 53 large industrial, commercial, and institutional end-use energy consumers with facilities throughout New York State, was concerned that RGGI would “drive up energy costs for end-use consumers”.²⁹ They advocated that the cost-impacts to end-use electric consumers be mitigated to the maximum extent possible by auctioning all of the RGGI allowances and applying all of the proceeds from such auctions as a per-kilowatt hour (“kWh”) credit to retail electric distribution rates within the RGGI states.³⁰ Similarly, the Connecticut Industrial Energy Consumers advocated that Connecticut should “mitigate the impact of RGGI on the price of electricity by auctioning all of the RGGI air emissions allowances, to the maximum extent possible, and utilizing all of the auction proceeds as a credit on retail electricity consumers’ bills on a kilowatt-hour basis”.³¹

In addition to large energy consumers, leading utilities, such as National Grid, supported the auction approach. National Grid submitted a white paper to the RGGI process on allowance allocation which stated that “for most generators and their shareholders, a free allocation of emission allowances will be a windfall, providing substantial additional profit in instances when wholesale electric price increases more than offset the added cost of emission allowances”.³² The whitepaper notes that “selling the allowances and using the proceeds to reduce rates paid by consumers will have the least potential for the RGGI program to have negative economic consequences for the region”.³³

²⁹ Multiple Intervenor’s comments are available here <http://rggi.org/docs/mi.pdf>

³⁰ Ibid

³¹ Connecticut Industrial Energy Consumers’ comments are available here http://rggi.org/docs/ciec_comments.pdf

³² National Grid White Paper on Allocation of Emission Allowances for the Regional Greenhouse Gas Initiative, Cliff W. Hamal and Alan L. Madian, September 2005. Available here http://rggi.org/docs/white_paper_9_20_05.pdf

³³ Ibid

State Leadership

As states began their legislative and regulatory processes to adopt the RGGI Model Rule, it became clear that an allowance auction was the preferred approach. In May 2006, the Vermont Legislature passed legislation requiring that 100 percent of the allowances be allocated to trustees “acting on behalf of consumers”.³⁴ Prior to the end of 2006, New York committed to auction all of its allowances. The approach gained traction following a New York staff recommendation to auction the consumer benefit allocation. New York leadership concluded that if the state was going to auction 25 percent of the allowances it should auction all of the allowances. Massachusetts, led by Governor Deval Patrick, was the next state to commit to auction all of its allowances in early 2007. Once New York and Massachusetts made the decision other states followed. As states moved forward to adopt their CO₂ cap-and-trade programs, state legislatures became involved with most of the legislative action occurring in 2007-2008.

Auction Design

Following commitments from several RGGI states to auction allowances, in March 2007, NYSDERDA engaged a research team led by University of Virginia (UVA) and RFF to evaluate regional auction design options and make recommendations to the RGGI states. This research provided recommendations to the RGGI states on auction design which the states used to develop a final RGGI auction design framework.

Auction Study

The research team used mock auctions in a laboratory setting to test the performance of a number of auction formats in addition to analysis of academic literature, lessons learned from other commodity auctions and other experiences with allowance auctions. The outcome of this research provided recommendations that enabled the RGGI states to jointly implement and administer a regional auction platform.³⁵ The recommendations were developed to meet key criteria, including the following: economic efficiency; deter collusive behavior by bidders; provide clear market price signals; result in low administrative costs; be perceived as fair, transparent and simple; and minimize price volatility. In addition, the auction should raise revenue and be compatible with electricity and energy markets.³⁶

³⁴ Act 123, approved May 2, 2006. Vermont does not have a covered RGGI CO₂ Budget Source.

³⁵ Auction Design for Selling CO₂ Emission Allowances Under the Regional Greenhouse Gas Initiative, Charles Holt and William Shobe, University of Virginia; Dallas Burtraw and Karen Palmer, Resources for the Future; Jacob Goeree, California Institute of Technology, October 2007. https://www.rggi.org/docs/rggi_auction_final.pdf

³⁶ Ibid

The final auction design study was released in October 2007, providing the following recommendations:

- There should be a joint and uniform auction for allowances sold from all RGGI states and allowances should be completely identical notwithstanding the state of origin.
- The RGGI auction should use a sealed-bid, uniform-price auction format, and the clearing price for the auction should be the value of the highest rejected bid.
- Separate auctions should be held for allowances issued in different years. Allowances for future years should be made available four years in advance of their vintage to assist generators in their planning for future investments.
- Auctions should be held quarterly. On each auction day, one auction should be held for a portion of current-year allowances and one auction for a portion of allowances for a future year.
- Reserve prices should be used at each auction. No bids under the reserve price should be accepted.
- Unsold allowances could be rolled into a contingency reserve account, and released into a future auction if the auction price rises above the first offset trigger price. Alternatively, unsold allowances could be rolled into the subsequent auction.
- RGGI should announce the auction clearing price, the identity of winners and the quantity they won. However, information about specific bids should be kept private, particularly prices, and the identity of losing bidders should not be revealed.
- Auctions should be open to anyone able to meet financial pre-qualification, but no single entity should be able to purchase (or take a beneficial interest in) more than 33% of the allowances for sale in any auction.
- RGGI should require that the authorized account representatives be obliged to disclose the party sponsoring or benefiting from the agent's activities in the allowance market if it was other than themselves or their immediate employer.
- RGGI market monitoring efforts should take advantage of existing monitoring activities by federal and state agencies and other interested parties.

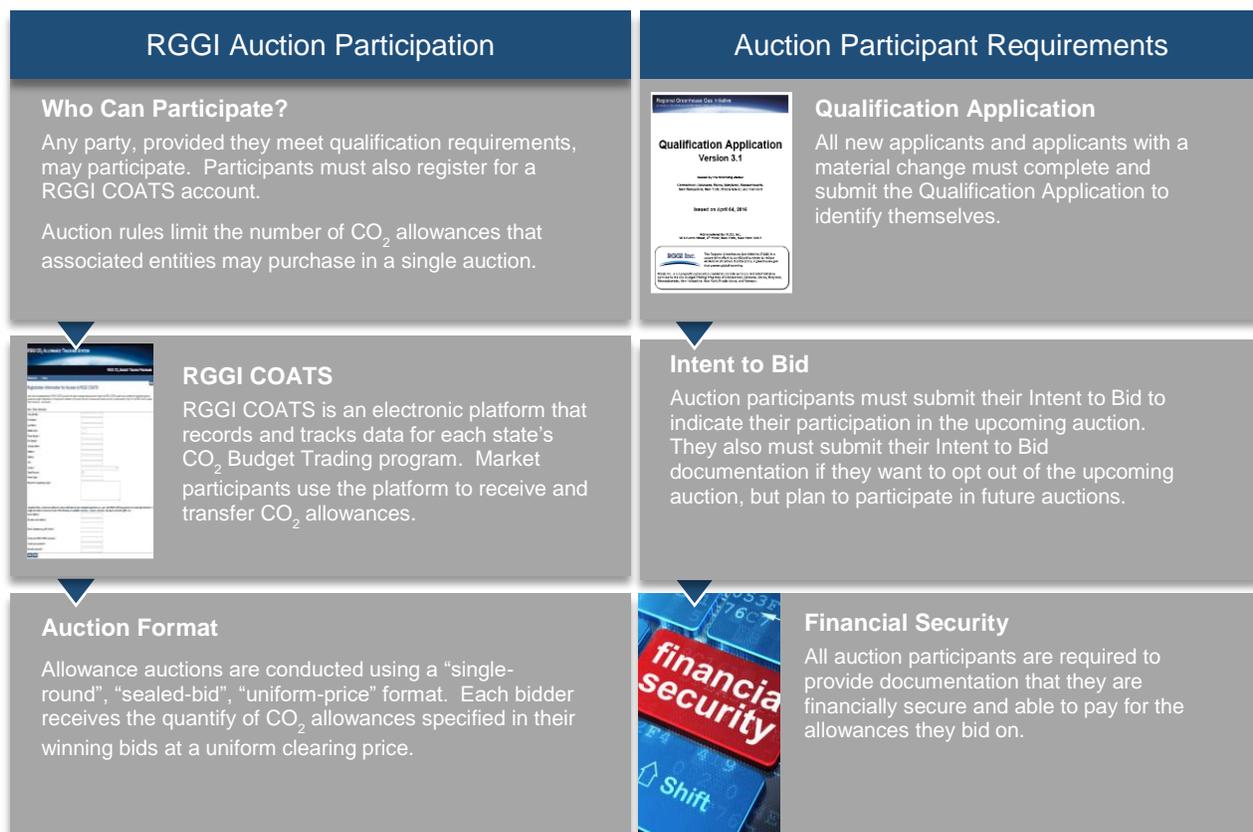
In March of 2008, the RGGI states released uniform design elements for the regional allowance auctions.³⁷ The participating states agreed to a uniform regional auction platform for the allowances that each state would be offering for sale.

Based on stakeholder input and expert recommendations, the RGGI states acted quickly to hold allowances auctions prior to the launch of the program set for January 1, 2009. The initial regional RGGI allowance auction took place on September 25, 2008 followed by the second auction on December 17, 2008.

³⁷ Design Elements for Regional Allowance Auctions under the Regional Greenhouse Gas Initiative. Available here http://www.rggi.org/docs/20080317auction_design.pdf

Final RGGI Auction Format

The RGGI auctions are conducted through electronic, internet based auction platform that is administered by a third party auction manager. **RGGI auctions are conducted quarterly with an Auction Notice released at least 45 days prior to each auction containing information on eligible bidders, participation qualification criteria, the number of allowances available, and rules for participation.**³⁸



Participation in the RGGI auction is open to all qualified participants. All auction participants are required to establish an account in RGGI-COATS, complete a *Qualification Application* (one-time submittal provided there is no material change to information previously submitted), submit an *Intent to Bid* (must file for every auction an entity intends to bid in), and meet specific financial security requirements.³⁹

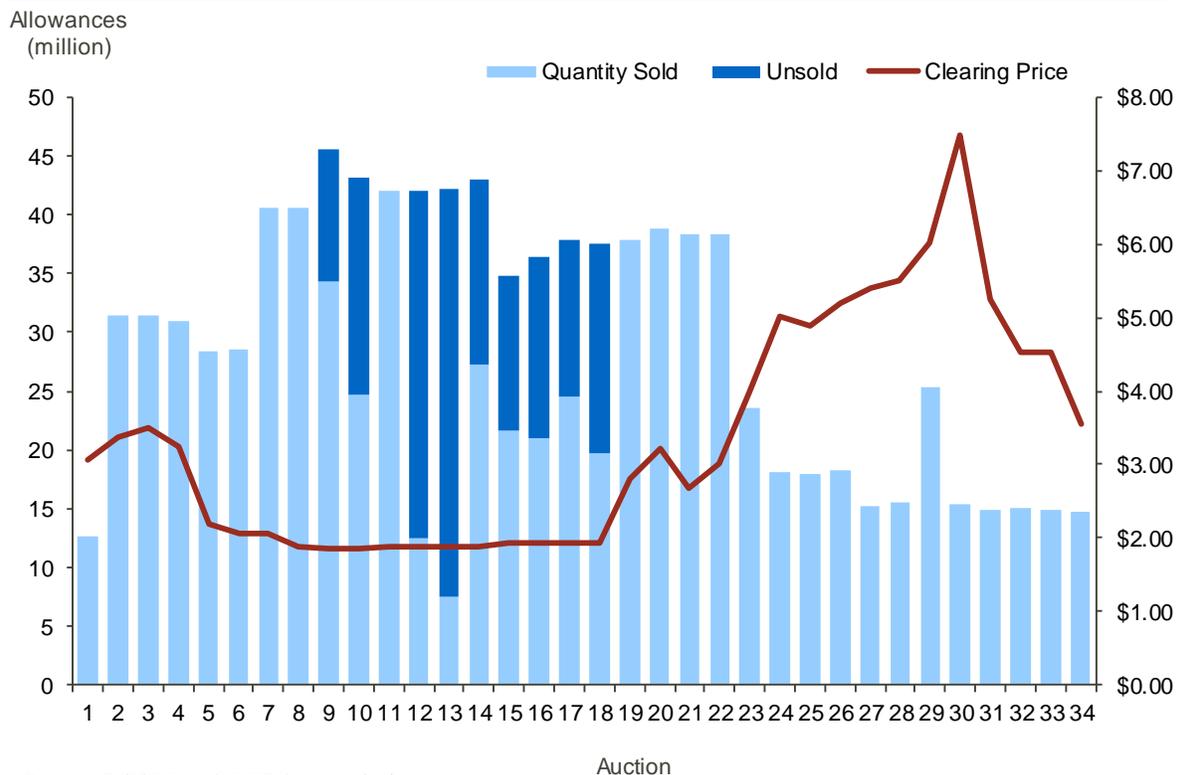
The RGGI CO₂ allowance auction consists of a "single-round", "sealed-bid", "uniform-price" format allowing participants to confidentially submit multiple bids for a certain number of CO₂

³⁸ The Auction Notice for Auction 34 is available here http://www.rggi.org/docs/Auctions/34/Auction_Notice_Oct_11_2016.pdf

³⁹ RGGI Qualification Application is available here https://www.rggi.org/market/co2_auctions/information

allowances at a price specified by the bidder and requires all parties to pay the same price for awarded allowances.

Figure 3 RGGI Auctions Results: Allowances Sold and Clearing Price



Source: RGGI Inc, & MJB&A Analysis

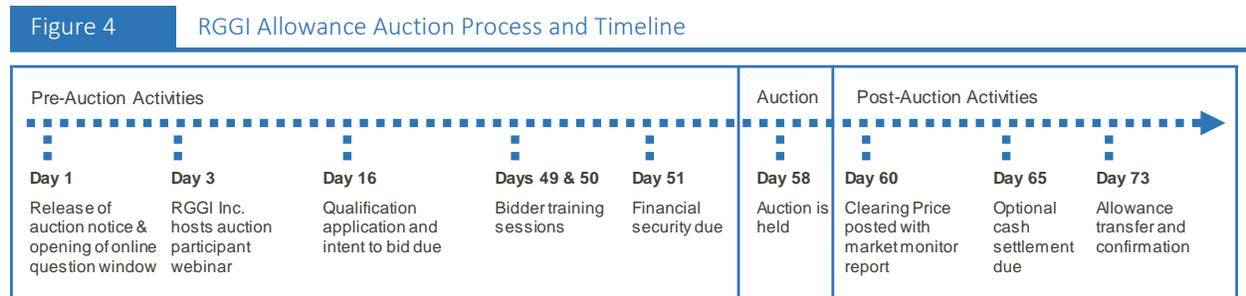
Bidders can submit an unlimited number of bids; however, only one bid may be submitted for any given price. Bidders can cancel or change their bids at their discretion until the bidding window closes. The value of an auction participant’s bids cannot exceed the amount of a bidder’s financial security. The value of a bidder’s bids is the maximum value the bidder would be liable to pay in a uniform-price auction format.

Qualified bidders are able to buy allowances in the auction in bundles of 1,000, each allowance being equivalent to one ton of CO₂. Each auction will sell allowances of uniform “vintage” which denotes the first year in which the allowance can be used towards compliance with the RGGI cap. For the most part, allowances carry a vintage for the year in which they are sold, however, states may offer unused allowances from state set-asides that carry vintages from previous years but can still be bought and sold for future compliance. Each participating entity (i.e., an individual person, or an organization and its affiliates and/or agents) is limited to bidding for no more than 25 percent of all available allowances in any single auction as a means to address the risk of allowance market manipulation.

Auction results are made available the second business day following each auction with the auction clearing price and the quantity of allowances sold, providing a transparent price signal into the

value of carbon emissions and electricity pricing justification. The auction results also provide a list of bidders that were pre-qualified to participate in the auction but it does not indicate which participants acquired allowances in the auction. Participating states release all results to all market participants and all other interested parties simultaneously.

Each auction is overseen by an independent market monitor. The purpose of this monitor is to ensure all participants are abiding by allowance auction rules while looking to identify any anti-competitive behavior. The market monitor also provides a summary report of activity in the secondary allowance market as well as any recommendations for improving the auction system.⁴⁰



Source: RGGI Inc, & MJB&A Analysis

The RGGI auction implemented a reserve price acting as a floor price for allowances to be sold in the RGGI auction originally set at \$1.86 per allowance for the first RGGI auction in 2008, increasing 2.5 percent annually, standing at \$2.10 in 2016. In RGGI’s early years, the clearing price paid for allowances was not too far from the reserve price, but today a widening gap reflects the increasing value of CO₂ allowances. At the end of an auction, winning bidders pay a clearing price for the quantity of bids they submitted at or above the clearing price. To determine the final clearing price, all submitted bids are ordered from highest to lowest, adding together the total allowances demanded at each price and identifying the marginal price where the allowance demand first exceeds available allowances. The clearing price, then, is set at the next lowest bid price under the marginal price.

In the RGGI 2012 Program Review, the RGGI states established a Cost Containment Reserve (CCR) consisting of additional RGGI allowances at pre-determined allowance “trigger prices” to mitigate against higher than anticipated allowance prices. In auctions in which the clearing price exceeds the CCR Trigger Price, more allowances are awarded to bidders in the auction. In Auction 34, held in December 2016, the CCR Trigger Price was \$8.00 per allowance with a CCR of 10 million allowances. Figure 3 details the pricing history of RGGI Auction 1 through 34, including the number of sold and unsold allowances, number of CCR allowances, and the clearing price.

RGGI’s emissions allowance tracking system, RGGI COATS, serves to track all allowance holdings and provide publicly available reports including CO₂ allowance transactions, RGGI emitting sources, and compliance data for RGGI sources. Auction participants must open and maintain a compliance or general account in RGGI-COATS and designate a CO₂ authorized account representative. Following approval of

⁴⁰ Market Monitor Reports are available here http://www.rggi.org/market/market_monitor

the outcome of the auction and upon payment in full of the amount owed by the successful bidders, CO₂ allowances are transferred into the winning bidders' RGGI COATS account.

Investment of Auction Proceeds

From 2009 through December 2016, the RGGI states have held 34 quarterly auctions and have disbursed virtually all of nearly \$2.6 billion in proceeds from CO₂-allowance auctions back into the economy in various ways, including: energy efficiency measures; community-based renewable power projects; credits on customers' bills; assistance to low income customers to help pay their electricity bills; greenhouse-gas-reduction measures; and education and job training programs.

The Analysis Group, an independent economic, financial, and business strategy consulting firm, completed two reports that evaluate the economic impact associated with investment of the RGGI auction proceeds in the region. The first report, published in November 2011, reviews the impact from the first compliance period, from 2009 to 2011.⁴¹ From September 2008 through November 2011, the auction or direct sale of RGGI allowances resulted in the collection and disbursement of nearly \$1 billion. From that \$1 billion, Analysis Group found that RGGI produced \$1.6 billion in net benefit to the ten state region.

The report explains that the use of auction proceeds and other revenues vary by state, and have been used for investment in energy efficiency programs, installation of renewable energy systems, direct reductions on electricity bills, education and job training programs, or other programs to help administer the RGGI program. The report found that a significant percentage of the RGGI allowance funding went to fund investments in energy efficiency programs across the RGGI states. This includes energy benchmarking and auditing programs, investments in retrofit measures, lighting and appliance changes, and others. The report concluded that investment in energy efficiency provided the maximum return of all investment choices. RGGI proceeds also resulted in a positive employment impact of about 16,000 new job-years.

“The auction mechanism has worked flawlessly as a result of painstaking preparation putting the regulations together and then implementing the auction on a quarterly basis without any bumps in the road. Investing the proceeds has been very successful.”— Jared Snyder, Deputy Commissioner for Air Resources, Climate Change & Energy at New York State Department of Environmental Conservation

In a second report, published in July 2015, Analysis Group evaluated the economic impact from RGGI allowance proceeds from the second compliance period, from 2012 to 2014.⁴² The second compliance period also reflected changes from the programs first program review in 2012, which resulted in a significantly lower overall cap on CO₂ emissions. Analysis Group reports that similar to the first

⁴¹ Hibbard P. et. al., The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States. Review of the Use of RGGI Auction Proceeds from the First, Three-Year Compliance Period, November 15, 2011. Available at

http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf

⁴² Hibbard P. et. al., The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States Review of RGGI's Second Three-Year Compliance Period (2012-2014), July 14, 2015. Available at http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf

compliance period, approximately \$1 billion in proceeds was collected from the RGGI allowance auctions from 2012 to 2014. These proceeds generated \$1.3 billion in net economic benefits across the nine state region. The analysis found that because states are investing substantial amounts of RGGI auction proceeds into energy-efficiency programs that reduce demand and renewable energy programs that displace higher-priced electricity, that in the end, consumer bills decrease as a result of RGGI allowance revenue investments. Electricity consumers are estimated to save \$341 million and natural gas and heating oil save \$118. The report also points out that the states adjusted how they spent their RGGI proceeds over time, shifting to reflect different programs and state objectives, and that RGGI states benefit from having prior program administration experience. The report also estimates an additional 14,200 new job years from during the second compliance period.

In September 2016, RGGI Inc. published, “Investment of RGGI Proceeds Through 2014” to quantify the lifetime energy savings of RGGI investments through the end of 2013.⁴³ Through 2014, cumulative RGGI auction proceed investments in the RGGI region were up to \$1.37 billion. The report explains that the investments fall into four major categories: energy efficiency, clean and renewable energy, direct bill assistance, and GHG abatement measures. The largest portion of the investments have gone to energy efficiency programs, which make up 58 percent of cumulative investments. Programs funded by these investments are expected to return more than \$3.62 billion in lifetime energy bill savings to over 960,000 participating households and 20,800 businesses. Clean and renewable energy makes up 13 percent of cumulative investments and are expected to return more than \$830 million in lifetime energy bill savings to 1.1 million participating households and 250 businesses. Direct bill assistance makes up 15 percent of cumulative investments and has returned more than \$178 million in bill savings to more than 2.6 million participating households. Greenhouse gas abatement accounts for the last 8 percent of cumulative investments. These abatement measures are expected to avoid the release of 417,000 short tons of carbon emissions into the atmosphere.

RGGI, Inc. projects that these auction proceeds will result in a lifetime savings of 76.1 million MMBtu of fossil fuel energy and 20.6 million MWh of electric, resulting in a total avoidance of 15.4 million short tons of carbon pollution.

State Investment of Auction Proceeds

RGGI states each have their own unique allowance auction revenue investment programs and plans. Overall, greater than 60 percent of proceeds are invested to improve end-use energy efficiency and to accelerate the deployment of renewable energy technologies. Table 1 highlights the benefits of the RGGI auction proceeds investment proceeds by program type.

⁴³ RGGI Inc., Investment of Auction Proceeds Through 2014, September 2016. Available here http://www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_Report_2014.pdf

Table 1

Benefits of RGGI Auction Proceed Investments by Program Type

	Energy Efficiency		Clean Energy		GHG Abatement		Direct Bill Assistance
	Cumulative ('08-'14)	Lifetime	Cumulative ('08-'14)	Lifetime	Cumulative ('08-'14)	Lifetime	Cumulative ('08-'14)
Participating Households	960,000	n/a	1.1 million	n/a	32,300	n/a	2.6 million
Participating Businesses	20,800	n/a	600	n/a	n/a	n/a	n/a
Short Tons CO ₂ Avoided	1.6 million	12.9 million	112,000	2.1 million	34,700	n/a	n/a
MWh Saved (MWh)	2.2 million	16.2 million	264,000	4.4 million	n/a	n/a	n/a
MMBtu Saved (MMBtu)	5 million	73.1 million	118,000	2.1 million	113,000	959,000	n/a
Energy Bill Savings	\$388.6 million	\$3.62 billion	\$50.1 million	\$836.1 million	\$3.8 million	\$37 million	\$178.2 million

Source: RGGI Inc.

Connecticut

Connecticut devotes the majority of its proceeds to energy efficiency measures and improvements. In 2014, almost 70 percent of the proceeds fund energy efficiency four energy efficiency programs, including the Connecticut Energy Efficiency Fund (CEEF), which supports a number of programs that provide energy efficiency services and incentives to residents and businesses and the Connecticut Green Bank. The CEEF programs provide funding for home energy audits, discounted lighting products, financing options, and sustainability measures.

Another 23 percent supports clean and renewable energy programs of the Connecticut Green Bank. Connecticut has invested \$45.8 million on energy efficiency programs, and \$18 million on renewable energy investments. Another \$7 million was spent on GHG programs.

Delaware

Delaware invests the majority of its allowance proceeds in energy efficiency and renewable energy through Delaware's Sustainable Energy Utility (SEU), a non-profit created by the Delaware State Legislature with the goal to help reduce energy consumption for participants and install renewable energy for residences and businesses. SEU administers a variety of programs, including Energize Delaware Initiative. During the second compliance period, from 2012 to 2014, Delaware spent nearly \$5 million on direct bill assistance, \$16.5 million on energy efficiency programs, \$16 million on GHG programs, and just over \$2 million on renewable energy investments. Programs like the Energize Delaware Farm Program provide loans up to \$400,000 and grants up to \$100,000 per farm for energy audits, equipment, project installation support and more. Energize Delaware also has a financial incentive program for the purchase of solar PV for residential and commercial customers, the Solar Renewable Energy Credit Purchase Program. The program is open to all Delaware residents to install solar systems less than 50 kW

in size. The program has been operating for two years, and currently had 480 participating solar installations. In August 2016, an additional \$750,000 was allocated to the program.

Maine

Maine invests the majority of its allowance proceeds directly into residential and commercial energy efficiency programs and grants, administered through the Maine Department of Environmental Protection and Efficiency Maine. Efficiency Maine offers rebates for the purchase of high-efficiency lights and equipment. Maine invested \$26.7 million on energy efficiency programs from 2012 to 2014. They invested another \$3.3 million on direct bill assistance and nearly \$1 million on GHG programs. The program highlights a multifamily case study where 87 ductless heat pumps were installed. Heat pumps are 300 percent more efficient than combustion heating systems, and are estimated to save \$65,270 in annual electricity costs with less than a one-year payback for the building.⁴⁴



In Maine, RGGI auction proceeds have been used to fund energy efficiency projects through the Efficiency Maine program.

Efficiency Maine is an independent administrator with a mission to lower the cost and environmental impacts of energy in Maine by promoting cost-effective energy efficiency and alternative energy systems.

Source: Maine Insights

Maryland

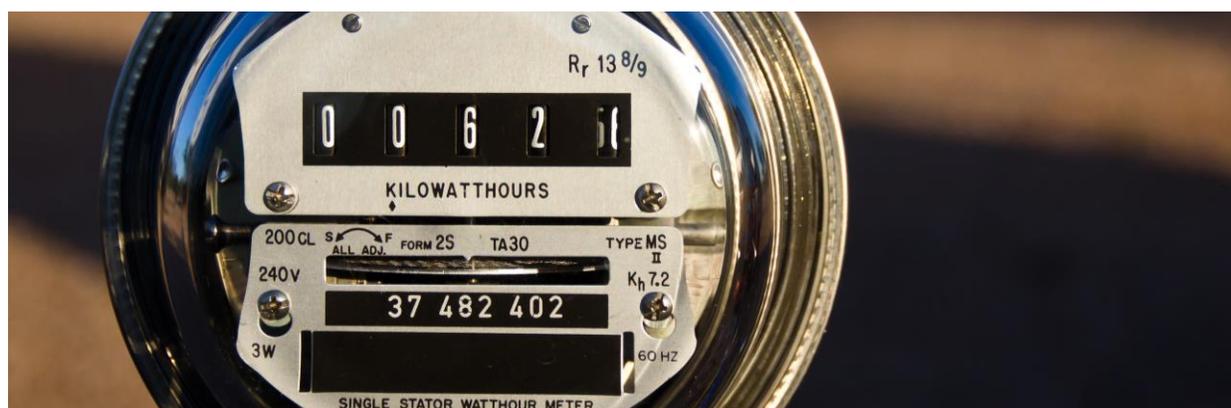
In Maryland, RGGI auction proceeds are invested in the state's Strategic Energy Investment Fund (SEIF) administered by the Maryland Energy Administration. The funds are used through the EmPOWER Maryland program that enables low-to-moderate income families to receive energy efficiency improvements in their homes. Maryland invested nearly \$222 million dollars from 2012 to 2014. The largest portion of the funds went to direct bill assistance, at nearly \$97 million dollars. They also invested \$68 million on energy efficiency programs, and smaller amounts on GHG programs, renewable energy investments and clean technology research and development. Since 2012, the program has reduced energy usage by more than 2 million MWh per year and saves \$250 million annually.

Massachusetts

Massachusetts spent most of their funding, \$151 million, on energy efficiency programs from 2012 to 2014. An additional \$14 million was spent on GHG abatement programs. Massachusetts has repeatedly

⁴⁴ http://www.energymaine.com/docs/Bucksport_Case_Study.pdf

been acknowledged as one of the lead energy efficiency states in the U.S. The top two programs are the Energy Efficiency Investment Plans delivered through Mass Save and the Green Communities Designation and Grant Program providing funds to communities. Mass Save provides residents and commercial businesses the opportunity to do energy audits, receive price discounts and rebates on lighting and appliances, upgrade heating and cooling systems, and make building envelope modifications. For example, the program funded a project at Cape Air, to help the airline become a net-zero electricity importer and reduce electricity usage by 25 percent. Cape Air installed a 258 kW solar PV system on the facility, with expectations to reduce electricity imported to the facility by 335,000 kWh in its first year. They also added insulation to the facility and fixed air leaks, and have estimated that these changes will achieve a 15 percent reduction in natural gas consumption.⁴⁵



New Hampshire

In New Hampshire, RGGI allowance proceeds are invested into the Energy Efficiency Fund, and are administered by the state's electric utility companies. The funds are used to expand programs run by the state's four electric utilities including home weatherization, ENERGY STAR certification, financial incentives to purchase high-efficiency appliances, lighting retrofits, and workshops to educate stakeholders on energy codes. New Hampshire spent nearly \$42 million from 2012 to 2014. They spent \$22 million on energy efficiency programs, and \$18.5 million on direct bill assistance. They also spent almost \$1 million on GHG abatement programs.

New York

During the second compliance period, New York invested nearly \$383 million. Of those funds, nearly \$225 million went to energy efficiency programs, \$106.6 million went to renewable energy investments, and \$51.7 million went to GHG abatement programs. The Analysis Group found that investment of the RGGI auction proceeds resulted in a positive economic value to the New York economy resulting in over \$400 million in economic value added. New York uses the funds to invest in a number of strategies and programs administered by NYSERDA like NY-Sun, Industrial Innovations, and Climate Smart Communities.

⁴⁵ <http://www.masssave.com/~media/Files/Business/Case-Study/CICaseStudiesCapeAirFINAL.pdf>

Rhode Island

Rhode Island invested nearly \$19 million on energy efficiency and almost \$2 million on greenhouse gas abatement programs from 2012 to 2014. To administer the funds, Rhode Island's Office of Energy Resources works with the state's primary electric utility, National Grid, on energy efficiency programs. In 2013, Rhode Island used a significant portion of the funds for the Rhode Island Public Energy Partnership. The Partnership is a three-year collaborative effort to achievable deep energy savings in state and municipal facilities with the goal to create a comprehensive inventory of energy consumption in the public sector, implement energy efficiency measures in approximately 100 facilities to attain an average of 20 percent energy reduction, and identify and mitigate barriers to efficiency improvements in the public sector.⁴⁶

Vermont

Vermont invested \$7 million on energy efficiency programs and \$200,000 on greenhouse gas abatement programs. Efficiency Vermont administers the majority of the funds to residents and businesses. Recently Efficiency Vermont has taken on a new initiative, named "Business Forward", to help make investing in energy efficiency easier and more cost effective for Vermont businesses. The campaign will run from September 2016 through the end of 2017, and the goal is to help Vermont businesses achieve annual energy savings equal to the output of a 30 MW gas power plant operating nonstop for 13 weeks.⁴⁷

Conclusion

The RGGI program will continue to evolve, but the allowance auction mechanism remains a central tenet of the program. The groundbreaking nature of the auction decision, successful implementation and experience has led to significant investments in energy efficiency and clean energy projects, magnifying the benefits of the RGGI program and contributing to RGGI's success. Power plant owners, once the strongest skeptics of the approach, now embrace the allowance auction as a transparent and straightforward process to acquire allowances. Other states evaluating policies to reduce carbon emissions may consider RGGI's proven approach as a model going forward.

⁴⁶ <http://www.energy.ri.gov/pep/>

⁴⁷ <https://www.encyvermont.com/news-blog/blog/moving-business-forward-the-energy-efficiency-opportunity>