



ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

THE ECONOMIC IMPACTS OF THE REGIONAL GREENHOUSE GAS INITIATIVE ON NINE NORTHEAST AND MID-ATLANTIC STATES

Review of RGGI's Third Three-Year
Compliance Period (2015-2017)

Paul J. Hibbard
Susan F. Tierney
Pavel G. Darling
Sarah Cullinan

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An independent
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THE
RGGI
PROJECT
SERIES

EXECUTIVE SUMMARY

Acknowledgments

This is an independent report on the economic impacts of RGGI program implementation, primarily covering the third three-year period of the program (2015-2017), which is known as Compliance Period 3. This Report complements two previous studies completed by Analysis Group in November 2011 and July 2015 on RGGI's Compliance Periods 1 and 2 (2009-2011 and 2012-2014, respectively). The analytic method and structure of this Report follow closely upon those used in the prior reports in order to ensure methodological consistency and provide continuity in focus, content and the consideration of lessons learned. Where relevant in this Report, we include data, information and observations particular to the 2015-2017 period, and elsewhere summarize developments and outcomes in all three Compliance Periods, covering all nine years of RGGI (2009-2017).

This Report is part of the RGGI Project Series: a series of independent and nonpartisan research and analysis projects to inform and assist leaders and stakeholders in the Northeast and other states.

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About Analysis Group

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1. EXECUTIVE SUMMARY

Overview and Context

In 2009, ten Northeastern and Mid-Atlantic states launched the Regional Greenhouse Gas Initiative (“RGGI”), the country’s first market-based program to reduce emissions of carbon dioxide (“CO₂”) from existing and new power plants.¹ The scope of RGGI is significant: the current set of RGGI states account for more than one-eighth of the population in the U.S. and more than one-seventh of the nation’s gross domestic product. It is thus important to evaluate and understand the program’s performance and outcomes. Through their development and implementation of the RGGI program, these states have gained first-mover policy experience and have collaborated to form a multi-state emission-control policy that has reduced CO₂ emissions from the power sector and operated seamlessly with well-functioning and reliable electricity markets.

Recently, other states have expressed interest in implementing carbon-control programs that are similar in structure to RGGI’s approach. One option for those states would be for active collaboration to allow for trading of CO₂ allowances among affected sources in these states and the current RGGI states.² Insights and observations gleaned from an analysis of RGGI’s performance could thus be valuable not only to the RGGI states as they consider future policy recommendations but also to other states and regions as they develop their own plans to reduce CO₂ emissions.

This Report analyzes the economic impacts of RGGI’s most recent three-year compliance period, which spanned 2015 through 2017. This analysis follows our two prior reports on the economic impacts of RGGI: the 2011 Report (hereafter “AG 2011 Report”) which assessed the economic impacts of RGGI’s first three-year compliance period (2009-2011), and the 2015 Report (hereafter “AG 2015 Report”) which assessed the economic impacts of RGGI’s second three-year compliance period (2012-2014).³

¹ The ten original RGGI states were Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. New Jersey participated in the first three years of the RGGI program, and withdrew its participation at the end of 2011.

² See, e.g., the recent statement by Ben Grumbles, Secretary of the Maryland Department of the Environment and Chair of the RGGI, Inc. Board of Directors, regarding RGGI’s interest in sharing information “...with any state that is interested, and especially look forward to further discussions with Virginia and New Jersey.” (See https://rggi.org/sites/default/files/Uploads/Auction-Materials/39/PR031618_Auction39.pdf)

³ Paul J. Hibbard, Susan F. Tierney, Andrea M. Okie, and Pavel G. Darling, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States*, November 2011 (available at http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf); and, Paul J. Hibbard, Andrea M. Okie, Susan F. Tierney, and Pavel G. Darling, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States*, July 2015 (available at http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf). The analytic method and structure of this Report were modeled closely on those of the prior reports, and in this report we carry forward observations from RGGI’s first six years (to the extent still relevant), so as to support methodological consistency and continuity in focus, content and the consideration of lessons learned.

There have been a number of relevant developments since our last economic review of RGGI in 2015. The electric industry has experienced changes in power-generation economics, emission-control requirements, and wholesale market structures in the RGGI region. In addition, absent federal requirements, a number of states continue to seek to address greenhouse-gas (“GHG”) emissions through an assortment of policy mechanisms. Finally, the RGGI states have undertaken a second comprehensive Program Review, completed in December 2017, which led to modified elements of the program including adopting a 30-percent reduction in the regional cap between 2020 and 2030.

In this Report, we examine RGGI’s recent economic performance under these changing economic and regulatory realities. We hope that the results of our assessment and lessons learned are useful not only to the RGGI states but also to others that have expressed interest in establishing carbon control programs (including with the possibility of linking to or participating in the RGGI program).⁴

RGGI has now been operating for over nine years. In every year, CO₂ emission allowances have entered the market through coordinated (centralized) regional auctions. Owners of fossil-fueled power plants have spent nearly \$2.8 billion to buy CO₂ allowances over the nine years. In turn, offer prices in the regional wholesale electricity markets reflect these purchases, and grid operators in these regions use these offer prices to dispatch power plants economically while maintaining system reliability.

Since 2009, the RGGI states have received virtually all of the nearly \$2.8 billion in proceeds from CO₂-allowance auctions and disbursed them back into the economy in various ways, including through expenditures on: energy efficiency (“EE”) measures and programs; renewable energy (“RE”) projects; GHG-emission reduction measures; direct electricity consumer bill assistance, including for low-income households; and education and job training programs. These local investments keep more of the RGGI states’ energy dollars in their region, and reduce the amount of dollars that leave the region to pay for fossil fuel resources produced outside the RGGI states.

**What We Study in this Report:
The Economic Impacts of RGGI (2015-2017)**

Our analysis tracks the path of RGGI-related dollars over the past three years as they leave the pockets of fossil-fuel power generators to buy CO₂ allowances, show up in electricity prices and customer bills, make their way into state expenditure accounts, and then roll out into the economy through the expenditure of the allowance auction proceeds.

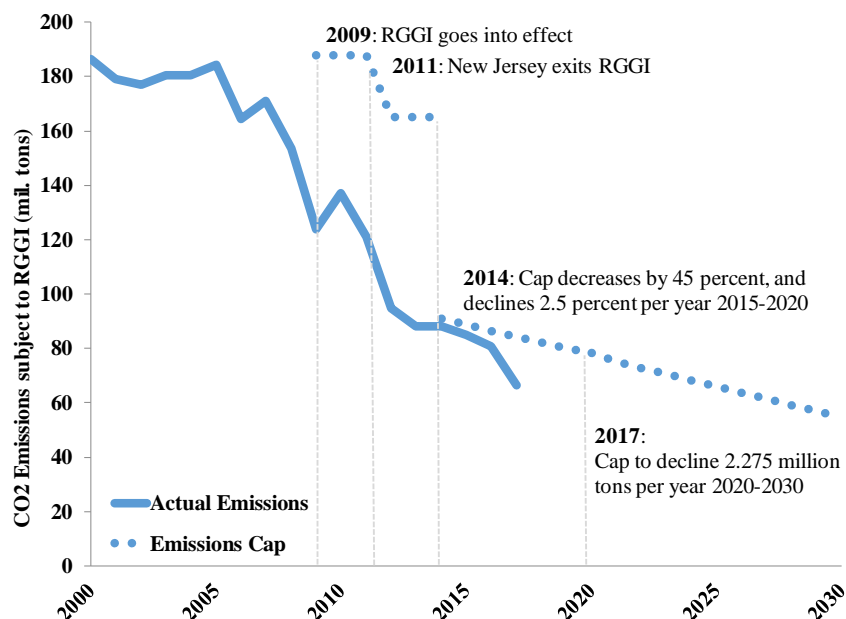
Our analysis thus focuses on the actual economic activity that results from RGGI: known CO₂ allowance prices; observable CO₂ auction results; dollars distributed from the auction to the states; actual state-government decisions about how to spend the allowance proceeds; measurable reductions in energy use from energy-efficiency programs funded by RGGI dollars; traceable impacts of lower energy use on wholesale power prices; and concrete value added to the economy.

By carefully examining the RGGI states’ implementation of the program to date, based on real historic data, we hope to provide a foundation for observations that can be used by others in the design of CO₂ control programs going forward.

⁴ See, e.g., RGGI Inc., Statement on Proposed Virginia Greenhouse Gas Rule, November 9, 2017.

Throughout the RGGI program's implementation, power system reliability has been maintained. And as shown in Figure ES-1, CO₂ emissions from power generation have decreased in the RGGI region (due to RGGI program design and implementation but also broader economic and industry factors).⁵

Figure ES-1
Actual CO₂ Emissions in the RGGI States and Evolution of the RGGI CO₂ Emissions Cap



Source: RGGI, Inc. data from the RGGI CO₂ Allowance Tracking System (COATS), accessed March 2, 2018.

With these many insights, we address several questions in this Report: What happened to the roughly \$1 billion in proceeds from the sale of CO₂ allowances over the 2015-2017 period? Has the RGGI program produced net economic benefits to these states in Compliance Period 3 (as it did in the first two compliance periods)? Are there new learnings from the outcomes of the RGGI program to date beyond those identified and described in our prior reports?

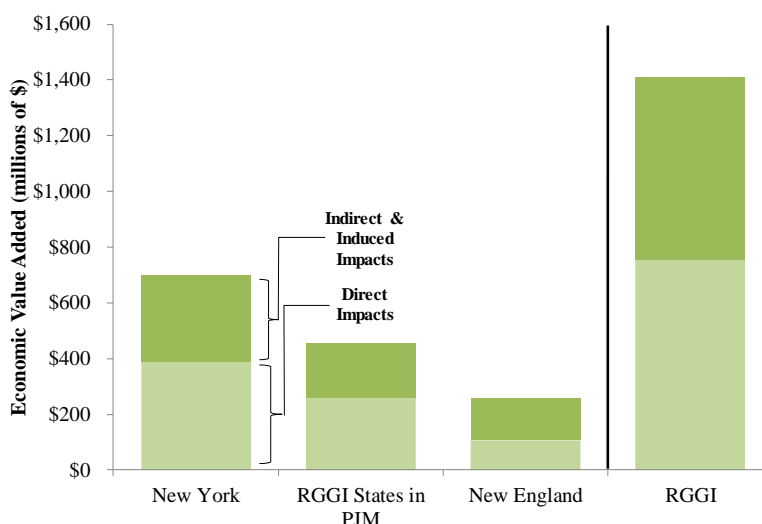
Finally, in this Report we consider the implications of our analysis for continued implementation in the RGGI states, and for states considering development of their own carbon reduction programs and/or coordination with a broader CO₂ trading region.

⁵ RGGI, Inc. data show that CO₂ emissions from RGGI electric generation sources decreased by 75.8 million short tons, or 53.3 percent compared to the average baseline emissions between 2006 and 2008. Note that these figures exclude New Jersey, which was a RGGI member during the first compliance period. Data available at <https://www.rggi.org/allowance-tracking/rggi-coats>, accessed April 4, 2018.

Results

Over the last three years (2015-2017), the RGGI program led to \$1.4 billion (net present value (“NPV”)) of net positive economic activity in the nine-state region.⁶ Each RGGI state’s electricity consumers and local economy also experienced net benefits from the RGGI program. When spread across the region’s population, these economic impacts amount to nearly \$34 in net positive value added per capita. Figure ES-2 shows the net economic value to the nine-state RGGI region as a whole, with results also broken out by power system region (with the six New England states participating in the ISO-New England electrical region, with New York participating in the one-state NYISO system, and with Maryland and Delaware participating in the multi-state PJM power system).

Figure ES-2
Net Economic Impact of the Implementation of RGGI During the 2015-2017 Period (NPV, 2018\$)



Notes: [1] Figures are reported in 2018 dollars (NPV), converted using a 3-percent public discount rate. [2] Total economic value added reflects the impacts of state spending of RGGI proceeds, including net electric sector impacts to consumers and power plant owners, non-electric benefits, and the economic impact of program spending.

RGGI’s net positive economic outcome results in large part from the states’ decisions to sell CO₂ allowances via a centralized auction and then to use the auction proceeds in various ways that address state policy objectives. This approach has been in place in all three RGGI compliance periods. As in the prior years, during the 2015-2017 period the states received and spent the roughly \$1.0 billion in auction proceeds primarily on EE measures, community-based RE projects, customer bill assistance, other GHG-emission reduction measures, and on research, education and job training programs.

⁶ All results for Compliance Period 3 are reported in 2018 dollars, with results reported using a 3-percent “public” discount rate. See the Appendices for a discussion of public and private discount rates.

These economic benefits reflect the complex ways that RGGI dollars interact within local economies.

Compared to energy-related dollar flows that would occur in the absence of the RGGI program, energy-related expenditures with RGGI lead to more purchases of goods and services in the RGGI states' local economies. Take the use of the auction proceeds on EE measures, for example: Such expenditures include payments for engineering services for energy audits, sales of energy-efficient equipment, dollars spent to train those installers, and state taxes collected on all of these activities. Together, these dollar flows have direct and indirect multiplier effects locally and regionally.

The size of RGGI's economic impacts varies by state and region, in large part because the states spent their RGGI auction proceeds differently.⁷ Different expenditures have different direct and indirect effects on their economies and on their electric systems. For example, a state's use of RGGI dollars to pay for EE measures that reduce electricity consumption and to invest in RE facilities with low operating costs both served to lower electricity prices in wholesale power markets (as compared to a "without-RGGI" scenario). This in turn lowers consumers' electricity bills over time.

Local investment of RGGI dollars on energy efficiency and renewable energy offset the impact on electricity prices resulting from CO₂ allowance costs.

On the one hand, the inclusion of the cost of CO₂ allowances in wholesale prices tends to increase wholesale electricity prices in the RGGI region at the beginning of the 2015-2017 period. But these near-term impacts are more than offset during these years and beyond, because the states invest a substantial amount of the RGGI auction proceeds on EE programs that reduce overall electricity consumption and on RE projects that reduce the use of higher-priced power plants. Consumers gain because their overall electricity bills go down. Since RGGI's commencement in 2009, energy and dollar savings resulting from all states' investments in EE and RE has more than offset the wholesale market price increases associated with inclusion of allowance costs in market bids.

Energy consumers enjoy a net gain of \$220 million as a result of the RGGI program (2015-2017), as their overall energy bills drop over time.

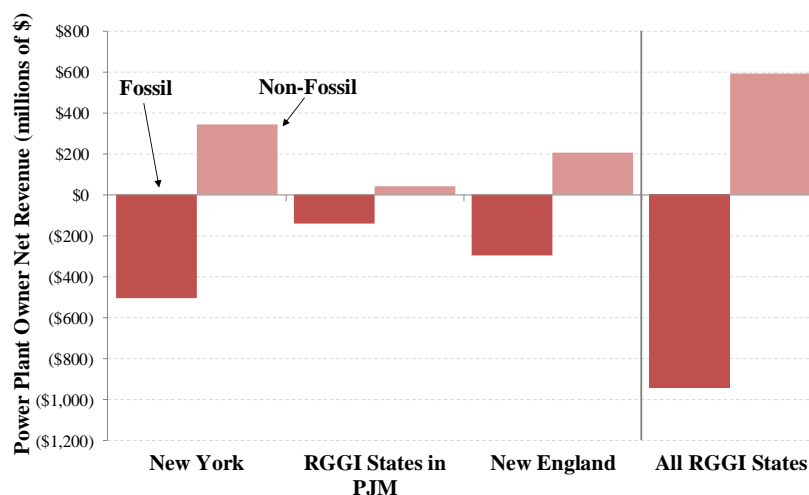
Net benefits accrue to residential, commercial and industrial customers. Consumers of electricity save \$99 million, and consumers of natural gas and heating oil save \$121 million. These amounts are in addition to the economic benefits they receive as members of the local economies of the RGGI states where the allowance auction proceeds are spent.

⁷ Overall, the distribution of spending across the RGGI states was as follows: 52% on EE; 18% on RE projects; 13% on bill-payment assistance to consumers; 7% on program administration; 4% on GHG-emission reduction programs; 3% on clean technology research and development; 2% on education, outreach, and job training; and 1% for payments into a general fund. Individual state expenditures varied significantly across these categories.

Power system changes that result from RGGI include: different dispatch order of power plants; plants with lower CO₂ emissions having a competitive advantage; and owners of emitting power plants recovering the costs of CO₂ allowances in the short run while experiencing lower output and revenues in the long run.

Including a price on CO₂ emissions tends to shift the power plant dispatch order and increase output of lower- and zero-carbon-emitting sources of power. Although RGGI requires owners of emitting power plants to purchase CO₂ allowances, power plant owners as a group recover all of their early expenditures on CO₂ allowances through the increase in wholesale electricity prices in the near term. But the net effect of the program tends to reduce the revenues of owners of plants over time as a result of RGGI expenditures on EE, which lower the demand for power. Plants with relatively high carbon emissions (*e.g.*, coal-fired or oil-fired units) collect less revenues over time while owners of zero-carbon generating sources (*e.g.*, nuclear, wind, solar, hydro) get the benefit of being paid higher wholesale market prices that reflect CO₂ allowance costs, without having to buy allowances. Figure ES-3 shows the changes in net revenues for power plant owners as a result of the RGGI program, with results broken out by location and by power-plant fuel type. Carbon-emitting power plant owners generally lose revenue (\$940 million), while owners of nuclear and renewable resources gain (\$590 million). On an NPV basis, total revenues to the power-generation sector drop by nearly \$350 million through our forecast period (ending in 2027), as shown in Figure ES-4.

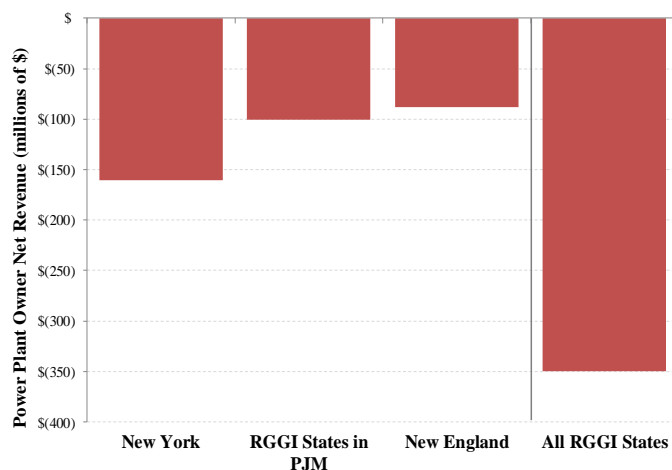
Figure ES-3
Net Revenue Change to Power Plant Owners (by Power-Plant Fuel Type and Electrical Region) as a Result of RGGI Implementation During the 2015-2017 Period (NPV, 2018\$)



Notes: [1] Figures are reported in 2018 dollars (NPV), using a 3-percent public discount rate. [2] Figures include PROMOD outputs for energy prices and revenues and for capacity-market revenue changes that are calculated separately. [3] “Fossil” includes natural gas, oil, and coal-fired generators. “Non-fossil” includes nuclear, hydro, pumped storage, wind, solar, and biomass.

Figure ES-4

Net Revenue Change Across All Power Plant Owners, by Region, as a Result of RGGI Implementation During the 2015-2017 Period (NPV, 2018\$)

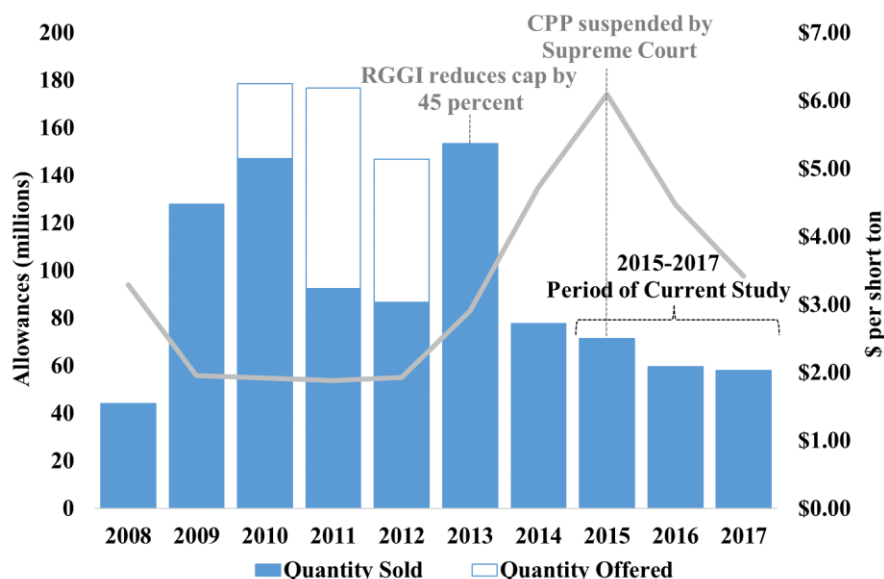


Notes: [1] Figures are reported in 2018 dollars (NPV), using a 3-percent public discount rate. [2] Figures include PROMOD outputs for energy prices and revenues and for capacity market revenue changes calculated separately.

Compared to RGGI's earlier two compliance periods (2009-2011 and 2012-2014), the amount of CO₂ allowances sold dropped in recent years, while clearing prices were on average higher, which had a mostly offsetting effect on the relative magnitudes of economic effects experienced in Compliance Period 3.

The RGGI states lowered the regional CO₂ emissions cap by 45 percent in 2014 and further tightened it by 2.5 percent per year thereafter, during the current study period (see Figure ES-1). The current compliance period was the first that involved a significantly tightened and declining cap (see Figure ES-1). This tightening supply of CO₂ allowances, in combination with other market and policy factors, initially elevated the price of allowances and, in turn, the wholesale power prices in the different parts of the RGGI region. Total auction proceeds in Compliance Period 3 ended up being only slightly lower than in each of the prior two periods (by less than ten percent), reflecting the offsetting impact of higher allowance prices and lower allowance volumes sold (as shown in Figure ES-5).

Figure ES-5
RGGI Auction Allowances and Clearing Prices



Notes:

[1] Clearing prices are weighted averages, based on number of allowances sold.

[2] In 2014 and 2015, the Cost Containment Reserve (“CCR”) trigger price was exceeded and additional allowances above what were originally offered into the market were ultimately presented and sold to market participants. In 2014 and 2015, 5 million and 10 million additional allowances were sold, respectively.

Source: RGGI, Inc., http://www.rggi.org/market/co2_auctions/results.

Observations

Based on these results as well as those in our prior assessments of the first two RGGI compliance periods, we have a number of observations that we summarize here. We hope that these provide useful information for the RGGI states as they consider how the program is performing relative to its original goals and for other states and stakeholders who are interested in carbon emission-control policies and programs.

As in its first six years, the RGGI program’s third three-year compliance period continued to generate substantial economic benefits for the states while reducing CO₂ emissions.

Economic value added

Our analysis of RGGI impacts over the past three years took into consideration the program’s effects on power system dispatch, costs to consumers, revenues to electric generators, and overall performance of the economies in the participating states. Even taking into account decreased revenues to the owners of emitting power plants (and to power-plant owners as a whole), we found positive macroeconomic impacts to the states due to the net benefits to electric consumers and the expenditures of the CO₂ allowance proceeds. RGGI led to approximately \$1.4 billion in economic value added (NPV, 2018\$) as a result of program implementation in the 2015-2017 period. Thus, the RGGI program continues to generate economic value for its member states.

Jobs

Taking into account the gains and losses to consumers and producers, RGGI Compliance Period 3 led to overall job increases amounting to thousands of new jobs over time. Some of the RGGI job impacts may be permanent, while others may be part-time or temporary. According to our analysis, the net effect is that RGGI activity during the 2015-2017 period leads to over 14,500 new job-years, cumulative over the study period, with each of the nine states experiencing net job-year additions. Jobs that result from RGGI-related expenditures occur in many parts of the economy, with examples including workers who perform efficiency audits and who install energy efficiency measures in residences and commercial buildings, and staff performing training on energy issues.

Fossil-fuel production and imports

Over the past three years, RGGI helped to lower the total number of dollars (by \$1.37 billion (NPV, 2018\$)) its member states sent outside their region in the form of payments for fossil fuels for power generation and other purposes. Most of the RGGI states' electricity comes from fossil fuels, even though these states produce little coal, natural gas, or oil. Because the RGGI program lowered these nine states' total fossil-fired power production and also reduced their use of natural gas and oil for heating, RGGI reduced the total dollars sent out of state for these energy resources.

Continuation of RGGI program benefits above and beyond the first six years

Our findings on economic impacts of RGGI's third three-year compliance period are consistent with the findings and observations we made with respect to the first and second three-year compliance periods. Those prior assessments revealed net economic benefits to the states participating in the program, including growth in economic output, increased jobs, reinvestment of energy dollars in local/state economic activity, long-run wholesale electricity cost reductions, and CO₂ emission reductions.

Many factors have changed in the electric industry and the economy since we completed our economic analyses of the RGGI program for Compliance Period 1 (2009-2011) and for Compliance Period 2 (2012-2014). These changes have affected the conditions (*e.g.*, lower gas prices, generation retirements and additions) analyzed in our assessment of Compliance Period 3.

For many reasons (such as the different vintages of each of our studies and notably the year in which we report NPV results), the results of our three studies are not directly additive. Even so, across the three studies, we have found net economic benefits to the RGGI states. Recognizing that these studies have reported outcomes in different-year dollar values, each of our assessments has found positive benefits for the participating RGGI states: \$1.6 billion (NPV, in 2011\$), \$1.3 billion (NPV, in 2015\$), and \$1.4 billion (NPV, in 2018\$) for Compliance Periods 1, 2, and 3 respectively.⁸ Our studies have also found that the RGGI-related expenditures led to job creation in each of the three

⁸ In addition to our prior studies of the RGGI program, RGGI, Inc. and others have conducted studies of the economic impacts of the program. We discuss the differences in these studies later on in this report.

compliance periods of approximately: 16,000 job-years (as of 2011); 14,200 job-years (as of 2015); and 14,500 (as of 2018), respectively.⁹

Thus our modeling of the three compliance periods indicates that, its first decade, RGGI's carbon cap-and-trade program has generated net positive economic value for the participating states' economies on the order of \$4 billion dollars.¹⁰ States' participation in RGGI has led to tens of thousands of job-years while also helping to reduce carbon emissions in the RGGI states' electric sector. At the same time, annual carbon-emissions have dropped nearly 50 percent since the program's start in 2009 (for many reasons, including implementation of RGGI).

RGGI's first nine years (2009-2017) provide empirical evidence that carbon-control programs for the power sector can provide positive economic outcomes.

Review of the nation's first multi-state CO₂ emission-control program provides useful information for states that are considering emission-reduction options.

Despite a recent lack of progress at the federal level, many state policymakers continue to focus their attention on the various alternatives for reducing emissions of CO₂ from the electricity sector (and other sectors). A wide range of alternatives are available including cap-and-trade programs, carbon tax/pricing approaches, energy research and development ("R&D") funding, consumer-funded procurements of low- and zero-carbon energy sources, rate policies supporting distributed-energy resource development, and funding of energy efficiency measures. The diverse set of policy options used reflects many states' interest in finding cost-effective and workable ways to cut CO₂ emissions. Lessons learned from RGGI's implementation can inform states as they consider their options.

The experience of the RGGI states, including their initial efforts that began in 2003 to work together to develop a multi-state, market-based CO₂ control program, through the nine years of program administration to date, provides a wealth of information. Their experience provides many lessons, most notably that states can collaborate successfully in developing programs to control CO₂ emissions, and market-based CO₂-allowance trading programs – combined with state-driven centralized auctions of CO₂ allowances and with local reinvestment of auction proceeds – can help states meet emission-reduction targets while generating positive economic benefits.

RGGI's positive impacts on state economies are additive to the purpose and expected benefits of the program.

RGGI is not and never was meant to be an economic development program. RGGI's purpose is to reduce CO₂ emissions from power generation in order to help mitigate the economic, social, and environmental risks of climate change. As shown in Figure ES-1, RGGI has contributed to

⁹ These reflect "job-years," and do not identify what portion of these numbers are associated with permanent versus temporary jobs. Job-years are reported cumulatively over the full study period.

¹⁰ As noted earlier, while the economic results from our three studies are not directly additive, we have used the same foundational analytic methods, assumptions, and data sources across all three studies in order to ensure consistency in study results. While changes in the assumptions used in our earlier studies – e.g., to reflect current market conditions and expectations – could change the results (in either direction), we expect such changes would be small given the consistency in the level of allowance proceeds collected and used by the RGGI states and in the benefits we have found across our studies.

significant reductions in emissions of CO₂ across the RGGI region. In our economic analysis of the RGGI program, however, we do not attempt to quantify the potential long-term benefits of reducing the risks of climate change. The focus of our analysis is specific and narrow: to review the direct impacts of program implementation on the economies of the RGGI states, in order to test the presumption that controlling emissions of CO₂ will somehow lead to negative consequences for states that take action. Our results – which instead reveal positive economic impacts – should be viewed as additive to whatever other benefits flow from reducing climate-change risks.

The RGGI model has successfully achieved CO₂ reductions through a cooperative multi-state framework that preserves state authority.

The states that comprise the RGGI region are highly diverse in many ways: their political settings and policy objectives vary widely across the states and have even changed significantly *within* states over time; their electric-generating portfolios differ substantially in size, technologies, fuel mix, and age; their economic bases vary; and the states have unique legal and regulatory structures that oversee energy, utility, and environmental policies. Despite these differences, however, the RGGI states' experience confirms the possibility that states can work together, particularly when doing so is likely to lower compliance costs and generate economic benefits. The states have designed a multi-state CO₂ program consistent with sound economic principles, completed the stakeholder, legislative, and regulatory steps necessary to adopt and implement the program, and smoothly administered the program and integrated it with wholesale electricity markets. In addition, over just ten years the states have completed two top-to-bottom programmatic reviews and agreed upon major changes to the framework. The RGGI states continue to implement the RGGI platform with an eye towards inclusion and a willingness to collaborate with other states outside the current nine-state region.

Mandatory, market-based carbon-control mechanisms are functioning properly in wholesale electricity markets and have not adversely affected system reliability.

RGGI's nine years of experience supports a conclusion that market-based CO₂ emission-control programs can produce positive economic impacts and meet emission objectives while dovetailing smoothly into the normal operation of power systems. RGGI's implementation has not adversely affected power system reliability in New England, New York, or PJM. Further, RGGI provides an important example of how states' public policies can be integrated into federally regulated competitive wholesale markets – an issue with which FERC, state regulators, and the courts are actively wrestling.

The design of the CO₂ market in the RGGI states has allowed for the creative use of public assets in support of diverse state energy/environmental policy and economic outcomes.

The joint decision by the RGGI states to make their CO₂ allowances available to the market through a unified auction has generated substantial revenues for public use. This approach transferred the value of emissions allowances from the public sector to the private sector at a monetary cost. Had the allowances been given away for free, the states would not have had the benefit of the auction proceeds and instead would have transferred away significant public economic value to owners of power plants (which in the RGGI region are merchant generators, not owned by electric distribution utilities). The states' use of allowance proceeds helped them meet a wide variety of social, fiscal, and environmental policy goals, such as assisting low-income customers, achieving advanced energy

policy goals, and restoring wetlands, among other things. Notably, however, auctioning of allowances is not necessary for the efficient and effective functioning of the cap-and-trade program design itself. Individual states may still determine their preferred method of moving allowances into the market, which could include auctions, direct allocation, and other mechanisms that may move allowances into the market while transferring or consigning auction value in whole or in part to other entities (such as electric distribution utilities or generating asset owners).

How allowance proceeds are used affects their economic impacts: Use of auction proceeds to invest in energy efficiency produces the biggest economic bang per buck, in terms of net positive benefits to consumers and to the economy.

The RGGI Memorandum of Understanding (“MOU”) fully supports the reality that states place different weights on various goals they hope to accomplish through participation in the program, and that the states will make their own decisions about how to allocate allowances to the market and how to use the proceeds from allowance auctions. But from a strictly economic perspective, some uses of proceeds clearly deliver economic returns more readily and substantially than others. For example, RGGI investment in EE leads to lower electrical demand, lower wholesale power prices, and lower consumer electricity bills. These savings remain in the pockets of electricity users, and the EE investments also produce positive macroeconomic impacts locally as more dollars stay in and contribute to the local economy. We observe that use of the RGGI dollars provides positive multiplier effects in the RGGI states’ economies, especially compared to other uses of the auction proceeds.

The RGGI states’ experience during 2015-2017 differed along a number of dimensions relative to the first six years of the program.

The RGGI program as implemented during the 2015-2017 period took place in the context of a changing industry and regulatory landscape and with significant changes adopted and implemented by RGGI states. Specifically:

- During 2017, the RGGI states used the six years of prior program experience as they undertook a top-to-bottom review of RGGI, and made a number of changes in the program.
- Many states adjusted how they spent RGGI auction proceeds over time, shifting the use of allowance revenues to reflect changing program and state objectives.
- Fossil fuel prices changed significantly since the start of the program, with natural gas prices (and in turn, wholesale electricity prices) having decreased substantially.
- Electric resources have shifted, with accelerated retirements of older and less efficient (and in most cases, higher-emitting) generating units, and with distributed and central-station renewable energy resources growing at a rapid pace in many of the RGGI states.

Such factors have the potential to influence the administration of RGGI and associated power system and economic impacts. For example, the lower average natural gas prices in 2015-2017 relative to the prior six years led to lower electricity prices in wholesale power markets, which had the effect of reducing the economic value of RGGI-funded EE programs for electricity and heating consumers. Also, the tightening of RGGI’s CO₂ emissions cap contributed to an increase in allowance prices, the operating costs of affected generating units, and impacts on wholesale electric prices. The lower number of allowances available to the market, however, was in part offset by higher allowance prices,

and thus only slightly reduced auction proceeds available to RGGI states during the 2015-2017 period.

Despite the shifting context for RGGI, the core elements of the program – including a declining CO₂ emissions cap, allowance auctions, reinvestment of auction proceeds, active trading of allowances, monitoring of program administration, participation and outcomes, and cooperation among a diverse set of states and stakeholders – operate in ways that continue to produce positive economic and programmatic results for the participating states.