

THE REGIONAL GREENHOUSE GAS INITIATIVE

An Initiative of the Northeast and Mid-Atlantic States of the U.S.

Potential Scenarios for Modeling: Overview

March 20, 2012 Stakeholder Meeting

www.rggi.org



RGGI Program Review

- Over the past eighteen months the RGGI states have been conducting stakeholder meetings to gather comments on the implementation of the RGGI program, RGGI design elements and potential program changes
- The RGGI states have also been convening Learning Sessions with experts and stakeholders on program design elements and other key topics



Analysis of RGGI Program Design Elements

- RGGI states have used IPM electricity sector modeling to inform program review
- The IPM modeling analyzes three key program design elements
 - RGGI CO₂ Cap Level
 - Flexibility Mechanism-Cost Containment Allowance Reserve (CCR)
 - Flexibility Mechanism-Offsets



Analysis of RGGI Program Design Elements

RGGI CO₂ Cap and First Control Period Emissions

	Current RGGI CO ₂ Cap (2012)	Estimated Three Year CO ₂ Emissions Average (2009-2011)
10 State RGGI Region	188 MM tons	126 MM tons
9 State RGGI Region	165 MM tons	108 MM tons



Analysis of RGGI Program Design Elements

Flexibility Mechanisms-CCR and Offsets

- Stakeholders recommend analysis of a cost containment reserve (CCR) as a flexibility mechanism
- Experts recommend limiting the size of the CCR and establishing price triggers for the use of the CCR
- Stakeholders and experts have reiterated the importance of a viable offset program and examining ways to expand the offset program while maintaining environmental integrity



IPM Modeling Potential Scenario Results

- The following slides present the IPM modeling results
- These analyses inform program review and do not reflect a preference for or selection of any specific policy



Review of IPM Reference Case and Sensitivity Analyses

March 20, 2012

RGGI Reference and Sensitivity Cases

- RGGI updated its Reference Case in 2011 to include new information on load growth and other inputs that became available.
- The Reference Case accounts for New Jersey's departure from the program at the beginning of 2012.
- There are also 6 sensitivity cases of the Reference Case:
 1. Higher Load Growth
 2. Lower Load Growth
 3. Higher Natural Gas Prices & Lower Oil Prices
 4. Lower Natural Gas Prices
 5. High Emissions Combination
 6. Low Emissions Combination
- This presentation summarizes the results of the Reference Case and High and Low Load Growth sensitivity cases, which are important to the potential scenario discussion that follows.
- These projections are draft and may change as ICF makes refinements based on state review and input.

Sources of Reference Case Assumptions

Parameter	Sources				
	ISOs	States	EPA	EIA	Other
Electric Demand	X	X			
Reserve Requirements	X				
Firmly Planned Capacity Additions	X	X			
Coal and Nuclear Capacity Limits		X			
Cost and Performance of New Capacity			X		
Transmission Capability	X				
Firmly Planned Transmission Additions	X	X			
Fuel Prices				X	
Federal Air Regulations		X			
State Air Regulations		X			
Offsets		X	X		
Renewable Portfolio Standards		X			
Firmly Planned Controls		X	X		
Cost and Performance of New Controls			X		

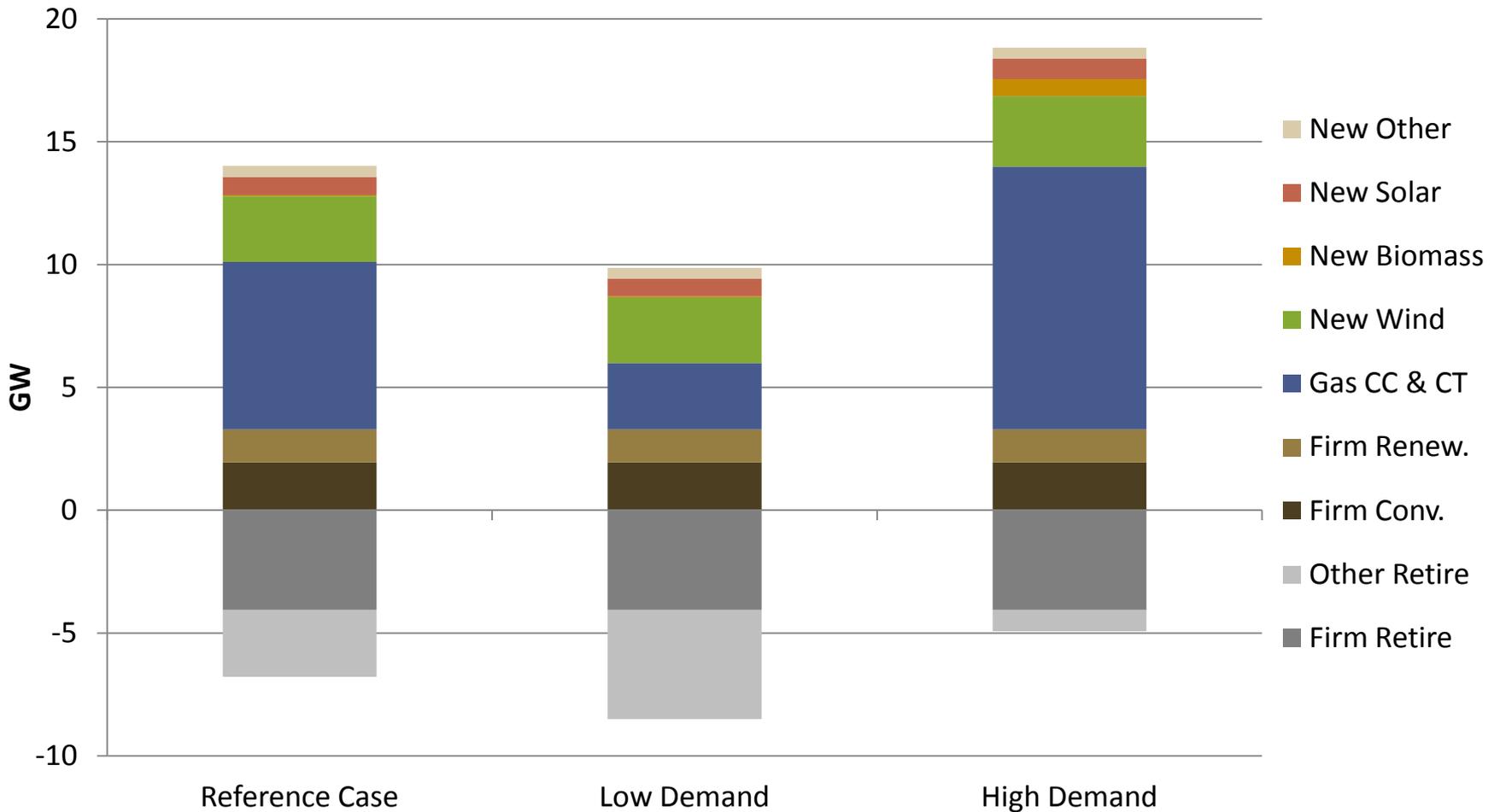
RGGI Sensitivity Case Specifications

Load Growth Sensitivity Cases

Sensitivity Run	Category of Change	Components	Assumptions
1 HIGH LOAD	Higher load growth	<ul style="list-style-type: none"> Economy Weather Additional load, e.g. Electric Vehicles 	<ul style="list-style-type: none"> Higher economic growth EV 1% penetration rate per year of the current fleet. The forecast is 1.6% and 2.4% higher than the reference case in 2020 and 2030, respectively. Weather proposal-10% increase over normalized weather Includes reference case energy efficiency estimates Above is estimated to result in average annual growth rate of 1.3% per year
2 LOW LOAD	Lower load growth	<ul style="list-style-type: none"> Increased Energy Efficiency 	<ul style="list-style-type: none"> State by state calculation of more aggressive EE targets than reference case

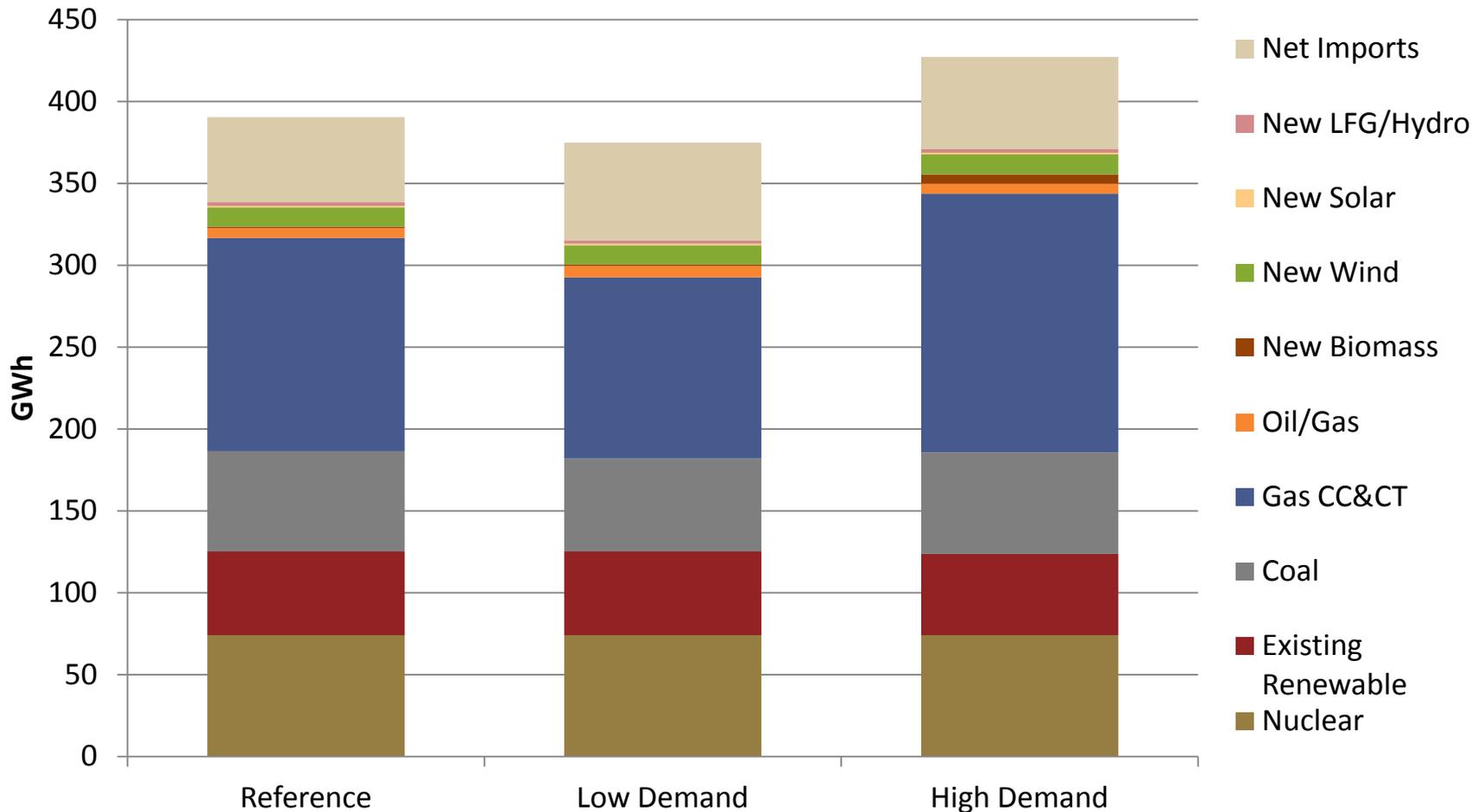
Cumulative Capacity Changes through 2020 in RGGI

Reference Case, Low and High Demand Sensitivities



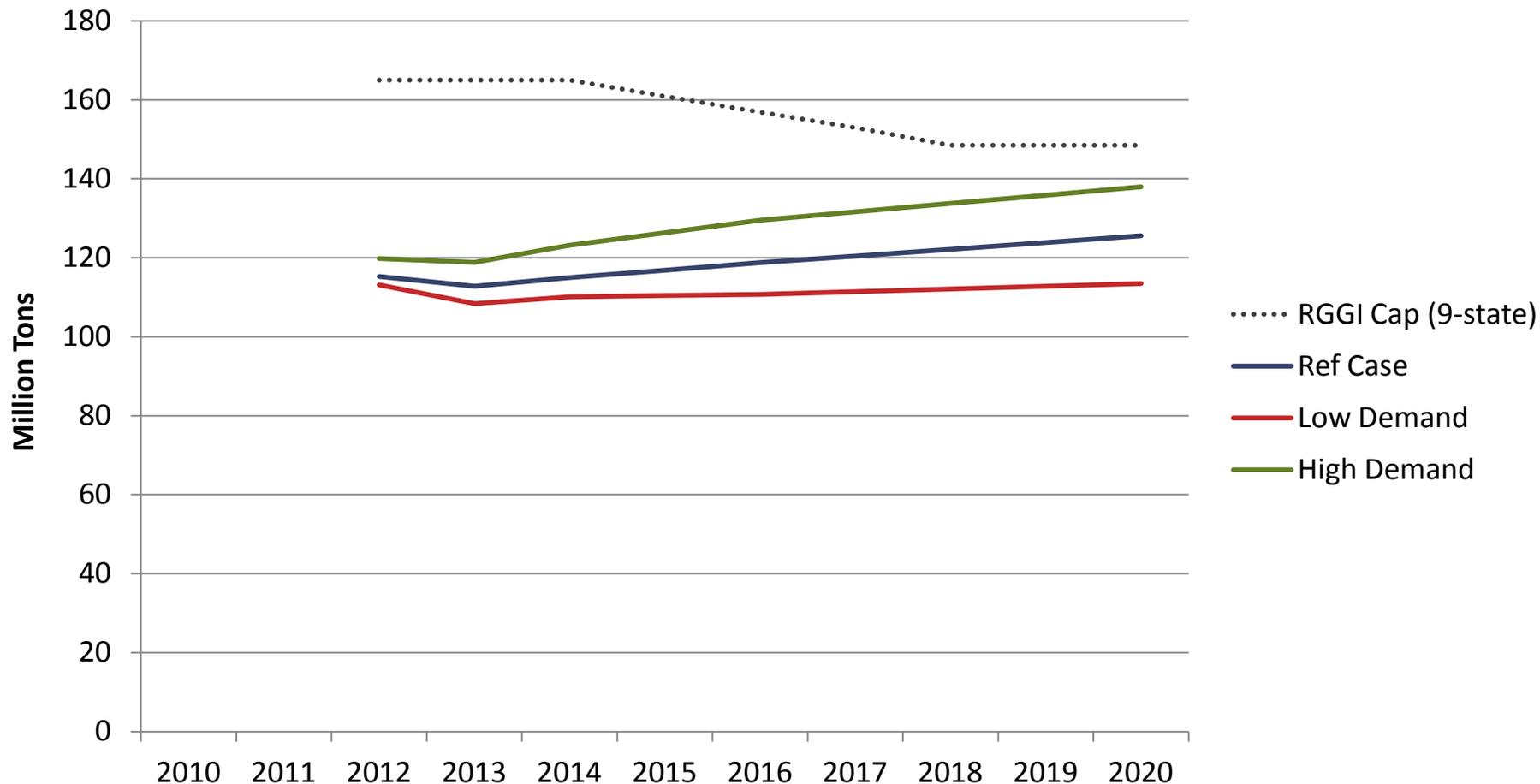
Generation Mix for RGGI in 2020

Reference Case, Low and High Demand Sensitivities



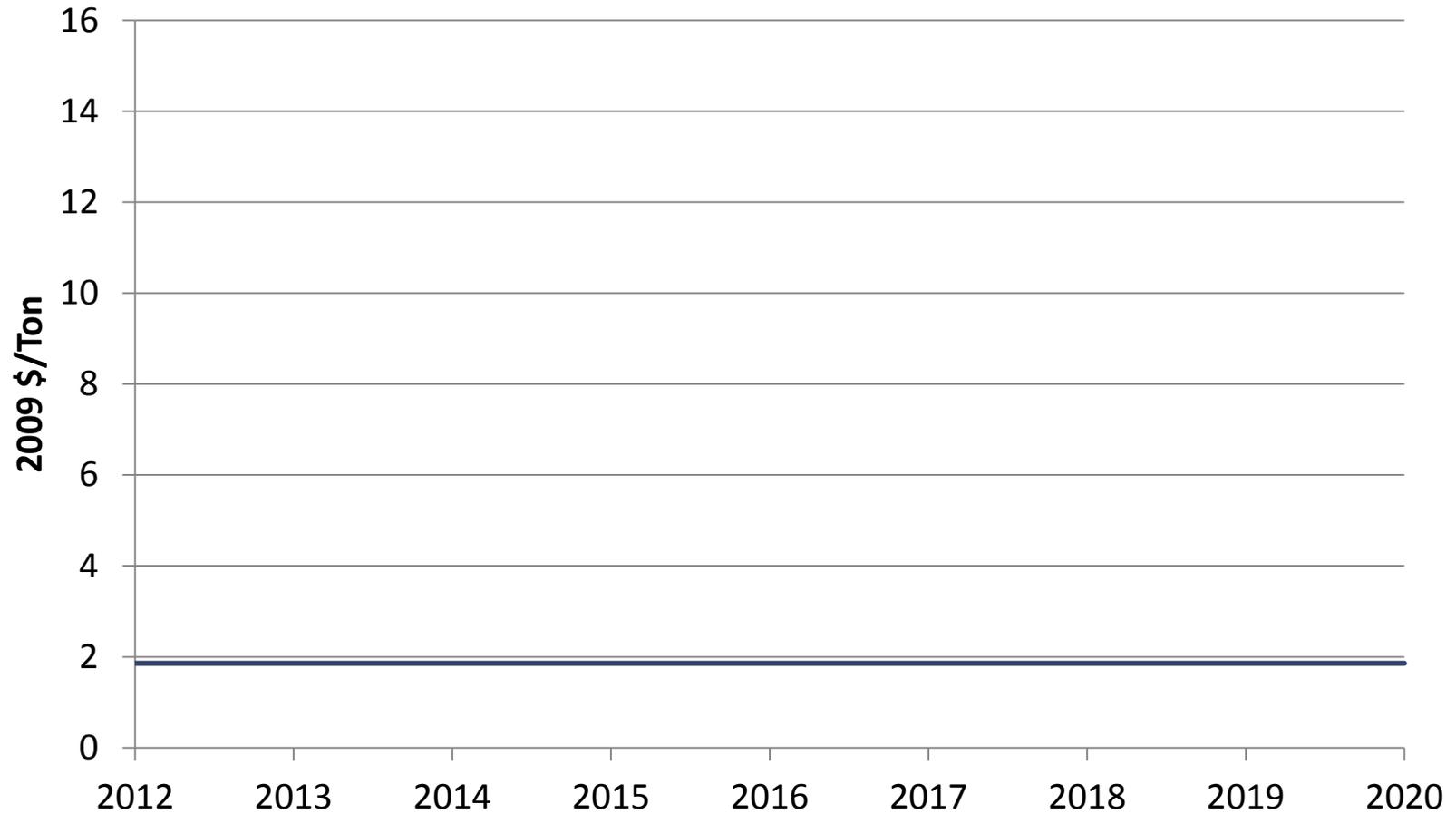
RGGI CO₂ Emissions from Affected Sources

Reference Case, Low and High Demand Sensitivities



RGGI Allowance Prices

All Cases



IPM Analysis of Potential Scenarios for Modeling

March 20, 2012

DRAFT RGGI Potential Scenario Analysis

Purpose

- This analysis provides information for the overall program review process. The scenario specifications do not reflect a preference for or selection of any specific policy.
- For this exercise, the RGGI states defined potential scenarios using combinations of three components:
 - Emissions cap
 - Cost containment reserve (CCR), including price collar and tons in reserve
 - Private allowance bank
- Potential scenarios were also tested against alternative electric demand growth and offset availability assumptions.

DRAFT RGGI Potential Scenario Analysis

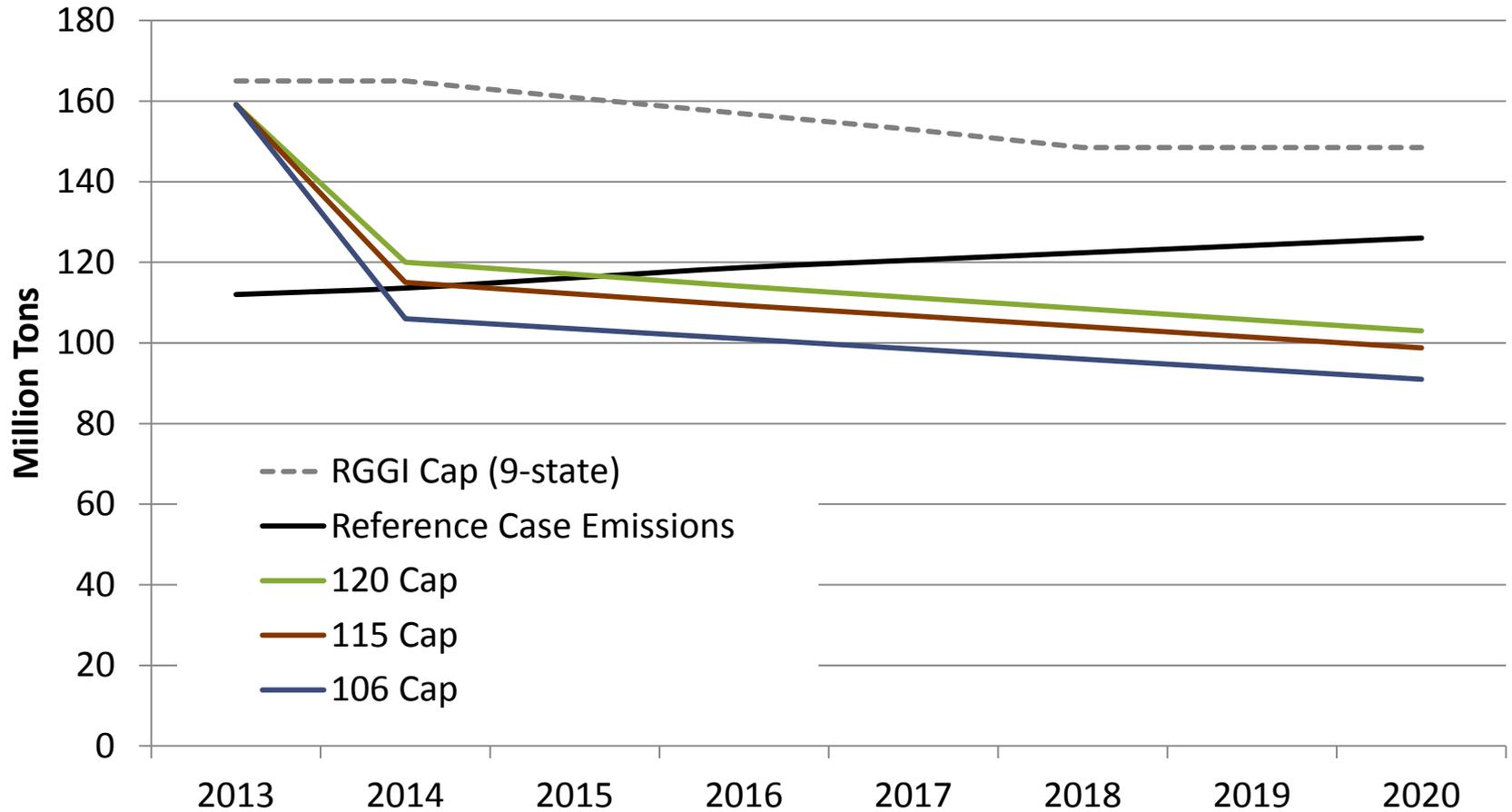
Emission Caps

- Each potential scenario includes one of three CO₂ emission cap trajectories. The regional caps cover the same affected sources as the current program over the 9-state RGGI area.
- The three CO₂ cap trajectories assume the existing cap in 2013 of roughly 165 MMTons, followed by a reduction in the cap in 2014 to one of three levels:
 - 120 MMTons
 - 115 MMTons
 - 106 MMTons
- The caps decline from those 2014 levels at 2.5% per year. For the purpose of this analysis, that decline continues through the modeled time horizon, or 2020.
- For the purpose of this presentation, the scenarios are referred to as “120 Cap”, “115 Cap”, and “106 Cap”, consistent with the assumed cap in 2014.
- Except for when stated otherwise, scenarios include the existing offset triggers at \$7/ton and \$10/ton.

DRAFT RGGI Potential Scenario Analysis

Emission Caps

Potential Scenario CO₂ Emission Caps

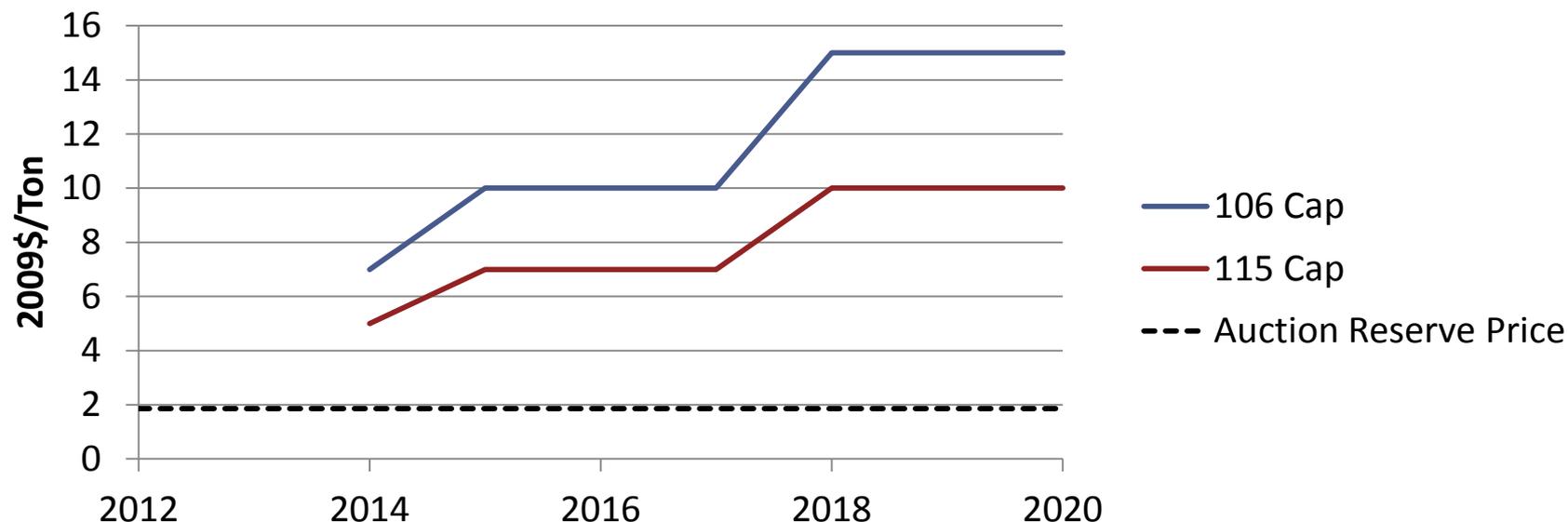


DRAFT RGGI Potential Scenario Analysis

Cost Containment Reserve

- The 115 and 106 Cap potential scenarios each include provisions for a cost containment reserve (CCR).
- The CCR includes a price collar that sets a floor on allowance prices in each year (the current auction reserve price) and a “CCR trigger” price, at which some number of allowances will be released to relieve pressure on the allowance price. The price collars are shown below.
- The scenarios assumed that up to 10 MM allowances could be released at the CCR trigger price in any year.

Cost Containment Reserve Price Collars



DRAFT RGGI Potential Scenario Analysis

Estimated Allowances Banked by Market Participants

- For this analysis, the potential scenarios assume that the market is made aware of the new policies in 2013, meaning that it can choose to bank allowances in that year for use under the new scenario.
- In 2013, with the existing emission cap still in place, market participants are projected to bank between 47 and 53 MM allowances under reference case demand growth assumptions, depending on the potential scenario.
- The potential scenarios also include an estimated 44 MM first control period allowances banked by market participants. This estimate is based upon estimated first control period allowances in circulation and first control period emissions.
- Combining these two sources of banked allowances, the total bank of allowances held by market participants carried into 2014 for each scenario (with reference case demand growth) is:
 - 120 Cap Scenario: 92 MM
 - 115 Cap Scenario: 94 MM
 - 106 Cap Scenario: 97 MM

DRAFT RGGI Potential Scenario Analysis

Scenarios Analyzed

Case Name (_Demand Assumption)	CO ₂ Cap	CCR Price Collar	CCR Tons available at Ceiling
120 Cap_Reference	2014: 120 MM Tons Declines 2.5%/yr. 2020: 103 MM Tons	None	None
115 Cap_CCR_Reference	2014: 115 MM Tons Declines 2.5%/yr. 2020: 99 MM Tons	<u>Ceiling Prices</u> 2014: \$5/ton 2015-17:\$7/ton 2018-20: \$10/ton Use reserve price as floor	No more than 10 MM released in any year 2014-2020
106 Cap_CCR_Reference	2014: 106 MM Tons Declines 2.5%/yr. 2020: 91 MM Tons	<u>Ceiling Prices</u> 2014: \$7/ton 2015-17:\$10/ton 2018-20: \$15/ton Use reserve price as floor	No more than 10 MM released in any year 2014-2020

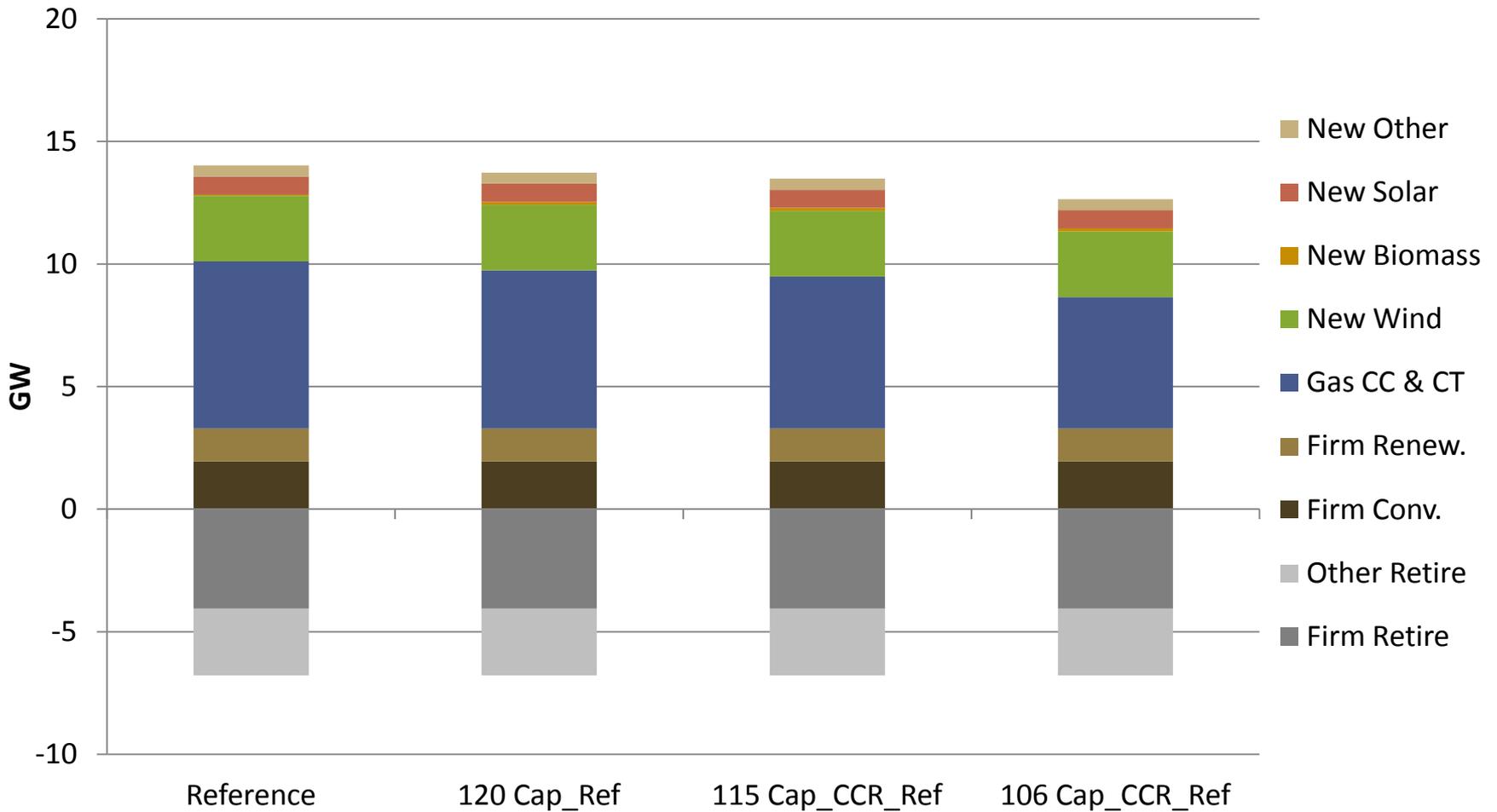
- In addition to the reference cases best estimates for demand, the 115 Cap_CCR and 106 Cap_CCR scenarios were also analyzed using lower and higher demand assumptions.
 - 115 Cap_CCR_High (High demand)
 - 115 Cap_CCR_Low (Low demand)
 - 106 Cap_CCR_High (High demand)
 - 106 Cap_CCR_Low (Low demand)

DRAFT RGGI Potential Scenario Results

- The following slides present projections from the latest RGGI Reference Case and draft potential scenarios.
- These projections are draft and may change as ICF makes refinements based on state review and input.
- The potential scenario results are compared to the Reference Case and to each other.
 - Note that the scenario sensitivity cases based on high and low demand growth should be compared to reference case sensitivity analyses projections with the same load growth assumptions (i.e., high and low, respectively).

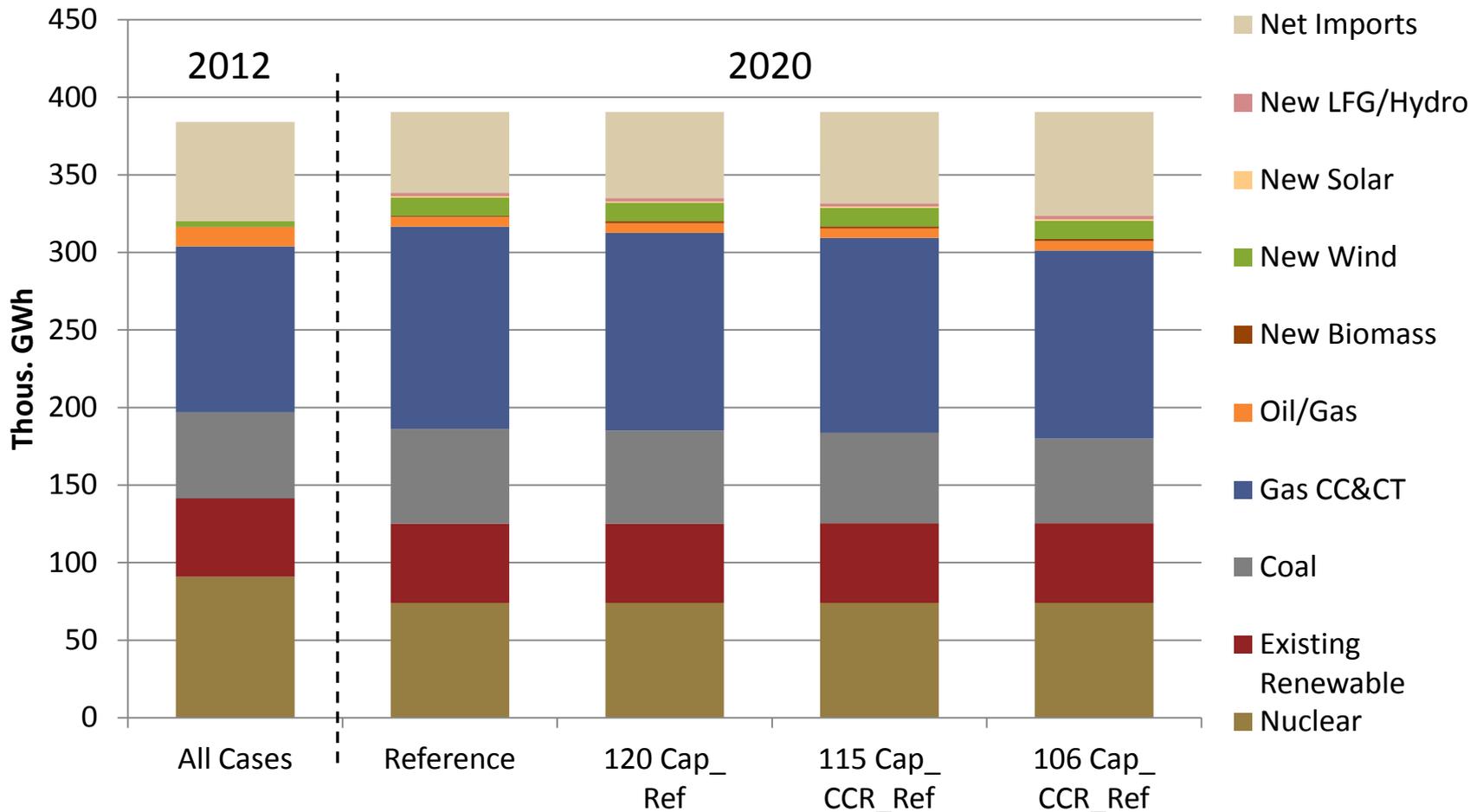
Cumulative Capacity Changes through 2020 in RGGI

Reference Demand Growth Cases



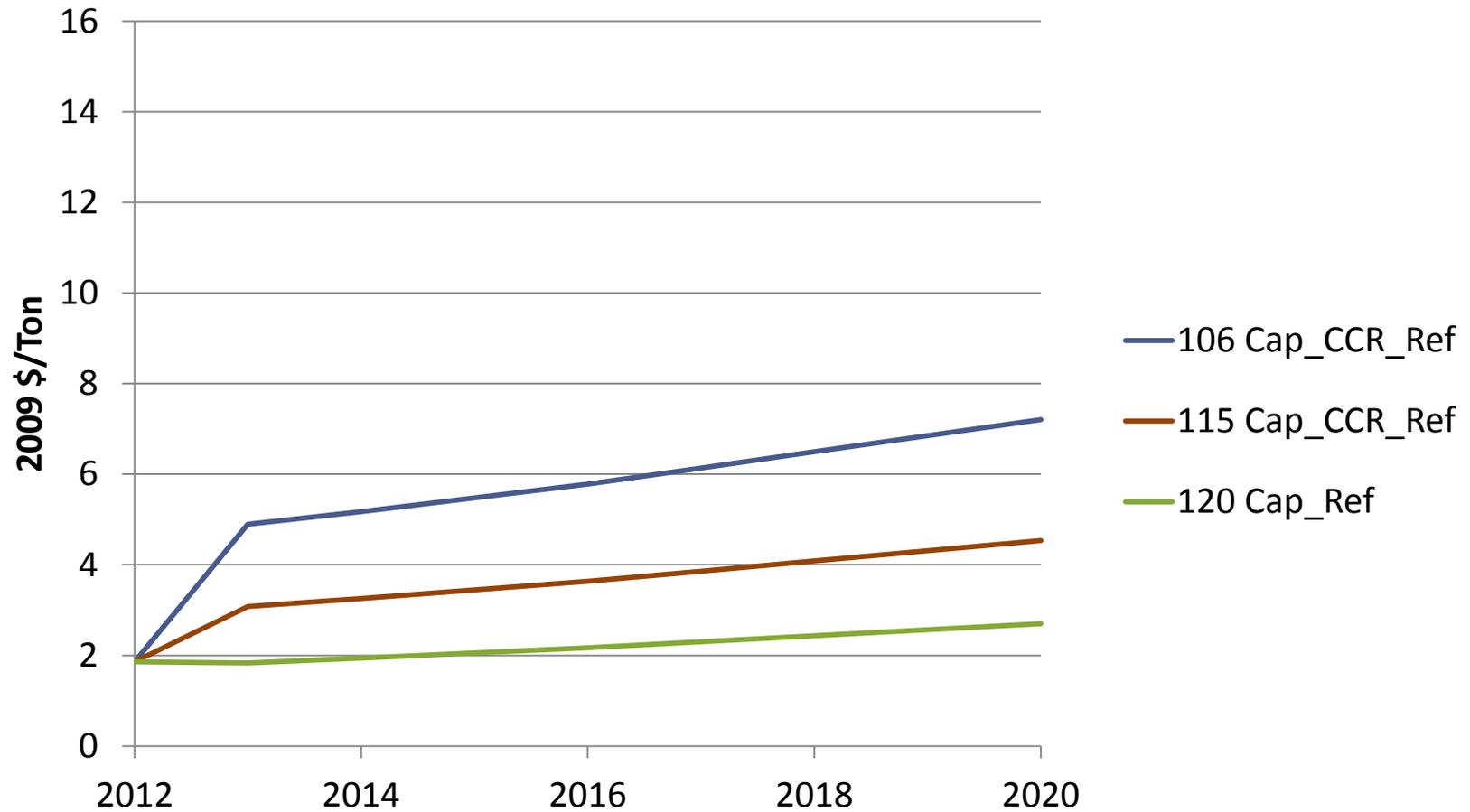
Generation Mix for RGGI in 2012 and 2020

Reference Demand Growth Cases



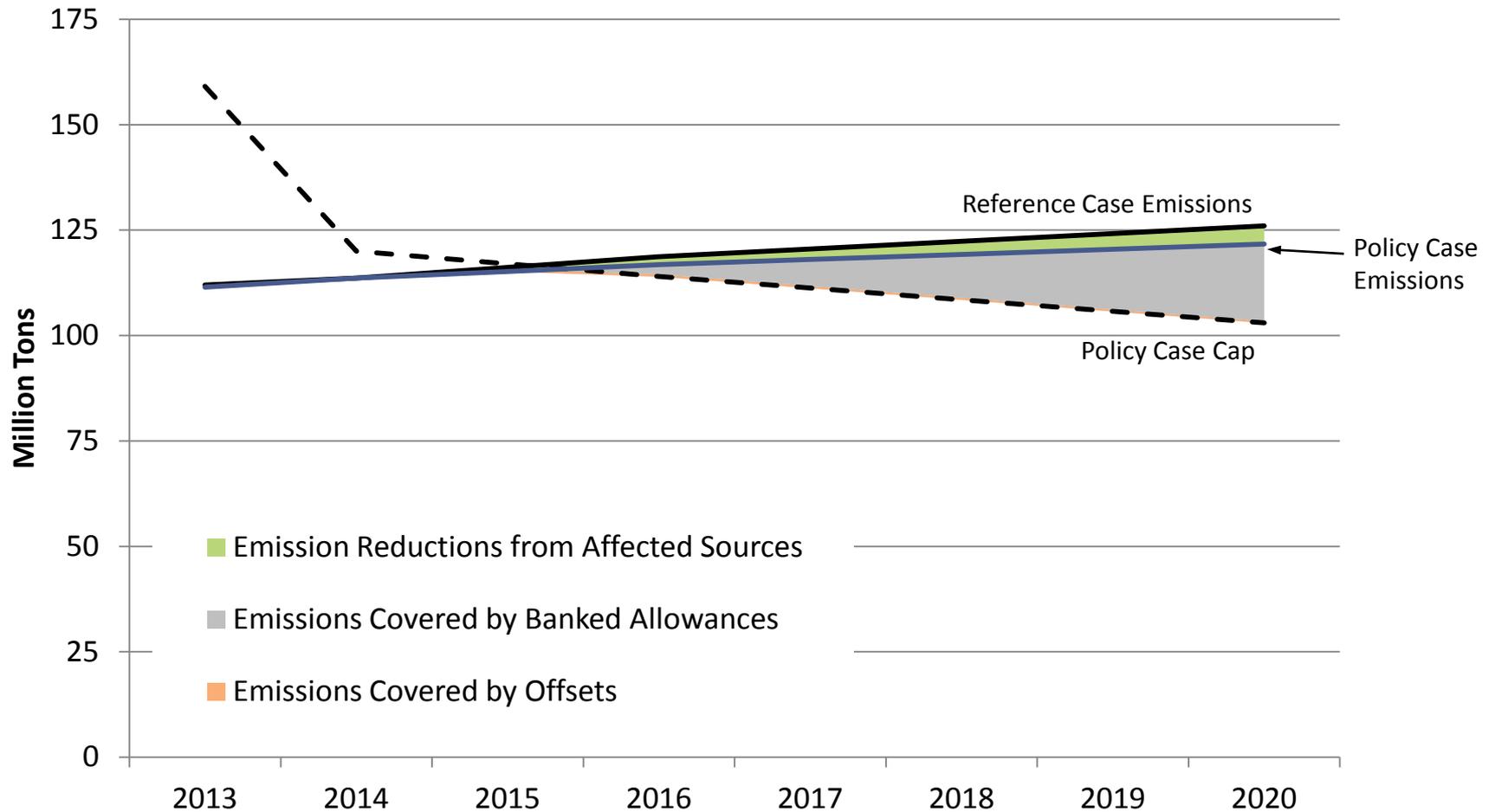
RGGI Allowance Price Projections

Reference Demand Growth Cases



Sources of Emission Reductions

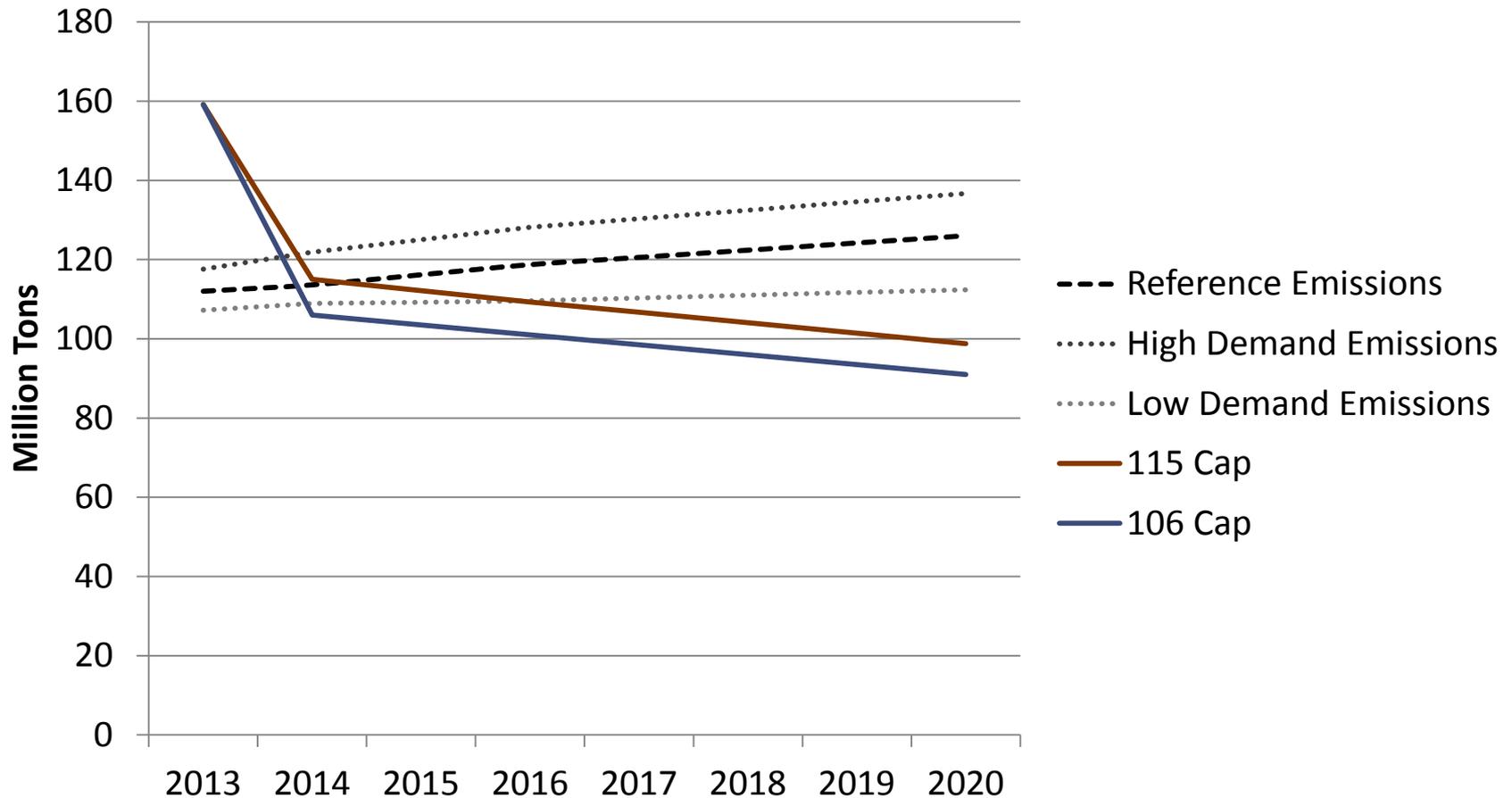
120 Cap CCR Reference Case



RGGI Potential Scenario Analysis

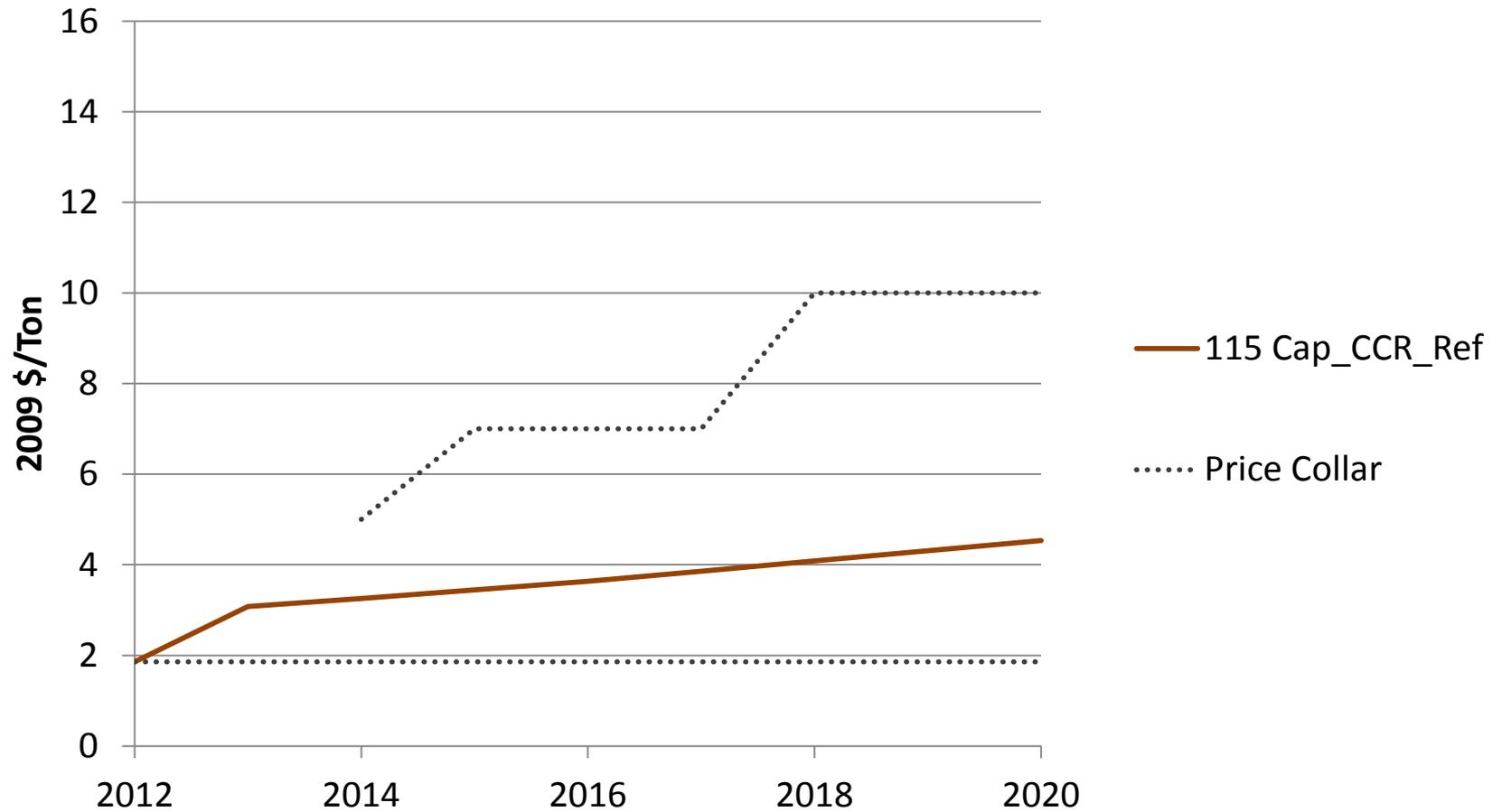
Caps compared to Emissions

Potential Scenario CO₂ Emission Caps



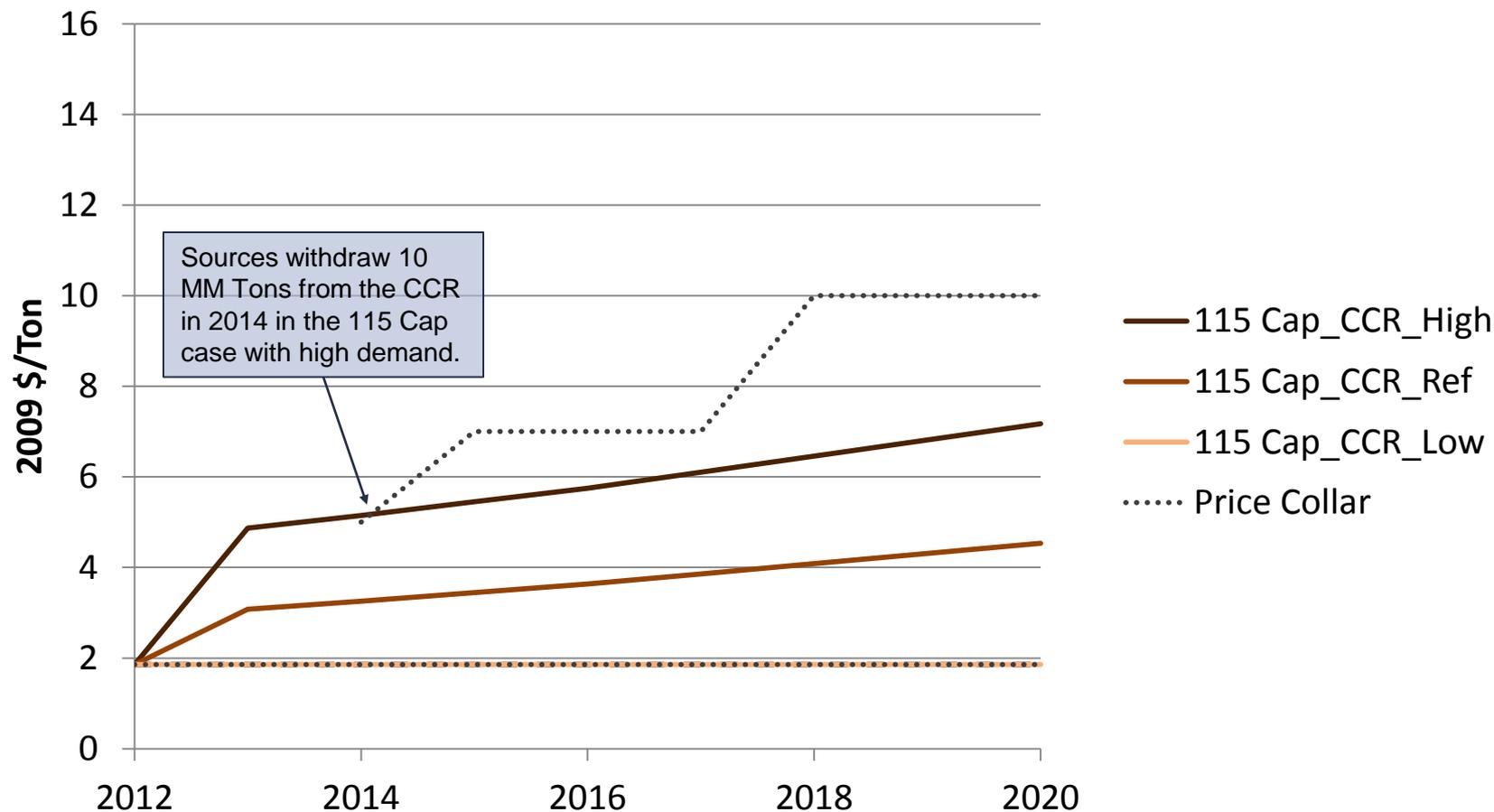
RGGI Allowance Price Projections

115 Cap CCR Reference Case



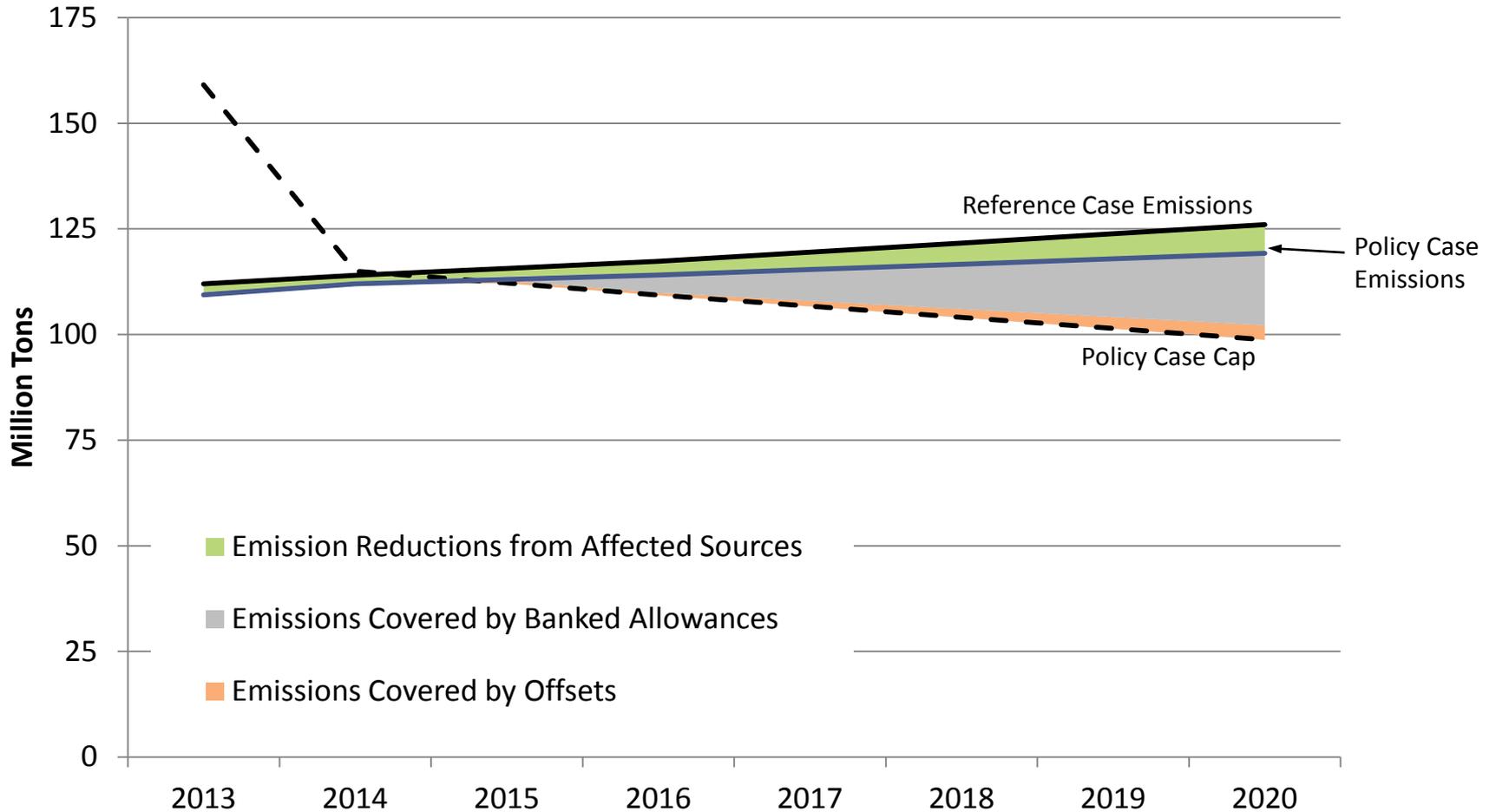
RGGI Allowance Price Projections

115 Cap CCR Cases (Reference, High Demand, Low Demand)



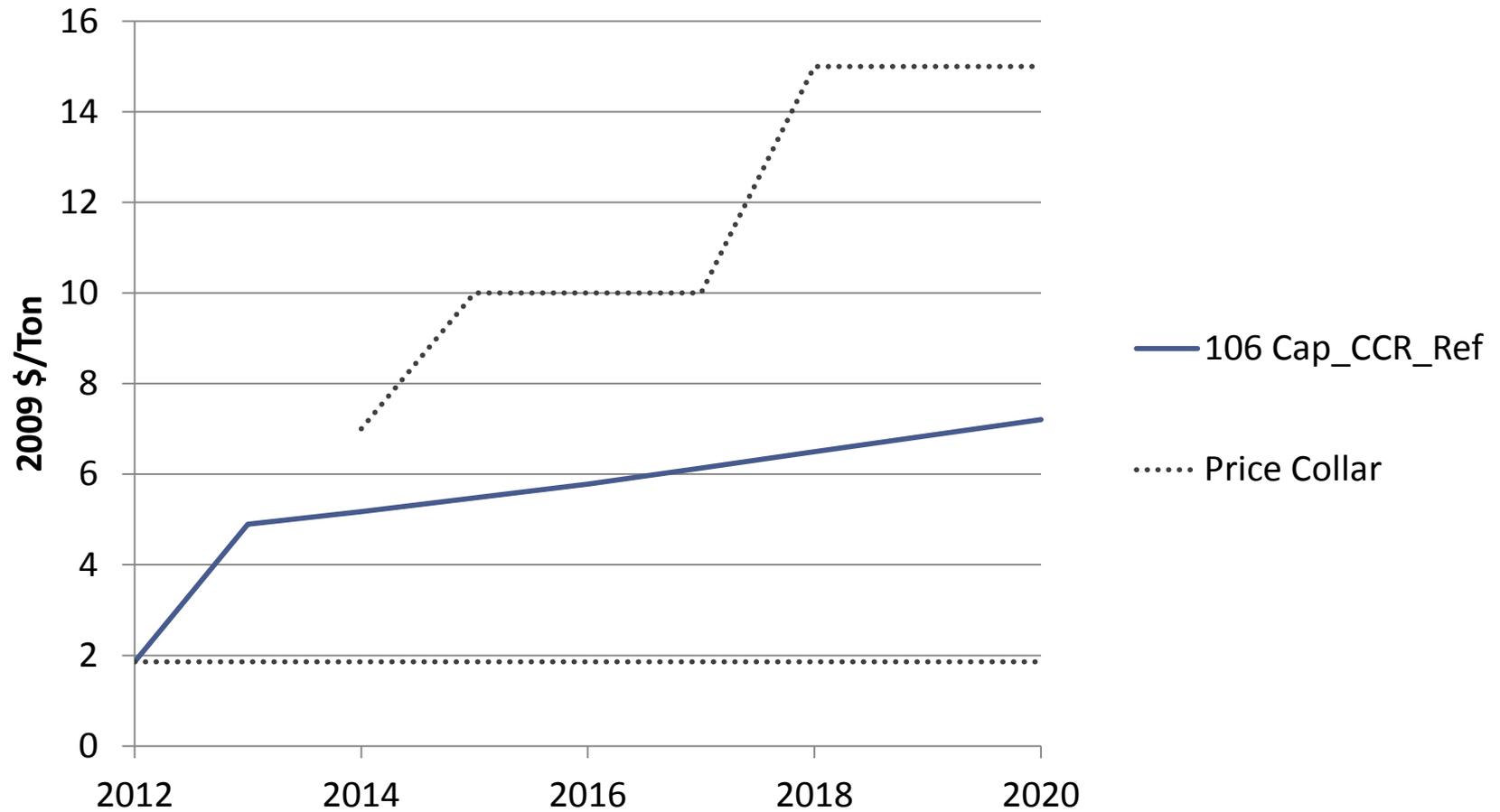
Sources of Emission Reductions

115 Cap CCR Reference Case



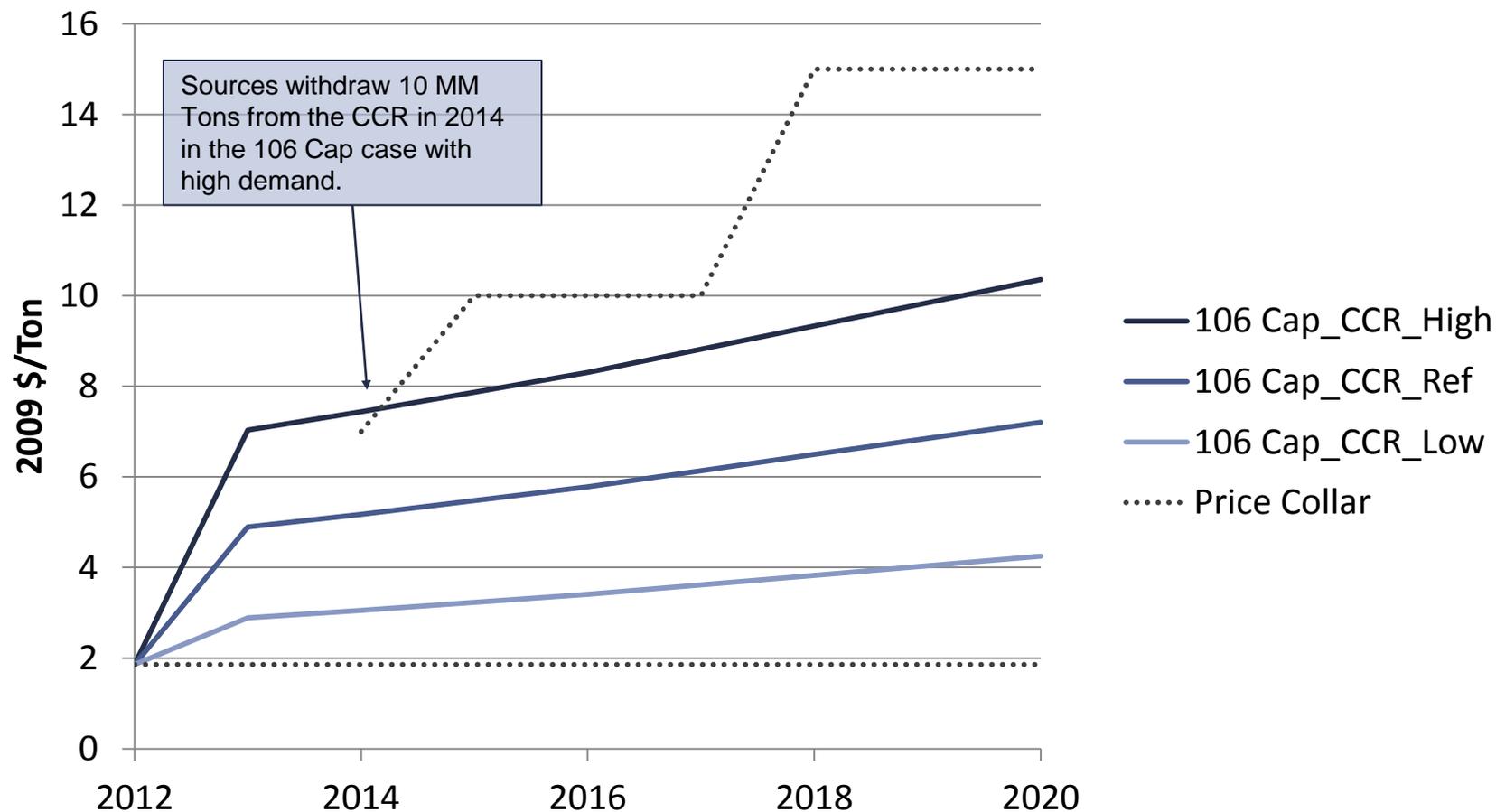
RGGI Allowance Price Projections

106 Cap CCR Reference Case



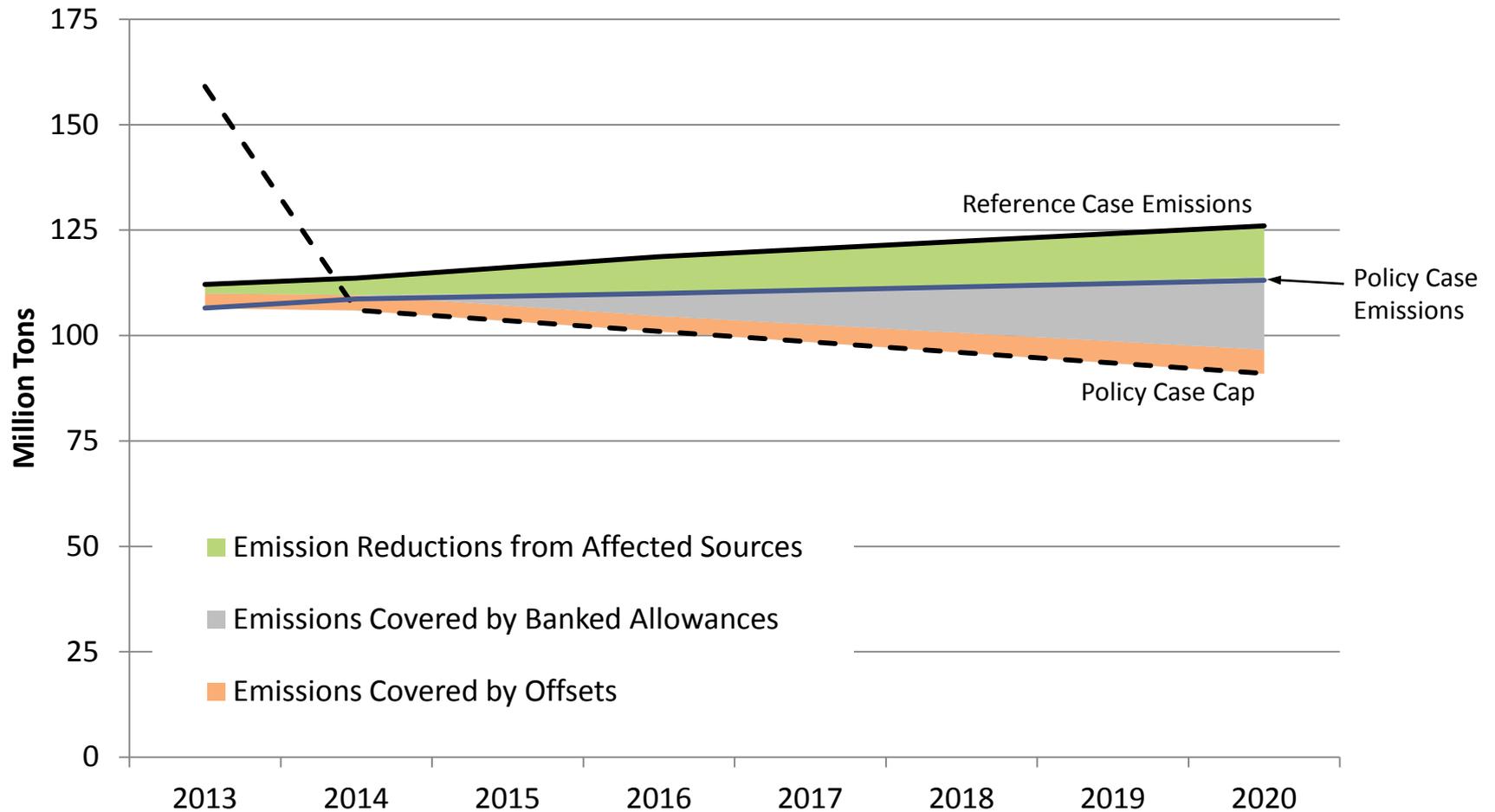
RGGI Allowance Price Projections

106 Cap CCR Cases (Reference, High Demand, Low Demand)



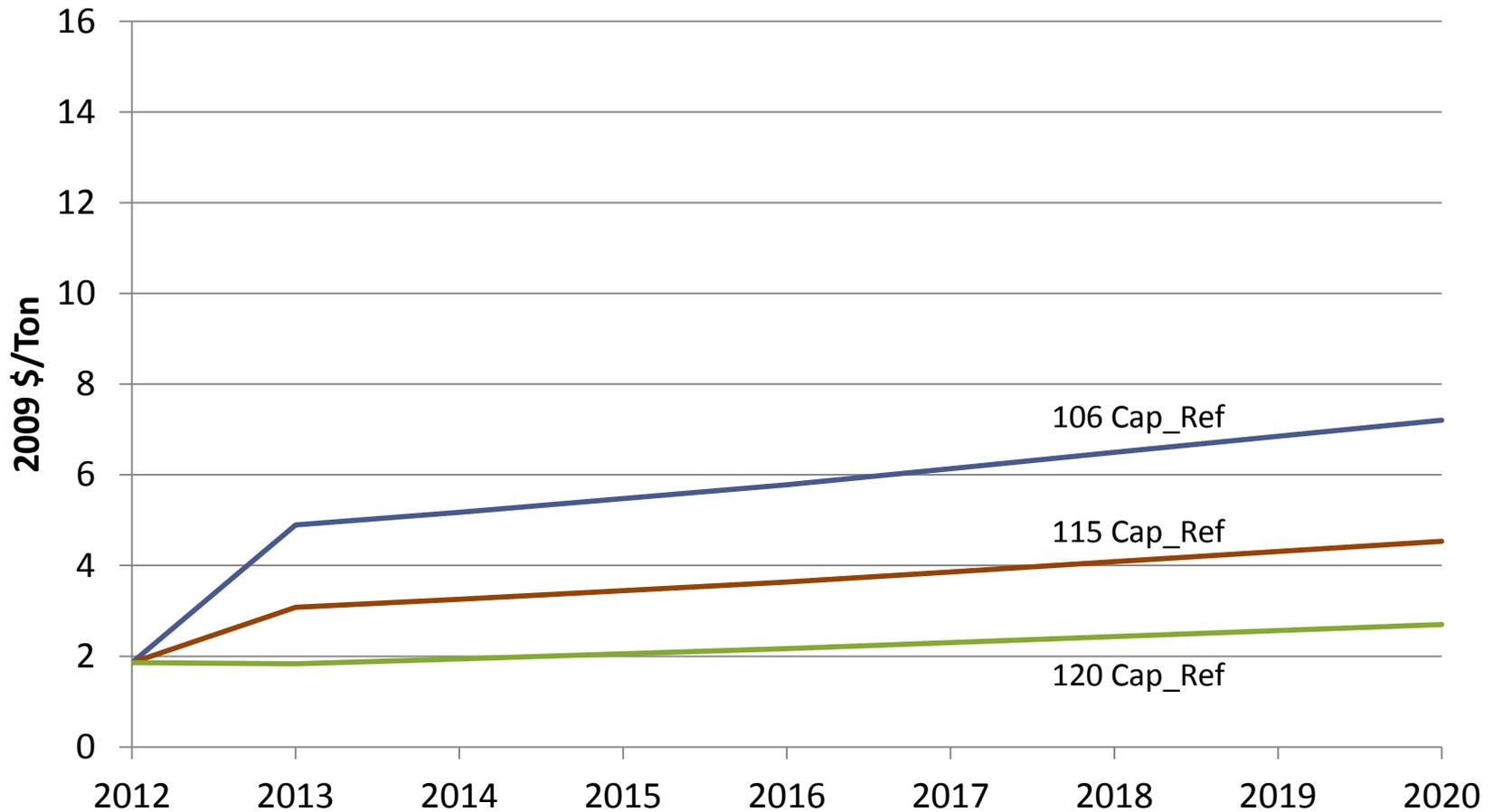
Sources of Emission Reductions

106 Cap CCR Reference Case

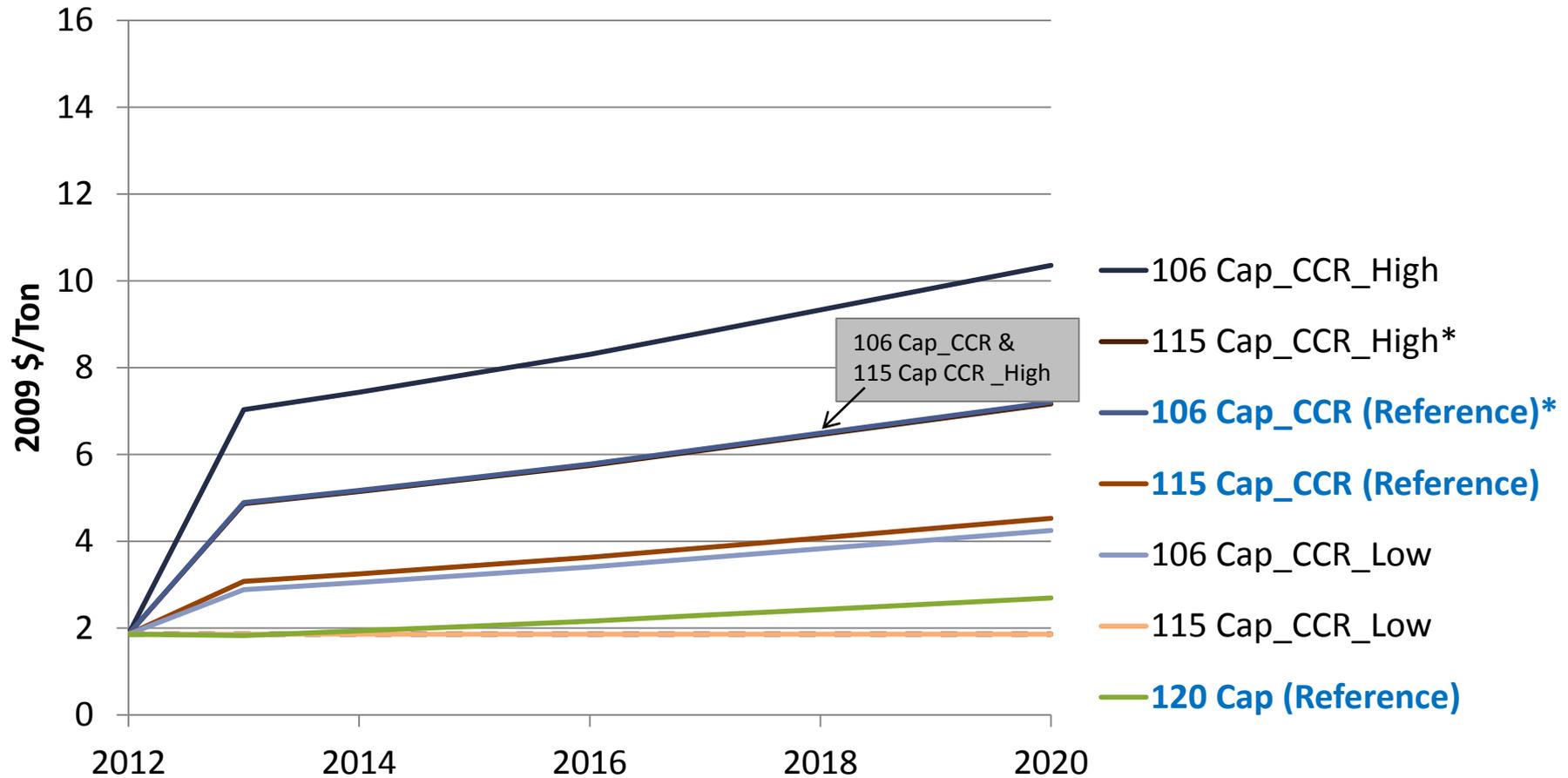


RGGI Allowance Price Projections

Reference Demand Growth Cases



All cases: 106 Cap, 115 Cap and 120 Cap Allowance Prices



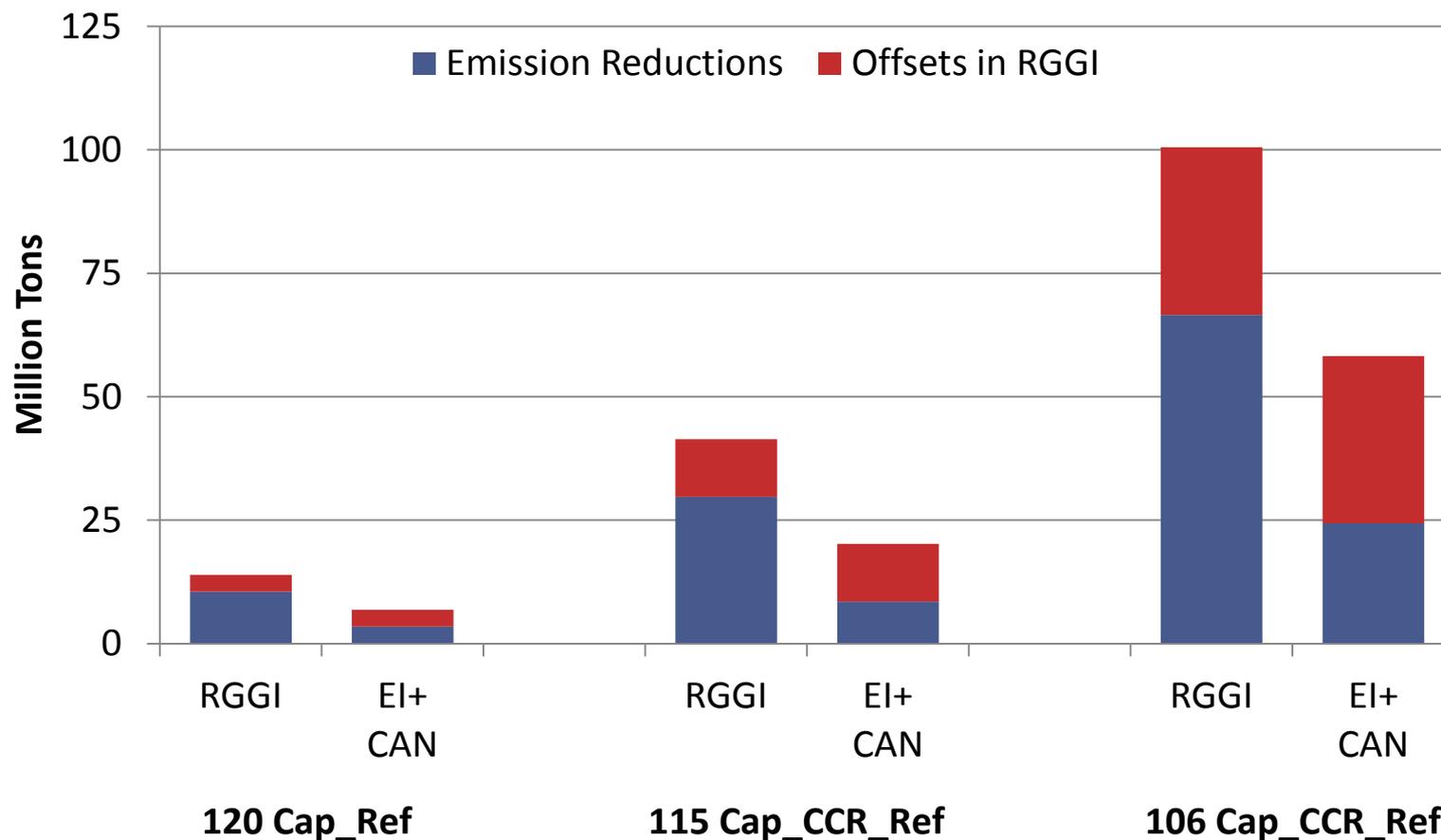
*The 115 Cap_CCR_High and 106 Cap_CCR results appear on the chart as single line

*Sources withdraw 10 MM Tons from the CCR in 2014 in both the 106 Cap_CCR_High (at \$7) and 115 Cap_CCR_High (at \$5)

Cumulative Emission Reductions, 2013 to 2020

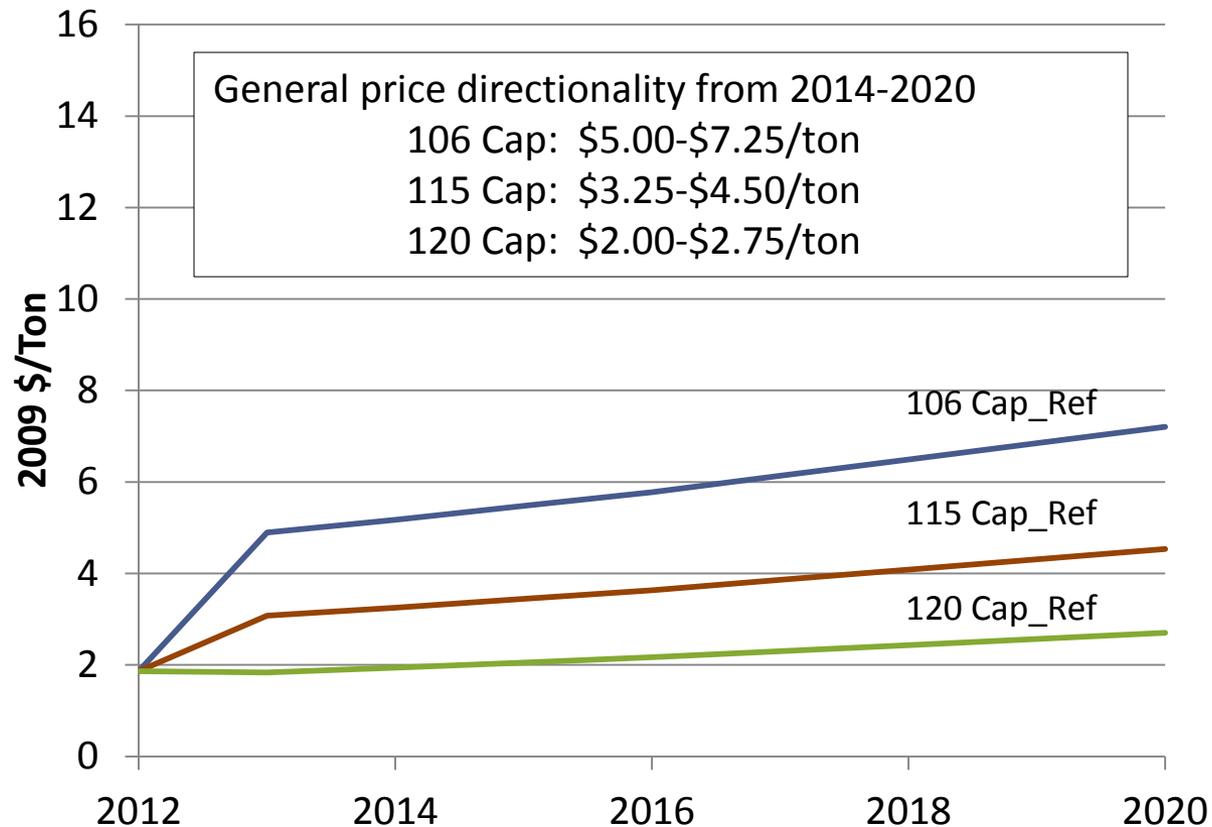
Reference Demand Growth Cases

Emission reductions for RGGI and the Eastern Interconnect (including RGGI) and eastern Canada (EI+CAN)



RGGI Allowance Price Projections-Recap

Reference demand cases reflect the best estimated projections for each cap scenario



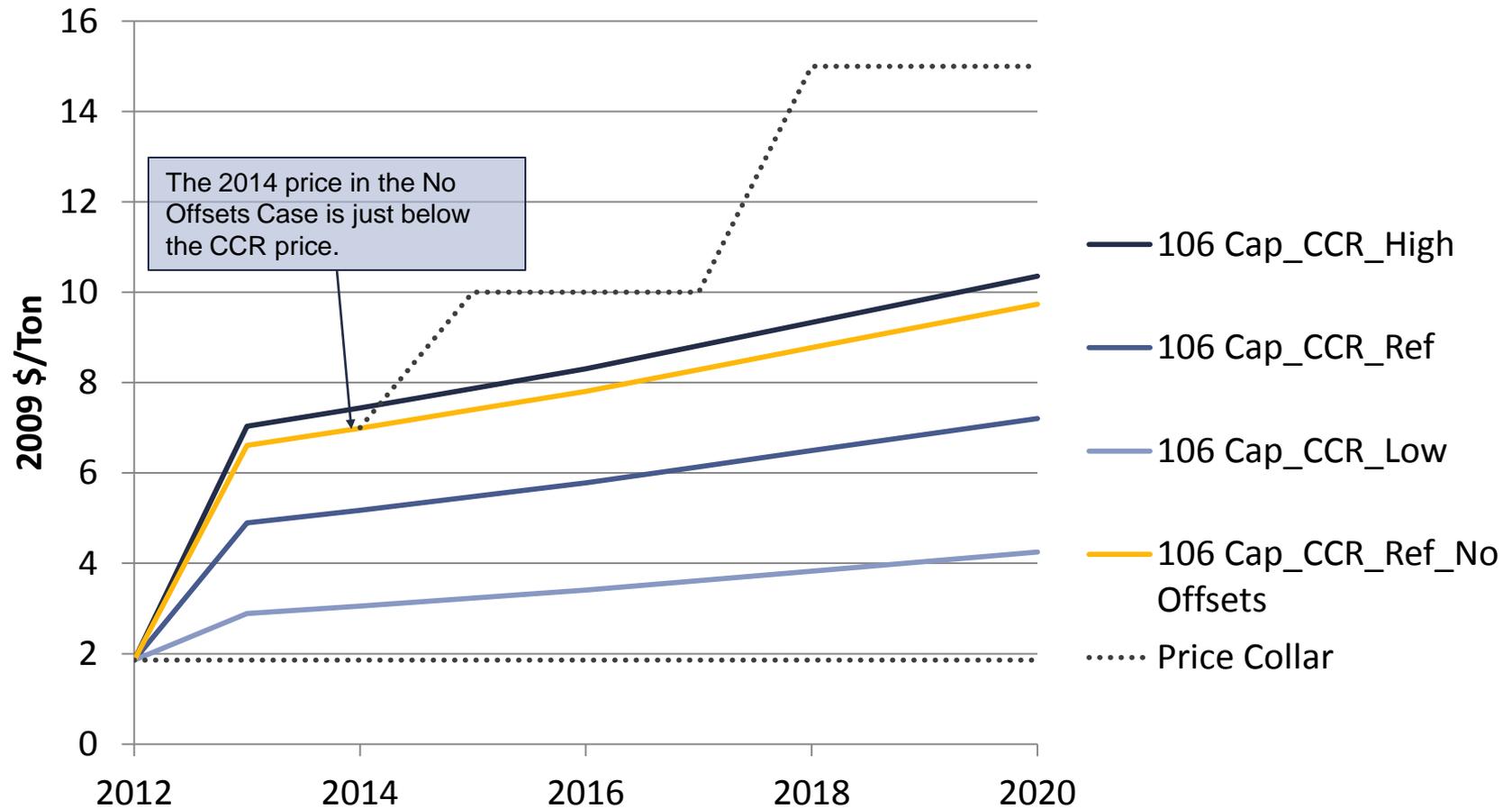
Offsets Analysis-106 Cap CCR Reference without Offsets

Case Name	CO ₂ Cap	CCR - Reserve	CCR – Price Collar	Offsets
106 Cap_CCR _Reference w/o offsets	2014: 106 MM Tons Declines 2.5%/yr. 2020: 91 MM Tons	No more than 10 MM released each year 2014-2020	2014: \$7/ton 2015-17: \$10/ton 2018-20: \$15/ton Use reserve price as floor	No offsets are available for compliance Removes 3.3% compliance and 5% and 10% at 7\$/ton and 10\$/ton price triggers

Note: This analysis evaluates the possibility that offsets would not be available; it is not evaluating removal of offsets from the program

RGGI Allowance Price Projections

106 Cap CCR Cases (Reference, Low, High, Reference w/o Offsets)



Sources of Emission Reductions

106 Cap CCR Reference with No Offsets

