

RGGI

*Evolution of the Country's First CO₂ Trading Program:
Opportunities and Challenges for the Future*

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Agenda

Overview of RGGI

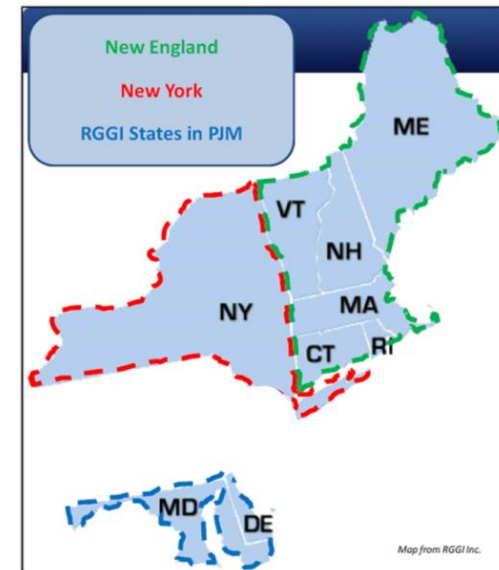
- Structure
- How it has worked
- Economic impacts of RGGI

Coordination with the Clean Power Plan

- Opportunities and Challenges

What is RGGI?

- **First carbon cap-and-trade program in the U.S. to reduce CO₂**
 - Includes nine Northeast and Mid-Atlantic states (+ New Jersey through 2011) covering ISO-NE, NYISO, and part of PJM
 - Covers fossil fuel power plants 25 MW or greater
 - Rights to emit CO₂ are sold via centralized quarterly auctions
 - Single cap, allocated among states and based loosely on historic emissions, with declining cap ratchet
 - Joint allowance tracking and trading
 - Central organization (RGGI Inc.) with coordinated governance
 - Auction proceeds remitted back to states
 - States determine how to spend proceeds



What is RGGI?

- **Key features of design and implementation**
 - Three year compliance period
 - First compliance period = 2009-2011
 - Second compliance period = 2012-2014
 - Third compliance period = 2015-2017
 - Covered sources can bank allowance credits
 - Units must hold 50% of annual obligation
 - Offsets allowed
 - Up to 3.3% of compliance obligation through qualified projects
 - Reserve Price serves as a floor (\$1.86 in 2008; \$2.10 in 2016)
 - Cost Containment Reserve (CCR) added in 2014 to provide additional allowances to be sold at auction if certain price thresholds are met
 - 2014: 5 million additional allowances at \$4/ton
 - 2015: 10 million additional allowances at \$6/ton

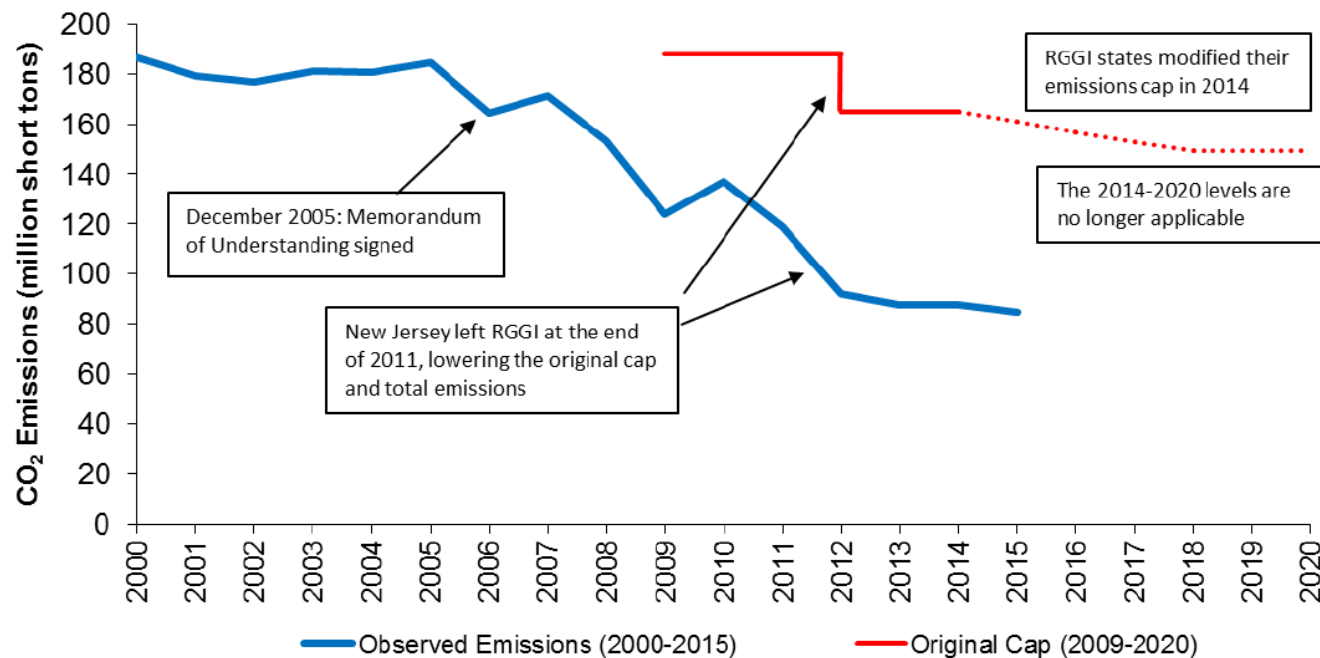
What is RGGI?

- **Key features of design and implementation (cont'd.)**
 - Leakage monitored but not enforced
 - Increases in emissions from non-covered sources may reduce emissions reductions from covered sources (e.g., electricity imported into RGGI states)
 - Periodic program reviews
 - 2012 Program Review
 - 2016 Program Review (for 2020-2030) currently underway
 - Single region-wide mass based cap for electric sector
 - Modified under 2012 Program Review, with adjustments for historical banked allowances; applicable through 2020
 - 2016 Program Review: additional reductions through 2030 (?)

RGGI CO₂ Cap Over Time

- Original cap constructed in 2005 and designed to stabilize CO₂ emissions from 2009-2014 at predicted 2009 levels before requiring gradual reductions
- Actual emissions decreased substantially over predicted 2009 levels

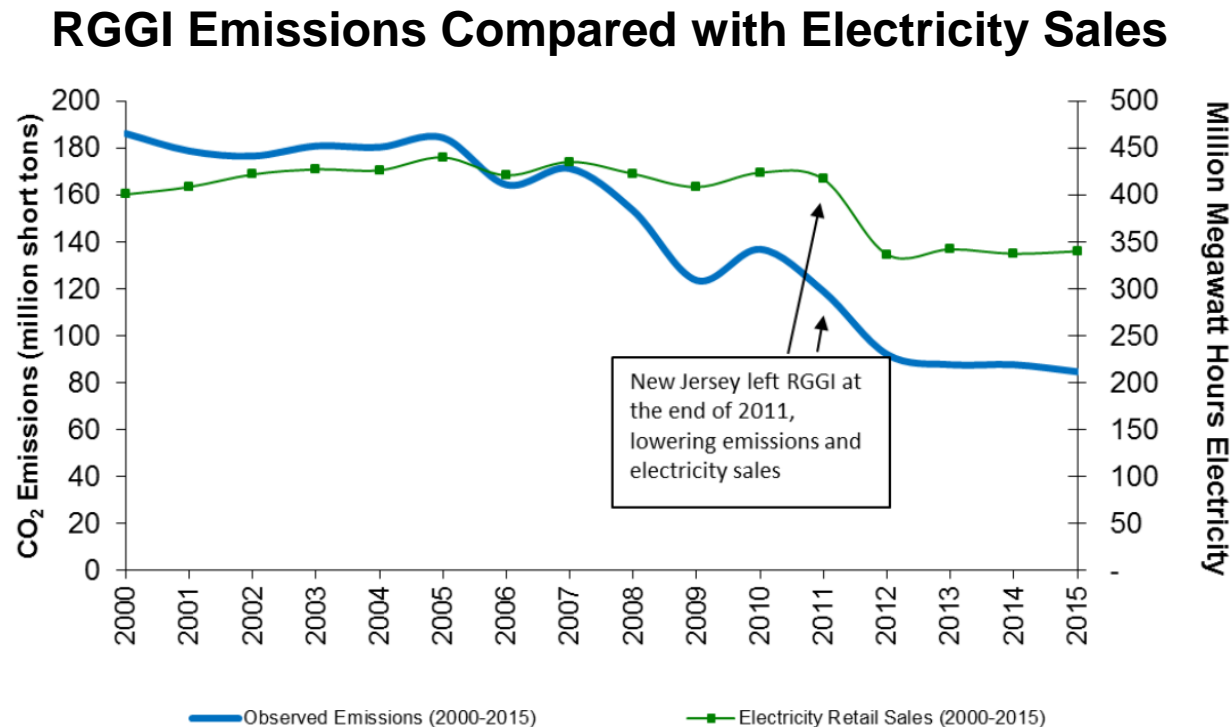
Observed Emissions Compared to the Original Emissions Cap



Source: Ramseur, J.L., "The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Congress," Congressional Research Service, April 27, 2016.

RGGI Emissions Compared with Electricity Sales

- RGGI electricity sales decreased 5% between 2005 and 2011 while CO2 emissions from in-state electric generation decreased by 36%
- Suggests that structural factors other than temporal economic conditions played a role (e.g., EE improvements, changes in generation portfolio (coal to gas))

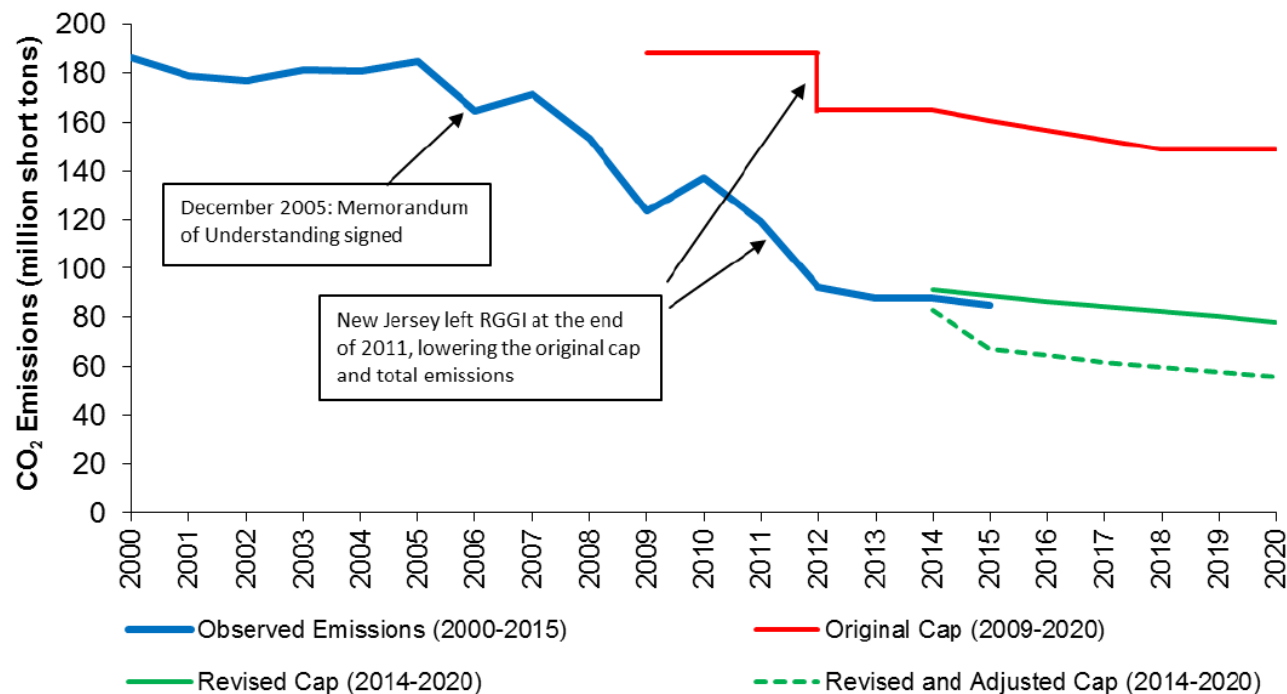


Source: Ramseur, J.L., "The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Congress," Congressional Research Service, April 27, 2016.

RGGI CO₂ Cap – Revised Emissions Cap

- Following 2012 Program Review, revised emissions cap put in place for 2014 and beyond. Emissions cap decreased by 2.5% annually thereafter through 2020.
- Revised cap also adjusted for substantial amount of banked emission allowances held by covered sources

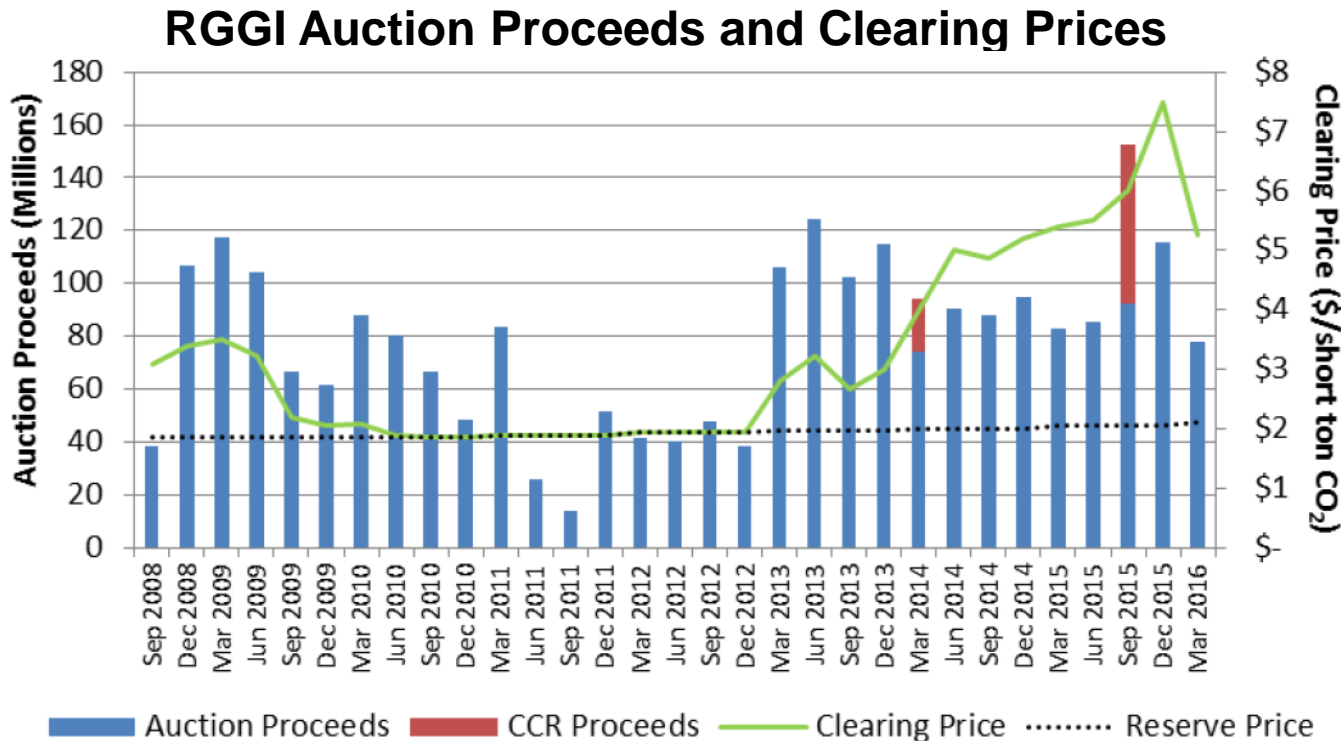
Observed Emissions Compared to the Original and Revised Emissions Cap



Source: Ramseur, J.L., "The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Congress," Congressional Research Service, April 27, 2016.

RGGI Auction Proceeds and Clearing Prices

- Auctions began in Q3 2008: 34 auctions to date, with 860 million cumulative allowances sold generating \$2.6 billion in revenues
- CCR hit in March 2014 and Sept. 2015 auctions; recent prices are following downward trend (\$4.54 in Auction 33, \$3.55 in Auction 34)

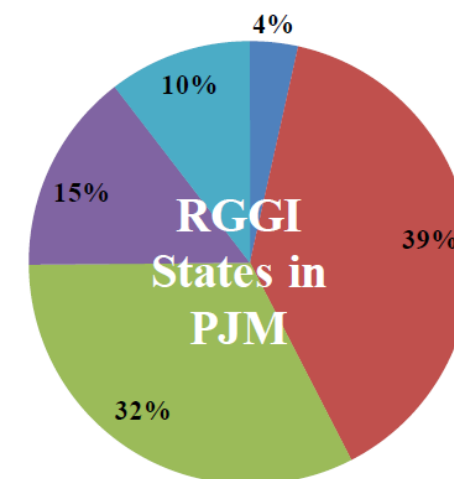
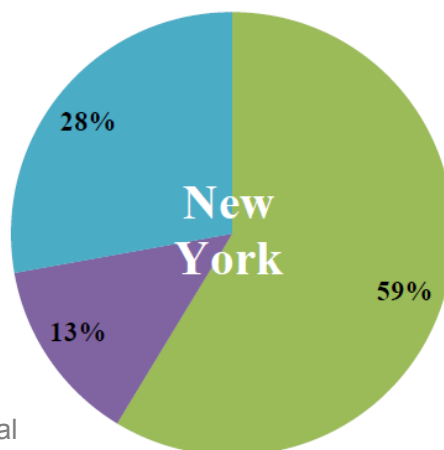
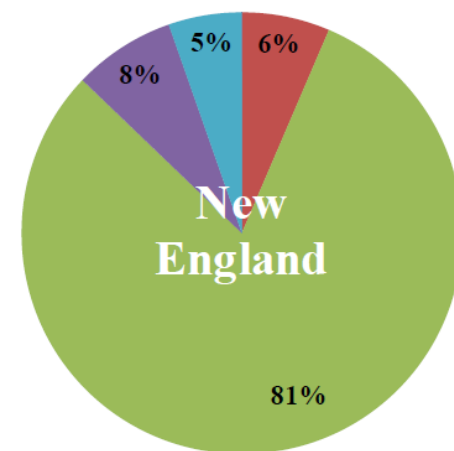
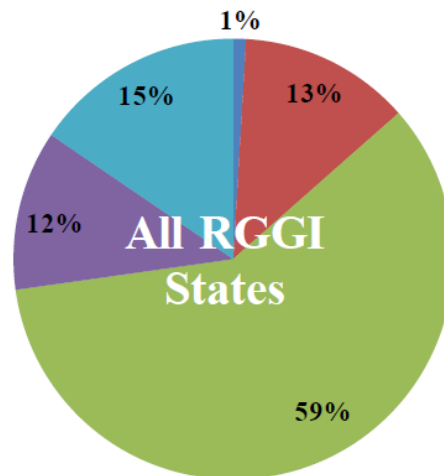


Source: Ramseur, J.L., "The Regional Greenhouse Gas Initiative: Lessons Learned and Issues for Congress," Congressional Research Service, April 27, 2016.



Expenditure of RGGI Auction Proceeds

- States retain auction revenues and decide how to use them
 - MOU states agreed that at least 25% of emission allowance value would be allocated for a “consumer benefit or strategic energy purpose”
 - RGGI states greatly exceeded this commitment
 - Results for Compliance Period Two (2012-2014)



Source: Okie, Andrea et al. “The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGI’s Second Three Year Compliance Period (2012-2014).”

■ Clean Technology R&D
■ Energy Efficiency
■ Renewable Investment

■ Direct Bill Assistance
■ GHG Programs and Program Administration

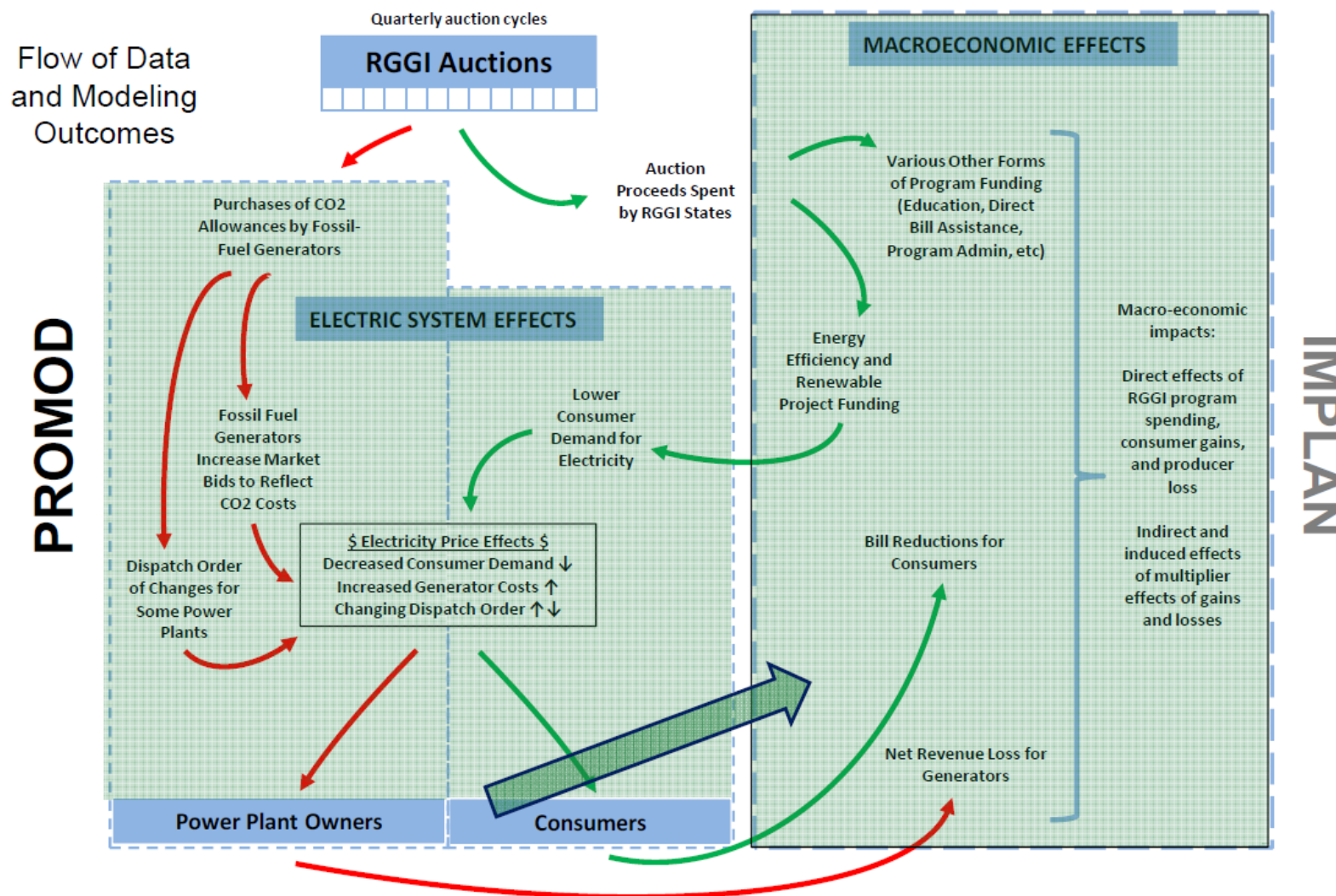
Impacts of RGGI Auction Expenditures

Analysis Group study of Second Compliance Period (2012-2014)

- **Each quarter:**
 - The states auction off an amount of CO₂ allowances; generators purchase them
 - States receive the revenues
- **In the wholesale electricity markets in each hour:**
 - Generators offer a price to supply power, including CO₂ allowance cost
 - The grid operator dispatches power plants, using offer prices including CO₂ costs
 - The hourly clearing price reflects the CO₂ costs of the 'marginal' power plant
 - The dispatch order changes as a result of CO₂ costs: more carbon-intensive plants operate less; less carbon-intensive plants operate more
 - Gas-fired generators tend to get their costs back; coal-fired plants recover some of their costs; and zero-carbon plants get a \$ boost
- **In the local economy:**
 - States spend the auction proceeds in various ways
 - Consumers pay electricity prices reflecting (a) CO₂ costs and (b) the impact of any cost-reducing investments that result from states' use of auction proceeds

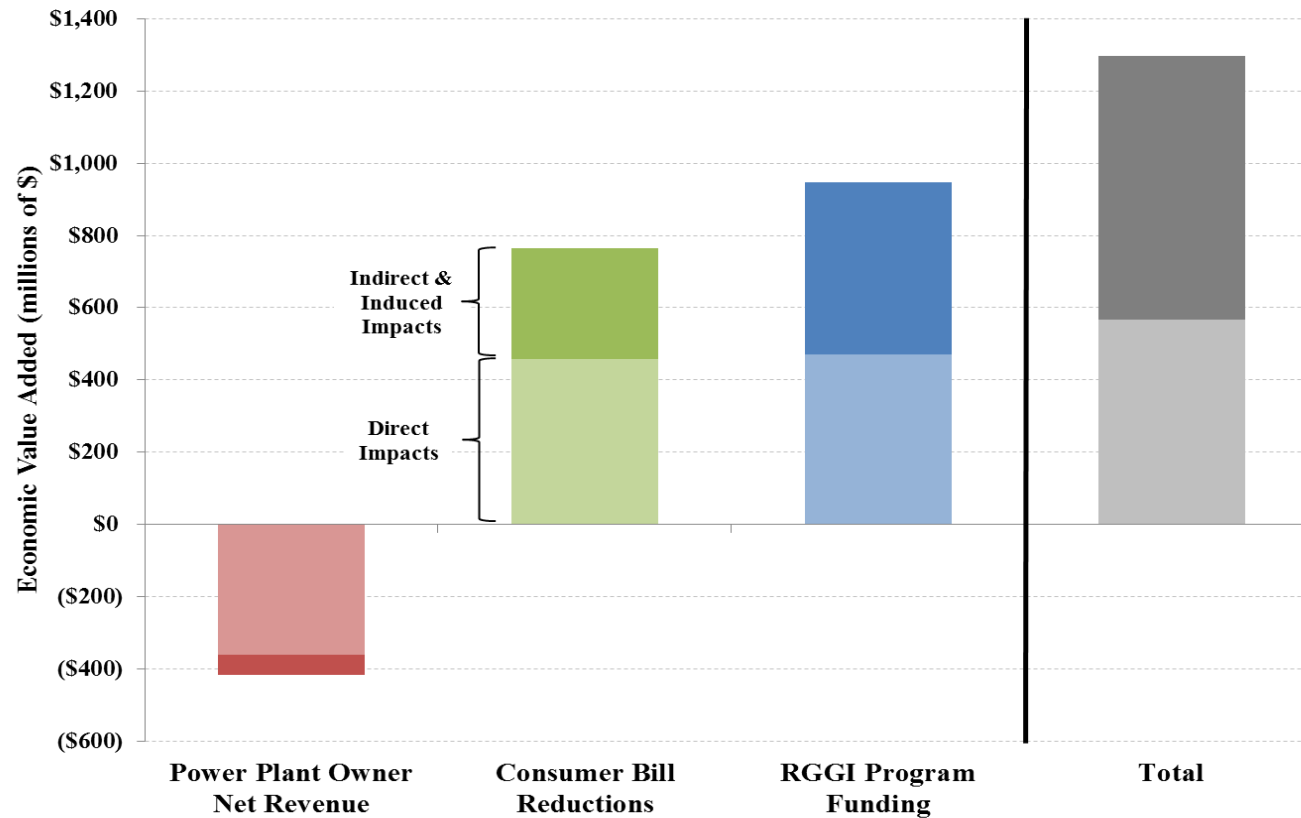
Impacts of RGGI Auction Expenditures

Run the \$ Through the Power System and the Economy....



Net Economic Impacts – All RGGI States (2012-2014, \$2015)

Direct, Indirect, and Induced Value Added Totals \$1.3B



Notes: Figures represent dollars discounted to 2015 using a 3% public discount rate.

Source: Okie, Andrea et al. "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGI's Second Three Year Compliance Period (2012-2014)."

Overall Economic Impacts – All RGGI States (2012-2014, \$2015)

- **\$1.3 billion:** economic value added in the region (NPV*)
- **\$0.98 billion:** Allowance auction proceeds 2012-2014
- **\$0.45 billion:** Consumer savings (electricity, heating customers) (NPV*)
- **\$0.5 billion:** Lower revenues to power plant owners (NPV*)
- **\$1.27 billion:** Fewer dollars spent on out-of-region fossil fuel (NPV*)
- **14,000 jobs created****

* Using a 3% social discount rate, with value reflecting the 2012-2014 period, with tail-end effects of energy efficiency investment analyzed over a 10-year period.

** Jobs = job years

Key Observations

- **The design of the CO₂ market in the RGGI states affected the size, character, and distribution of public benefits**
 - Decision by RGGI states to auction allowances transfers emission rights from public to private sector at a monetary cost
 - Retains value of allowances – and generates substantial revenue – for public use
 - Prevents transfer of that value to power plant owners
- **The states have used CO₂ allowance proceeds to support diverse policy & economic outcomes**
 - Use of RGGI revenues has allowed states to meet a wide variety of social, fiscal, and environmental policy goals

Key Observations

- **RGGI has functioned efficiently while delivering positive economic benefits**
 - Program has integrated seamlessly into regional power markets
 - Reinvestment in local EE and other programs – along with reductions in imports of fossil fuels for electricity generation – has generated substantial net economic benefits for RGGI states
- **States have retained full implementation authority, but have worked cooperatively for 10+ years through:**
 - Regional program design and state legal/regulatory processes
 - Setting of cap; allocation of allowance pool
 - Auctioning of allowances, monitoring of market
 - Shared administration and governance
 - Major program redesign, including tightening of cap

Overview of Clean Power Plan

- **Targets CO₂ emissions from existing power plants**
 - Rule relies on authority asserted by EPA under section 111(d) of Clean Air Act
 - Sets individual state targets for CO₂
 - Interim targets for 2022-2029
 - Final targets to be met by 2030
 - Target for each state derived from a formula based on three “building blocks”
 - Building blocks: heat rate improvements to coal-fired EGUs; improved NGCC capacity factors; increases in renewable energy generation
 - Each state can reach its goal however it chooses, without needed to “comply” with assumptions in building blocks
 - States submit individual State Implementation Plans to achieve targets
 - States can meet targets using a mass-based target (tons₂) or emissions rate-based target (tons CO₂/MWh) approach

Overview of Clean Power Plan

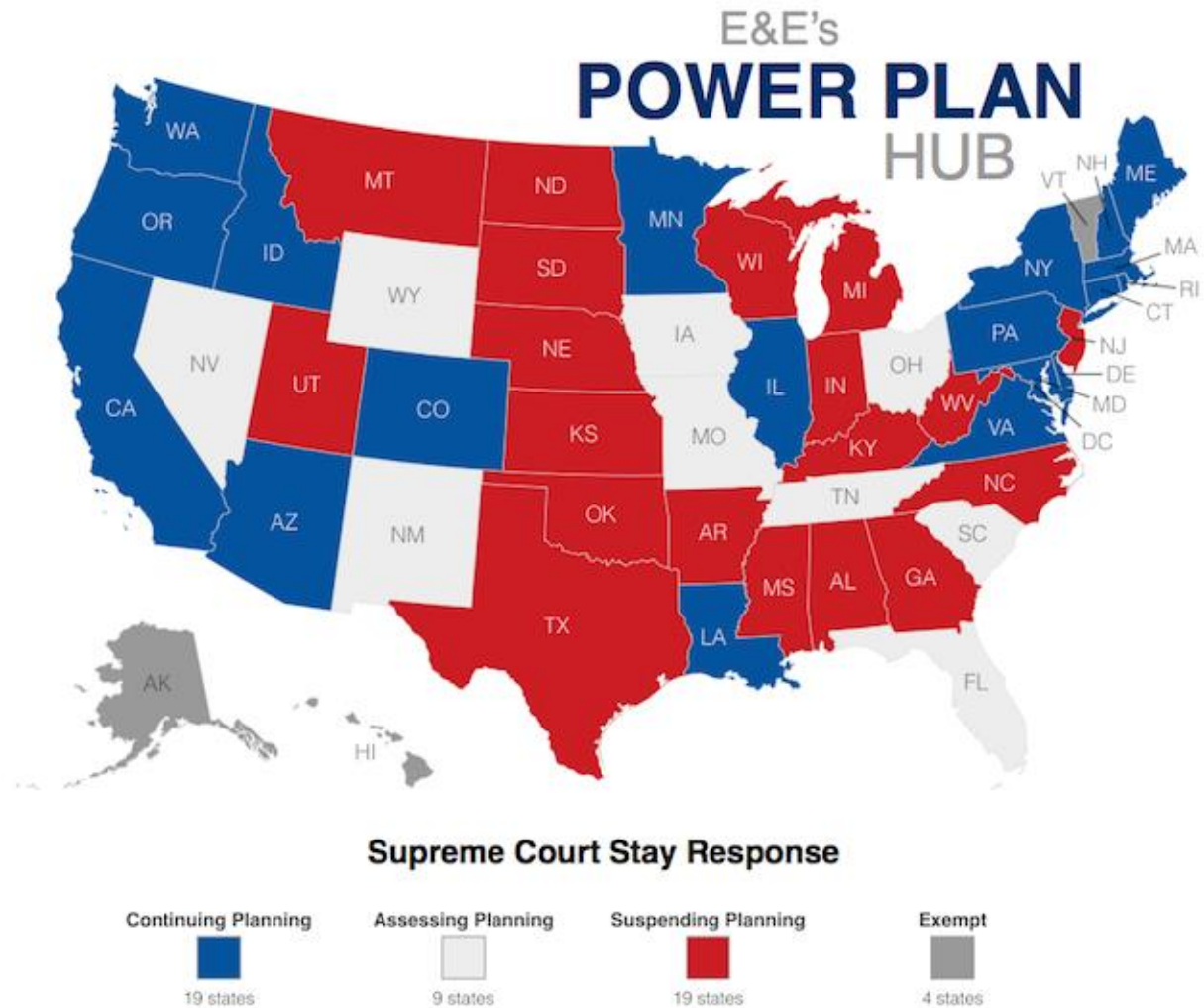
■ **Current status**

- August 2015: EPA promulgates final rule
- October 2015: Opponents of the rule (certain states, industry groups, utilities) states petition US Court of Appeals for District of Columbia Circuit for a stay
- January 2016: DC Circuit Court declines to stay rule
- February 2016: Supreme Court issues stay of final rule until pending litigation is resolved
- September 2016: DC Circuit Court hears oral arguments
- ????: DC Circuit Court issues ruling; likely subsequent appeals to Supreme Court

Overview of Clean Power Plan

Current status

- States diverge over whether to proceed with compliance planning for CPP; some states moving forward while others suspend efforts



Source: E&E's Power Plan Hub, available at http://www.eenews.net/interactive/clean_power_plan.

Opportunities Presented by CPP for RGGI

- States can meet their goals individually or collaborate with other states to create multistate plans
- Success of first two RGGI compliance periods has demonstrated:
 - Feasibility and value of multi-state approaches to controlling CO₂
 - Ability of states to work cooperative and effectively together (e.g., 2012 Program Review and revisions to emissions cap)
 - RGGI states include differing political settings, different generation profiles, state industrial/commercial profiles
 - Ability of market-based allowance trading programs to help states control CO₂ emissions while generating positive economic benefits
 - Ability of allowance trading programs to operate seamlessly in wholesale markets, with no impact on power system reliability

Challenges Presented by CPP for RGGI

- RGGI based on mass-based emissions approach; states would need to adopt mass-based SIP for CPP compliance
- Differences in scope of affected sources: RGGI covers all (new and existing) CO₂ emitting EGUs; CPP covers existing sources only
 - Including only existing sources may shift generation from existing sources to new ones, creating emission leakage and distorting the carbon price signal in electricity markets
- Uncertain either the scope and stringency of RGGI would be sufficient to meet CPP's targets
 - RGGI's existing cap stops at 2020; CPP's requirements begin in 2022 and continue through 2030
 - CCR has the potential to provide up to 10 million of additional allowances each year, making analysis more challenging
- Some issues may be resolved coming out of 2016 Program Review

Contact

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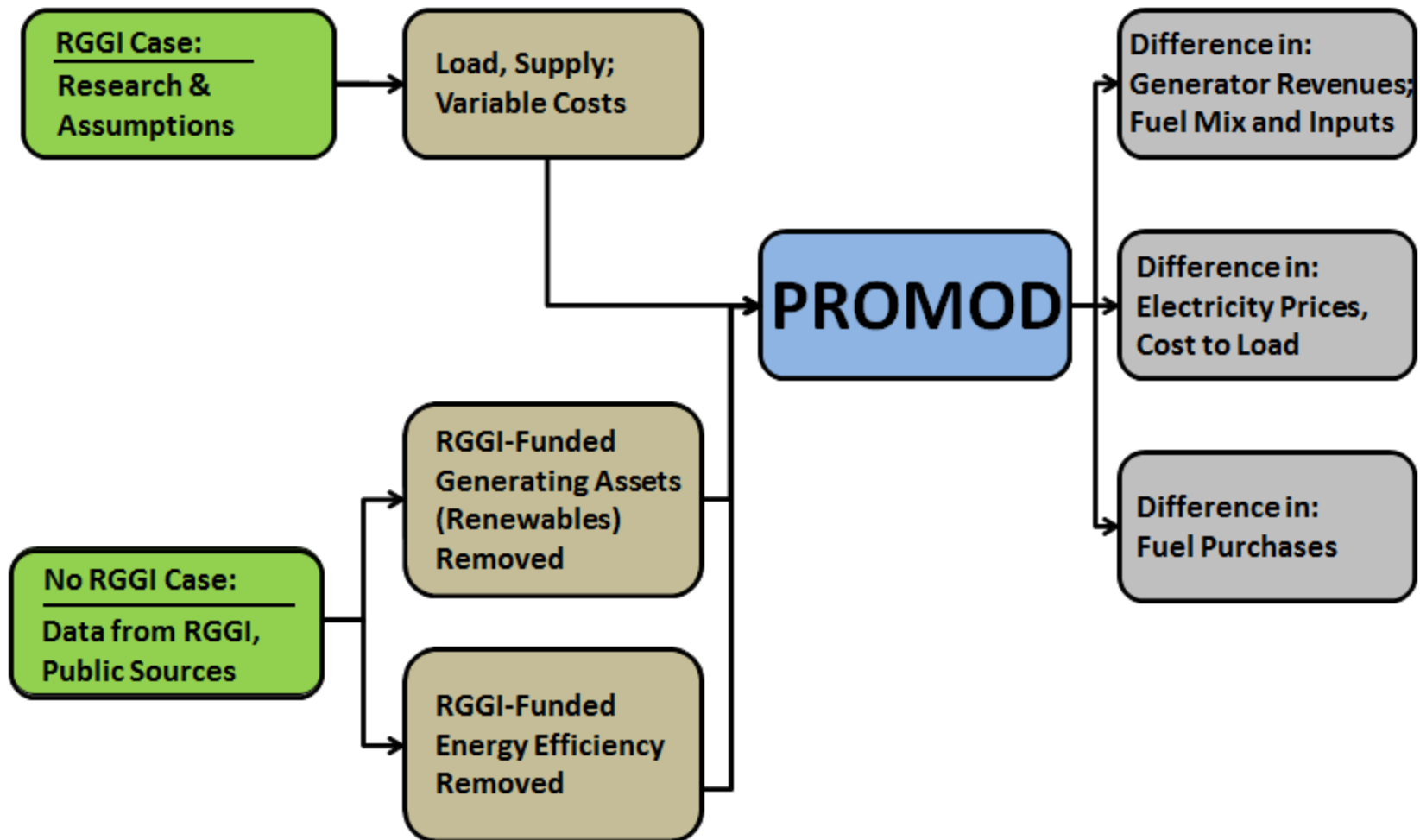
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Appendix

Power Sector Modeling - PROMOD

Diagram of PROMOD Modeling Inputs and Outputs



Allowance Auction and Direct Sales Proceeds: \$0.98 billion (2012-2014) to the participating states



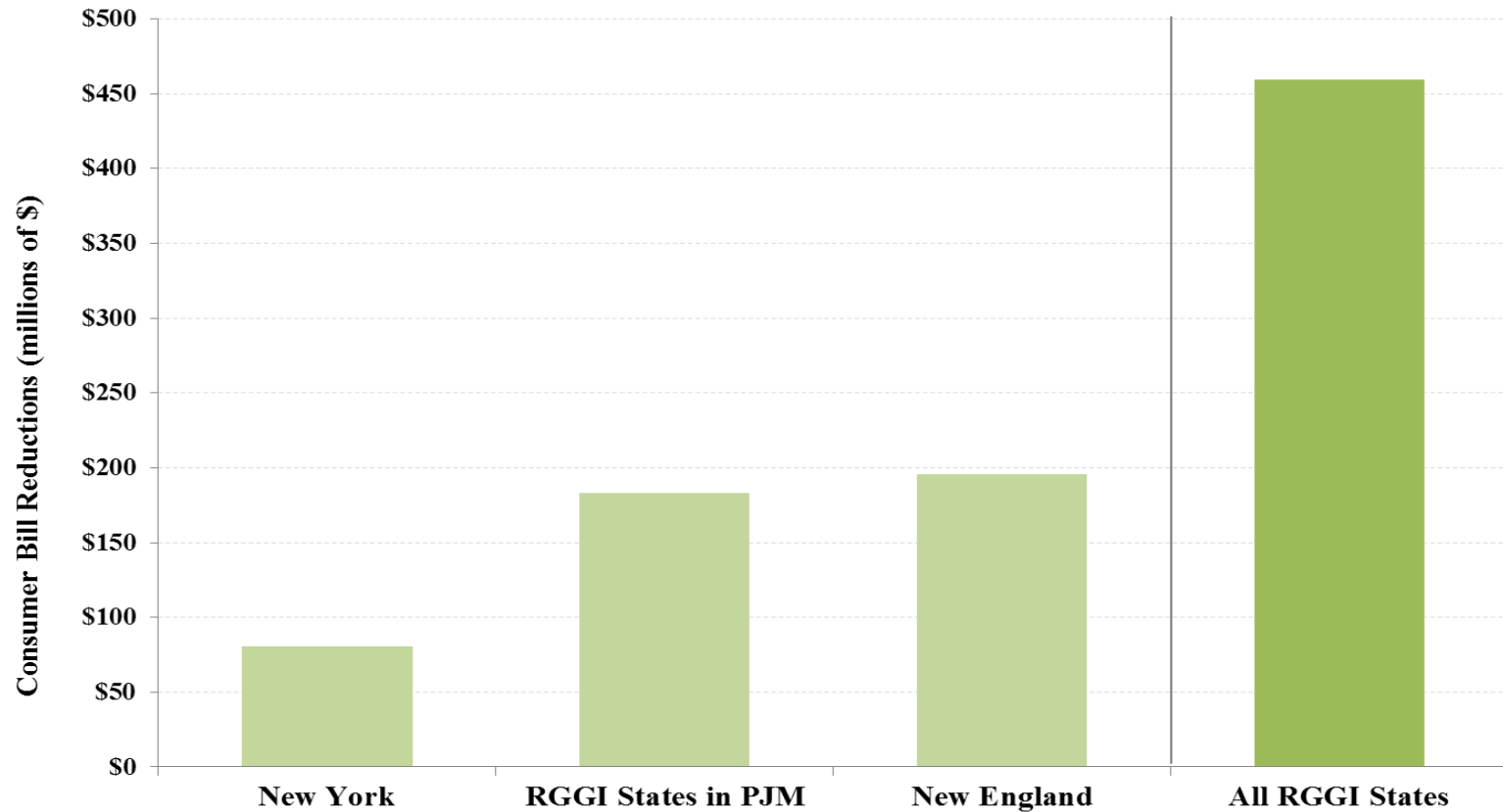
RGGI Inc.

Figures include Auctions 1-26 and direct sales proceeds for New Jersey (2009) and Connecticut (2009/2010).

Auction proceeds from Auctions 1 and 2 are reflected in the 2009 values.

New Jersey does not have auction proceeds after Compliance Period 1.

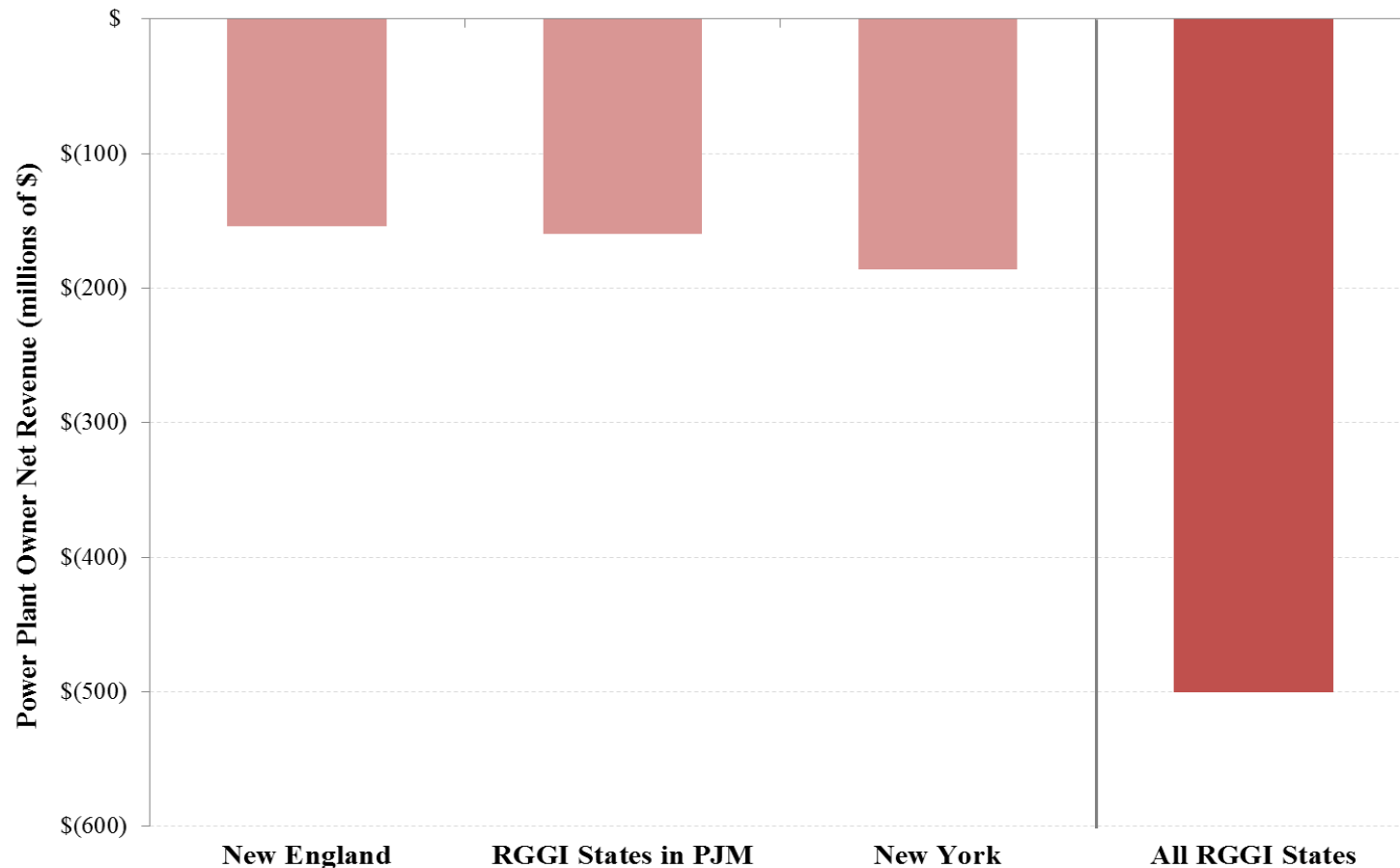
Consumer Bill Reductions by Region (2015\$)



Notes: Figures include PROMOD outputs, non-electric benefit calculations, capacity market gain calculations, and direct bill assistance savings.

Figures represent dollars discounted to 2015 using a 3% public discount rate.

Net Revenue Change for Power Plant Owners (2015\$)



Notes: Figures include PROMOD outputs, allowance true-up calculations and capacity market loss calculations.
Figures represent dollars discounted to 2015 using a 3% discount rate.

Net Economic Impact (2012-2014): By State

State/Region	Value Added ^[1] (\$2015 Millions)	Employment ^[2] (Cumulative job-years)
Connecticut	\$56.2	863
Maine	122.3	1,113
Massachusetts	243.3	2,718
New Hampshire	67.3	583
Rhode Island	16.6	195
Vermont	14.8	177
New England Subtotal	\$520.5	5,649
 New York	 \$385.5	 4,463
New York Subtotal	\$385.5	4,463
 Delaware	 \$107.3	 952
Maryland	213.8	2,475
RGGI States in PJM Subtotal	\$321.1	3,428
 Regional Impact ^[3]	 \$69.6	 615
 All RGGI States	 \$1,296.7	 14,155