



Synapse
Energy Economics, Inc.

Highlights of AESC 2011 Report

Presentation for the MA EEAC
September 9, 2011

- Benefits incorporated in cost effectiveness evaluation in Massachusetts include avoided energy supply costs (energy, capacity, price suppression effects, natural gas costs, other fuels costs, transmission and distribution costs). See May 2011 EEAC presentation on Total Resource Test.
- If a program's avoided costs exceed the program's costs, then it is considered cost-effective.
- Every two years, New England energy efficiency program administrators engage a contractor to develop avoided energy supply costs components (energy, capacity, price suppression, natural gas costs, and other fuel costs) for use in determining cost-effectiveness.

AESC 2011: Study Sponsors and Participants



Non-Sponsoring Participants

- CT Energy Efficiency Board
- MA Department of Public Utilities
- MA Department of Energy Resources
- MA Attorney General
- MA Energy Efficiency Advisory Council
- MA Low-Income Energy Affordability Network
- NH Public Utilities Commission
- RI Division of Public Utilities and Carriers

nationalgrid



Northeast Utilities System



The United Illuminating Company



AESC 2011 Process

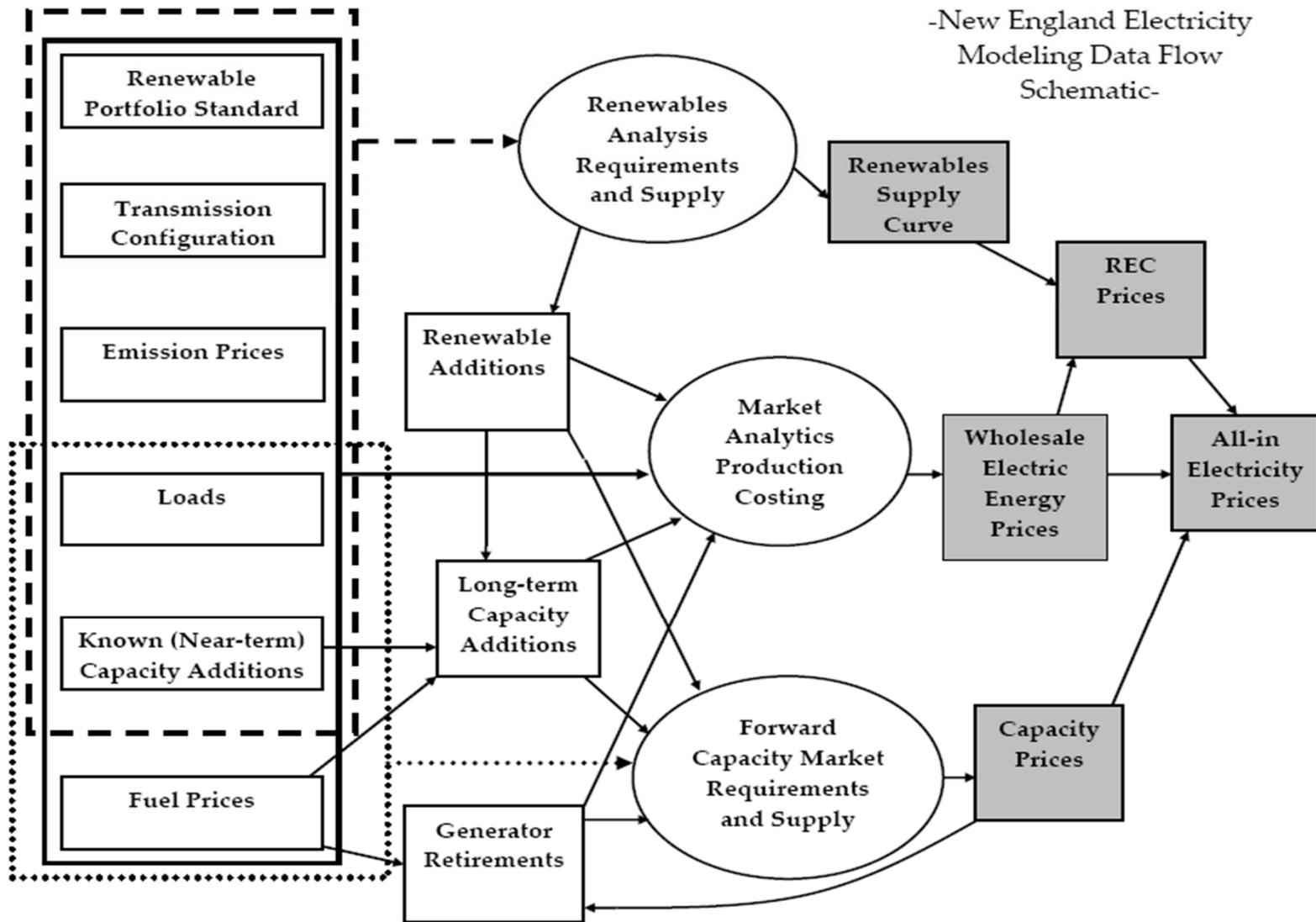
- Draft deliverables sent to Study Group for review followed by discussion
- Deliverables and summary notes posted onto internal Study Group website

Event / Task / Deliverable	Version/ Action	Date
Contract Award		February 16
1. Electronic communication protocol	Draft	Tuesday, February 22
2. Proposed schedule of deliverables / meetings		
Common modeling assumptions		
Kickoff Meeting with Study Group	Discussion	Thursday, February 24
Follow-up Discussion (Common Modeling Assumptions)	Discussion	Tuesday, March 1 at 2:30 PM
3. Electric forecast assumptions	Draft	Friday, March 25
4. Gas forecast background		
5. Sector-Specific Fuel Oil Forecast – electric generation component		
	Discussion	Friday, April 1 at 1:30 PM
7A. New England basic electric avoided cost forecast	Draft	Friday April 22
7B. Zonal basic electricity avoided cost forecasts		
	Discussion	Thursday, April 28 at 10 AM
7C. Avoided Energy Supply Components	Draft	Friday May 6
	Discussion	May 11 at 10 AM
5. Sector-Specific Fuel Oil Forecast	Draft	Friday May 13
6. Gas Avoided Costs (retail)		
9. Other Fuels Forecast (residential heating)		
	Discussion	Wednesday, May 18 at 10 AM
Clean-up Discussion	Discussion	Wednesday, May 25 at 10 AM
8. Scenario Analyses	Draft	Friday, May 27
	Discussion	Wednesday, June 1 at 10 AM
10. Usage Instructions	Draft	Friday, June 3
11. Draft Final Report		
11. Presentation	Discussion	Monday, June 13 at 1 PM
11. Final Report	Draft	Thursday June 23
	Final	July 8

Topics Analyzed in AESC 2011

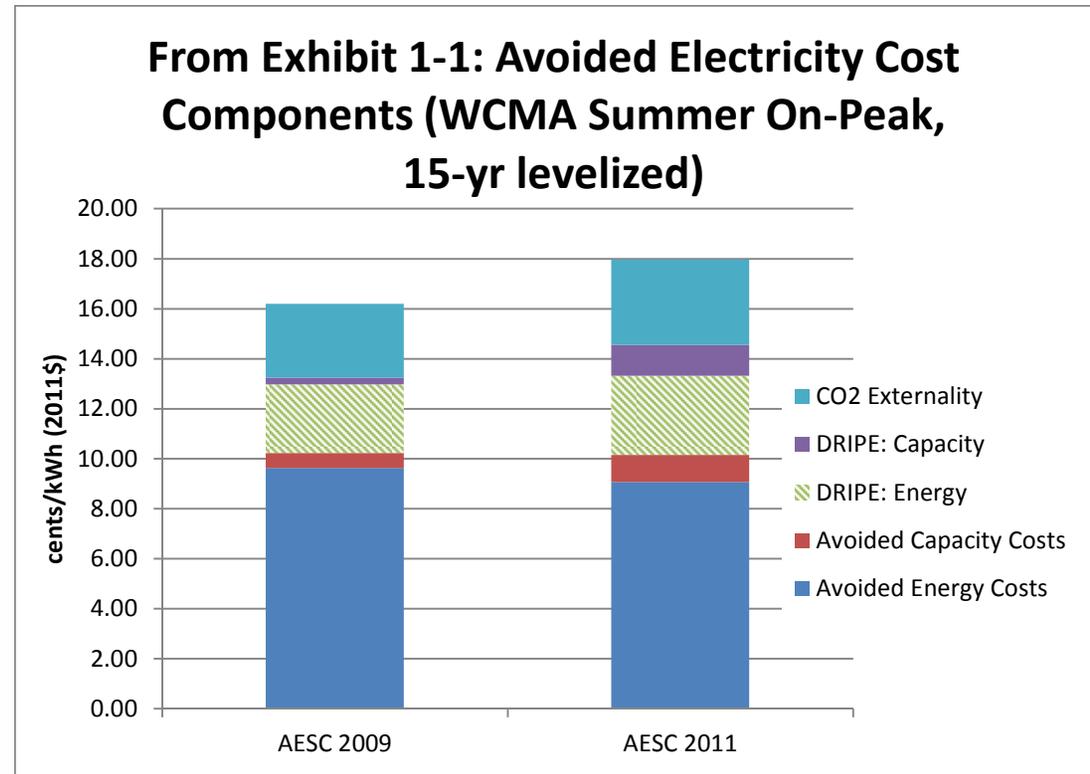
- Methodology and Assumptions
 - Load Growth
 - Emission Allowances
 - Transmission
 - Retirements
 - New Additions
 - Renewable Portfolio Standards
- Wholesale Natural Gas Prices
- Avoided Natural Gas Costs
- Forecast of New England Regional Oil Prices and Avoided Cost of Other Fuels by Sector
- Regional Electric Energy Supply Prices Avoided by Energy Efficiency
 - Forward Capacity Auction Prices
 - Avoided Electric Energy Costs
 - Demand Reduction Induced Price Effects: Capacity and Energy
 - Avoided Cost of Compliance with Renewable Portfolio Standards
 - Avoided Cost of CO₂ Emissions
- Sensitivity Analyses

Avoided Electricity Costs Schematic



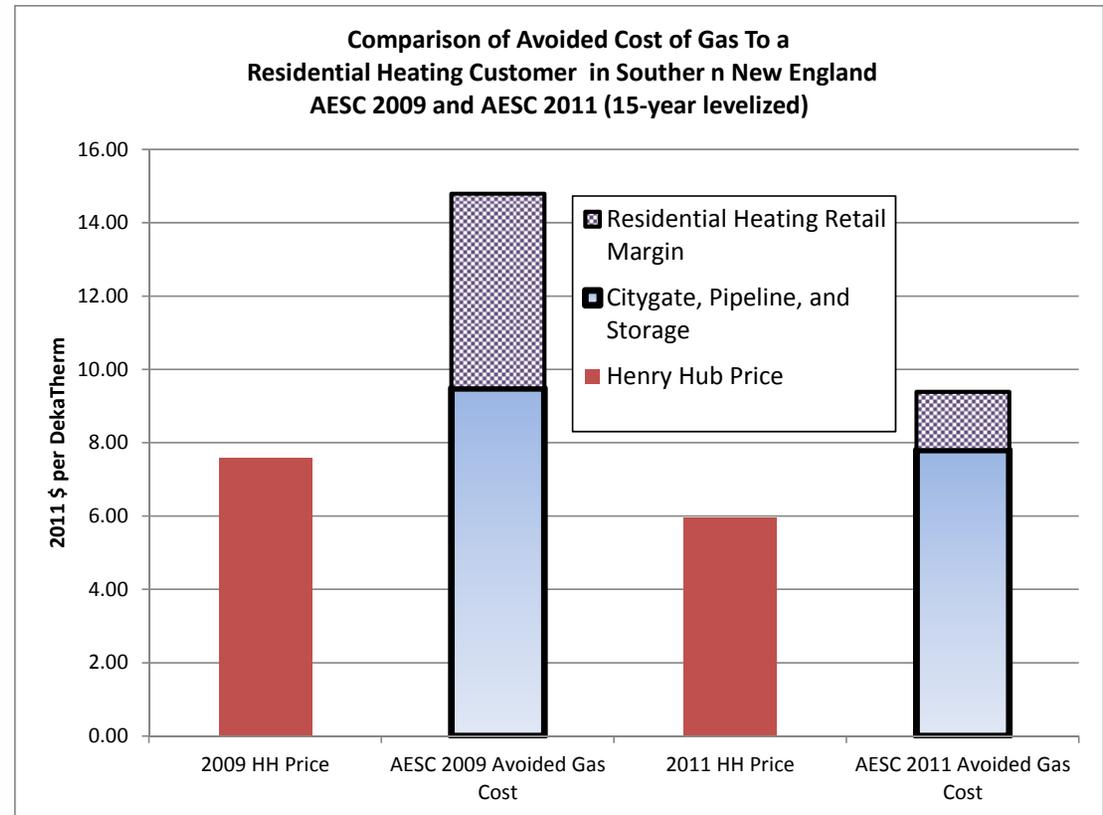
Avoided Cost of Electricity: Summary

- Lower natural gas prices
- Delay in federal regulation of CO₂ regulations
- Higher estimate of the value of capacity due to retirements
- Changes in energy DRIPE dissipation factor for new generation
- Changes in capacity DRIPE dissipation and higher capacity prices



Avoided Natural Gas Costs: Summary

- Lower Henry Hub price forecast
- Lower estimate of avoidable distribution costs (retail margin)





Carbon Dioxide: Internalized Component and Long-term Marginal Abatement Cost

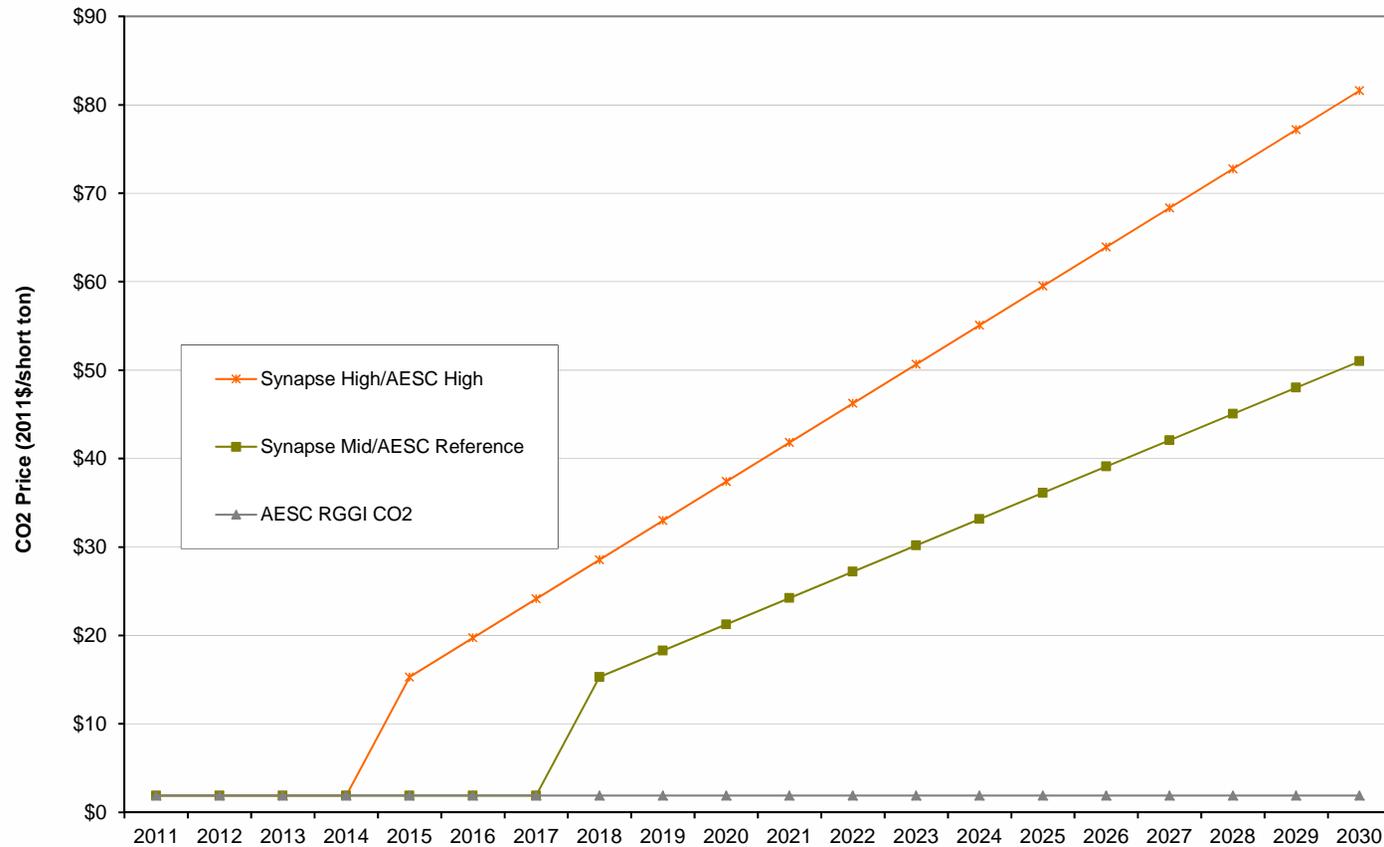


Carbon Dioxide: Internalized Component

Allowance Prices for Carbon Dioxide Internalized

- Emission allowance price forecasts for SO₂, NO_x, and CO₂
- Price forecasts for SO₂ and NO_x based upon values from allowance futures markets and experience with existing regulations
- Price forecast for CO₂ assumes Regional Greenhouse Gas Initiative (RGGI) will be in effect in 2011 and will be replaced by national regulations for CO₂ in 2018.

Allowance Prices for Carbon Dioxide Internalized



Note: The AESC Reference and High Forecasts begin with the RGGI allowance price in 2011. The forecasts assume implementation of a federal cap-and-trade program, and use the Synapse Mid and High cases in 2018 and 2015.



Carbon Dioxide: Long-term Marginal Abatement Cost

Long-term Marginal Abatement Cost for Carbon Dioxide

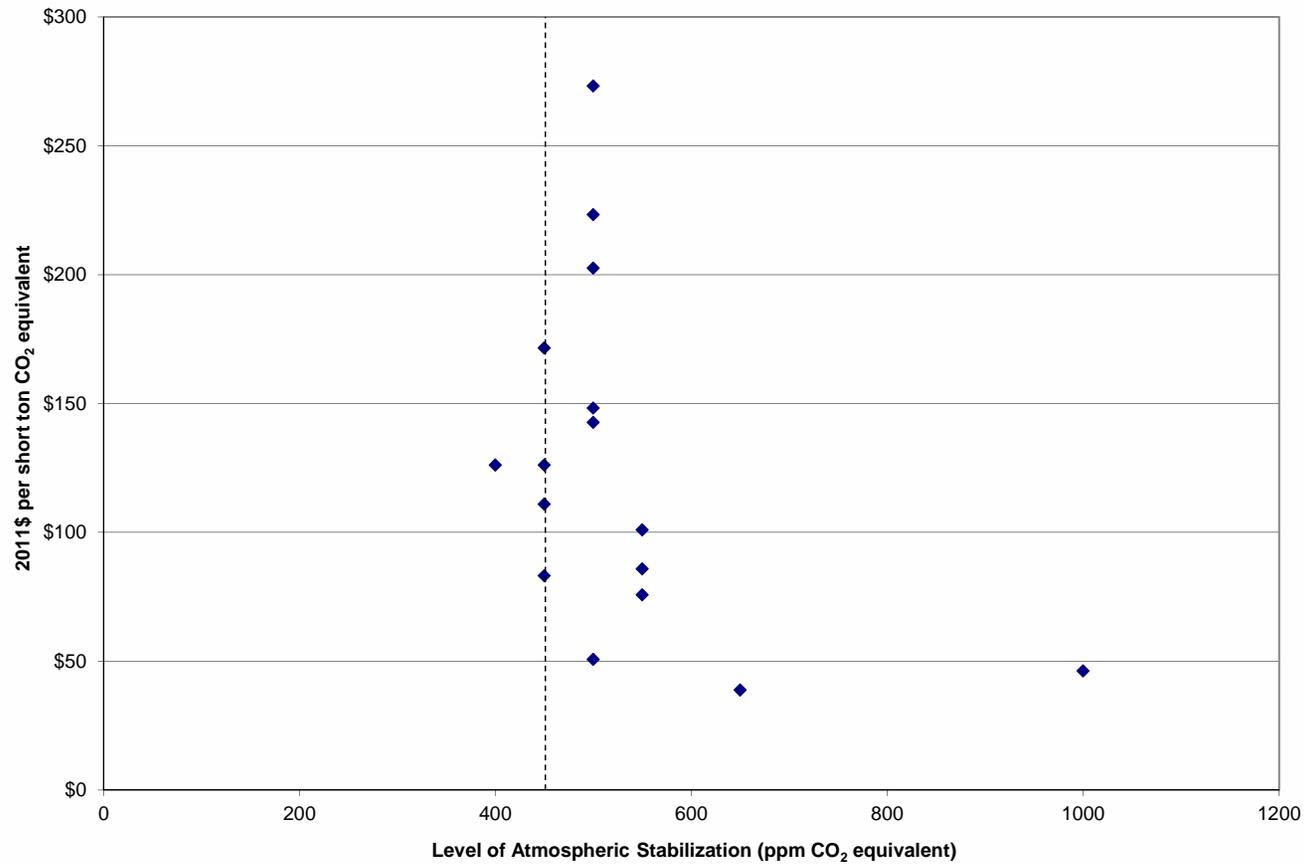
The Study Group has identified CO₂ as the one major emission associated with electricity usage whose **internalized** cost, as reflected in allowance prices, most significantly understates the externality value supported by current science.

The near-term **internalized** cost of carbon dioxide emissions will be driven by RGGI and proposed federal CO₂ regulations. These regulations will only internalize a portion of the "greenhouse gas externality"

Long-term Marginal Abatement Cost for Carbon Dioxide: Sustainability Target Approach

- AESC 2011 approach consistent with the concepts of “sustainability” and “avoidance of undue risk.”
- AESC 2011 looked at the marginal costs associated with controlling total carbon emissions at, or below, the levels that avoid the major climate change risks.
 - Atmospheric concentration of CO₂ equivalent at 450 parts per million.
 - Corresponds to a two degree centigrade increase in temperatures above pre-industrial levels.
 - Requires a 80 to 90 percent reduction of greenhouse gas emissions from 1990 levels by 2050 for United States and other industrialized nations.

Developing the \$80/ton Long-term Marginal Abatement Cost

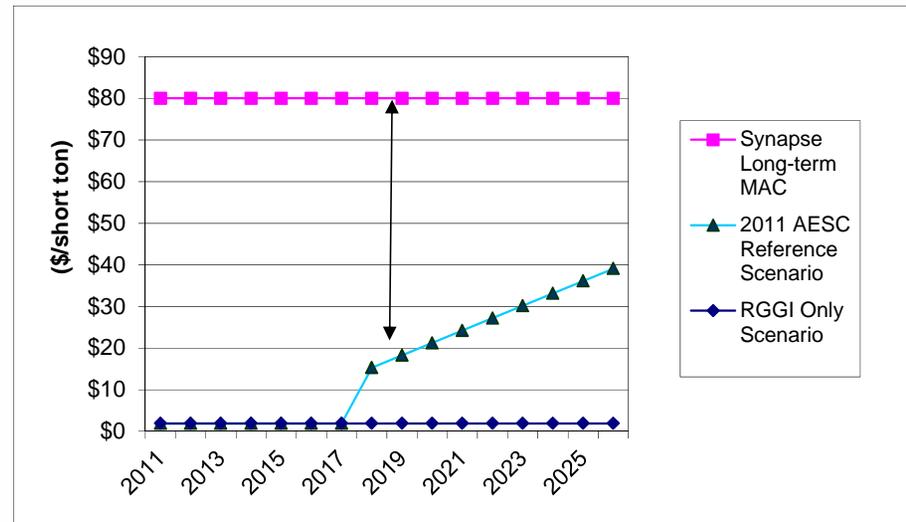


Environmental Effects – CO₂ Externality Value

	LT MAC (\$/short ton) a	2011 AESC Reference Allowance Price (\$/short ton) b	2011 AESC Reference Externality (\$/short ton) c=a-b	RGGI Only Scenario Allowance Price (\$/short ton) d	RGGI Only Scenario Externality (\$/short ton) e=a-d
2011	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2012	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2013	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2014	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2015	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2016	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2017	\$80	\$1.89	\$78.11	\$1.89	\$78.11
2018	\$80	\$15.30	\$64.70	\$1.89	\$78.11
2019	\$80	\$18.28	\$61.72	\$1.89	\$78.11
2020	\$80	\$21.25	\$58.75	\$1.89	\$78.11
2021	\$80	\$24.23	\$55.77	\$1.89	\$78.11
2022	\$80	\$27.20	\$52.80	\$1.89	\$78.11
2023	\$80	\$30.18	\$49.82	\$1.89	\$78.11
2024	\$80	\$33.15	\$46.85	\$1.89	\$78.11
2025	\$80	\$36.13	\$43.87	\$1.89	\$78.11
2026	\$80	\$39.10	\$40.90	\$1.89	\$78.11

Notes

Values expressed in 2011 Dollars
 Allowance Prices from Exhibit 2-4
 Inflation rate of 2%



Applying AESC 2011 Avoided CO2 Costs

- Scenario 1: No state-specific climate change requirement.
- At a minimum, the costs associated with anticipated future *federal* climate change requirements should be included.
- This would be the AESC 2011 mid-case CO2 allowance price forecast.
- This is based on RGGI allowance prices in the early years, and federal cap and trade starting in 2018.
- On a levelized basis, this is approximately
 - \$15/ton.
 - \$9.4/MWh.

Applying AESC 2011 Avoided CO2 Costs

- Scenario 2: States that, or expect to have, state-specific climate change regulations that are more stringent than anticipated federal climate change requirements.
- State should use whatever information is available to develop state-specific estimates of the cost of complying with those regulations.
 - The marginal cost of state-specific policies and resources needed to meet those state targets would represent the cost of compliance with environmental regulations.
- The AESC study did not analyze the cost of state-specific climate change requirements.

Applying AESC 2011 Avoided CO2 Costs

- Scenario 3: States that have, or expect to have, state-specific climate change regulations that :
 - are more stringent than anticipated federal climate change requirements, and
 - consistent with the global climate stabilization goal of 450 ppm.
- State should use a generally applicable marginal abatement cost for CO₂e. The AESC 2011 value of \$80/ short ton is an approximation that can be generally applied.
 - This represents the general cost of achieving the global climate stabilization goal of 450 ppm.
- The cost of reducing carbon emissions to meet climate change regulations will vary across the different sectors of the economy. Since the \$80/short ton represents the marginal abatement cost across all sectors, it should be applied to electricity, oil, and natural gas resource planning.