

The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States

Review of RGGI's Fourth Three-Year Compliance Period (2018-2020) and Options for RGGI States to Advance Key Equity Priorities

EXECUTIVE SUMMARY

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I. Executive Summary

A. Overview

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-seventh of the population in the U.S. and more than one-sixth of the nation’s gross domestic product. It is thus important to evaluate and understand the program’s performance and outcomes. Insights and observations gleaned from an analysis of RGGI’s net economic impacts on its member states is valuable not only to the RGGI states as they consider future policy approaches but also to other states and regions as they develop their own plans to reduce CO₂ emissions.

RGGI Continues to Deliver Economic Benefits for Member States, with \$669 Million in Net Economic Benefits and 7,874 Job-Years Added Between 2018 to 2020

Although RGGI’s original purpose was to reduce CO₂ emissions from power generation to help mitigate the economic, social, and environmental risks of climate change, RGGI impacts economic outcomes through changes in power sector operations and the spending of auction proceeds. As in our previous three reports, we track how RGGI-related dollars impact the economies of member states over a three-year compliance period. First, we track how RGGI dollars leave the pockets of fossil-fuel power generators to buy CO₂ allowances, make their way into state accounts, and then roll out into the economy through the expenditure of the allowance auction proceeds. Second, we track how fossil-fuel power generators pass on RGGI-related costs through changes in wholesale electricity prices. Third, we track how RGGI-related investments in energy efficiency and behind-the-meter PV (“BTM PV”) reduce consumer payments through declines in load.

Although our study uses power sector and macroeconomic modeling to develop credible counterfactuals to observed outcomes, the analysis is empirically grounded by focusing on the actual economic activity that results from RGGI including:

- CO₂ allowance prices and 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
- Value added to the economy.

Consistent with our previous three reports, we find that RGGI has continued to deliver net economic benefits to member states, with \$669 Million in economic value-added and 7,874 job-years added between 2018 to 2020.

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 but withdrew its participation at the end of 2011. New Jersey rejoined RGGI and participated in its first auction after rejoining in 2020. Virginia joined RGGI in 2020 and participated in its first auction in 2021. Pennsylvania joined RGGI in 2022 but is yet to participate in an auction. Virginia and Pennsylvania are not included in our economic analysis but are included in our discussion of key equity issues as relevant member states for RGGI’s current Third Program Review.

This Report analyzes the economic impacts of RGGI's most recent three-year compliance period, which spanned 2018 through 2020, for RGGI member states which participated in an auction during this time period (Connecticut, Delaware, Massachusetts, Maryland, Maine, New Hampshire, New York, Rhode Island, Vermont, and, for 2020, New Jersey). This analysis follows three previous studies completed by Analysis Group in November 2011, July 2015, and April 2018 on RGGI's Compliance Periods 1, 2, and 3 (2009-2011, 2012-2014, and 2015-2017 respectively).² The robust conclusion across all of our reports is that RGGI has delivered economic benefits to its member states while helping states make progress toward their greenhouse gas ("GHG") emission reduction targets.

RGGI States Are Taking New and Innovative Approaches to Advance Equity Priorities

Beyond RGGI's original purpose to abate CO₂ and its associated impact on aggregate economic activity, RGGI intersects with recently announced goals of RGGI states to monitor and address the disproportionate impact on overburdened communities of harmful air, water and solid waste hazards associated with energy production and use. RGGI impacts overburdened communities through changes in economic activity and changes in local air pollutants. However, unlike the aggregate impact of RGGI on economic activities, much less is known about the impact of RGGI on overburdened communities.

In this report we review the status of state and federal efforts to monitor and address disproportionate environmental impacts on overburdened communities, consider the intersection of these issues with RGGI program design and administration, and provide observations and recommendations for consideration by the RGGI states. In particular, there are opportunities for new studies of potential pollution hot spots impacting overburdened communities, increased spending of RGGI auction proceeds on ambient air pollution monitors, greater participation of members of overburdened communities in the review of permitting of polluting facilities, additional gathering of data on investments impacting overburdened communities, and minimum spending requirements for the investment of RGGI auction proceeds in overburdened communities.

In addition, we discuss how RGGI intersects with state goals to monitor and address the disproportionate impact on overburdened communities of energy production and use, and the associated harmful air, water and solid waste hazards.³ The RGGI states have committed to consider these issues on a going-forward basis, both as part

² 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 Economic Impacts Of The Regional Greenhouse Gas Initiative On Nine Northeast And Mid-Atlantic States," Analysis Group, April 17, 2018, available at

https://www.analysisgroup.com/globalassets/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf. The analytic method and structure of this Report were modeled closely on those of the prior reports. The analytic method employed in these reports has been peer-reviewed. See Hibbard, Paul and Susan Tierney. "Carbon Control and the Economy: Economic Impacts of RGGI's First Three Years." *The Electricity Journal*. Volume 24: 10, December 2011, pp. 30-40 and Hibbard, Paul, Susan Tierney, Pavel Darling, and Sarah Cullinan. "An expanding carbon cap-and-trade regime? A decade of experience with RGGI charts a path forward." *The Electricity Journal*. Volume 31: 5, June 2018, pp. 1-8.

³ As documented in **Section III.B**, many different terms have been used by environmental justice and equity advocates, federal regulators, and state regulators to describe communities disproportionately impacted by environmental, health, and economic inequities including harmful air, water, and solid waste hazards. Such terms include "overburdened communities," "disadvantaged communities," "environmental justice communities," "frontline communities," and "distressed communities." For the purposes of simplicity, without assuming that this is the appropriate term to use in any given situation, we will refer to these communities as "overburdened communities" except when referring to the specific terminology employed by state or federal agencies.

of the RGGI program and more generally in the development and administration of economic, energy, and climate policies. In this report we review the current status of such efforts at state and federal levels, consider the intersection of these issues with RGGI program design and administration, and provide observations and recommendations related to this for consideration by the RGGI states. Additionally, we catalog the status of equity metrics under development for every RGGI state, select federal agencies, and select non-RGGI states.

B. Economic Results

Reflecting the original aim of the RGGI program, over the past twelve years, CO₂ emissions from power generation in the RGGI region have declined 46% from an average of 142 million short tons in the base period of 2006 to 2008 to 77 million short tons in 2020.⁴ These emissions declines are partly driven by RGGI itself, along with other state energy and environmental policies and broader economic and industry factors.⁵

However, beyond these CO₂ reductions, owners of fossil-fueled power plants have spent \$3.8 billion to purchase CO₂ emission allowances as part of a centralized regional auction over RGGI's history. In turn, fossil-fuel power plants have modified their bid offers in regional wholesale electricity markets to reflect these allowance purchases and grid operators in these regions have used these offer prices to dispatch power plants economically while maintaining system reliability.

Since 2009, the RGGI states have received virtually all of the \$3.8 billion in auction proceeds and disbursed them back into the economy in various ways including: energy efficiency (“EE”) measures and programs; renewable energy (“RE”) projects; GHG-emission reduction measures; direct electricity consumer bill assistance, including for low-income households; education and job training programs; and beneficial electrification programs.

RGGI has delivered \$669 million in net economic benefits to member states from 2018 to 2020

Consistent with our previous reports, we find that RGGI member states experienced net economic benefits over the last three years (2018-2020) after accounting for both direct program spending and the impacts of RGGI on the power sector. Overall, RGGI led to \$669 million (net present value or “NPV”) of total economic activity in the ten-state region over the 2018-2020 time period.⁶ When spread across the region's population, these economic impacts amount to \$15 in net positive value added per capita.⁷ **Figure 1** shows the net economic value to the ten-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-NE electrical region, New York participating in the one-state NYISO system, and Maryland, Delaware, and New Jersey participating in the multi-state PJM power system).

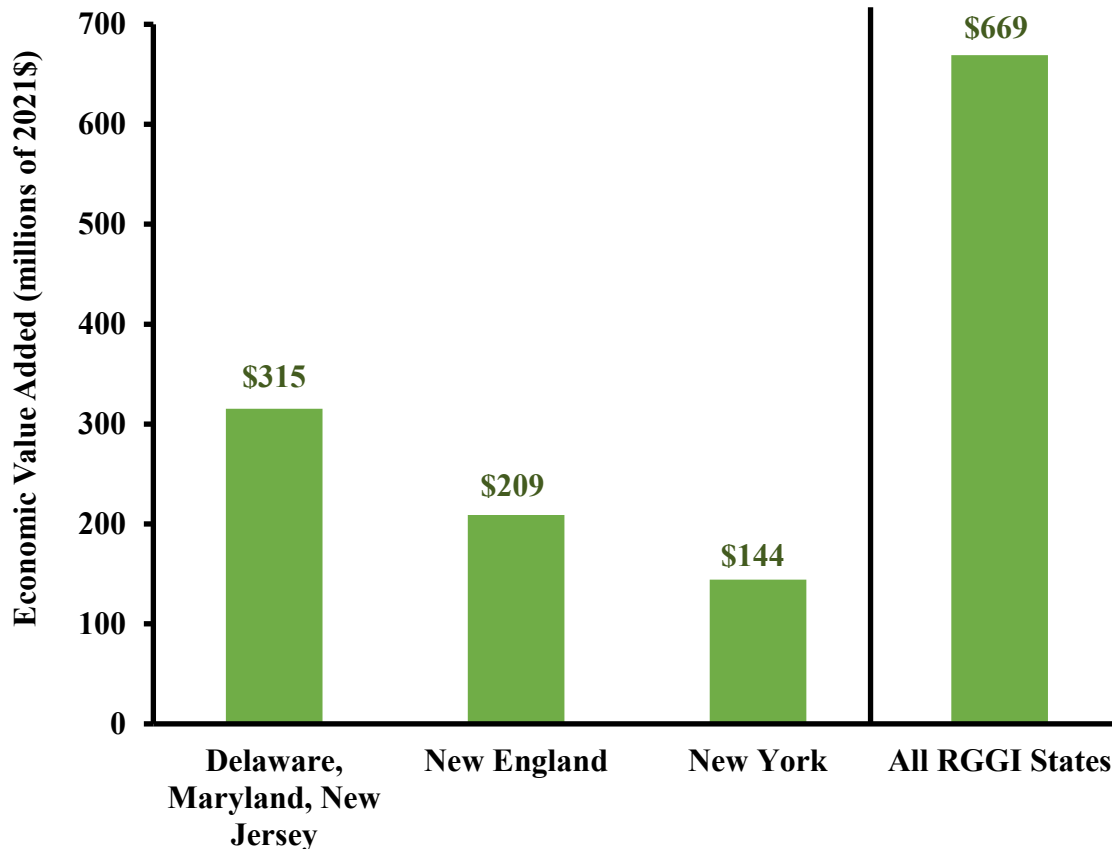
⁴ “CO₂ Emissions from Electricity Generation and Imports in the Regional Greenhouse Gas Initiative: 2019 Monitoring Report,” The Regional Greenhouse Gas Initiative, June 15, 2022, available at: https://www.rggi.org/sites/default/files/Uploads/Electricity-Monitoring-Reports/2019_Elec_Monitoring_Report.pdf; <https://www.rggi.org/allowance-tracking/rggi-coats>

⁵ Murray, Brian and Peter Maniloff. “Why have greenhouse emissions in RGGI states declined? An econometric attribution to economic, energy market, and policy factors,” September 2015, available at: <https://www.sciencedirect.com/science/article/pii/S0140988315002273>

⁶ All results for Compliance Period 4 are reported in 2021 dollars, with results reported using a 3-percent “public” discount rate.

⁷ The relevant population is defined as the average population covering the nine continuous RGGI member states for 2018 and 2019, and the ten member states including New Jersey in 2020. Source: <https://www.census.gov/programs-surveys/popest/technical-documentation/research/evaluation-estimates/2020-evaluation-estimates/2010s-state-total.html>

Figure 1. Net Economic Impact of the Implementation of RGGI During the 2018-2020 Period



Notes: [1] Figures are reported in 2021 dollars (NPV), converted using a 3-percent public discount rate. [2] Total economic value added reflects the impacts of the direct spending of RGGI proceeds, net electric sector impacts to consumer payments, net impacts to power plant owner profits, changes in capacity payments, and consumer benefits from natural gas savings associated with energy efficiency investments funded with RGGI auction proceeds.

Moreover, Compliance Period 4 led to overall job increases amounting to thousands of new job-years over time. According to our analysis, the net effect is that RGGI activity during the 2018-2020 period led to over 7,874 new job-years, cumulative over the study period. 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, renewable resource installers, and staff performing training on energy issues.

Importantly, in our economic analysis of the RGGI program 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 to test the possibility that controlling emissions of CO₂ will lead to negative economic consequences for states that take action. Our results – which instead reveal positive economic impacts – should be viewed as additive to whatever other benefits to

human health and the environment flow from reducing economic, social, health and environmental risks associated with climate change, reduced health risks associated with ancillary reductions in other pollutants, or reduced health and environmental impacts associated with other effects of fossil-fuel generation.

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

These net economic benefit estimates capture the direct impacts of RGGI spending, along with producer-to-producer supply-chain linkages and changes in spending due to changes in household income. Together, these dollar flows have direct and indirect multiplier effects locally and regionally.⁸ The size of RGGI's economic impacts varies by state, in large part because the states spent their RGGI auction proceeds in different ways, tailored to each state's economic, energy, and climate policy goals.⁹ 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 or RE facilities will tend to lower electricity prices in wholesale power markets (as compared to a "without-RGGI" scenario). This in turn places downward pressure on consumers' electricity bills over time.

Local investment of RGGI dollars on energy efficiency and renewable energy help counter 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 in the 2018-2020 compliance period. But these near-term impacts are offset in subsequent years because states invest a substantial amount of the RGGI auction proceeds on EE and RE programs. EE and RE programs reduce net electricity consumption for program participants and lower wholesale electricity prices for everyone in the RGGI region by lowering regional electricity demand. Overall, despite an initial increase in wholesale electricity prices during the compliance period, consumers enjoy net economic gains through the combination of direct program spending and savings associated with EE and RE spending.

Over the previous twelve years, RGGI has contributed to a 46% reduction in carbon emissions, raised \$3.8 billion in allowance revenues, generated net economic benefits of approximately \$5.7 billion dollars, and added 48,000 incremental job-years

While RGGI contributed to a 46% reduction in carbon emissions, the AG Reports have consistently found that RGGI delivered net economic benefits to the RGGI states. In short, we have found that across all four compliance periods – the period 2009-2020 – RGGI has delivered \$475 million in economic benefits and 4,000 incremental job-years per year to the RGGI states.

These findings have been consistent since RGGI's inception, creating substantial cumulative economy and job benefits to participating states.¹⁰ Our modeling of the four compliance periods indicates that, over the past twelve years, RGGI's carbon cap-and-invest program has generated cumulative net positive economic value for the

⁸ Our macroeconomic analysis captures all regional impacts of a single state's spending for the ten RGGI member states.

⁹ Overall, the distribution of spending across the RGGI states for the 2018-2020 period was: 41% on EE; 17% on RE projects; 17% on direct bill assistance to consumers; 6% on program administration; 13% on GHG-emission reduction programs; and the remainder on other programs. Individual state expenditures varied significantly across these categories.

¹⁰ Job benefits reflect "job-years," and do not identify what portion of these numbers are associated with permanent versus temporary jobs.

participating states' economies of approximately \$5.7 billion dollars (2021\$).¹¹ States' participation in RGGI has led to approximately 48,000 job-years while, at the same time, annual carbon-emissions have dropped nearly 46 percent.

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, notably, have changed significantly *within* states over time. For example, 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, the RGGI states' experience confirms that states can work together, particularly when doing so is likely to lower compliance costs. The joint decision by the RGGI states to make their CO₂ allowances available to the market through a unified auction has generated \$3.8 billion for public use. 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. Because of RGGI's "cap-and-invest" model, states' use of allowance proceeds has allowed for the support of diverse state energy/environmental policy and economic outcomes. For example, states have used RGGI auction proceeds to support a variety of state-specific social, fiscal, and environmental policy goals, such as assisting low-income customers, supporting advanced energy policy goals, and restoring wetlands, among other things.

C. RGGI States Are Implementing New and Innovative Policies to Advance Equity Priorities

RGGI states are actively implementing new policies to address the disproportionate impacts of energy supply and use on overburdened communities.

We summarize recent policy developments among RGGI states, which have increasingly recognized the disproportionate impacts of energy supply and use on overburdened communities. Moreover, RGGI states have committed to exploring environmental justice and equity issues in the context of RGGI's current Third Program Review process. This will be the first time environmental justice and equity issues are considered in the context of RGGI program design: the current RGGI Memorandum of Understanding (MOU), which outlines the framework of the Model Rule that may be considered by each participating state in developing their own RGGI implementation laws and regulations, does not mention justice or equity considerations.¹² Within the context of these policy

¹¹ As noted earlier, we have used the same foundational analytic methods, assumptions, and data sources across all four studies to ensure consistency in study results. However, caution must be exercised in directly adding results across study periods. We rely on our previous work for this calculation. See, Hibbard, Paul, Susan Tierney, Pavel Darling, and Sarah Cullinan. "An expanding carbon cap-and-trade regime? A decade of experience with RGGI charts a path forward." *The Electricity Journal*. Volume 31: 5, June 2018, pp. 1-8.

¹² The RGGI States' MOU has a preamble that recognizes the common objectives of the states' own policies "to conserve, improve, and protect their natural resources and environment in order to enhance the health, safety, and welfare of their residents consistent with continued overall economic growth and to maintain a safe and reliable electric power supply system." The MOU also declares a common goal of the states of "reducing our dependence on imported fossil fuels will enhance the region's economy by augmenting the

developments, we highlight several ways identified by federal and state agencies and stakeholders to address equity issues.

The RGGI states could specifically evaluate and address potential pollutant “hot spot” issues arising from RGGI implementation.

Although RGGI has reduced air pollution in aggregate as a co-benefit of reducing CO₂ emissions, the RGGI program could result in increases in emissions of harmful pollutants at times from one or more individual power plants. To assess this potential effect, we describe a hybrid methodological approach in **Section III.C** that combines actual emissions data from specific generators, pollution transport modeling, and economic supply curve analysis that could be used to estimate the impact of RGGI or other similar environmental policies on the emissions from a specific generator. This method could allow RGGI states to analytically assess the potential for adverse public health and environmental impacts in specific locations and, if found, seek ways to avoid or address them.

The RGGI states could use RGGI allowance revenues to improve the monitoring of air quality in specific communities.

Given the potential for local air quality impacts discussed in the previous bullet, states could consider increasing the installation of air quality monitoring stations in overburdened communities to monitor ambient air pollutant concentrations and assess the impact of RGGI, or other climate/environmental policies, on air quality and public health in these locations. To the extent funding is an issue, a state could consider using RGGI allowance proceeds for this purpose.

RGGI program reviews could actively support greater participation by affected members of the public in overburdened communities.

Many of the state programs we review have developed procedures to require opportunities for, and in some cases fund, the active participation of representatives from overburdened communities and environmental justice groups. The attention of RGGI program design to these equity issues could be significantly improved by ensuring active participation of members and/or representatives of these communities in (a) programs to monitor pollutant emissions from affected power plants and the monitoring of changes in the air quality at these locations, and (b) specific proceedings of state agencies related to the siting, development and/or permitting of power plants in or near these communities. RGGI auction proceeds could be used to support the participation of community members in relevant program reviews and other formal state proceedings.

RGGI states could track and report the use of RGGI allowance proceeds specifically with respect to the distribution of the benefits of RGGI-funded programs among residents, with a focus on overburdened communities.

Historically, the RGGI states have carefully tracked the use of auction proceeds. Studies like this have tracked the benefits that flow from RGGI revenue spending. The RGGI states could consider expanding the collection of data

region’s energy security and by retaining energy spending and investments in the region...” Additionally, the original RGGI MOU states that delay in addressing GHG emissions will make later investments in mitigation and adaptation more difficult and costly, and that a market-based carbon allowance-trading program will create strong incentives for the development of lower-emitting energy sources and energy efficiency. See https://www.rggi.org/sites/default/files/Uploads/Design-Archive/MOU/MOU_12_20_05.pdf, pp. 1-2.

related to allowance proceeds spending with a focus on investments in overburdened communities and the distribution of benefits of RGGI program spending to different segments of the population.

RGGI states could consider establishing standards that set a minimum distribution of benefits to overburdened communities.

In line with recent minimum spending standards by state governments and the Justice 40 Executive Order by President Biden, RGGI states could use the data and analysis described in the previous bullet to ensure that a minimum proportion of RGGI investing – and associated benefits – flows to overburdened communities. As one example, this minimum could be set at the proportion of the population living in overburdened communities. If a state wishes to go beyond the minimum to alleviate inequities more rapidly, it could consider directing a much higher proportion of RGGI auction proceeds to be invested in overburdened communities.