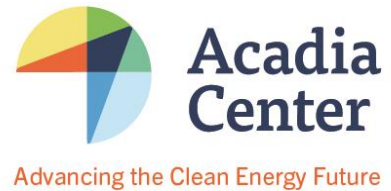


Virginia and RGGI

Compliance with the Clean Power Plan

April 8, 2015



Participation in the Regional Greenhouse Gas Initiative (RGGI) would allow Virginia to meet the requirements of the Environmental Protection Agency's (EPA) Clean Power Plan (CPP) using a flexible, administratively straightforward approach that benefits consumers and provides funding for complementary programs. EPA has enabled approaches like RGGI by setting mass-based targets for states to achieve individually or in partnership with other states. The regional grid operator PJM has modeled the impacts of using such an approach, and projected that a regional mass-based trading program would result in lower wholesale energy prices than a business-as-usual scenario.¹

RGGI's market-based program sets a regional cap on CO₂ emissions from the power sector and requires power generators to purchase allowances for each ton of CO₂ that they emit. This approach provides the flexibility necessary to achieve the lowest-cost emissions reductions by relying on the private sector to make investment decisions rather than requiring outlays on specific technologies or power plant modifications. The sale of emissions allowances generates revenue for reinvestment in complementary programs, resulting in additional benefits. Should Virginia choose to participate in RGGI:

- The state would be adopting a proven and administratively straightforward policy;
- The state's power sector would be compliant with EPA's requirements; and
- The sale of emissions allowances is projected to generate \$2.8 billion in revenue through 2030, and reinvesting this revenue could produce significant benefits for the state.

RGGI's Proven Success

RGGI has been successful on many levels in the nine states that currently participate.² It is helping to reduce carbon pollution, while at the same time supporting economic development, creating new jobs and saving consumers money on energy.

RGGI has generated positive economic impacts by replacing expenditures on fossil-fuel generated energy with investments in energy efficiency and clean energy resources. Consumer savings resulting from energy efficiency are then spent on other goods and services, boosting local economic activity. Since it launched in 2009, RGGI has already helped participating states to:

- Avoid 8 million tons of lifetime emissions, the equivalent of taking 1.4 million cars off the road;³
- Lock in more than \$1.8 billion in savings through energy efficiency; and
- Create more than 16,000 job-years of employment from direct job creation in clean energy fields and employment growth due to increased consumer spending.

¹ *PJM Economic Analysis of EPA's Proposed Clean Power Plan*, March 2015, available at:

<http://www.pjm.com/~media/4CDA71CBEC864593BC11E7F81241E019.ashx>

² The nine states currently participating in RGGI are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

³ RGGI benefits report, available at: http://www.rggi.org/rggi_benefits

Over the next 10 years RGGI is projected to generate \$8.7 billion in economy-wide growth and 132,000 job-years of employment in participating states,⁴ while cutting power plant emissions by an additional 15 percent from 2012 levels.⁵

The Case for Virginia

Using RGGI as the CPP compliance mechanism makes sense for Virginia both administratively and financially.

From an administrative perspective, participation in RGGI represents a simple, plug-and-play means of complying with the Clean Power Plan. The current RGGI states have already done the time-consuming work of setting the cap, creating allowance auction and tracking platforms, and establishing enforcement protocols. Virginia could build on this existing foundation by adopting the RGGI model rule,⁶ which would allow the Commonwealth to participate in the market while preserving authority and enforcement at the state level.

Virginia's electricity generation owners and air regulators are already familiar with market-based programs to reduce power sector emissions, such as the Acid Rain Program and its successors, and many of Virginia's generation owners have experience with RGGI through their ownership of assets in RGGI states. Furthermore, RGGI provides a clear and equitable path forward for the treatment of new and existing generation in Virginia by requiring all covered entities to submit one allowance for each ton of CO₂ emitted. An energy company with a demand-focused business model can continue to grow and build new generation under this system, with RGGI providing an incentive that favors development of less carbon-intensive resources.

RGGI also provides a clear way to demonstrate compliance with CPP targets. Figure 1 illustrates how a RGGI-based cap would compare to EPA's mass-based targets if Virginia began participating in 2016. Using the approach that the RGGI states took in setting their current cap would establish a 2016 cap for Virginia of 24,398,563 tons.⁷ The cap would then decline by 2.5% each year, arriving at 15,409,619 tons in 2030. Combining Virginia with the current RGGI states would create a combined cap of 70,009,619 tons in 2030, which is below the combined mass-based targets that EPA has proposed for RGGI states plus Virginia, which add up to 90,554,874 tons.⁸ In conjunction with reforms the RGGI states will have to make to the existing program⁹ Virginia and the other RGGI states would be able to demonstrate adequate stringency to comply with the CPP.

⁴ REMI Economic Impact Analysis: Assumptions and Results, June 3, 2013, available at:

https://www.rggi.org/docs/ProgramReview/REMI%2091%20Cap%20Bank%20MR_2013_06_03.pdf

⁵ See summary of Program Review reforms at:

http://www.rggi.org/docs/ProgramReview/Program_Review_%20Summary_of_Proposed_RGGI_Cap_Changes_13_11_21.pdf

⁶ Updated RGGI Model Rule available at:

https://www.rggi.org/docs/ProgramReview/FinalProgramReviewMaterials/Model_Rule_FINAL.pdf

⁷ The allowance budget for Virginia is calculated in the same manner by which the current RGGI cap was determined:

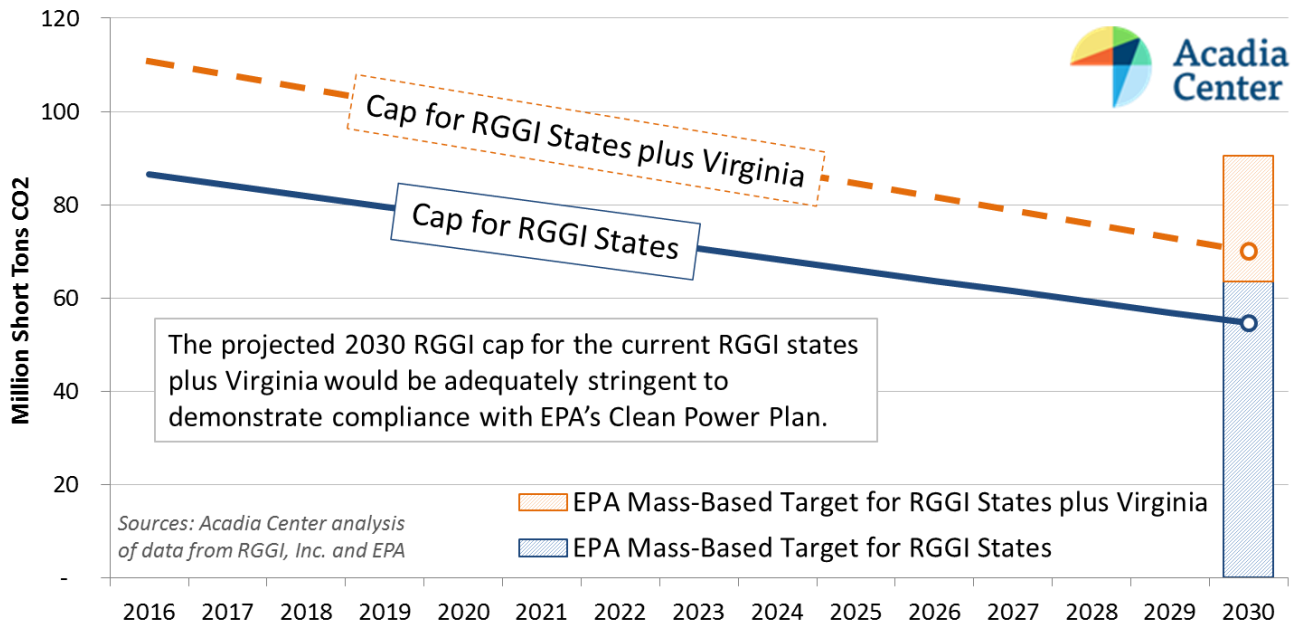
beginning in 2014 at 2012 emissions levels, and decreasing annually by 2.5% of that 2014 value. In Virginia's case, this would mean beginning at 24,398,563 allowances in 2016 (5% below 2012 emissions), and then continuing to decline by 2.5% (642,067 allowances) each year thereafter, resulting in a 2030 allowance budget of 15,409,619. This trajectory is consistent with trends in the Virginia electric sector, where emissions have declined by 6.4 million tons, or 17% since 2005.

⁸ EPA TSD: *Translation of the Clean Power Plan Emission Rate-Based CO₂ Goals to Mass-Based Equivalents*, page 15:

<http://www2.epa.gov/sites/production/files/2014-11/documents/20141106tsd-rate-to-mass.pdf>

⁹ In order to demonstrate compliance with the CPP, RGGI states will have to: 1) extend the RGGI cap, which currently ends in 2020, to 2030 to match the CPP timeline, 2) reduce the cap by a fixed quantity of allowances each year—2.5% of 2012 emissions—in order to provide a predictable, long-term trajectory toward achievement of an 80% reduction by 2050, and 3) revise the cost containment reserve to draw allowances from under the cap in order to ensure the achievement of

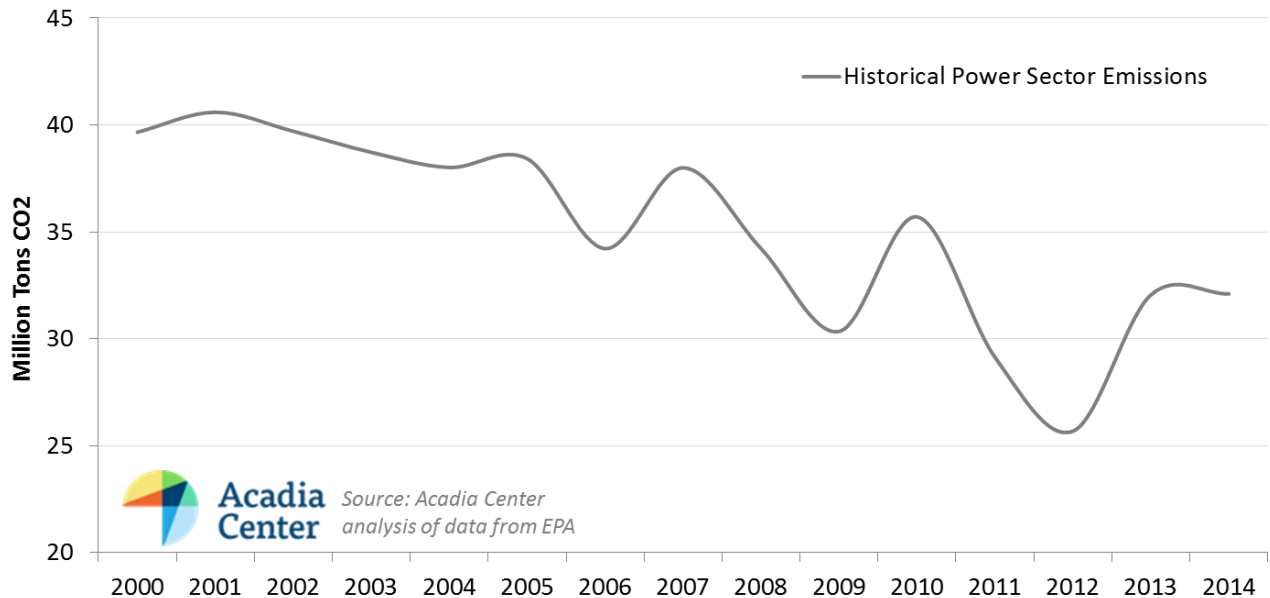
Figure 1: Clean Power Plan Compliance for RGGI States and Virginia



Virginia's Power Sector

Virginia's power sector is well positioned to meet both EPA and RGGI requirements. Emissions from power plants in Virginia have declined significantly over the past decade (Figure 2), falling by 16% from 2005 to 2014.

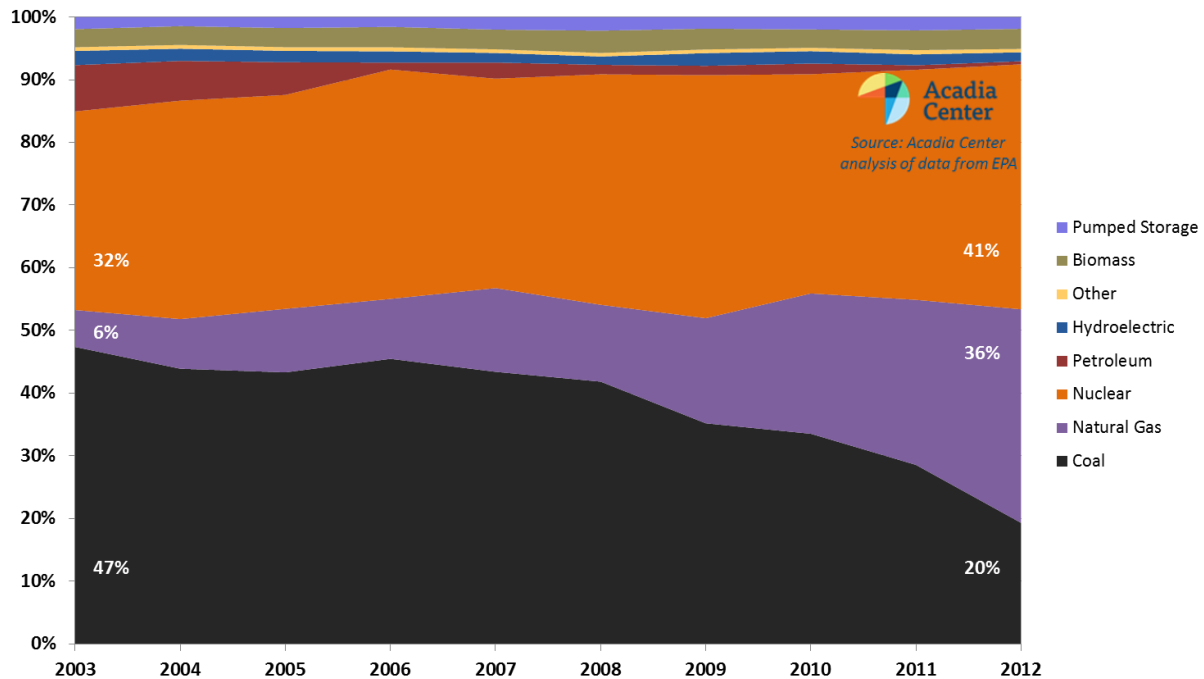
Figure 2: Virginia Power Sector Emissions



environmental targets. For more detail on these program reforms, see: RGGI & EPA Requirements: A Model for Market-Based Compliance <http://acadiacenter.org/document/rggi-and-epa-requirements-a-model-for-market-based-compliance/>

While the emissions decline was caused by a number of factors, fuel-switching to less carbon-intensive power sources played a large role (Figure 3). With aging coal plants continuing to retire and utilization of cleaner forms of generation continuing to increase, the establishment of an emissions reduction target for Virginia would build on current trends, while providing the market certainty necessary to encourage new long term investment in clean energy projects.

Figure 3: Virginia Electric Generation by Fuel Type



Potential Economic Impacts in Virginia

Participating in a regional mass-based trading program would likely result in significant economic benefits for Virginia. The experience of the RGGI states as well as recent energy system modeling both suggest that RGGI would produce positive results in Virginia compared to a business-as-usual (BAU) scenario.

PJM conducted an analysis to assess the economic impacts of Virginia's compliance with the CPP. The results of this modeling, shown in Table 1 below, demonstrate that wholesale energy prices under a regional mass-based trading program would be cheaper than projected wholesale energy prices under the 2014 transmission planning case (BAU scenario).¹⁰ While the assumptions that PJM used for the regional compliance scenario differ from RGGI in a number of ways (e.g. no auctioning of allowances, and therefore no revenue to reinvest in the electric sector), the results are indicative of the market impacts of a mass-based trading program like RGGI.

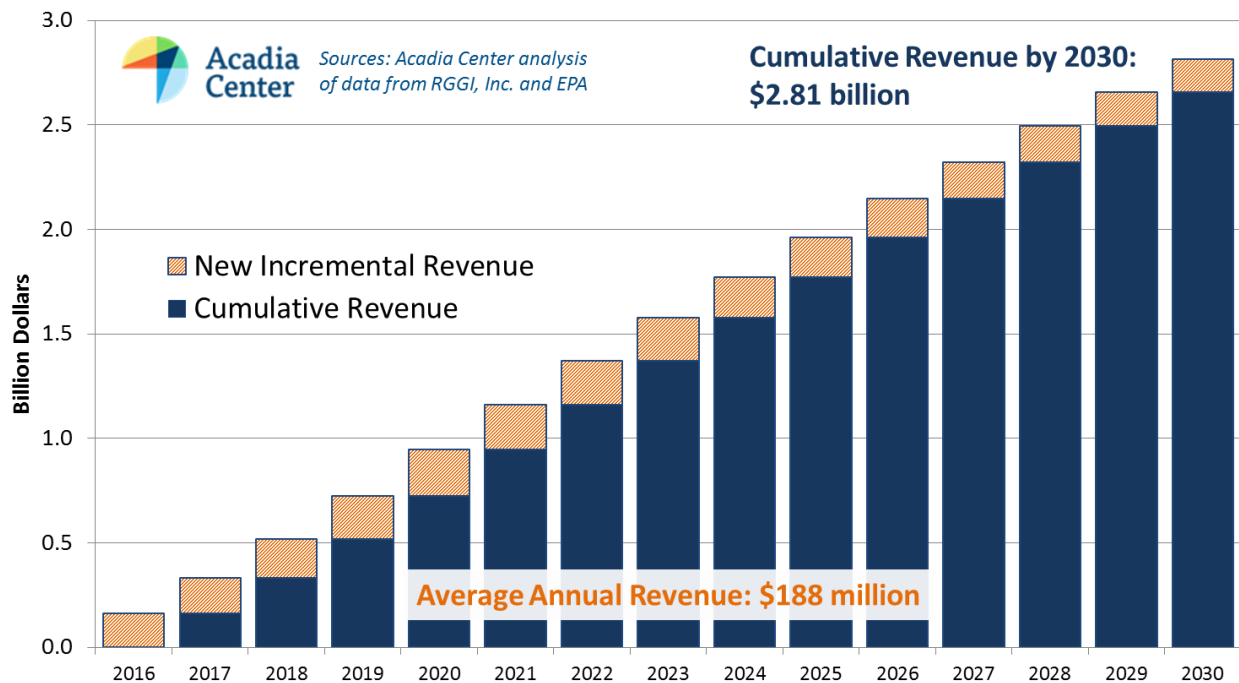
¹⁰PJM Economic Analysis of EPA's Proposed Clean Power Plan: State-Level Detail, March 2015, available at: <http://www.pjm.com/-/media/documents/reports/20150302-state-level-detail-pjm-economic-analysis-of-epas-proposed-clean-power-plan.ashx>

Table 1: PJM Modeling of Wholesale Energy Prices

	Virginia Locational Marginal Price (LMP) of Electricity (\$/MWh)	
	Transmission Planning Case	Regional Compliance Scenario
2020	\$39.8	\$37.1
2025	\$54.0	\$49.5
2029	\$62.2	\$56.7

By assuming that emissions allowances are not distributed through auctions, PJM’s modeling does not include potential economic benefits of reinvesting revenue allowance sales. RGGI states have benefitted from investing auction revenue in energy efficiency and clean energy programs. Virginia could replicate this successful model, and/or design a reinvestment program crafted to meet local needs such as adaptation planning or investment in diversifying Southwest Virginia’s economy and retraining its workforce. **As depicted in Figure 4, Virginia’s allowance auction revenue could exceed \$2.8 billion by 2030.**¹¹ While allowances in a mass-based trading program could be freely allocated to power generators or load serving entities, this approach would not result in lower electricity prices,¹² nor would it produce revenue for reinvestment. The auctioning of allowances and reinvestment of that revenue is a key factor in the success of the RGGI model.

Figure 4: Potential Virginia Auction Revenue



¹¹ These projections are based on future allowance prices included in the 2013 IPM modeling for RGGI, Inc. (<http://www.rggi.org/docs/ProgramReview/2013%20IPM%20Modeling%20Results.zip>). Specifically, prices were taken from the 91_Cap_Alt_Bank_MR scenario, which projects prices forward to 2020. For 2021-2030, we make the conservative assumption that prices hold constant at the 2020 level rather than continuing to increase each year.

¹² This is due to the opportunity cost of tradable allowances. Even if generators receive allowances for free, they will still include the cost of allowances in their cost of producing electricity, based on the secondary market price for allowances.

The experience of the current RGGI states demonstrates that the reinvestment of \$2.8 billion of program revenue would likely generate significant net benefits in Virginia. States that have invested most heavily in energy efficiency (i.e. Maine, Massachusetts and Connecticut) have seen \$3.40-\$3.70 in value added to their economies for each dollar of RGGI allowance revenue, while states that used a greater share of their revenue for non-energy programs saw smaller positive benefits.¹³ According to independent analysis of program impacts through 2011, the combined economies of the RGGI states experienced \$1.77 in value added per dollar of RGGI revenue, resulting in \$1.61 billion in net benefits overall.¹⁴

Examples of Reinvestment Beneficiaries in RGGI States

New York: Climate Smart Communities - \$4.8 million

Established in 2009, the Climate Smart Communities (CSC) Program is comprised of a network of local governments across the State coordinating to reduce greenhouse gas (GHG) emissions and better prepare for unavoidable changes in climate. RGGI funds are used to hire technical experts in climate protection and adaption to work with local governments to develop climate action plans.*

Connecticut: Solar-Powered Schools - \$850,000

The grant, provided through the Clean Energy Finance and Investment Authority, covered 45% of the cost for a 181 kW solar PV system at Edna C. Stevens Elementary School and a 166 kW system at Cromwell Middle School.**

New Jersey: CHP at University Medical Center of Princeton - \$5 million

NRG Thermal, LLC, received \$5 million in RGGI funds for a 4.6 MW combined heat and power (CHP) system at Princeton's University Medical Center. This CHP system is now the anchor of a microgrid which, during Superstorm Sandy, kept the lights on and allowed for uninterrupted operation of essential functions while surrounding customers were without power for days.***

*<http://www.nysderda.ny.gov/-/media/Files/Publications/Energy-Analysis/RGGI/2014-Q2-RGGI-Status-Report.pdf>

**http://www.rggi.org/rggi_benefits/37-rggi-benefits/rggi-benefits

***http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Appendix.pdf

Virginia's Path to Participation

In order to participate in RGGI, Virginia would need to enact regulations to mirror regulations that exist in the current RGGI states.¹⁵ Virginia should also be involved—at least as an observer—in the 2016 RGGI program review,¹⁶ which will be the forum for discussion of potential programmatic changes including the possible addition of new participants. The 2016 program review will provide an opportunity for the participating states to discuss the development of a joint plan for compliance with EPA's CPP.

For Further Information:

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¹³ Analysis Group, 2012, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid- Atlantic States*, Appendix, available at:

http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Appendix.pdf

¹⁴ Ibid.

¹⁵ Eight of the current RGGI states received legislative authority for their regulations, while New York administered the program through executive action.

¹⁶ Discussions pertaining to the 2016 Program Review will commence in the second half of 2015.