Emissions Trends and the Inaugural Allowance Auction

Regional Greenhouse Gas Initiative

September 3, 2008

RGGI at a Glance:

- 10 States (ME, MA, NH, VT, RI, CT, NY, NJ, DE and MD)
- Applies to all fossil fuel-fired power plants 25 MW or greater
- Goes into effect Jan 1, 2009
- First auction Sept 25th, 2008
- Initial regional cap is 188 million tons CO2
- Cap is two-phase:
  - Stabilization at initial level for 2009-2014.
  - 2.5% reduction per year 2015-2018 for total 10% reduction
- Compliance period is 3 years; first permits due March 1, 2012.

The Regional Greenhouse Gas Initiative (RGGI) is the first-in-the-nation carbon cap and trade program designed to reduce greenhouse gas emissions 10% from Northeastern and Mid-Atlantic power plants by 2019. Electric generators covered by RGGI must purchase an allowance (permit to pollute) for each ton of carbon dioxide emitted. The 10 states participating in RGGI have agreed to hold uniform regional auctions for the emissions allowances, with the first to be held on September 25, 2008.

The approaching inaugural auction has created significant interest in RGGI emissions trends, and in what the potential demand for allowances might be from both regulated generators and other entities. Environment Northeast (ENE) compiled this short report to supply background information prior to the first auction. To this end ENE compiled and analyzed emissions trends through 2008, using available Environmental Protection Agency (EPA) data and available data from the states. The report further examines underlying factors that influence CO_2 emissions levels, such as electricity consumption, weather, economic trends and fuel switching. Lastly, the report discusses supply and demand dynamics, such as non-generator demand, the schedule for supplying allowances to be auctioned, and the three year RGGI compliance period.

Summary of Key Findings:

- Emissions from facilities regulated under RGGI have declined significantly since the program was negotiated in 2005 – a favorable trend – and remain well below the level of the regional RGGI cap, which should moderate demand for allowances and keep prices down in the near-term if the trend continues.
- Although emissions have declined, there is significant potential for this trend to reverse should there be a change in underlying emissions and energy consumption drivers – such as energy prices, weather, economic trends, and availability of non-emitting generation.
- Despite low emissions, demand for allowances in the inaugural auction on September 25, 2008 may still be strong. Four states (Delaware, New Hampshire, New Jersey and New York) were unable to finalize regulations in time to contribute allowances to the first auction. These four states cumulatively account for 55% of the cap. If market participants do not factor this supply-demand imbalance and the three year compliance period into their bids, prices could be artificially high in the September auction.
- Any new commodity market goes through an initial, and sometimes volatile, period of "price discovery" as market participants learn the system and underlying fundamentals. There is every reason to anticipate that RGGI allowance prices may be unsettled and experience some price volatility through the first rounds of auctions.

Emissions Data

In order to inform market participants and disseminate useful background information in advance of the inaugural RGGI auction, ENE has conducted its own assessment using EPA data from the Acid Rain Program (ARP). (ENE's methodology is described in Attachment 1.)

The emissions trends that have emerged from this analysis lead ENE to believe that the RGGI cap level remains higher than actual emissions. 2007 data from power plants in the Acid Rain Program indicates a slight increase from 2006 emissions levels, but ENE is projecting that total emissions in 2007 were approximately 9% below the RGGI cap. This is confirmed by industry trade publications, such as Point Carbon[1] and New Carbon Finance[2], and by financial analysts who believe that the cap is over-allocated.[3]

ENE projections through 2007 describe the relationship between emissions and the cap, as shown below in Figure 1. Emissions data reported by the RGGI member states formed the basis for the analysis. Facility level data was collected for all power plants that report CO_2 emissions under the EPA Acid Rain Program and ENE used this trend to project the overall emissions in the RGGI region. For more detailed description see Attachment 1. Note that ARP data does not include all RGGI facilities and thus it should be used as an indicator but ENE's projection may under- or over-predict total emissions from RGGI facilities.

Figure 1: RGGI Facility CO_2 Emissions from Various Sources

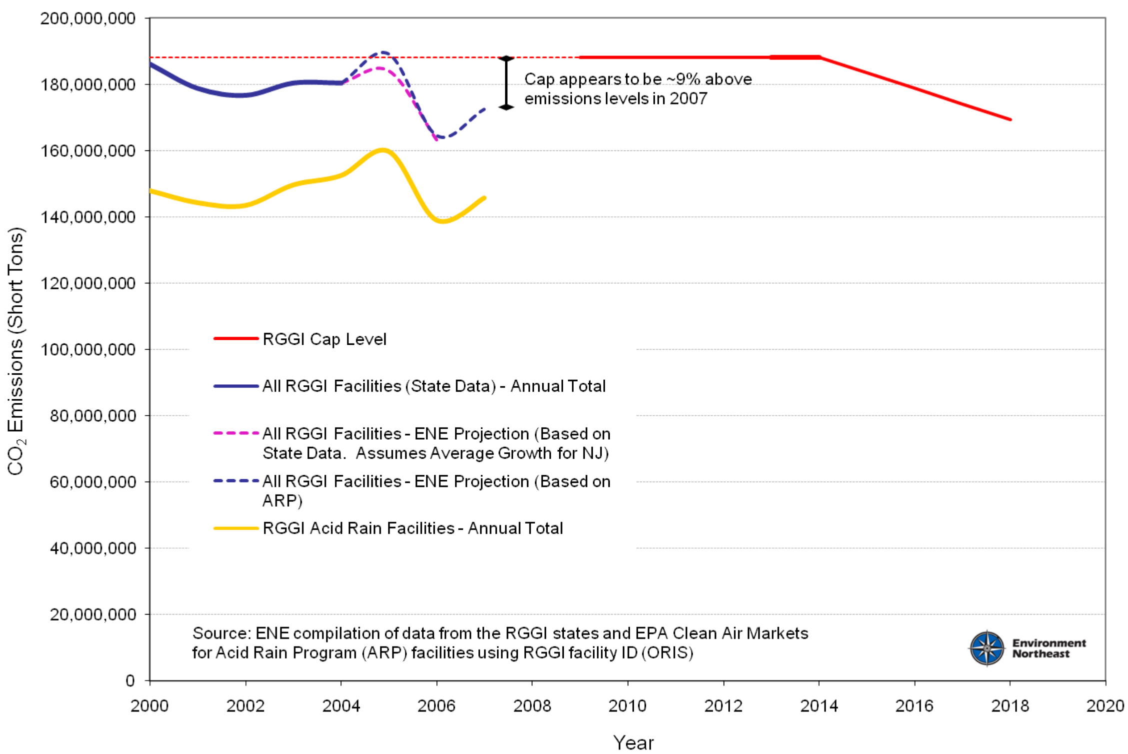
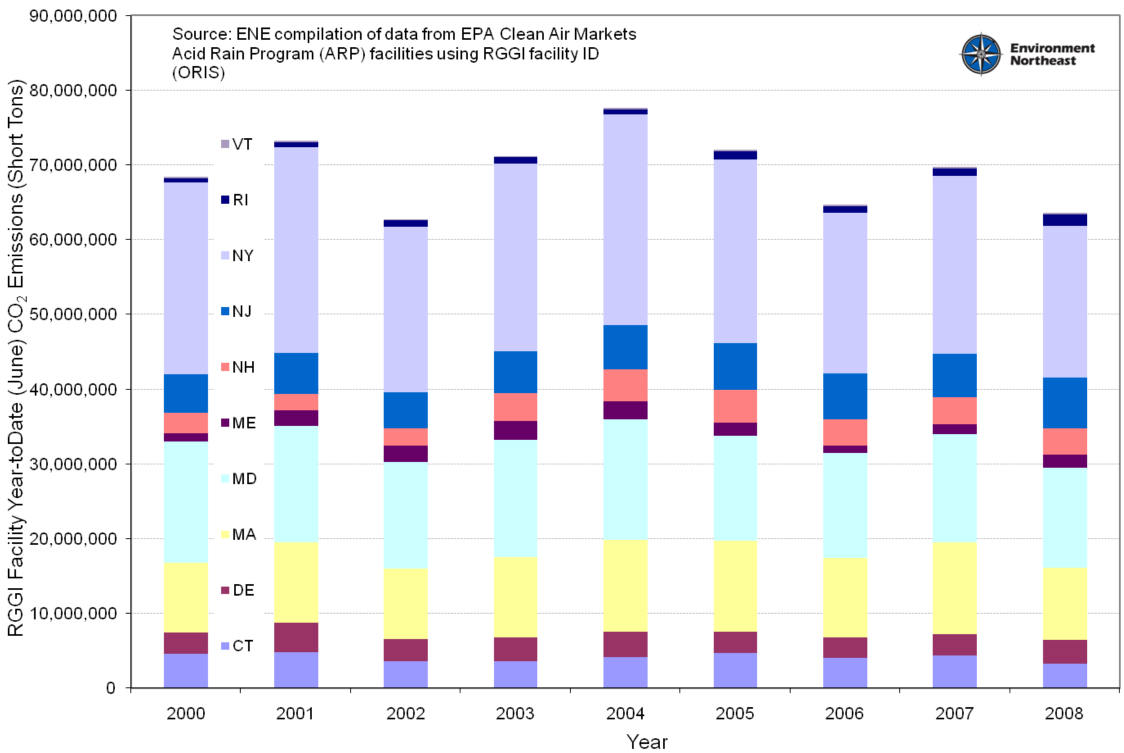


Figure 2 (below) shows first and second quarter RGGI ARP facility emissions by state. Although trends evidenced in year to date (YTD) data may not hold for the reminder of the year, the existing data suggests that 2008 emissions will likely remain below the cap and has the potential to decline from the levels seen in 2007.

Figure 2: Year-to-Date RGGI ARP Facility CO_2 Emissions by State (though June)



Note: in some cases Year-to-Date data covers different time frames at different points in this report. Latest available data was used at all times, with the following implications: YTD emissions data (Figures 1 and 2) is through June 2008; YTD electricity consumption data (Figures 3 and 4) and cooling degree days data (Figure 5) are through July 2008; and nuclear production data (Figure 9) is through March 2008.

ENE's analysis of this latest emissions data indicates that 2008 YTD emissions are similar to 2006 emissions. Since ENE projections indicate that 2006 emissions fell below the cap, it is uncertain how effective the cap will be in limiting emissions in the near-term if emissions trends hold. However, significant uncertainty surrounds underlying drivers of emissions levels over the coming months and years. These drivers – including electricity consumption, weather, fuel prices, economic trends, and nuclear generation – will impact emissions trends and determine how constraining the cap will be in the future.

Electricity Consumption

Energy consumption is directly related to emissions levels within the RGGI region. Recent data from the New England Independent System Operator (ISO-NE) indicates that 2008 energy consumption through July has dropped slightly from 2007 (Figure 3). Total electricity consumption in 2008 could still outpace 2007 consumption (data through July does not cover the entire summer spike in demand), but if the trend holds 2008 total emissions will likely remain at or below historic levels.

This trend is supported by annual electricity consumption in New England and New York (Figure 4). State-level data from the PJM region (New Jersey, Delaware and Maryland) was unavailable, but it can fairly be assumed that electricity consumption for the RGGI region in 2008 was at or slightly below 2007 levels, and that electricity consumption has essentially remained stable over the last 5 years.

Figure 3: Year-to-Date New England Electricity Consumption (through July)

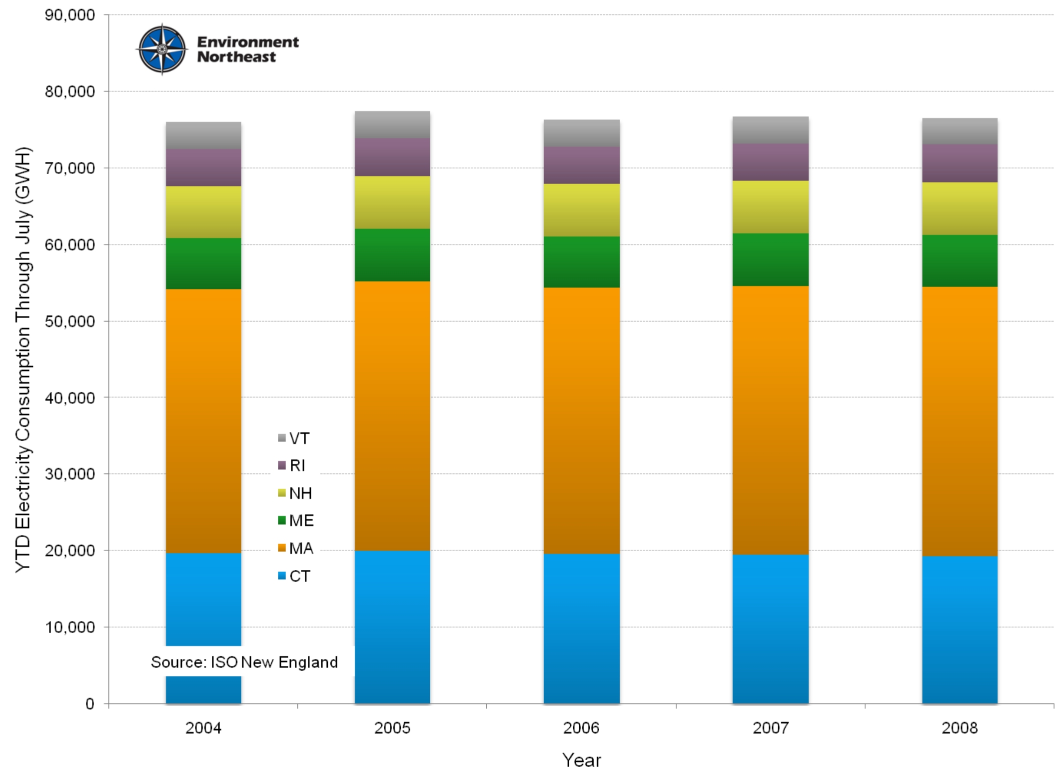
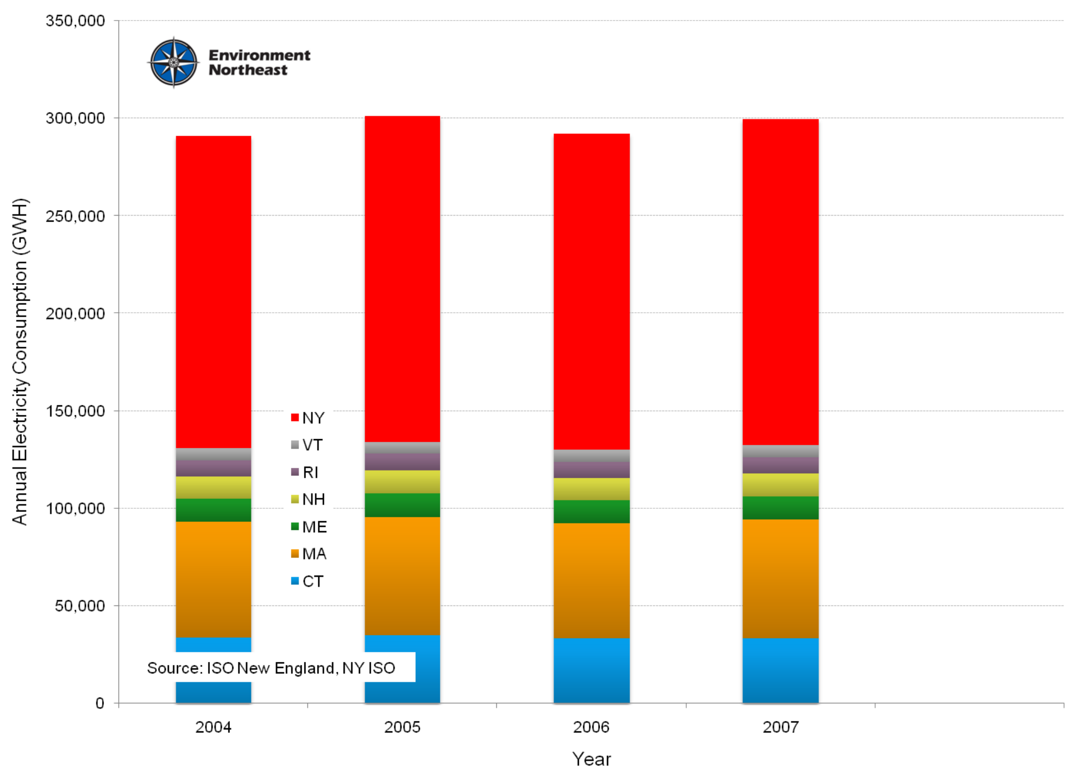


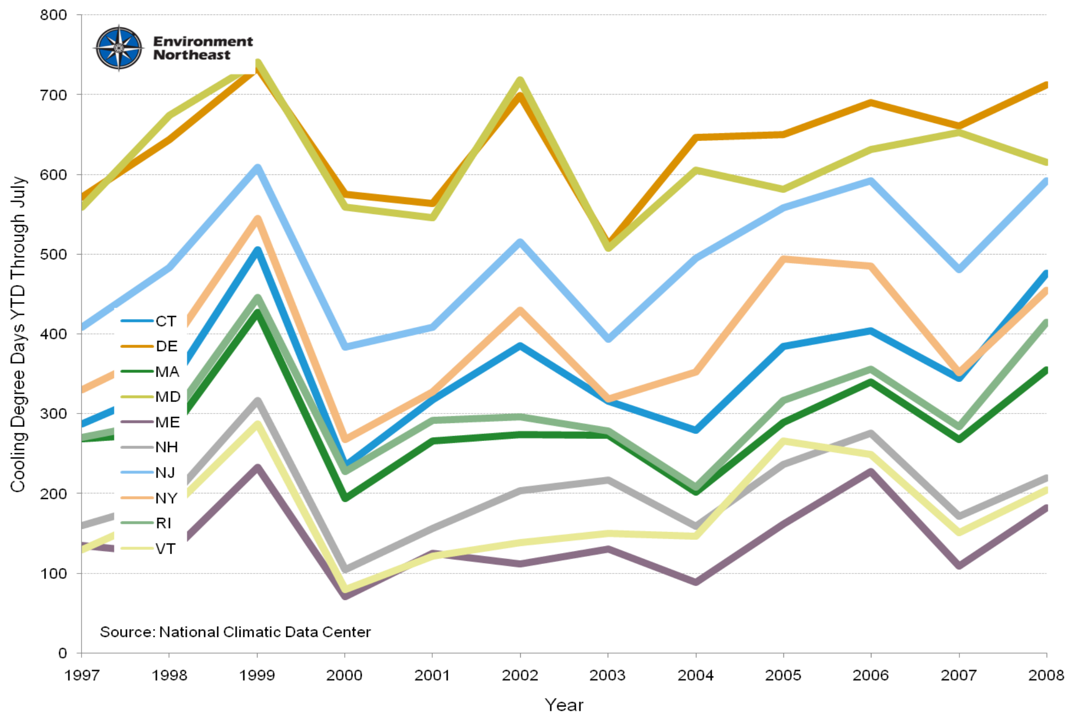
Figure 4: Annual New England + New York Electricity Consumption



Weather

Weather is a significant driver of emissions within the RGGI region. Hot summer weather leads to greater electricity consumption for air conditioning, whereas cold winter weather has a greater impact on natural gas and heating oil consumption (only a small percentage of buildings in the region are heated with electricity). While electricity generation is covered by the RGGI cap, home heating fuels are not. Therefore cooling-degree days[4] are more important indicators of electricity consumption and associated emissions because only a small percentage of buildings in the region are heated with electricity. RGGI region cooling-degree days through July indicate that 2008 has been a relatively hot year, which may increase emissions over 2007 levels due to electricity consumption for air conditioning.

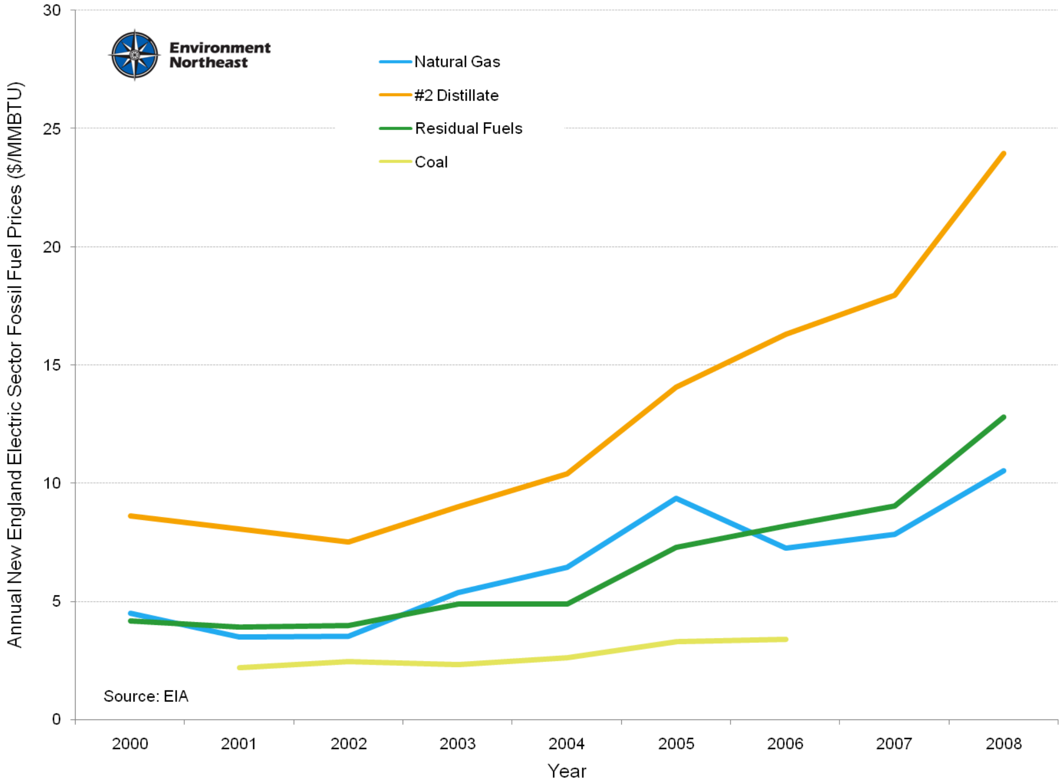
Figure 5: Year-to-Date RGGI State Cooling Degree Days (through July)



Energy Prices

Energy prices have risen significantly since the baseline years (2000-2004) used to determine the RGGI cap. Figure 6 documents the upward trajectory of fuel prices.

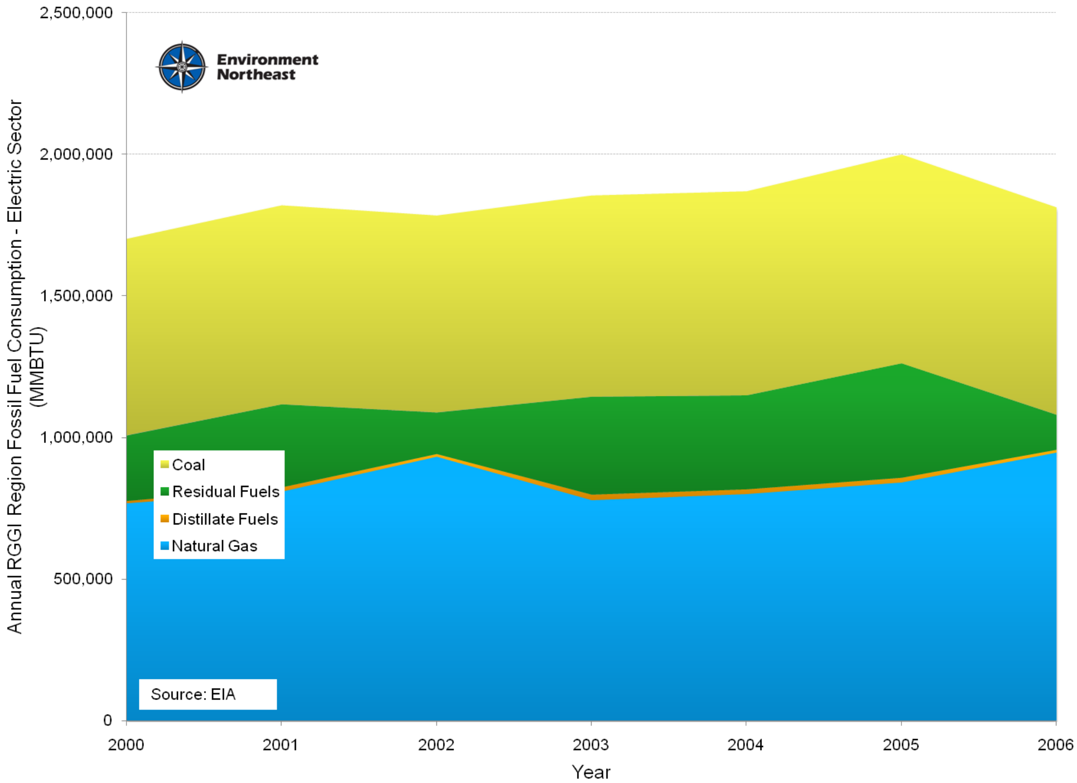
Figure 6: Annual New England Fuel Prices[5]



The rising cost of fuel inputs has contributed to a 10.9% rise in average New England wholesale electricity prices from $62.74/MWh in 2006 to $69.57/MWh in 2007.[6]

Fuel prices have risen at different rates for different fuel types. The resulting price disparities have impacted fuel use in New England (and likely other RGGI states as well). Of particular importance to regional emissions, the lower price of natural gas in relation to oil has led many dual fuel plants (those that can burn either residual fuel oil or natural gas) to favor natural gas. The resulting drop in residual fuel use is evidenced below in Figure 7 (below), and the continuing price disparity between natural gas and residual fuels suggests that this trend will continue. Because natural gas has a lower carbon emissions factor (53.06 kg CO_2/MMBtu) than residual fuel oil (78.80 kg CO_2/MMBtu)[7], increasing use of natural gas will reduce regional emissions.

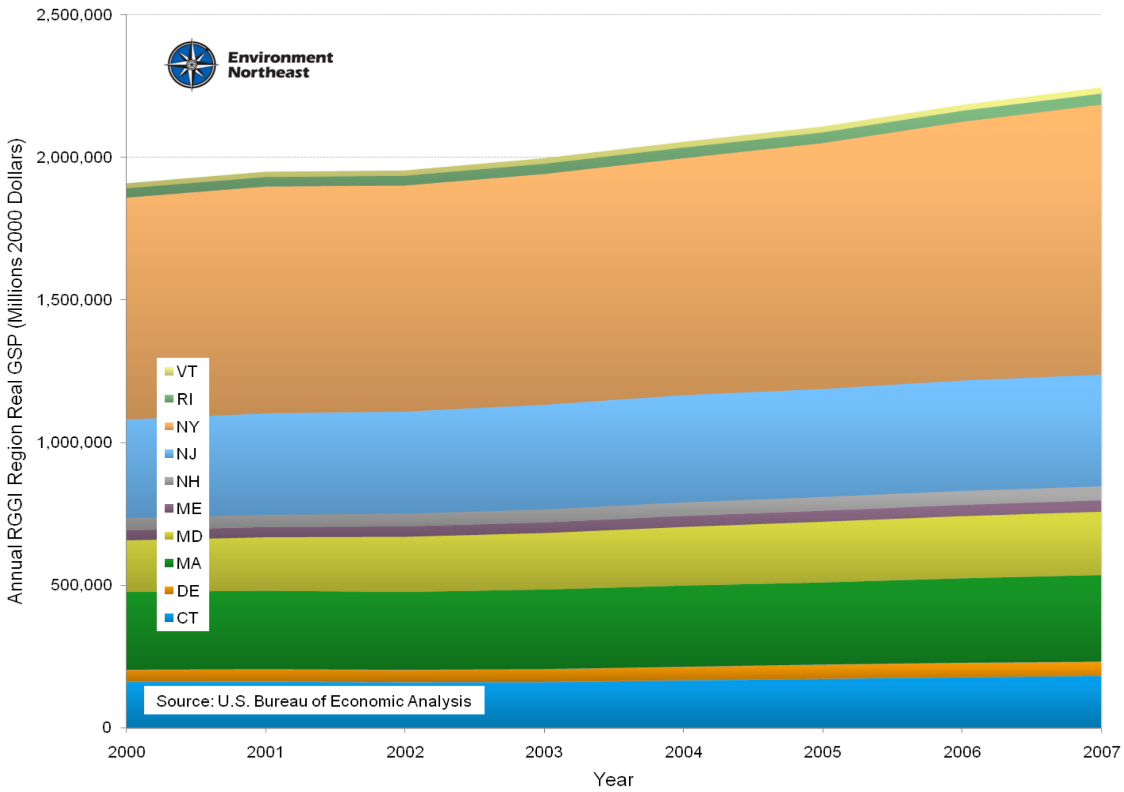
Figure 7: RGGI Region Electric Sector Fossil Fuel Consumption



Economic Trends

Economic growth has historically been a significant driver of emissions, with increased economic growth leading to increased electricity sales, leading, in turn, to higher emissions levels. However, recent economic growth (see Figure 8 below) appears to have coincided with a period of relative emissions stability; but the extent of this disassociation between economic growth and emissions is unclear. Economic conditions in the RGGI region have worsened over 2008, and recent reports from the Federal Reserve show continuing weakness in RGGI districts.[8] An economic downturn in the region has the potential to reduce electricity consumption and emissions.

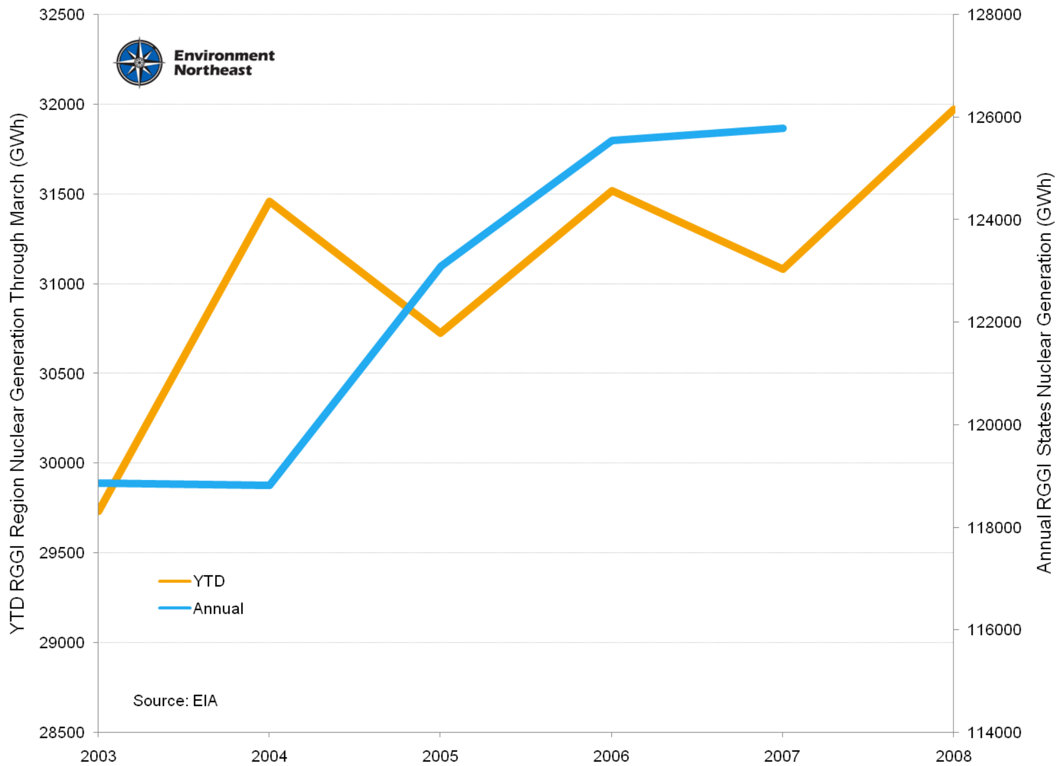
Figure 8: Annual RGGI Region Gross State Product to 2007



Nuclear Generation

Nuclear generation affects emissions in the RGGI region by displacing electricity from fossil fuel generators and thereby reducing emissions. This is true for any non-CO_2 emitting resource including hydro power, wind, and other renewables. Recent data indicate that nuclear generation has come to assume a greater share of regional electricity generation since 2003 (see Figure 9 below), and EIA predicts that nuclear generation will continue to increase in the near term.[9]

Figure 9: RGGI Region Electricity Production from Nuclear Power



Higher output from nuclear plants seems to be driven both by higher capacity factors (ratios of actual generation to generating capacity) and uprates (power output improvements). In 2006, nuclear power plants comprised 13.9% of nameplate capacity in RGGI states, but accounted for 32.1% of generation.[10]

The impact of nuclear generation on RGGI emissions in the short-term is likely to be significant. However, recent increases in nuclear output could decline with plant outages or other unforeseen problems. Over time, new renewables and hydro are likely to provide additional non-emitting generation. Growth in nuclear generation and even the continued operation of these plants is restrained by high capital costs, regulatory uncertainty, and public concern regarding safety, lack of waste disposal sites, and nuclear proliferation.

Supply and Demand

Emissions trends from RGGI power plants have taken on increasing importance as the inaugural auction approaches and generators and other interested parties attempt to forecast demand for allowances. Emissions trends, however, are not the only drivers of demand for allowances. Demand from non-regulated entities and the ability to bank allowances for later periods will also affect demand.

Allowance Supply

Maine, Vermont, Massachusetts, Rhode Island, Connecticut and Maryland will supply allowances for the September 25th auction, whereas New Hampshire, New York, New Jersey and Delaware will not. The latter states were unable to finalize regulations in time to supply allowances for the September auction. The six states participating in the September auction comprise 45% of the cap, while the four states withholding allowances comprise 55% of the cap. Each of the six participating states will provide one-sixth (16.67%) of its 2009 allocation (state portion of the total RGGI region cap) at the September auction, one-sixth at the December 17th auction, and one-sixth at each of the quarterly auctions in 2009. 2009 allocations and the September 25th auction supply are listed below in Table 1. Potential revenue streams are also projected at the reserve price of $1.86 per ton and at $5.00 per ton (the price expected by many market participants[11] and approximately matched by RGGI forward contracts traded on the Chicago Climate Exchange).[12]

Note: New York has finalized regulations and will contribute allowances to the December auction. ENE is also confident that Delaware, New Hampshire, and New Jersey will finalize regulations and participate in the December or 2009 first quarter auction—and all ensuing ones.

Table 1: 2009 State Allocations and September 25th 2008 Auction Supply

State	Sept. Auction	2009 Allocation	Share of RGGI Cap	September Contribution	Potential September Auction Revenue	
	(yes/no)	(short tons)	(%)	(short tons)	@ $1.86/ton	@ $5.00/ton
Connecticut	Yes	10,695,036	5.7%	1,372,530	$2,552,906	$6,862,650
Delaware	No	7,559,787	4.0%	-	-	-
Maine	Yes	5,984,902	3.2%	872,506	$1,622,861	$4,362,530
Maryland	Yes	37,503,983	19.9%	5,331,781	$9,917,113	$26,658,905
Massachusetts	Yes	26,660,204	14.2%	4,347,543	$8,086,430	$21,737,715
New Hampshire	No	8,620,460	4.6%	-	-	-
New Jersey	No	22,892,730	12.2%	-	-	-
New York	No	64,310,805	34.2%	-	-	-
Rhode Island	Yes	2,659,239	1.4%	438,774	$816,120	$2,193,870
Vermont	Yes	1,225,830	0.7%	202,262	$376,207	$1,011,310
Total	6 of 10	188,112,976	100%	12,565,387	$23,371,620	$62,826,935

Only 12.6 million allowances—or 6.7% of total RGGI region 2009 supply—will be available at the inaugural auction. This limited supply will be available to generators from all RGGI states, including generators from the four states unable to supply allowances.

To be clear, the supply-demand imbalance of the inaugural auction is not a structural flaw in RGGI, but rather a temporary startup aberration. Any short-term demand pressures will diminish once all states contribute to auction supply (by the second auction on December 17, 2008 or the third auction in early 2009). Furthermore, the secondary market, to the extent that it is effective in the beginning, will also dampen any over-exuberance of demand.

Though additional sources of demand (such as investors, actors from the voluntary offset market, and others) could contribute to initial price volatility, a combination of factors should cause allowance prices to stabilize at a modest level after the initial market-settling period. These stabilizing factors include the eventual contribution of allowances from the four outstanding states, over-allocation of the cap, and the three year compliance period (generators do not have to submit allowances to the states until 2012.)

If market participants are not mindful of this situation, however, demand may exceed supply and cause the allowance clearing price at the initial auction to reach a higher value than can be expected at future auctions.

ENE encourages market participants to recognize this supply imbalance in the first auction. Over time there should be a more than adequate supply of allowances.

Any new commodity market goes through an initial, and sometimes volatile, period of "price discovery" as market participants learn the systems and underlying fundamentals. There is every reason to anticipate that RGGI allowance prices may be unsettled and experience some price volatility through the first rounds of auctions. The New York Mercantile Exchange[13] and Chicago Climate Exchange[14] recently announced that they will list futures and options contracts for the RGGI allowance market for December 2009, suggesting a belief that the RGGI allowance market will not settle until late 2009. These kinds of tools will also provide liquidity and the ability to hedge a company's risk.

Voluntary Participants

Investors and other interested parties may be an additional source of demand in the September 25th and subsequent auctions.

- Financial market actors are interested in the potential of carbon markets and may use the initial RGGI auction to gain experience or stake positions on future demand.
- Buyers from the voluntary carbon market may bid on RGGI allowances, especially if the RGGI allowance prices fall below offset prices on the voluntary market. (2009 vintage carbon credits are currently trading at approximately $4 per ton on the Chicago Climate Exchange, and in 2008 have traded as high as $7.40[15])
- There is also some discussion of entities purchasing RGGI allowances and banking them for use in a future federal program. However, this strategy carries significant risks, as it is unclear if RGGI allowances would be incorporated into a future federal program at all and, if so, whether they would hold full value.

The cumulative demand from these voluntary participants may increase demand slightly but long-term effects will likely be modest.

RGGI Compliance Schedule

RGGI compliance periods extend three years. This means that covered generators must submit sufficient allowances to cover 2009-2011 emissions on March 31, 2012. Given the extended timeframe of compliance, generators may not feel obliged to secure significant quantities of allowances in early auctions, especially if prices are deemed high.

Conclusion

Recent data indicate that 2007 emissions from covered RGGI units fell approximately 9% below the cap, and 2008 emissions through the second quarter (June) are indicative of a similar level for 2008. Regional emissions remain below peak levels of 2005, and emissions drivers such as declining electricity consumption, increasing fuel prices, slowing economic growth, and increased nuclear generation suggest that emissions will remain below the cap in the near term.

Despite lower emissions – a favorable trend – ENE believes that demand for allowances in the inaugural auction on September 25, 2008 may remain strong. Demand may be driven by supply limitations caused by a lack of allowance contributions from Delaware, New Hampshire, New Jersey and New York (which cumulatively account for 55% of the cap), although this should not be the case if participants understand the market and policy fundamentals. Demand may additionally be bolstered by voluntary participants in the market.

Factors that should dampen demand in the early auctions include low emissions, the possibility of unusually high prices in the first auctions, and the three year compliance period – which removes urgency from early purchasing of allowances.

RGGI auctions may be unsettled and with some price volatility through the first rounds of auctions as market participants better understand the systems and underlying fundamentals.

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Environment Northeast is a nonprofit research and advocacy organization focusing on the Northeastern United States and Eastern Canada. Our mission is to address large-scale environmental challenges that threaten regional ecosystems, human health, or the management of significant natural resources. We use policy analysis, collaborative problem solving, and advocacy to advance the environmental and economic sustainability of the region.

Endnotes:

[1] Point Carbon, August 17, 2007, *Emissions Trading in the US: Is RGGI Over-allocated?* Carbon Market Analyst: North America, http://www.pointcarbon.com/

[2] New Carbon Finance, April 25, 2008, *North America Deep Dive – April 2008*

[3] Reuters, 2008, *U.S. exchanges launch cap and trade emissions contracts*, August 18, 2008. Available at: www.reutersinteractive.com/Carbon/103742?utm_source=20080818&utm_medium=email

[4] Cooling degree-days: A measure of how warm a location is over a period of time relative to a base temperature, most commonly specified as 65 degrees Fahrenheit. The measure is computed for each day by subtracting the base temperature (65 degrees) from the average of the day's high and low temperatures, with negative values set equal to zero. Each day's cooling degree-days are summed to create a cooling degree-day measure for a specified reference period. Cooling degree-days are used in energy analysis as an indicator of air conditioning energy requirements or use. (Taken from EIA)

[5] Natural gas price is for Massachusetts because EIA does not report a regional price. Given the state's central location and large consumption, prices for Massachusetts are most representative of those of the region. 2008 figures are YTD average through May for distillate and residual fuels, but only through February for Natural Gas.

[6] ISO New England, 2008, *ISO New England Outlook: A wholesale electric industry update*, Available at: www.iso-ne.com/nwsiss/nwltrs/outlook/2008/outlook_july_2008.pdf

[7] EIA, Appendix H of the instructions to Form EIA-1605, Available at: www.eia.doe.gov/oiaf/1605/excel/Fuel%20Emission%20Factors.xls

[8] July 2008 "Beige Book" reports for districts 1-3 (Boston, New York & Philadelphia) indicate that high fuel and input costs, and the weakness of the housing market continue to constrain growth. Reports available at: www.federalreserve.gov/FOMC/BeigeBook/2008/

[9] EIA, 2008, *Annual Energy Outlook 2008 with Projections to 2030*, Available at: www.eia.doe.gov/oiaf/aeo/electricity.html

[10] EIA, 2007, *US Nuclear Generation of Electricity*. Available at: www.eia.doe.gov/fuelnuclear.html

[11] Based on ENE conversations with potential RGGI market participants

[12] Since RGGI futures trading began on August 15 prices have ranged between $5.25 and $5.70. Market data available at: www.ccfe.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi

[13] NYMEX, 2008, *NYMEX to Launch Regional Greenhouse Gas Initiative (RGGI) CO2 Allowance Futures, Options Contracts as Part of its Green Exchange Venture,* Available at: http://nymex.mediaroom.com/index.php?s=43&item=1929

[14] Craig Rubens, August 18, 2008, *Traders Start Snapping Up U.S. Carbon Futures On The Cheap,* available at: earth2tech.com/2008/08/18/us-cap-and-trade-launch-highlights-hurdles/

[15] Chicago Climate Exchange, 2008, market data available at: www.chicagoclimatex.com/market/data/summary.jsf

Attachment 1: Emissions Data Methodology

Data Sources

ENE compiled emissions data from two sources for this analysis. Facility level data was collected for all power plants that report CO_2 emissions under the EPA Acid Rain Program (ARP).[1] ARP data is drawn from continuous emissions monitors at each facility and reported in short tons. ARP data was imported for the years 1995 to 2008. State-reported emissions data was obtained from the RGGI website.[2]

All other data sources are reported in the relevant figure.

Emissions Analysis Methods

ENE compiled RGGI facility emissions data through the following steps:

- Compiled state-reported emissions data for 2000-2006, with the exception of New Jersey, which is through 2004 only.
- Compiled a list of RGGI facility codes based on the state data tables available on the RGGI web page (233 facilities in 10 states)
- Compiled EPA ARP data from January, 2000 through June, 2008 for all facilities in the 10 states
- Identified the RGGI facilities that report CO2 emissions to EPA through the ARP
- Calculated the annual changes in emissions for the RGGI facilities that report through the ARP.
- Projected the 2005-2006 state-reported emissions trend by assuming that New Jersey's emissions changed at the same rate as the rest of the region for those years.
- Projected the 2005-2007 emissions trend by assuming overall emissions for the region changed at the same rate as the emissions from RGGI facilities in the ARP program.

[1] EPA Clean Air Markets, ARP Data, Available at: http://camddataandmaps.epa.gov/gdm/

[2] Regional Greenhouse Gas Initiative (RGGI). Available at http://www.rggi.org/docs/CO2_2000_2006.xls