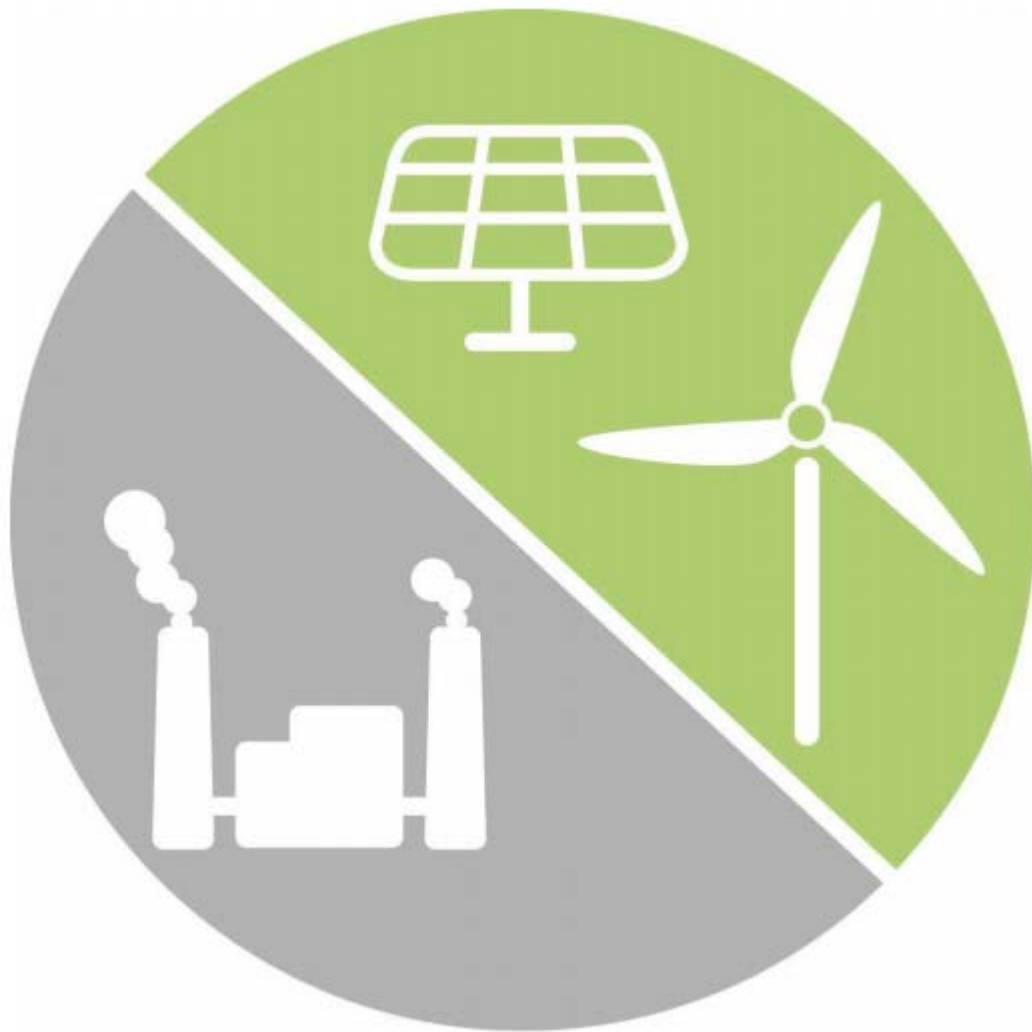


# Outpacing the Nation:

**RGGI's environmental and economic success**



September 2017

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## Executive Summary

Through eight and a half years of operation, the Regional Greenhouse Gas Initiative (RGGI) has helped Northeast and Mid-Atlantic States<sup>1</sup> achieve significant reductions in emissions of carbon dioxide (CO<sub>2</sub>) and other pollutants from the electric power sector. Over the same period RGGI states' economies have outpaced the rest of the country, and electricity prices within RGGI have fallen, even as prices in other states have increased.

Factors that have contributed to RGGI's success show no signs of reversing. Fuel-switching, improved energy efficiency, and growing renewable energy output have caused emissions to drop by 40% since RGGI launched.<sup>i</sup> The rate of pollution reductions continues to outpace expectations, with 2016 emissions falling 8% below an emissions cap that was tightened three years ago.

More broadly, RGGI is achieving its initial goals. Power generators have incorporated RGGI requirements into normal business operations, and the electric sector as a whole has adapted to the shifting economics of cleaner generation sources while continuing to provide reliable electricity supply. Requiring electric generators to pay for disposing CO<sub>2</sub> in the atmosphere has led the market to incorporate the cost of pollution into resource utilization and planning decisions, while at the same time raising revenue for states to reinvest in clean energy and consumer programs that reduce emissions and boost economic growth.

RGGI states' experience reducing emissions faster and at lower cost than anticipated has emboldened them to strengthen the program for the future. As the federal government undermines climate action, the RGGI states have just announced a proposal to reduce the emissions cap by an additional 30% by 2030. This announcement is not just symbolic, as the RGGI states' combined economic output of \$2.8 trillion comprises the sixth largest economy in the world, ahead of India, Brazil and France.<sup>ii</sup> Additionally, New Jersey and Virginia may both join RGGI in the near future, taking the combined economic output to \$3.9 trillion, fourth in the world.<sup>iii</sup>

Momentum is building in the transition to a clean energy economy, and this report describes how RGGI states are leading the way.

### Key Facts:

- ◆ In 2016 RGGI states emitted 79,228,039 tons of CO<sub>2</sub>, falling 8.4% below the RGGI cap, and emissions have fallen 40% since RGGI launched.
- ◆ Average electricity prices across the region have decreased by 6.4% since RGGI took effect, while electricity prices in other states have increased by 6.2%.
- ◆ Since RGGI launched member states have reduced emissions by 15% more than other states and experienced 4.3% more economic growth.
- ◆ The RGGI states have proposed to strengthen the program through 2030, supporting the program's continued environmental and economic success.
- ◆ Proposed RGGI reforms will result in 130 million fewer tons of CO<sub>2</sub> and \$1.28 billion in avoided health impacts.

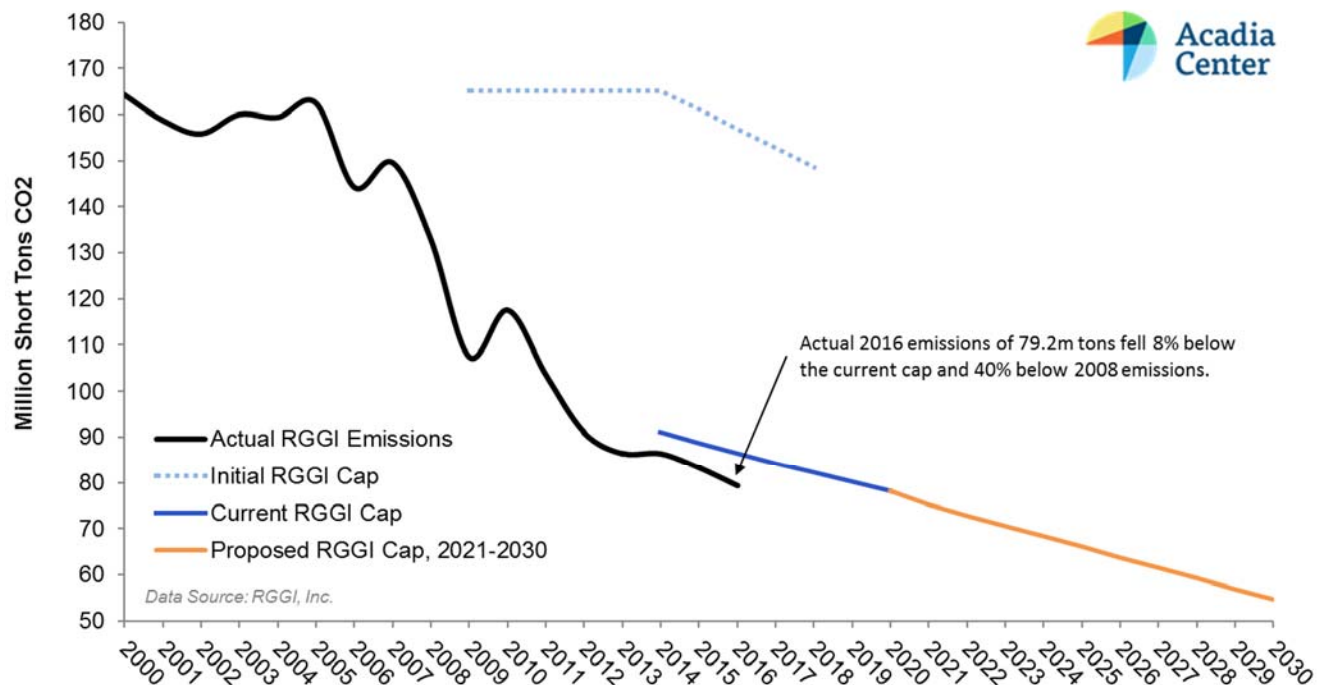
<sup>1</sup> Analysis in this report covers the participating RGGI states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. [Footnotes elaborate on points within this report, whereas endnotes cite references and provide detailed analytic methodologies where relevant.]

## Emissions Trends

### CO<sub>2</sub> Reductions

Emissions in 2016 continued the downward trend of recent years. CO<sub>2</sub> emissions from power plants covered by RGGI totaled 79,228,039 short tons of CO<sub>2</sub> in 2016, which was **8.4% below the 2016 emissions cap** of 86,506,875 tons, and **40% below emissions levels in 2008**, the year before RGGI started. This trend has continued into 2017, as both the first and second quarters have set records for lowest quarterly emissions.<sup>iv</sup>

Figure 1: RGGI Caps and Actual Emissions



While many factors can cause emissions reductions, RGGI appears to be the single most significant force behind recent declines in power sector CO<sub>2</sub> emissions. According to a 2015 study from the Duke Nicholas Institute which attributed emissions reductions to specific market factors, RGGI was responsible for a greater portion of the reductions through 2014 than fuel switching to natural gas or the economic downturn.<sup>v</sup>

Substantial emissions reductions have been achieved to date, but the RGGI states have made it clear that they are committed to additional progress. Through the 2016 Program Review the RGGI states have agreed to extend and strengthen the program through 2030.<sup>vi</sup> Agreed reforms include a 30% reduction in the cap from 2020 to 2030 as well as other program design changes to protect the program's environmental integrity.<sup>vii</sup> Adoption of these reforms will result in **130 million fewer tons of CO<sub>2</sub> emissions by 2031,**<sup>viii</sup> equivalent to avoiding emissions from 28 million cars for one year.

## Health Impacts

The decline in power plant CO<sub>2</sub> emissions has been accompanied by reductions in hazardous pollutants, producing significant health benefits for the region. Emissions of sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and mercury (Hg)—all of which are harmful to human health—have fallen significantly since the program began. A recent study from Abt Associates found that RGGI was directly responsible for a substantial share of the reductions in criteria air pollutants<sup>2</sup> from 2009 to 2014, offering a clear assessment of RGGI's value to the well-being of the region:<sup>ix</sup>

*“The RGGI program improved air quality throughout the Northeast states and created major benefits to public health and productivity, including avoiding hundreds of premature deaths and tens of thousands of lost work days . . . The economic value of RGGI's health and productivity benefits is estimated at a cumulative \$5.7 billion.”*

Reforms to strengthen RGGI through 2030 will deliver additional benefits going forward. Modeling conducted for the RGGI states finds that the recently proposed policy package will result in less electricity generation from fossil fuels in the region compared to the business-as-usual reference case.<sup>x</sup> Applying EPA's Benefit Per Ton (BPT) metrics to projected emissions shows that the RGGI cap decision will have a significant impact on public health. **The proposed policy scenario is projected to result in \$1.28 billion in monetized health impacts from avoided SO<sub>2</sub> and NO<sub>x</sub> emissions.**<sup>xi</sup>

## Economic Trends

### RGGI's Economic Impacts

RGGI has generated significant economic benefits for states participating in the program. By selling allowances (permits to emit CO<sub>2</sub>), RGGI states raise revenue to reinvest in energy efficiency, renewable energy, and other consumer programs that increase economic activity in participating states. The majority of program revenue (59% during the second control period, 2012 to 2014<sup>xii</sup>) has been invested in energy efficiency programs that reduce consumers' bills and reduce demand for power. Lower power demand resulting from energy efficiency means fewer emissions from power plants, and less money leaving the region to pay for imported fossil fuels. Energy bill savings increase consumer spending, benefiting businesses that offer goods and services in the region. Independent macroeconomic analysis has found that programs supported with revenue raised over RGGI's first six years of operation will generate **over \$1.56 billion in energy bill savings.**<sup>xiii</sup> These savings create **over \$2.76 billion in net economic gains and 28,500 job-years of employment.**<sup>3</sup>

<sup>2</sup> “Criteria air pollutants” refer to the six most common air pollutants in the United States: carbon monoxide (CO), lead, ground-level ozone (O<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS), which are maximum allowable concentrations for these pollutants that are protective of public health.

<sup>3</sup> These figures are based on the combined findings from two separate reports from the Analysis Group, the first of which covered impacts from 2009 through the first half of 2011 (New Jersey employment and net economic impacts have been excluded from this analysis), the second report covering 2012 to 2014. As a result, the combined benefits included above only account for five and a half years of revenue reinvestment, rather than the full six years from 2009 to 2014.

## Economic Growth and Emissions

The RGGI states have managed to rapidly reduce CO<sub>2</sub> emissions without impeding economic growth. In fact, the region is proving that decarbonization and economic growth can go hand in hand. While the country as a whole has been experiencing declining carbon emissions and economic growth, the RGGI states have outpaced other states on both metrics. From 2008 (before RGGI’s launch) to 2016, **RGGI states’ economies grew by 29.7% versus 25.4% in states that do not regulate or put a price on carbon emissions** (this group of 40 “other states” does not include California, which has similarly outpaced national growth since capping GHG emissions<sup>xiv</sup>). Over the same 2008 to 2016 period, **emissions in the RGGI region dropped by 33% versus 18% in other states.**<sup>4</sup>

Figure 2: Change in Economic Growth and Emissions, 2008 to 2016

	Economic Growth	CO <sub>2</sub> Emissions
RGGI States	+29.7%	-33%
Rest of the Country	+25.4%	-18%
RGGI vs. Others	<b>+4.3%</b>	<b>-15%</b>

Electricity demand has historically been tied to economic growth, with electricity consumption and related emissions increasing during periods of economic expansion and decreasing in economic downturns. This correlation has broken in the RGGI region and appears to be mirrored—slightly less dramatically—at the national level, demonstrating that emissions reductions can be achieved while promoting economic growth.

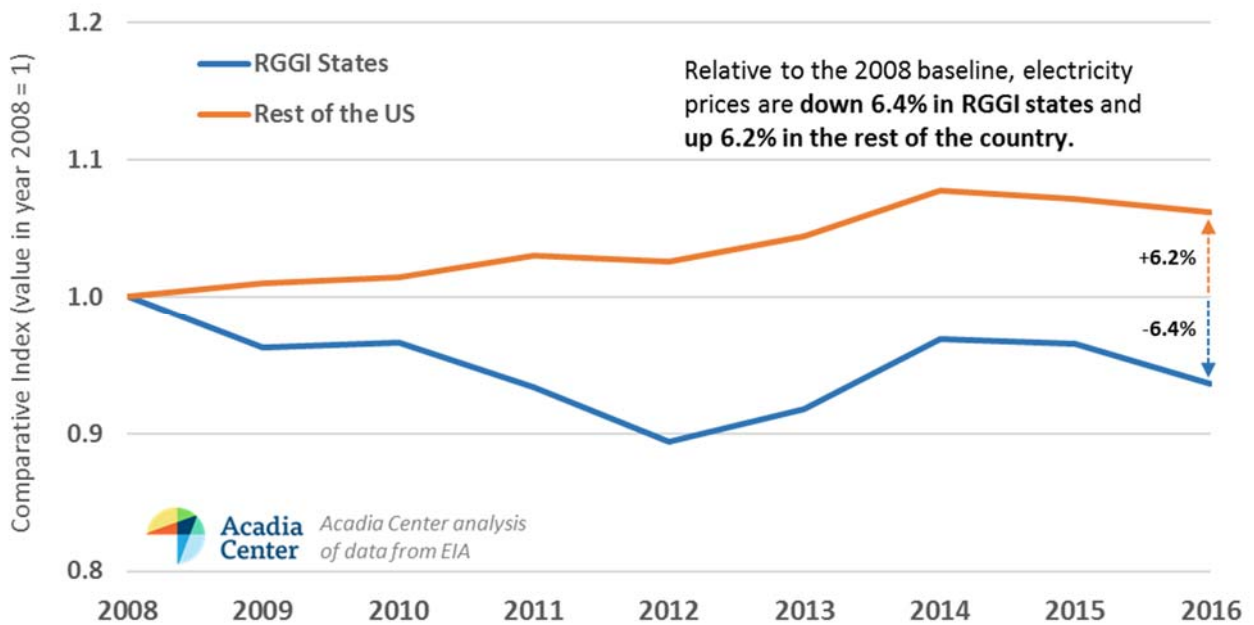
## Electricity Prices

Average retail electricity prices in the region have decreased since RGGI took effect. Comparing retail electricity prices from 2008 to 2016 shows that prices have dropped by 6.4% across the region.<sup>xv</sup> While RGGI’s direct impact on electricity prices is difficult to isolate from other factors, it is evident that the program has not caused electricity prices to rise from 2008 levels.<sup>xvi</sup> Concerns that climate policy will make states less competitive are directly refuted by RGGI’s experience: RGGI states are faring much better than the rest of the country on electricity price trends. As shown in Figure 3, while RGGI’s electricity prices have fallen from where they were in 2008, the rest of the country<sup>5</sup> has experienced a 6.2% increase in retail electricity prices over the same period.

<sup>4</sup> In order to compare emissions in the RGGI states to emissions in the rest of the country, the emissions measured in this section are from EIA Form 923. This represents a broader range of emissions sources than those covered by RGGI, which explains the difference in reported RGGI emissions here versus elsewhere in this report.

<sup>5</sup> The “rest of the country” excludes California, which, like the RGGI states, has implemented a cap-and-invest program to reduce CO<sub>2</sub> emissions.

Figure 3: Volume-Weighted Electricity Prices, 2008 to 2016



## Conclusion

RGGI has successfully demonstrated the viability of a market-based program to reduce CO<sub>2</sub> emissions from the power sector while generating benefits for participating states. RGGI's experience has disproven the concerns most frequently associated with capping emissions from the power sector. Emissions have declined rapidly, far more dramatically than projected, without stifling economic growth. RGGI's reinvestment model has benefited the regional economy and increased employment. The region now pays lower electricity prices than before the program began.

The RGGI states have committed to build on this success by extending the program through 2030. This continued progress in the power sector is necessary to maximize the climate benefits of electrifying buildings and transportation. The RGGI states' track record of bipartisan collaboration provides a foundation for additional efforts to expand the program to additional sectors and states. With CO<sub>2</sub> emissions from the transportation sector surpassing power sector emissions in the region and the country, the RGGI experience provides a blueprint for the states to apply to this urgent challenge. New Jersey and Virginia are also poised to join RGGI, providing a pathway to broader climate action at the state and regional levels.

## Endnotes

- <sup>i</sup> Acadia Center analysis of emissions data from RGGI, Inc., at: [https://rggi-coats.org/eats/rggi/index.cfm?fuseaction=search.rggi\\_summary\\_report\\_input&clearfuseattrs=true](https://rggi-coats.org/eats/rggi/index.cfm?fuseaction=search.rggi_summary_report_input&clearfuseattrs=true)
- <sup>ii</sup> Acadia Center, RGGI on the World Stage, 2017, available at: <http://acadiacenter.org/document/rggi-on-the-world-stage/>
- <sup>iii</sup> GDP data for states and countries provided by the US Bureau of Economic Analysis and the International Monetary Fund, respectively. Available at <https://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#reqid=70&step=1&isuri=1> and <http://www.imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx>
- <sup>iv</sup> Cap levels and emissions from RGGI, Inc., at: <http://rggi.org/>
- <sup>v</sup> Brian Murray and Peter Maniloff, *Why Have Greenhouse Emissions in RGGI States Declined? An Econometric Attribution to Economic, Energy Market, and Policy Factors*, Duke Nicholas Institute, August 2015. Available at: <https://nicholasinstitute.duke.edu/environment/publications/why-have-greenhouse-emissions-rggi-states-declined-econometric-attribution-economic>
- <sup>vi</sup> Announcement of Proposed Program Changes, RGGI, Inc., September 2017. Available at: [http://www.rggi.org/docs/ProgramReview/2017/08-23-17/Announcement\\_Proposed\\_Program\\_Changes.pdf](http://www.rggi.org/docs/ProgramReview/2017/08-23-17/Announcement_Proposed_Program_Changes.pdf)
- <sup>vii</sup> Program Elements Overview and Next Steps, RGGI, Inc., September 2017. Available at: [http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Program\\_Elements\\_Overview\\_09\\_25\\_17.pdf](http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Program_Elements_Overview_09_25_17.pdf)
- <sup>viii</sup> Draft IPM Base Model Rule Policy Results, September 2017, Available at: [http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Draft\\_IPM\\_Results\\_Model\\_Rule.xlsx](http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Draft_IPM_Results_Model_Rule.xlsx), and Draft IPM Modeling Reference Case Results (No CPP), September 2017. Available at: [http://www.rggi.org/docs/ProgramReview/2017/04-20-17/DRAFT\\_Results\\_RGGI\\_2017\\_Reference\\_Case\\_No\\_CPP.xlsx](http://www.rggi.org/docs/ProgramReview/2017/04-20-17/DRAFT_Results_RGGI_2017_Reference_Case_No_CPP.xlsx)
- <sup>ix</sup> Michele Manion, et al, *Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative, 2009-2014*, Abt Associates, January 2017. For more information, see: <http://abtassociates.com/RGGI>
- <sup>x</sup> Draft IPM Base Model Rule Policy Results, September 2017, Available at: [http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Draft\\_IPM\\_Results\\_Model\\_Rule.xlsx](http://www.rggi.org/docs/ProgramReview/2017/09-25-17/Draft_IPM_Results_Model_Rule.xlsx), and Draft IPM Modeling Reference Case Results (No CPP), September 2017. Available at: [http://www.rggi.org/docs/ProgramReview/2017/04-20-17/DRAFT\\_Results\\_RGGI\\_2017\\_Reference\\_Case\\_No\\_CPP.xlsx](http://www.rggi.org/docs/ProgramReview/2017/04-20-17/DRAFT_Results_RGGI_2017_Reference_Case_No_CPP.xlsx)
- <sup>xi</sup> EPA Technical Support Document: Estimating the Benefit per Ton of Reducing PM<sub>2.5</sub> Precursors from 17 Sectors, available at: <https://www.epa.gov/sites/production/files/2014-10/documents/sourceapportionmentbpttsd.pdf>. Our analysis uses the Krewski et al. (2009) mortality estimate and a 3% discount rate. We apply the 2016 BPT estimates for emissions generated from 2017-2019, the 2020 BPT estimates for emissions generated from 2020-2024, the 2025 BPT estimates for emissions generated from 2025-2029, and the 2030 BPT estimates for emissions generated in 2030.
- <sup>xii</sup> Analysis Group, 2015, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States*, available at: [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis\\_group\\_rggi\\_report\\_july\\_2015.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf)
- <sup>xiii</sup> Id.
- <sup>xiv</sup> As detailed in the Environmental Defense Fund's recent report, *Carbon Market California: A Comprehensive Analysis of the Golden State's Cap-and-Trade Program*, California has experienced significant economic benefits resulting from AB 32, and GDP growth in the state outpaced the national average in 2011, 2012, and 2013: [http://www.edf.org/sites/default/files/content/carbon-market-california-year\\_two.pdf](http://www.edf.org/sites/default/files/content/carbon-market-california-year_two.pdf)
- <sup>xv</sup> Energy Information Administration (EIA), Form 826, <http://www.eia.gov/electricity/data/eia826/>. The volume-weighted average shown in Table 1 is a product of each state's electricity price multiplied by electric load in the given year.
- <sup>xvi</sup> VT buys more power through long term contracts than other states in the region. This approach has stabilized prices but means that VT is insulated from wholesale price trends, which have recently decreased power prices in other states in the region. It is worth noting that Vermont's RGGI revenue supports thermal efficiency programs for customers using propane, fuel oil, and natural gas. While thermal efficiency programs generate greater cost and GHG savings than electricity programs in Vermont, electric price suppression is not as significant as in other states that direct RGGI revenue to electric efficiency programs. NH is also more dependent on long term contracts, though not to the same extent as VT, and NH directs the majority of auction revenue to rebates, which do not suppress electric prices.