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Economic Impact in New Hampshire of the Regional Greenhouse Gas Initiative (RGGI): *An Independent Assessment*

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October 2007

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1 Executive Summary

1.1 Overview

It is in the economic interest of the state of New Hampshire to participate in the Regional Greenhouse Gas Initiative (RGGI). RGGI is a regional cap and trade program to limit power plant emissions of carbon dioxide. Electricity costs will increase in New Hampshire even if the State were not to participate in RGGI. This is because all of the utilities in the State purchase competitively generated power from the New England marketplace. If New Hampshire were not to join RGGI, it would not receive the economic value from the allowances allocated to it under RGGI, but would still experience the increased cost of RGGI in regional wholesale power prices.

The costs of RGGI will primarily be borne by ratepayers no matter how carbon allowances are allocated. If New Hampshire joins RGGI, the costs of RGGI are expected to increase the electric utility bills of New Hampshire customers by $20 million (if $2 carbon allowance price) in 2009 rising to $88 million (if $8 carbon allowance price) in 2018. If NH were not to participate in RGGI, electricity costs would increase to a lesser degree, $7 million in 2009 rising to $36 million in 2018. However, the revenue expected from auctioning carbon allowances with RGGI participation more than offsets the added cost of joining RGGI.

The state would expect to receive allowances valued at $17 million in 2009 rising to $62 million by 2018. These funds could be used to help address the increased cost of RGGI to electricity customers through rebates or funding energy efficiency. These funds could also be put to other purposes by the State.

Customers of PSNH, the utility with the highest percentage of retail electricity usage (~72%), will incur a higher percentage increase in electricity rates than the customers of other NH utilities if NH participates in RGGI. The reason for this is that PSNH generates a significant portion of power for its customers from fossil fueled power plants located within the State. These plants produce twice as much carbon dioxide per unit of output as natural gas plants. New England wholesale power prices are primarily set by natural gas power plants. This results in PSNH having higher carbon compliance costs per kWh than the overall regional market. The other three NH utilities do not own any power generation and purchase power only through the wholesale electricity markets.

If none of the revenue from allowances were to be used for customer benefit, the cost of RGGI is expected to increase PSNH customers' electricity rates by 1.2% (at $2 per ton in 2009) to 4.4% (at $8 per ton in 2018). For the other NH utilities, the cost of RGGI is expected to increase their customer's electricity rates by 0.7% to 2.9% over the same time period. The average PSNH residential customer could expect to pay $1.17 more per month in 2009, rising to $4.44 in 2018. The other NH utilities' residential customers could expect to pay $0.72 more per month in 2009, rising to $2.88 more in 2018.

If New Hampshire were not to participate in RGGI, PSNH customers' rates would increase to a lesser degree. Electricity rates would be expected to increase by 0.2% in 2009, rising to 1.1% in 2018. The average PSNH residential customer could expect to pay $0.22 more per month in 2009, rising to $1.15 in 2018. The increased costs of RGGI are the same for the other NH utilities' customers whether or not NH participates in RGGI.

Carbon allowance prices are expected to be between $2 and $8 from 2009 to 2018. However, it is possible, although much less likely, that carbon allowance prices could be significantly higher. Under a higher price case, where carbon allowance prices were between $12 and $18 from 2009 to 2018, the cost of RGGI would be expected to increase PSNH customers' electricity rates by 7.1% in 2009 to 9.9% in 2018. For the other NH utilities, the cost of RGGI is expected to increase their customer's electricity rates by 4.3% to 6.4% over the same time period.

If none of the revenue from allowances were to be used for customer benefit, under the higher price case, the average PSNH residential customer could expect to pay $7.04 more per month in 2009, rising to $10.00 in 2018. The other state utilities residential customers could expect to pay $4.32 more per month in 2009, rising to $6.48 more in 2018. Under the higher price scenario, the state would receive allowances valued at $86 million in 2009 and $140 million in 2018.

Beyond the direct net economic benefits to electricity customers in New Hampshire, additional benefits of joining RGGI include placing the state in an advantaged position to respond to future federal policies and helping the state to better manage its energy portfolio.

1.2 Implementation Method in the State's Best Economic Interest

In general, carbon allowances should be auctioned, not directly allocated to generators. With or without the auctioning of allowances the price of carbon allowances will be incorporated into the cost of electricity and will be mostly borne by ratepayers. This is because there is a regional market for energy generation and the price of carbon allowances will be added to the wholesale cost of power generation.

However, because PSNH still owns generation, there are some benefits to NH ratepayers of direct allocation of allowances to PSNH. These include reduced transactional costs and increased certainty which would be expected to have a positive impact on PSNH customer rates. This is not the case for the other three state utilities as they do not own their own generation.

Regional Economic (REMI) Model simulations identified that the best overall economically efficient use of the auction revenue would be to fund energy efficiency and/or reduce marginal business taxes in the state. By 2018, if allowance revenue were to go strictly to energy efficiency, the overall economic affect would be to increase the state's employment by 815 and economy by $63 million (or 0.06% of total annual GSP). If 100% of the auction revenue were used to reduce business taxes, the overall economic affect would be to increase the state's employment by 673 and economy by $100 million (or 0.1% of total annual GSP), even when taking into account the increased cost of electricity due to RGGI.

If New Hampshire were not to join RGGI, the overall economic impact would be slightly negative, as the state's employment would be reduced by 72 and overall economic activity would be reduced by $6.5 million (or 0.006% of total annual Gross State Product) by 2018.

For utility customers (both PSNH and other NH utility customers) increased costs are minimized if all allowance revenue were to be dedicated to ratepayer benefit. Cumulative costs would be minimized if 100% of allowance revenue went to energy efficiency. In the short term, utilizing allowances to directly rebate customers would have the most significant reduction on rates, but over the long term would result in higher costs than investment in energy efficiency. Energy efficiency investment would have the lowest short term rate impact, but over the long term would result in lower costs than rebating.

If New Hampshire chose to rebate 100% of auction revenue to utility customers, PSNH customers' electricity bills would increase by 0.3% in 2009 to 1.3% in 2018. The average PSNH residential customer could expect to pay $0.26 more per month in 2009 and $1.30 in 2018. For the other NH utilities, their customer's electricity rates would decrease by 0.2% in 2009 and decrease by 0.3% in 2018. The average other NH utilities residential customer could expect to save $0.19 per month in 2009, and save $0.27 in 2018.

If New Hampshire chose to use 100% of auction revenue to invest in energy efficiency for utility customers, PSNH customers' electricity bills would increase by 0.9% in 2009 but decrease 1.4% by 2018. The average PSNH residential customer could expect to pay $0.87 more per month in 2009, but save $1.37 by 2018. For the other NH utilities, their customer's electricity rates would increase by 0.5% in 2009 and decrease by 1.7 % by 2018. The average other NH utilities residential customer could expect to pay $0.48 more per month in 2009, but save $1.70 by 2018.

2 Introduction

In 2005, New Hampshire signed a Memorandum of Understanding with seven other Northeastern states to participate in a regional program to reduce carbon dioxide emissions from fossil fueled power plants. The Regional Greenhouse Gas Initiative (RGGI) currently has ten signatory states that have committed to participating in a cap-and-trade program for carbon dioxide that incorporates a market-based emissions trading system for compliance.

The University of New Hampshire (UNH) was approached by the New Hampshire Department of Environment Services (NHDES) to examine the potential economic impact of New Hampshire's participation in RGGI. UNH was also asked to provide independent economic analysis of different allocation methods for carbon emissions allowances with specific consideration for New Hampshire's unique utility structure. Funding for the research was provided by The Energy Foundation, a partnership of philanthropic investors that provide grants for clean energy initiatives.

This report provides an independent analysis of the potential economic impact of New Hampshire participation in the Regional Greenhouse Gas Initiative (RGGI). The research team from the University of New Hampshire's Whittemore School of Business and Economics conducted a review of existing studies of RGGI's economic impact, both those undertaken prior to the original RGGI Memorandum of Understanding among the participating states and subsequently in the RGGI states during their consideration of RGGI implementation.

The research critically assessed the previous studies and conducted an updated independent assessment and estimate of economic costs and benefits of NH participation in RGGI under different scenarios. These scenarios include different assumptions about the cost of carbon allowances, allocation methods of allowances, and potential uses of revenue that could be generated from the auctioning of carbon allowances. The analysis takes into account the unique structure of the energy market in New Hampshire and considers RGGI implementation specifically in the context of New Hampshire's economy.

The RGGI framework has been established. The purpose of this analysis was not to critique the program design, but to focus on two basic questions. Is it in New Hampshire's economic interest to join RGGI? If so, what is the most economically beneficial implementation method? In addition, this study did not conduct any region-wide power sector modeling and does not attempt to project changes to the region's power generation or surrounding power pools as a result of NH participation or not in RGGI.

This report is organized to first provide a general introduction to carbon regulation and the features of the Regional Greenhouse Gas Initiative. The report then discusses assumptions and methodology utilized in the study and finishes with detailed data and analysis of the potential economic impact of RGGI in New Hampshire. Readers familiar with RGGI might skip the first sections of the report and read the detailed analysis sections. The initial section of the report, Section 3, provides general information related to global climate change, RGGI and carbon cap and trade programs. Section 4 discusses the methodology and assumptions utilized in the analysis. Section 5 discusses the economic costs and benefits associated with New Hampshire joining RGGI and the cost impacts of different allocation methods of carbon allowances. Section 6 provides conclusions related to the research and analysis.

3 Background

3.1 Significance of Climate Change

A significant body of scientific research has been developed that indicates that global temperatures are rising and that the rising global temperatures are directly linked to human activities involving the emissions of greenhouse gases (GHG). Several different gases are considered to contribute to global climate change; however, the primary gas implicated is carbon dioxide (CO_2). Man-made sources of carbon dioxide include the combustion of fossil fuels (oil, coal and natural gas) from cars, power plants and other sources.

The Intergovernmental Panel on Climate Change (IPCC), established by the World Meteorological Organization and the United Nations Environment Programme, recently issued the report *Climate Change 2007: The Physical Science Basis - Summary for Policymakers*. This report is the result of the efforts of over 800 contributing authors and 2500 scientific expert reviewers from 130 countries. The report found that average global temperatures have increased 1.3 degrees Fahrenheit since 1850, with the trend in warming in the last 50 years being almost double that of the prior 100 years. Current Atmospheric carbon dioxide levels exceed the natural range observed over the last 650,000 years. Fossil fuel use by humans has been implicated as the primary source of the observed increase[1].

Changes in global temperature are impacting the global climate in significant ways including:

- Mountain glaciers and snow cover have declined significantly contributing to rises in sea level.
- Average Arctic temperatures have increased at almost twice the global rate in the past 100 years
- Increased precipitation has been observed in the eastern parts of North and South America, Northern Europe and Northern and Central Asia.
- Mid-latitude westerly winds have strengthened in both hemispheres since the 1960s.

Current science suggests that to significantly reduce the threats to the global climate, worldwide reductions of carbon dioxide emissions between 50% and 85% of current levels will be required by 2050[2].

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[1] IPCC Fourth Assessment Report, Working Group III, Mitigation of Climate Change
[2] Ibid.

3.2 New Hampshire Climate Change

Climate change appears to be having a significant impact in New Hampshire. A collaboration between The Union of Concerned Scientists (UCS) and a team of independent experts assessed climate change in the northeastern United States and issued a report in July 2007. Among their findings was that significant changes consistent with global warming were already taking place in New Hampshire. Since 1970, the overall northeastern region has been warming at a rate of nearly 0.5°F per decade with winter temperatures rising even faster, at a rate of 1.3°F per decade from 1970 to 2000.

The report found that undesirable changes related to global warming in the region included:

- Increased likelihood and severity of heavy rainfall events, including more than a 10 percent increase in the number of annual extreme rainfall events and a 20 percent increase in the maximum amount of rain that falls in a five-day period each year.

- Increases in winter precipitation on the order of 20 to 30 percent.

- A combination of higher temperatures and increased evaporation will cause summer and fall to become drier, with extended periods of low rivers and streams. This will reduce the availability of water to natural ecosystems, agriculture, and other needs.

The report also found that while some continued climate change due to current carbon levels in the atmosphere is unavoidable, that policies that limit man-made carbon emissions can significantly reduce the severity of the impacts associated with global warming[3].

3.3 Carbon Cap & Trade Programs

3.3.1 Overview

One public policy that has been proposed to reduce carbon emissions is a “cap & trade” program. The basic premise is that a regulatory body establishes a “cap”. The cap sets the maximum amount of pollution that can be emitted in aggregate from all regulated sources on an annual basis. It does not put any type of limit on emissions for individual units. Instead, allowances are created that give the right to emit a certain amount of pollution, typically one ton. Allowances are marketable commodities that can be

[3] " Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions", Northeast Climate Impacts Assessment, July 2007, Available online at http://www.climatechoices.org/ne/resources_ne/jump.jsp?path=/assets/documents/climatechoices/confronting-climate-change-in-the-u-s-northeast.pdf

purchased, sold or banked (held for future use). Each year a number of allowances equal to the cap are allocated.

Regulated sources need to obtain enough allowances to cover the amount of carbon pollution they generate. A cap and trade program draws on the power of the marketplace by not prescribing specific mechanisms for regulated sources to manage their carbon emissions. Regulated sources can design their own compliance strategies to obtain all of the allowances they require. These strategies include sales or purchases of allowances, installation of mitigating technologies, fuel switching and efficiency measures. A cap and trade program provides a system for regulated sources to choose the lowest cost approach to managing their carbon emissions.

The primary options for allocating allowances are to either auction allowances or to directly allocate (also known as "grandfather") allowances to existing impacted generators. Under auctioning, all allowances are sold to impacted generators and other market participants in an open auction. Revenue generated from auction sales can be used for other purposes, such as energy efficiency, customer rebates, or provide for general revenue or tax relief for the regulating body.

Under direct allocation, allocations of allowances are made to impacted generators based on historical performance at the plant. Two common ways to allocate allowances are either on an emissions or generation basis.

3.3.2 Background

Currently, there is no federal legislation in place regulating carbon emissions. While no legislation has been passed, recently there has been significant interest in this area. In the current U.S. Congressional legislative session, over 70 bills have been proposed to regulate some aspect of carbon emissions. Several proposed bills, such as The Global Warming Reduction Act of 2007, have featured cap and trade programs to reduce carbon emissions.

The federal government does have experience with using cap and trade programs for other air pollutants from power plants. The Federal Acid Rain Program uses a market-based cap and trade program for the pollutant sulfur dioxide. That program primarily utilizes direct allocation to regulated sources based on historical fuel consumption and emission rates. In addition, 3% of the total allowances available under the cap are auctioned by the Environmental Protection Agency (EPA) to provide a public source of allowances for regulated sources[4].

While there has been limited progress for regulation of carbon at the federal level, significant progress has been made at the state level for carbon cap and trade programs, specifically in the Western, Northeastern and Mid-Atlantic regions of the country. On

[4] "Cap and Trade: Acid Rain Program Basics," Environmental Protection Agency, Available online at http://www.epa.gov/airmarkets/cap-trade/index.html

the West Coast, Governor Schwarzenegger signed into law the California Global Warming Solutions Act of 2006, which establishes a statewide greenhouse gas emission cap for 2020 based on 1990 emissions to take effect in 2008.

On February 26, 2007, Arizona, California, New Mexico, Oregon, and Washington signed an agreement establishing the Western Climate Initiative. In this initiative members pledged to reduce greenhouse gas emissions by 15% below 2005 levels by 2020. Since the initial signing, the state of Utah and the Canadian provinces of British Columbia and Manitoba have joined the initiative. By August 2008, the initiative members have pledged to complete the design of a market-based system for meeting that goal.

The Regional Greenhouse Gas Initiative is expected to be the first mandatory US carbon cap and trade program. The program design is complete and participant states are currently establishing the laws and rules required to enact RGGI. In addition, efforts are underway to explore linking the RGGI program with the Western Climate Initiative[5]

3.4 Regional Greenhouse Gas Initiative (RGGI)

RGGI is an agreement among 10 Northeast and Mid-Atlantic states to propose legislation and/or regulations at the state level to implement a flexible, market-based program to reduce carbon dioxide (CO_2) emissions from fossil-fueled power plants (plants that use coal, oil or natural gas).

The groundwork for RGGI started in 2003 when then New York Governor Pataki called on the Northeastern states to work together on developing a cap and trade program for the electricity sector to reduce greenhouse gas emissions. By late 2003, an interstate working group of staff from the New England state environmental and public utility agencies, and a 25-member body of stakeholders, including representatives of electricity generators, electric utilities, other businesses, residential consumers, and environmentalists, began to discuss the structure of a regional cap and trade program.

In December 2005, the governors of Maine, New Hampshire, Vermont, Connecticut, New Jersey, New York, and Delaware signed a Memorandum of Understanding (MOU) agreeing to initiate legislation to adopt RGGI. By April 2007, Maryland, Massachusetts, and Rhode Island had also signed the MOU.

During the RGGI stakeholder process, ICF Consulting conducted analysis to determine the regional power system and economic impact of RGGI. The results from their analysis led the participating states to release a draft model rule in March 2006 outlining regulations for state governments to use in adopting RGGI. Public input was received from more than 100 organizations after the rule was released. After revisions, the Model

5 "California, New York Agree to Explore Linking Greenhouse Gas Emission Credit Trading Markets; Gov. Schwarzenegger Tours Carbon Trading Floor," Office of the Governor-California, October 16, 2006, Available online at http://gov.ca.gov/index.php?/press-release/4449/

Rule was finalized and released in August 2006, with slight technical revisions made to the Model Rule in January 2007.

While the Model Rule and the MOU have provisions that all participating states must follow, each state has flexibility in how it implements the program. Specifically, each state can choose how to allocate carbon dioxide emission allowances, with the two primary choices being to auction the allowances or to directly allocate allowances to impacted facilities. When considering possible options, all states are required to allocate at least 25% of their allowances for "strategic energy and consumer benefit purposes". These purposes can include such things as promoting energy efficiency, set-asides for renewable energy, set-asides for combined heat and power facilities, and reducing costumer rates.

The total cap set for the 10 states participating in RGGI is initially set at 188 million tons annually. Total annual emissions in the RGGI states cannot exceed the annual cap from 2009 to 2014, and then must fall by 2.5% per year through 2018, so that by 2019 they must be at least 10% below the projected 2009 level. Modeling conducted in the RGGI stakeholder process suggests that without RGGI, emissions from power plants in the region would grow by 7% from 2009 to 2019. Therefore when compared to “business as usual,” RGGI is designed to cut carbon emissions by 17%[6].

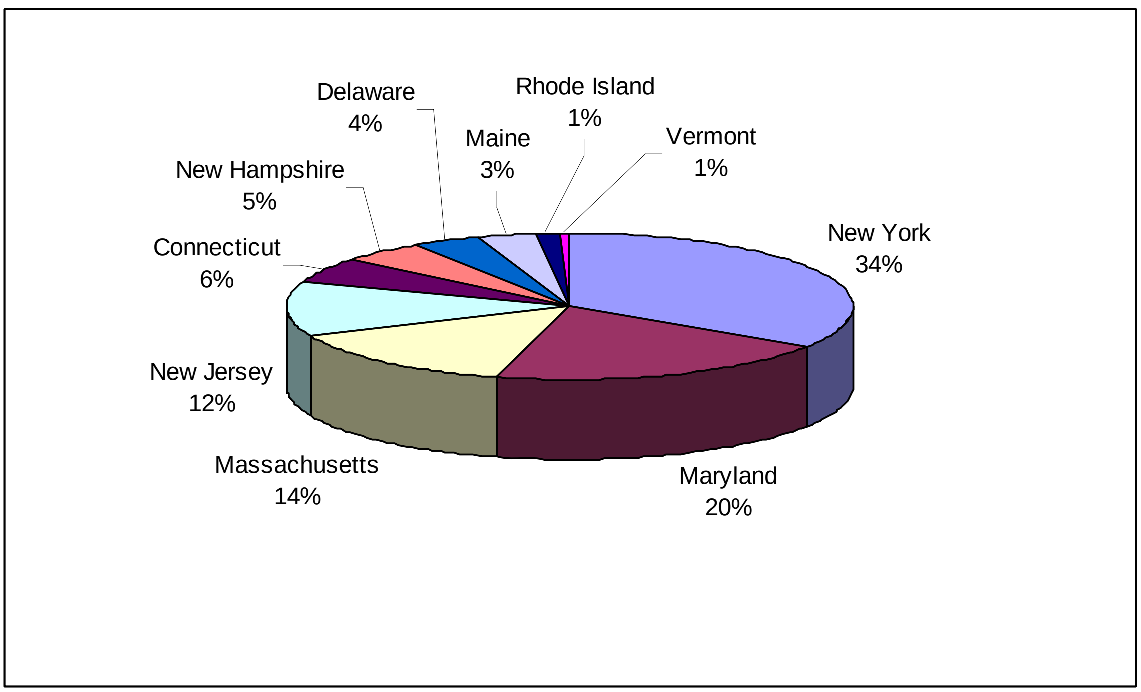
[6] " Updated Reference, RGGI Package - 10/11/06," PowerPoint posted on RGGI web site, May 2007, Available online at http://www.rggi.org/docs/ipm_modeling_results_10.11.06.ppt

Table 1: State Carbon Allowance Allocations

State	Years				
	2009-2014	2015	2016	2017	2018
Connecticut	10,695,036	10,427,660	10,160,284	9,892,908	9,625,532
Delaware	7,559,787	7,370,792	7,181,798	6,992,803	6,803,808
Maine	5,948,902	5,800,179	5,651,457	5,502,734	5,354,012
Maryland	37,503,983	36,566,383	35,628,784	34,691,184	33,753,585
Massachusetts	26,660,204	25,993,699	25,327,194	24,660,689	23,994,184
New Hampshire	8,620,460	8,404,949	8,189,437	7,973,926	7,758,414
New Jersey	22,892,730	22,320,412	21,748,094	21,175,775	20,603,457
New York	64,310,805	62,703,035	61,095,265	59,487,495	57,879,725
Rhode Island	2,659,239	2,592,758	2,526,277	2,459,796	2,393,315
Vermont	1,225,830	1,195,184	1,164,539	1,133,893	1,103,247
Total	188,076,976	183,375,052	178,673,127	173,971,203	169,269,278

Source: RGGI.org

Figure 1: State Carbon Allowance Allocation 2009-2014



Source: RGGI.org

The program regulates CO_2 emissions from fossil fuel power plants with 25 megawatts (MW) or greater of capacity. Power plants are required to show compliance with the program every three years. The power plants must be able to surrender a number of allowances equal to their emissions for each compliance period.

In addition to allowances, the program does allow emission offsets to be used for compliance. Offsets are greenhouse gas emissions projects outside of the power generation process. Currently, there are specific categories of offset projects that are approved for RGGI including afforestation, landfill methane capture and avoided methane emissions from agricultural manure management. The eligibility of offset projects expands as allowance prices increase, in an attempt to provide a buffer against excessive energy price increases.

If average emission allowance prices are below $7.00, a generator may cover up to 3.3% of its emissions using offsets. Offsets can be used from anywhere in the United States, including non-RGGI states, as long as the offset projects in the non-RGGI states meet credibility requirements.

At an average allowance price of $7.00, there is an "offset trigger", that allows power plants to cover up to 5% of its emissions using allowances. If this offset trigger occurs during two consecutive 12-month periods, the scope of eligible offset projects will be expanded to include international projects. Generators can then use offsets to meet up to 10% of their carbon emissions.

3.4.1 RGGI Benefits

States are choosing to participate in RGGI for many different reasons, including:

- **To mitigate the risks to human health and environment associated with climate change**- as discussed above, there is growing scientific consensus that man-made emissions of greenhouse gases (including carbon dioxide) are changing the Earth's climate in harmful ways. These changes can include more severe droughts and floods, increased smog, destruction of coastal wetlands, increased incidence of disease carrying insects, among many others.

- **To increase energy security -** the carbon allowance trading system is expected to promote energy efficiency. This will reduce the dependence on foreign sources of fossil fuel for power generation.

- **To foster local economic development** - RGGI is expected to spur innovation in new technologies as well as provide employment opportunities in sectors related to energy efficiency, leading to economic growth.

- **To lead the nation in reducing carbon emissions -** States that participate in RGGI will gain first hand knowledge of managing their carbon emissions which may provide a competitive advantage with other US states that lag behind until federal regulation is enacted.

3.4.2 State RGGI Activity

All RGGI states with the exception of New Hampshire and Delaware appear to be either starting or well into the rulemaking process for implementing RGGI. Some of the states, such as Maine and Vermont, have passed legislation to require participation in the RGGI program, while others, such as Massachusetts and New York, went directly into the rulemaking process.

All of the currently established legislation or proposed rules direct 100% of allowance revenue proceeds to some form of consumer benefit, with most clearly stating the intention to auction. At this point, none of the states have indicated that they are (grandfathering) directly allocating allowances to impacted facilities.

Table 2: State RGGI Activity

State	Auction	Proceeds	Status
Connecticut	100%	Consumer benefit, including energy efficiency	In the rulemaking process[7]
Delaware	?	?	Legislation passed in 2007 to study RGGI[8]
Maine	100%	Public benefit for carbon reduction and energy conservation	Legislation passed mandating participation in 2007[9]
Maryland	?	?	Legislation passed mandating participation in 2007[10]
Massachusetts	100%	Energy efficiency	In the rulemaking process[11]
New Hampshire	100%[12]	Energy efficiency	Legislation has been proposed[13]
New Jersey	100%	Consumer benefit	In the rulemaking process[14]
New York	100%	Consumer benefit, including energy efficiency	In the rulemaking process[15]
Rhode Island	100%	Energy efficiency and carbon reduction programs	Legislation passed mandating participation in 2007[16]
Vermont	?	Trustee account with 100% for consumer benefit	Legislation passed mandating participation and in the rulemaking process[17]

[7] "Regional Greenhouse Gas Initiative," CT SIPRAC Subcommittee Workgroup, Available online at http://www.ct.gov/dep/cwp/view.asp?a=2684&q=332278&depNav_GID=1619

[8] "SCR 28," 144th General Assembly-Delaware, July 1, 2007

[9] "An Act To Establish the Regional Greenhouse Gas Initiative Act of 2007," Maine State Legislature, Signed into law June 18, 2007, Available online at http://www.mainelegislature.org/legis/bills/billtexts/LD185101.asp

[10] "Governor Martin O'Malley Signs Greenhouse Gas Agreement, Climate Change Executive Order," Press release-Office of the Governor, April 20, 2007, Available online at www.gov.state.md.us/pressreleases/070420.html

[11] "Recently Proposed & Promulgated Regulations," The Massachusetts Department Of Environmental Protection, Available online at http://www.mass.gov/dep/service/regulations/newregs.htm#co2trade

[12] With the exception of the ~4 million allowances to be directly allocated to PSNH as part of the NH Clean Power Fact, "Bonus Allowances under the Clean Power Act: Briefing to the Legislative Air Pollution Advisory Committee," New Hampshire Department of Environmental Services, July 2007

[13] Draft legislation, E-mail sent by Joe Fontaine of NH Department of Environmental Services, September 2007

[14] Commissioner Lisa P. Jackson, "Testimony Supporting the Reduction of Greenhouse Gas Emissions Subcommittee on Energy and Air Quality Hearing Climate Change: State and Local Perspectives," New Jersey Department Of Environmental Protection, March 15, 2007, Available online at http://www.state.nj.us/dep/commissioner/031507_testimony.pdf

[15] "Notice of Pre-Proposal of New York RGGI Rule," New York State Department of Environmental Conservation, December 5, 2006, Available online at http://www.dec.ny.gov/regulations/26450.html

[16] " An Act Relating To Health And Safety - Implementation Of The Regional Greenhouse Gas Initiative Act," State of Rhode Island General Assembly, Signed into law July 2, 2007

[17] " Notice of Pre-Proposal Draft of Vermont RGGI Rule and Call for Comments," Vermont Department of Environmental Conservation, March 1, 2007, Available online at http://www.anr.state.vt.us/air/htm/RGGI.htm

3.5 RGGI Region

3.5.1 Electricity Usage

Electric power consumption in the 10 states that have signed on to RGGI, grew from 354 million MWH in 1990 to 440 million MWH in 2005[18]. This reflects a 24% increase over that time period, or a 1.5% average annual increase. More recently, between 2000 and 2005, electricity consumption growth has increased at a significantly higher rate, 1.9% per year.

In 2005, 49 million people, 16% of the total US population, lived in the RGGI participating states. The population living in the RGGI region has increased 9.4% from 1990 through 2005, or a 0.6% average annual increase. From 2000 through 2005 the population increase was slightly lower at 0.5% average annual increase. Growth in residential electricity use has not only been driven by population growth but also by increased household consumption. In 1990, residential consumption was 2.7 MWH per capita increasing to 3.3 MWH per capita in 2005. This is an average annual increase of 1.5%. In the time between 2000 and 2005 individual consumption has increased at double that rate, 3%.

3.5.2 Carbon Emissions

Carbon emissions for the region from RGGI eligible generation were 175 million tons in 2004. This is 7% lower than the 188 million cap established by RGGI for 2009.

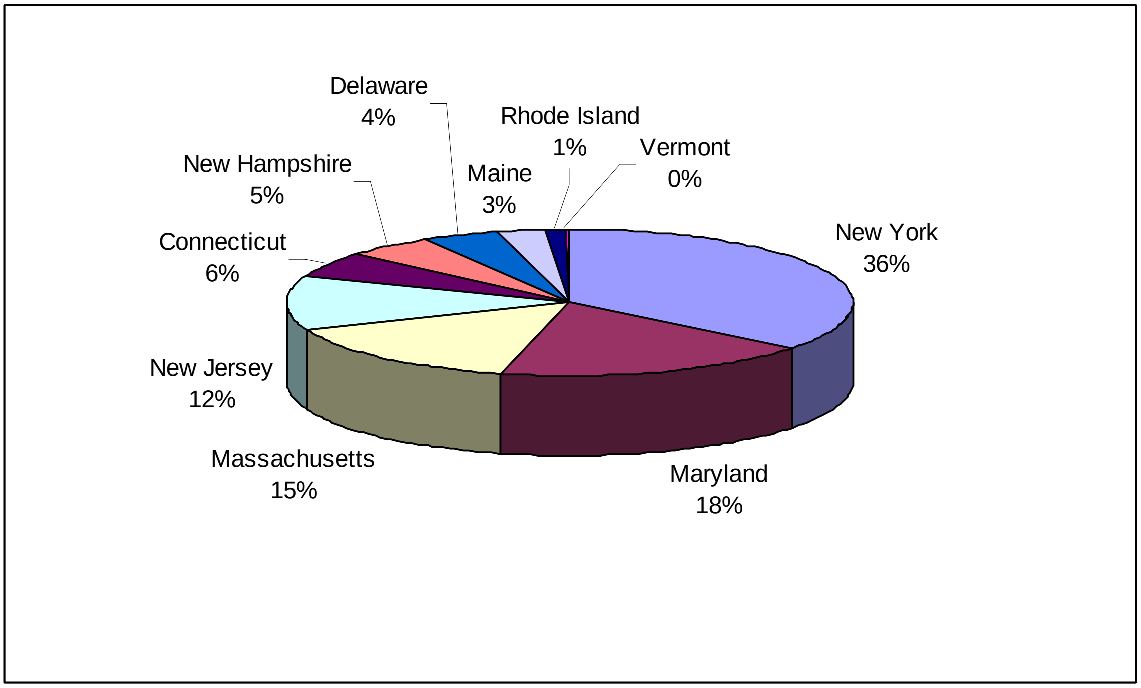
Table 3: State RGGI CO_2 Emissions

State	2004 Estimate Of CO_2 Emissions (Tons)
Connecticut	9,884,343
Delaware	7,534,152
Maine	4,719,458
Maryland	31,984,000
Massachusetts	26,370,000
New Hampshire	8,812,538
New Jersey	21,133,145
New York	62,240,867
Rhode Island	2,219,000
Vermont	378,408
Total	175,275,911

Source: US Energy Information Administration

[18] " State Electricity Profiles," Energy Information Administration, Available online at http://www.eia.doe.gov/cneaf/electricity/st_profiles/e_profiles_sum.html

Figure 2: 2004 CO_2 Emissions from RGGI Regulated Sources by State



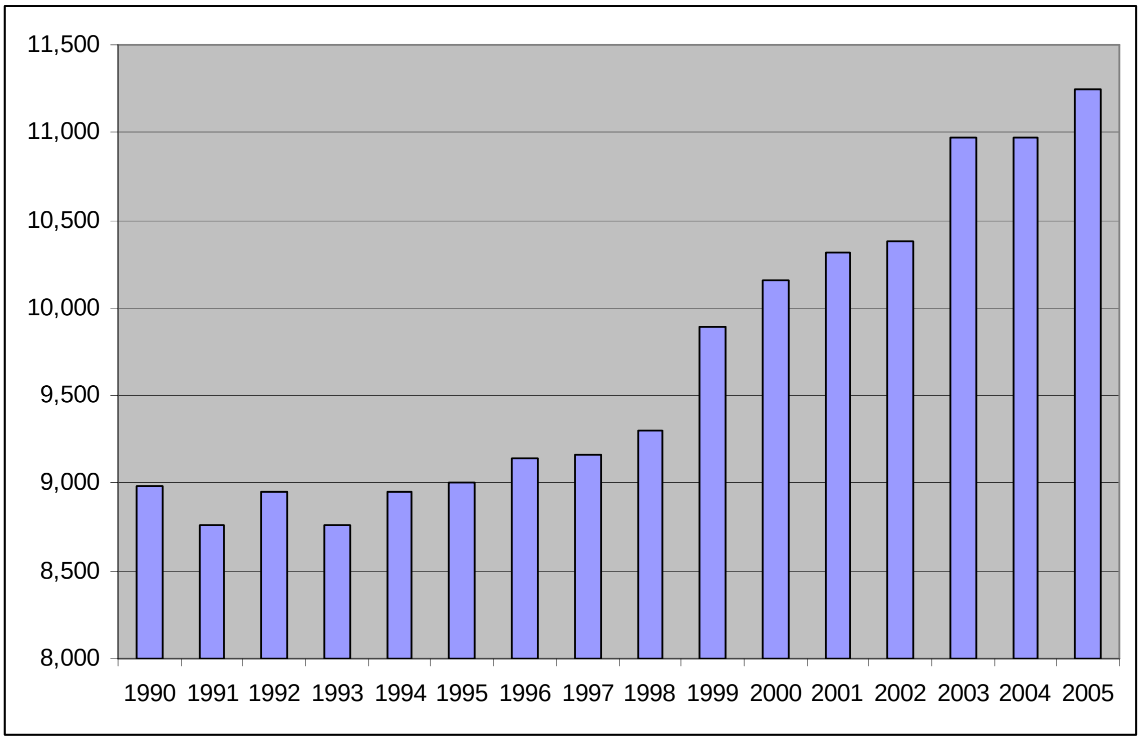
Source: US Energy Information Administration

3.6 New Hampshire

3.6.1 Electricity Consumption

Electric power consumption in New Hampshire grew from 9.0 million MWH in 1990 to 11.2 million MWH in 2005[19]. This reflects a 31% increase over that time period, or a 2.0% average annual increase. However, in the time period between 2000 and 2005, electricity consumption growth experienced a significant increase. Over 75% of the increase from 1990 to 2005 occurred in the last five years, for a 4.6% average annual increase. Electricity consumption is increasing at a significantly higher rate in New Hampshire than for the overall RGGI region.

Figure 3: New Hampshire Retail Electricity Usage 1990-2005



Source: US Energy Information Administration

In 2005, 1.3 million people, 3% of the US population, lived in New Hampshire. The population living in the New Hampshire has increased 18% from 1990 through 2005, or a 1.1% average annual increase. In 1990, residential consumption was 3.1 MWH per capita increasing to 3.4 MWH per capita in 2005.

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[19] "NH Electricity Profile," Energy Information Administration, Available online at http://www.eia.doe.gov/cneaf/electricity/st_profiles/new_hampshire.html

3.6.2 Electricity Sector

In 2005, New Hampshire generated 24.5 million MWH of electricity [20]. This is approximately twice as much power as New Hampshire retail customers utilized that year. New Hampshire is a net exporter of electricity to the New England power region. The primary fuel used in power generation is nuclear at 38%, which is associated with no carbon emissions. However, combined generation from fossil fuels (coal, natural gas and petroleum) is 51%, which do have associated carbon emissions. The remainder of New Hampshire power generation is from renewable resources at 11%, which typically are not associated with carbon emissions.

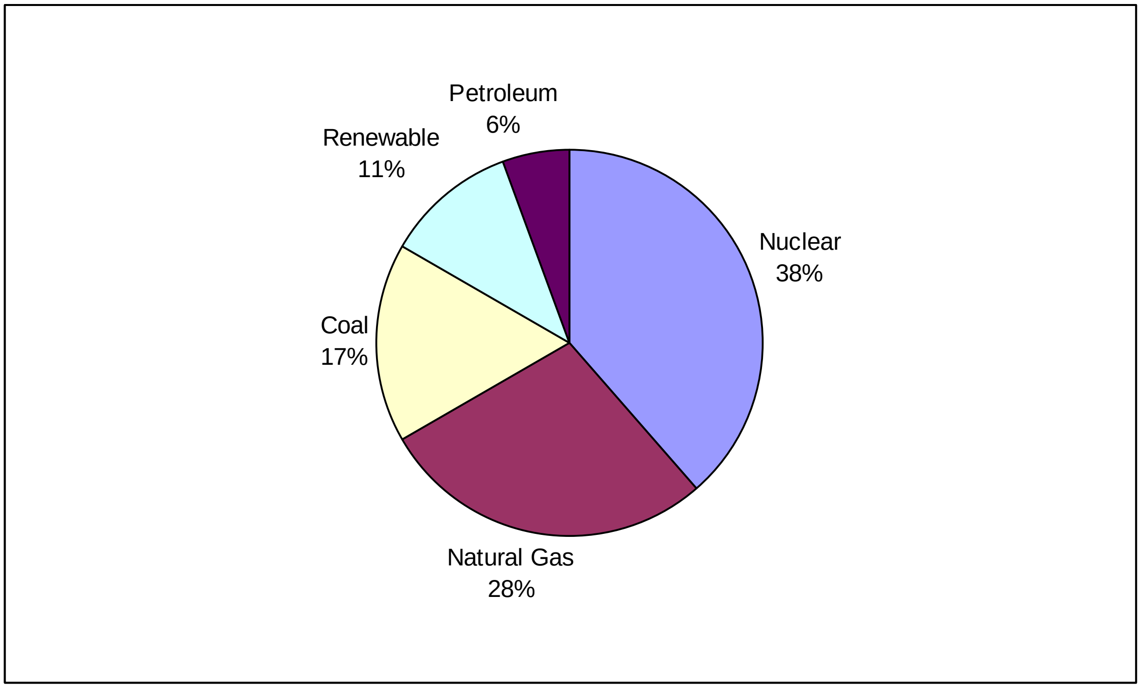
Table 4: 2005 NH Generation by Fuel Type

Fuel type	Generation (MWH)
Nuclear	9,455,885
Natural Gas	6,784,735
Coal	4,072,987
Renewable	2,740,802
Petroleum	1,357,142
Total	**24,470,014**

Source: US Energy Information Administration

[20] "NH Electricity Profile," Energy Information Administration, Available online at http://www.eia.doe.gov/cneaf/electricity/st_profiles/new_hampshire.html

Figure 4: 2005 NH Generation by Fuel Type



Source: US Energy Information Administration

New Hampshire has a unique utility structure. Power generation has been partially restructured (some utility companies were required to sell off their power plants). But the major utility company in the state by retail sales, PSNH, was allowed to retain its power generation plants. PSNH default service power generation rates are established through Public Utility Commission rate making and reflect the average cost of provision.

In 2005, 72% of retail sales in New Hampshire were to PSNH customers. The three other utilities in the state -- Granite State Electric (now a subsidiary of National Grid), Unitil and New Hampshire Electric Cooperative --accounted for 25% of retail sales and municipalities accounted for 3%. These entities are subject to the restructured New England power market. In this market, power generation cost is determined by the marginal producer versus the average cost in regulated markets.

PSNH power plants do not produce sufficient energy to meet all of its power requirements for customers. PSNH purchases the remainder of power for its customers in the competitive electricity markets. In 2005, PSNH purchased 36% of its retail customer power through the open market.

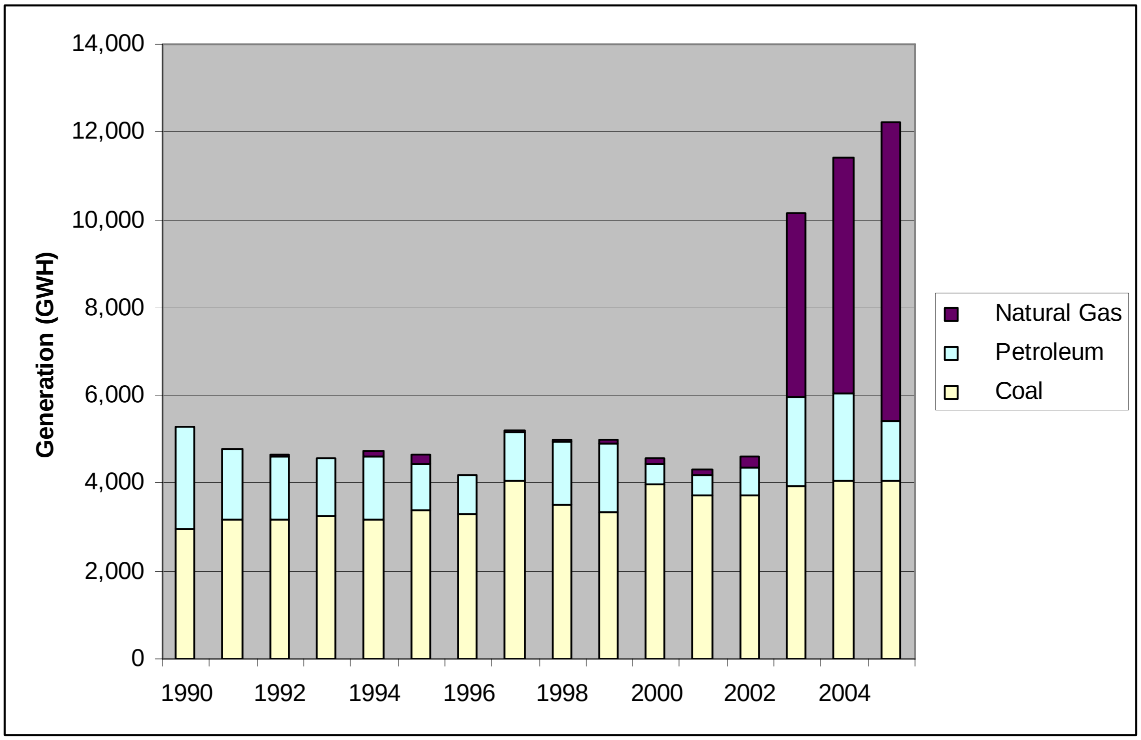
In New Hampshire, RGGI would apply to Public Service of New Hampshire (PSNH) fossil fuel units (Merrimack, Portsmouth, Newington) and two natural gas plants (Granite Ridge, Londonderry & Newington Energy LLC).

Table 5: RGGI Regulated Plants in New Hampshire

Plant ID (ORIS)	Plant Name	Boiler ID	Nameplate Capacity (MW)	Primary Fuel Type	Secondary Fuel Type
2364	MERRIMACK (PSNH)	1	114.0	Coal	
2364	MERRIMACK (PSNH)	2	346.0	Coal	
2367	SCHILLER (PSNH)	4	50.0	Coal	
2367	SCHILLER (PSNH)	5	50.0	Coal	
2367	SCHILLER (PSNH)	6	50.0	Coal	
8002	NEWINGTON (PSNH)	1	414.0	Oil	Natural Gas
55170	AES GRANITE RIDGE	CT 1	240.0	Natural Gas	Distillate Oil
55170	AES GRANITE RIDGE	CT 2	240.0	Natural Gas	Oil
55661	NEWINGTON ENERGY	CT 1	180.0	Natural Gas	Oil
55661	NEWINGTON ENERGY	CT 2	180.0	Natural Gas	Oil

Source: RGGI

Figure 5: 2005 NH Generation by Fossil Fuel Type



Source: US Energy Information Administration

3.6.3 Carbon Emissions

In 2004, New Hampshire had CO2 emissions from its fossil fuel power plants of 8.8 million tons[21]. This is relatively closely matched to the initial NH CO2 allocation in RGGI of 8.6 million tons. Carbon emissions increased 2% to 9 million tons in 2005, but then fell 16% to 7.6 million tons in 2006. The decrease in emissions observed in 2006 appears to be weather-related, which can have a significant impact on carbon emissions in the RGGI region[22]

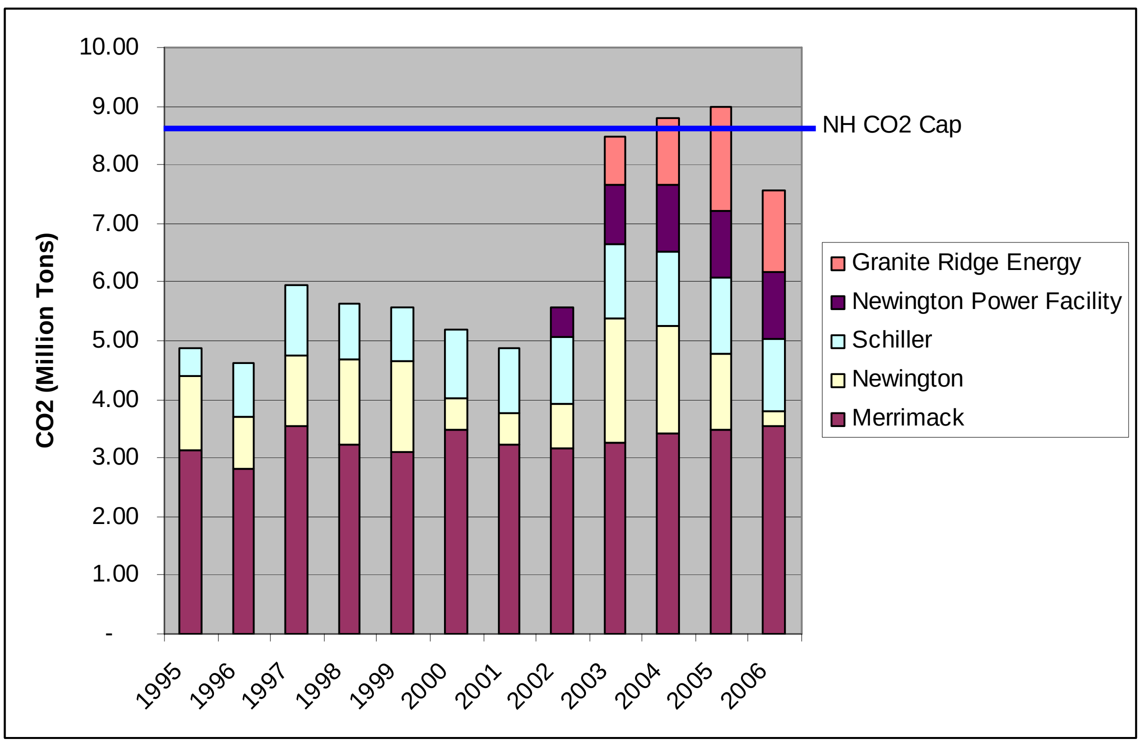
[21] "Clean Air Markets-Data and Maps," US Environment of Protection Agency, Available online at http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard
[22] "Emissions trading in the US: Is RGGI overallocated?," Point Carbon Research, August 2007

Table 6: CO_2 Emissions from RGGI Eligible Units in 1895-2006

Owner	FACILITY_NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AES, LLC	Granite Ridge Energy	-	-	-	-	-	-	-	-	0.8	1.2	-	-
AES, LLC Total		-	-	-	-	-	-	-	-	0.8	1.2	-	-
Granite Ridge Energy, LLC	Granite Ridge Energy	-	-	-	-	-	-	-	-	-	-	1.7	1.4
Granite Ridge Energy, LLC Total		-	-	-	-	-	-	-	-	-	-	1.7	1.4
Newington Energy	Newington Power Facility	-	-	-	-	-	-	-	0.5	1.0	1.1	1.2	1.1
Newington Energy Total		-	-	-	-	-	-	-	0.5	1.0	1.1	1.2	1.1
Public Service of NH	Merrimack	3.1	2.8	3.5	3.2	3.1	3.5	3.2	3.2	3.3	3.4	3.5	3.5
	Newington	1.3	0.9	1.2	1.5	1.6	0.5	0.5	0.8	2.1	1.8	1.3	0.3
	Schiller	0.5	0.9	1.2	0.9	0.9	1.2	1.1	1.2	1.2	1.3	1.3	1.2
PSNH Total		4.9	4.6	5.9	5.6	5.6	5.2	4.9	5.1	6.6	6.5	6.1	5.0
Grand Total		4.9	4.6	5.9	5.6	5.6	5.2	4.9	5.6	8.5	8.8	9.0	7.6

Source: US EPA

Figure 6: CO_2 Emissions from RGGI Eligible Units 1995-2006



Source: US EPA

4 Methodology & Assumptions

Our analysis of the potential economic impact of RGGI on New Hampshire utilizes a spreadsheet model for calculating electricity costs and updates and draws significantly on previous economic analysis of RGGI in NH and other states. Benefits of a spreadsheet model include that it is transparent, providing easy access to assumptions and calculation methodology, and that it is relatively flexible in enabling changes in assumptions and scenarios.

4.1 Allowances Methodology & Assumptions

Under the RGGI MOU, the number of allowances to be allocated to each state is known. The primary area of uncertainty with allowances is their future market value. The cost of the allowances is a significant factor in the overall cost impacts of RGGI. This analysis did not attempt to undertake any original modeling to determine carbon allowance prices.

Based on extensive review of the analysis and modeling undertaken of RGGI to date (both prior to MOU and subsequently) allowances are expected to have a market value range from $2 to $8 through 2018. This is based on carbon allowance prices projected by three different studies: University of Maryland, ICF Consulting for RGGI, and Synapse Energy. Carbon allowance prices from each of the studies are shown in the Table 7.

The RGGI study by the University of Maryland is the only study to project carbon allowance prices based on all 10 states participating and is also the most recent (the report was released in January 2007)[23]. RGGI modeling by ICF Consulting, is the only other study that has specifically developed estimates of carbon allowance prices for the RGGI region. These estimates were developed in October of 2006 and include all RGGI participants except Maryland[24]. A study by Synapse Energy, released in June 2006, did not specifically look at RGGI, but developed a range of US carbon allowance prices[25]. This study has been cited by other studies reviewing RGGI, specifically ISO New England[26].

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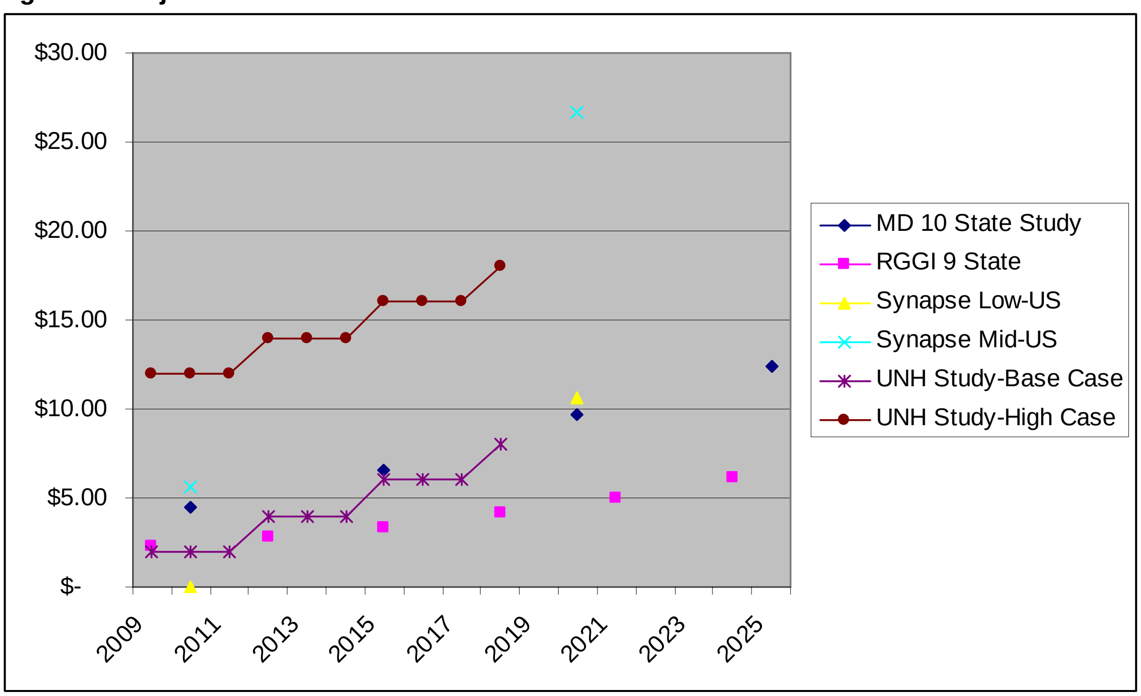
[23] "Economic and Energy Impacts from Maryland's Potential Participation in the Regional Greenhouse Gas Initiative," Center for Integrated Environment Research , University of Maryland, January 2007, Available online at http://www.cier.umd.edu/RGGI/documents/UMD_RGGI_STUDY_FINAL.pdf
[24] "RGGI Package Scenario," RGGI web site, ICF Consulting, October 2006, Available online at http://www.rggi.org/docs/packagescenario_10_11_06.xls
[25] "Climate Change and Power: Carbon Dioxide Emissions Costs and Electricity Resource Planning," Synapse Energy Economics, June 2006, Available online at http://www.synapse-energy.com/Downloads/SynapsePaper.2006-06.0.Climate-Change-and-Power.A0009.pdf
[26] "New England Electricity Scenario Analysis: Exploring the economic, reliability, and environmental impacts of various resource outcomes for meeting the region's future electricity needs," ISO New England, August 2007, Available online at http://www.iso-ne.com/committees/comm_wkgrps/othr/sas/mtrls/elec_report/index.html

Table 7: Studies Projecting Carbon Allowance Prices ($2007)

	MD 10 State Study	RGGI 9 State	Synapse Low-US	Synapse Mid-US	UNH Study-Base Case	UNH Study-High Price Case
2009		$ 2.27			$ 2.00	$ 12.00
2010	$ 4.47		$ -	$ 5.66	$ 2.00	$ 12.00
2011					$ 2.00	$ 12.00
2012		$ 2.77			$ 4.00	$ 14.00
2013					$ 4.00	$ 14.00
2014					$ 4.00	$ 14.00
2015	$ 6.57	$ 3.38			$ 6.00	$ 16.00
2016					$ 6.00	$ 16.00
2017					$ 6.00	$ 16.00
2018		$ 4.13			$ 8.00	$ 18.00
2019						
2020	$ 9.65		$ 10.67	$ 26.66		
2021		$ 5.04				
2022						
2023						
2024		$ 6.14				
2025	$ 12.38					

Figure 7: Projected Carbon Allowance Prices from Various Studies



Two additional factors that were taken into consideration when evaluating expected future carbon allowance prices were the provision for offsets and the level of the cap set by RGGI. The offset provisions in RGGI are expected to provide resistance to carbon allowance cost appreciation at both the $7.00 and $10.00 range. This conclusion regarding offsets in general is supported by a recent EPA analysis of a proposed federal carbon cap and trade program, the Climate Stewardship and Innovation Act of 2007. The scenario that had provisions for unlimited offsets, had significantly lower allowance costs (75% less), than a scenario with no provision for offsets[27].

This study did not attempt to determine the economically achievable offset potential in the RGGI region. The RGGI website presented estimates related to methane recovery from agriculture, but did not provide estimates discussing potential of other categories of offset projects[28]. One assumption made in the study is that offset projects would be available at a similar cost per ton of carbon as emission allowances to meet any shortfall in allowances that may occur.

An analysis by Point Carbon, a market research firm, suggests that the cap may be set too high. This would tend to put downward pressure on allowance prices at least in the short term[29]. While the US does not have any direct experience with carbon allowance prices, the European market has a cap and trade program for carbon dioxide that has been in existence since 2005. Carbon allowance prices for the initial phase of the program peaked in March of 2006 at $36.75 per ton. Allowance prices have since, significantly declined. As of September 24, 2007, carbon allowances have declined down to $0.08[30]. The precipitous decline in price is attributed to the cap being set too high, therefore eliminating the need for industries to cut emissions[31].

RGGI is expected to increase power prices in the competitive electricity markets as power producers will include the additional price of allowances into their power bids. Therefore, the price of electricity will be expected to increase by the cost of the allowance for the marginal power producer[32]. A study released by ISO New England evaluated several different resource scenarios to meet future New England electricity needs including increased energy efficiency and renewable energy. The study included the expected impacts of RGGI and found that under all scenarios, natural gas is expected to remain the predominant marginal producer[33].

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[27] "EPA Analysis of the Climate Stewardship and Innovation Act of 2007," Environmental Protection Agency, July 2007, Available online at http://www.blueclimate.com/blueclimate/2007/07/epa-releases-an.html

[28] "RGGI Offsets Limited Analysis," RGGI web site, ICF Consulting, August 2005, Available online at http://rggi.org/documents.htm

[29] "Emissions trading in the US: Is RGGI overallocated?," Point Carbon Research, August 2007

[30] EU emission allowance spot market prices accessed 9/24/2007 from the European Energy Exchange, Available online at http://www.eex.com/en/Market%20Information/Emission%20Allowances/EU%20Emission%20Allowances%20%7C%20Spot

[31] "What now for carbon? As carbon recovers from its April 2006 crash, what is next for the EU's emissions trading scheme?," Renewable Energy World, May 2007, Available online at http://www.renewable-energy-world.com

[32] " CO2 Allowance Allocation in the Regional Greenhouse Gas Initiative and the Effect on Electricity," Resources for the Future, December 2005

[33] "New England Electricity Scenario Analysis: Exploring the economic, reliability, and environmental impacts of various resource outcomes for meeting the region's future electricity needs," ISO New England,

The average emissions rate for the marginal producer plant in 2005 was 1,107 pounds of carbon dioxide per MWH for the New England power pool[34]. This level of carbon emissions per unit of output is consistent with a New England energy mix that is heavily reliant on natural gas for marginal power production. As natural gas is expected to continue to remain the marginal producer, this analysis assumed a marginal carbon emissions rate of 0.55 tons per MWH throughout the study period. The marginal emissions rate was used to determine the added cost of carbon compliance to the New England wholesale power markets.

Table 8: Marginal Cost of Allowances per MWH

Carbon Allowance Price	$ 2.00	$ 4.00	$ 6.00	$ 8.00	$ 10.00
Marginal Cost of Allowances per MWH	$ 1.11	$ 2.21	$ 3.32	$ 4.43	$ 5.54

All of the NH utilities except PSNH will only have exposure to RGGI increased costs through the marginal cost of allowances reflected in New England wholesale power prices. This will be true for the portion of PSNH electricity that is purchased on the wholesale power market as well(currently about 36%).

The majority of power for PSNH customers comes through its own generating facilities including the units subject to RGGI. In this analysis, the plants subject to RGGI were estimated to produce 6.5 million tons of carbon dioxide emissions annually. Allowances required were based on the maximum CO_2 emissions observed for 2000-2006 from the EPA Clean Air Markets database for each RGGI eligible unit minus the maximum emissions from the Schiller boiler associated with the Northern Wood Project (a 50 MW PSNH coal boiler was converted to a 50 MW wood boiler in 2006). This approach is expected to be conservative as it is using maximum CO_2 emissions from each unit.

August 2007, Available online at http://www.iso-ne.com/committees/comm_wkgrps/othr/sas/mtrls/elec_report/index.html

[34] " 2005 New England Marginal Emission Rate Analysis," ISO New England, August 2007, Available online at http://www.nepool.com/genrtion_resrcs/reports/emission/index.html

4.2 New Hampshire Electricity Forecast Methodology & Assumptions

In our modeling of RGGI economic impacts retail electricity consumption for New Hampshire was taken from the 2007 ISO New England CELT report[35]. This report provides electricity load projections from 2007 through 2016. The base case and the high carbon allowance Price scenario in this study utilized the ISO New England's base net energy load for New Hampshire in determining the cost impacts of RGGI. Sensitivity of the model was tested using ISO New England's low and high net energy load forecasts for New Hampshire. These runs are not included in this research study, but they did not change any of the material findings in the study.

Table 9: NH Forecast Electricity Retail Sales & Prices

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NH Retail Sales (thousand MWH)	12,265	12,430	12,660	12,890	13,115	13,330	13,550	13,775	14,004	14,236
Electricity Cost ($2007) per kWh	$ 0.154	$ 0.155	$ 0.155	$ 0.155	$ 0.155	$ 0.155	$ 0.155	$ 0.155	$ 0.155	$ 0.155

Source: ISO New England 2007 CELT Report

PSNH was analyzed separately from the other utilities as it has a unique structure of owning generation in a restructured market. None of the other utilities own their own generation and all are expected to experience increased costs due to the price of carbon compliance in the regional electricity marketplace.

Forecasts of future electricity prices were obtained from the 2007 ISO New England CELT report[36] These forecasts went through 2017 and were specific to New Hampshire. As the forecast only went out through 2017 and this analysis modeled costs through 2018 the same price for 2017 was used for 2018. All price data in the study are provided in 2007 dollars. No other sources were utilized for electricity price data.

4.3 US Greenhouse Gas Policy

While there is significant federal legislation being proposed for a national carbon cap, this analysis did not attempt to determine the impact that a national policy for a carbon cap and trade program would have on RGGI and New Hampshire. Also, there was no attempt to determine the potential impact of an interconnection between the Western Climate Initiative and RGGI.

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[35] "Forecast Data 2007," ISO New England, September 2007, Available online at http://www.iso-ne.com/trans/celt/fsct_detail/index.html

[36] "Forecast Data 2007," ISO New England, September 2007, Available online at http://www.iso-ne.com/trans/celt/fsct_detail/index.html

4.4 Energy Efficiency

Energy efficiency savings were estimated in the following manner in this analysis. The annualized energy efficiency cost was calculated by taking the allowance revenue available for energy efficiency in any given year and dividing by the expected lifetime of the efficiency investment. The annualized energy efficiency cost was then divided by the average cost of an energy-efficient kWh. This provided expected annual kWh savings from the allowance revenue invested for that given year. Total annual dollar savings was calculated by multiplying the total kWh saved in a given year by the expected cost of a kWh of electricity in that given year.

Annual kWh savings were cumulative. In 2009, if New Hampshire were to dedicate 100% of allowance revenue towards investment in energy-efficient technologies, it would save an estimated 37 million kWh of electricity. Electricity costs are estimated to be $.15 per kWh, therefore in 2009, $5.3 million would be saved from overall electric retail costs. In 2010, allowance revenue investment in that year would be expected to save an additional 37 million kWh of electricity. There would also be savings from the previous year's energy efficiency investments, resulting in a total of 74 million kWh of electricity savings, saving $10.9 million in 2010. This pattern of building on previous years' energy efficiency investments would continue throughout the lifetime of the investments.

An energy-efficient investment had an assumed 14 year lifetime. Energy efficiency lifetime is based on the value used in the New Hampshire's System Benefit Charge funded energy efficiency programs [37].

The average cost of an energy-efficient kWh used in this study was assumed to be $0.033. This is based on the average cost of energy efficiency provided in an analysis performed by Optimal Energy, Inc. for the Northeast Energy Efficiency Partnerships, Inc. [38]. This assumption for cost seems reasonable given that for New Hampshire's System Benefit Charge funded energy efficiency programs in 2005, residential energy efficiency costs were $0.033 per kWh and commercial energy efficiency costs were $0.012 per kWh[39].

In this analysis, a maximum economically achievable energy efficiency potential for New Hampshire was assumed to be 23% of the business as usual electricity load. This is based on the analysis performed by Optimal Energy, Inc. for the Northeast Energy Efficiency Partnerships, Inc which projected an economically achievable energy efficiency potential

[37] Conversation with Gil Gelineau, PSNH, July 2005

[38] Average economically achievable energy efficient kWH cost is $0.031 in $2005. "Economically Achievable Energy Efficiency Potential in New England," Northeast Energy Efficiency Partnerships, Inc., May 2005, Available online at www.neep.org/files/Updated_Achievable_Potential_2005.pdf

[39] Residential: 225,882,381 Lifetime kWh at a cost of $7,492,991; Commercial: 746,152,949 Lifetime kWh at a cost of $9,016,773. "Reports of the Legislative Oversight Committee on Electric Restructuring: Results and Effectiveness of the System Benefits Charge," State of New Hampshire Public Utilities Commission, October 2, 2006, Available online at http://www.puc.state.nh.us/Electric/100106%20LI-SBC%20legislative%20report.pdf

of 23% by 2013 in New England[40]. This level of energy efficiency potential is supported by a recent meta-analysis of 11 recent studies that found the median achievable energy efficiency potential in the electricity sector for the United States is 24%[41]

In both the base case and the high price scenario, the revenue available if New Hampshire were to conduct auctions would not be sufficient to exceed the estimated potential of 23% and therefore was not a constraint in this study.

4.5 NH RGGI Scenario Methodology & Assumptions

Nine different scenarios were analyzed to determine the impact on **New Hampshire electric utility customers**

These include:

- 25% rebate/75% energy efficiency
- 50% rebate/50% energy efficiency
- 75% rebate/25% energy efficiency
- 100% rebate
- 100% energy efficiency
- 100% of allowance revenue goes to corporate taxes
- 100% of allowances are given to existing RGGI impacted power generation units
- The cost impact on ratepayers if New Hampshire was not to join RGGI.

PSNH was analyzed separately from the other utilities for each scenario. Six scenarios ranging from 100% rebate to 100% energy efficiency are based on the assumption that New Hampshire will auction allowances and provide auction revenue funds to the utilities. These allocation scenarios were modeled and compared to the case if New Hampshire were not to join RGGI. One scenario was devoted to direct allocation ("grandfathering") of carbon allowances. Another scenario discusses the utility costs if all allowance revenue went to corporate taxes; this scenario shows the direct impact of the cost of RGGI on utility customers, as none of the revenue from allowance sales goes directly back to utility customers.

Annual compliance for the RGGI cap was used as a proxy for the three year compliance. Allocation of revenue from auction sales to the different utilities was based on the relative proportion of retail electricity consumption. The historical average over the past five years has been approximately 72% of retail consumption is by PSNH customers.

Because PSNH owns fossil fueled generating facilities, PSNH ratepayers were assumed to be responsible for 100% of the cost of carbon compliance for those RGGI affected

[40] 34,375 GWH of electricity savings due to energy efficiency compared to the ISO New England forecast of 147,300 GWH in 2013.

[41] Nadel et al., "The Technical, Economic and Achievable Potential for Energy Efficiency in the US -- a Meta-Analysis of Recent Studies," American Council for an Energy- Efficient Economy, 2004 Available online at http://www.aceee.org/conf/04ss/rnemeta.pdf

units. Grandfathering allowances was based on allocating allowances to PSNH based on PSNH market share. The remaining allowances were assumed to be distributed to the other RGGI eligible plants in New Hampshire.

These different scenarios were analyzed in two carbon allowance price cases. The base case where carbon allowance prices start at $2 in 2009 rising to $8 by 2018 and the high price case where carbon allowance prices start at $12 in 2009 rising to $18 by 2018.

4.6 Energy Modeling

The study did not undertake any original energy modeling. Therefore some factors that would impact electricity costs are not a part of this study including the forward capacity markets and transmission and distribution costs. While these are relevant factors which would impact the precision of the modeling, they are not believed to materially change any of the findings in this study.

4.7 REMI Modeling Methodology

In addition to the spreadsheet modeling done to examine the impact on ratepayers, the Regional Economic Models Inc. (REMI) was used to examine the potential **overall economic impacts of RGGI** on the New Hampshire economy, not just on electric ratepayers. REMI is a widely used model that estimates the total economic effects, including effects on the number of jobs created and income, of any specific policy initiative.

REMI is constantly revised and updated to include new model specification and data. The overall structure of the model includes output and demand, population and labor force, wages, and costs. REMI and other models, however, are limited by model specification assumptions and reliance on past economic relationships and trends. The REMI model is also limited in detail on the energy market and energy efficiency.

Electric utility costs and usage for residential and commercial customers and available allowance revenue that were calculated in the spreadsheet model were used as inputs to REMI . Options evaluated include:

- New Hampshire chooses not to participate in RGGI, while the other states implement RGGI
- NH RGGI participation with 3 alternative uses of carbon allowance auction revenues:
    - 100% for ratepayer rebate
    - 100% rebate to commercial and household ratepayers for energy efficiency
    - 100% to reduce NH business taxes.

The modeling was undertaken using a wide range of potential carbon allowance prices (significantly higher and lower prices than base case price) and the main findings on possible policy options were found not to be sensitive to carbon allowance prices (only the base case allowance price results are presented in this analysis).

5 Economic Cost-Benefit and Modeling Analysis

Based on the different scenarios analyzed, it is believed that it is in New Hampshire's economic interest to join RGGI. Costs will increase in the regional electricity marketplace whether or not New Hampshire joins RGGI. New Hampshire, as a participant in the regional electricity marketplace, will experience those increased costs whether or not New Hampshire joins RGGI.

The study finds that total cost increases are lower if New Hampshire joins RGGI and auctions allowances than if it does not participate in RGGI. The manner in which New Hampshire chooses to use the allowances it receives as part of participating in RGGI will have a significant impact on electric costs to NH businesses and residents. Under all possible scenarios except for directly allocating allowances or dedicating allowance revenue to corporate taxes, if New Hampshire were to join RGGI, utility customers would have lower cost increases or, in some scenarios, savings on their utility bills.

5.1 Economic Rationale for NH to Join RGGI

NH participation results in lower cost overall to New Hampshire regardless of the carbon allowance price. In this analysis, results are presented for the expected ("modeled") carbon allowance price scenario, but the economic benefit argument to New Hampshire holds at both higher and lower carbon allowance prices.

If New Hampshire were not to join RGGI, the proportion of electricity usage that comes from the wholesale competitive electricity markets would reflect the increased cost of carbon compliance. All utilities in New Hampshire purchase some power for customers through the wholesale electricity markets. The main difference in total New Hampshire utility cost is that PSNH would not have any increased costs specifically due to carbon compliance for the power plants that it owns.

If New Hampshire does not join RGGI, the cost of RGGI to all NH utility customers is expected to be $7 million. This cost is expected to grow to $36 million by 2018. If New Hampshire does not join RGGI then it will not receive an allocation of carbon allowances. Therefore the State is subject to a regional policy that will increase costs for the state, but would not receive any compensation for those increased costs.

If New Hampshire were to join RGGI, the cost of RGGI to NH utility customers is higher because PSNH fossil fuel generation will be subject to carbon regulation. In 2009, the cost of RGGI to all NH utility customers is expected to be $20 million. This cost is expected to grow to $88 million by 2018. However by joining RGGI, New Hampshire receives an allocation of carbon allowances. These carbon allowances had financial value, projected to be $17 million in 2019 growing to $62 million in 2018. When taking into account the benefits of the carbon allowances allocated to New Hampshire, the net financial cost is lower if New Hampshire joins RGGI. In 2009, the net financial cost is expected to be $3 million. This cost is expected to grow to $26 million by 2018.

In comparing New Hampshire participating in RGGI and not participating in RGGI, net costs are expected to be 60% lower in 2009 if New Hampshire participates. By 2018, the difference between the two scenarios decreases and is approximately 30% lower if New Hampshire were to participate in RGGI. A primary factor for the decrease in difference between participation and nonparticipation in RGGI, is the allocated allowances to New Hampshire (as with all participants in the RGGI program) are decreased 10% from 2009 levels in 2018. Therefore New Hampshire will have a smaller number of allowances to use to offset the cost increases due to RGGI, starting in 2015.

Table 10: NH RGGI Cost ($2007 Millions)

	No RGGI			RGGI			
	Cost of RGGI to Utility Customers	Allowance Revenue	Net Difference	Cost of RGGI To Utility Customers	Allowance Revenue	Net Difference	% Difference between Scenarios
2009	($7)	$0	($7)	($20)	$17	($3)	-60%
2012	($15)	$0	($15)	($41)	$35	($6)	-60%
2015	($25)	$0	($25)	($62)	$50	($13)	-50%
2018	($36)	$0	($36)	($88)	$62	($26)	-30%

5.2 Statewide Utility Cost Impact for Scenarios Evaluated

Nine different scenarios were evaluated under the expected case of gradually increasing carbon allowance prices from $2 in 2009 to $8 in 2018. It was found that **for both PSNH and the other utility customers,** cumulative costs were lowest if 100% of the revenue from sales of allowances was to be invested in energy efficiency. In the short term, rebating had the biggest reduction on rates, but over the long-term had significantly higher cost than many of the other scenarios. Energy efficiency on the other hand had the lowest short-term impact, but leads to significant long-term gains. Direct allocation of allowances had costs that were similar to the scenario of New Hampshire not joining RGGI. The highest cost option from a utility rate perspective would be if allowance revenue was not put back into the utility sector, but instead used to reduce corporate taxes.

Table 11 shows the absolute changes in cost for PSNH customers for the different scenarios evaluated; Table 12 shows the absolute changes in cost for the other NH utilities' customers for the different scenarios evaluated; Table 13 shows the absolute changes in cost for all of NH utilities' customers for the different scenarios evaluated. Figure 8 depicts the change in cost for the different scenarios for all NH utilities from 2009 through 2018.

Table 14 shows the percent change in cost for PSNH customers for the different scenarios evaluated; Table 15 shows the percent change in cost for the other NH utilities' customers for the different scenarios evaluated; Table 16 shows the percent change in cost for all of NH utilities' customers for the different scenarios evaluated.

Table 17 shows the average monthly change in residential bills for PSNH customers for the different scenarios evaluated; Table 18 shows the average monthly change in residential bills for the other NH utilities' customers for the different scenarios evaluated; Table 19 shows the average monthly change in residential bills for all of NH utilities' customers for the different scenarios evaluated.

Table 11: Net Rate Impact - PSNH

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 2	$ 4	$ 6	$ 8	
25% RB/ 75% EE	$ 9,757,745	$ 11,055,557	$ 4,103,694	$(11,065,484)	$ 10,517,504
50% RB/ 50% EE	$ 7,684,007	$ 10,060,159	$ 7,296,523	$ (566,707)	$ 40,153,142
75% RB/ 25% EE	$ 5,610,269	$ 9,064,760	$ 10,489,352	$ 9,932,071	$ 69,788,779
100% RB	$ 3,536,531	$ 8,069,362	$ 13,682,182	$ 20,430,849	$ 99,424,416
100% EE	$ 11,831,483	$ 12,050,956	$ 910,865	$(21,564,262)	$ (19,118,133)
Corporate Taxes	$ 15,949,993	$ 32,896,286	$ 50,922,569	$ 70,084,699	$ 372,520,589
Grandfathering	$ 3,536,531	$ 8,069,362	$ 13,682,182	$ 20,430,849	$ 99,424,416
Don't Join	$ 2,967,646	$ 6,931,591	$ 11,975,526	$ 18,155,308	$ 86,908,942

Table 12: Net Rate Impact - Other NH Utilities

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 2	$ 4	$ 6	$ 8	
25% RB/ 75% EE	$ 1,652,177	$ 790,221	$ (2,504,101)	$ (8,218,203)	$ (24,424,708)
50% RB/ 50% EE	$ 759,518	$ (27,901)	$ (2,296,900)	$ (6,031,846)	$ (21,002,971)
75% RB/ 25% EE	$ (133,140)	$ (846,024)	$ (2,089,699)	$ (3,845,490)	$ (17,581,233)
100% RB	$ (1,025,798)	$ (1,664,146)	$ (1,882,499)	$ (1,659,133)	$ (14,159,495)
100% EE	$ 2,544,835	$ 1,608,343	$ (2,711,301)	$(10,404,560)	$ (27,846,446)
Corporate Taxes	$ 3,801,659	$ 7,990,769	$ 12,599,874	$ 17,650,698	$ 92,044,572
Grandfathering	$ 3,801,659	$ 7,990,769	$ 12,599,874	$ 17,650,698	$ 92,044,572
Don't Join	$ 3,801,659	$ 7,990,769	$ 12,599,874	$ 17,650,698	$ 92,044,572

Table 13: Net Rate Impact – All NH Utilities

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 2	$ 4	$ 6	$ 8	
25% RB/ 75% EE	$ 11,409,921	$ 11,845,778	$ 1,599,594	$(19,283,688)	$ (13,907,204)
50% RB/ 50% EE	$ 8,443,525	$ 10,032,257	$ 4,999,623	$ (6,598,553)	$ 19,150,171
75% RB/ 25% EE	$ 5,477,129	$ 8,218,736	$ 8,399,653	$ 6,086,582	$ 52,207,546
100% RB	$ 2,510,733	$ 6,405,215	$ 11,799,683	$ 18,771,716	$ 85,264,920
100% EE	$ 14,376,318	$ 13,659,299	$ (1,800,436)	$(31,968,822)	$ (46,964,578)
Corporate Taxes	$ 19,751,653	$ 40,887,055	$ 63,522,443	$ 87,735,396	$ 464,565,160
Grandfathering	$ 7,338,190	$ 16,060,130	$ 26,282,056	$ 38,081,547	$ 191,468,988
Don't Join	$ 6,769,305	$ 14,922,360	$ 24,575,400	$ 35,806,006	$ 178,953,514

Table 14: Percentage Change in Utility Customer Costs-PSNH

	2009	2012	2015	2018
Allowance Price	$ 2	$ 4	$ 6	$ 8
25% RB/ 75% EE	0.7%	0.8%	0.3%	-0.7%
50% RB/ 50% EE	0.6%	0.7%	0.5%	0.0%
75% RB/ 25% EE	0.4%	0.6%	0.7%	0.6%
100% RB	0.3%	0.6%	0.9%	1.3%
100% EE	0.9%	0.8%	0.1%	-1.4%
Corporate Taxes	1.2%	2.3%	3.4%	4.4%
Grandfathering	0.3%	0.6%	0.9%	1.3%
Don't Join	0.2%	0.5%	0.8%	1.1%

Table 15: Percentage Change in Utility Customer Costs- Other NH Utilities

Other Utilities	2009	2012	2015	2018
Allowance Price	$ 2	$ 4	$ 6	$ 8
25% RB/ 75% EE	0.3%	0.1%	-0.4%	-1.3%
50% RB/ 50% EE	0.1%	0.0%	-0.4%	-1.0%
75% RB/ 25% EE	0.0%	-0.2%	-0.4%	-0.6%
100% RB	-0.2%	-0.3%	-0.3%	-0.3%
100% EE	0.5%	0.3%	-0.5%	-1.7%
Corporate Taxes	0.7%	1.4%	2.1%	2.9%
Grandfathering	0.7%	1.4%	2.1%	2.9%
Don't Join	0.7%	1.4%	2.1%	2.9%

Table 16: Percentage Change in Utility Customer Costs- All NH Utilities

All Utilities	2009	2012	2015	2018
Allowance Price	$ 2	$ 4	$ 6	$ 8
25% RB/ 75% EE	0.6%	0.6%	0.1%	-0.9%
50% RB/ 50% EE	0.4%	0.5%	0.2%	-0.3%
75% RB/ 25% EE	0.3%	0.4%	0.4%	0.3%
100% RB	0.1%	0.3%	0.6%	0.8%
100% EE	0.8%	0.7%	-0.1%	-1.4%
Corporate Taxes	1.0%	2.0%	3.0%	4.0%
Grandfathering	0.4%	0.8%	1.2%	1.7%
Don't Join	0.4%	0.7%	1.2%	1.6%

Table 17: Average Change in Residential Household Bill - PSNH

PSNH		2009		2012		2015		2018
Allowance Price	$	2	$	4	$	6	$	8
25% RB/ 75% EE	$	0.72	$	0.77	$	0.27	$	(0.70)
50% RB/ 50% EE	$	0.57	$	0.70	$	0.49	$	(0.04)
75% RB/ 25% EE	$	0.41	$	0.63	$	0.70	$	0.63
100% RB	$	0.26	$	0.57	$	0.91	$	1.30
100% EE	$	0.87	$	0.84	$	0.06	$	(1.37)
Corporate Taxes	$	1.17	$	2.30	$	3.39	$	4.44
Grandfathering	$	0.26	$	0.57	$	0.91	$	1.30
Don't Join	$	0.22	$	0.49	$	0.80	$	1.15

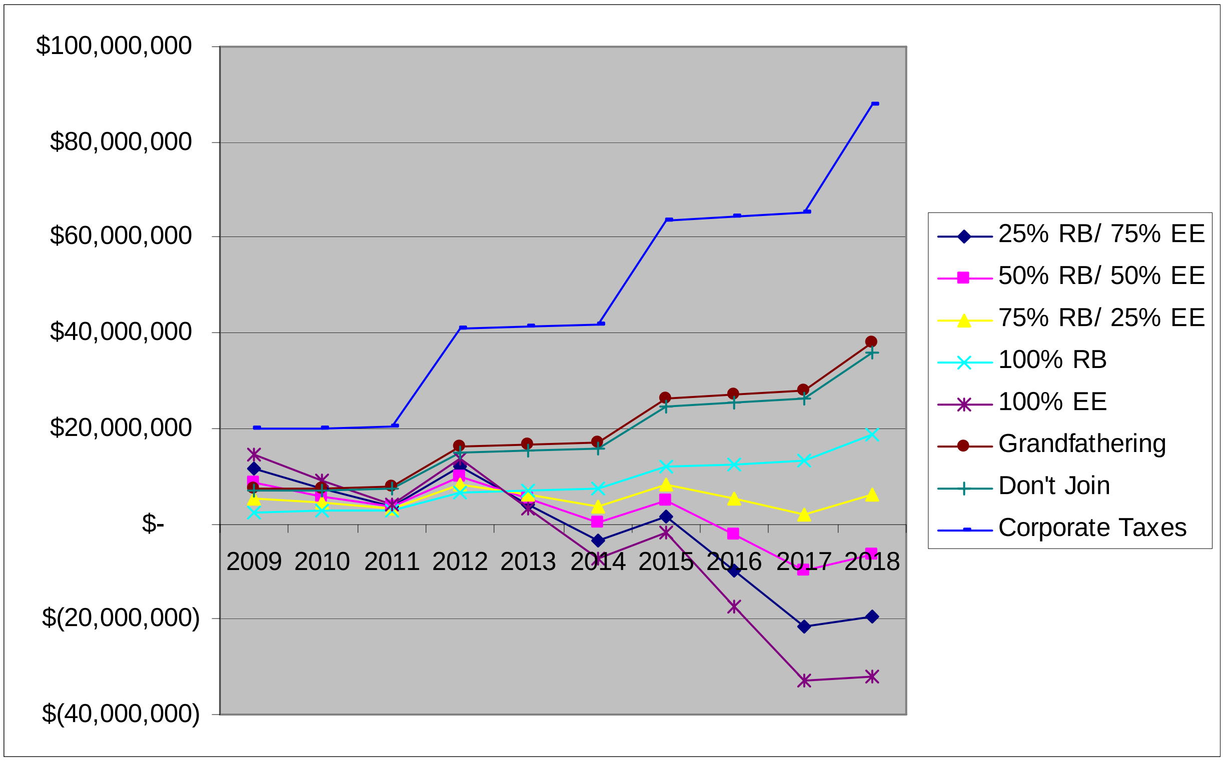
Table 18: Average Change in Residential Household Bill – Other NH Utilities

Other Utilities		2009		2012		2015		2018
Allowance Price	$	2	$	4	$	6	$	8
25% RB/ 75% EE	$	0.31	$	0.14	$	(0.43)	$	(1.34)
50% RB/ 50% EE	$	0.14	$	(0.01)	$	(0.39)	$	(0.98)
75% RB/ 25% EE	$	(0.03)	$	(0.15)	$	(0.36)	$	(0.63)
100% RB	$	(0.19)	$	(0.30)	$	(0.32)	$	(0.27)
100% EE	$	0.48	$	0.29	$	(0.46)	$	(1.70)
Corporate Taxes	$	0.72	$	1.44	$	2.16	$	2.88
Grandfathering	$	0.72	$	1.44	$	2.16	$	2.88
Don't Join	$	0.72	$	1.44	$	2.16	$	2.88

Table 19: Average Change in Residential Household Bill – All NH Utilities

All Utilities		2009		2012		2015		2018
Allowance Price	$	2	$	4	$	6	$	8
25% RB/ 75% EE	$	0.60	$	0.60	$	0.08	$	(0.88)
50% RB/ 50% EE	$	0.45	$	0.51	$	0.24	$	(0.30)
75% RB/ 25% EE	$	0.29	$	0.41	$	0.40	$	0.28
100% RB	$	0.13	$	0.32	$	0.57	$	0.86
100% EE	$	0.76	$	0.69	$	(0.09)	$	(1.46)
Corporate Taxes	$	1.05	$	2.06	$	3.05	$	4.01
Grandfathering	$	0.39	$	0.81	$	1.26	$	1.74
Don't Join	$	0.36	$	0.75	$	1.18	$	1.63

Figure 8: Net Cost Impact to All NH Utilities Under Different Scenarios Analyzed- Base Case



Directly allocating allowances to PSNH generation is similar cost to providing a rebate for the value of the allowances to PSNH customers. This is due to the fact that PSNH will directly apply the allowances to emissions from its own generating facilities. In this analysis, transactional and administrative costs were not taken into account.

However, because PSNH still owns generation, there are some additional benefits to direct allocation of allowances to PSNH. These include reduced transactional costs and reduced volatility which would directly benefit PSNH customer rates. This is not the case for the other three state utilities as they do not own their own generation In essence, the economic value of the allowances is given away without any financial benefit to NH ratepayers.

PSNH and the other utilities would not be equally impacted if New Hampshire were to participate in RGGI. PSNH ratepayers will incur higher percentage increases then the other NH utilities if the State participates in RGGI. PSNH ratepayers will incur lower percentage increases then the NH state utilities if the State does not participate in RGGI. The other NH utilities besides PSNH incur the same increase in electricity rates whether or not the state participates in RGGI. PSNH experiences higher percentage increases because it owns a substantial portion of fossil fueled power generation that has higher carbon emissions per unit of output than the regional marginal producer natural gas power plants.

5.3 Statewide Utility Cost Impact for Scenarios Evaluated Under High Carbon Allowance Price Case

To evaluate the utility cost impact if carbon allowance prices are significantly higher than expected, the nine different scenarios were evaluated under the case of increasing carbon allowance prices from $12 in 2009 to $18 in 2018. Based on the literature review, carbon allowance prices of this magnitude are expected to be possible but highly unlikely.

In the higher carbon allowance price case, the conclusions were the same as for the base case. It was found that **for both PSNH and the other utility customers,** cumulative costs were lowest if 100% of the revenue from sales of allowances was to be invested in energy efficiency. The highest utility costs would occur if allowance revenue were not directed back to the utility sector but instead went into reducing corporate taxes.

Table 20 shows the absolute changes in cost for PSNH customers for the different scenarios evaluated; Table 21 shows the absolute changes in cost for the NH state utilities' customers for the different scenarios evaluated; Table 22 shows the absolute changes in cost for all of the NH utilities' customers for the different scenarios evaluated. Figure 9 depicts the change in cost for the different scenarios for all NH utilities from 2009 through 2018.

Table 23 shows the percent change in cost for PSNH customers for the different scenarios evaluated; Table 24 shows the percent change in cost for the NH state utilities' customers for the different scenarios evaluated; Table 25 shows the percent change in cost for all of NH utilities' customers for the different scenarios evaluated.

Table 26 shows the average monthly change in residential bills for PSNH customers for the different scenarios evaluated; Table 27 shows the average monthly change in residential bills for the other NH utilities' customers for the different scenarios evaluated; Table 28 shows the average monthly change in residential bills for all of NH utilities' customers for the different scenarios evaluated.

Table 20: Net Rate Impact – PSNH - High Price Case

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 12	$ 14	$ 16	$ 18	
25% RB/ 75% EE	$ 58,546,469	$ 15,243,454	$ (35,942,788)	$ (95,196,258)	$ (168,147,670)
50% RB/ 50% EE	$ 46,104,041	$ 19,576,558	$ (11,799,919)	$ (48,141,036)	$ (7,255,504)
75% RB/ 25% EE	$ 33,661,613	$ 23,909,662	$ 12,342,949	$ (1,085,813)	$ 153,636,662
100% RB	$ 21,219,185	$ 28,242,765	$ 36,485,817	$ 45,969,410	$ 314,528,827
100% EE	$ 70,988,897	$ 10,910,350	$ (60,085,656)	$ (142,251,481)	$ (329,039,836)
Corporate Taxes	$ 95,699,959	$ 115,137,002	$ 135,793,517	$ 157,690,572	$ 1,208,298,120
Grandfathering	$ 21,219,185	$ 28,242,765	$ 36,485,817	$ 45,969,410	$ 314,528,827
Don't Join	$ 17,805,874	$ 24,260,569	$ 31,934,736	$ 40,849,444	$ 273,569,095

Table 21: Net Rate Impact - Other Utilities - High Price Case

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 12	$ 14	$ 16	$ 18	
25% RB/ 75% EE	$ 9,913,060	$ (4,414,455)	$ (21,031,828)	$ (40,010,615)	$ (142,842,601)
50% RB/ 50% EE	$ 4,557,110	$ (4,884,474)	$ (15,694,551)	$ (27,918,093)	$ (112,082,922)
75% RB/ 25% EE	$ (798,840)	$ (5,354,493)	$ (10,357,274)	$ (15,825,571)	$ (81,323,244)
100% RB	$ (6,154,789)	$ (5,824,512)	$ (5,019,997)	$ (3,733,049)	$ (50,563,566)
100% EE	$ 15,269,009	$ (3,944,436)	$ (26,369,105)	$ (52,103,137)	$ (173,602,279)
Corporate Taxes	$ 22,809,956	$ 27,967,691	$ 33,599,664	$ 39,714,070	$ 297,013,381
Grandfathering	$ 22,809,956	$ 27,967,691	$ 33,599,664	$ 39,714,070	$ 297,013,381
Don't Join	$ 22,809,956	$ 27,967,691	$ 33,599,664	$ 39,714,070	$ 297,013,381

Table 22: Net Rate Impact – All NH Utilities - High Price Case

	2009	2012	2015	2018	Total Additional Cost 2009-2018
Allowance Price	$ 12	$ 14	$ 16	$ 18	
25% RB/ 75% EE	$ 68,459,528	$ 10,828,999	$ (56,974,616)	$ (135,206,874)	$ (310,990,271)
50% RB/ 50% EE	$ 50,661,151	$ 14,692,084	$ (27,494,470)	$ (76,059,129)	$ (119,338,427)
75% RB/ 25% EE	$ 32,862,773	$ 18,555,168	$ 1,985,675	$ (16,911,384)	$ 72,313,417
100% RB	$ 15,064,395	$ 22,418,253	$ 31,465,821	$ 42,236,361	$ 263,965,261
100% EE	$ 86,257,906	$ 6,965,914	$ (86,454,762)	$ (194,354,619)	$ (502,642,114)
Corporate Taxes	$ 118,509,915	$ 143,104,693	$ 169,393,181	$ 197,404,641	$ 1,505,311,501
Grandfathering	$ 44,029,141	$ 56,210,456	$ 70,085,481	$ 85,683,480	$ 611,542,209
Don't Join	$ 40,615,830	$ 52,228,260	$ 65,534,400	$ 80,563,513	$ 570,582,476

Table 23: Percentage Change in Utility Customer Costs-PSNH - High Price Case

	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	4.3%	1.1%	-2.4%	-6.0%
50% RB/ 50% EE	3.4%	1.4%	-0.8%	-3.0%
75% RB/ 25% EE	2.5%	1.7%	0.8%	-0.1%
100% RB	1.6%	2.0%	2.4%	2.9%
100% EE	5.2%	0.8%	-4.0%	-8.9%
Corporate Taxes	7.1%	8.0%	9.0%	9.9%
Grandfathering	1.6%	2.0%	2.4%	2.9%
Don't Join	1.3%	1.7%	2.1%	2.6%

Table 24: Percentage Change in Utility Customer Costs- Other NH Utilities - High Price Case

Other Utilities	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	1.9%	-0.8%	-3.6%	-6.5%
50% RB/ 50% EE	0.9%	-0.9%	-2.7%	-4.5%
75% RB/ 25% EE	-0.2%	-1.0%	-1.8%	-2.6%
100% RB	-1.2%	-1.0%	-0.9%	-0.6%
100% EE	2.9%	-0.7%	-4.5%	-8.4%
Corporate Taxes	4.3%	5.0%	5.7%	6.4%
Grandfathering	4.3%	5.0%	5.7%	6.4%
Don't Join	4.3%	5.0%	5.7%	6.4%

Table 25: Percentage Change in Utility Customer Costs- All NH Utilities - High Price Case

All Utilities	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	3.6%	0.5%	-2.7%	-6.1%
50% RB/ 50% EE	2.7%	0.7%	-1.3%	-3.4%
75% RB/ 25% EE	1.7%	0.9%	0.1%	-0.8%
100% RB	0.8%	1.1%	1.5%	1.9%
100% EE	4.6%	0.3%	-4.1%	-8.8%
Corporate Taxes	6.3%	7.1%	8.0%	8.9%
Grandfathering	2.3%	2.8%	3.3%	3.9%
Don't Join	2.2%	2.6%	3.1%	3.6%

Table 26: Average Change in Residential Household Bill - PSNH - High Price Case

PSNH	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	$ 4.31	$ 1.07	$ (2.39)	$ (6.04)
50% RB/ 50% EE	$ 3.39	$ 1.37	$ (0.79)	$ (3.05)
75% RB/ 25% EE	$ 2.48	$ 1.67	$ 0.82	$ (0.07)
100% RB	$ 1.56	$ 1.98	$ 2.43	$ 2.92
100% EE	$ 5.23	$ 0.76	$ (4.00)	$ (9.02)
Corporate Taxes	$ 7.04	$ 8.06	$ 9.05	$ 10.00
Grandfathering	$ 1.56	$ 1.98	$ 2.43	$ 2.92
Don't Join	$ 1.31	$ 1.70	$ 2.13	$ 2.59

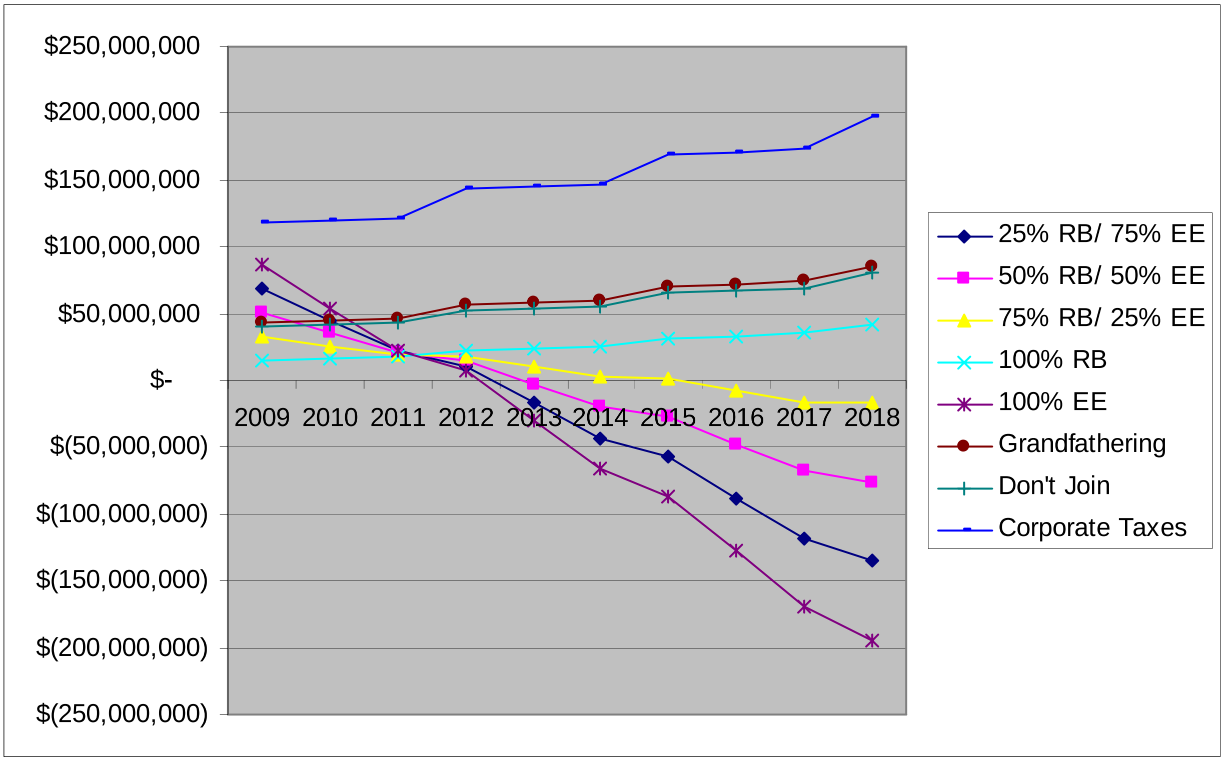
Table 27: Average Change in Residential Household Bill – Other NH Utilities - High Price Case

Other Utilities	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	$ 1.88	$ (0.80)	$ (3.60)	$ (6.52)
50% RB/ 50% EE	$ 0.86	$ (0.88)	$ (2.69)	$ (4.55)
75% RB/ 25% EE	$ (0.15)	$ (0.96)	$ (1.77)	$ (2.58)
100% RB	$ (1.16)	$ (1.05)	$ (0.86)	$ (0.61)
100% EE	$ 2.89	$ (0.71)	$ (4.52)	$ (8.50)
Corporate Taxes	$ 4.32	$ 5.04	$ 5.76	$ 6.48
Grandfathering	$ 4.32	$ 5.04	$ 5.76	$ 6.48
Don't Join	$ 4.32	$ 5.04	$ 5.76	$ 6.48

Table 28: Average Change in Residential Household Bill – All NH Utilities - High Price Case

All Utilities	2009	2012	2015	2018
Allowance Price	$ 12	$ 14	$ 16	$ 18
25% RB/ 75% EE	$ 3.63	$ 0.55	$ (2.73)	$ (6.17)
50% RB/ 50% EE	$ 2.68	$ 0.74	$ (1.32)	$ (3.47)
75% RB/ 25% EE	$ 1.74	$ 0.94	$ 0.10	$ (0.77)
100% RB	$ 0.80	$ 1.13	$ 1.51	$ 1.93
100% EE	$ 4.57	$ 0.35	$ (4.15)	$ (8.87)
Corporate Taxes	$ 6.28	$ 7.22	$ 8.13	$ 9.01
Grandfathering	$ 2.33	$ 2.83	$ 3.36	$ 3.91
Don't Join	$ 2.15	$ 2.63	$ 3.14	$ 3.68

Figure 9: Net Cost Impact to All NH Utilities Under Different Scenarios Analyzed- High Price Case



5.4 *NH Economy-Wide Impact of RGGI: Economic Modeling Result Using REMI*

NH participation in RGGI would have a positive impact on employment and the overall New Hampshire economy. The most positive impact would be if allowances are auctioned and auction revenue goes to ratepayer rebates for investment in energy efficiency or for reduction in business taxes.

Not participating in RGGI would have a negative impact on the overall NH economy. There would be net job loss and also overall economic decline. Both of the declines would be slight. By 2018, 72 jobs (or .004 of the employment base in the state) would be lost and overall economic activity would decline by $6.5 million, or .006 percent of the state's economy.

If allowance revenue was directly rebated to electricity rates, the employment and overall economic impact would be slightly negative until 2015 and slightly positive thereafter. The 2009 to 2015 decline would be less than the decline in New Hampshire did not join RGGI.

The REMI modeling suggests that the most efficient way to allocate the auction revenue is through either use of auction revenue for investment in energy efficiency or to reduce business taxes in New Hampshire.   Use of carbon allowance auction revenue for investment in energy efficiency would have the greatest positive employment impact and use of auction revenue to reduce business taxes would have the greatest positive impact on overall economic activity. The differences between the two are not very significant. If the state were to use auction revenue for investments in energy efficiency by 2018 employment would increase by 815 (or .08 percent increase to the base) and Gross State Product (GSP) would increase by over $63 million (or about 0.06% of total annual GSP). If the auction revenue were used to reduce business taxes by 2018 employment would increase by 673 (or .066 percent) and Gross State Product would increase by $100 million (or about 0.1% of total annual GSP).

Table 29: Gross State Product Change ($2007 Millions)

	2009	2012	2015	2018
100% Rebate- Applied directly to rates	$ (2.1)	$ (2.3)	$ (0.3)	$ 3.6
100% Revenue- Applied directly to Energy Efficiency	$ 2.1	$ 11.8	$ 32.3	$ 62.8
100% Revenue- Applied directly to corporate taxes	$ 3.3	$ 23.9	$ 60.3	$ 99.5
New Hampshire does not join	$ (3.6)	$ (6.3)	$ (7.3)	$ (6.5)

Figure 10: Gross State Product Change ($2007 Millions)

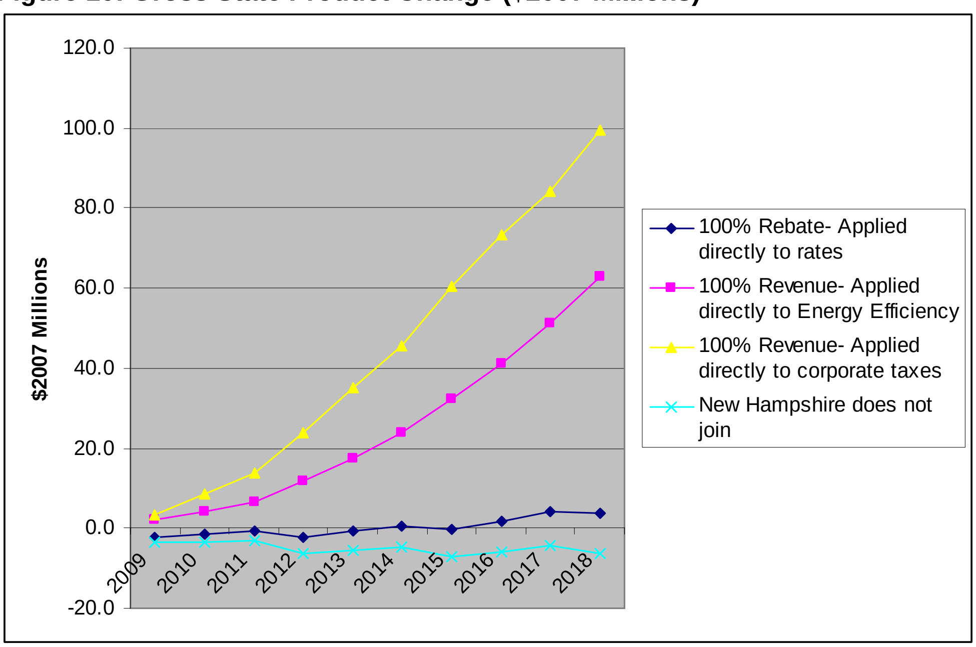
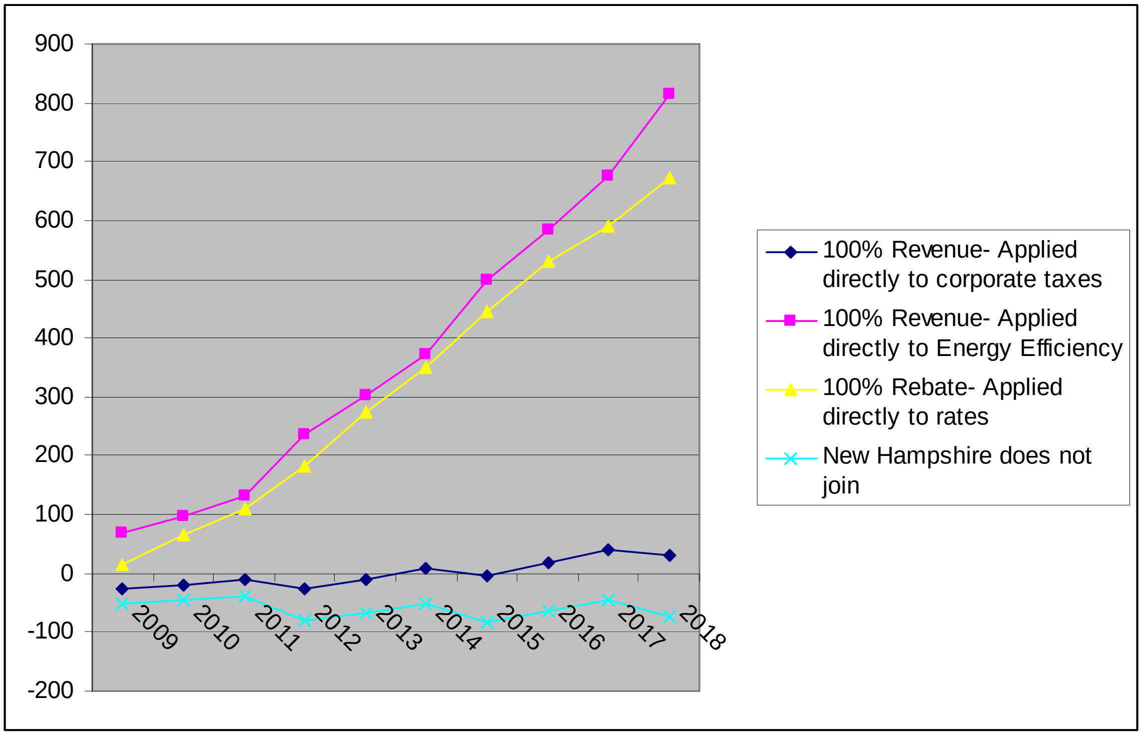


Table 30: Employment Change

Scenario	2009	2012	2015	2018
100% Rebate- Applied directly to rates	-28	-27	-5	32
100% Revenue- Applied directly to Energy Efficiency	68	237	498	815
100% Revenue- Applied directly to corporate taxes	16	184	446	673
New Hampshire does not join	-51	-80	-84	-72

Figure 11: Employment Change

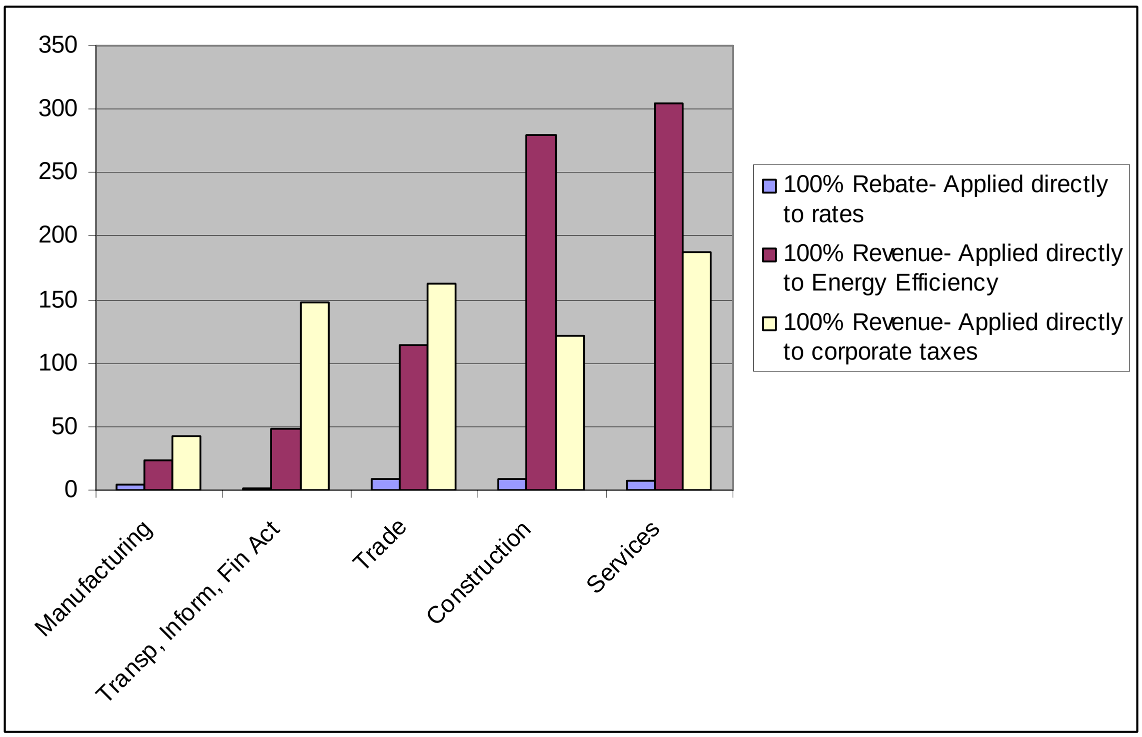


With regards to employment sector impacts, the largest sector benefiting from a 100 percent use of auction revenue for investment in energy efficiency or reduction in corporate taxes would be the services industry. Thirty-eight percent of total employment gains by 2018 would be in service industry employment with use of auction revenue for energy efficiency investment and 28 percent with use of revenue to reduce business taxes. With the energy efficiency use of auction revenue there would be near equal increase in construction industry employment as services, while with auction revenue use for reduction of business taxes there would be more evenly distributed employment gains in across services, construction, and trade and manufacturing.

Table 31: Sector Employment Change

	100% Rebate-Applied directly to rates	100% Revenue-Applied directly to Energy Efficiency	100% Revenue-Applied directly to corporate taxes
Manufacturing	5	23	42
Transp, Inform, Fin Act	2	49	148
Trade	9	114	163
Construction	9	280	121
Services	7	305	187

Figure 12: Sector Employment Change



The New Hampshire REMI-RGGI modeling results support the view widely-held among economists and policy analysts that the most efficient way of reducing greenhouse gases in cap-and-trade program such as RGGI, is auctioning allowances[42].

[42] "Compensation Rules for Climate Policy in the Electricity Sector," Resources for the Future, July 2007 Available online at www.rff.org/documents/RFF-DP-07-41.pdf

5.5 Facility Discussion

This study did not engage in any energy modeling to attempt to determine what impact RGGI would have on generation from existing power plants. However, literary review provides some insights into how existing facilities would be impacted.

An assessment of RGGI for ISO New England by Levitan & Associates, Inc. suggests that for existing New England generation, carbon allowance prices would need to reach $19 per ton before some coal-fired units would no longer have a price advantage over natural gas[43]. Current projections of allowance prices are far below that level and would indicate that New Hampshire's coal-fired power plants would be unlikely to change output level through at least 2018 if New Hampshire were to participate in RGGI. This finding is supported by RGGI modeling by ICF consulting, which shows virtually no change in coal generation through 2024[44].

The impact of RGGI on New Hampshire is not expected to negatively impact natural gas generation in the state either. New Hampshire natural gas facilities are not expected to be at a cost disadvantage relative to the other participant states in RGGI. ISO New England projects a need for additional capacity to meet future energy needs and that natural gas will make up a significant portion of generation for the foreseeable future. Therefore, it is not expected that these facilities will be significantly negatively impacted or unable to compete in the regional marketplace. This finding does conflict with modeling performed for RGGI by ICF consulting that projected reduced generation from natural gas in New Hampshire through 2024[45].

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[43] "RGGI Compliance Strategies in New England," Levitan & Associates Inc., April 2006, Available online at http://www.nepool.com/genrtion_resrcs/reports/emission/levitan_rggi_memo04142006.pdf

[44] "RGGI Package Scenario," RGGI web site, ICF Consulting, October 2006, Available online at http://www.rggi.org/docs/packagescenario_10_11_06.xls

[45] Ibid.

6 Conclusion

It is in the economic interest of the state of New Hampshire to participate in the RGGI. Compared to the overall RGGI region and New England region, New Hampshire is a relatively minor participant and will have only a minor influence over RGGI and regional electricity prices. Yet relative to the region NH has experienced a higher growth rate in population and increase in electricity consumption. This growth will present challenges for New Hampshire to reduce carbon emissions.

The other RGGI states are moving forward with implementing RGGI, primarily as a 100% auction to energy efficiency. Electricity costs will increase in New Hampshire even if New Hampshire were not to participate in RGGI because the cost of carbon will be priced into the regional marketplace.

If New Hampshire does not join RGGI, it would not receive the revenue from allowances. Economic analysis shows that not participating in RGGI would have a slight negative impact on the overall NH economy. NH participation in RGGI has a positive impact on employment and the overall NH economy if allowance revenue goes towards energy efficiency and/or reducing corporate taxes.

Carbon allowances should be auctioned, not directly allocated to generators. The costs of RGGI will primarily be borne by ratepayers no matter how carbon allowances are allocated. However, there are some benefits to customers of directly allocating allowances to PSNH that would not be the case for the other utilities.

For utility ratepayers (both PSNH and other utility customers) increased costs are minimized if all allowance revenue were to be dedicated to ratepayer benefit. Cumulative utility costs would be lowest if 100% of allowance revenue went to energy efficiency. In the short term, rebating has the most significant reduction on rates, but over the long-term has higher cost than energy efficiency. Energy efficiency has the lowest short-term impact, but over the long term had significantly lower cost than “unconditional” rebating to consumers.