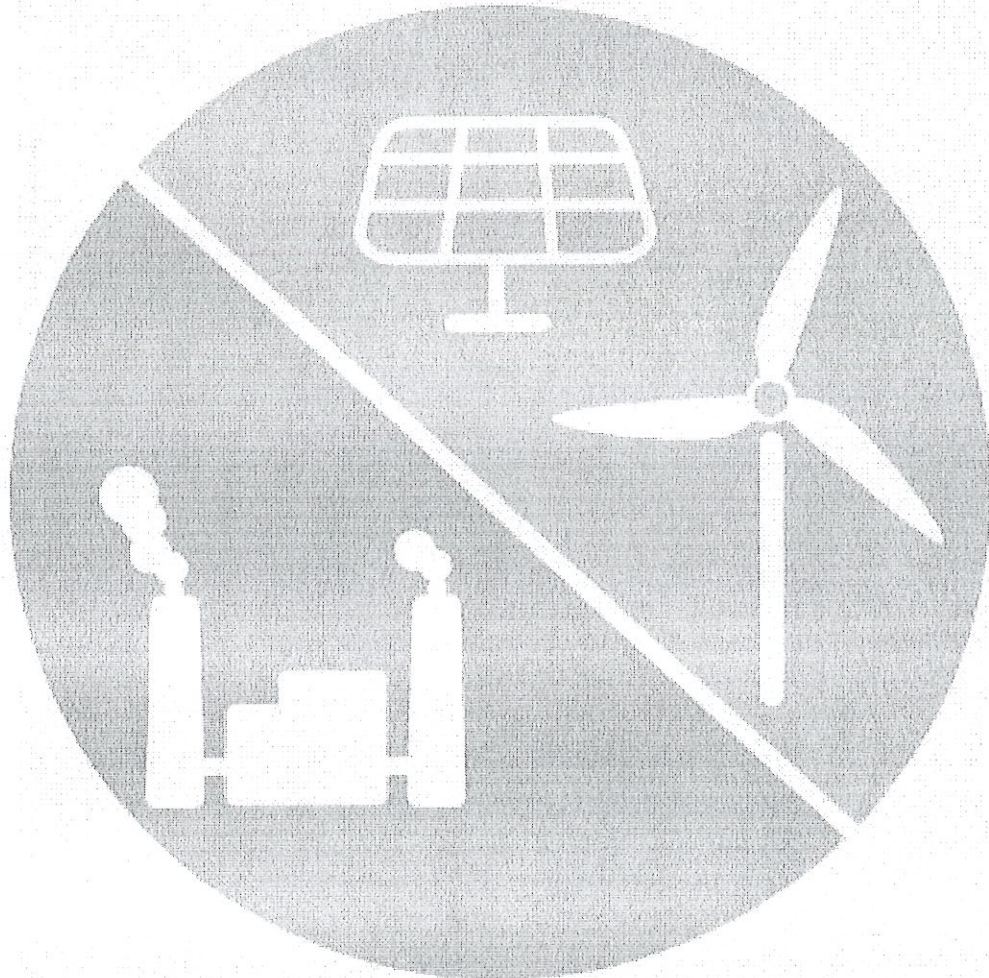


Regional Greenhouse Gas Initiative Status Report

Part I: Measuring Success



July 2016



**Acadia
Center**

Advancing the Clean Energy Future

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Introduction – An Effective Program

Through seven and a half years of operation, RGGI has helped Northeast and Mid-Atlantic States¹ achieve significant reductions in emissions of carbon dioxide (CO₂) 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 the region have fallen, even as prices in other states have increased.

Through reforms considered in the 2016 Program Review, states can build on this success and solidify RGGI's role in achieving state-level climate commitments and requirements of the Environmental Protection Agency's (EPA) Clean Power Plan (CPP).

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 37% since RGGI launched.¹ The rate of pollution reductions continues to outpace expectations, with 2015 emissions falling 6% below an emissions cap that was tightened only two years ago.

Key Facts:

- ◆ 2015 emissions of 83,201,850 tons of CO₂ fell 6.3% below the RGGI cap.
- ◆ Electricity prices across the region have decreased by 3.4% on average since RGGI took effect, while electricity prices in other states have increased by 7.2%.
- ◆ Since RGGI launched member states have reduced emissions by 16% more than other states and seen 3.6% more economic growth.
- ◆ Electric sector trends responsible for low emissions — including increasing generation from renewables and natural gas, and growing investments in energy efficiency — show no signs of reversing.
- ◆ Reforms decided during the 2016 Program Review will determine whether RGGI continues to succeed.

More broadly, RGGI has achieved 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 different generation sources while continuing to provide a reliable supply of electricity. Requiring electric generators to pay for disposing CO₂ in the atmosphere has led the market to incorporate the cost of pollution into planning decisions, while at the same time raising revenue for states to reinvest in clean energy and consumer programs that drive additional emissions reductions and economic growth.

RGGI states' experience reducing emissions faster and at lower cost than anticipated comes at an important time as states work to chart RGGI's course into the future, and as other states consider implementing market-based climate policy to comply with the CPP. Part I of this Status Report focuses on: 1) key trends since RGGI's launch, 2) electric sector drivers, 3) economic trends, and 4) the status of the RGGI market.

Part II of the Status Report focusing on key decisions that RGGI states face in the 2016 Program Review will be released shortly.

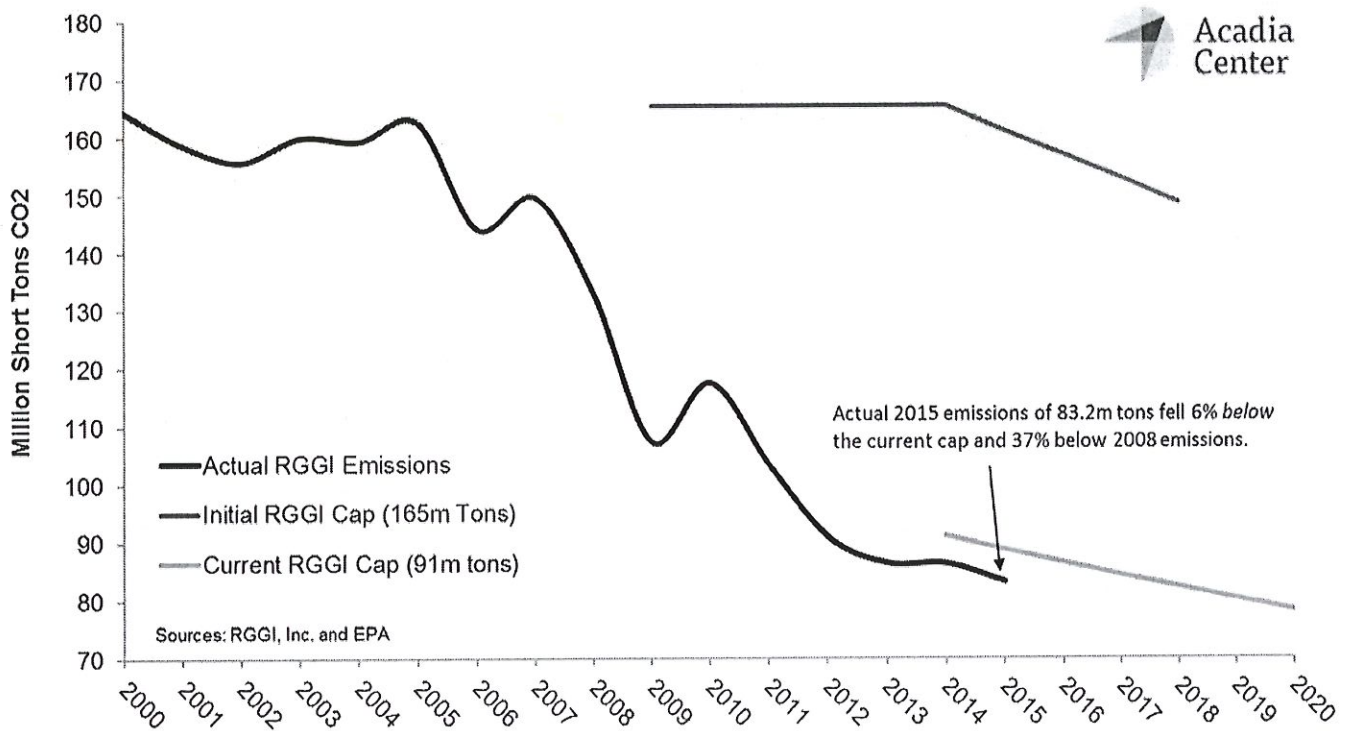
¹ Analysis in this report covers the participating RGGI states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. [Footnotes elaborate on points within this report, whereas endnotes cite references and provide detailed analytic methodologies where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

1. Key Trends

1.1 Emissions Reductions

Emissions in 2015 continued the downward trend of recent years. CO₂ emissions from the power plants covered by RGGI totaled 83,201,850 short tons of CO₂ in 2015, which was 6.3% below the 2015 emissions cap of 88,725,000 tons, and 37% below emissions levels in 2008, the year before RGGI started.ⁱⁱ

Figure 1: RGGI Caps and Actual Emissions

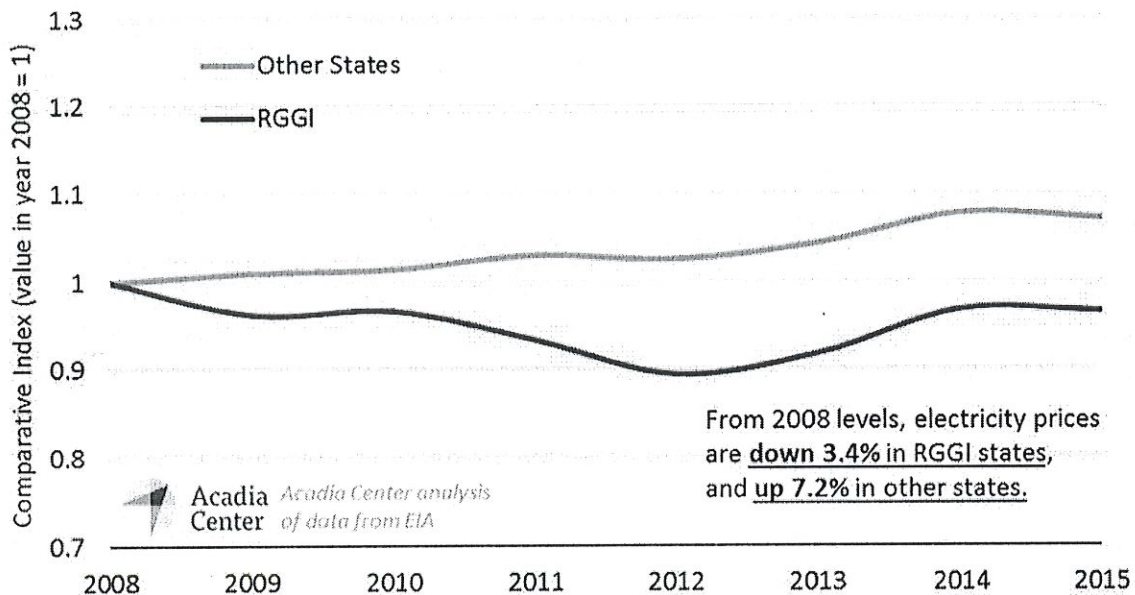


1.2 Electricity Prices

Electricity prices are lower than they were before RGGI took effect. Comparing retail electricity prices from 2008 (before RGGI's launch) to 2015 shows that prices have dropped by 3.4% across the region.ⁱⁱⁱ While RGGI's direct impact on electricity prices (and other trends described in this report) is difficult to isolate from other factors, it is evident that the program has not caused electricity prices to increase above 2008 levels.^{iv} Due to higher natural gas prices in recent years, electricity prices have increased in both the RGGI region and the rest of the country. Nonetheless, RGGI states are faring better than the rest of the country on electricity price trends. As shown in Figure 2, while RGGI's electricity prices remain lower than they were in 2008, the rest of the country² has experienced a 7.2% increase in retail electricity prices over the same period.

² The "rest of the country" excludes California, which, like the RGGI states, has implemented a cap-and-trade program to reduce CO₂ emissions.

Figure 2: Volume-Weighted Electricity Prices, 2008 to 2015 (Cents/kWh)



1.3 Health Impacts

The decline in carbon dioxide emissions from power plants in the RGGI region has been accompanied by reductions in hazardous pollutants that threaten public health. Emissions of sulfur dioxide (SO₂), nitrogen oxides (NO_x), and mercury (Hg) are all down significantly since the program began. Both SO₂ and NO_x can trigger asthma attacks and difficulty breathing, and NO_x can increase the risk of developing infectious disease.^v SO₂ and NO_x also react in the air to form more dangerous pollutants, including ground level ozone — which increases susceptibility to respiratory illnesses like pneumonia and bronchitis — and particulate matter — which is breathed deep into the lungs and can cause or contribute to heart attacks, stroke, and increases the risk of premature death in infants, young children, and adults.^{vi} Mercury deposited in waterways and accumulated in seafood has adverse neurological and reproductive impacts.^{vii}

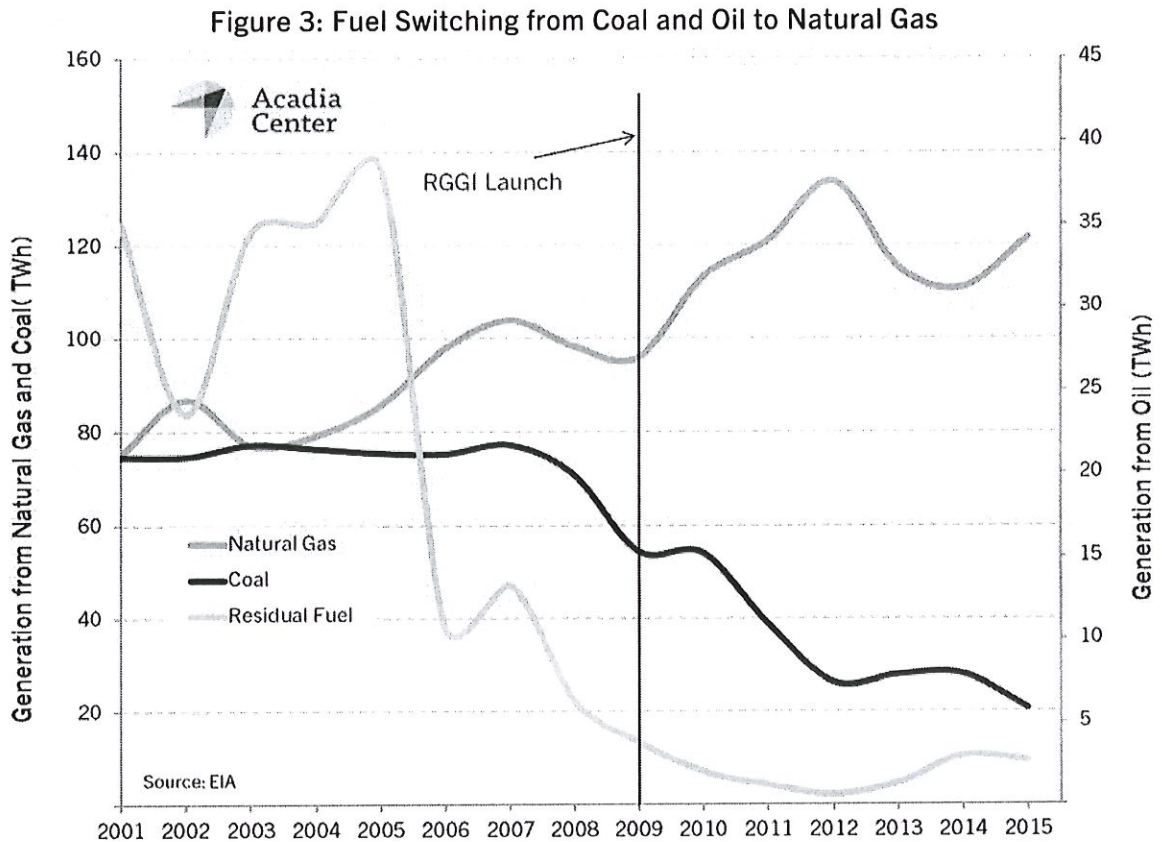
Reductions in hazardous emissions were driven by a combination of broader electric sector trends described in this report and regulations specific to hazardous pollutants, but RGGI has contributed to reducing hazardous emissions. Power plants that emit large quantities of pollutants like SO₂, NO_x, and mercury also emit large quantities of CO₂. Requiring these plants to pay for CO₂ emissions makes dirtier plants less economically viable in comparison to cleaner generating sources. Thus, while market-based programs like RGGI allow for flexibility in achieving emission-reduction targets for CO₂, they also support existing controls for hazardous pollutants. In Acadia Center's 2015 report we estimate that regional reductions in SO₂ and NO_x since RGGI's launch accounted for over \$10 billion in health benefits.^{viii}

2. Electric Sector Drivers

Electric sector carbon dioxide emissions are determined by two main factors: 1) the source of electricity and 2) how much electricity is consumed. In the RGGI, carbon-intensive coal and oil generation are being displaced by generation from natural gas and renewables, and energy efficiency investments are constraining consumption.

2.1 Fossil Generation

Electric generation from fossil fuels is increasingly shifting to lower-priced natural gas. The relative prices of natural gas, residual fuel (oil), and coal in the RGGI region determine which fuels are used to generate power. Since 2008, when RGGI took effect, generation has decreased dramatically from residual fuel (-58%) and coal (-71%), while natural gas generation increased (+24%). This fuel switching from coal and oil to natural gas has had a significant impact on emissions, as natural gas emits 44% less carbon than coal and 33% less carbon than fuel oil^{ix} and natural gas plants are more efficient.³



³ Note that direct stack emissions from natural gas are much lower than stack emissions from coal and oil, but there is increasing concern about upstream GHG and other pollution from natural gas, which needs to be quantified and regulated.

During recent cold winters when building heating consumes the majority of the natural gas supply, some RGGI states — particularly in New England — have increased utilization of coal and oil. However, with emissions continuing to fall below the new cap, it appears that the temporary uptick in oil and coal generation in the winters of 2013/2014 and 2014/2015 is not increasing emissions significantly.⁴

RGGI and Natural Gas

Concerns about overreliance on natural gas and about the environmental impacts of extracting, processing, and transporting natural gas have raised important questions about how RGGI interacts with other energy and environmental priorities. Due to their higher carbon-intensity, coal- and oil-fired power plants have to purchase more RGGI allowances than natural-gas-fired generators. However, gas generators still have to purchase allowances for emissions, creating a financial incentive to reduce natural gas combustion and benefitting non-emitting energy.

Furthermore, reinvesting revenue from the sale of emissions allowances in energy efficiency reduces direct consumption of natural gas in buildings and reduces power plant consumption of natural gas to generate electricity. Thermal efficiency programs funded by RGGI through 2013 saved 2.9 trillion BTU and are projected to save 49 trillion BTU over their (typically 10-year) measure lifetimes.^{vi} Based on the latest data, if only half of these savings are from natural gas,⁵ this would translate into approximately 1.45 million cubic feet (MMcf) of avoided natural gas demand through 2012, and 24.4 MMcf in lifetime savings. Electric efficiency programs avoid demand for electricity and the need to burn natural gas at power plants. With natural gas used to generate 44% of electricity in the RGGI region in 2012 (EIA), electricity savings of 928,000 MWh^{vi} avoided the combustion of an additional 409 MMcf of natural gas at power plants. Over their lifetimes these electric efficiency investments will avoid the consumption of an additional 3,750 MMcf of natural gas.^x

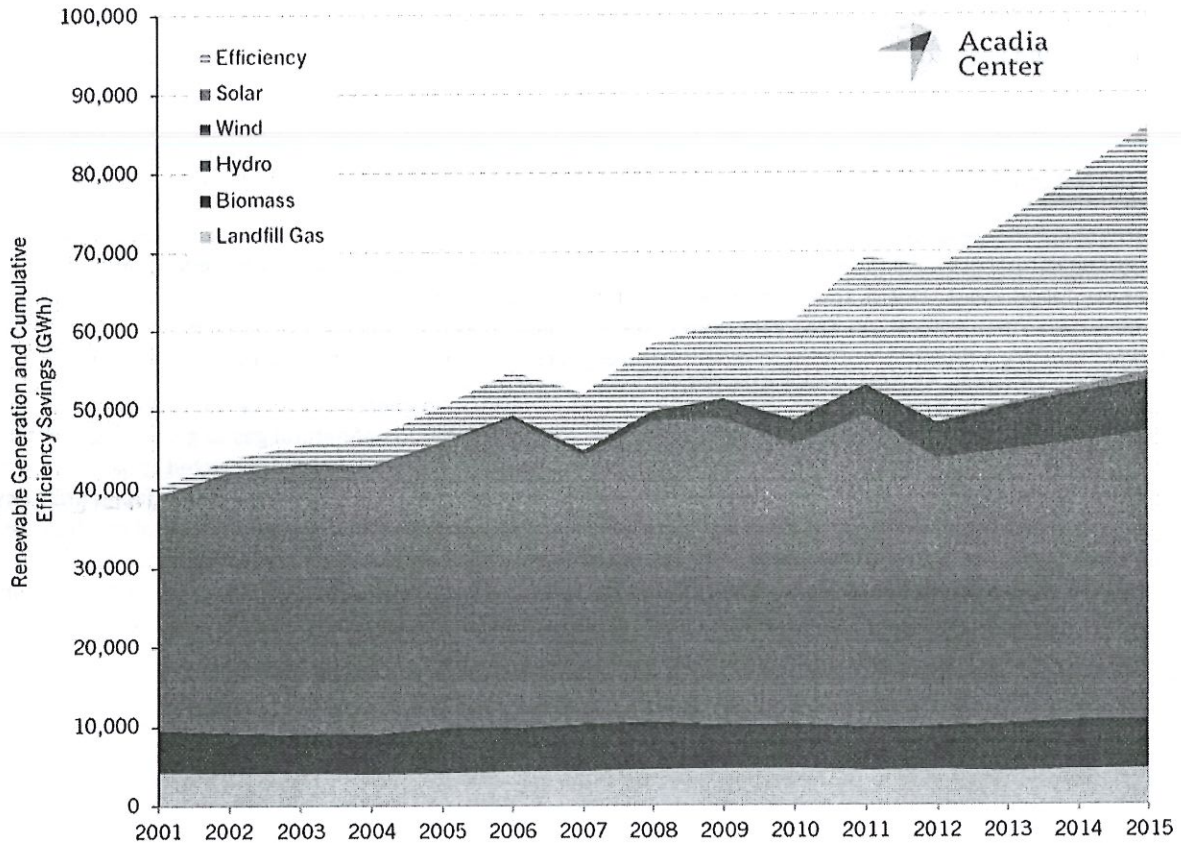
2.2 Energy Efficiency and Non-Emitting Generation

Energy efficiency programs are reducing demand for electricity across the region, while electricity is increasingly being supplied by non-emitting energy sources. State data shows that energy efficiency programs in RGGI states have saved a cumulative total of 22,684 GWh of electricity since RGGI launched.^{xi} During the same period renewable energy generation — led by hydroelectricity, as well as landfill gas, biomass, and wind — has increased by 4,822 GWh in RGGI states, according to EIA.

⁴ Additional natural gas pipeline capacity (the Algonquin Incremental Market expansion) will deliver 345 million cubic feet of natural gas into New England in 2016, and increasing investment in demand side solutions (natural gas and electric energy efficiency, demand-response, combined heat and power) and additional electric imports are likely to alleviate problems caused by overreliance on natural gas, and reduce the need for oil and coal generation during winter peaks.

⁵ Division of thermal savings between natural gas and other fuels not available, but efficiency programs in a number of RGGI states are fuel-blind, or mingle use of revenue.

Figure 4: Increasing Role of Energy Efficiency and Renewable Generation



Both energy efficiency and non-emitting generation are projected to continue increasing in the years ahead. In the nine RGGI states, budgets for electric efficiency programs grew from \$575 million in 2008 to \$1.9 billion in 2015, an increase of 230%.^{xii} Escalating annual electricity savings requirements in eight of the nine RGGI states will require increasing investments in future years.^{xiii} Renewable generation is also projected to continue increasing nationwide according to EIA,^{xiv} and all nine RGGI states have Renewable Portfolio Standards that require electric utilities to procure increasing quantities of renewable electricity.^{xv}

It is worth noting that with the exception of steady, incremental growth in wind capacity and modest natural gas additions, the decline in electric sector emissions has occurred without the addition of significant new capacity or capital expenditures. This low-cost transition to lower regional emissions indicates that reducing emissions can be far more cost-effective than commonly assumed.

Going forward, many of the RGGI states are increasing commitments to clean energy. Connecticut, Rhode Island, and Massachusetts are procuring significant quantities of hydroelectricity and renewable energy through a joint procurement,^{xvi} and soon-to-be-enacted legislation in Massachusetts will require additional procurements of hydroelectricity, offshore wind, and other renewables equivalent to approximately 15%-20% of New England's electric consumption.^{xvii} New York has committed to a 50% renewable energy supply by 2030, and Rhode Island recently adopted a 40% renewable energy requirement by 2035.^{xviii}