



Maryland
Department of
the Environment

Power Sector Carbon Reduction Strategies in Maryland



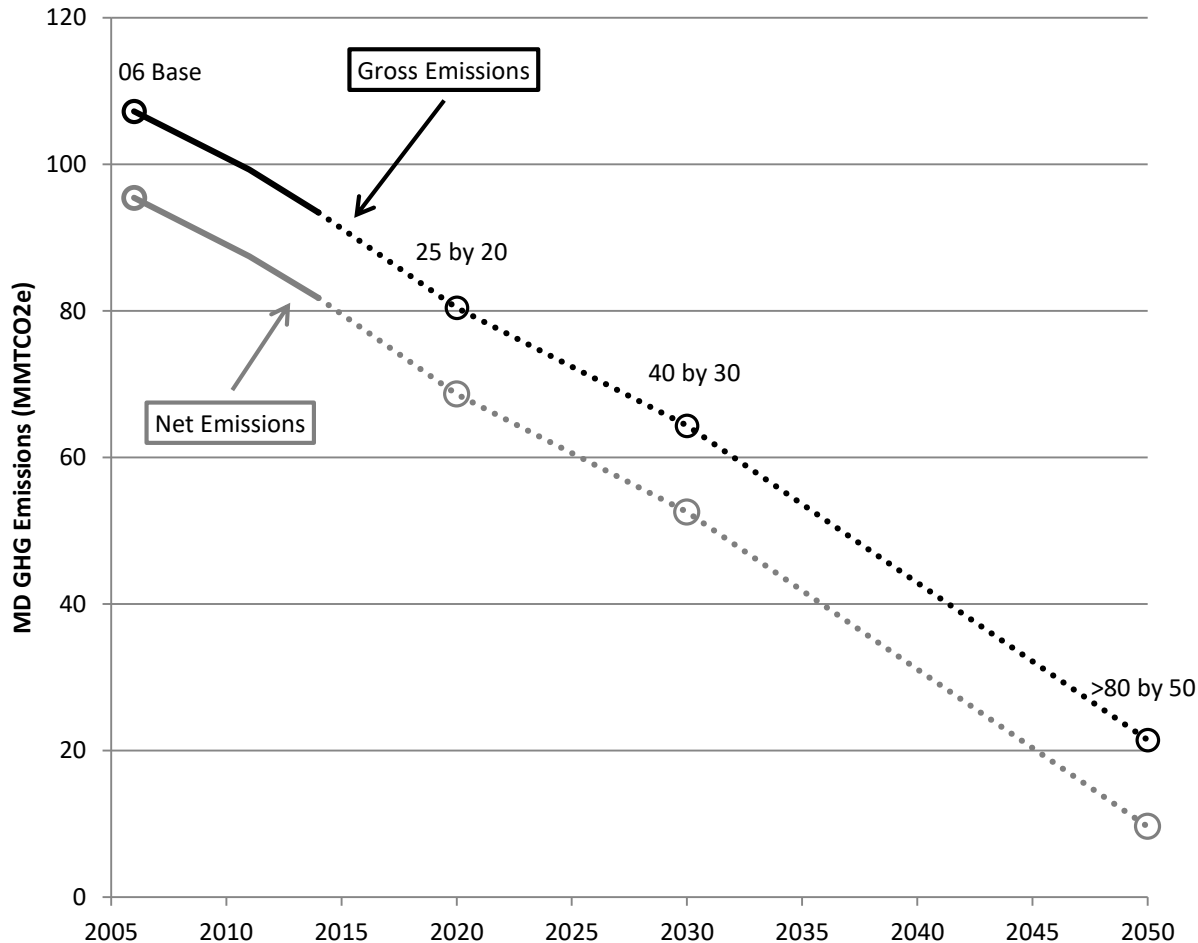
Chris Hoagland
March 8th, 2018

Presentation Outline

1. Maryland GHG Goals and Trends
2. Maryland's Renewable Portfolio Standard & Community Solar Pilot
3. The Regional Greenhouse Gas Initiative



Background – Maryland GHG Goals



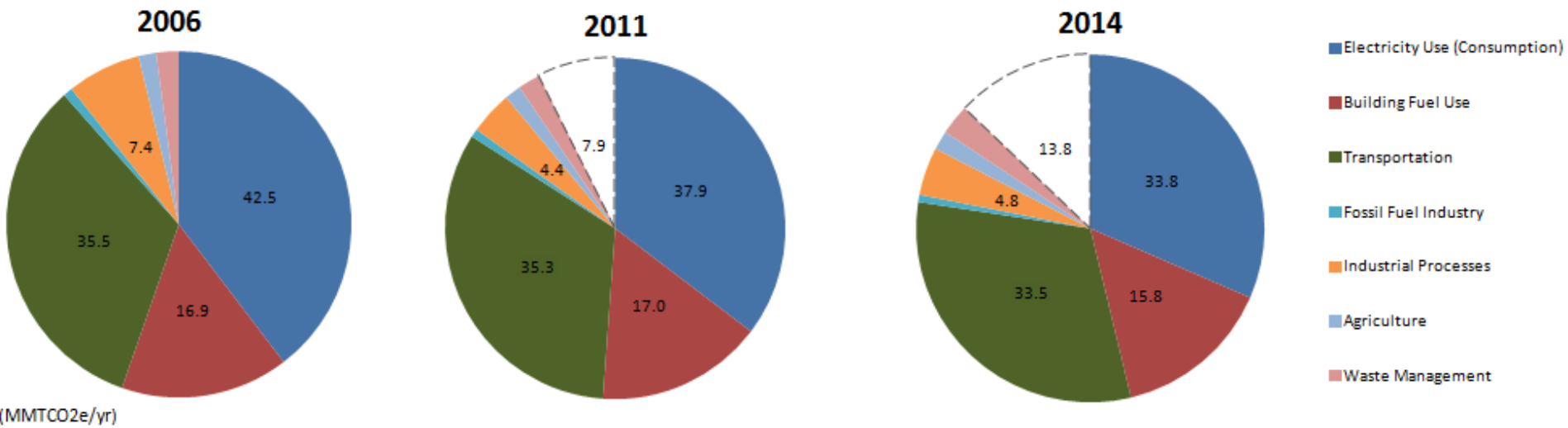
Maryland GHG targets (“GGRA Goals”):

- 25% reduction by 2020
- 40% reduction by 2030
- 80% to 95% reduction by 2050 (aspirational)



Maryland
Department of
the Environment

Progress to Date (2017 data coming soon)



MD GHG Inventories:

<http://www.mde.state.md.us/programs/Air/ClimateChange/Pages/GreenhouseGasInventory.aspx>

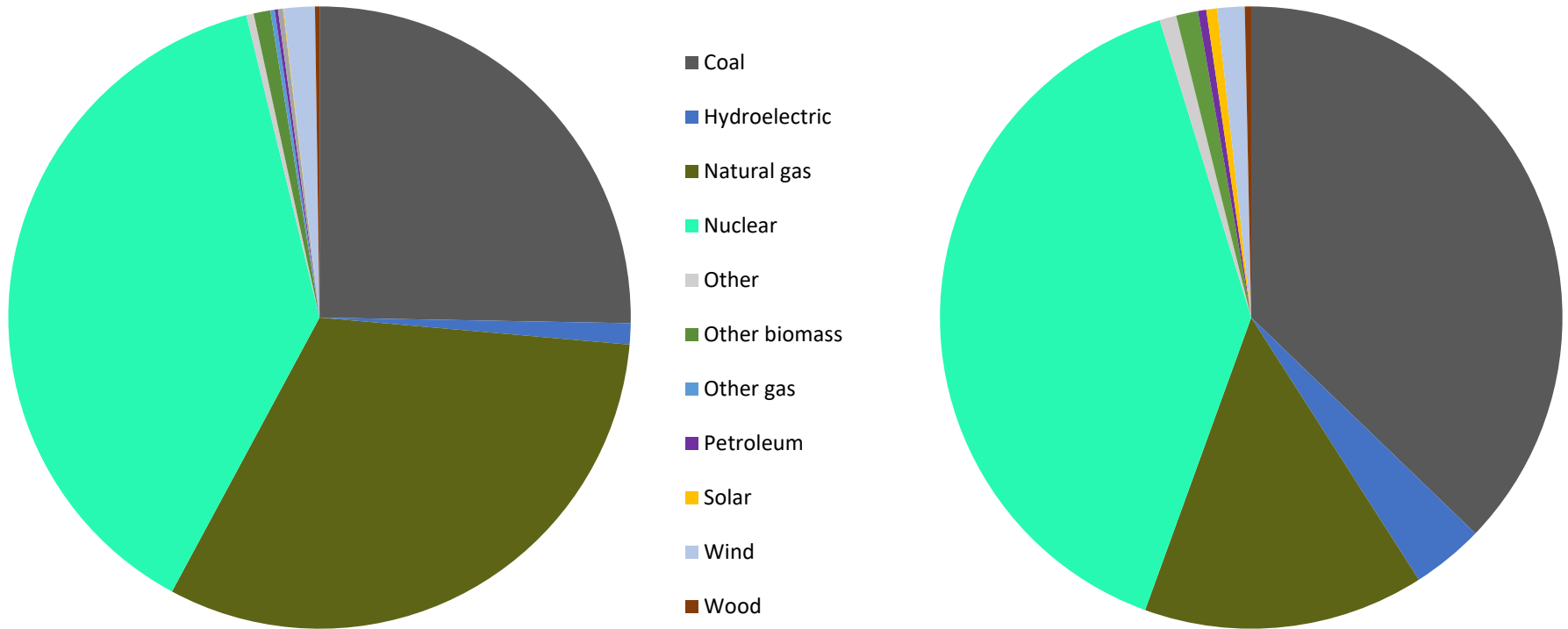


Maryland
Department of
the Environment

MD & PA: 2016 Generation Mix

Pennsylvania

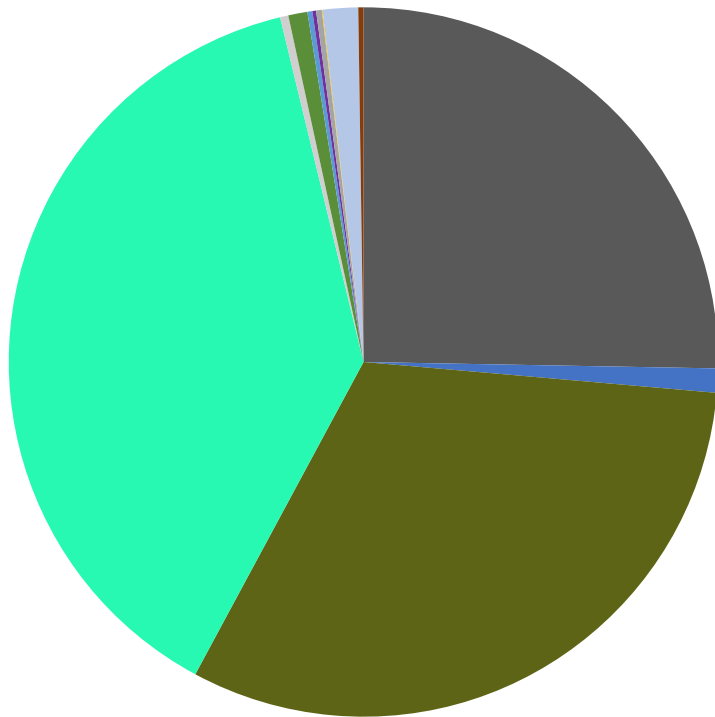
Maryland



Not that different...

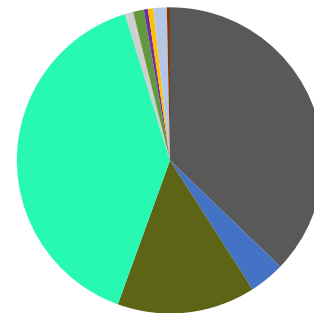
MD & PA: 2016 Generation Mix

Pennsylvania



215 TWh Total

Maryland

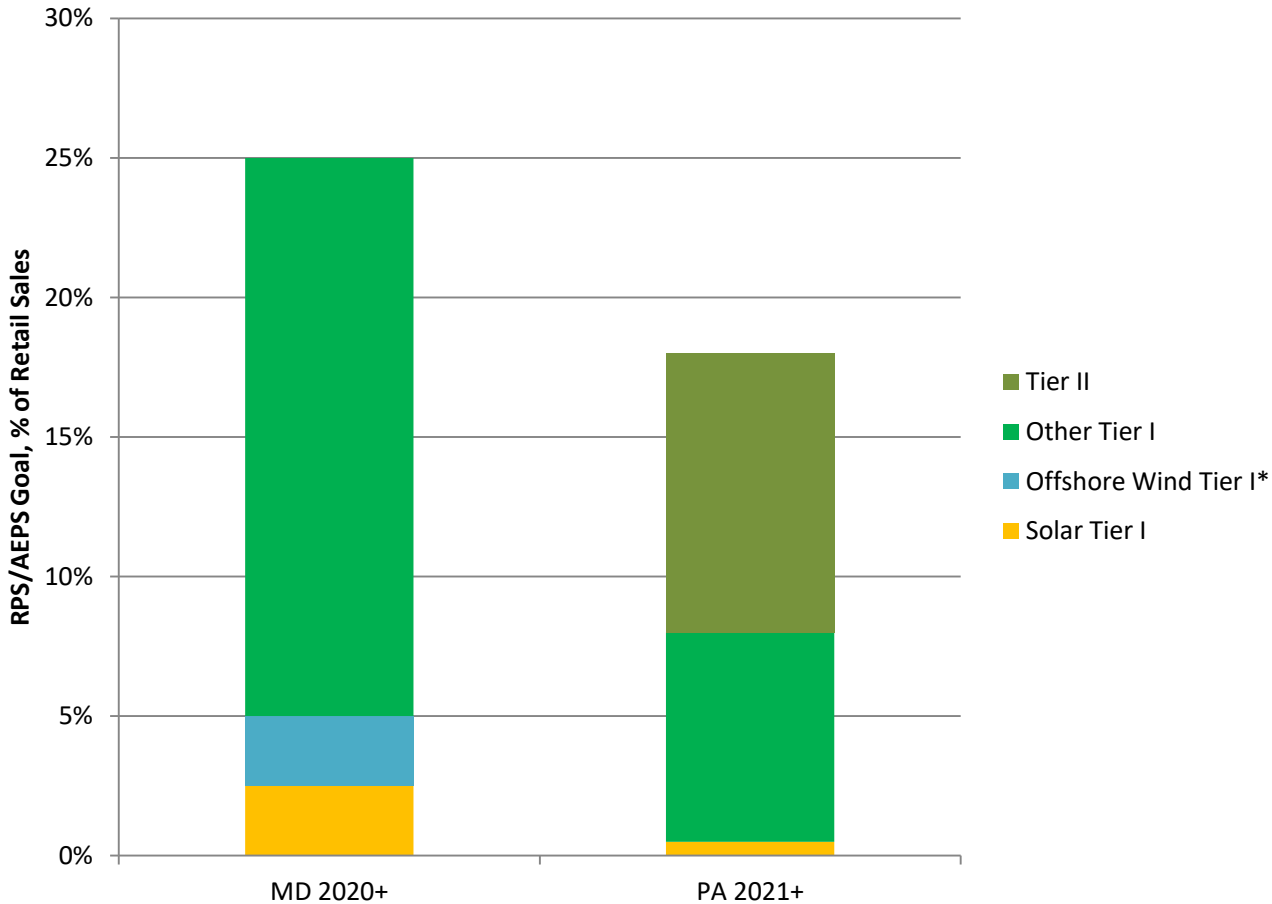


37 TWh Total



Maryland
Department of
the Environment

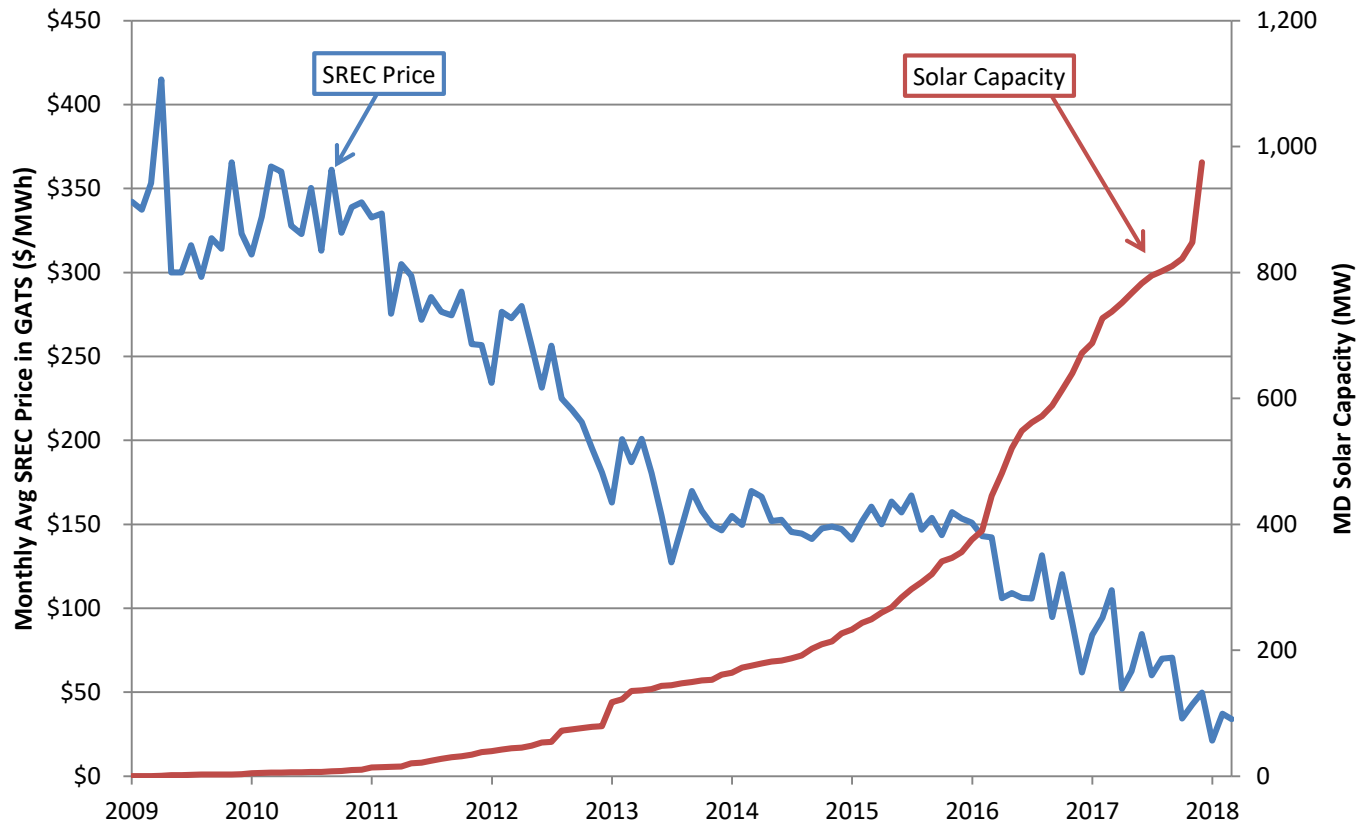
MD & PA: RPS & AEPS Goals



Maryland
Department of
the Environment

*OSW carve-out can be up to 2.5%; actual amount will depend on actual supply.

MD Solar Trends



Maryland
Department of
the Environment

Source: PJM GATS Solar Weighted Average Price Report

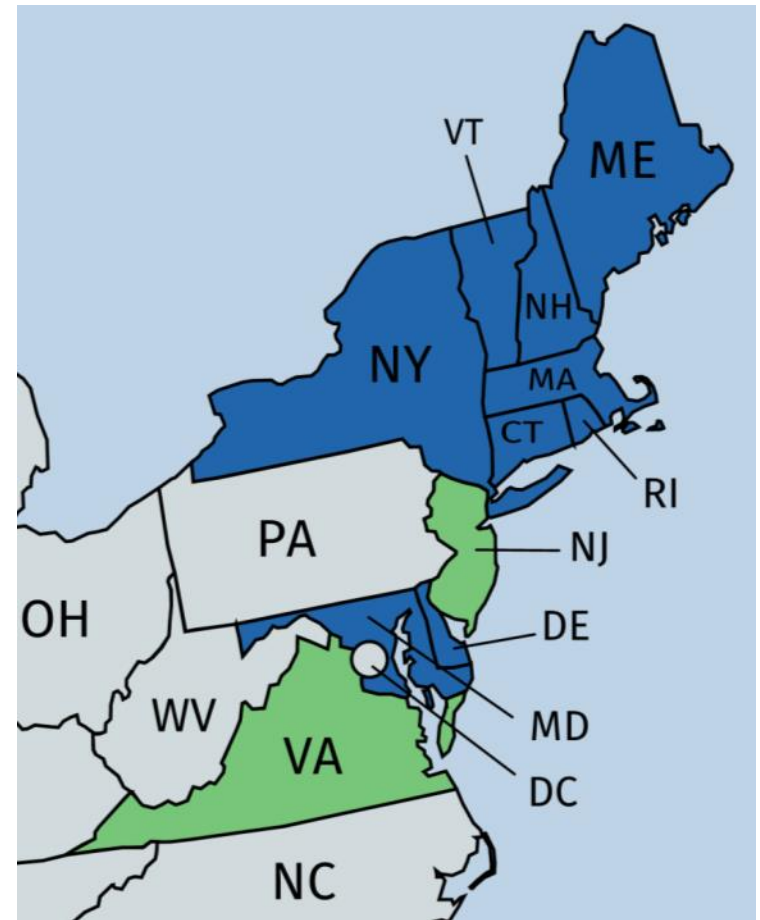
MD Community Solar Pilot

- Makes virtual net metering available to subscribers.
- 193 MW state-wide.
 - 60 MW set-aside for Low and Moderate Income.
- Applications began last year; first projects coming online this year.
- Maryland Energy Administration developing financial incentives.



The Regional Greenhouse Gas Initiative

- Carbon Cap on Power Plants
- 9 States Participate
- Most allowances sold at auction
- Auction proceeds fund energy programs



What does RGGI have to do with solar?

- RGGI *indirectly* affects solar
 - Affects relative competitiveness of fossil vs zero-emissions generation
- Other programs *directly* affect solar (RPS, net metering, tax incentives, etc.)
 - Provide subsidies for solar generation
- Some states invest RGGI proceeds in solar
 - E.g. MD offers grants for <200 kW projects
- All RGGI states have Complementary Programs



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.

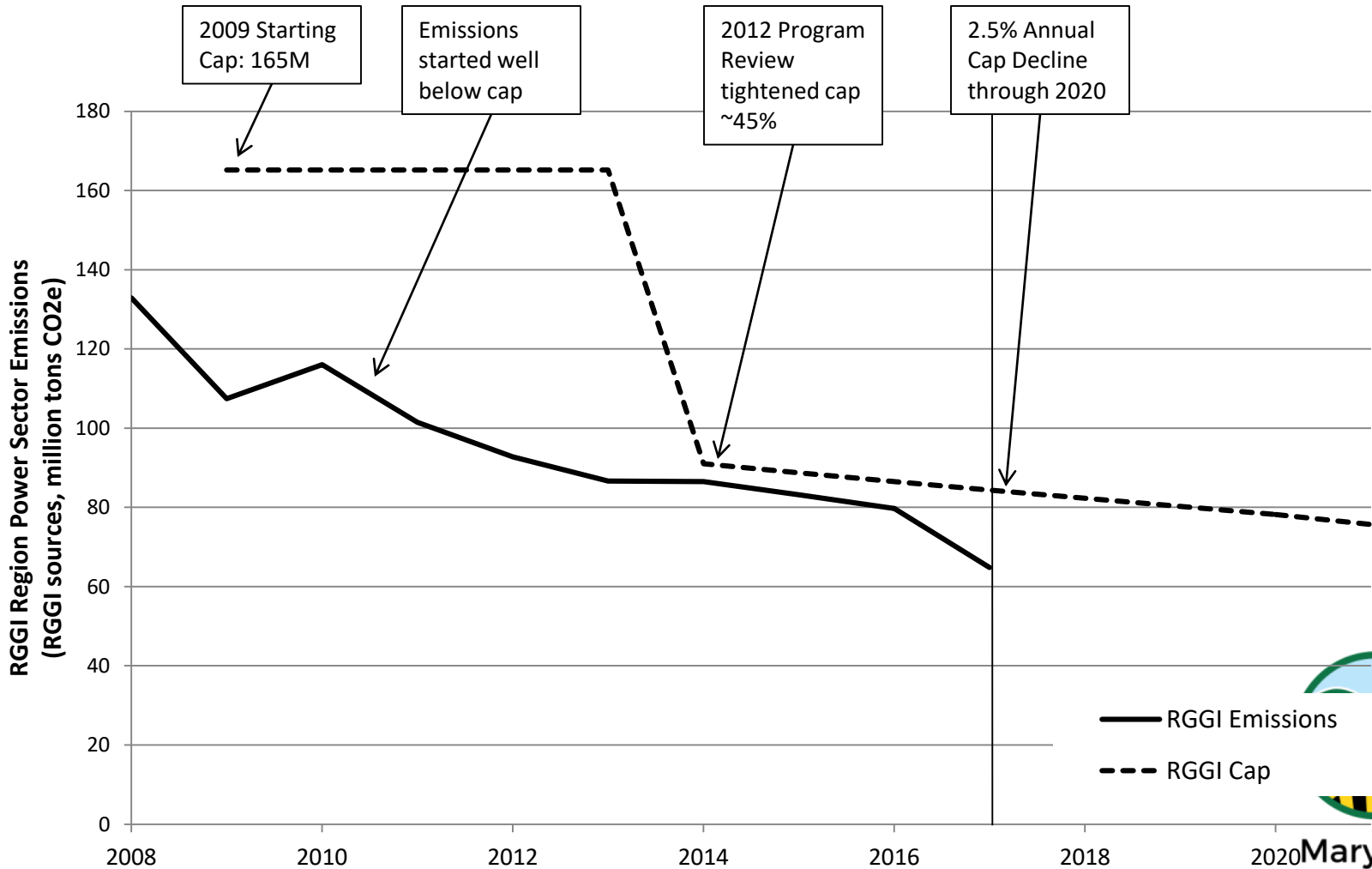
“Cap and Trade”

“Cap and Invest”

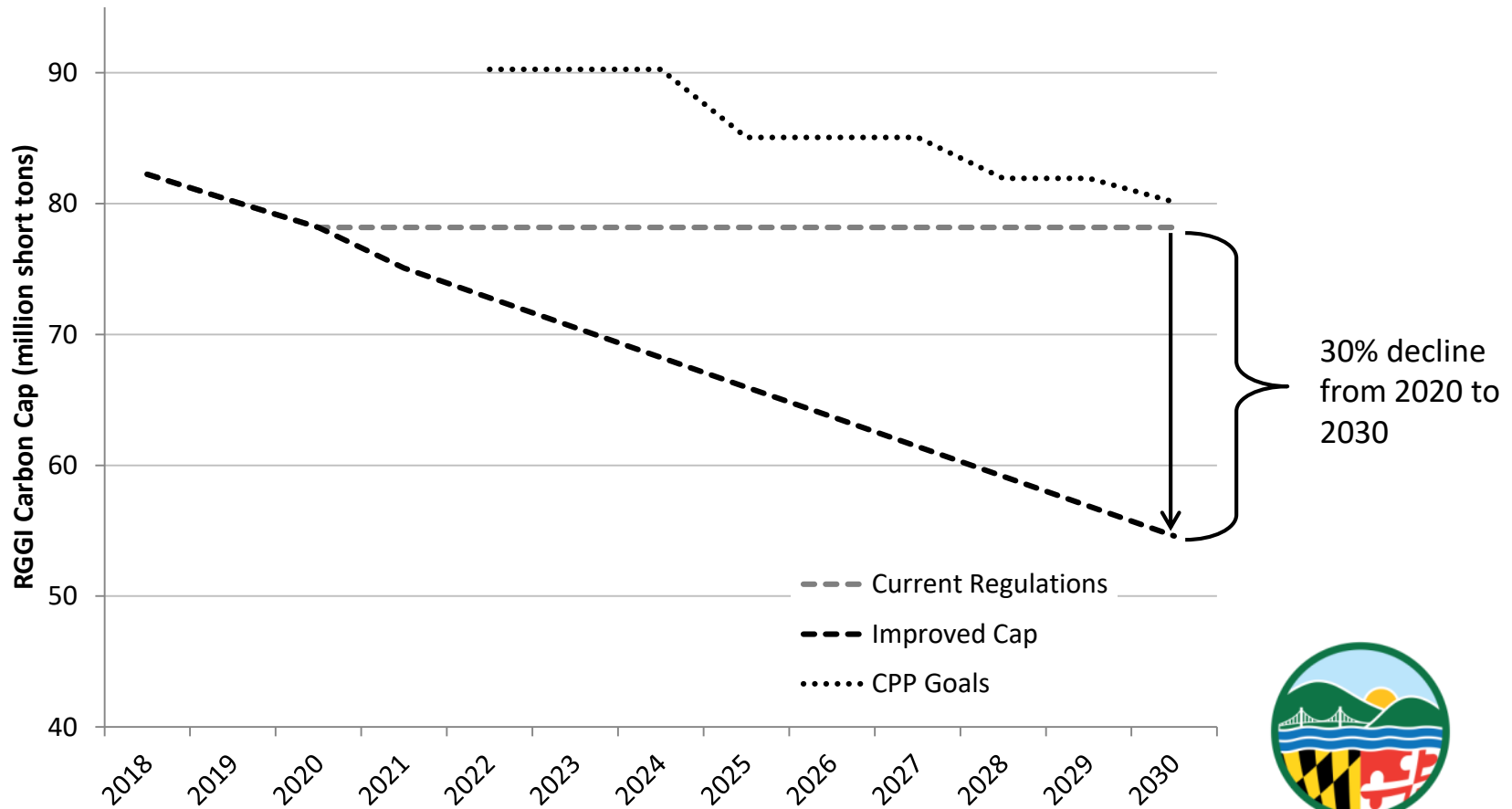


Maryland
Department of
the Environment

RGGI Caps & Emissions



2017 Agreement: 30% Cap Decline



Maryland
Department of
the Environment

Allowance Allocation

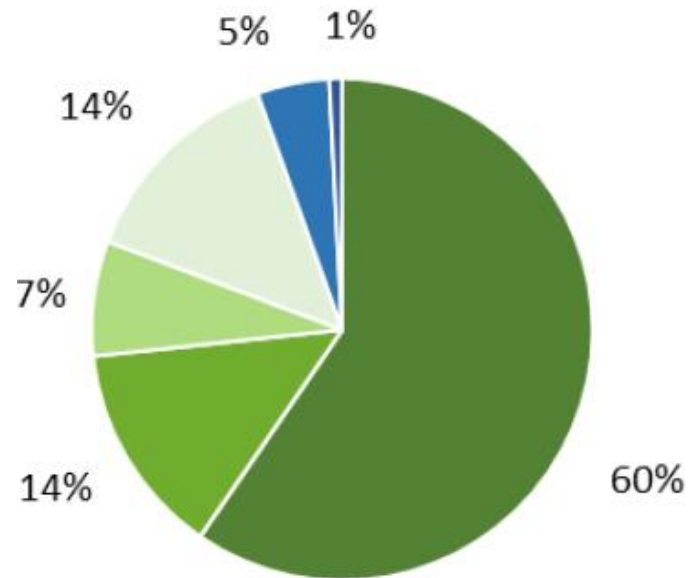
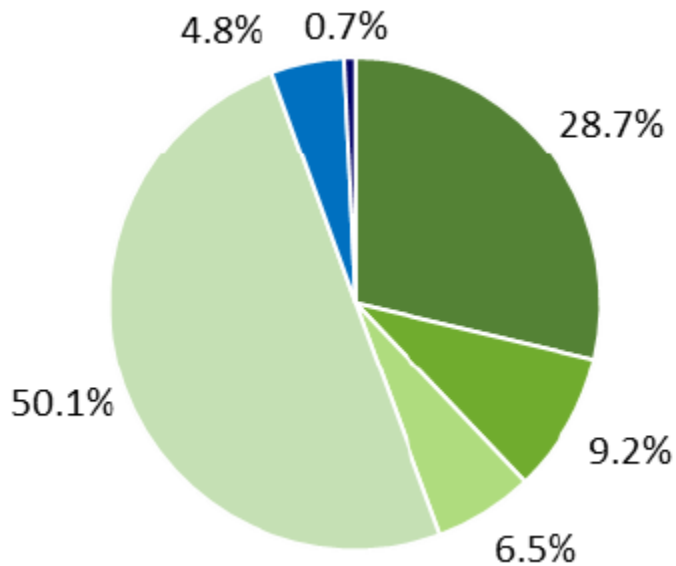
- Most allowances sold at quarterly auctions
- Participating states receive the proceeds
- \$2.8 billion raised region-wide to-date
- \$600 million in Maryland



Auction Proceeds Allocation

Maryland:

Region-wide:



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









Cumulative investments through 2015



Maryland
Department of
the Environment

Auction Proceeds Impacts

Table 1: Benefits of 2015 RGGI Investments

Category	Annual Benefits of 2015 Investments	Lifetime Benefits of 2015 Investments
 Participating Households	161,805 (Programs)* 1.5 million (Bill Assistance)	N/A
 Participating Businesses	6,060 (Programs)* 37,396 (Bill Assistance)	N/A
 Workers Trained	552	N/A
 Short Tons CO ₂ Avoided	298,410	5.3 million
 Equiv. Cars Off Road	57,184	1.0 million
 Megawatt-Hours Saved	505,761 MWh	9.0 million MWh
 MMBtu Saved	1.5 million MMBtu	28.0 million MMBtu
 Energy Bill Savings	\$154.5 million	\$2.31 billion

*Participants in all programs other than direct bill assistance.



Maryland
Department of
the Environment

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.

“The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeastern and Mid-Atlantic States.” Analysis Group. July 2015.
http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf

3. RGGI has improved public health.

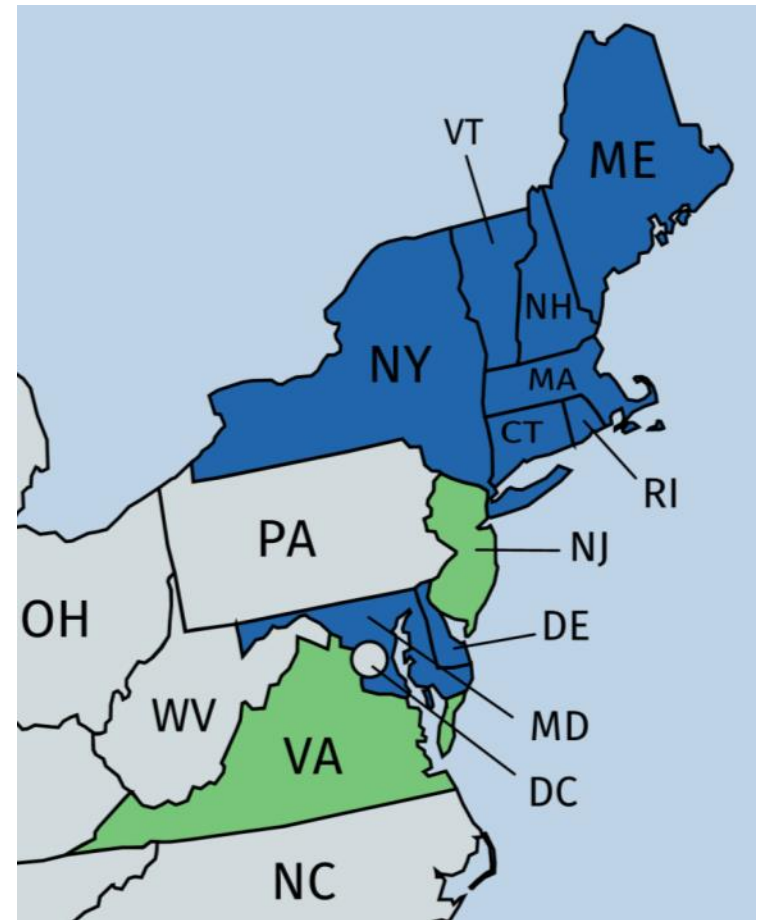
“Analysis of the Public Health Impacts of the Regional Greenhouse Gas Initiative.” Abt Associates, 2017. <http://abtassociates.com/reports/2017/rggi.aspx>



Maryland
Department of
the Environment

New State Participation

- VA & NJ are developing programs.
- RGGI states always available to discuss participation with interested states.
- Important considerations:
 1. Comparable Stringency
 2. Consistent Program Elements



My Info

Chris Hoagland
Economist, Climate Change Division
Maryland Department of the Environment
410-537-3291
chris.hoagland@maryland.gov



Maryland
Department of
the Environment

Extra Slides



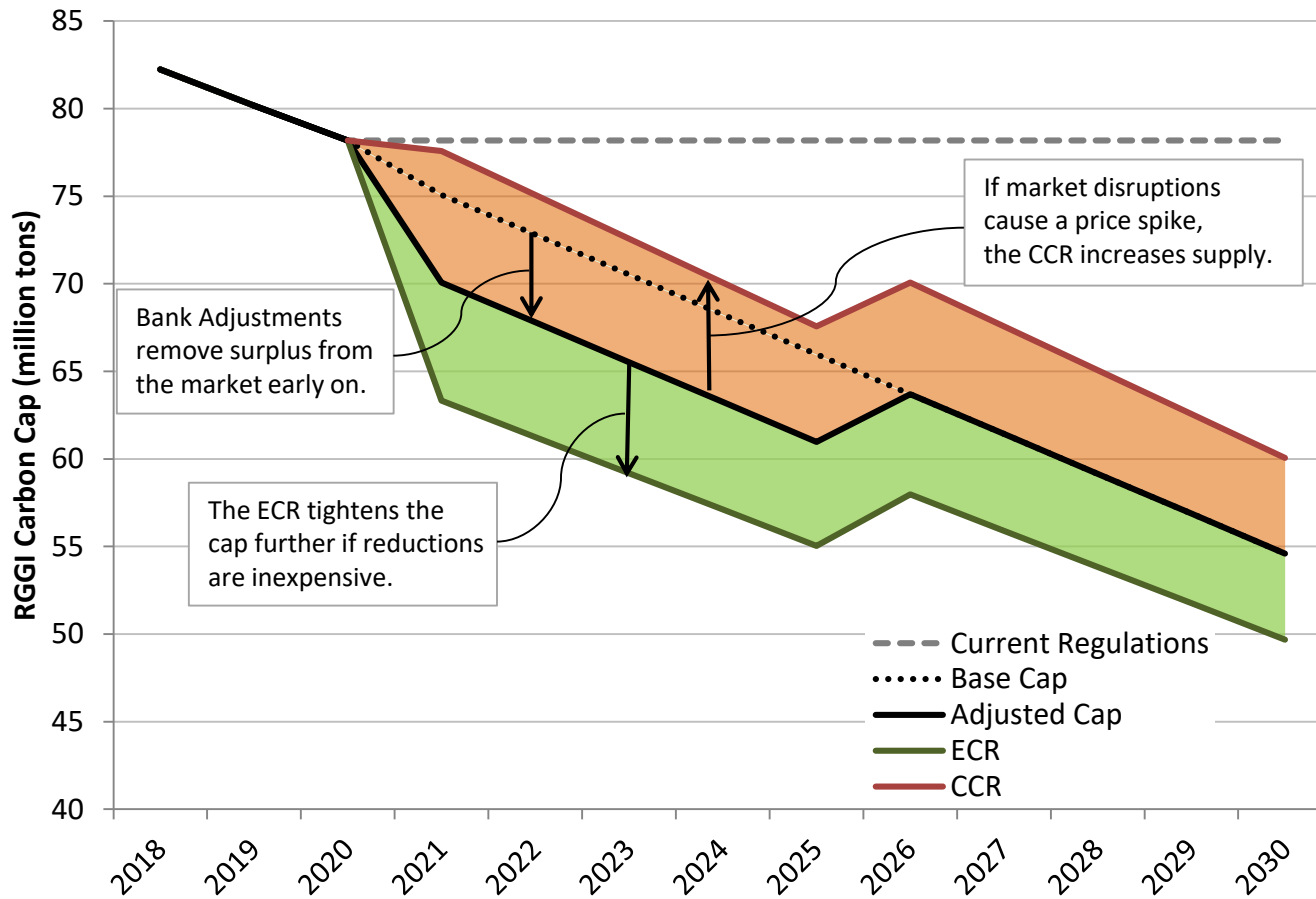
Maryland
Department of
the Environment

RGGI Regulations

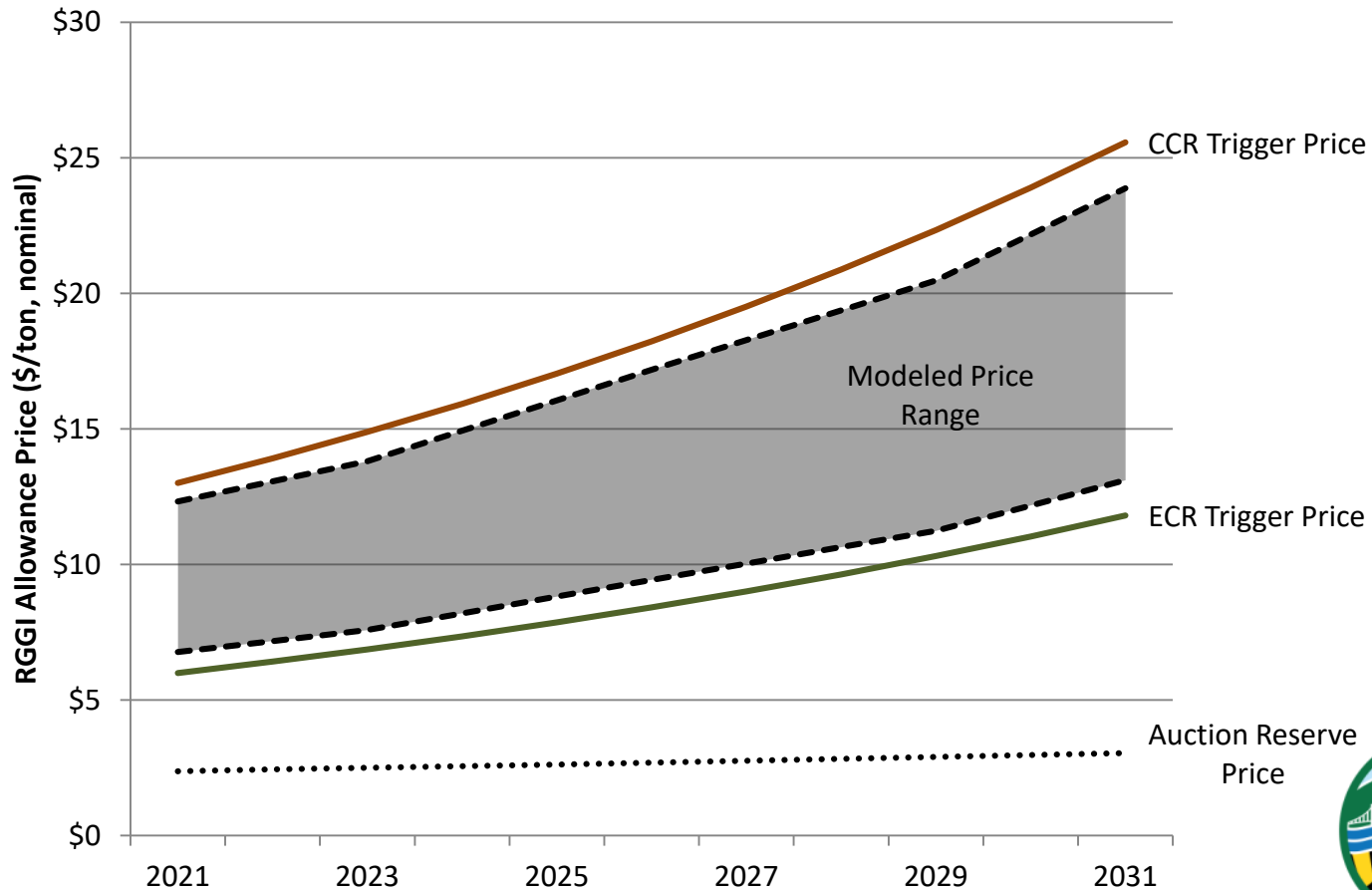
- The participating states work together to write a Model Rule
 - <http://www.rggi.org/design>
- Each state's RGGI program is consistent with the Model Rule
 - <http://www.rggi.org/design/regulations>



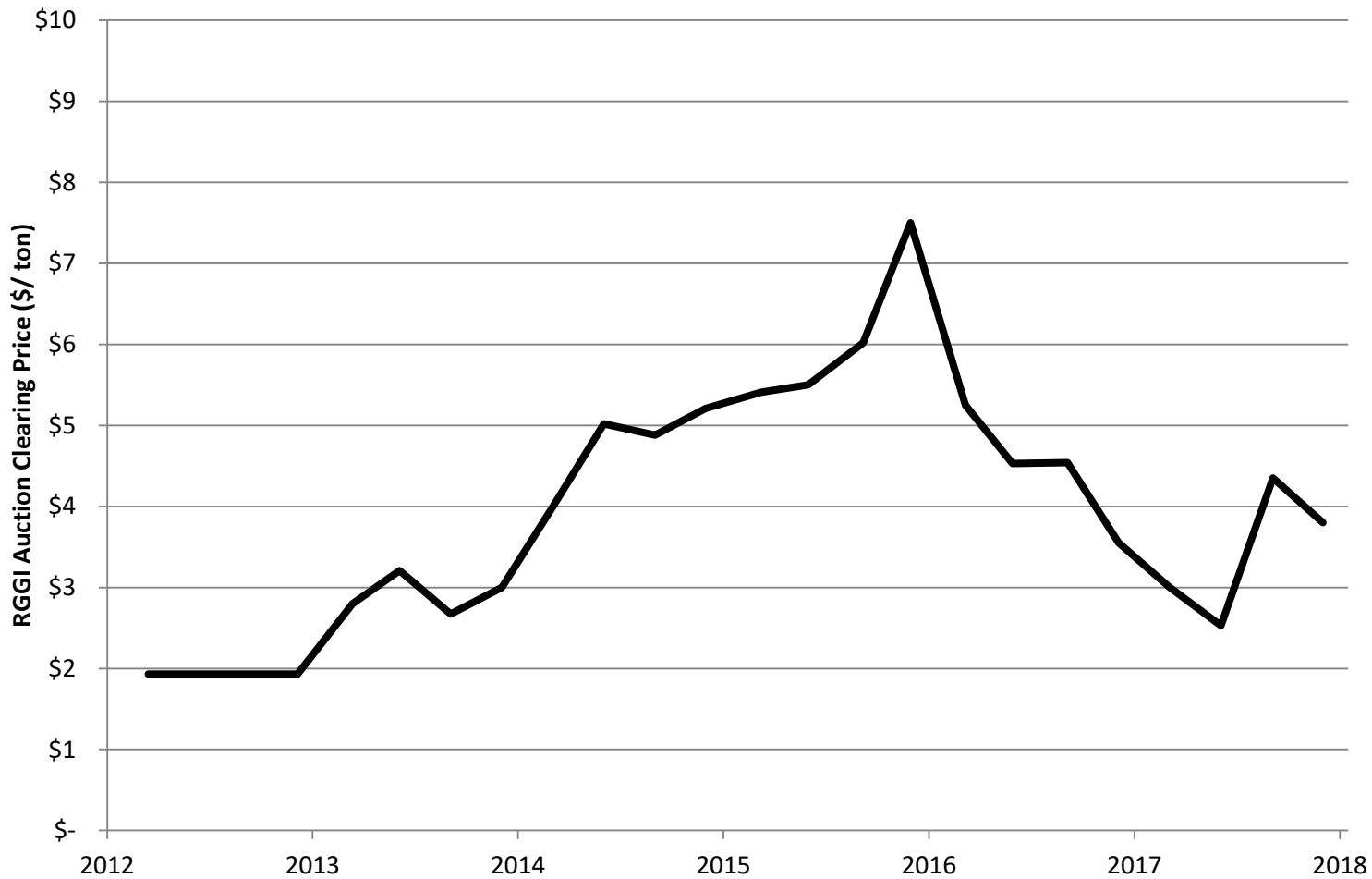
2017 Agreement: An Adaptive Cap



2017 Agreement: CCR and ECR Price Triggers



RGGI Prices



How the ECR Works

The CCR is...

A reserve from which
allowances are
released

If prices are high

The ECR is...

A reserve into which
allowances are
diverted

If prices are low

Both act during the auction



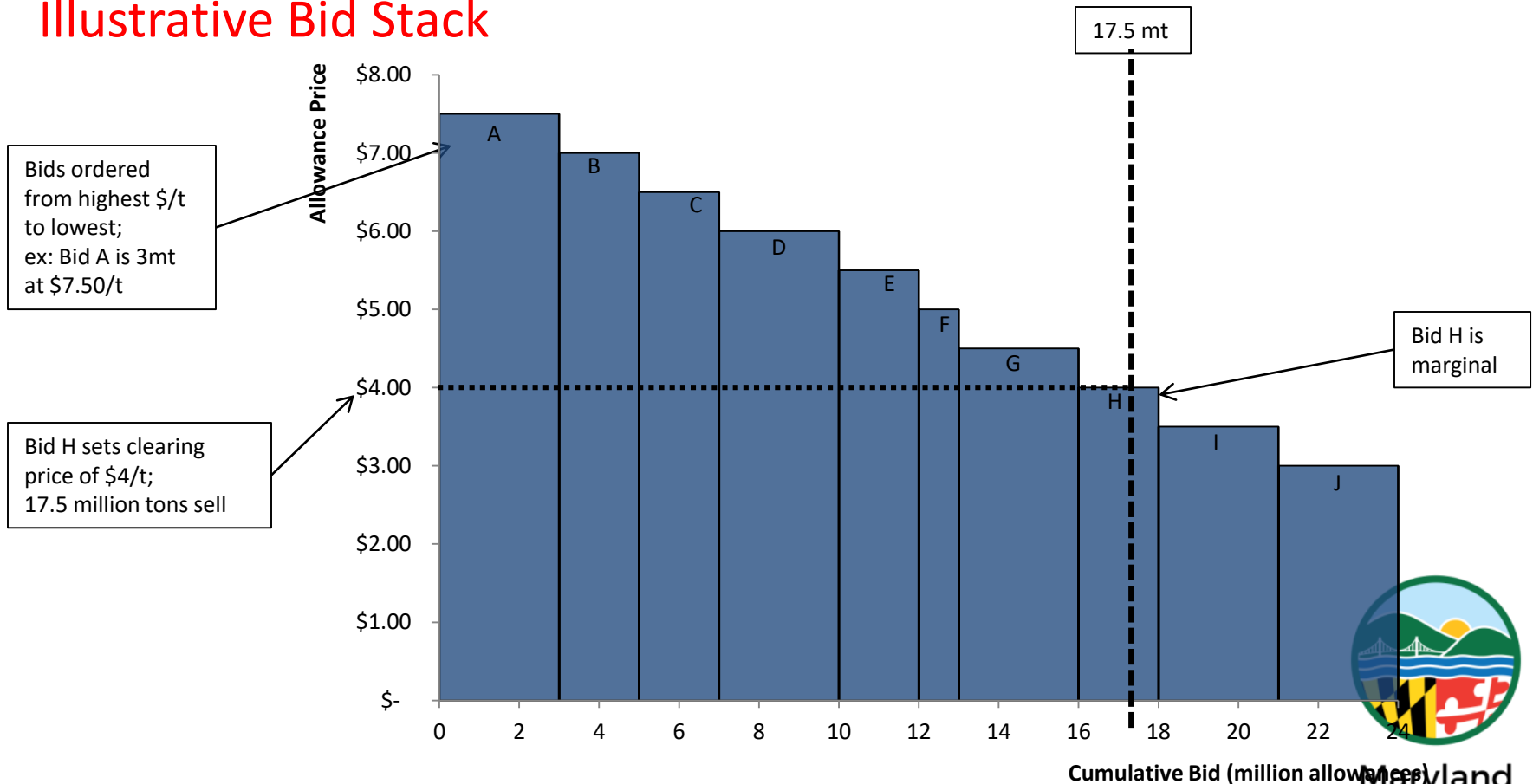
Maryland
Department of
the Environment

How the ECR Works

(Illustrative Example – No ECR)

Auction in 2021 of ~17.5 million tons (25 million ton bank adj.)

Illustrative Bid Stack

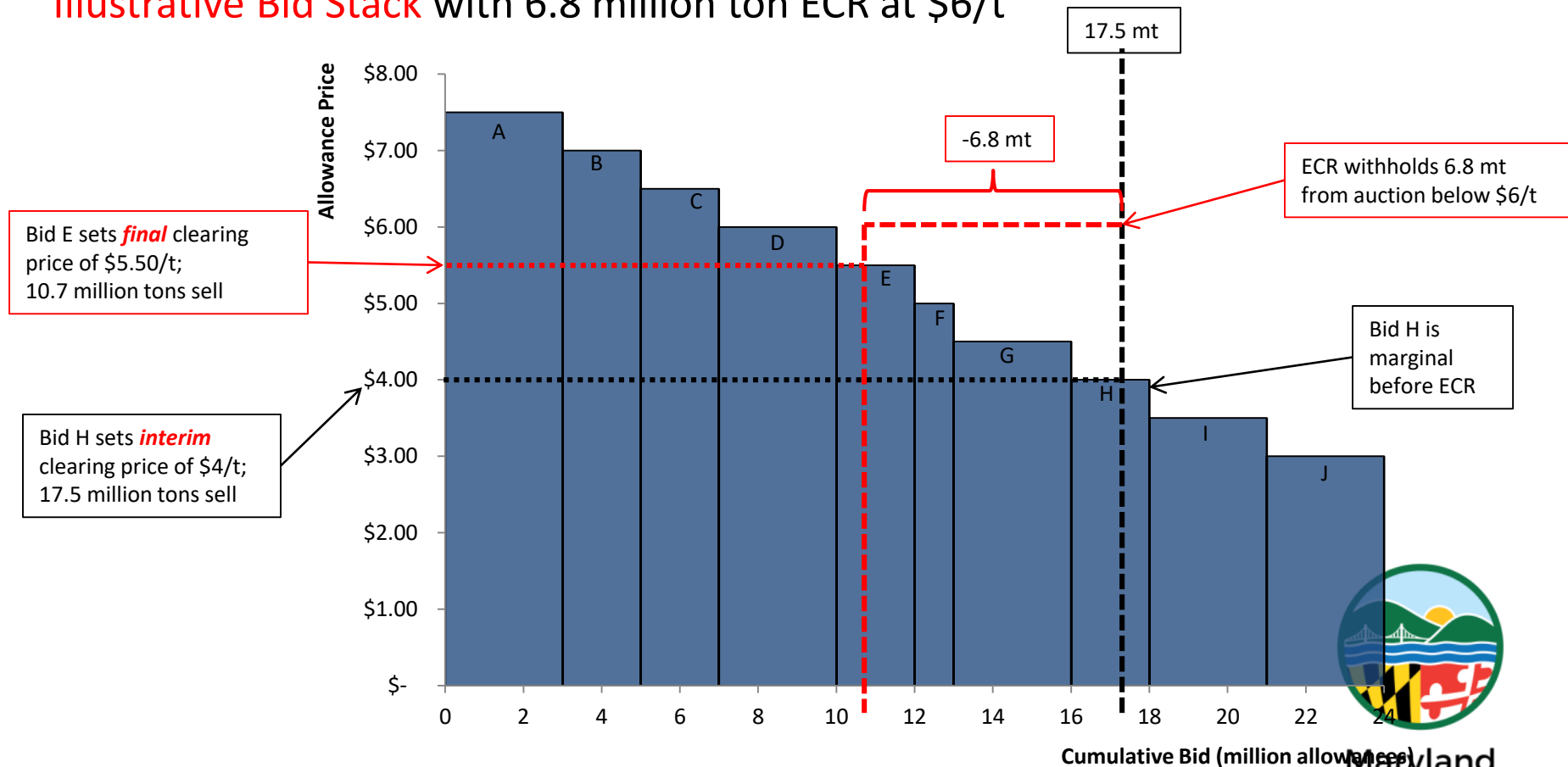


How the ECR Works

(Illustrative Example – ECR Triggers)

Auction in 2021 of ~17.5 million tons (25 million ton bank adj.)

Illustrative Bid Stack with 6.8 million ton ECR at \$6/t



Bid E sets **final** clearing price of \$5.50/t; 10.7 million tons sell

Bid H sets **interim** clearing price of \$4/t; 17.5 million tons sell

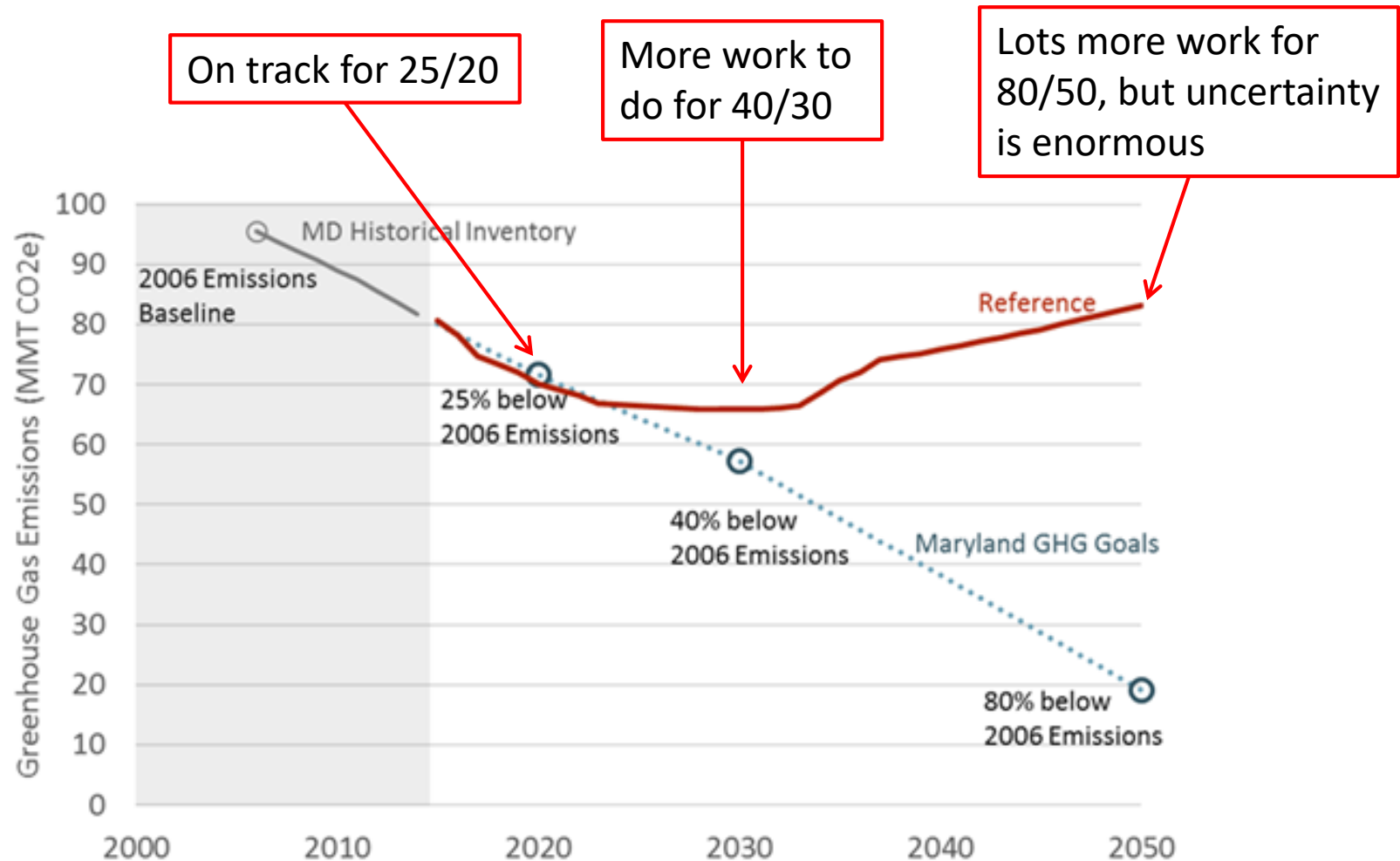
-6.8 mt

ECR withholds 6.8 mt from auction below \$6/t

Bid H is marginal before ECR

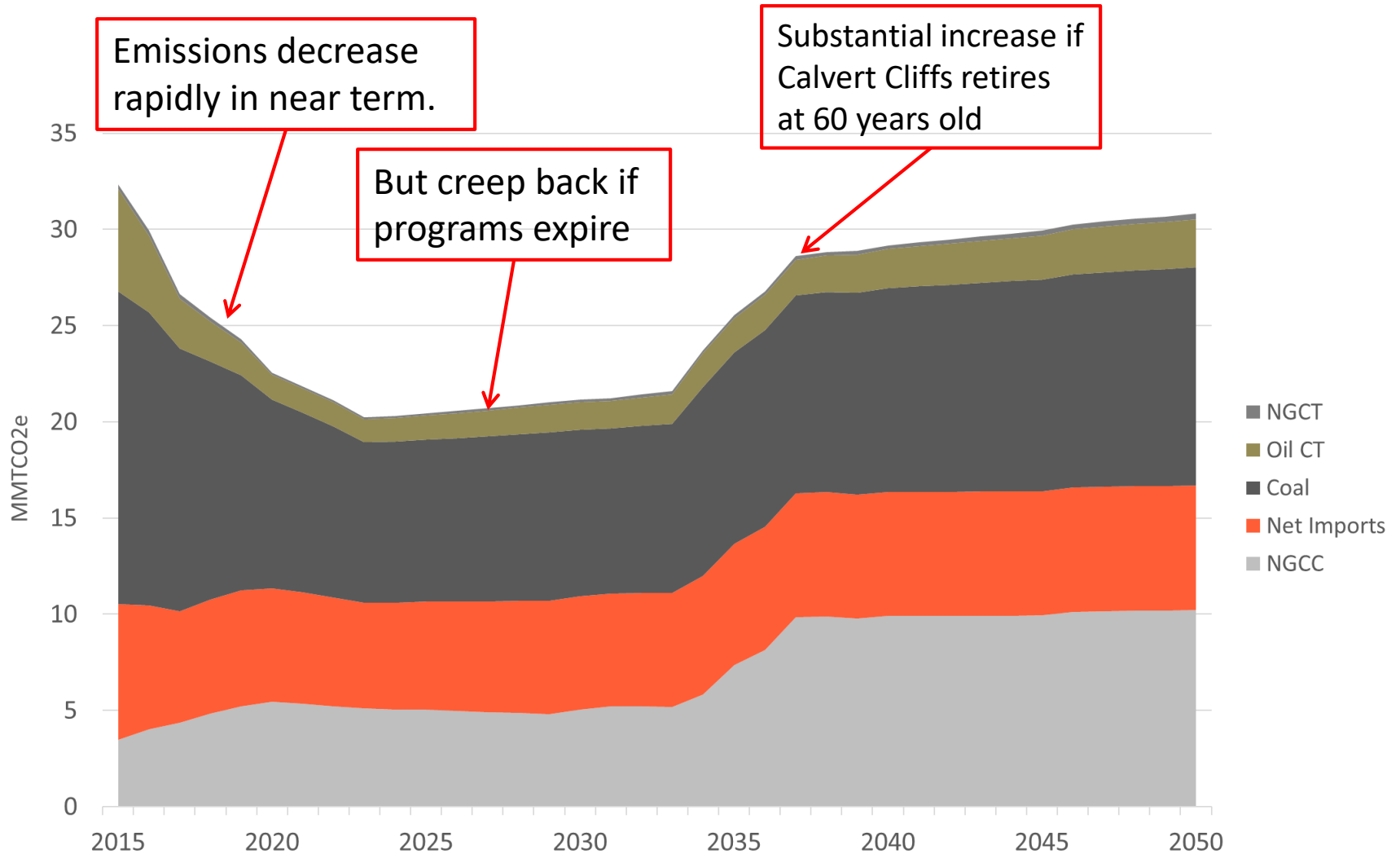


Current Draft Projections



(Initial draft - only includes major electricity & transportation programs.)

Projected Electricity Emissions



(Initial Draft; Projections Will Change)