

DRAFT 2011 Reference and Sensitivity Case Results

September 12, 2011

DRAFT RGGI Reference and Sensitivity Case Results

- The following slides present select projections from the latest RGGI Reference Case and draft sensitivity cases, based on assumptions in place as of September 2, 2011.
- These projections are draft and may change as ICF makes refinements based on review and input by the States.
- The RGGI States specified 7 sensitivity cases for analysis:
 1. Higher Load Growth
 2. Lower Load Growth
 3. Modified Oil/Gas Price Relationship
 4. Modified Gas/Coal Price Relationship
 5. High Emissions Combination
 6. Low Emissions Combination
 7. Federal Regulatory Policy
- This presentation first provides an overview of the assumptions selected by the states for the 2011 analysis. It then summarizes the Reference Case projections and the results of the sensitivity cases.

2011 Assumptions

Updated Assumptions for September 2011 Projections

Overview

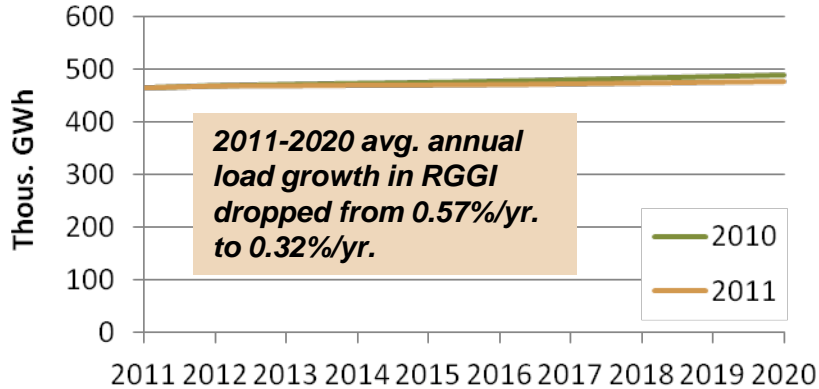
- The table below summarizes the sources for key assumptions in the new 2011 analysis as compared to the 2010 analysis.
- The following slides compare electric demand by ISO and then gas prices for the 2010 and 2011 analyses.

Assumption	2010 Analysis	2011 Analysis
Electric load growth	RGGI states – ISOs 2010 Other states – AEO 2010	RGGI states – ISOs 2011 Other states – AEO 2011
Reserve margin requirements	ISOs 2010	ISOs 2011
Natural gas prices	Combination of NYMEX and AEO 2010	AEO 2011
Base costs of new generating capacity	AEO 2010	AEO 2011
Costs of pollution controls	EPA Base Case v4.10	EPA Base Case v4.10
SO ₂ and NO _x regulation	Clean Air Transport Rule (CATR, as proposed)	Cross-State Air Pollution Rule (CSAPR)
Firm capacity additions and retirements	RGGI states	RGGI states

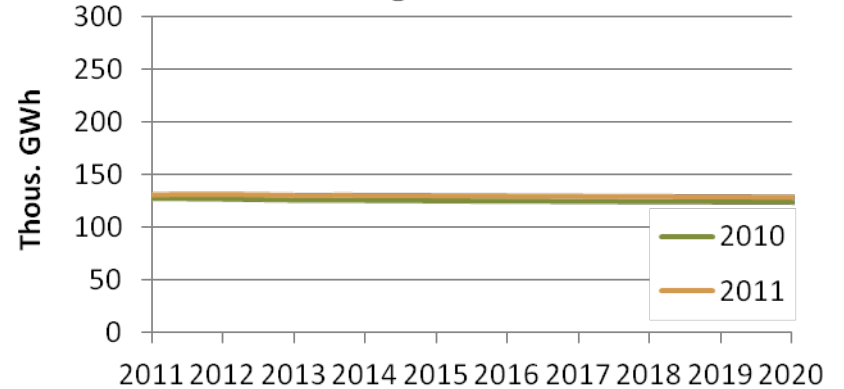
Updated Assumptions for September 2011 Projections

Load Growth in the RGGI Region

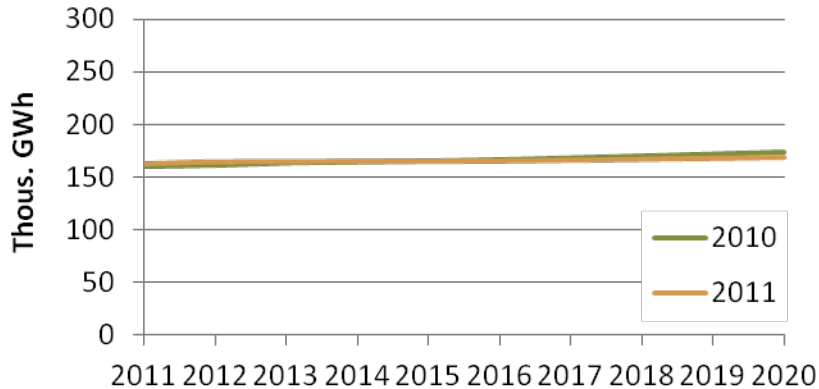
RGGI Load



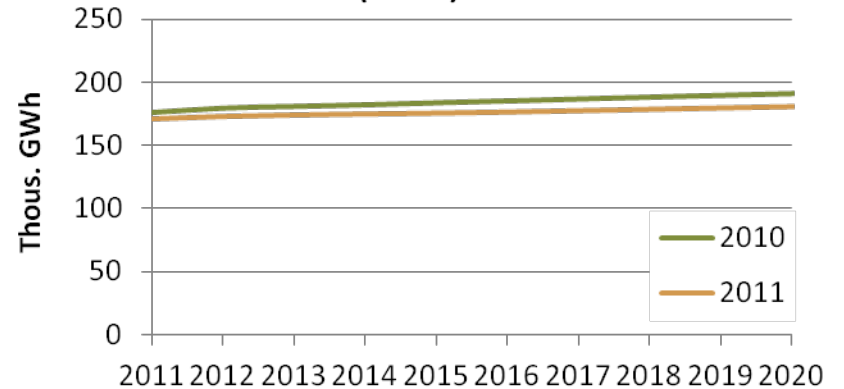
New England Load



New York Load



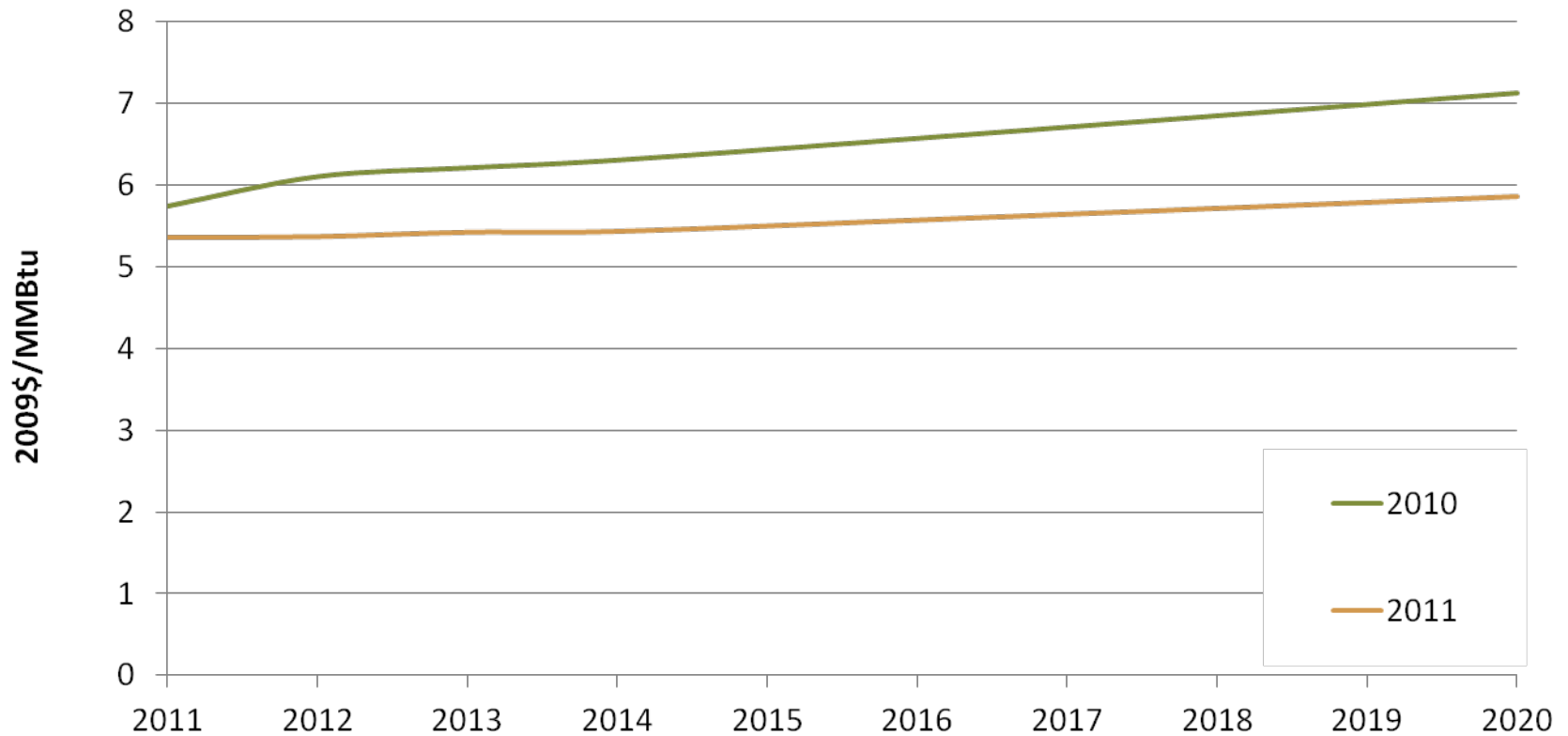
PJM (RGGI) Load



Updated Assumptions for September 2011 Projections

Natural Gas Prices

Delivered Natural Gas Prices to RGGI



RGGI Program and Modeling Changes for 2011

Overview

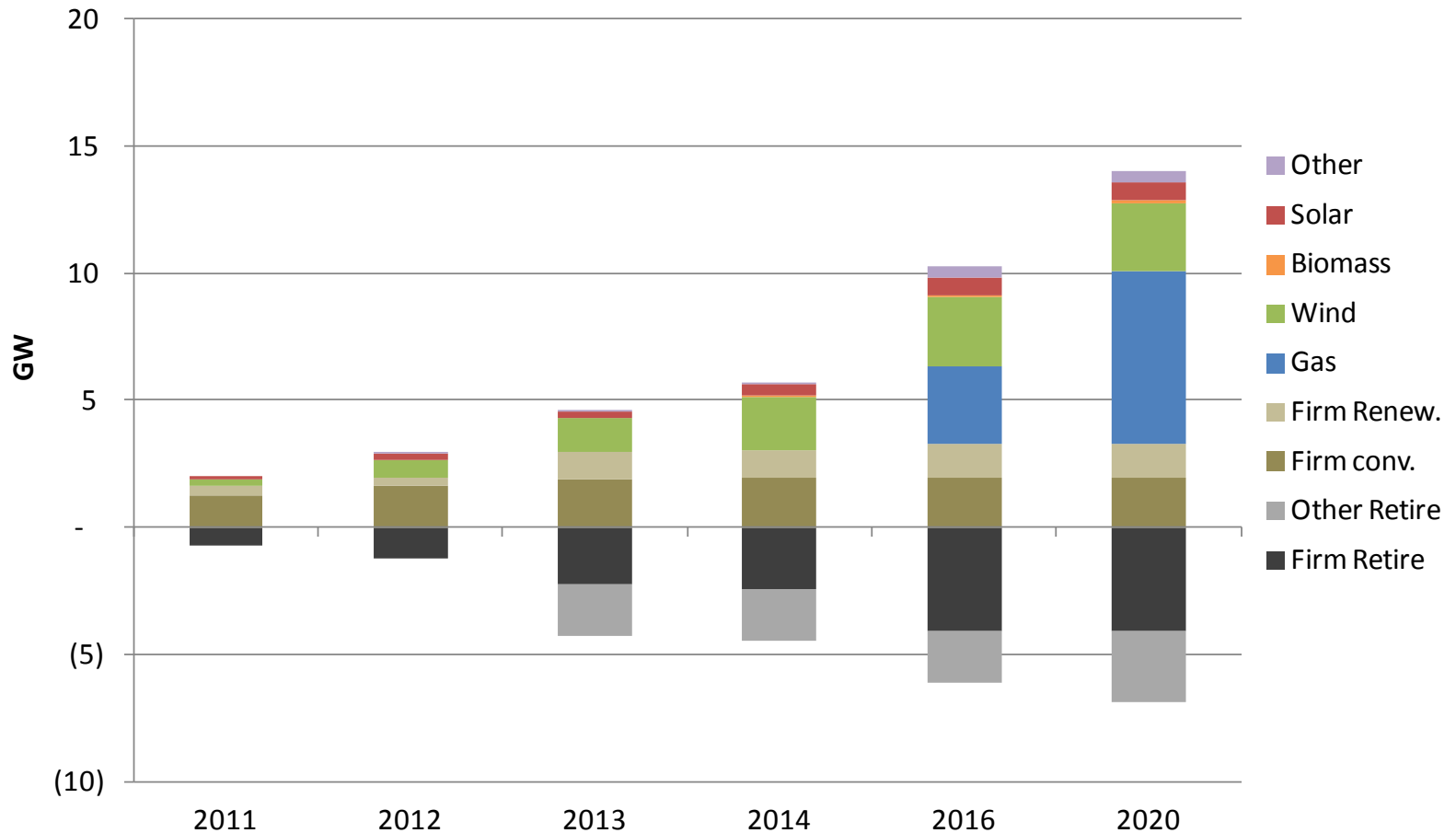
- The projections presented in the following section assume that New Jersey leaves the RGGI program at the beginning of 2012.
 - Charts containing multiple years will include results for New Jersey in 2011 but exclude it in all later years.
 - Charts showing results for 2020 only (e.g., capacity additions and generation mix for the sensitivity cases) do not include results for New Jersey.
- The timeframe for the modeling analysis has been adjusted to 2020 rather than 2030. Unlike actual market participants, the model has “perfect foresight” about all market parameters (e.g., fuel prices, allowance scarcity, electricity load). As a result, the model may over-compensate in the short-term for a condition that it observes far in the future. The revised timeframe is being selected in order to have the model provide results that are more consistent with market participant decision making time horizons.

RGGI Reference Case Projections

Reference Case Projections

Cumulative Capacity Additions

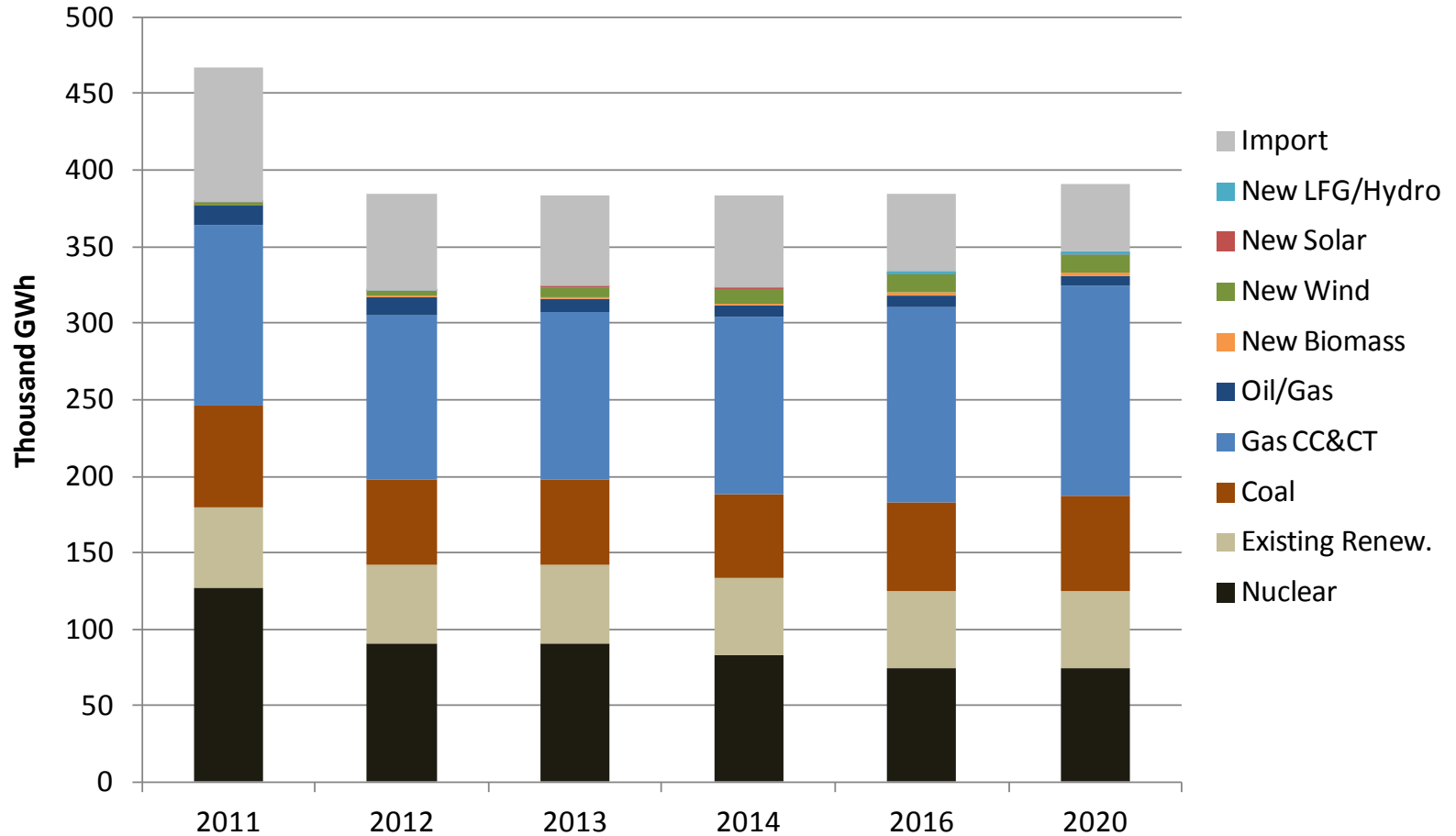
- The chart shows total firmly planned (“Firm”) and economic capacity additions by type and total retirements projected by IPM.



Reference Case Projections

RGGI Generation Mix

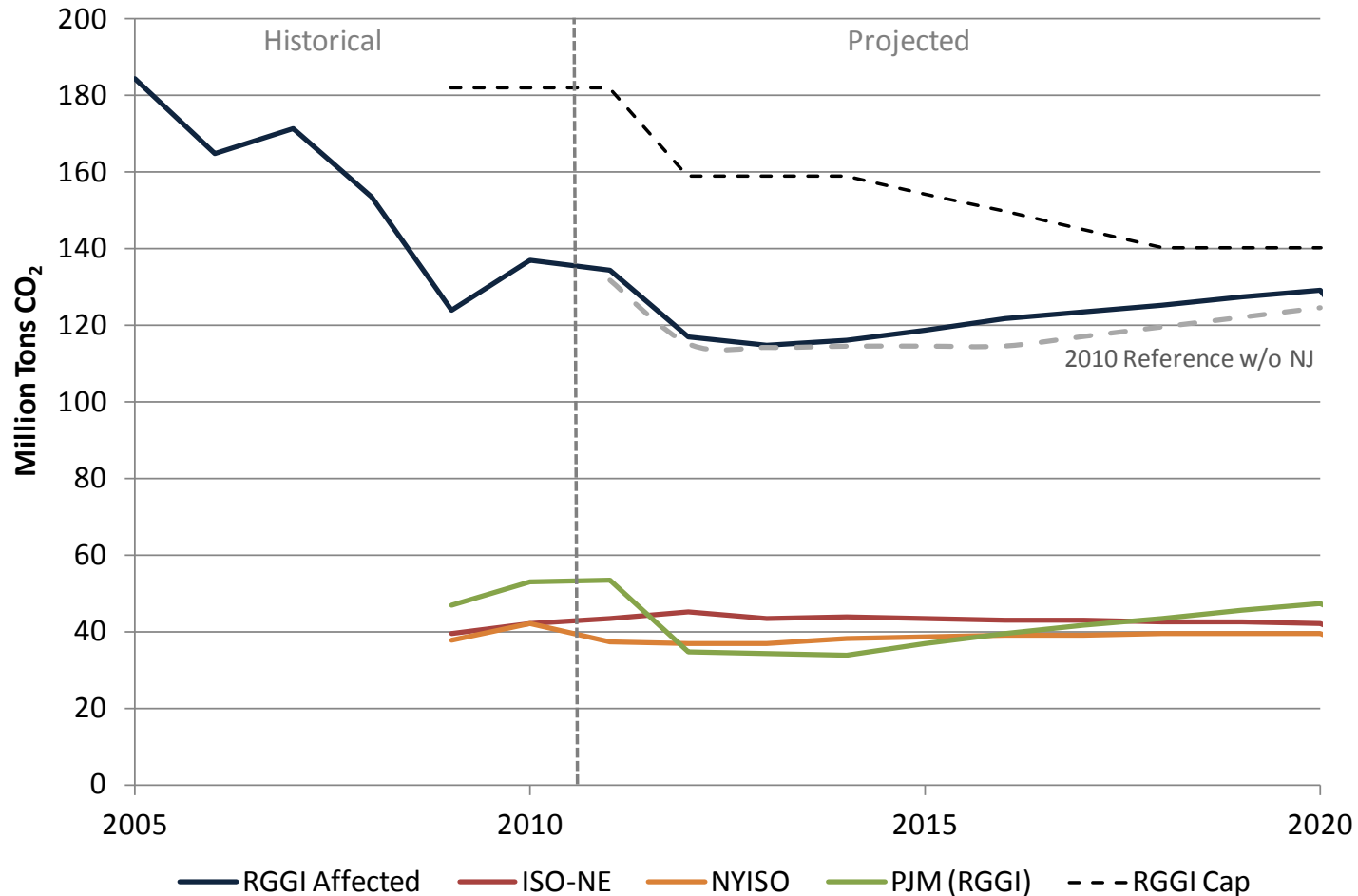
- The chart shows projected generation by type in the RGGI-affected states. In 2012 and beyond, the projections exclude NJ, which is assumed to depart the program at the start of 2012.



Reference Case Projections

CO₂ Emissions

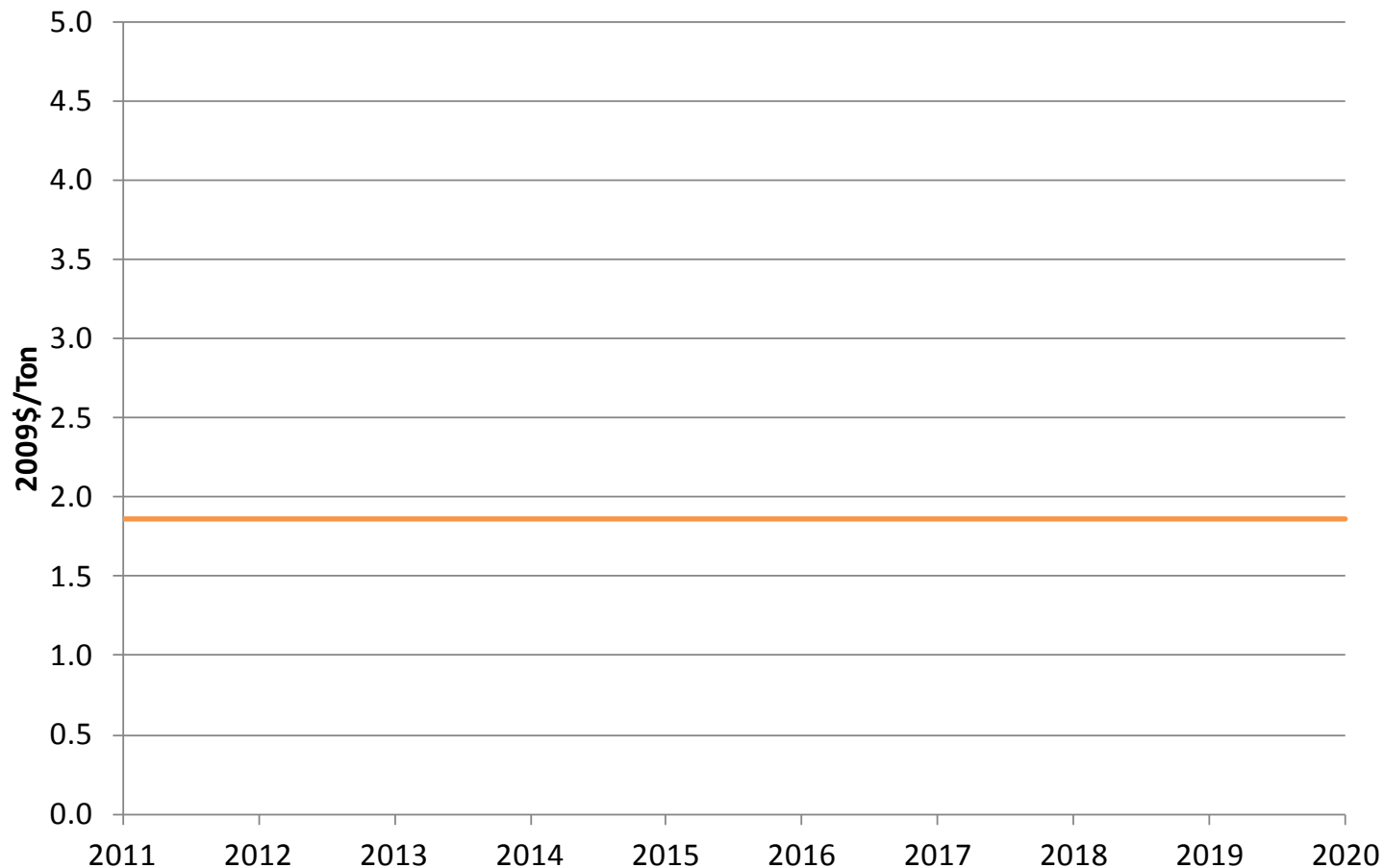
- The chart shows historical and projected CO₂ emissions for the RGGI states and by ISO.



Reference Case Projections

RGGI Allowance Price

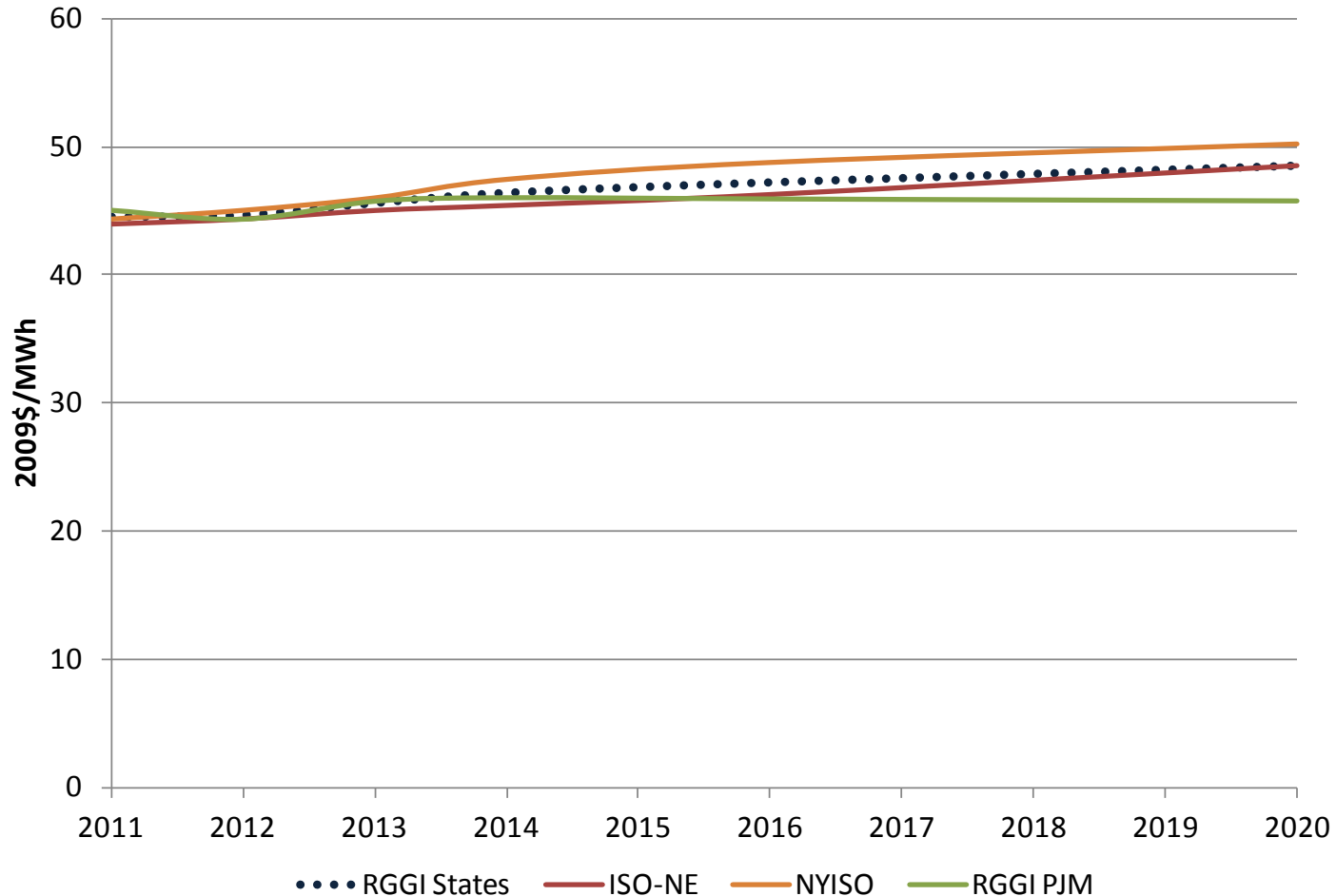
- RGGI emissions are projected to remain below the cap over the time horizon of the analysis, so the projected prices are set by the auction price floor.



Reference Case Projections

Wholesale Electricity Prices

- The chart shows projected weighted-average wholesale electricity prices* for the ISOs and the RGGI states as a whole. These prices are not indicative of a particular hub in each region but are instead an average of all the regions included in IPM.



* IPM also projects capacity prices by region, which are not included here.

RGGI Sensitivity Case Descriptions & Projections

DRAFT RGGI Sensitivity Case Specifications

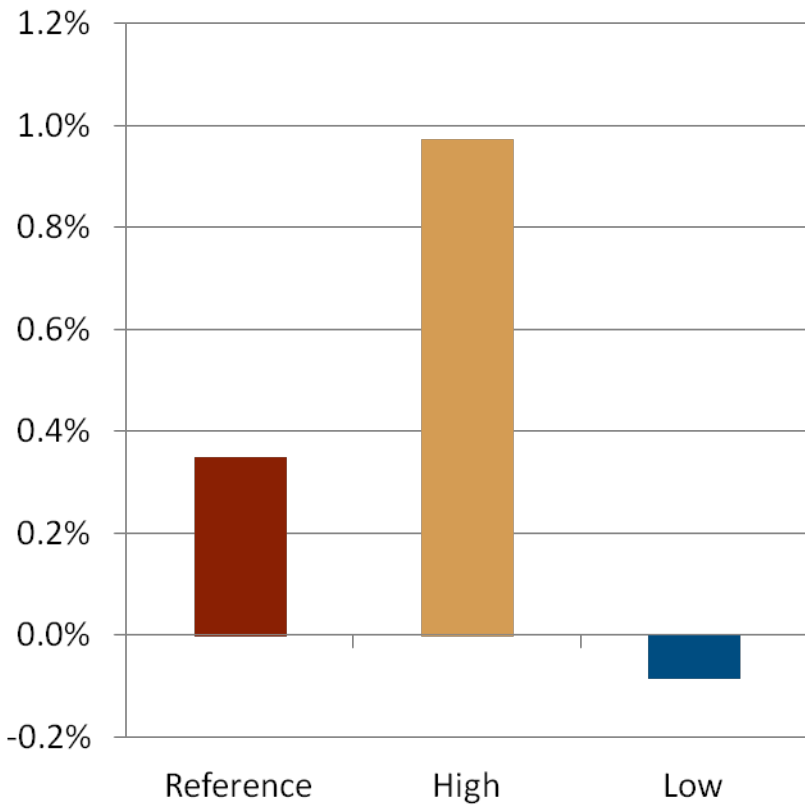
Load Growth Sensitivity Cases

Sensitivity Run (Run Label)	Objective	Assumptions
1. High Load Growth (High Load)	To understand the impact of higher electricity demand	<ul style="list-style-type: none"> • GDP growth rate of 2.5% (1990-2009) - associated projected load growth is 1.0% annually • 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 • Changes above estimated to result in average annual growth rate of 1.3% per year
2. Low Load Growth (Low Load)	To understand the impact of lower electricity demand	<ul style="list-style-type: none"> • State by state calculation of more aggressive EE targets than Reference Case (applied to new Reference Case demand levels)

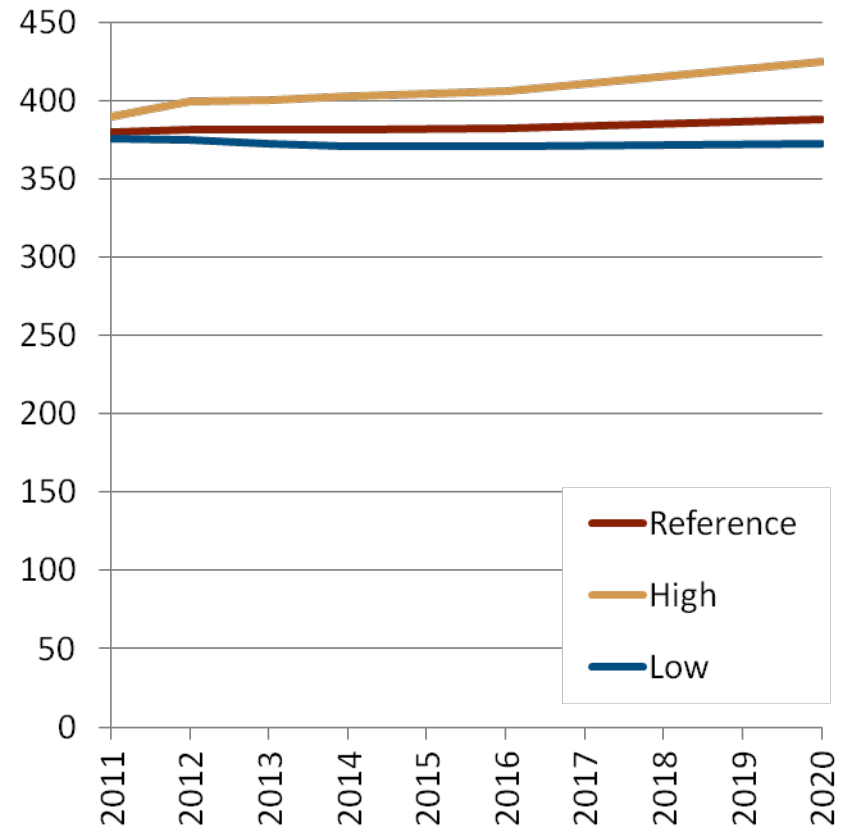
RGGI Electric Load Growth

Load Growth Sensitivity Cases

RGGI (9 state) Avg. Annual Growth Rate, 2011 to 2020



RGGI (9 state) Electric Load (Thous. GWh)



DRAFT RGGI Sensitivity Case Specifications

Fuel Price Sensitivity Cases

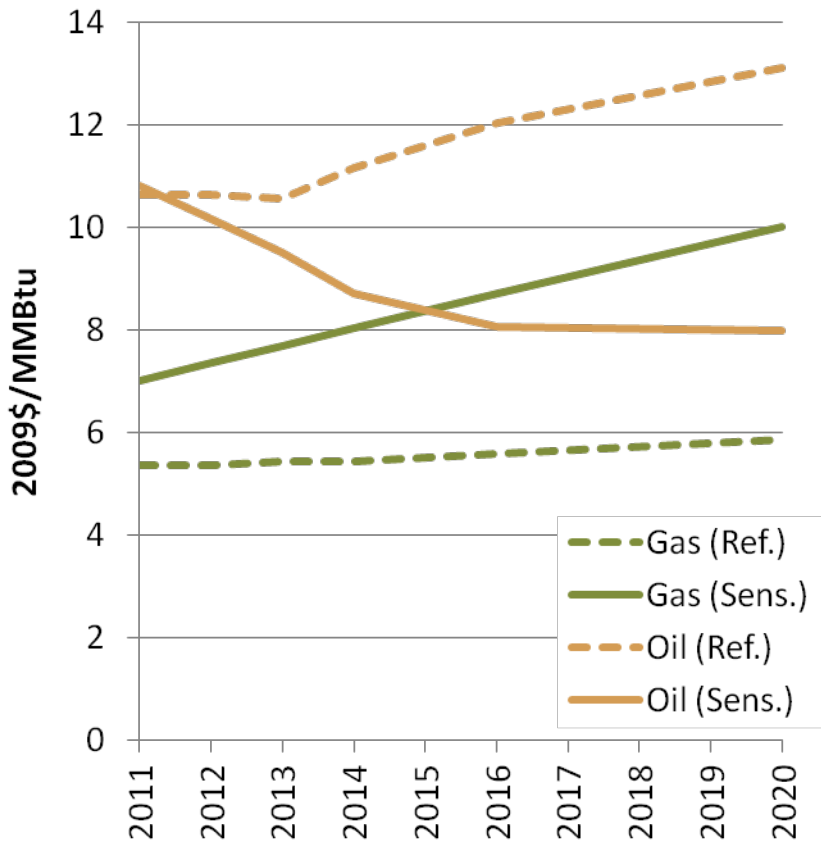
- These “what if?” sensitivity runs are designed to assess the impact of changes in oil, gas, and coal fuel prices relative to each other that are sufficiently large to cause one fuel to be substantially substituted for another, thereby resulting in significantly higher or lower CO₂ emissions. They are not intended to predict future fuel prices in accordance with any particular forecast, but rather to understand the order of magnitude of the potential impacts of trends in fuel prices that could be different from conventional expectations.

Sensitivity Run (Run Label)	Objective	Assumptions
3. Modified Oil/Gas Price Relationship (Oil/Gas)	To understand the impact of a change in the oil/gas price relationship that could result in substantial use of oil at dual fuel (oil/gas) units	<ul style="list-style-type: none"> Modified AEO Low Oil and High Gas (Low Shale Resource) cases such that delivered oil to RGGI falls below cost of delivered gas in 2016.
4. Modified Coal/Gas Price Relationship (Coal/Gas)	To understand the impact of a change in the coal/gas price relationship that could substantially impact the use of coal vs. gas generation in the marketplace	<ul style="list-style-type: none"> Use a delivered price differential where coal is \$1.50/MMBtu lower than gas, on average.

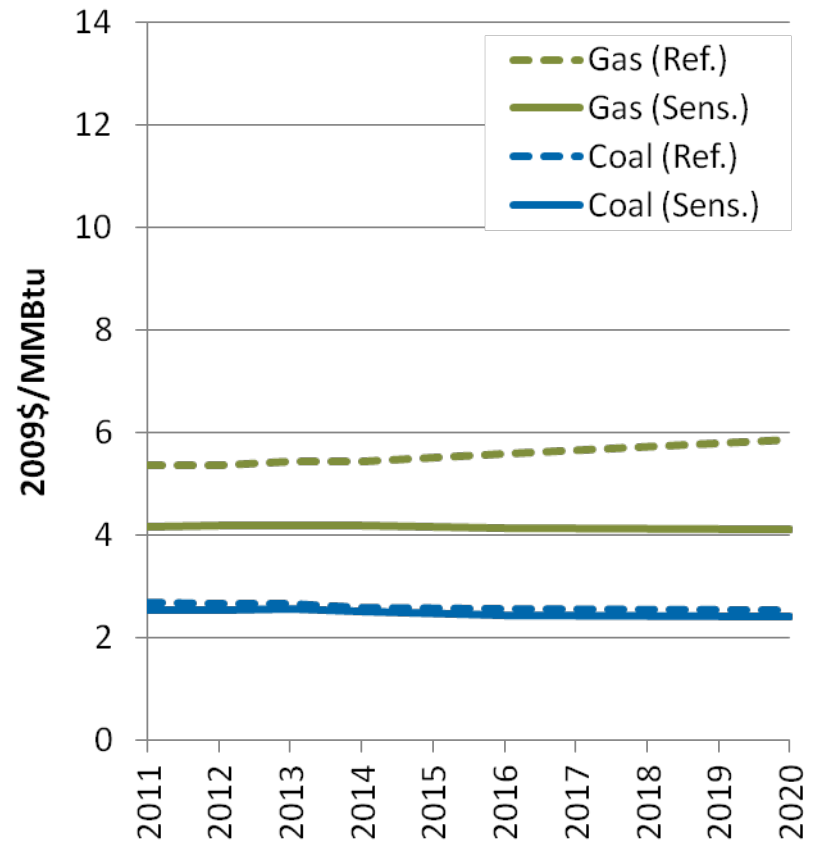
RGGI Delivered Fuel Prices

Fuel Price Sensitivity Cases

Oil/Gas Sensitivity Fuel Prices



Coal/Gas Sensitivity Fuel Prices



DRAFT RGGI Sensitivity Case Specifications

Emissions Combination Sensitivity Cases

Sensitivity Run (Run Label)	Objective	Assumptions
<p>5. High Emissions Combination (High Combo)</p>	<p>To understand how multiple factors may combine to increase emissions relative to the Reference Case</p>	<ul style="list-style-type: none"> • Electricity demand from High Load Sensitivity • Natural gas prices from Modified Oil/Gas Sensitivity • Do not include Cape Wind or Bluewater Wind projects • Lower renewable deployment by 50% • Do not include MAPP transmission line
<p>6. Low Emissions Combination (Low Combo)</p>	<p>To understand how multiple factors may combine to decrease emissions relative to the Reference Case</p>	<ul style="list-style-type: none"> • Electricity demand from Low Load Sensitivity • Natural gas prices from Modified Gas/Coal Sensitivity • New nuclear unit at Calvert Cliffs in 2020 • New nuclear unit at Hope Creek/Salem in 2020 • Vermont Yankee and Indian Point do not retire • Additional transmission in 2018 – 1,200 MW from Canada to New York City; 1,200 MW from Canada to New Hampshire; 600 MW from Maine to Boston

DRAFT RGGI Sensitivity Case Specifications

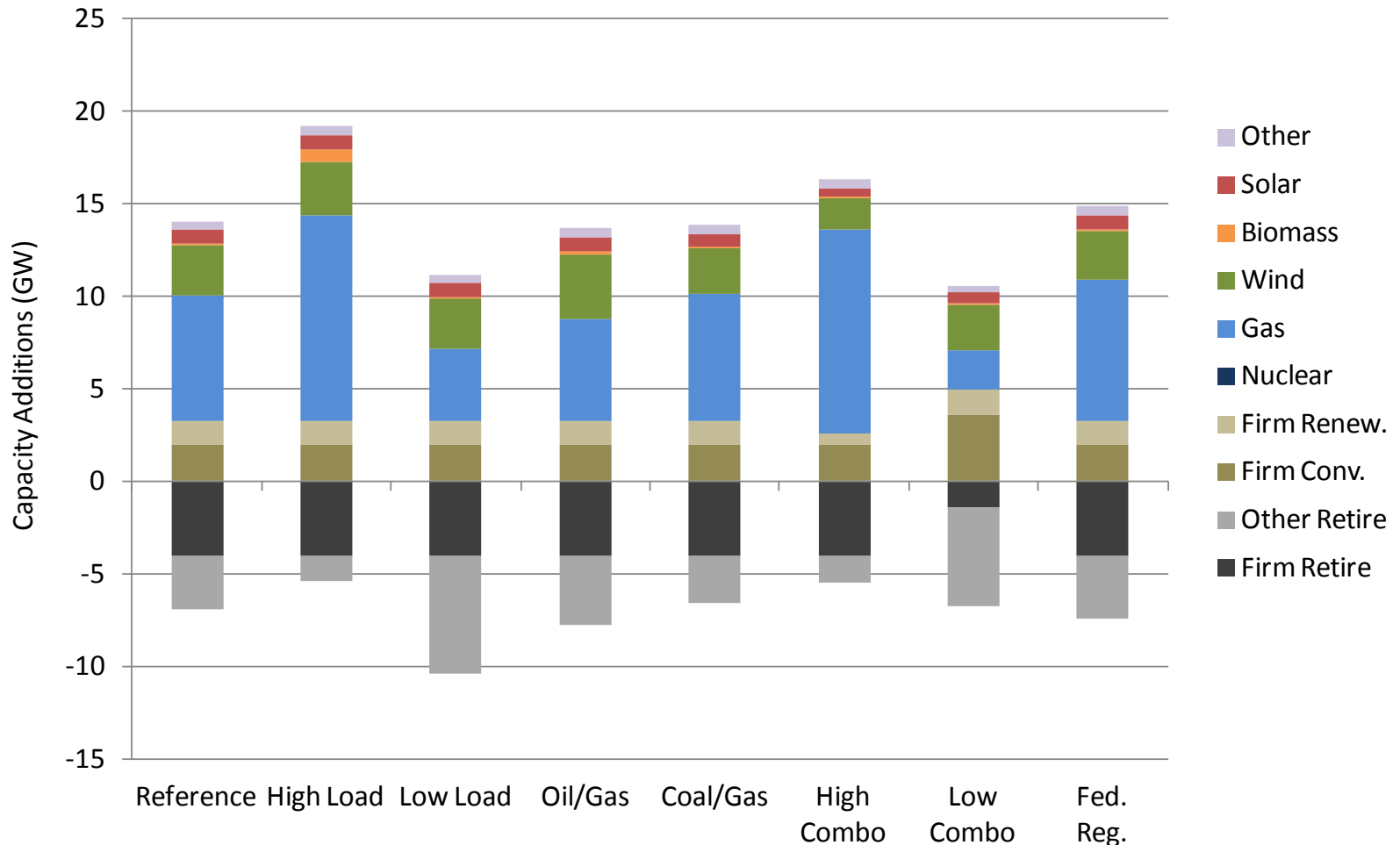
Federal Regulatory Sensitivity Case

Sensitivity Run (Run Label)	Objective	Assumptions
<p>7. Federal Regulatory Policy (Fed Reg.)</p>	<p>To understand the impact of new regulations under development by EPA on the generation mix and emissions</p>	<p><u>Hazardous Air Pollutants (HAPs)</u></p> <ul style="list-style-type: none"> Coal units must have in place scrubber, SCR, ACI and fabric filter by 2015. Oil/gas steam units are required to install a fabric filter, but will continue to meet minimum run requirements. <i>Note that Reference Case includes national 90% mercury reduction requirement starting in 2015.</i> <p><u>Water Intake-316(b)</u></p> <ul style="list-style-type: none"> Assume that all steam units (coal, nuclear, and oil/gas) that currently rely on once-through cooling must install a cooling tower by 2018. Cooling tower costs based on NERC 2010 Special Reliability Scenario Assessment (\$240 - \$300 per gallon per minute) State modifications to NERC cost data for individual plants <p><u>Coal Combustion Residuals (CCR, ash)</u></p> <ul style="list-style-type: none"> Plants with surface impoundments must convert to dry ash handling EOP Group 2009 report cost data (also referred to in the NERC 2010 study) Compliance date of 2015 <p><u>Ozone NAAQS</u></p> <ul style="list-style-type: none"> New NAAQS standards are met with the SCR control requirement included in the HAPs compliance assumption.

RGGI Cumulative Capacity Changes by 2020

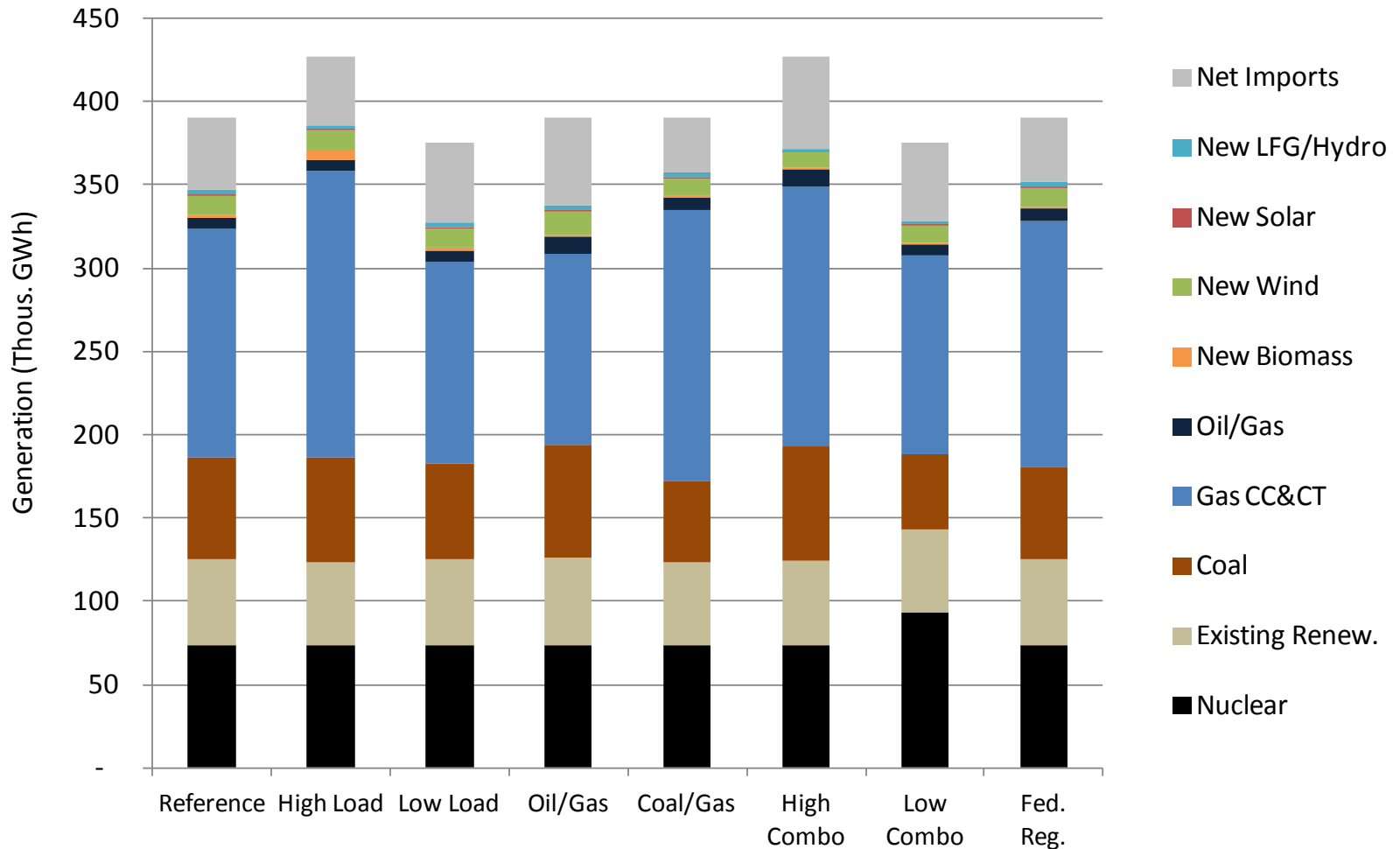
Reference Case and Sensitivity Cases

- The chart shows total firmly planned (“Firm”) and economic capacity additions by type and total retirements projected by IPM.



RGGI Generation Mix in 2020

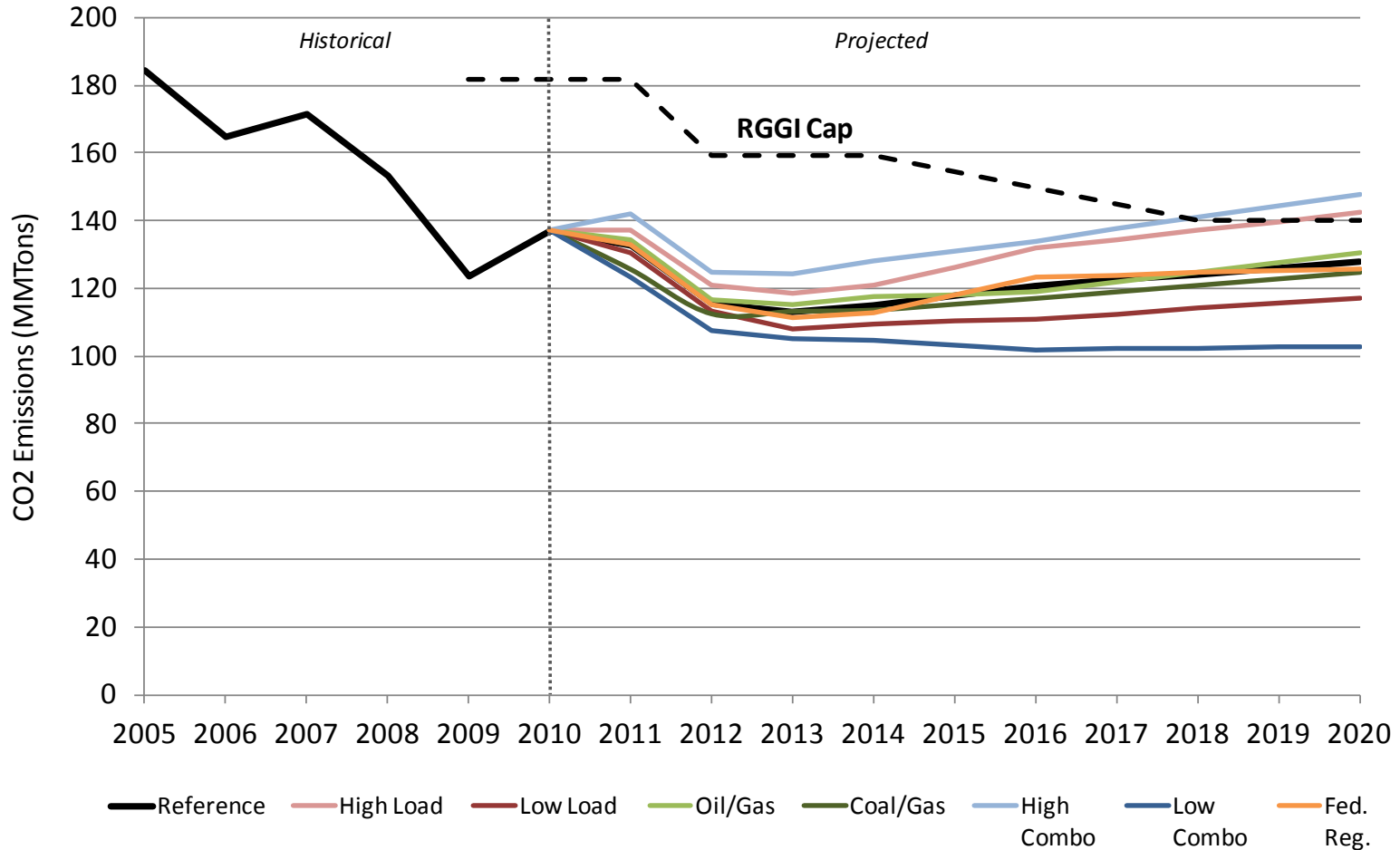
Reference Case and Sensitivity Cases



RGGI CO₂ Emissions

Reference Case and Sensitivity Cases

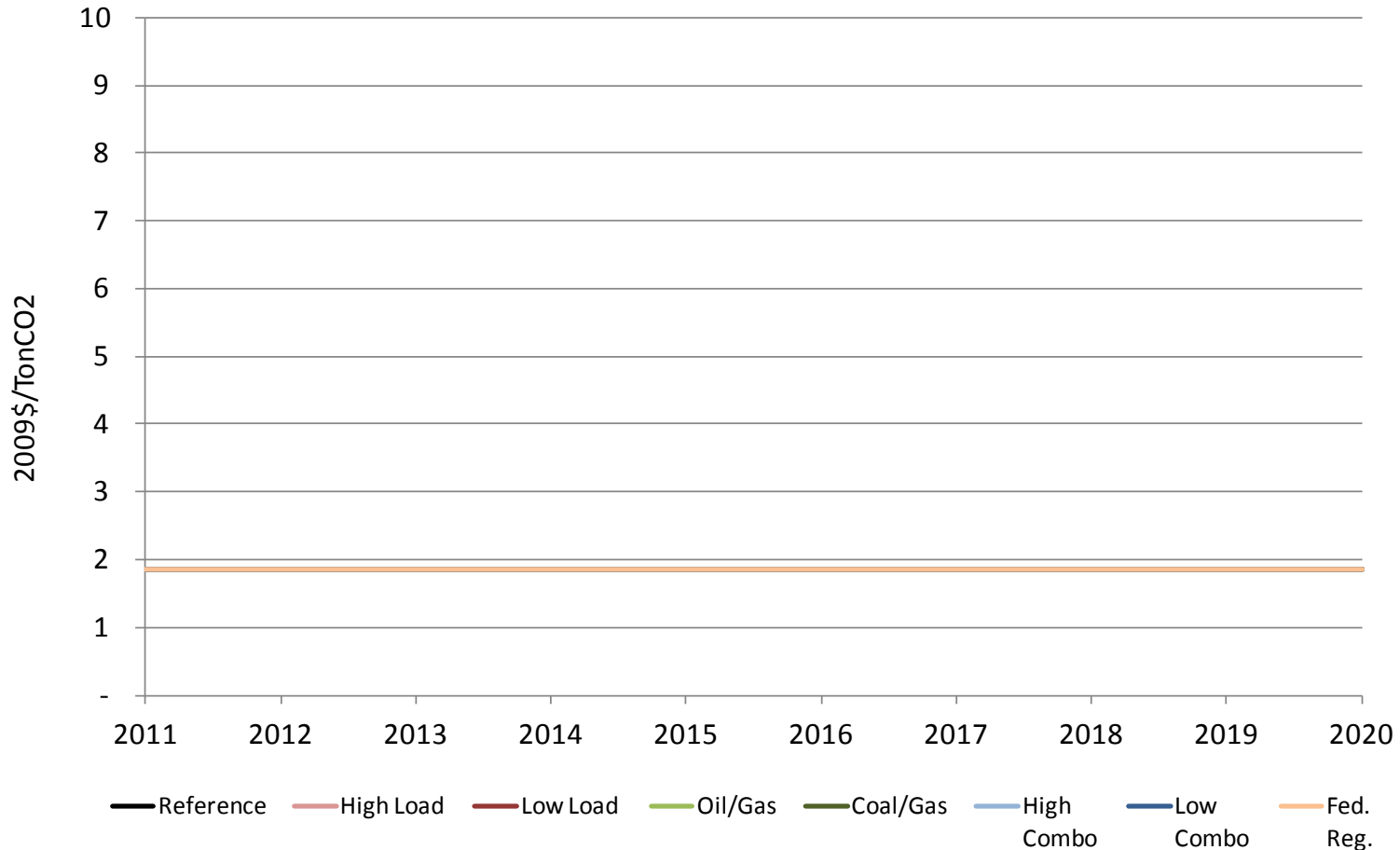
- The chart shows historical and projected CO₂ emissions for the RGGI states.



RGGI Allowance Price

Reference Case and Sensitivity Cases

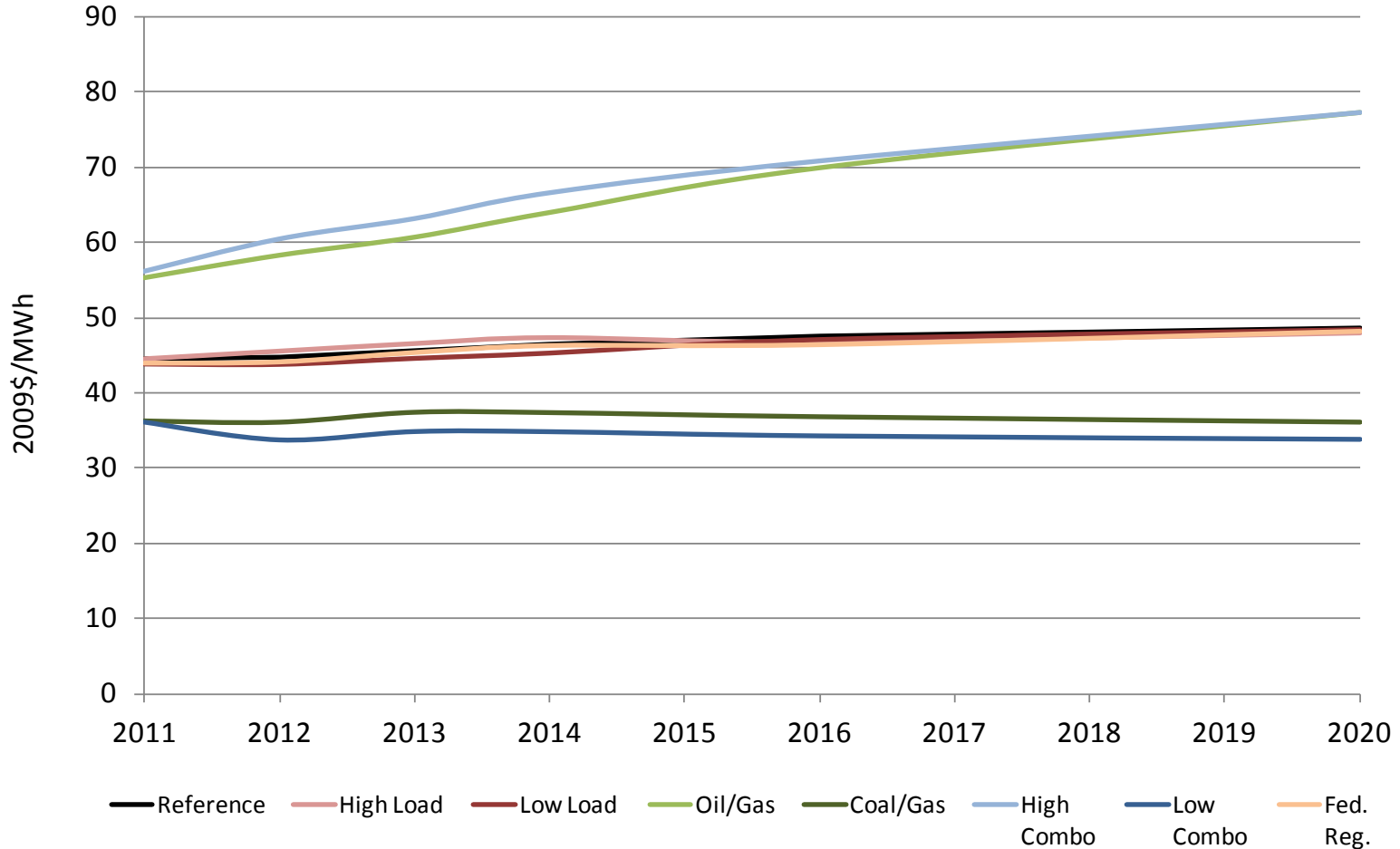
- RGGI emissions are projected to remain below the cap in most cases over the time horizon of the analysis, so projected prices in those cases are set by the auction price floor. Cases with emissions that exceed the cap in some years carry a sizable enough bank into those years to keep the price at the auction floor.



Wholesale Electricity Prices

Reference Case and Sensitivity Cases

- The chart shows projected weighted-average wholesale electricity prices* for the RGGI states as a whole. These prices are not indicative of a particular hub in the RGGI region but are instead an average of all the RGGI states.



* IPM also projects capacity prices by region, which are not included here.