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The Regional Greenhouse Gas Initiative

Pennsylvania Senate Environmental Resources and Energy Committee

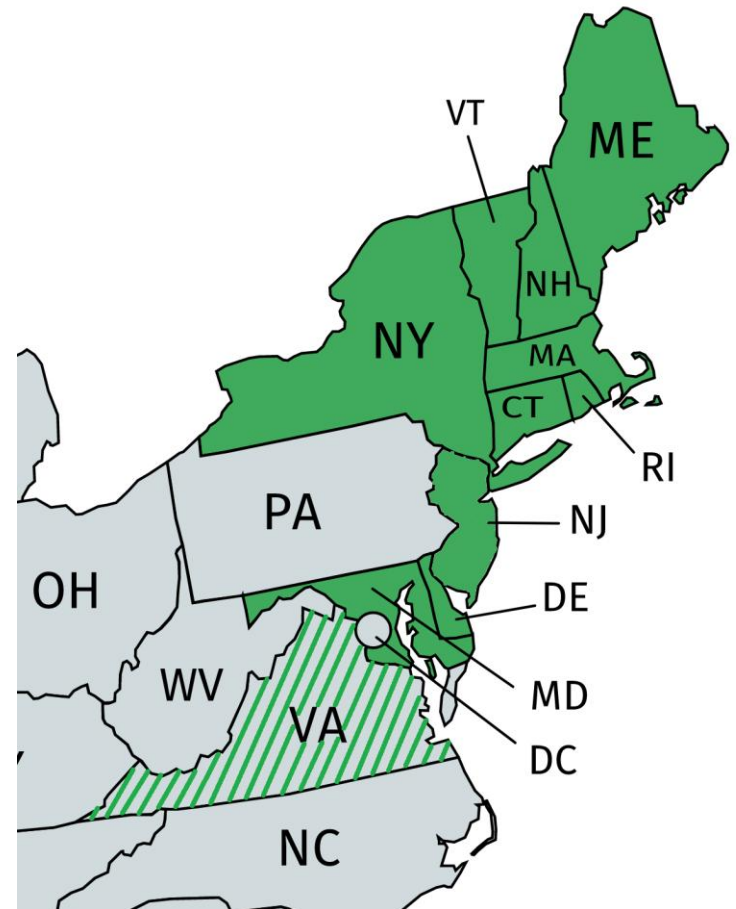
Chris Hoagland

Maryland Department of the Environment

October 22, 2019

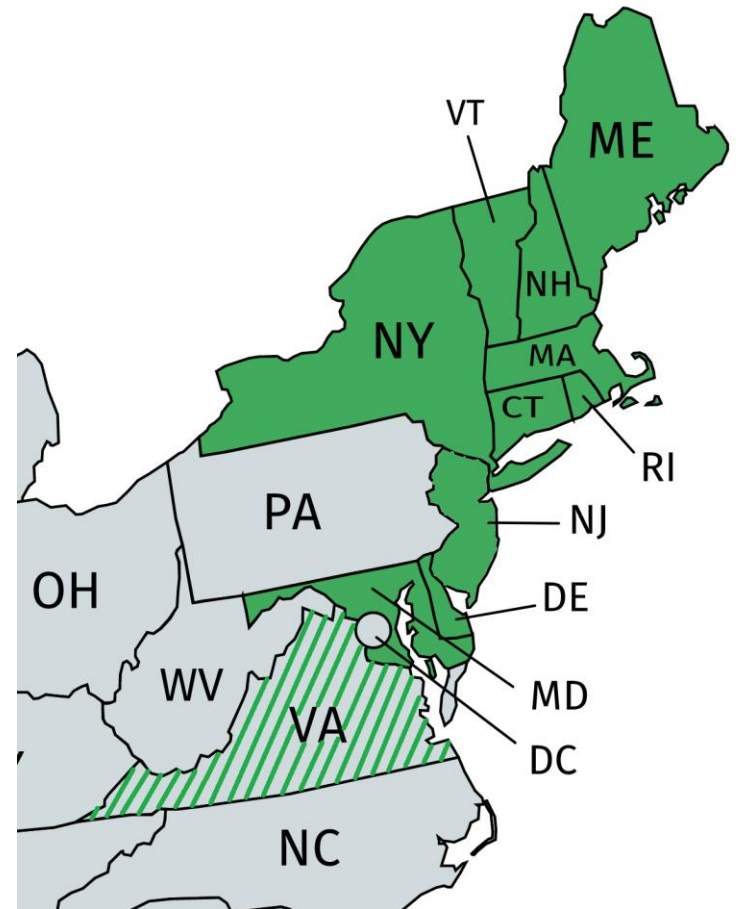
The Regional Greenhouse Gas Initiative

- Carbon Cap on Power Plants
- 10 States Participate
 - NJ now participating
 - VA promulgated regulation but not participating
- Most allowances sold at auction
- Auction proceeds fund energy programs



The Regional Greenhouse Gas Initiative

- 10 *Independent* State Programs
 - Markets are linked via consistent regulations & reciprocal acceptance of allowances
 - Collaborative program review
- There is no central “RGGI” authority
 - RGGI Inc. performs administrative functions for states



Cap and Invest

1. Require sources to turn in **allowances** for CO2 emissions.
2. Only issue a limited number of allowances.
3. Let sources trade allowances.
4. Invest proceeds from allowance auctions into energy programs.

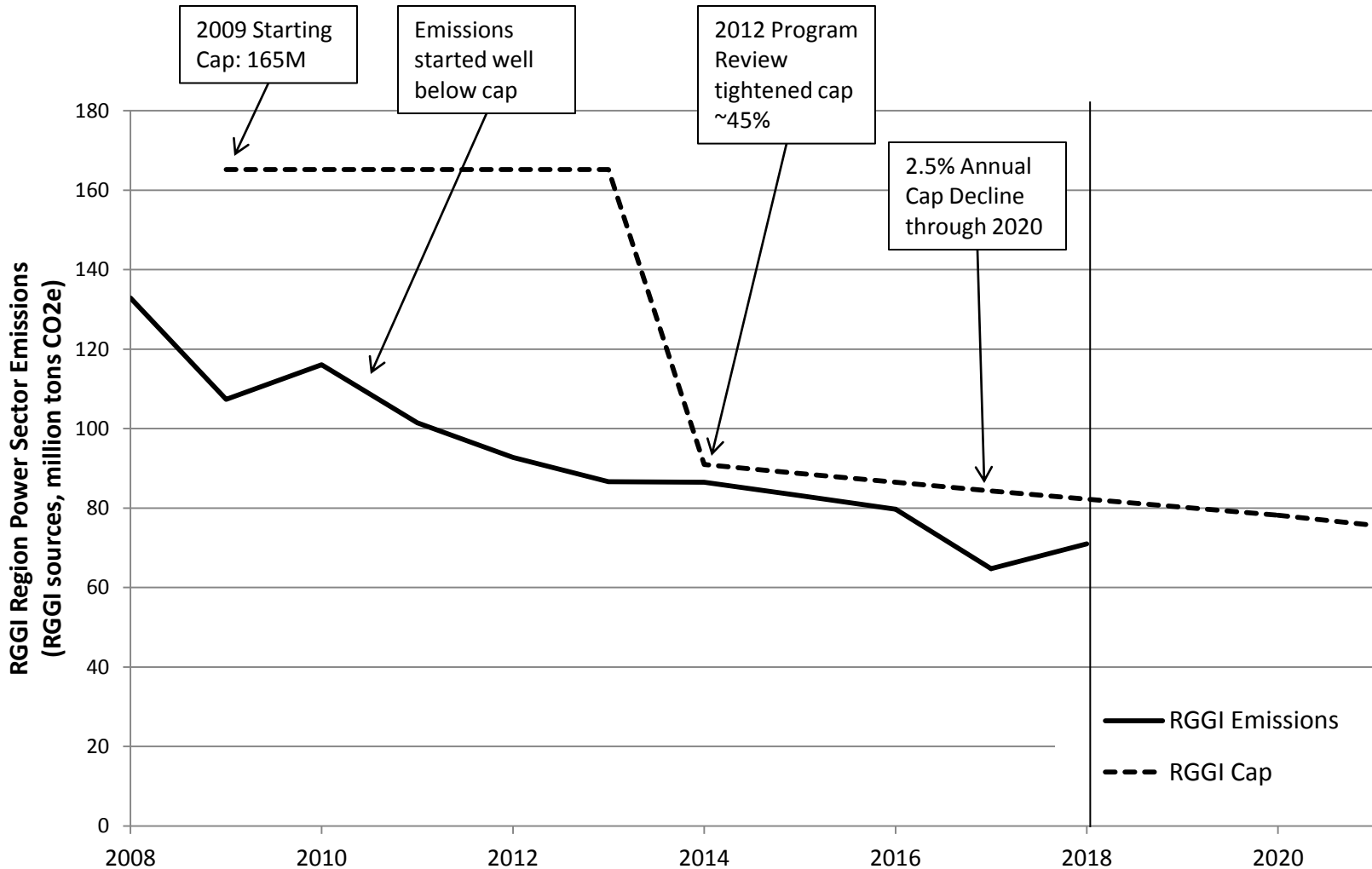
“Cap and Trade”

“Cap and Invest”



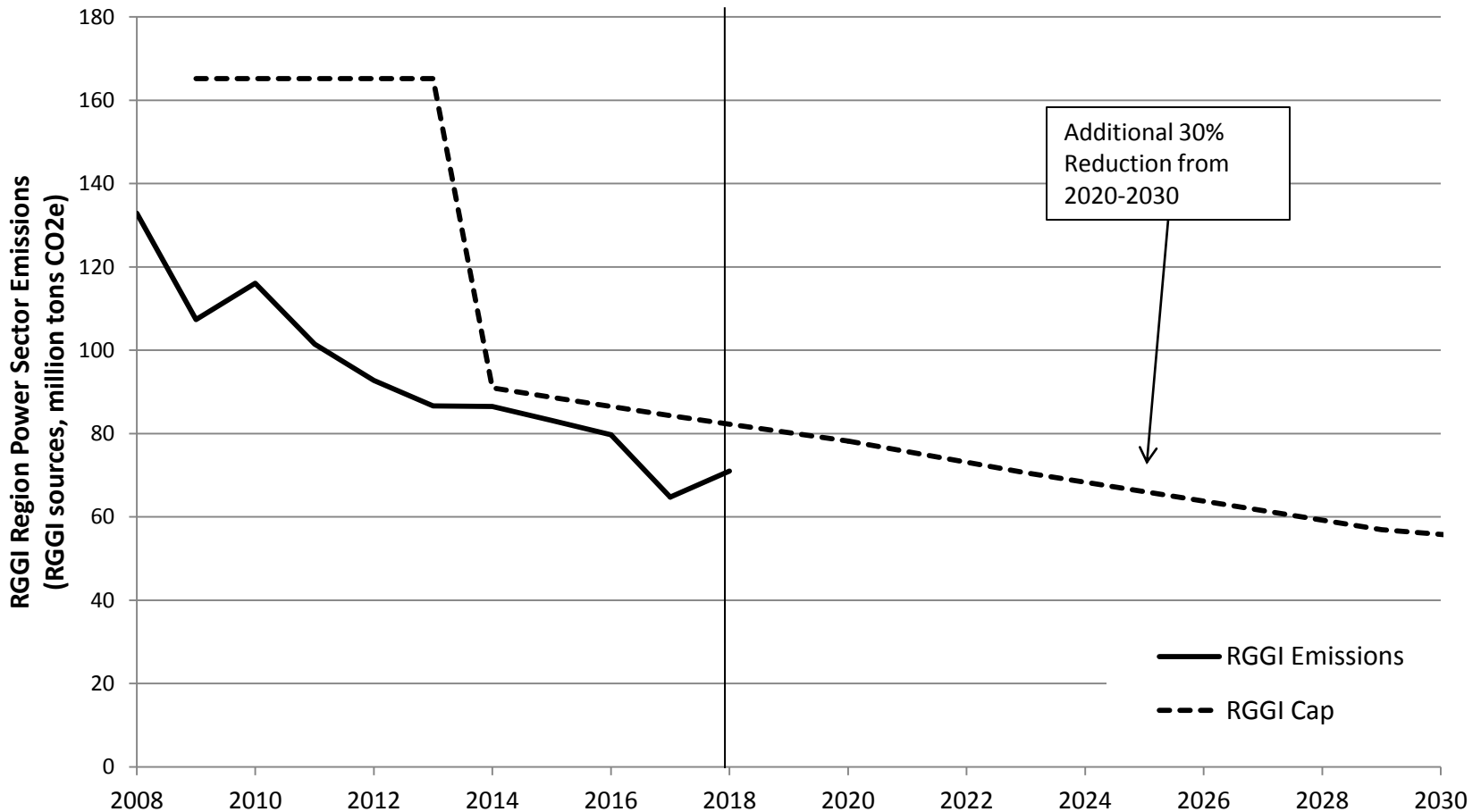
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RGGI Caps & Emissions: through 2020



NOTE: Does not include New Jersey, which participated from 2009-2011.

RGGI Caps & Emissions: through 2030



NOTE: The addition of New Jersey will increase the cap & covered emissions starting in 2020.

Emissions Reductions

- Many factors have influenced emissions reductions since RGGI began, including RGGI

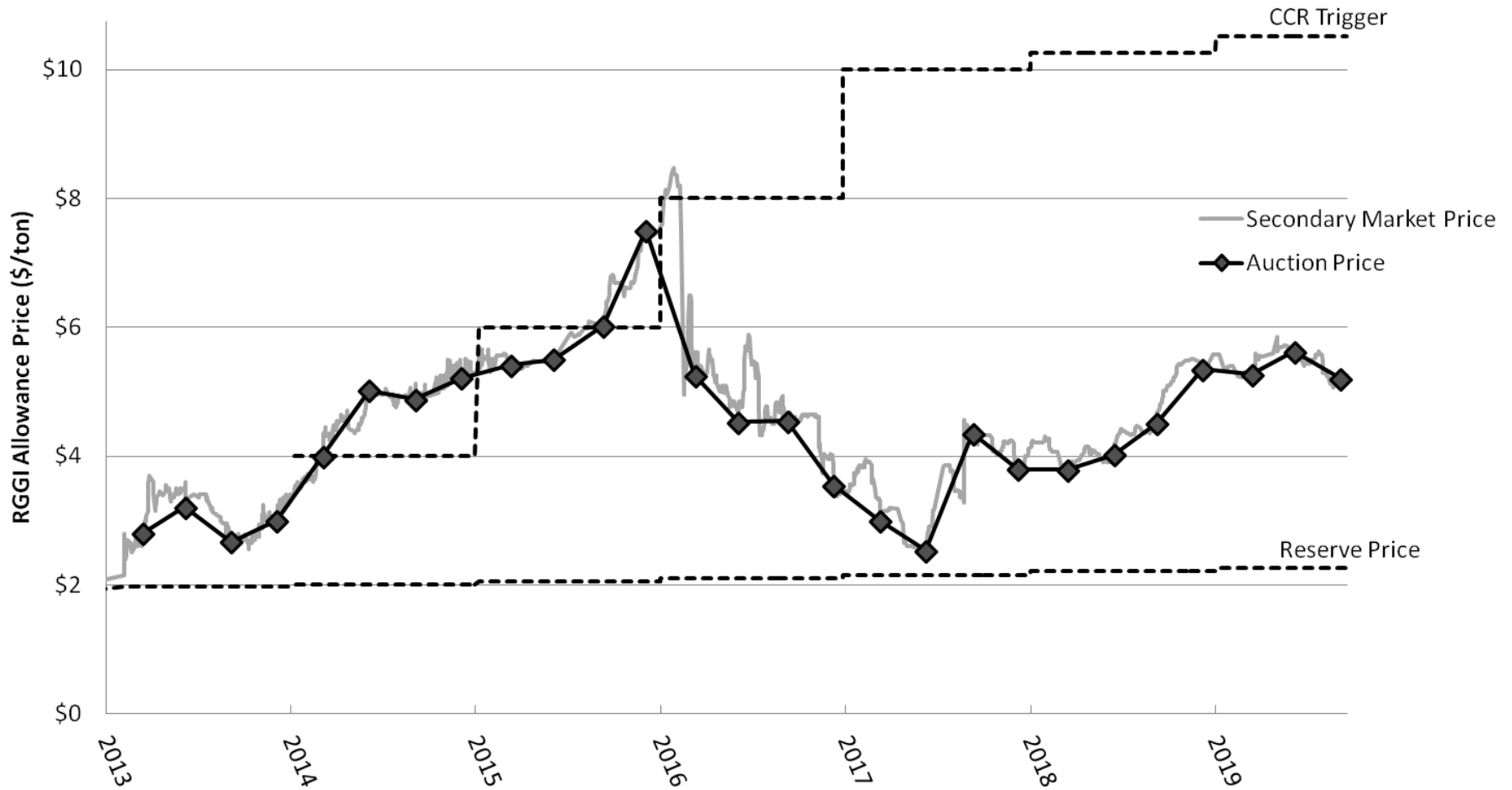
Reductions since 2008 (year before RGGI began):

	2008-2017	2008-2018
RGGI States	50%	45%
Maryland	59%	43%
Pennsylvania	34%	39%



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RGGI Prices



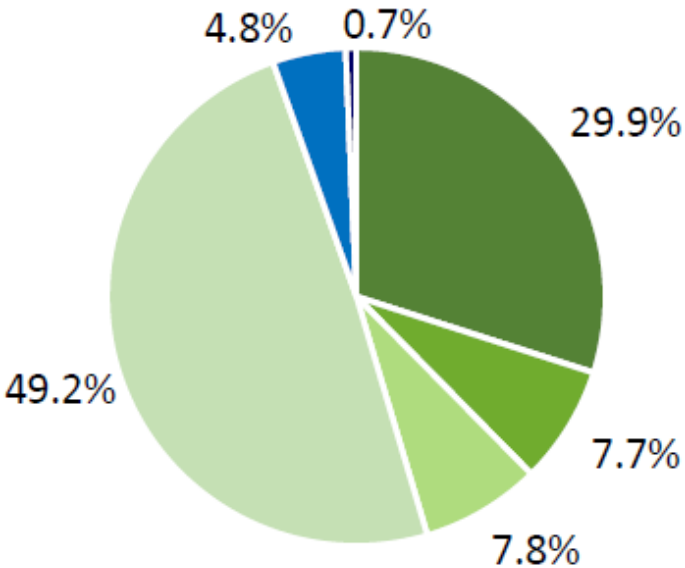
Allowance Allocation

- Most allowances allocated through quarterly auctions
- Participating states receive the proceeds
- \$3.2 billion raised region-wide to-date
 - \$669 million in Maryland
- Each state receives proceeds from sale of its allowances
 - The regional cap is just the sum of individual state allowance budgets.

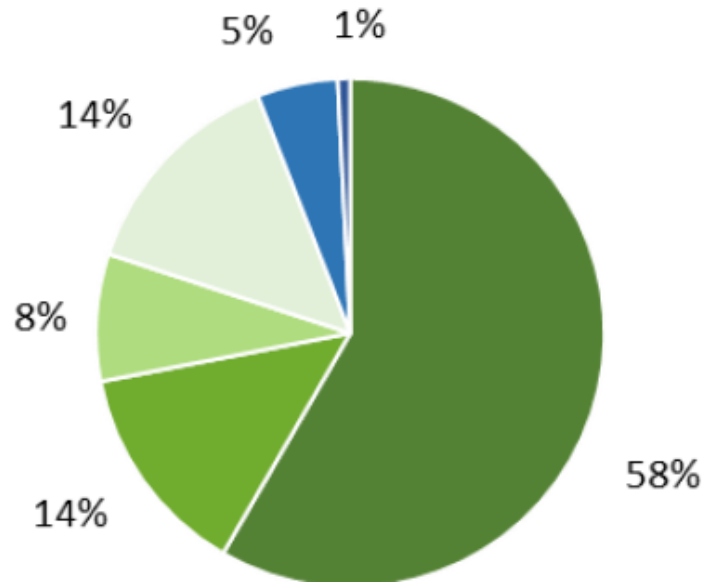


Auction Proceeds Investment

Maryland:



Region-wide:











- Energy Efficiency
- Clean & Renewable Energy
- GHG Abatement
- Direct Bill Assistance
- Administration
- RGGI, Inc.



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Auction Proceeds Impacts

Table 1: Benefits of 2017 RGGI Investments

Category	Annual Benefits of 2017 Investments	Lifetime Benefits of 2017 Investments
 Participating Households	Program*: 294,787 Direct Bill Assistance: 100,057	N/A
 Participating Businesses	3,331	N/A
 Workers Trained	83	N/A
 Short Tons CO ₂ Avoided	438,099	8,258,236
 Equiv. Cars Off Road	84,381	1,590,604
 Megawatt-Hours Saved	699,019	13,913,252
 MMBtu Saved	1,424,199	22,637,135
 Energy Bill Savings	\$128,704,015	\$1,400,088,616

*Participants in all programs other than direct bill assistance.



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RGGI Impacts (Independent Estimates)

1. RGGI has reduced emissions.

Murray, Brian C. and Peter T. Maniloff. “Why Have Greenhouse Emissions in RGGI States Declined? An Econometric Attribution to Economic, Energy Market, and Policy Factors.” *Energy Economics*. August 2015. <http://www.sciencedirect.com/science/article/pii/S0140988315002273>

2. RGGI has boosted economic growth & employment (Billions in GDP & Thousands of Jobs).

“The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeastern and Mid-Atlantic States.” Analysis Group. April 2018.
https://www.analysisgroup.com/globalassets/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf

3. RGGI has improved public health.

“Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative.” Abt Associates, 2017. <http://abtassociates.com/reports/2017/rggi.aspx>

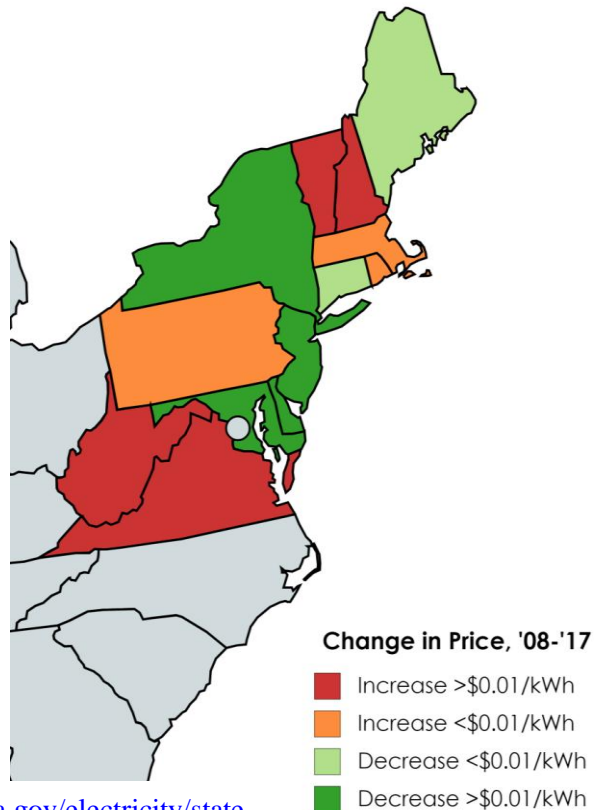


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Does RGGI Increase Electricity Costs?

Rough Analysis:

Most RGGI states' average retail rates have gone down since RGGI began, while non-participating neighbors' have gone up.



Sophisticated Analysis:

Analysis Group Retrospective:

“Since RGGI’s commencement in 2009, energy and dollar savings resulting from all states’ investments in EE and RE has more than offset the wholesale market price increases associated with the inclusion of allowance costs in market bids...consumers of electricity saved \$99 million [from 2015-2017 alone]”

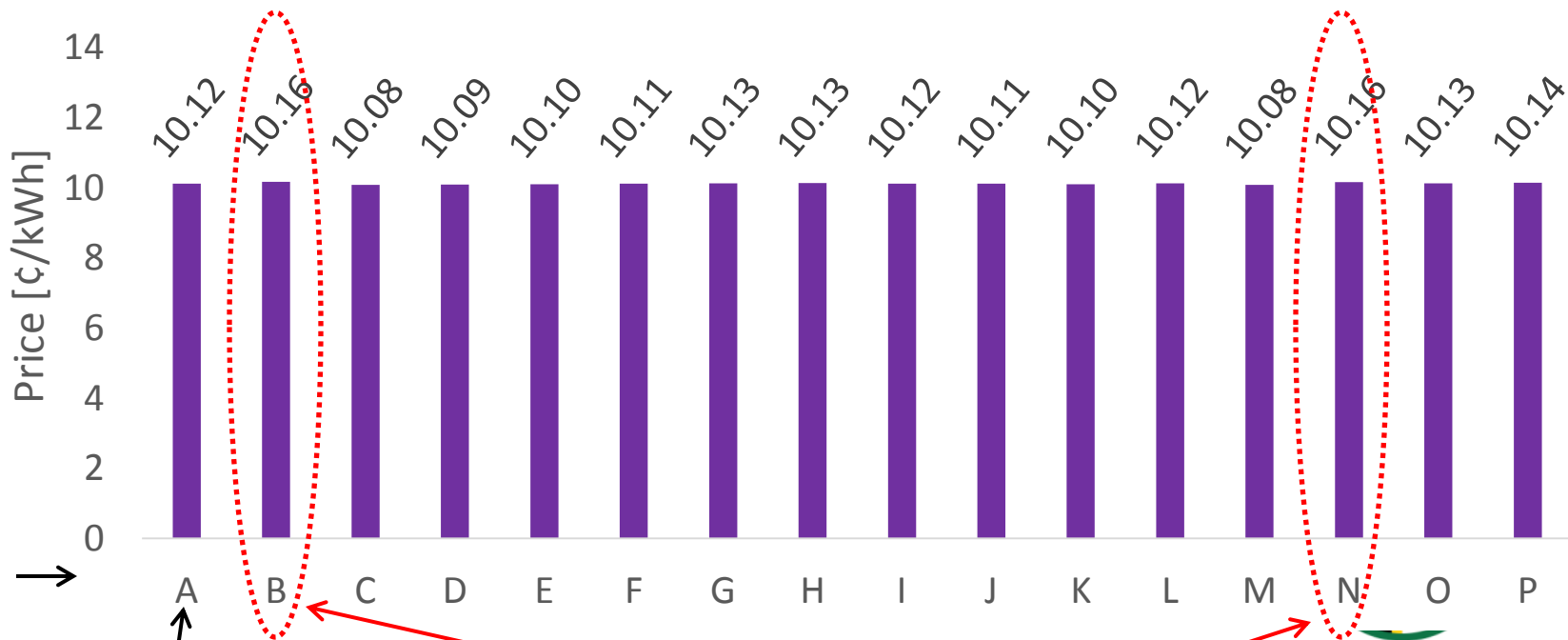


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Would RGGI Increase PA Electricity Costs?

Resources for the Future: only if auction proceeds are spent on non-energy purposes, and then not materially.

PA Retail Electricity Price [¢/kWh]



Various scenarios for how \$ spent →

No RGGI

RGGI auction proceeds spent on non-energy purpose

RGGI Regulations

- The participating states work together to write a Model Rule
 - <http://www.rggi.org/design>
- Each state's RGGI regulation is consistent with the Model Rule
 - <http://www.rggi.org/design/regulations>
- The cap is the sum of participating state allowance budgets



My Info

Chris Hoagland
Program Manager
Climate Change Program
Maryland Department of the Environment
410-537-3291
chris.hoagland@maryland.gov



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Extra Slides



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Other RFF Results

- RGGI would substantially reduce future PA emissions
- PA has options to design the program to prioritize:
 - GHG Reductions
 - Electricity savings
 - Preventing decrease in exports



Options for Issuing Emissions Allowances in a Pennsylvania Carbon Pricing Policy

Issue Brief 19-08 by Dallas Burtraw, Maya Domeshek, Anthony Paul, and Paul Picciano — October 2019

We explore policy design elements for a potential electricity sector carbon cap in Pennsylvania.

A carbon cap is a method of carbon pricing that sets a limit on total carbon emissions and requires emitters to turn in a permit, called an allowance, for each ton of carbon dioxide they emit. Emissions allowances under a cap can be sold through an auction or distributed directly to emitters or other entities and can be traded in a secondary market, which leads to the identification of a carbon price based on the scarcity of allowances. This ensures that those entities that can reduce emissions in the least expensive manner will do so, saving the cost of an allowance.

An electricity sector carbon cap in Pennsylvania would require generators to turn in allowances for the carbon emitted in the process of electricity generation. Such a program brings with it several policy options—whether to allow trading of allowances (“linking”) with the Regional Greenhouse Gas Initiative (RGGI) carbon market, what to do with the revenue from the sale of allowances (allowance value), and what companion policies to implement.

In a previous **report** (Report 19-04) and **issue brief** (Issue Brief 19-07) we concluded that with a Pennsylvania electricity sector carbon cap:

- Emissions reductions would be achieved at low cost.

- Low allowance prices would accelerate emissions reductions if Pennsylvania adopted features of the RGGI design.
- Renewable energy policy would achieve emissions reductions at greater cost but would also create clean energy infrastructure that would contribute to emissions reductions in the long run.
- A trade-ready program design in Pennsylvania would link seamlessly with the Regional Greenhouse Gas Initiative.
- Emissions leakage would be moderate.

Here, using RFF’s Haiku electricity sector model, we expand on our previous work by focusing in more detail on a Pennsylvania carbon cap that is linked with RGGI. Linking the state program with RGGI can lower total costs, insulate the allowance markets from shocks due to local events, and amplify the climate policy signal of Pennsylvania’s decision to cap emissions on the national stage.

In this analysis, we study the distribution of allowance value between the general fund (No AA), electricity consumers (Cons), and electricity producers (Prod) as well as the interaction of carbon pricing with Pennsylvania’s Alternative Energy Portfolio Standard (AEPS) which is designed to support the development of clean energy. All results are for 2026.

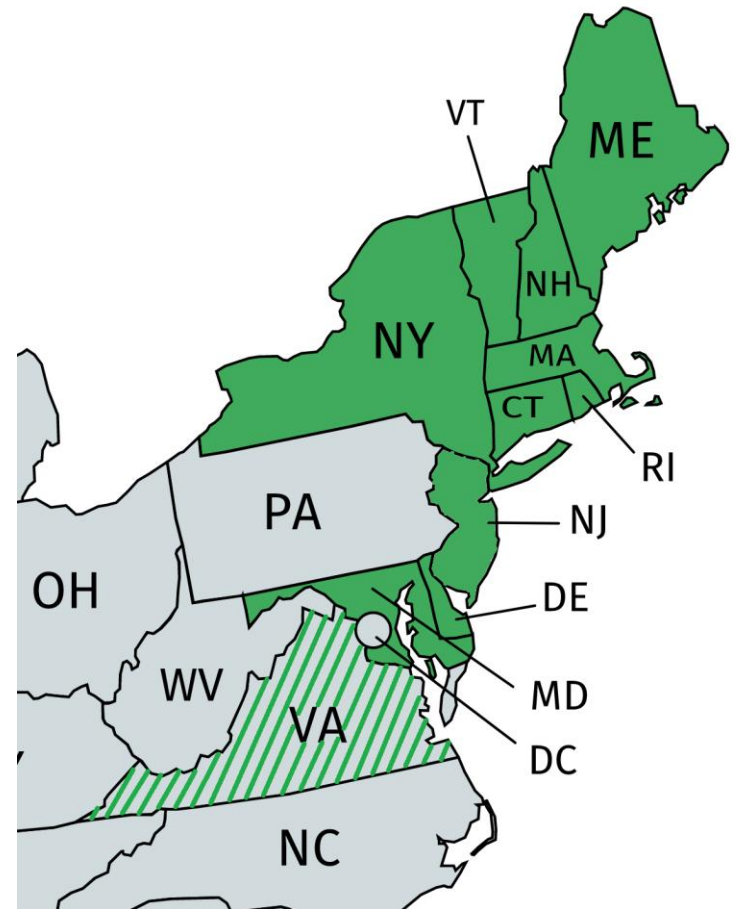
We present six main findings.

New State Participation

- RGGI states are always available to discuss participation.

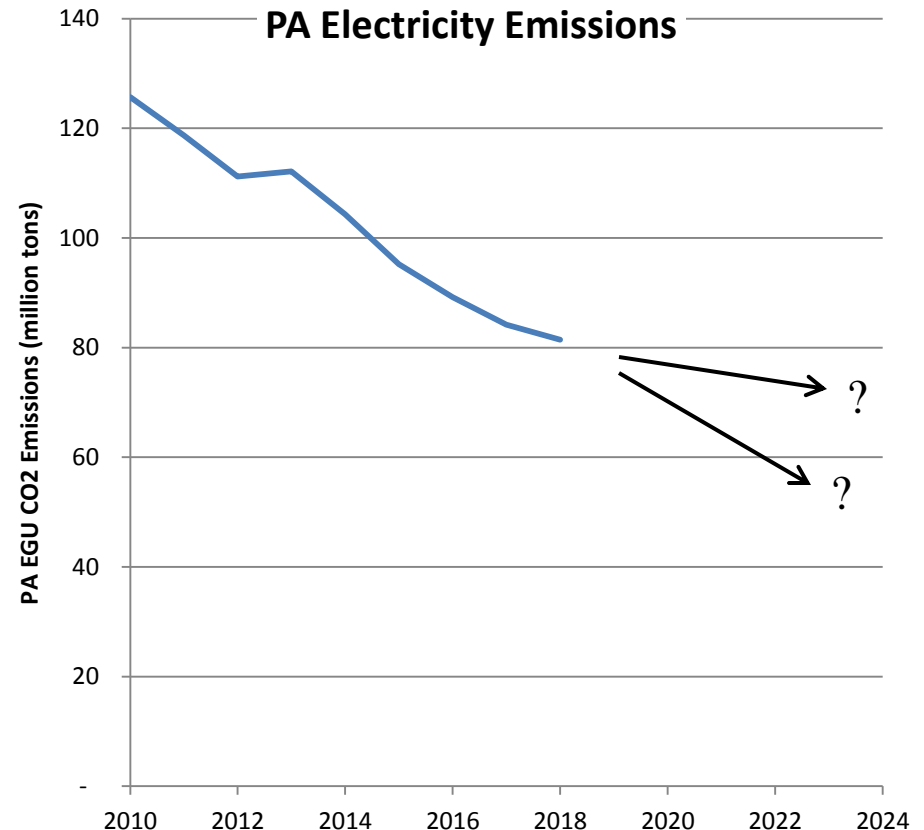
Important Considerations:

- 1- Comparable Stringency
- 2- Consistent Program Elements
- 3- Governance



Comparable Stringency

- New states bring in more allowances (i.e. higher cap), and more emissions
 - How does that affect the overall balance between the cap and emissions?
- Indicators of stringency:
 - Allowance price
 - Modeling is useful here: will future allowance price decrease because of the new state?
 - New state's budget vs current emissions



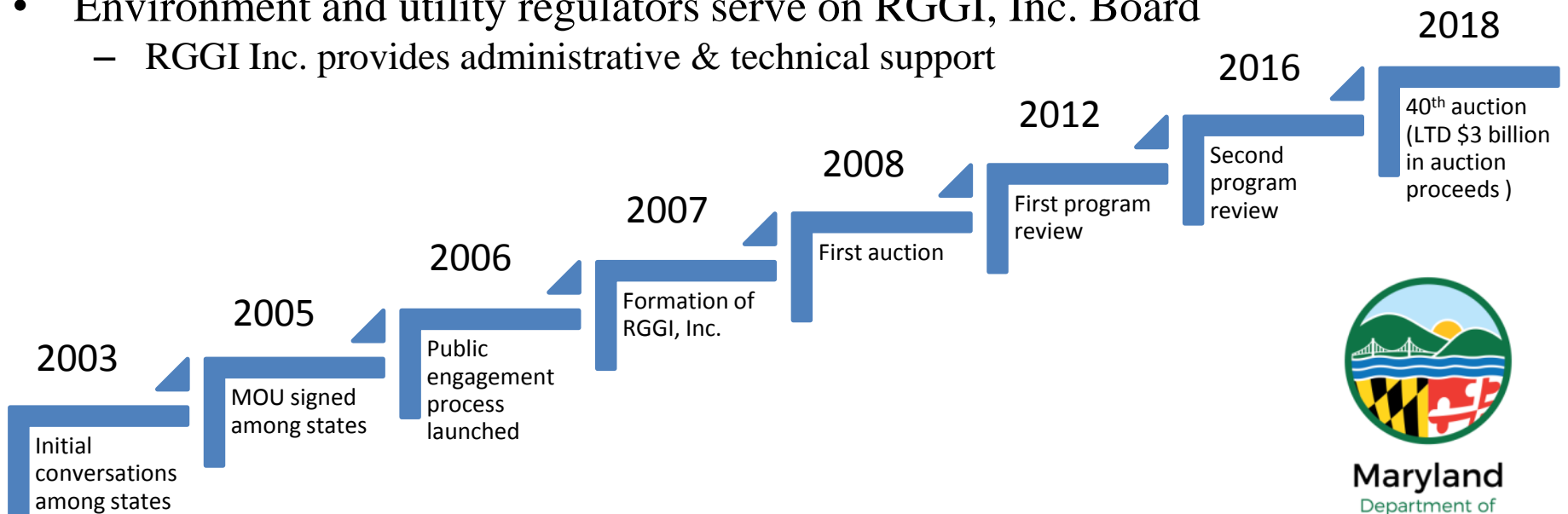
Consistent Program Elements

- How will new state allocate allowances?
- How will new state implement important elements?
 - Price Floor
 - Cost Containment Reserve
 - Emissions Containment Reserve
 - Bank Adjustment
- All state programs are independent, but consistent enough for generators to participate in one market



Governance

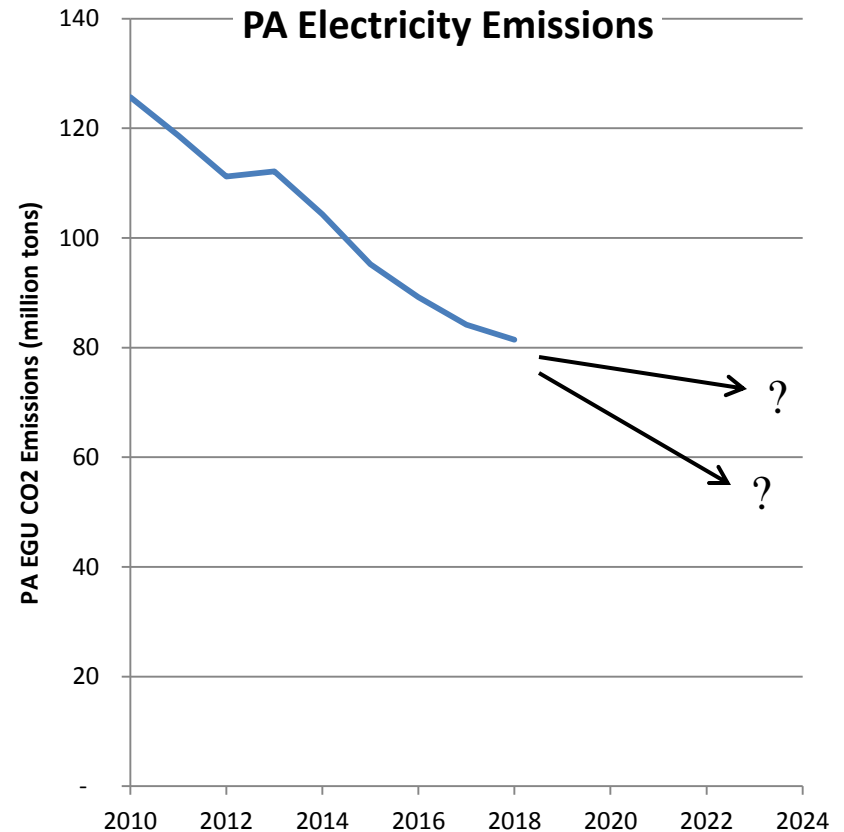
- RGGI emerged and continues through bipartisan collaboration & public engagement
- Participating states convene periodic Program Review to improve program
 - Third Program Review will start by 2021
- Environment and utility regulators serve on RGGI, Inc. Board
 - RGGI Inc. provides administrative & technical support



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Process to Participate

1. Begin formal discussions w/ RGGI states
2. RGGI States will assist with modeling, analysis, regulation interpretation, stakeholder engagement to design consistent program
3. Follow rulemaking process



Flexibility Mechanisms

The Cost Containment Reserve is...

A reserve from which allowances are released

If prices are high

The Emissions Containment Reserve is...

A reserve into which allowances are diverted

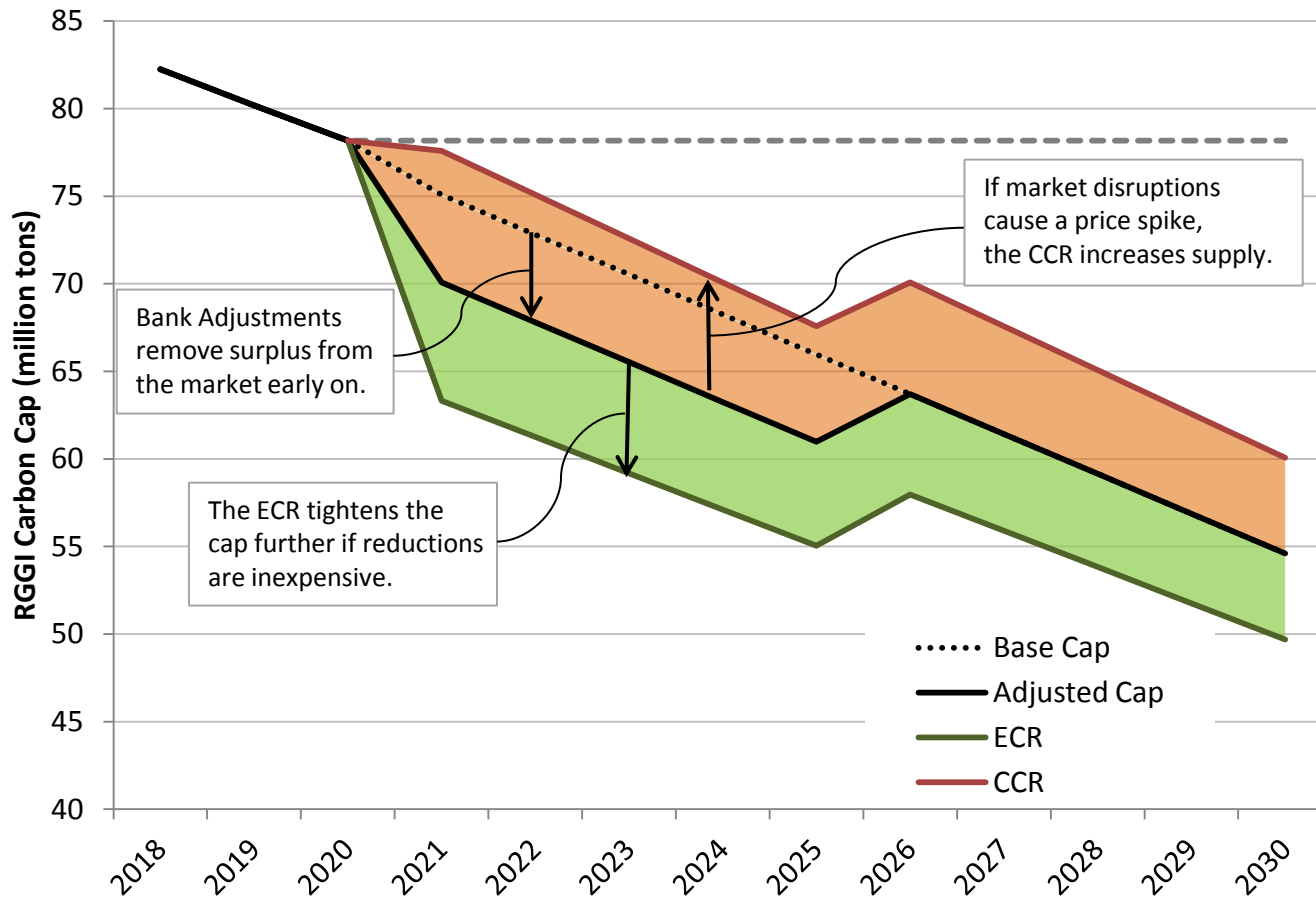
If prices are low

Both act during the auction

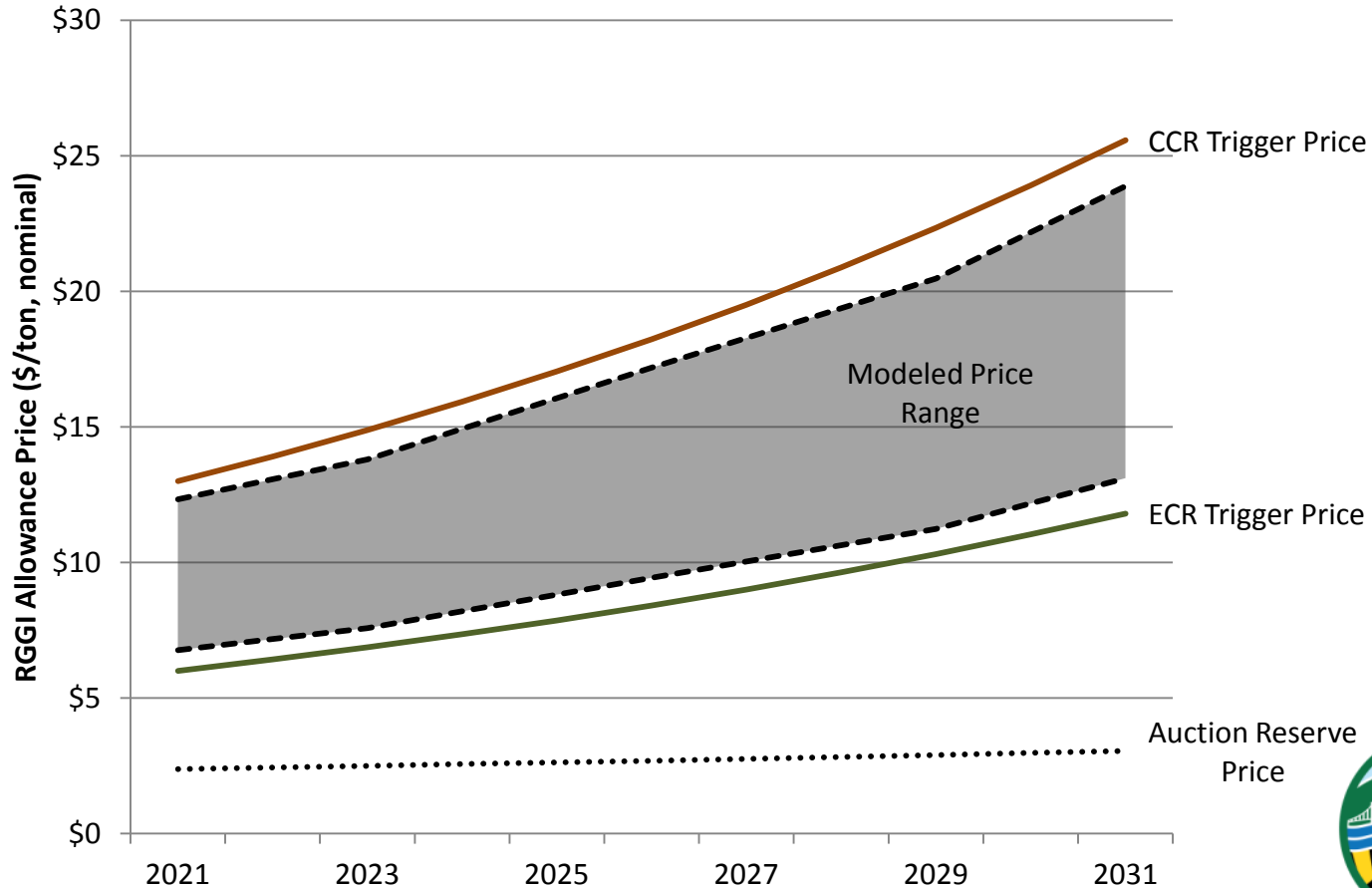


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2017 Agreement: An Adaptive Cap



2017 Agreement: CCR and ECR Price Triggers



Leakage

Leakage has been a concern since program design.

The states monitor for leakage through the annual electricity monitoring report.

Leakage cannot be directly measured.

Dispatch models will generally leak, even at low allowance prices (this may not always be realistic).



Leakage

Current state strategies to counteract leakage:

- 1- Invest in reductions in-region
- 2- Expand state participation

Potential state strategies to counteract leakage:

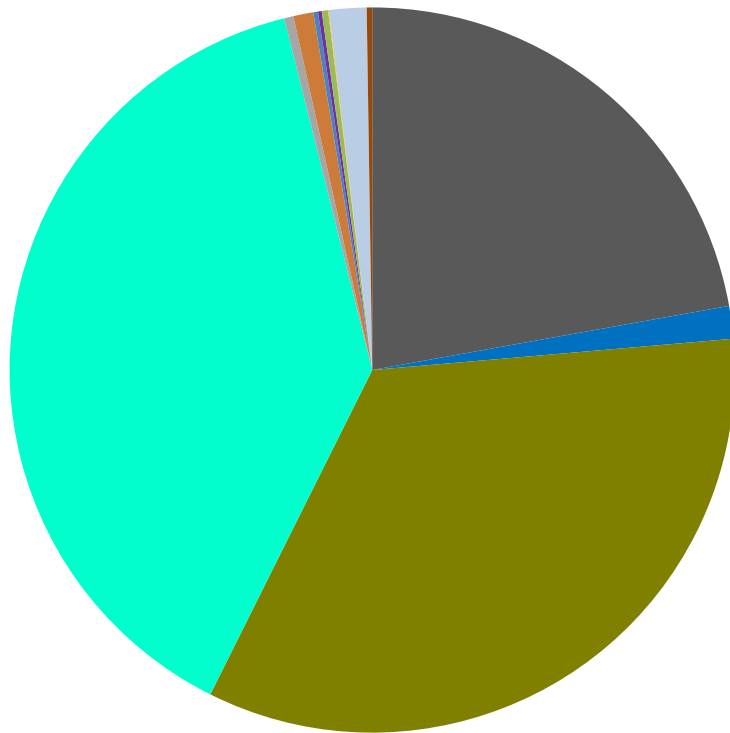
- 1- ISO/RTO market rules to reflect carbon pricing & address leakage
- 2- Updating Output-based Allowance Allocation



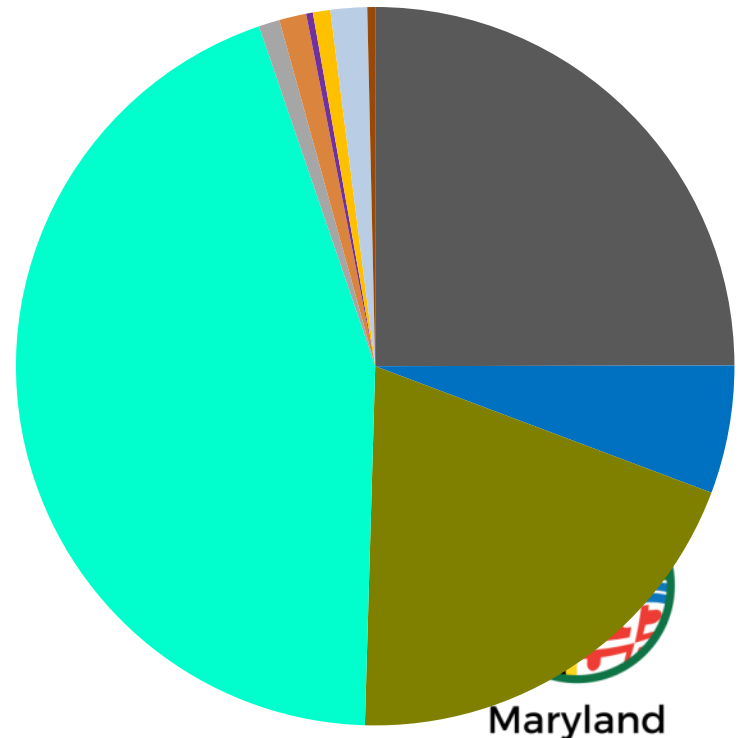
MD & PA: 2017 Generation Mix

Pennsylvania

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- Coal
- Hydroelectric
- Natural gas
- Nuclear
- Other
- Other biomass
- Other gas
- Petroleum
- Solar
- Wind
- Wood

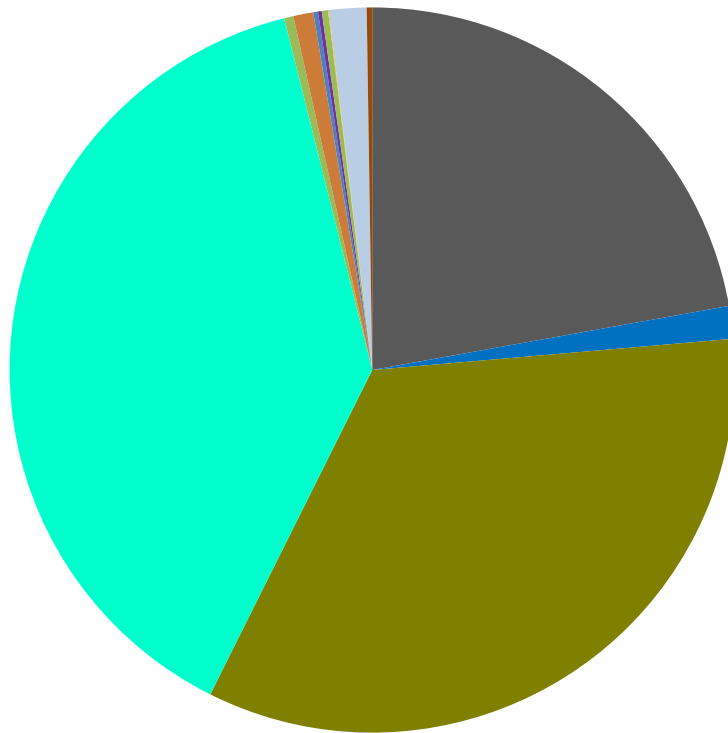


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Not that different...

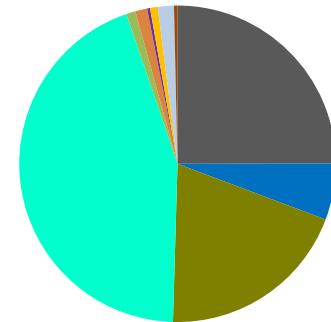
MD & PA: 2017 Generation Mix

Pennsylvania



213 TWh Total

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34 TWh Total



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