DRAFT 2017 Reference Case Overview

April 20, 2017

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Contents

- 2017 Reference Case Overview
- 2017 Sensitivity Cases

DRAFT 2017 Reference Case and Sensitivity Case Projections

- The following slides present select projections from the draft 2017 RGGI Reference and Sensitivity Cases, with and without CPP in the rest of the U.S.
- Projections are based on assumptions in place as of April 14, 2017.
- These projections are draft and may change as ICF makes refinements based on review and input by the States.

IPM Model Design

- The following projections were developed using the Integrated Planning Model (IPM), the same model used by EPA in analyzing power sector impacts of environmental regulation.
- Models are schematic representations which are used to project trends.
- Model design features will impact projected results.
- One key feature of IPM is that it optimizes across the time horizon of the analysis, so it will act in the near-term in response to long-term requirements and costs.
- This optimization has two implications for the projections:
  - The projections assume that any allowance bank is exhausted within the timeframe of the analysis.
  - Projections in the near term including generation, emissions, and allowance pricing, can be a function of projections in later years of the analysis.

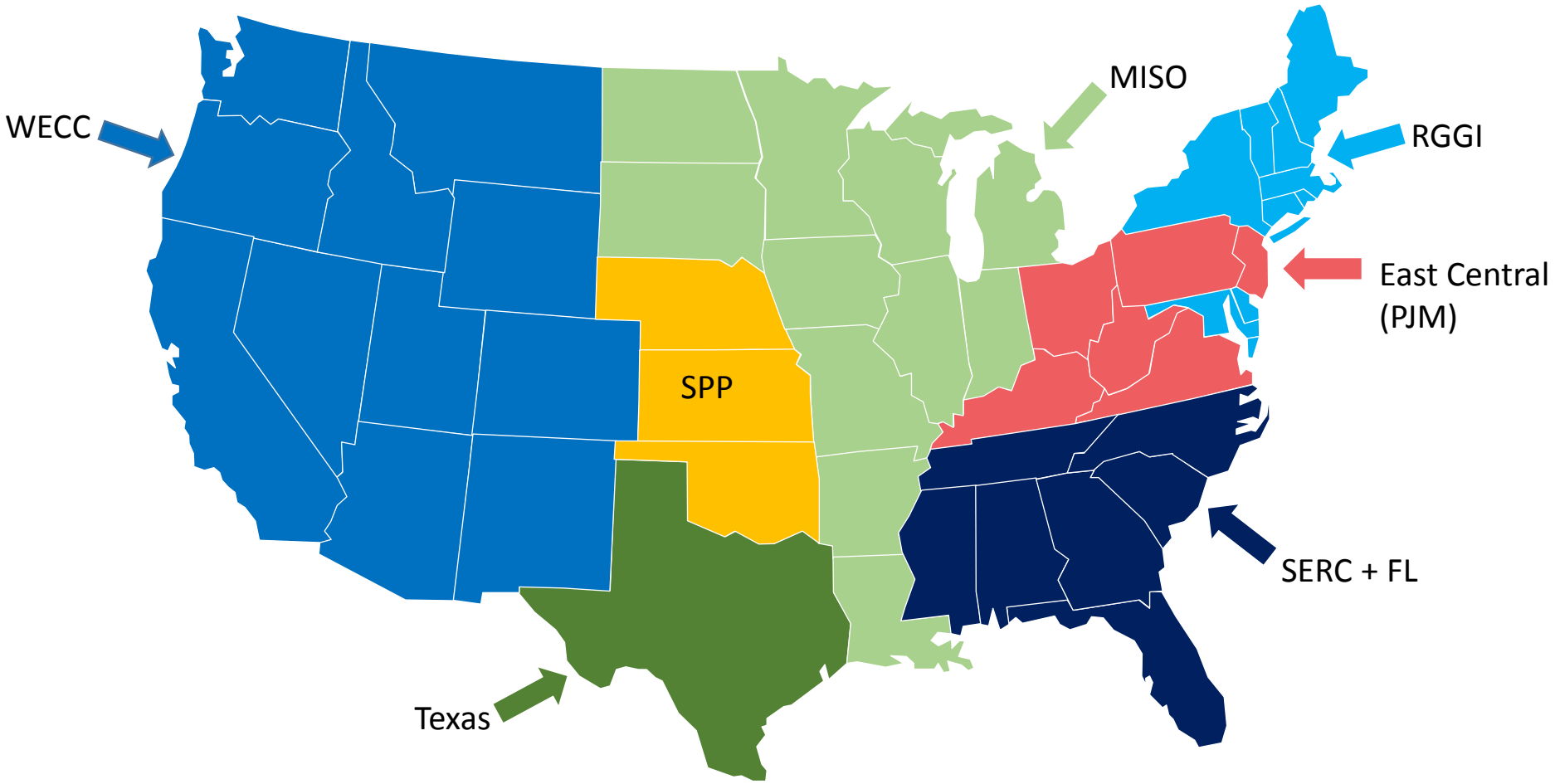
2017 Reference Cases

DRAFT 2017 RGGI Reference Case Assumptions

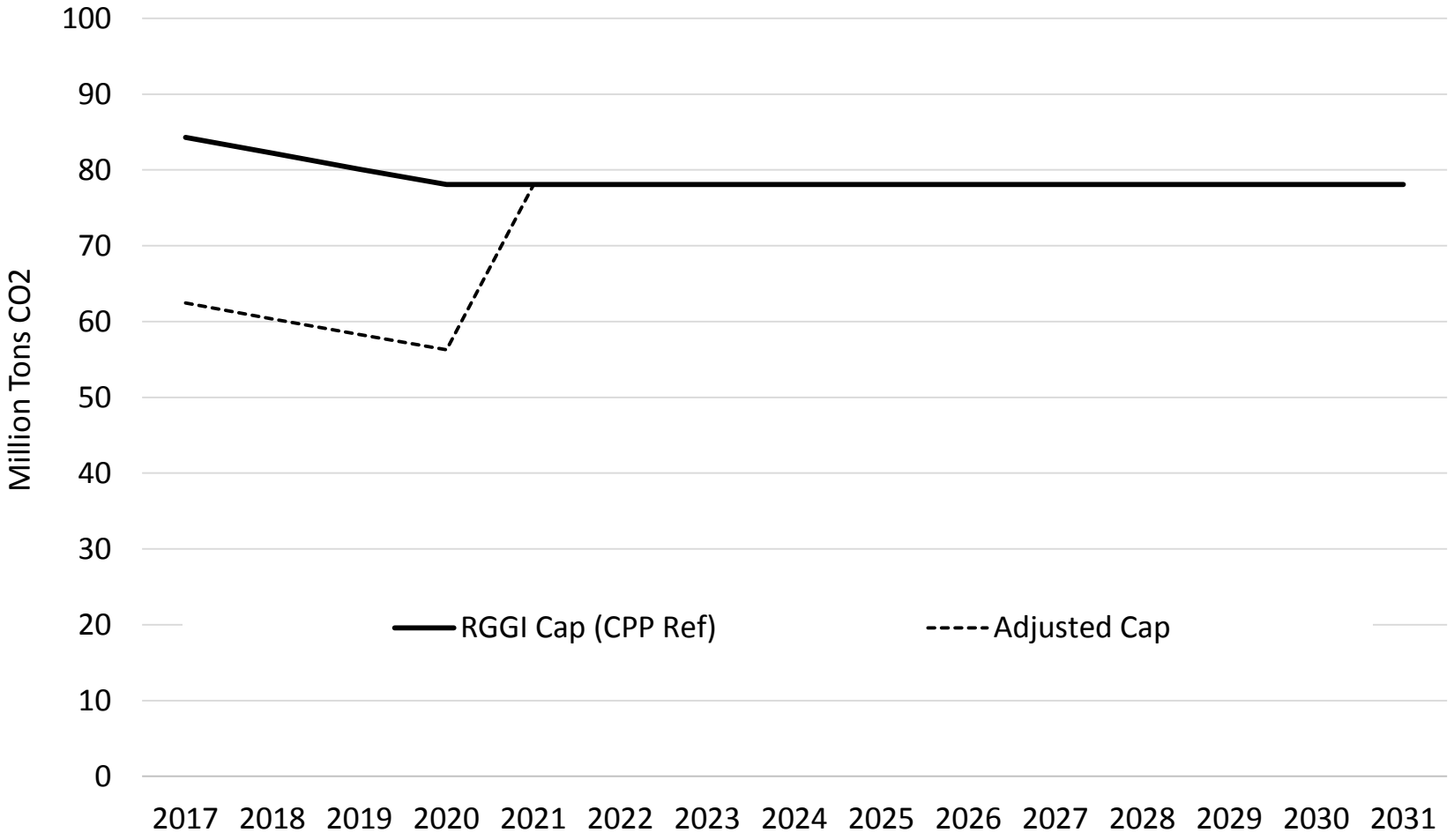
Assumption	2017 CPP Reference Case	2017 No CPP Reference Case
RGGI Cap	Adjusted cap 2017-2020; 2020 cap held constant post-2020	
RGGI Cost Containment Reserve (CCR)	10 million tons available at trigger price 2017-2031; Trigger price of $10/ton (nominal) in 2017, rising at 2.5% per year	
RGGI Trading	Trading of RGGI allowances among RGGI states	
RGGI Banking	Unlimited banking across the modeling horizon	
Non-RGGI Clean Power Plan Targets	States outside of RGGI subject to mass based goals covering existing and new sources	No CPP
Gas Prices	Average of AEO 2017 Reference Case and High Resource Case	
Nuclear Retirements	Pilgrim retires in 2019; Fitzpatrick continues operating until current license expires; Ginna retires 2030; Nine Mile Point 1 retires 2030; Indian Point retires in 2020/2021	
Imports	NY Firm renewable imports from QC and ON; Addition of 1,050 MW line in 2022 from Quebec to New England	

Other modeling assumptions not listed in table above were consistent with the 2017 Proposed Approach from the Feb. 8, 2017 presentation.

DRAFT 2017 CPP Cases Assumption: CPP Trading Zones

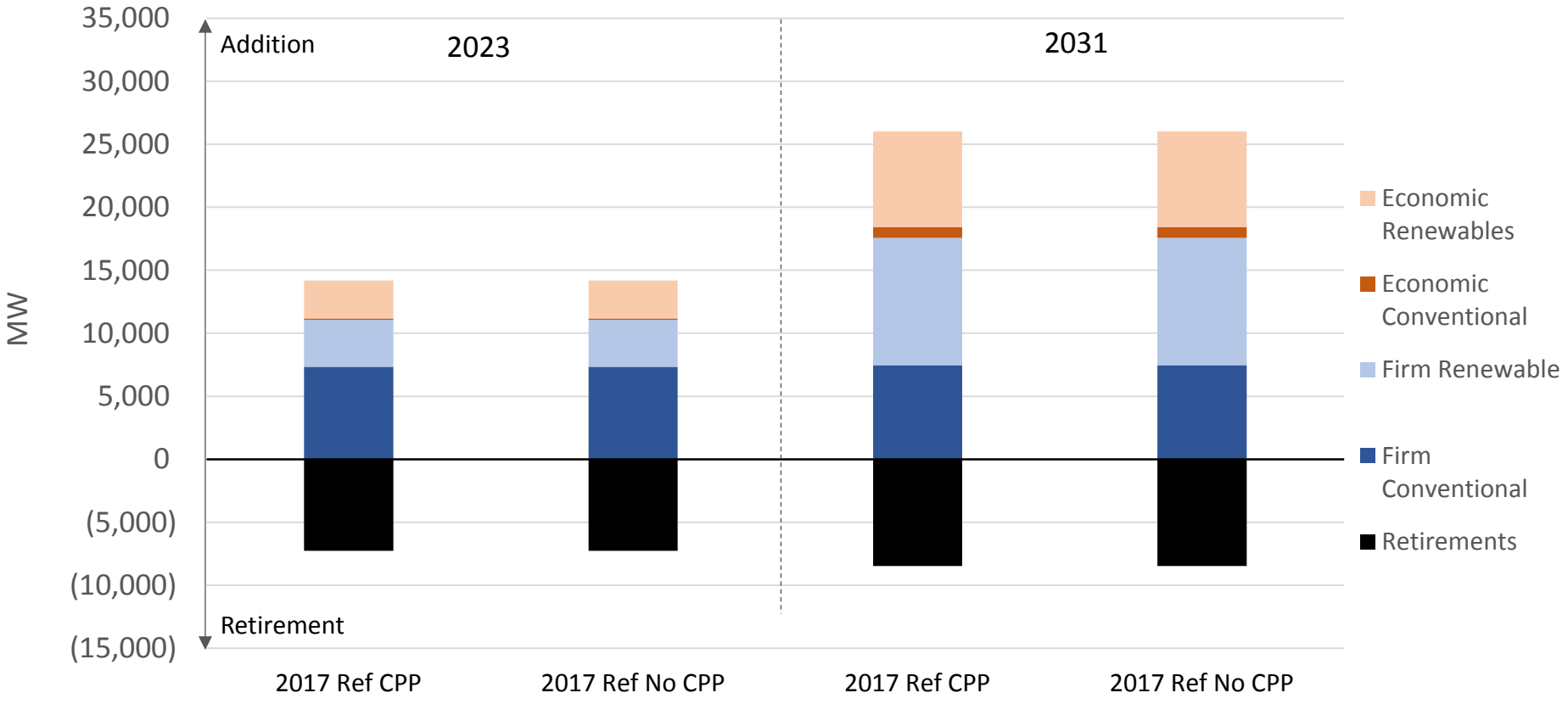


Assumed RGGI CO_2 Reference Case Cap



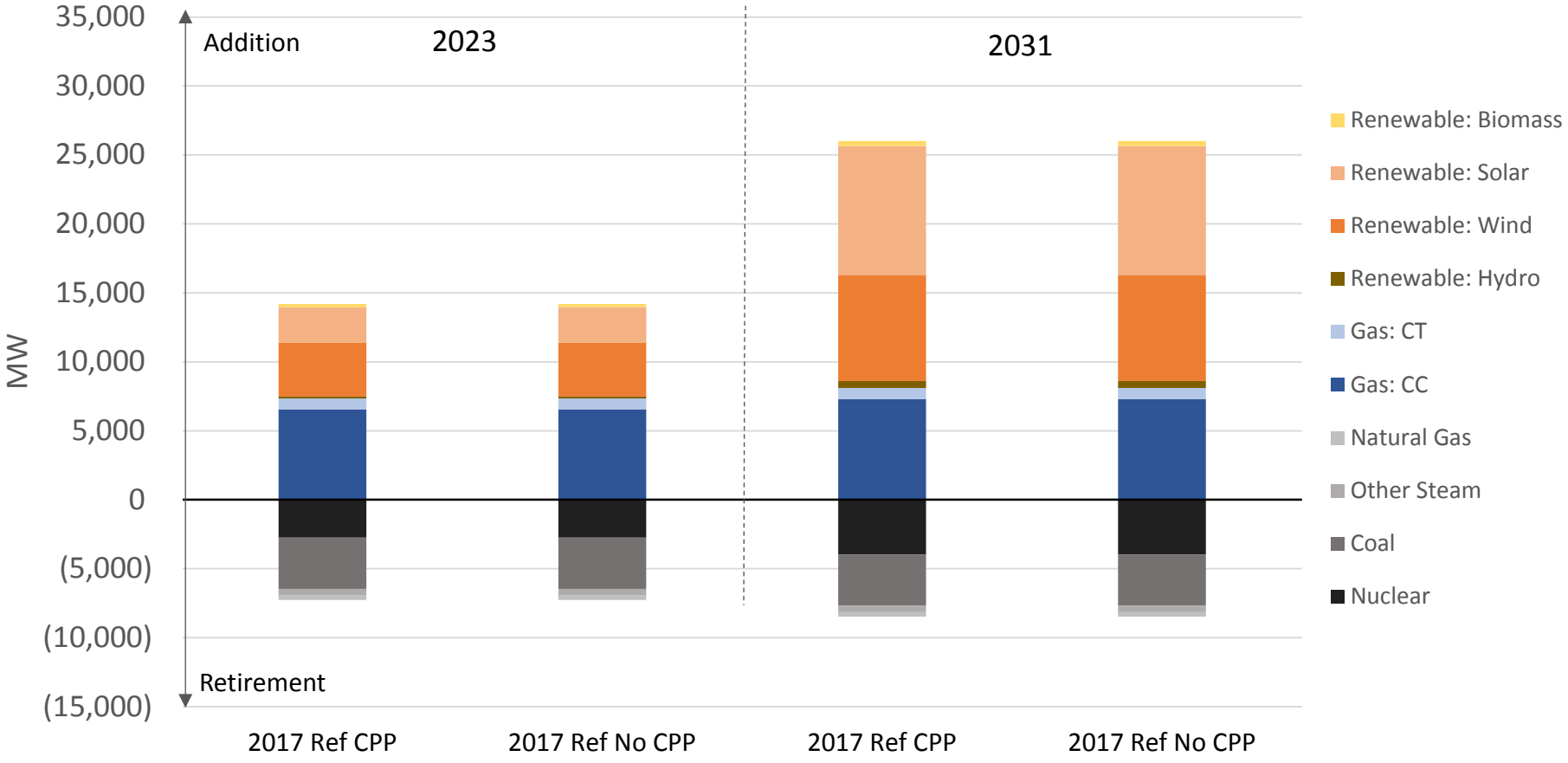
RGGI Cumulative Capacity Additions

- The chart shows the distribution of capacity additions and retirements across firmly planned ("Firm") and model-projected ("Economic") types.



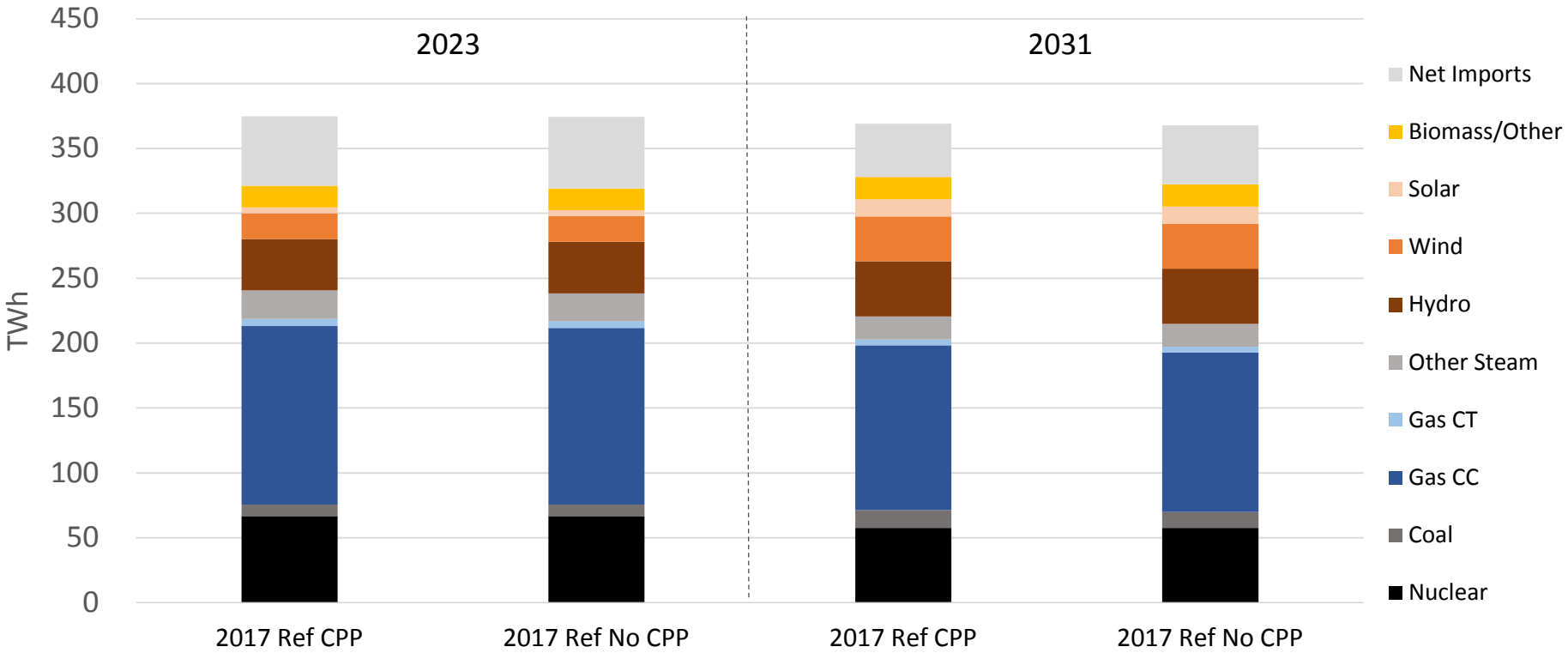
RGGI Cumulative Capacity Additions (2)

- The chart shows the distribution of capacity additions and retirements by capacity type.

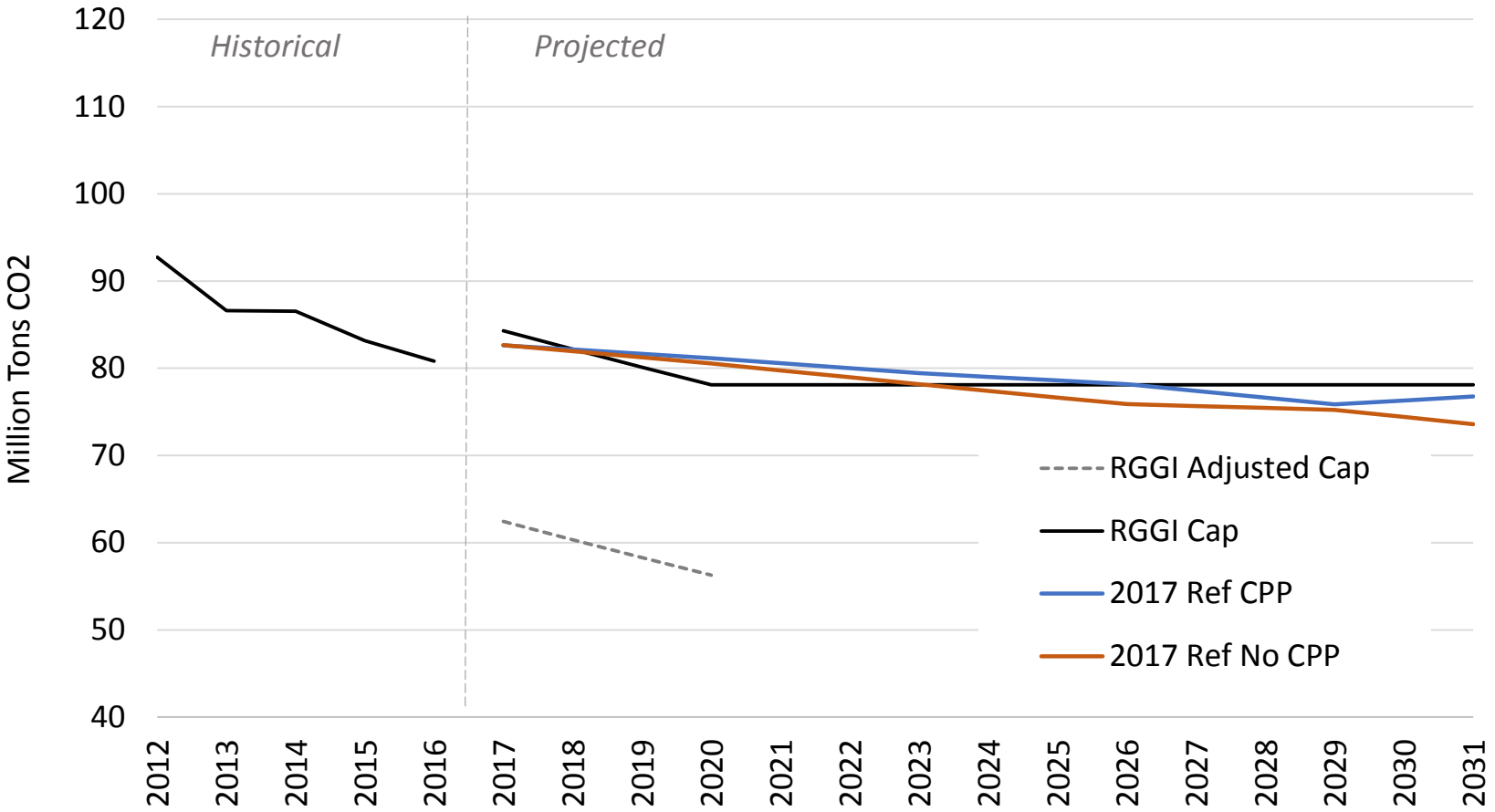


RGGI Generation Mix

- The chart shows generation by type and net imports for the RGGI states.



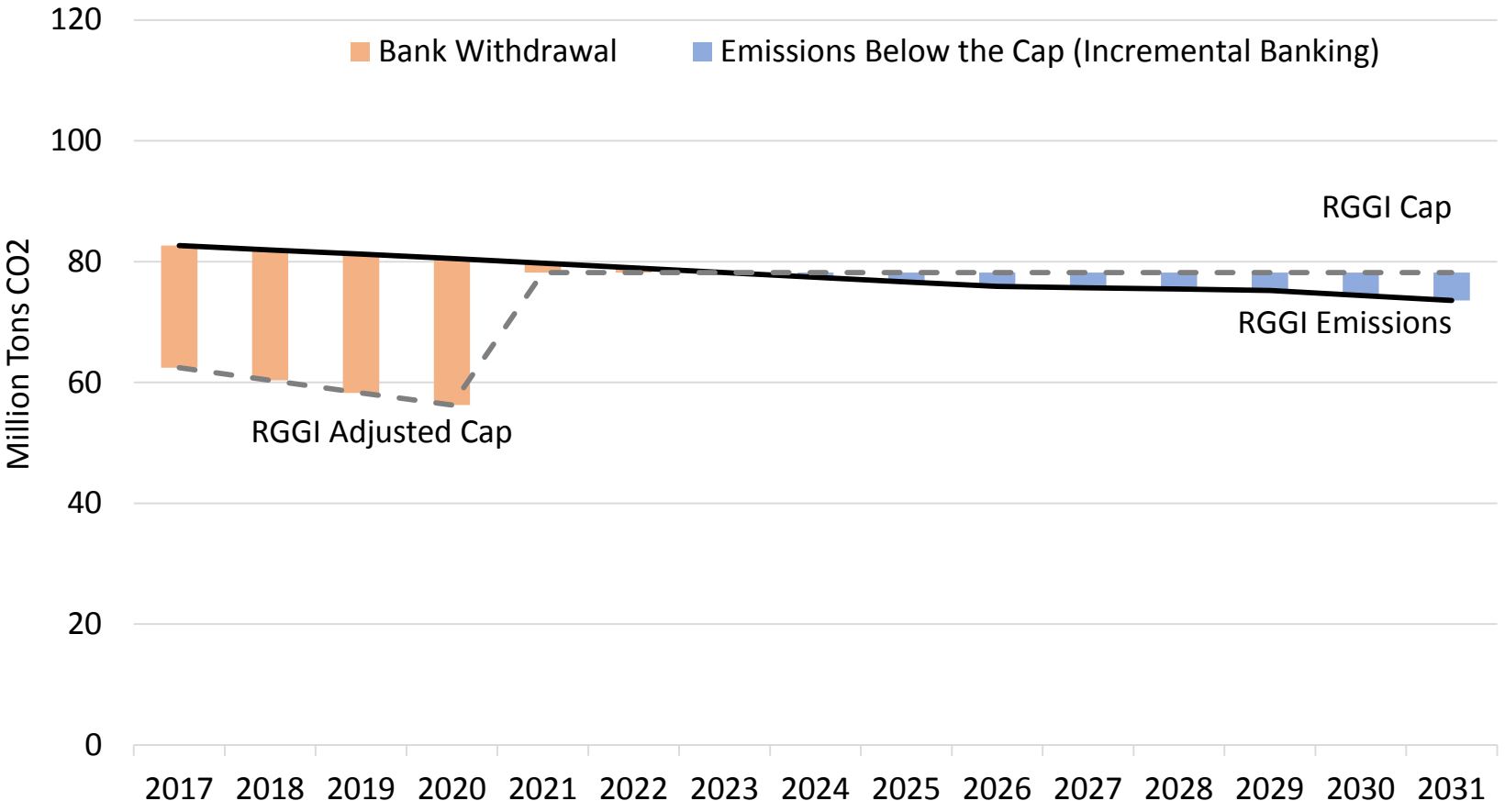
RGGI CO_2 Emissions



Note: Model assumes that any allowance bank is fully exhausted in 2031. In 2032, emissions would immediately drop to cap levels shown on slide #8.

CO_2 Emission Reductions
2017 Reference Case No CPP

- The chart shows the projected CO_2 emissions relative to the cap and the use of banked allowances for compliance.



CO_2 Emission Reductions
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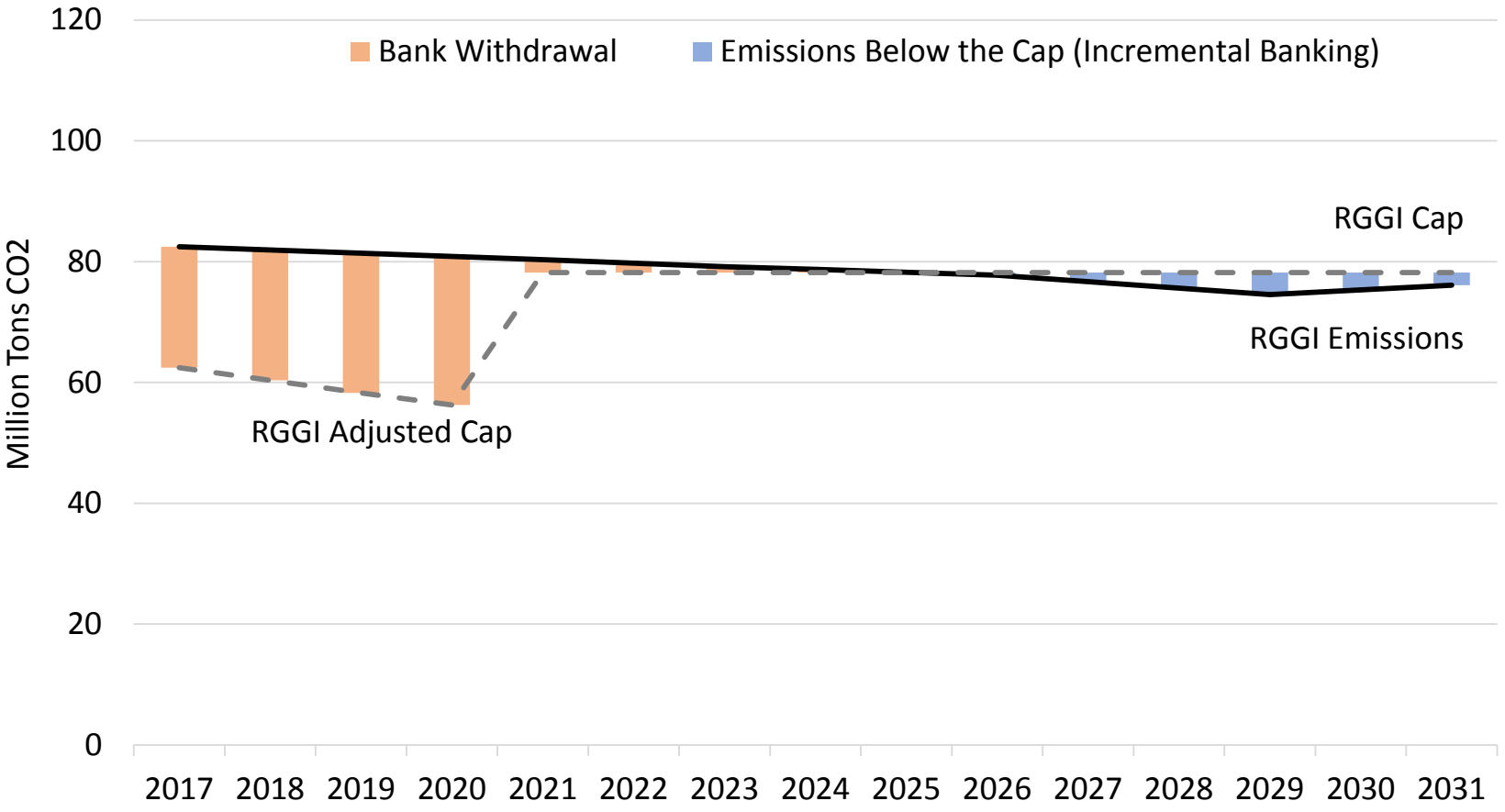
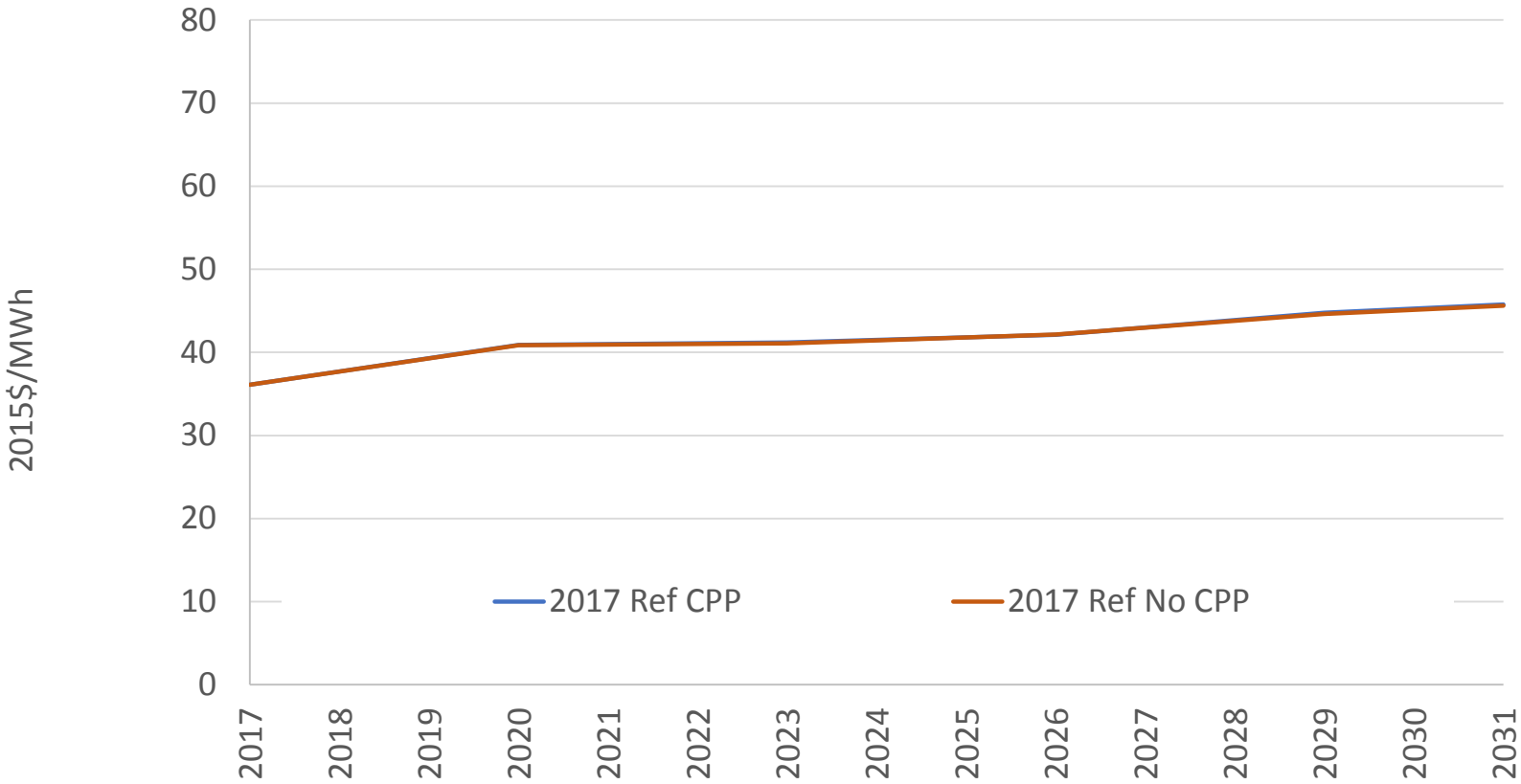


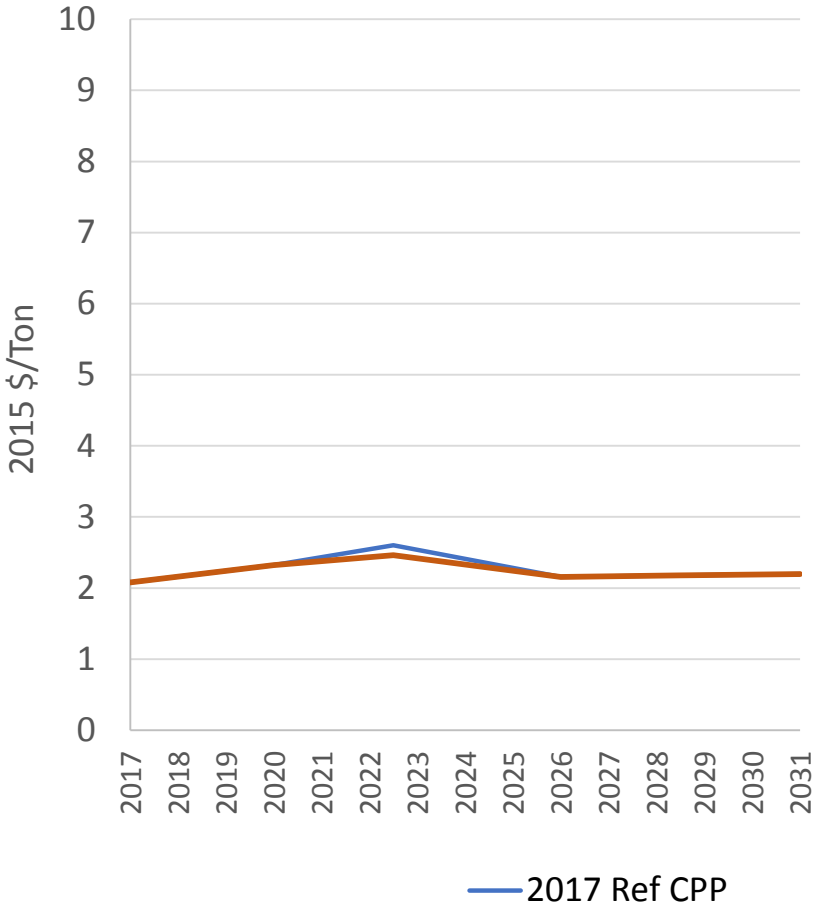
RGGI Firm Power Prices

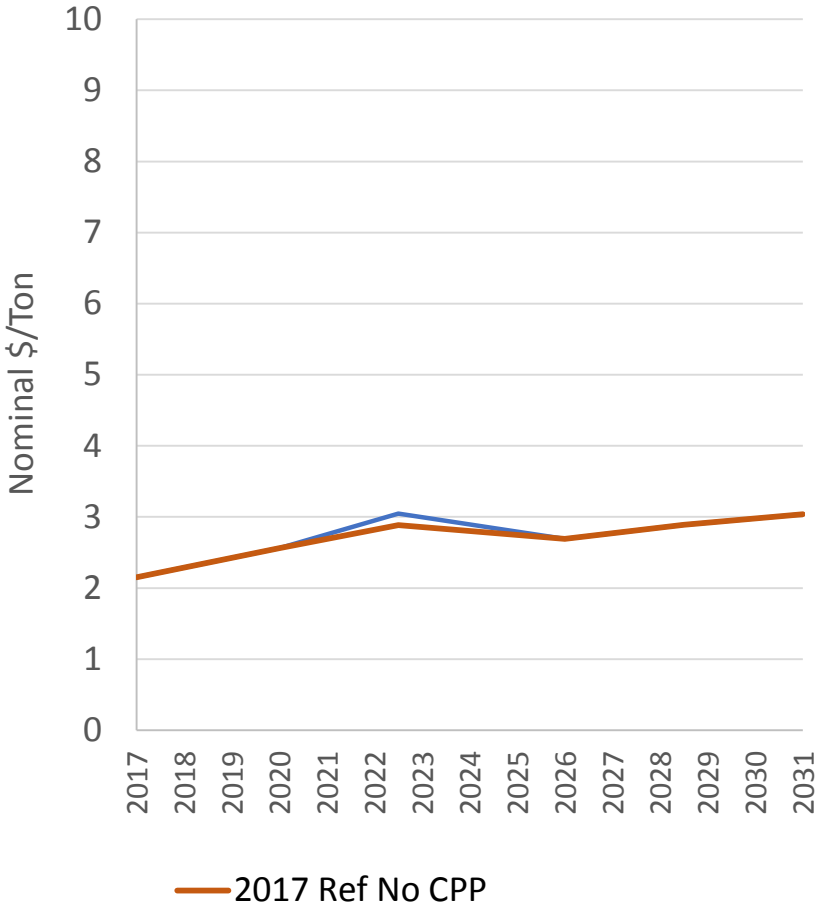
- The chart shows the projected RGGI average annual firm (energy + capacity) prices in constant 2015 dollars.



RGGI Allowance Prices

- The charts show the projected RGGI allowance prices in constant 2015 and nominal dollars.





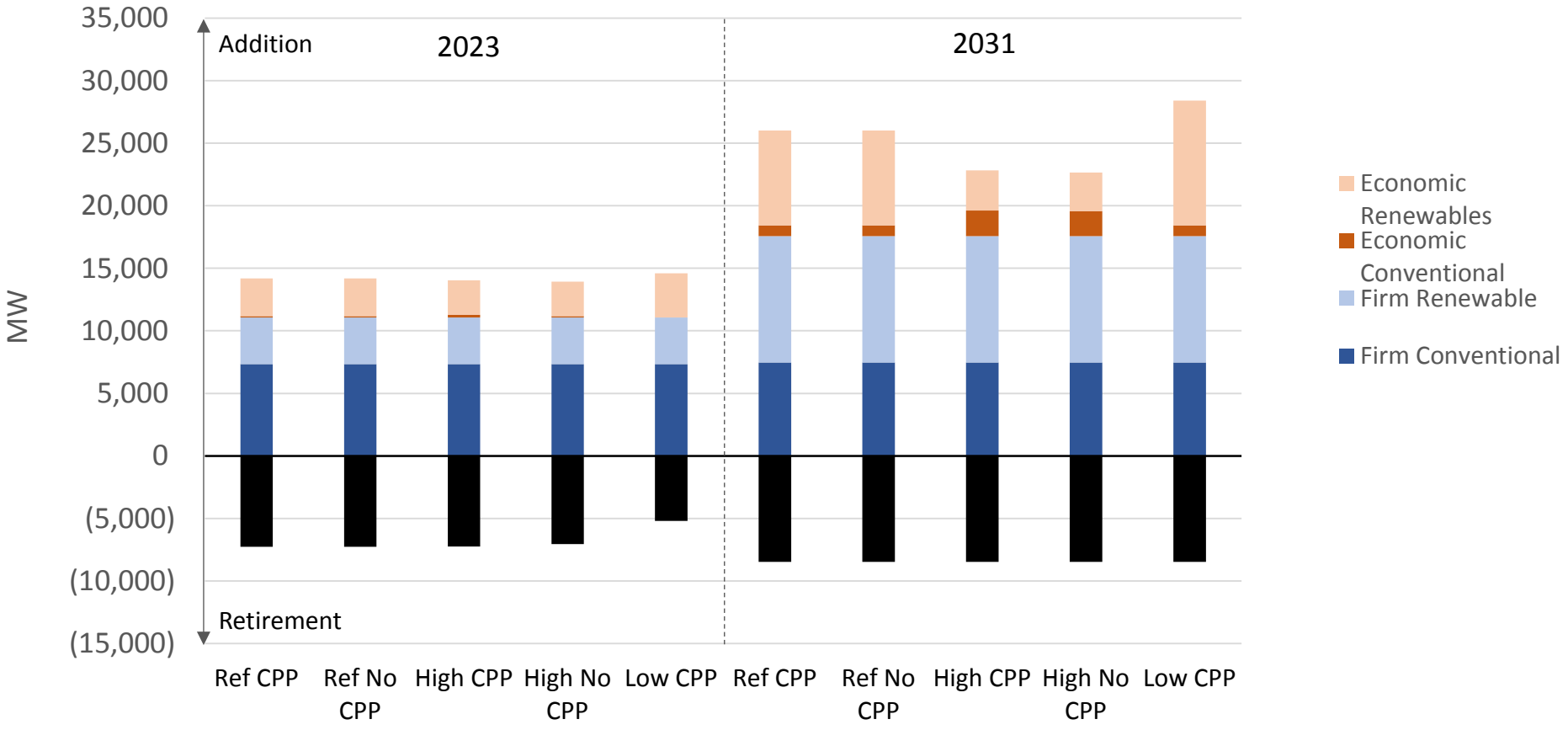
2017 Sensitivity Cases

DRAFT 2017 RGGI Sensitivity Case Assumptions

Assumption	2017 Reference Cases	2017 High Sensitivity Cases	2017 Low Sensitivity Case
RGGI Program	Adjusted cap 2017-2020; 2020 cap held constant post-2020; Full banking CCR: 10 million tons available at trigger price 2017-2031; Trigger price of $10/ton (nominal) in 2017, rising at 2.5% per year		
Non-RGGI Clean Power Plan Targets	CPP: States outside of RGGI subject to mass based goals covering existing and new sources No CPP: No federal CO2 program		CPP Only
Gas Prices (2017-2031 Avg., 2015$/MMBtu)	Average of AEO 2017 Reference Case and High Resource Case ($3.84)	AEO 2017 Reference Case ($4.30)	AEO 2017 High Resource Case ($3.39)
Nuclear Retirements	Pilgrim retires in 2019; Indian Point retires in 2020/2021	50% reduction of NY and NE generation by 2024	Pilgrim retires 2019; Indian Point retires 2024/2025
Imports	NY Firm renewable imports from QC and ON		
Transmission	New transmission line from Canada to New England (1050 MW) in 2022	No new transmission line(s) from Canada to New England	Base Reference Case, with additional new transmission line from Canada to New England (1050 MW) in 2025
Renewable Costs	NREL 2016 Base Case	NREL 2016 High Case	NREL 2016 Low Case
Firm Builds	Reference Case Assumptions	Reference Case Assumptions	Add 1,600 MW Offshore wind

RGGI Cumulative Capacity Additions

- The chart shows the distribution of capacity additions and retirements across firmly planned ("Firm") and model-projected ("Economic") types.



RGGI Cumulative Capacity Additions (2)

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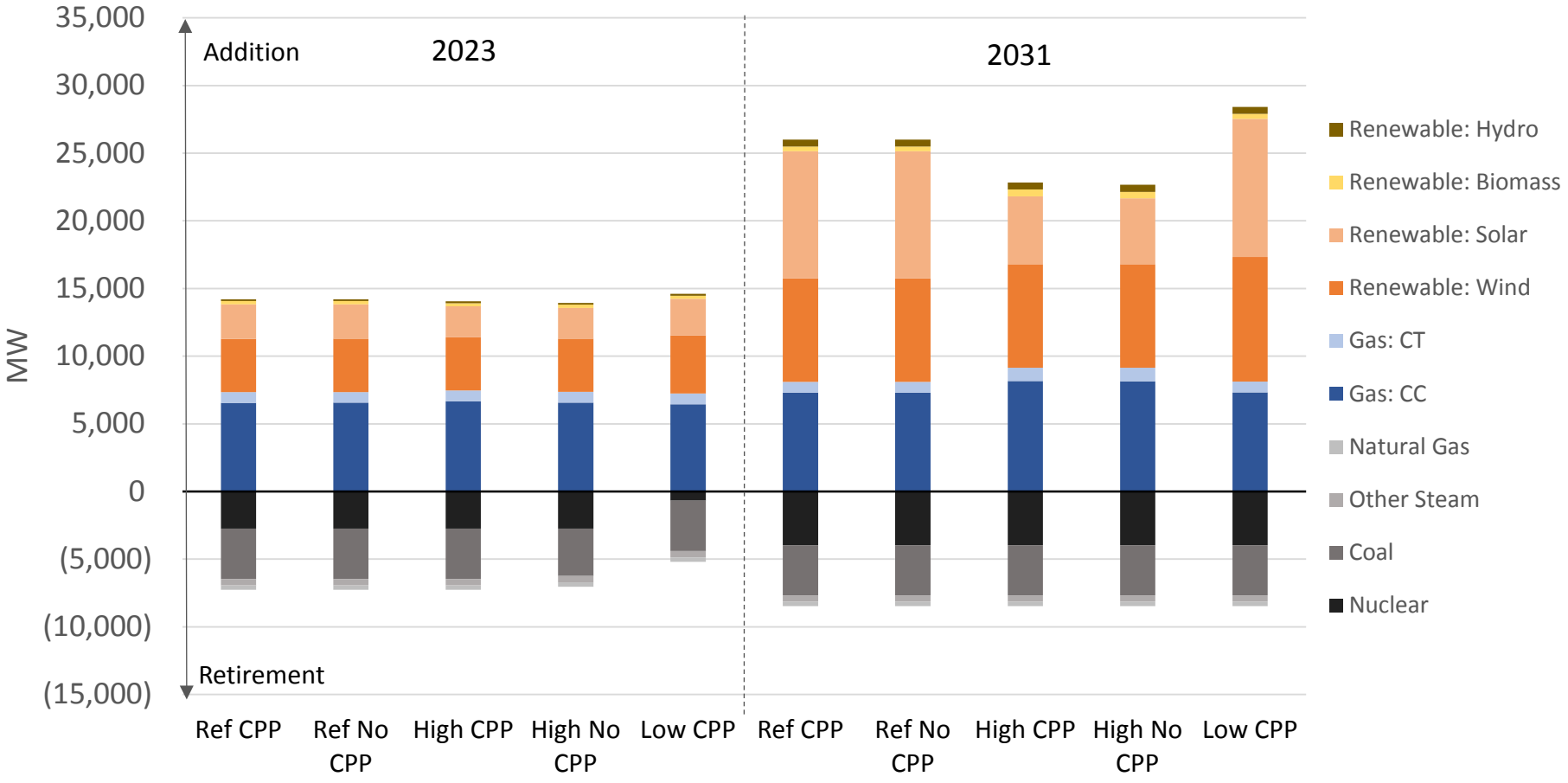

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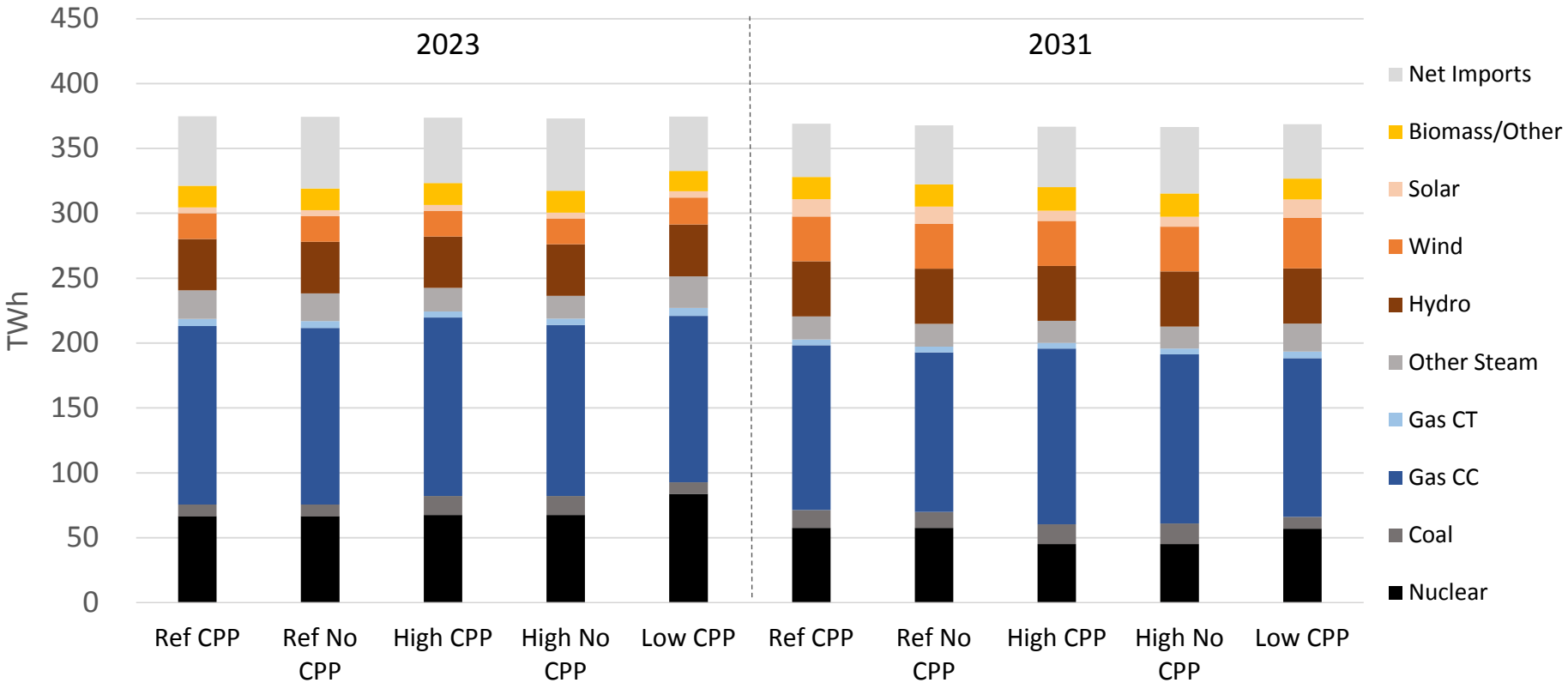
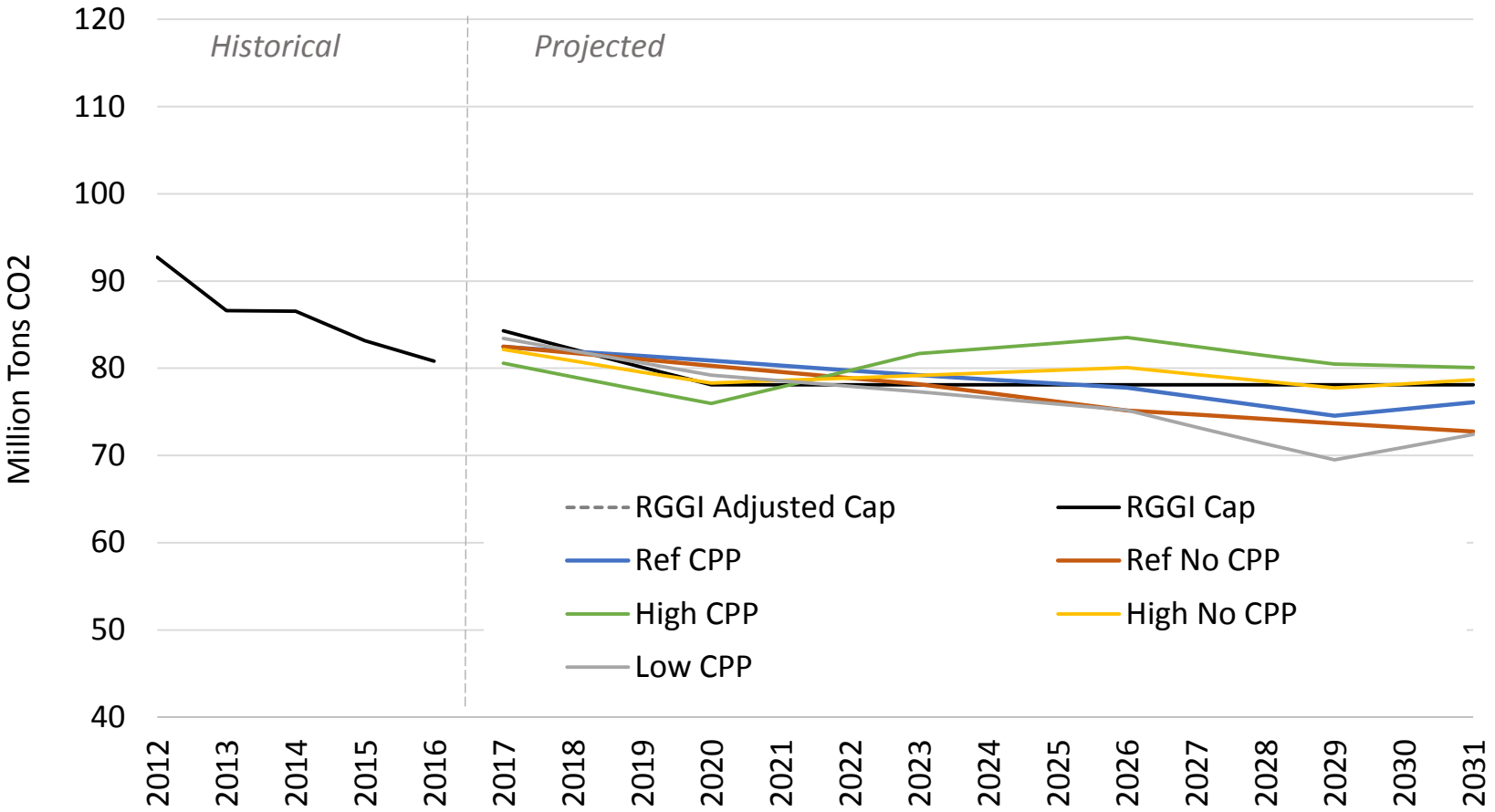


RGGI CO_2 Emissions



Note: Model assumes that any allowance bank is fully exhausted in 2031 and in 2032, emissions would immediately drop to cap levels shown on slide #8.

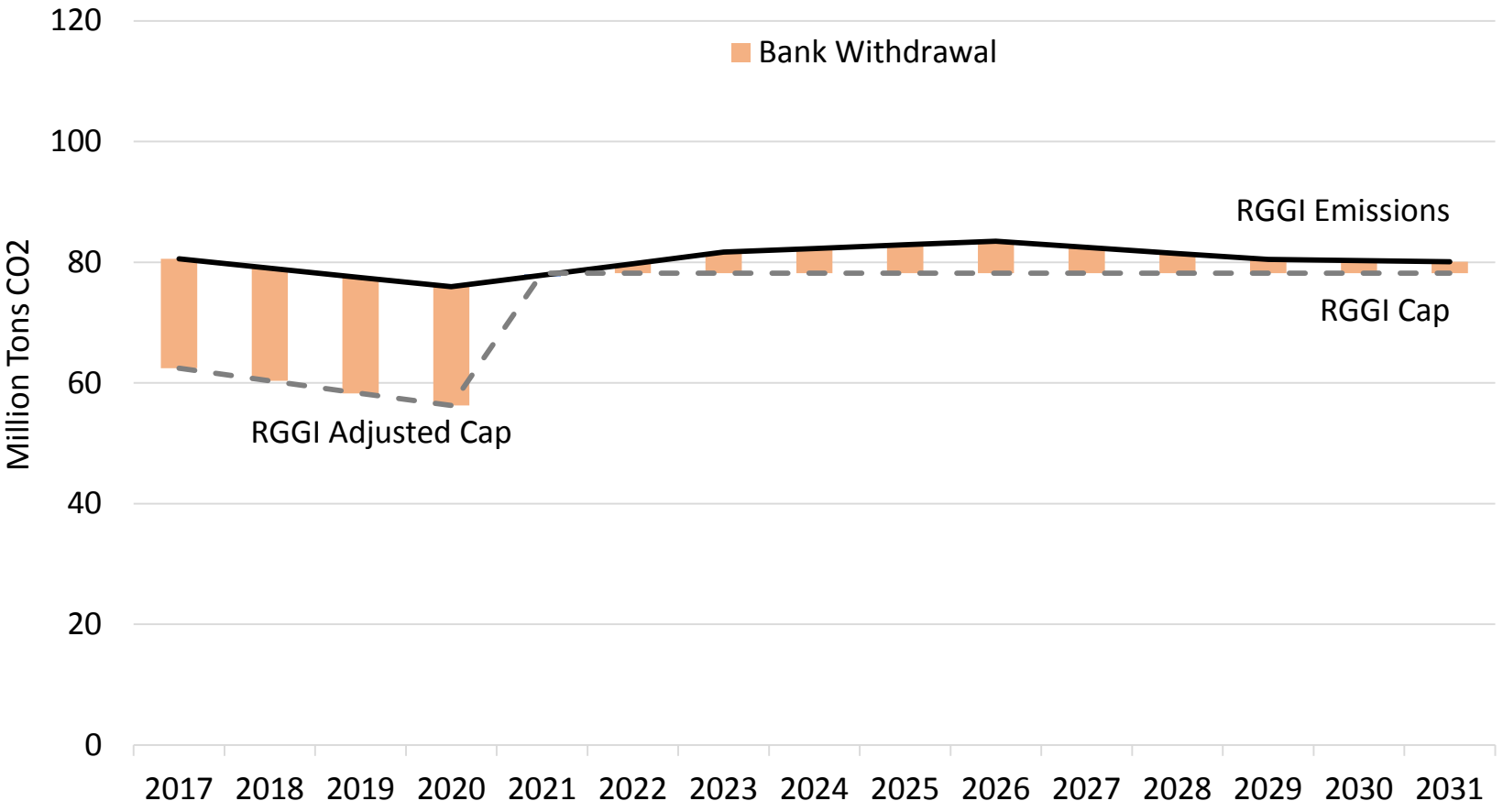
RGGI Emissions (Million of Tons)

Case	Cumulative Emissions				Average Emissions, 2017-2031	2031 Projected Emissions	2032 Cap*
	2017-2021	2022-2031	2022-2029	2030-2031			
2017 Ref CPP	407	772	621	151	79	76	78
2017 Ref No CPP	405	754	608	146	77	73	78
2017 High CPP	391	815	655	160	80	80	78
2017 High No CPP	399	790	633	157	79	79	78
2017 Low CPP	404	740	597	143	76	72	78
CPP Goals (Aggregate for RGGI States)		*850*	*690*	*160*			

* The time horizon of this analysis is 2017 through 2031. As discussed in slide 4, IPM will optimize use of allowance banking over that time period and carry no bank beyond 2031. To illustrate the impact of the banking behavior on long-term emissions in an analysis with a longer time horizon, the 2032 cap value can be compared to the 2031 emissions.

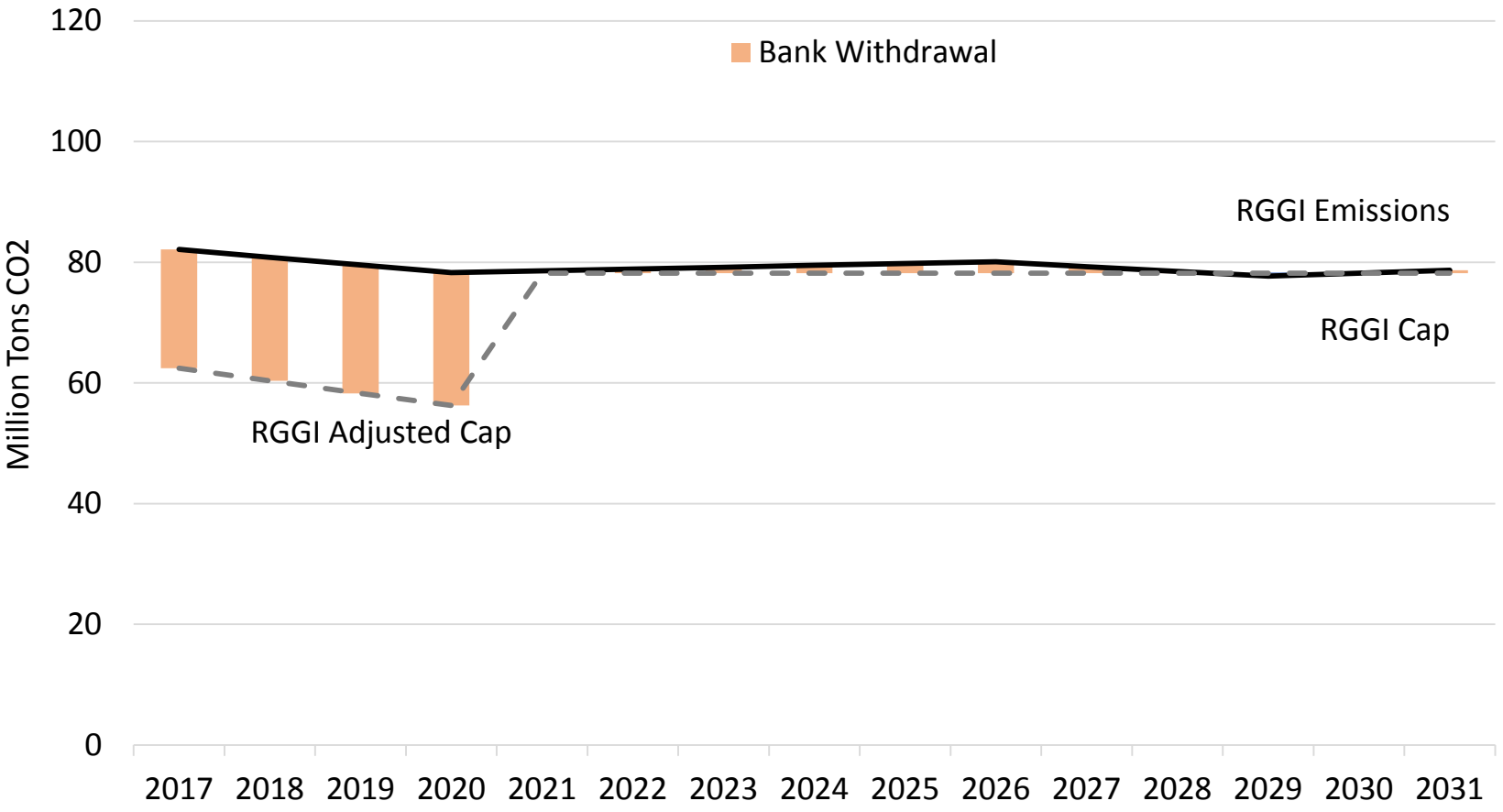
CO_2 Emission Reductions
2017 High Case CPP

- The chart shows the projected CO_2 emissions relative to the cap and the use of banked allowances for compliance.



CO_2 Emission Reductions
2017 High Case No CPP

- The chart shows the projected CO_2 emissions relative to the cap and the use of banked allowances for compliance.



CO_2 Emission Reductions
2017 Low Case CPP

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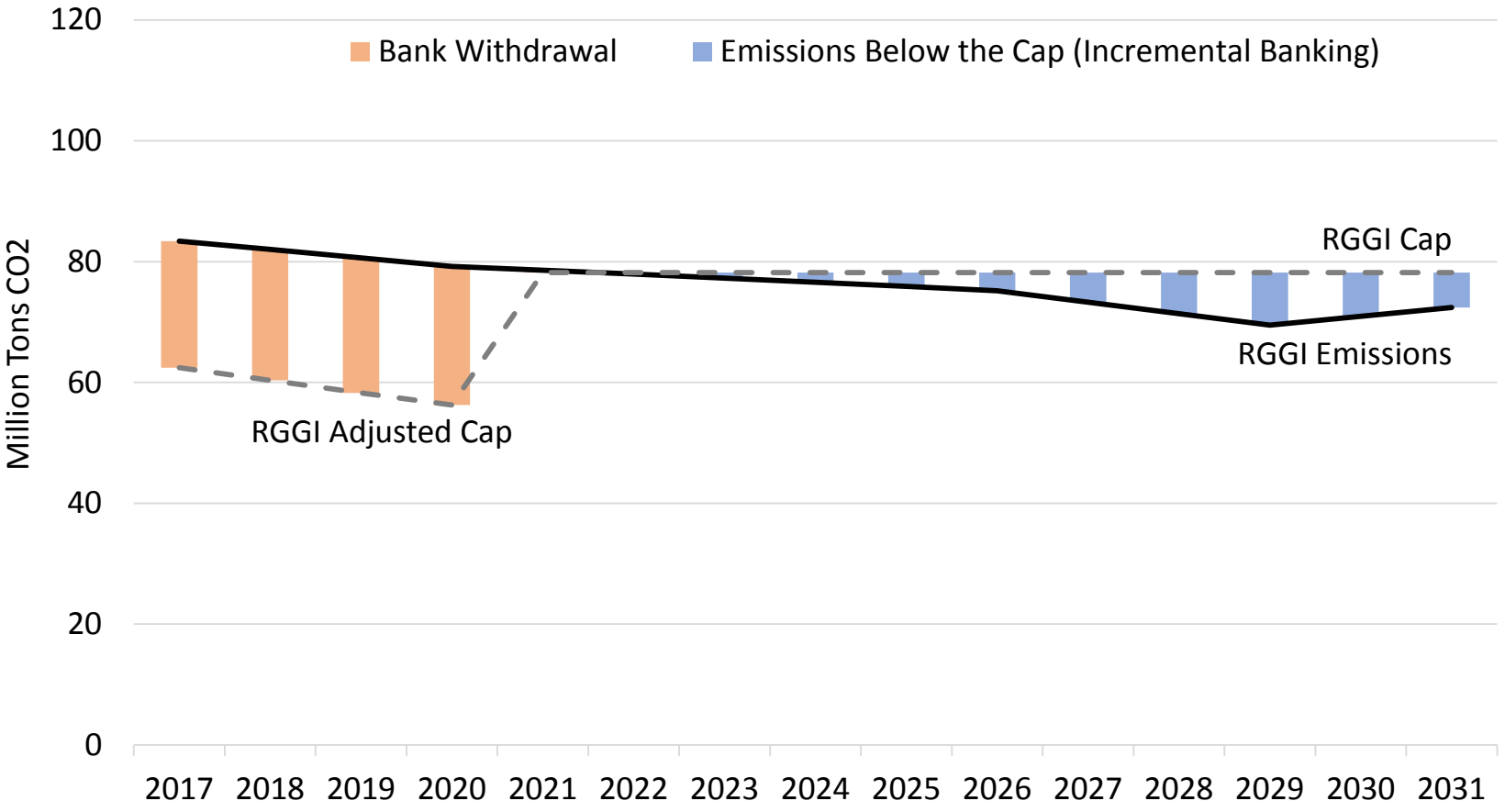

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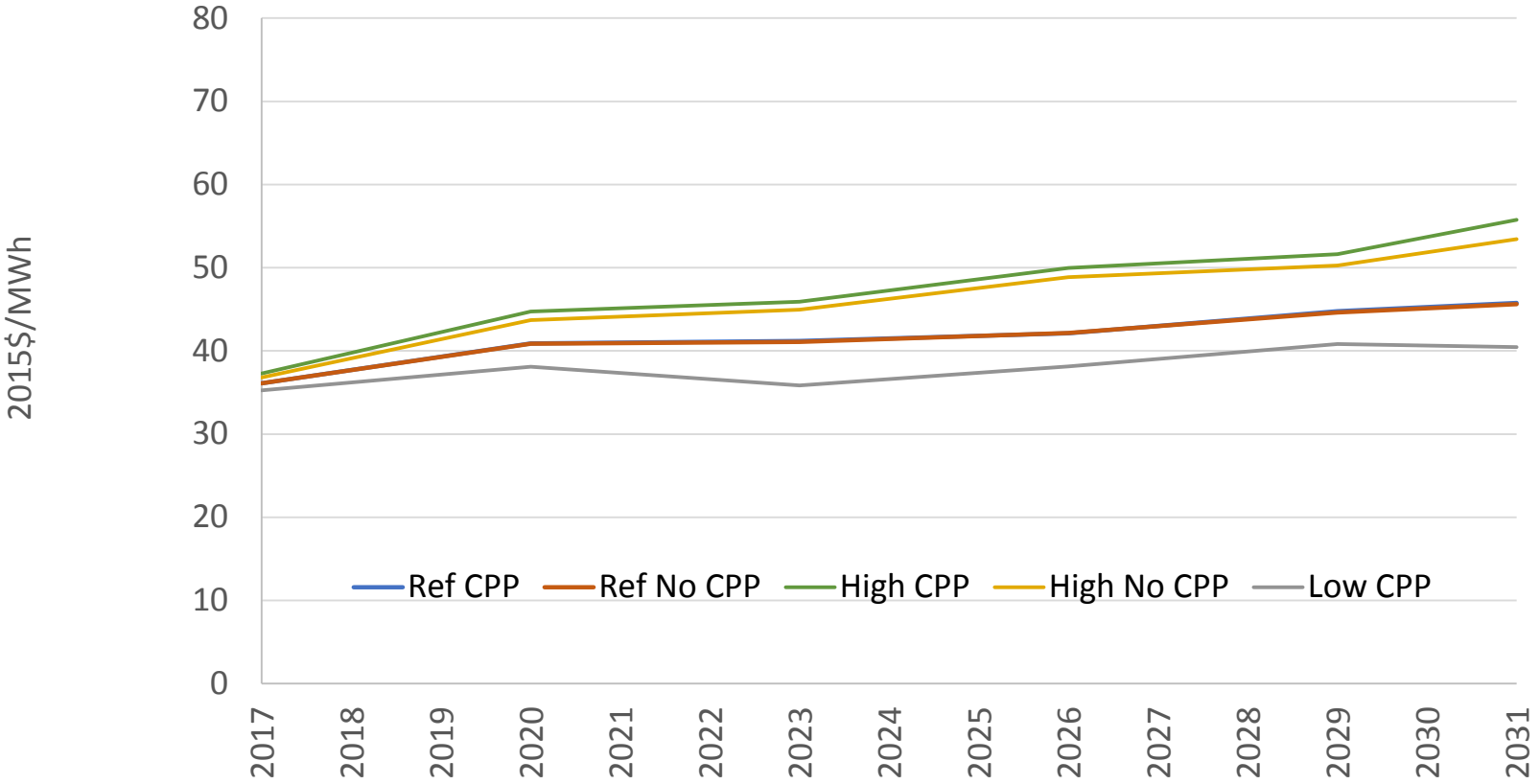

RGGI Allowance Prices

- The charts show the projected RGGI allowance prices in constant 2015 and nominal dollars.