# RGGI

# Electricity Sector Modeling Results

## *Updated Reference and RGGI Package*

**August 30, 2005**

**ICF Consulting**
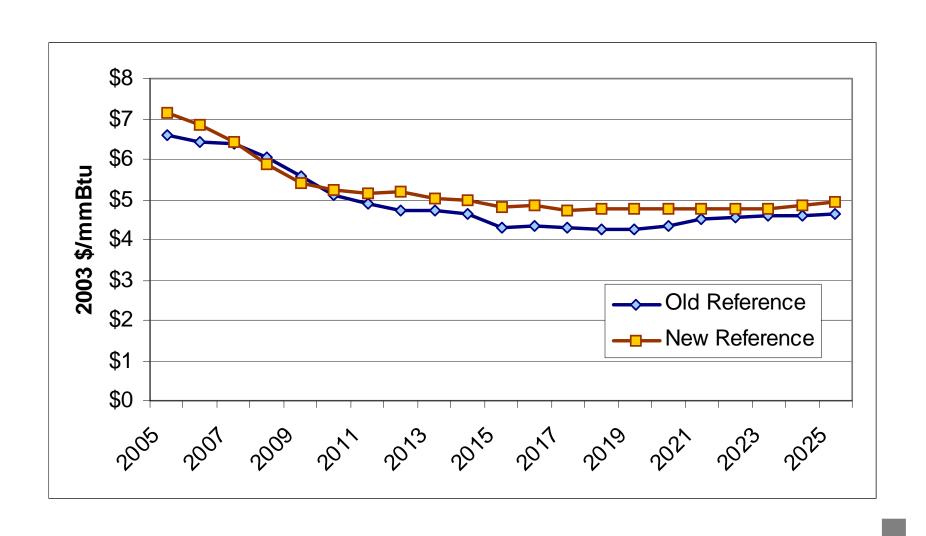
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# Outline

➤ RGGI Reference Case: New v. Old

- Changes

- Results

➤ RGGI Policy Scenarios

- Carbon Cap Only

- RGGI Package Scenario

- Package Scenario with US/Canada Policies

# RGGI Reference Case
## New v. Old

# New v. Old Reference Case - Changes

➢ Three categories of changes were made to the original February RGGI Reference Case to arrive at the updated August Reference Case:

- Assumptions updates to take advantage of more recent fuel market projections

- Near-term calibration measures to bring 2006 model projections more in-line with recent market experience

- Capacity market adjustments

➢ Updated gas price trajectory

- Natural gas prices have been updated to reflect more recent work by EEA in the short term and AEO 2005 in the long term.

- The change increased 2006 gas prices relative to the original Reference Case and resulted in mid- to long-term gas prices (2010-2024) averaging 7.5% higher ($4.89/MMBtu v. $4.55/MMBtu, in year 2003 dollars).

- Oil prices were adjusted proportionally
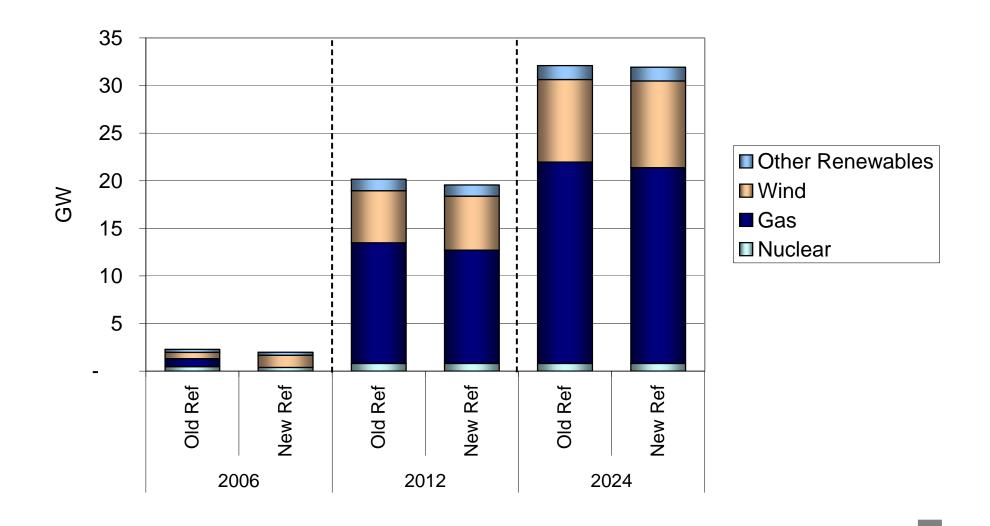
# New v. Old Reference Case Natural Gas Prices
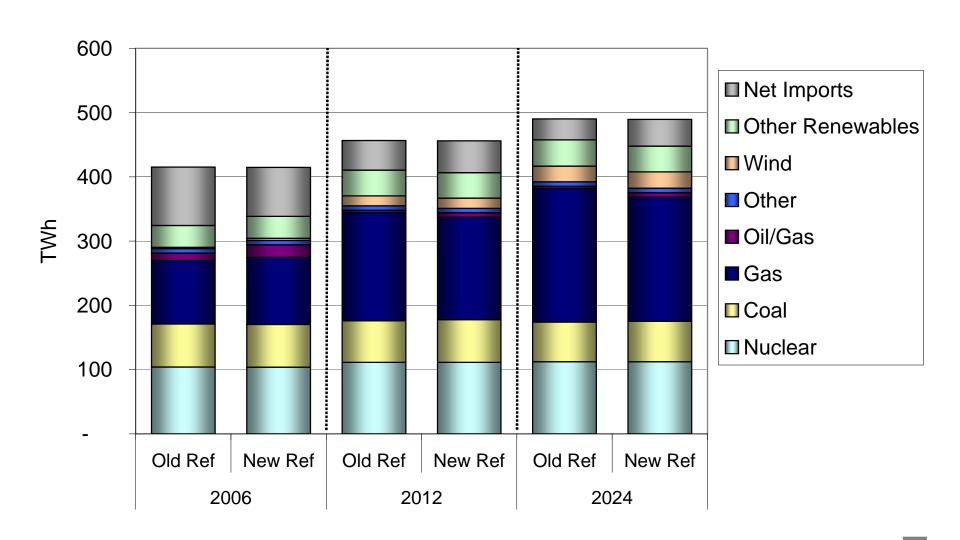
# New v. Old Reference Case - Changes

➢ Near-term Calibration

- Calibrated near-term oil/gas steam generation

  - Near term oil/gas steam generation in New York and the RGGI region has been calibrated to approximate recent historical levels.

  - 5-year average historical levels were used as a starting point and prorated for the 2006, 2009 and 2012 run years.

  - In 2015 and beyond specific units are required to run at minimum levels during summer to meet specific reliability requirements and all oil/gas units are required to run for a minimum of 2 months during the winter.

- Calibrated near-term transmission flows into the RGGI region

  - More closely represent 5-year average historical levels in the short term.

  - Flows were calibrated for flows from Canada and PJM West into RGGI.

  - The constraints affect only the 2006 and 2009 run years and are phased out by 2012.

- Capacity Market Adjustments

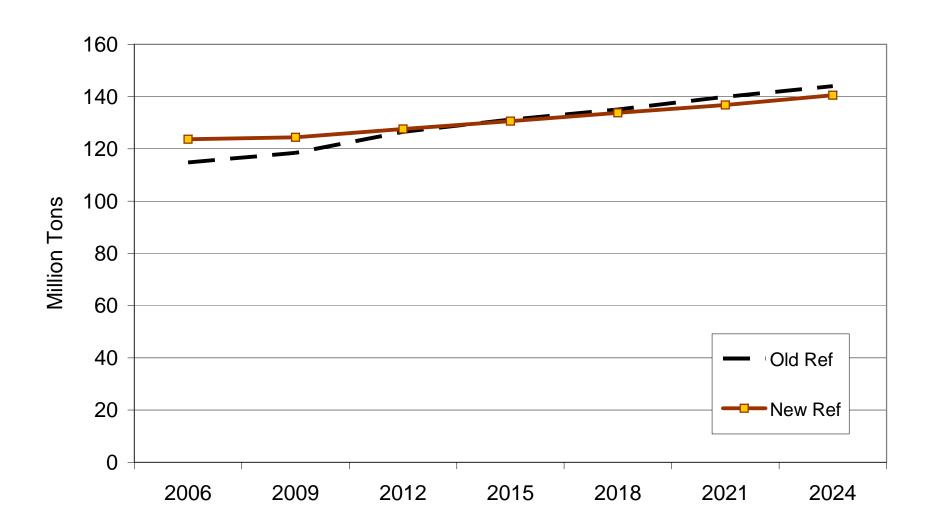  - More closely represent New York's upstate capacity market

# RGGI Cumulative Capacity Additions
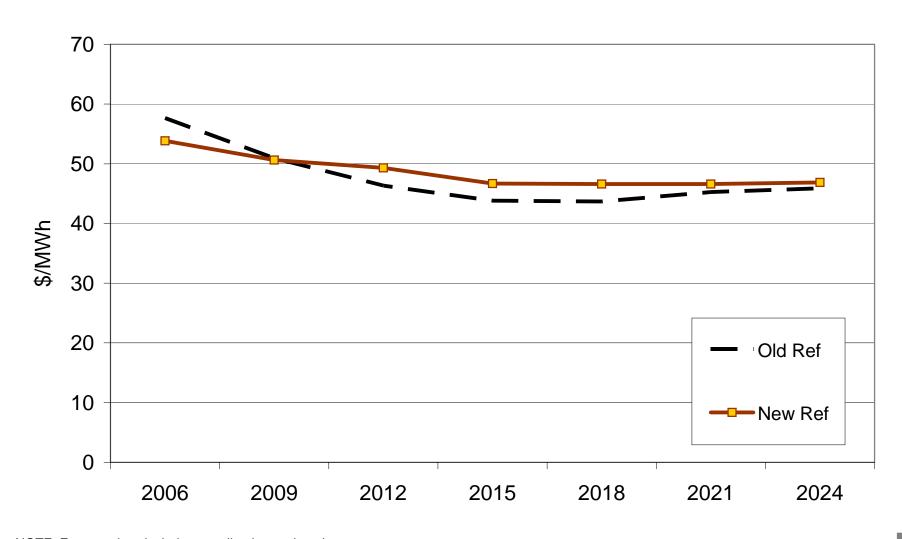## New Reference v. Old Reference
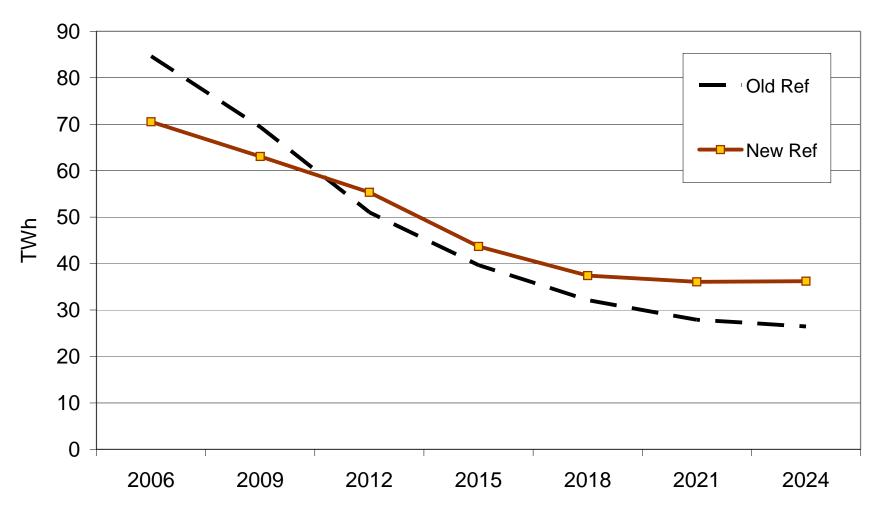
# RGGI Generation Mix
## New Reference v. Old Reference

# CO$_2$ Emissions
## New Reference v. Old Reference

# RGGI Average Annual Energy Prices
## New Reference v. Old Reference



NOTE: Energy prices include annualized capacity prices.

# RGGI Net Imports
## New Reference v. Old Reference



Note: Net imports have been adjusted to account for losses
and now represent the actual energy served by imports.

# RGGI Package Scenario
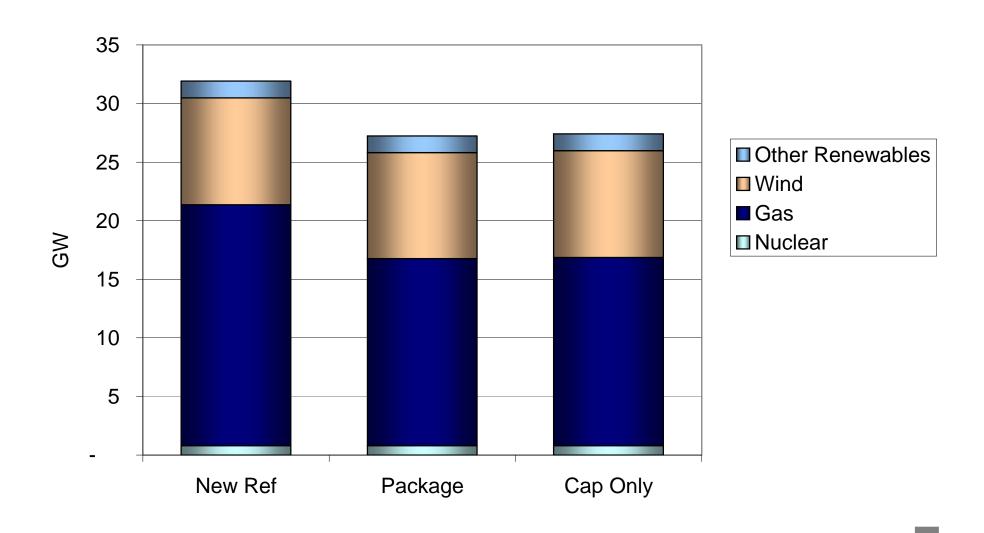## compared to updated *Reference Case*

# Package Scenario

➤ The Package Scenario presented here is based on the new RGGI Reference Case and includes the following:

- $CO_2$ Policies – Phased-in cap to 2020 (see table below), With or Without US and Canada National Programs

  - US Policy assumes stabilization at projected 2015 levels starting in 2015

  - Canada Policy assumes stabilization at projected 2008 levels starting in 2008

- Offsets – Combined RGGI and CDM Offset Curves, Limited to 50% of Required Reductions

- End Use Efficiency – Technology costs, load shapes, load factors, and potential supply by sector are based on data provided by ACEEE.  Program costs to implement measures are based on average of RGGI states' actual expenditures through 2004 to implement public benefit programs.  The Package Scenario assumes that current levels of annual state expenditures for public benefit programs continue through 2025.
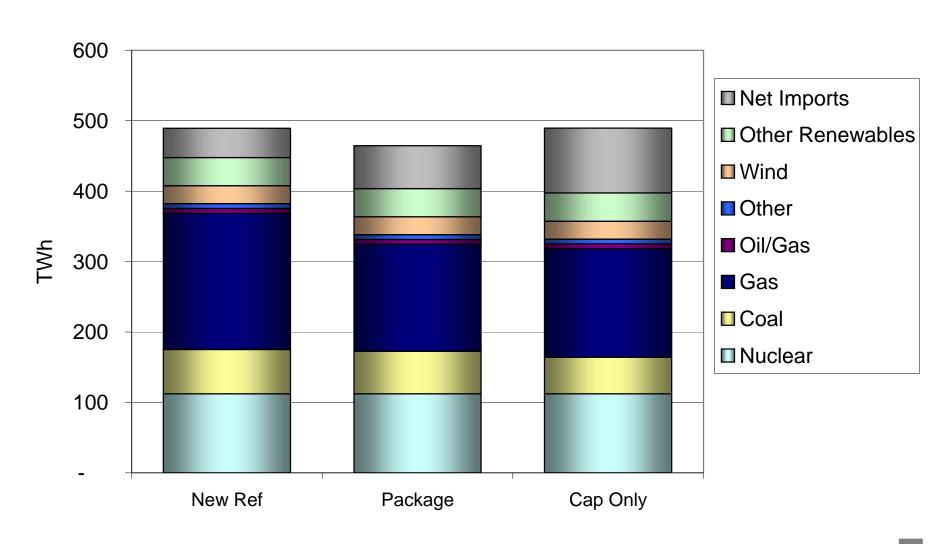
# Package Scenario Emissions Cap

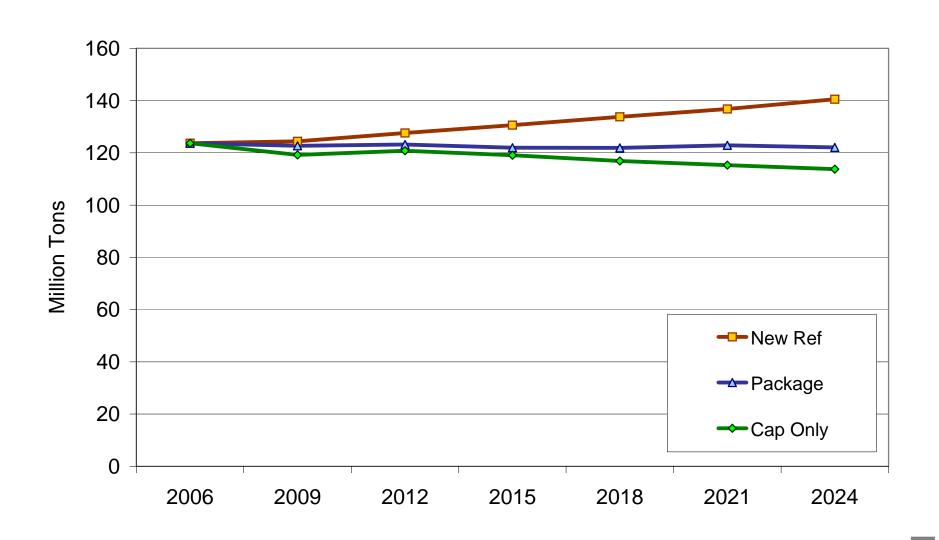| | Emissions/Cap (Million Tons $CO_2$) | |
|---|---|---|
| | **Reference Case** | **Package Cap** |
| 2006 | 123.7 | |
| 2009 | 124.4 | 123.7 |
| 2012 | 127.6 | 123.7 |
| 2015 | 130.7 | 120.2 |
| 2018 | 133.8 | 114.9 |
| 2021 | 136.8 | 111.3 |
| 2024 | 140.5 | 111.3 |

# RGGI Cumulative Capacity Additions by 2024

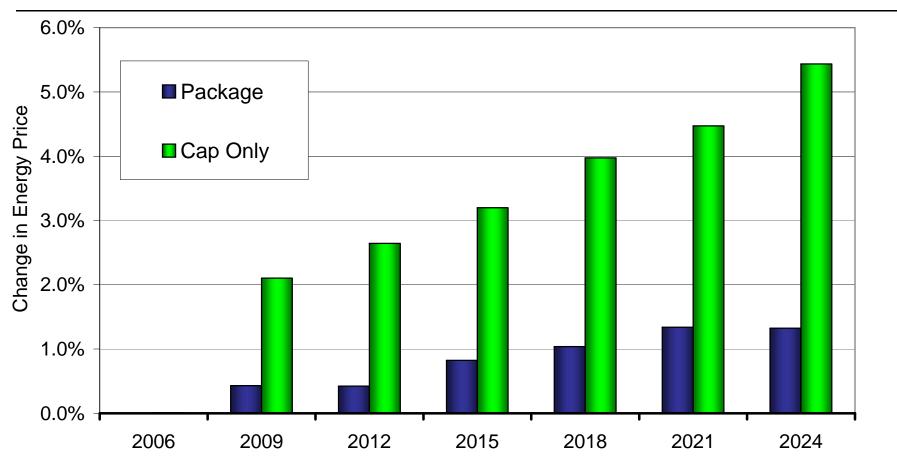# RGGI Generation Mix in 2024

# CO$_2$ Emissions Trajectories

# CO$_2$ Allowance Prices

# RGGI Average Annual Energy Prices
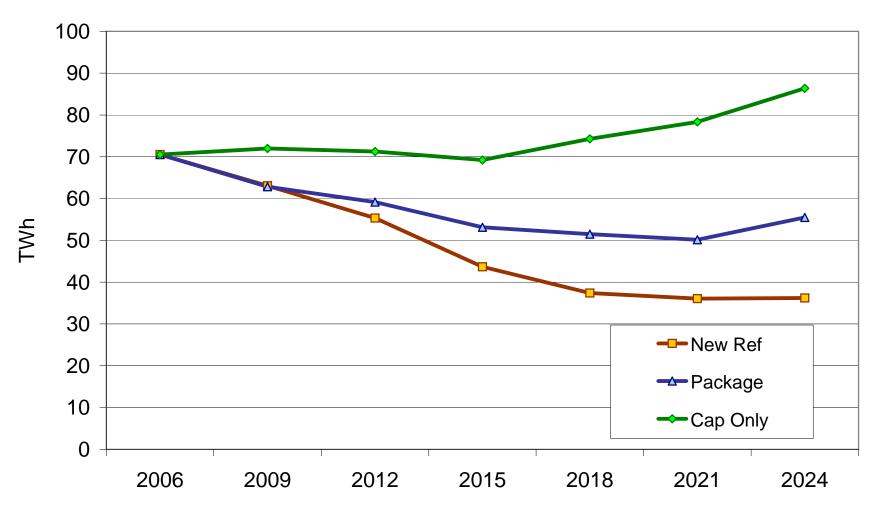


NOTE: Energy prices include annualized capacity prices.

# Change in RGGI Average Annual Energy Prices



NOTE: Energy prices represent wholesale market prices and include annualized capacity prices. Note that the RGGI Package Scenario assumes that current levels of annual state expenditures for public benefit programs continue through 2025. While these types of programs cause lower wholesale prices by reducing electricity demand, they are paid for by consumers through a line item charge at the retail level, and are therefore not reflected in the wholesale price changes shown above. Current retail electricity prices already include the annual costs of these programs.
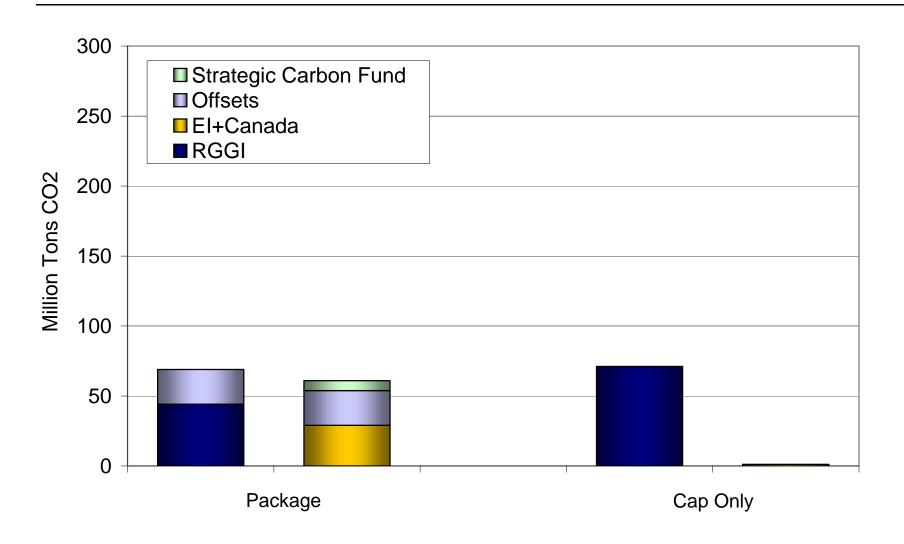
While the modeling assumes that end-use energy efficiency is implemented entirely by public benefit programs, it is recognized that energy efficiency could also be implemented by actions such as appliance standards and building codes that do not require state funding and could possibly be done at lower costs.
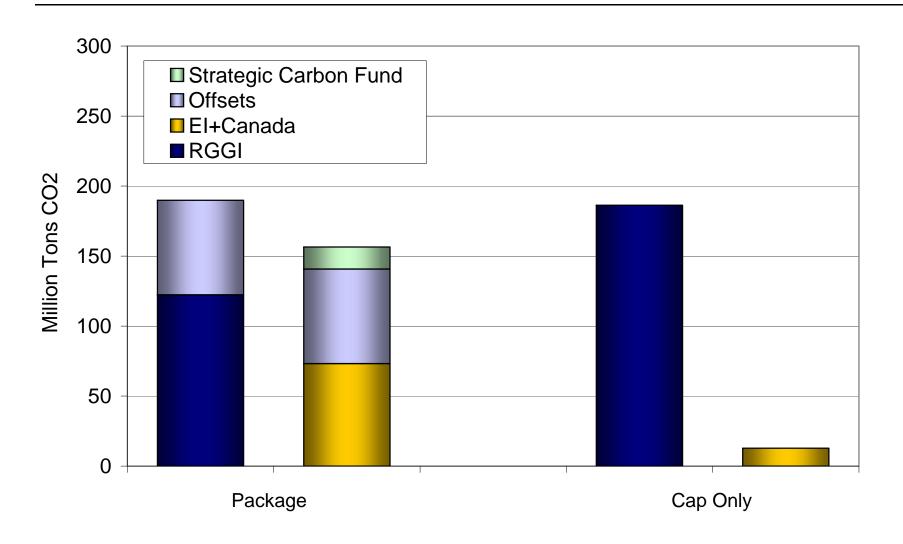
# RGGI Net Imports



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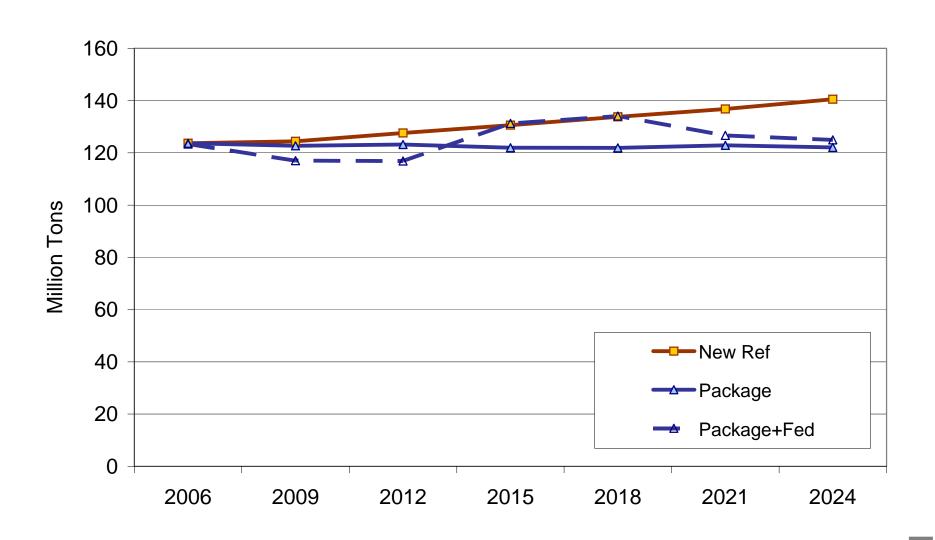# Cumulative CO$_2$ Reductions by 2015
## RGGI and Eastern Interconnect/Canada

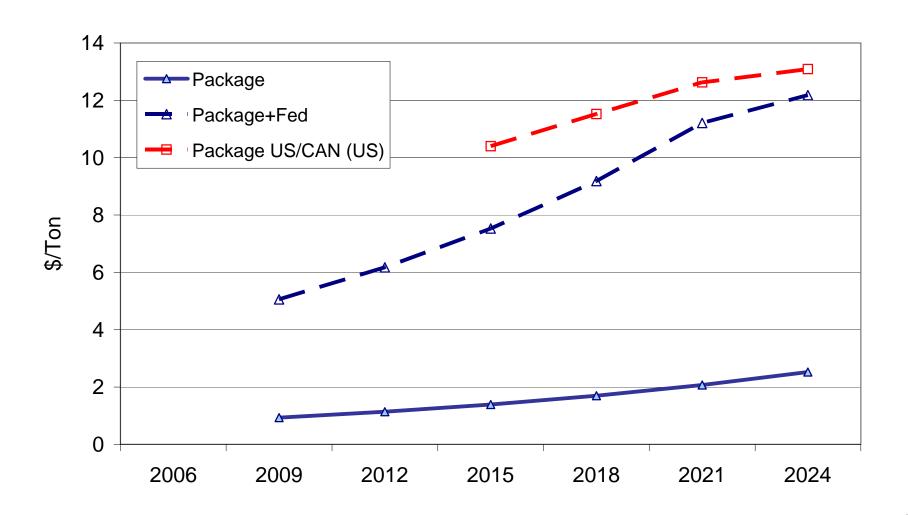# Cumulative $CO_2$ Reductions by 2021
## RGGI and Eastern Interconnect/Canada
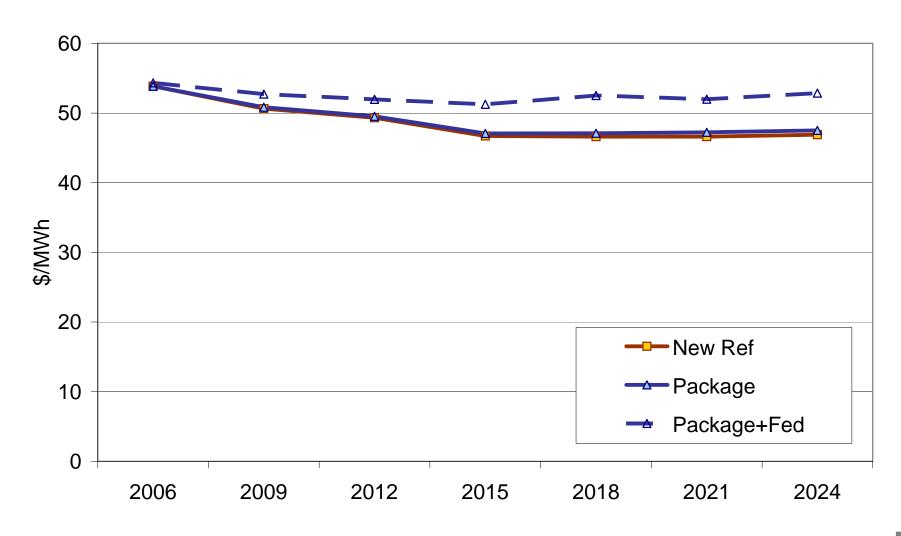
# Package Scenario with US/Canada Policies
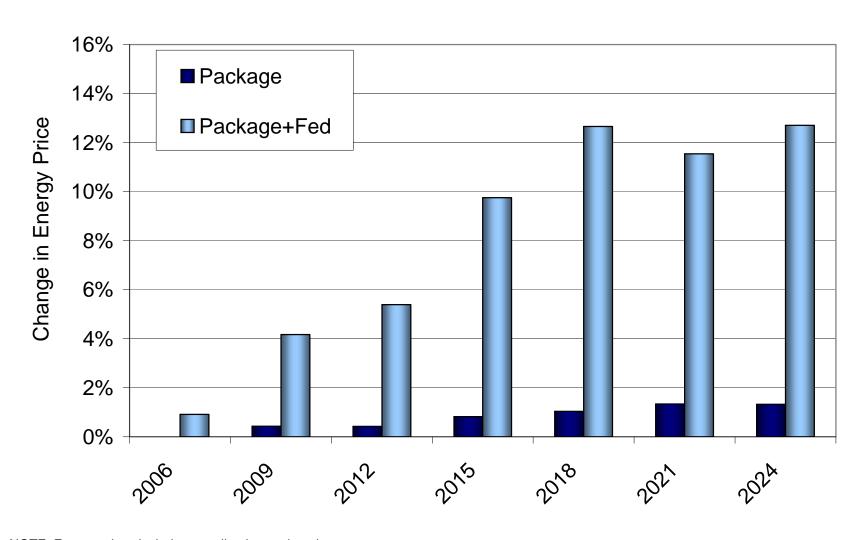
# CO$_2$ Emissions Trajectories

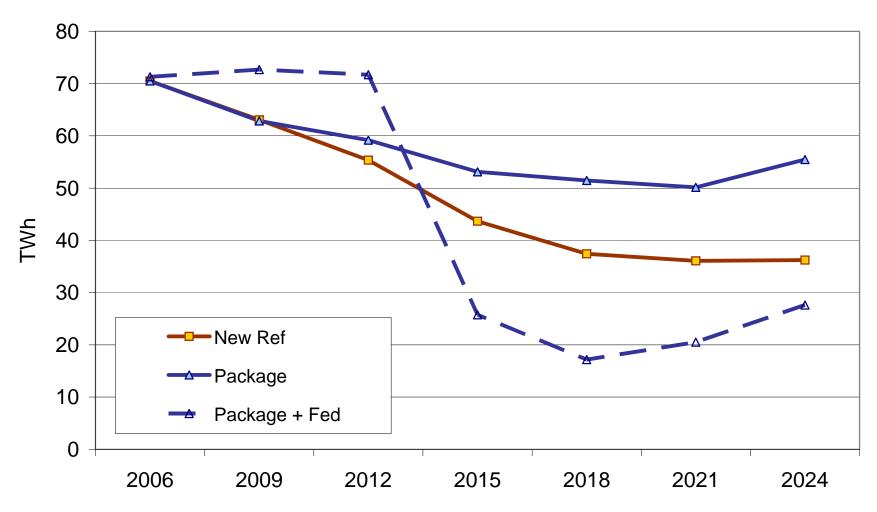# CO$_2$ Allowance Prices

# RGGI Average Annual Energy Prices



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# Change in RGGI Average Annual Energy Prices



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# RGGI Net Imports



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