

# RGGI Emissions Trends & the Second Allowance Auction

December 15, 2008



The second auction of emissions allowances under the Regional Greenhouse Gas Initiative (RGGI) will be held on December 17, 2008. In order to disseminate relevant information and increase market transparency, ENE (Environment Northeast) compiled the following report on emissions trends through 3<sup>rd</sup> quarter 2008, using data from the Environmental Protection Agency (EPA), RGGI member states, and other sources. The report also examines emissions drivers, such as economic conditions, fuel-switching, electricity consumption, non-emitting electricity generation, and weather. Additionally, the impacts of new developments in energy and climate regulation are considered, as are implications of the recent financial downturn.

## 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 conducted September 25<sup>th</sup>, 2008
- Second auction on December 17<sup>th</sup>, 2008
- Initial regional cap is 188 million tons CO<sub>2</sub>
- 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 three years; first permits due March 1, 2012.

## Summary of Key Findings:

- Recent data (through September) indicate that 2008 emissions from RGGI units are trending 16% below the RGGI cap – a good thing, but emissions are unlikely to remain as low in 2009.
- Emissions have fallen as a result of the following conditions, some of which are unlikely to continue into 2009:
  - The high price of oil in relation to the price of natural gas and corresponding decline in oil utilization in favor of natural gas – this price trend has reversed in the last month and could lead to significant additional emissions from oil fired plants.
  - The high price of coal in the summer of 2008 and corresponding decrease in combustion of this carbon-intensive fuel – the price trend for coal has also reversed, which could lead coal emissions to return to their prior levels.
  - Increased availability of wind, hydro and nuclear – this increase in non-emitting generation will likely continue at a modest pace as more wind power comes online in the future.
  - Electricity consumption has been stable in recent years – consumption will likely remain stable owing to economic conditions and expanded efficiency investments; but hotter, more humid summers could drive up consumption and emissions in future years.
- ENE believes that demand for allowances in the second auction on December 17<sup>th</sup>, 2008 will remain strong; the successful conduct of the first auction on September 25<sup>th</sup> dispels doubts about RGGI's permanence and increases the value of RGGI allowances as the January 1, 2009 effective date approaches and calls for expanded climate regulation at the state and federal level increase.

## Emissions Data

In order to inform the public on developments within RGGI, ENE conducted an assessment of regional emissions using EPA data from the Acid Rain Program (ARP). ENE's methodology is described in Attachment 1.

The trend that emerged from this analysis indicates that the RGGI cap level remains higher than actual emissions. Recently-released data from power plants in the Acid Rain Program lead ENE to project that total emissions in 2007 were approximately 9% below the RGGI cap and 2008 emissions through September fell approximately 16% below the cap.

ENE projections through September 2008 describe the relationship between emissions and the cap as shown below in Figure 1. Emissions data made available by the RGGI member states formed the basis for the analysis. Facility level data was collected for all power plants that report CO<sub>2</sub> 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 should be used as an indicator. ENE's projection may under- or over-predict total emissions from RGGI facilities.

**Figure 1: RGGI Facility CO<sub>2</sub> Emissions from Various Sources**

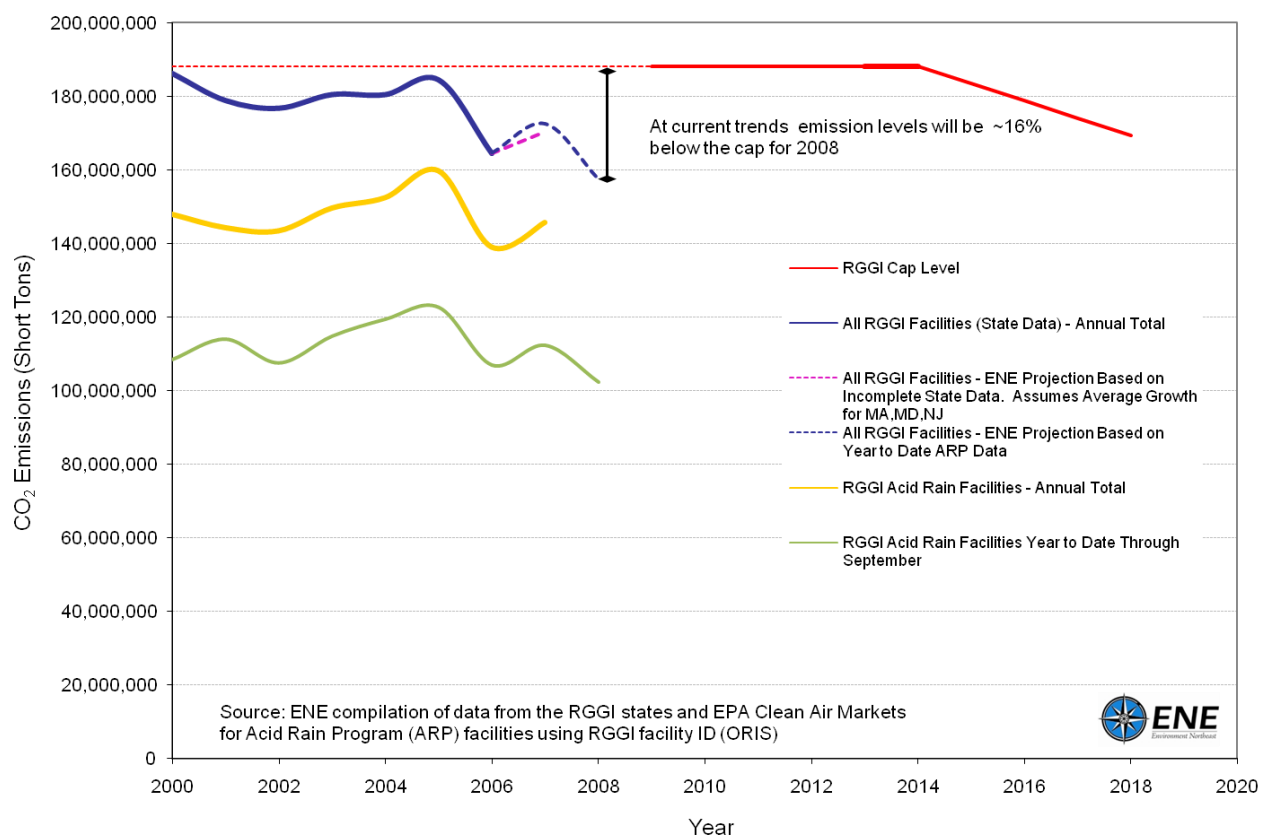
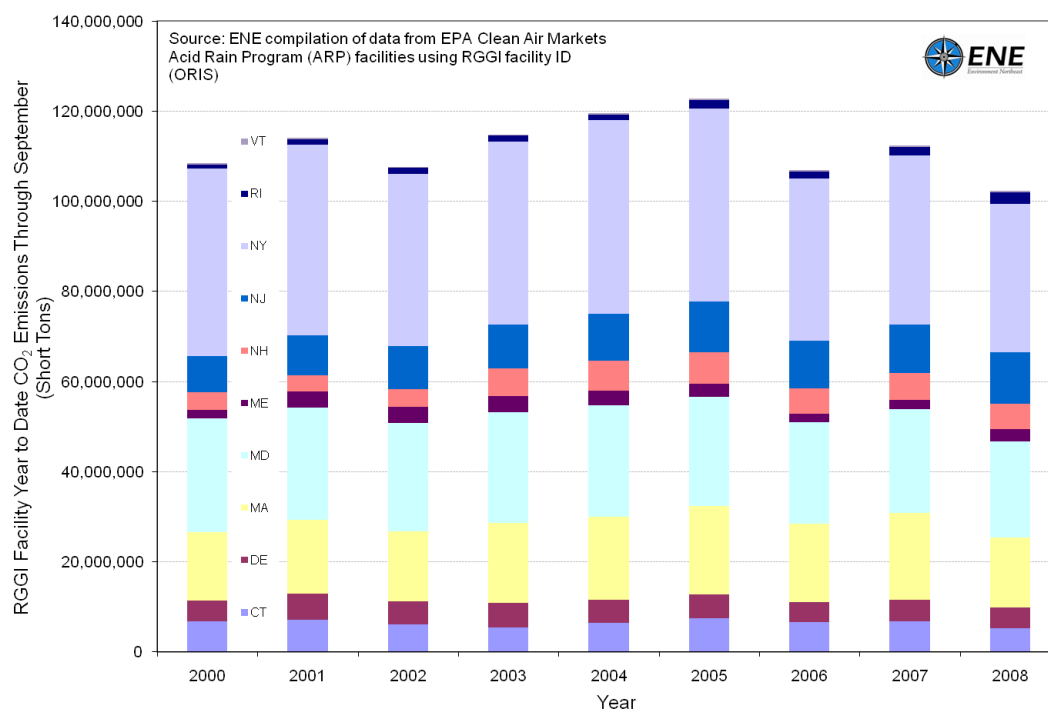


Figure 2 (below) shows first, second and third quarter RGGI ARP facility emissions by state. Although trends evidenced in year-to-date data may not hold for the remainder of the year, the existing data suggest that 2008 emissions will remain below the cap and will decline from the levels seen in 2007.

**Figure 2: Year-to-Date RGGI ARP Facility CO<sub>2</sub> Emissions by State (through September)**



Note: 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: year to date emissions data (Figures 1 and 2) is through September 2008; electricity consumption data and weather data are through November 2008; and electric generation data is through August 2008.

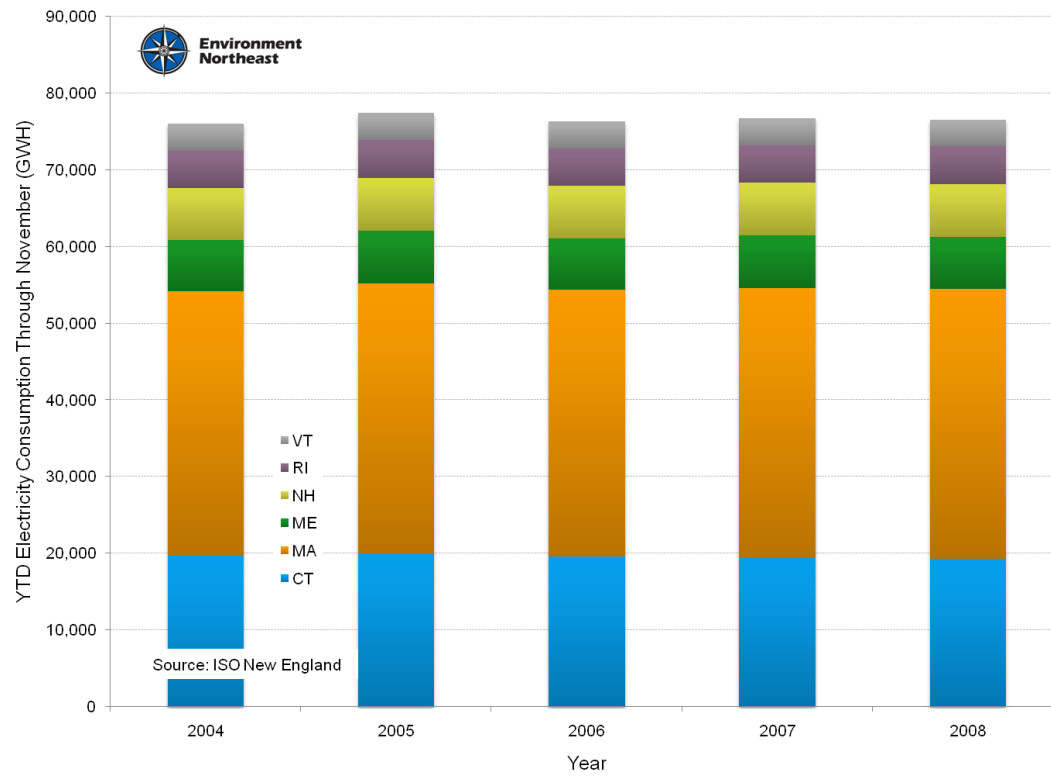
ENE's analysis of this latest emissions data indicates that 2008 year to date emissions are similar to 2006 emissions. Significant uncertainty surrounds underlying drivers of emissions levels over the coming months and years. These drivers – including electricity consumption, weather, relative fuel prices, economic trends and availability of non-emitting generation – will impact emissions trends and determine how constraining the cap will be in 2009 and beyond (first compliance year). An overall decline in emissions across the region is a very favorable trend environmentally and may allow the RGGI states to reduce the level of the cap more quickly in subsequent compliance periods.

### ***Electricity Consumption***

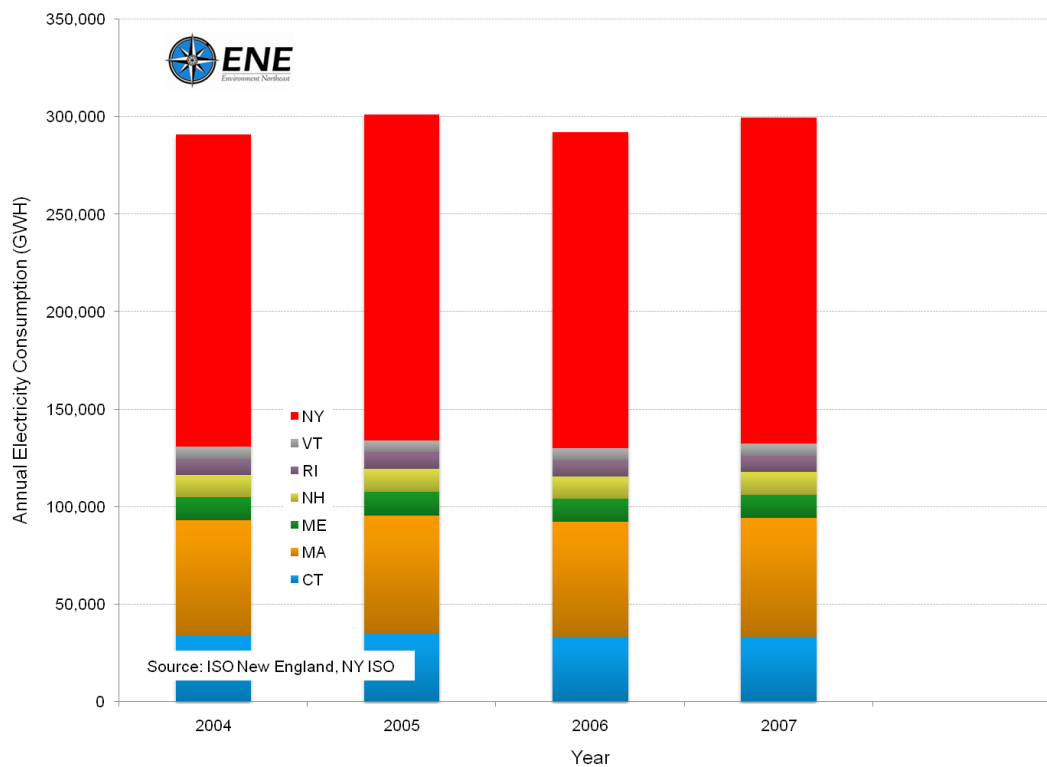
Emissions levels are directly related to electricity consumption within the RGGI region. Recent data from the New England Independent System Operator (ISO-NE)<sup>1</sup> indicates that 2008 electricity consumption through November dropped slightly (0.75%) from 2007 (Figure 3). Total electricity consumption in 2008 could still outpace 2007 consumption, but if consumption remains down, total 2008 emissions will likely remain low. More important, anticipated increases in energy consumption are not occurring.

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 five years.

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



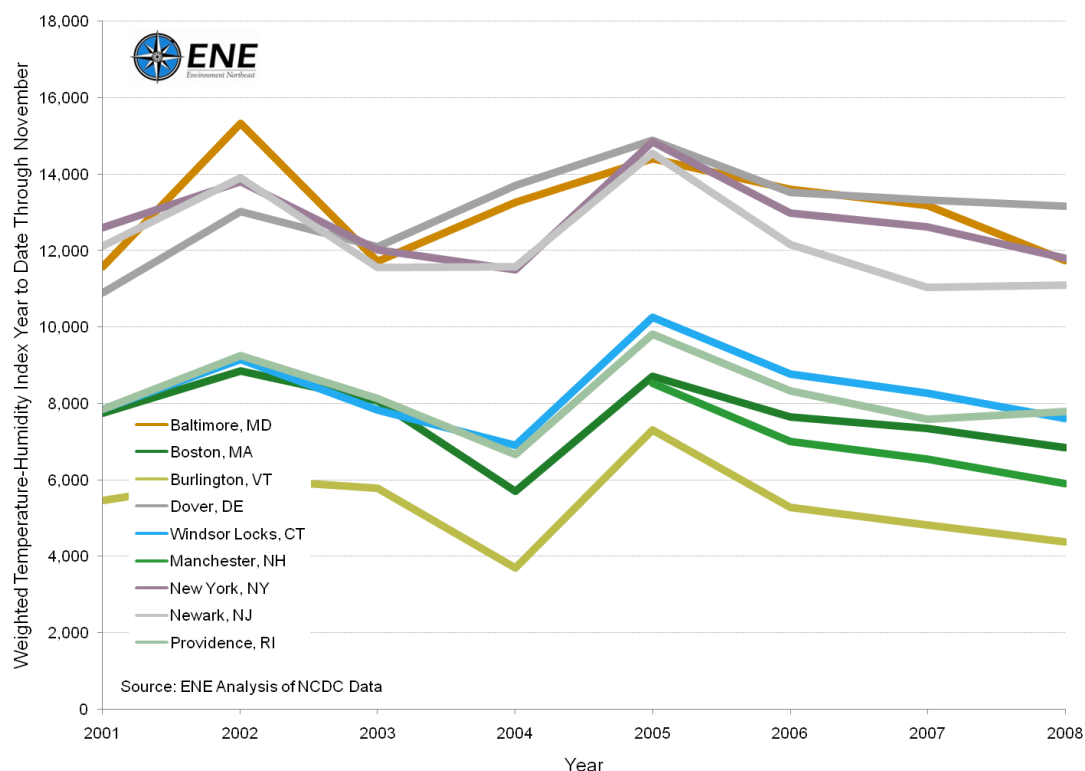
**Figure 4: Annual New England + New York Electricity Consumption**



## Weather

Weather is a significant driver of energy consumption and thus emissions within the RGGI region. Hot and humid 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 the temperature-humidity index<sup>2</sup> is a more important indicator of electricity consumption and associated emissions than cooling or heating degree days. The temperature-humidity index through November indicates that 2008 has been a moderate year in the RGGI region, which is reflected in the slight decrease in electricity consumption in summer months.

**Figure 5: Year-to-Date RGGI Weighted Temperature-Humidity Index (through November)**



## 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, economic growth in recent years appears to have coincided with a period of relative emissions stability. The extent of this disassociation between economic growth and emissions is unclear, but it suggests that economic growth need not always increase emissions.

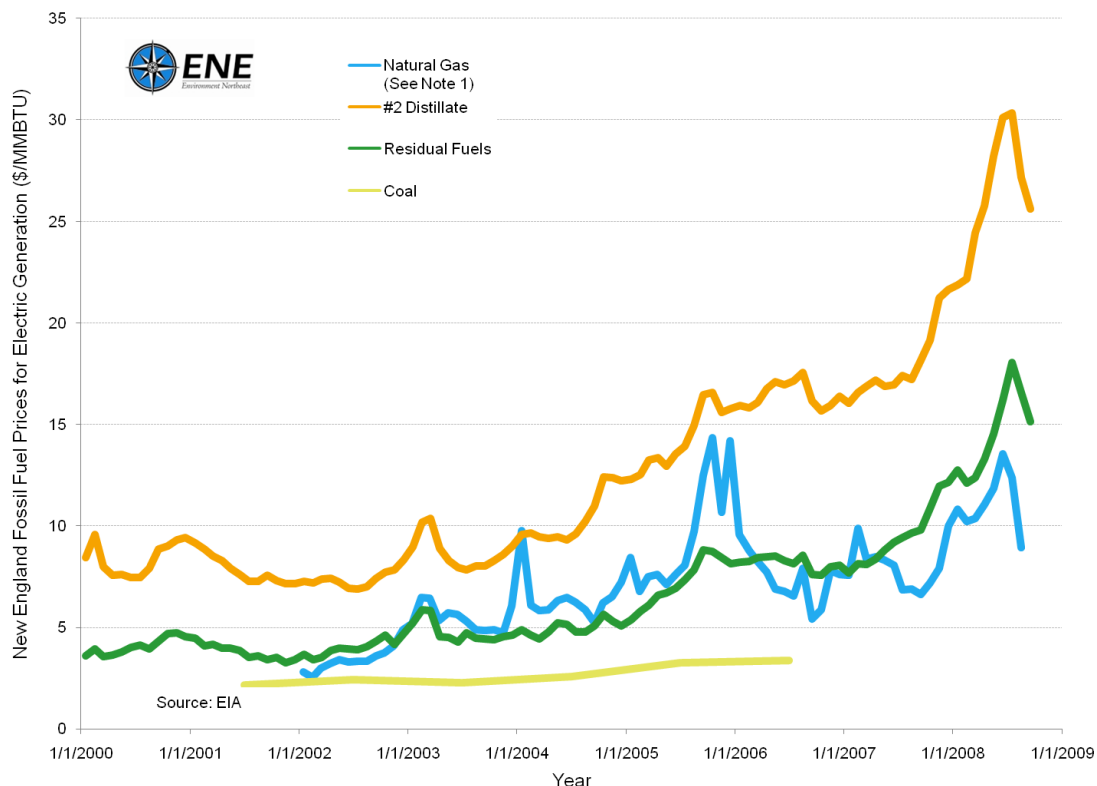
In the recent months economic conditions in the RGGI region have worsened significantly, and recent reports from the Federal Reserve show increasing weakness in RGGI districts.<sup>3</sup> The economic downturn in the region has the potential to reduce electricity consumption and emissions.

## Energy Prices & Generation from Fossil Fuel Power Plants

Energy prices have risen significantly since the baseline years (2000-2004) used to determine the RGGI cap. The rising cost of fuel inputs (see Figure 6) drove New England wholesale electricity prices up in

recent years, though recent decreases in fuel costs have arrested the upward trajectory in prices. The December 2<sup>nd</sup> price of \$62.65/MWh was far below the 2008 peak of \$194.42/MWh, and more closely approximated the 2006 average price of \$62.74/MWh.<sup>4</sup> If fuel costs continue to decrease electricity prices will likely follow, but prices would need to fall significantly to reach the 2001-2002 average price of \$45.20/MWh. In recent years higher energy prices likely restrained energy consumption and emissions, but falling prices may reverse this trend.

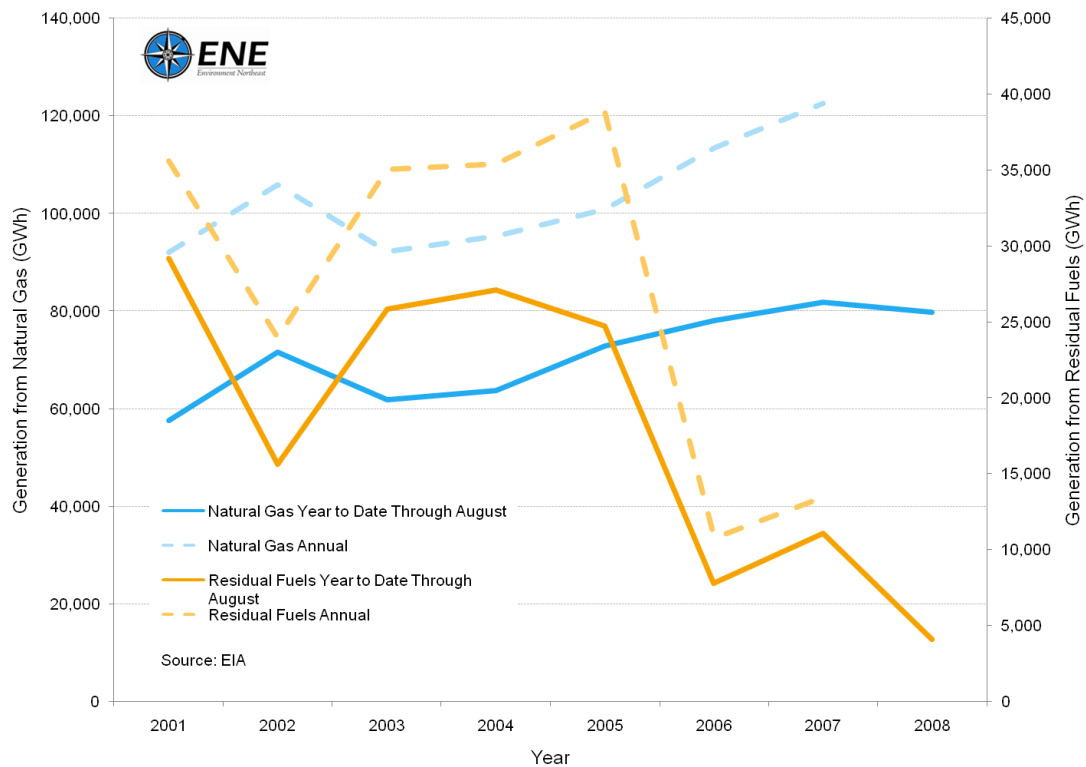
**Figure 6: Monthly New England Fuel Prices<sup>5</sup>**



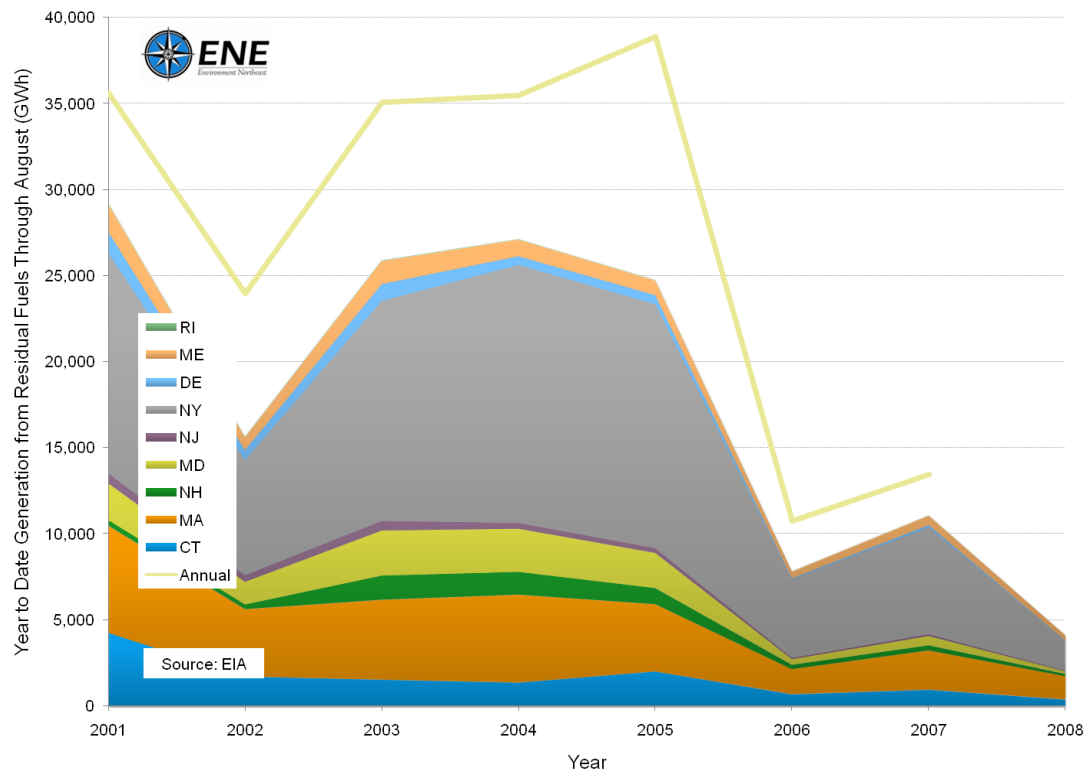
Recent increases in the price of oil and coal in relation to natural gas have altered fuel combustion patterns in the region leading to significant reductions in emissions. As oil prices rose in recent years and coal prices jumped over the summer, electricity generated by these fuels became more expensive and generation from these sources declined.

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 in Figures 7 & 8 (below). Because natural gas has a lower carbon emissions factor (53.06 kg CO<sub>2</sub>/MMBtu) than residual fuel oil (78.80 kg CO<sub>2</sub>/MMBtu)<sup>6</sup>, and natural gas plants are typically more efficient, increasing use of natural gas reduces regional emissions.

**Figure 7: RGGI Region Electric Generation from Residual Fuels vs. Natural Gas**

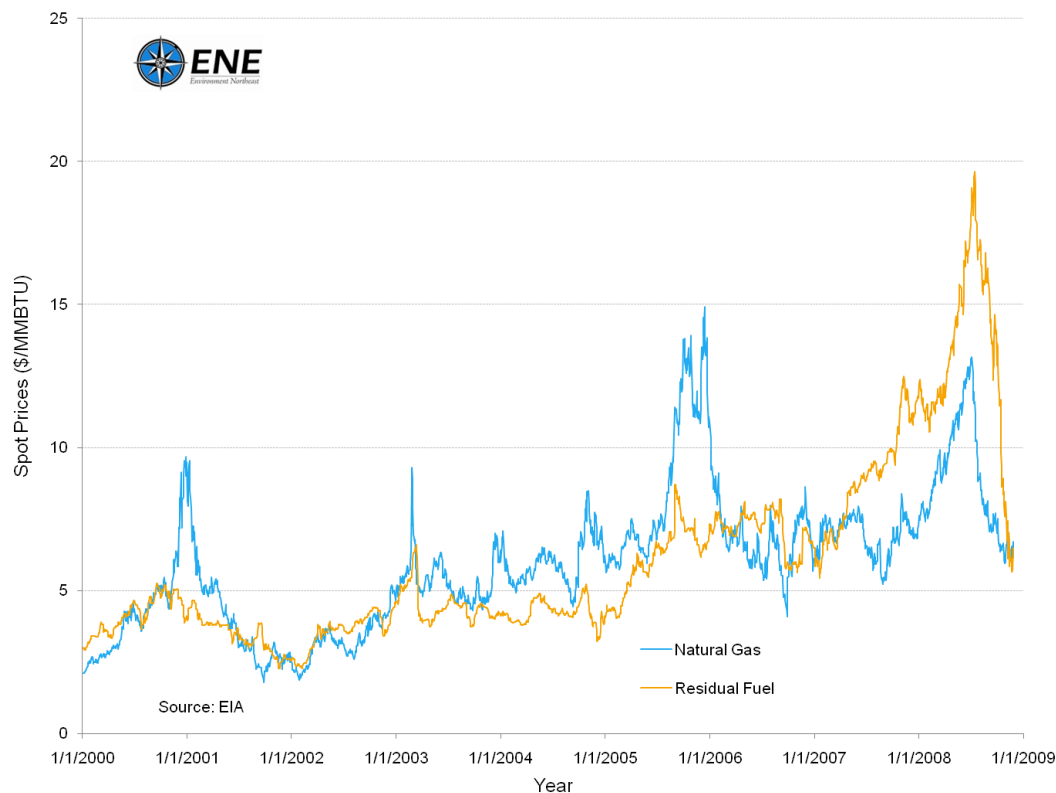


**Figure 8: Year to Date Electric Generation from Residual Fuel by State (through August)**



Declining use of residual fuel has clearly reduced emissions with the annual residual fuel generation trend very closely matching the total RGGI emissions trend. However, in the last few months the price of oil has plummeted. Oil's price decrease relative to natural gas (and in absolute terms) is most evident in monthly spot market data (Figure 9) which shows residual fuel now trading below natural gas for the first time since mid-2007, when oil prices began to increase rapidly. The decrease in oil prices is an important development that may increase use of residual fuels in dual-fuel plants – leading to increased emissions. 30,000 GWh of residual fuel generation (the scale of the recent decline) creates roughly 25 million short tons of CO<sub>2</sub> annually. A decrease in these emissions is somewhat offset by increasing emissions from of natural gas and other power sources, but the impact of high prices for oil in relation to natural gas was a significant reduction in regional emissions. Oil's recent price decrease in relation to natural gas may thus increase emissions.

**Figure 9: National Spot Prices for Residual Fuel and Natural Gas**

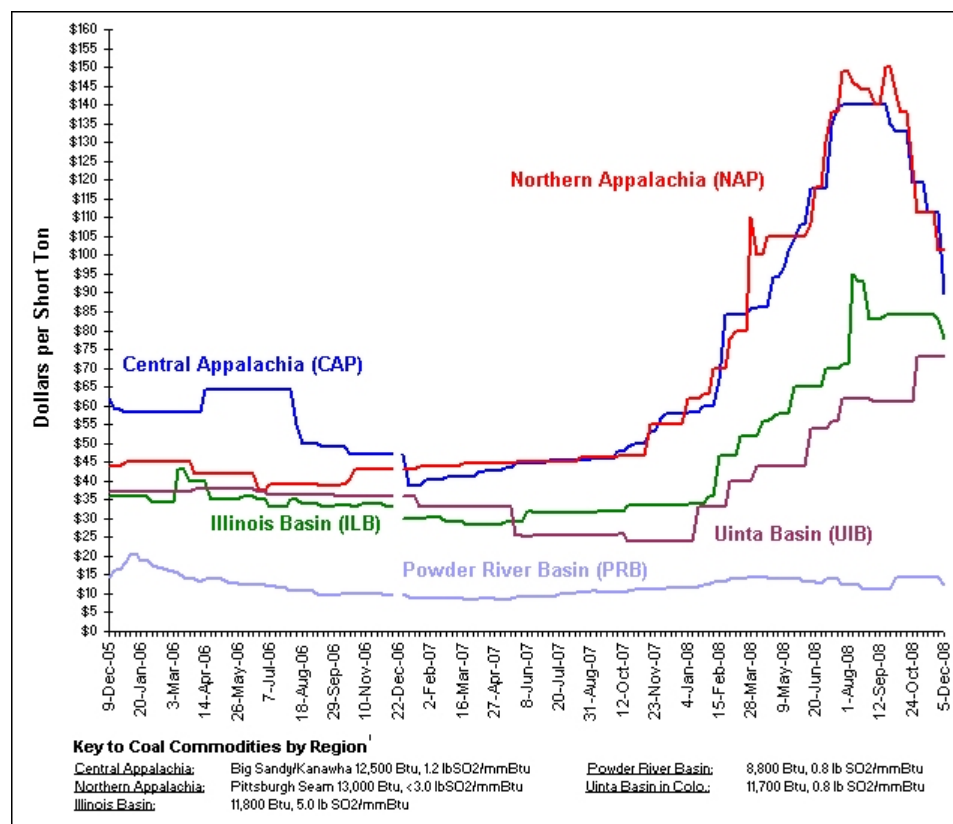


In addition to the decline through August 2008 in electric generation from oil there has been a significant decline in coal fired generation within the RGGI region. Coal generation has been relatively stable over the past few years, but limited EIA surveys for 2008 show coal generation down by about 7%. This decline – if it proves consistent through the end of the year – could be a significant driver of lower emissions. A decline in coal generation of about 5,000 GWh is roughly equivalent to 5 million short tons of CO<sub>2</sub> annually.

Similar to fuel oil, the decline in coal generation and associated emissions is likely driven by coal prices doubling over the summer (see Figure 10 below). However, in the last few months coal prices have declined and coal generation and associated emissions may return to levels seen in previous years.



Figure 10: Coal Spot Prices



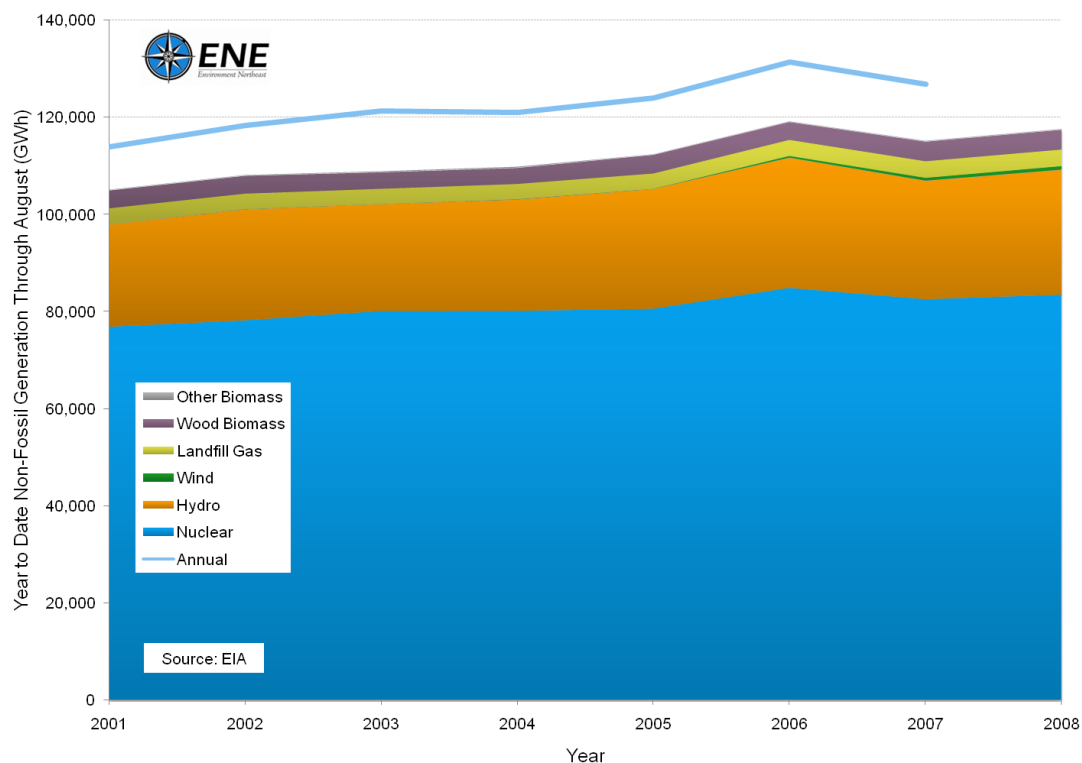
Source: EIA, based on Platts

The decline in power plant emissions in the RGGI region appears closely tied to large price increases for oil and coal. Given the decline in these prices, it may be that low emissions in 2008 are an anomaly and that emissions will begin to climb in the coming months and years.

### Non-Fossil Fuel Generation

Non-fossil fuel 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<sub>2</sub> emitting resource including nuclear, hydro, wind and other renewables. Recent data indicate that annual generation from hydro, wind, and nuclear increased nearly 10% between 2001 and 2007 (see Figure 11 below).

**Figure 11: RGGI Region Electricity Production from Non-Fossil Sources**



The net effect of a steady increase in non-fossil generation is significant. Wind generation – although small today – is growing rapidly. Investments in state-of-the-art wind facilities and aggressive renewable portfolio standards in the region will support continued growth and wind is likely to become a larger part of the regional resource mix. Generation from hydro is also up slightly in 2008, primarily due to increased precipitation replenishing reservoirs. Finally, nuclear generation has increased due to both uprates (increased capacity) and higher capacity factors. Uprates approved for nuclear plants within RGGI since 2001 will add 686 MW of nuclear power, or 0.6% of total capacity.<sup>7</sup>

Between 2001 and 2007 annual non-fossil generation has increased by about 15,000 GWh, which is roughly equivalent to reducing emissions by 9 million short tons of CO<sub>2</sub>, assuming this new generation replaces natural gas on the margin. Over time new renewables are likely to provide additional non-emitting generation, though growth in nuclear generation and even the continued operation of nuclear plants is restrained by high capital costs, regulatory uncertainty, and public concern regarding safety, lack of waste disposal sites and nuclear proliferation.

### **Auction Dynamics and Regulatory Updates**

In addition to emissions trends, an analysis of supply and demand characteristics of RGGI auctions must consider the future value of emissions allowances. Recent developments within RGGI and at the federal level indicate that emissions constraints are assuming a central role in environmental and energy policy, and that future climate regulation will build on RGGI and likely preserve the value of RGGI allowances. The successful conduct of the first RGGI auction removes uncertainty about auction functionality and indicates tacit support from affected parties and other market participants. Recent completion of state regulations confirms RGGI's permanence and ensures auction supply contributions from all ten states. Beyond RGGI, states and the federal government are proposing ambitious emission reductions through

cap-and-trade systems that incorporate existing initiatives, implying that RGGI allowances will maintain value into the future.

### ***First Auction Results***

Results of the first RGGI auction reveal that demand for allowances is robust amongst both affected generators and other market participants. According to the market monitor report<sup>8</sup> prepared by Potomac Economics:

- Fifty-nine separate entities submitted bids to purchase more than four times the available supply of allowances.
- Generators purchased slightly more than 80% of allowances, non-compliance entities purchased close to 20% of allowances, and participation from individuals and environmental organizations was insignificant.
- Bids ranged from \$1.86 to \$12.00, with a mean average of \$2.77 and a median average of \$2.51.
- The largest successful bid won 2,528,000 allowances at a price of \$7,760,960.

These results indicate that the regulated sector (generators) and voluntary participants made significant investments (\$38.6 million in total) in RGGI allowances. Thus, market participants now have interest vested in the continuity of RGGI and the preservation of allowance value. Additionally, generators may make investments in allowances now – while prices are low – for use in future years when prices may increase or the cap may be adjusted downward.

### ***State RGGI Regulations***

Since the first auction on September 25<sup>th</sup>, Delaware, New Hampshire, New Jersey and New York have completed the implementation of their RGGI regulations, ensuring that all ten RGGI states will contribute allowances to the second auction and that RGGI will take effect across the region on January 1, 2009. DE, NH, NJ and NY were unable to finalize regulations in time to supply allowances for the first auction in September, and the six other participating states (CT, ME, MD, MA, RI, VT) comprised only 45% of the cap. Thus at the first auction supply was constrained to 12.6 million allowances.

In order to distribute 2009 allowances equally over the remaining auctions, CT, ME, MD, MA, RI, and VT will each provide 1/6<sup>th</sup> of its auction allocation, and DE, NH, NJ and NY will each provide 1/5<sup>th</sup> of its auction allocation. Thus, for the December 17<sup>th</sup> and subsequent auctions, total supply will be 31.5 million allowances. 2009 allocations and December 17<sup>th</sup> auction supply are listed below in Table 1. Potential revenue streams are also projected at the first auction clearing price of \$3.07/ton and the current \$3.38/ton price of RGGI futures traded on the Chicago Climate Exchange.<sup>9</sup>

**Table 1: 2009 State Allocations and September 25<sup>th</sup> 2008 Auction Supply**

State	2009 Allocation (short tons)	Share of RGGI Cap (%)	December 17 Supply (short tons)	Potential Revenue	
				at \$3.07/ton	at \$3.38/ton
Connecticut	10,695,036	5.70%	1,372,530	\$4,213,667	\$4,639,151
Delaware	7,559,787	4.00%	755,979	\$2,320,856	\$2,555,209
Maine	5,984,902	3.20%	872,506	\$2,678,593	\$2,949,070
Maryland	37,503,983	19.90%	5,331,781	\$16,368,568	\$18,021,420
Massachusetts	26,660,204	14.20%	4,387,534	\$13,469,729	\$14,829,865
New Hampshire	8,620,460	4.60%	1,189,610	\$3,652,103	\$4,020,882
New Jersey	22,892,730	12.20%	4,532,761	\$13,915,576	\$15,320,732
New York	64,310,805	34.20%	12,422,161	\$38,136,034	\$41,986,904
Rhode Island	2,659,239	1.40%	438,774	\$1,347,036	\$1,483,056
Vermont	1,225,830	0.70%	202,262	\$620,944	\$683,646
<b>Total</b>	<b>188,112,976</b>	<b>100.00%</b>	<b>31,505,898</b>	<b>\$96,723,107</b>	<b>\$106,489,935</b>

Looking beyond the near-term, RGGI member states may adjust the cap level after the first compliance period in 2012. When member states established the regional cap they provided for periodic assessments and necessary revisions of the cap level. Emissions may increase in the next three years, but if they do not, or if they decrease further, it is not unlikely that the RGGI cap would be adjusted downward.

### ***Voluntary Participants***

Investors and other interested parties may be an additional source of demand in the December 17<sup>th</sup> and subsequent auctions. Results from the first auction indicate significant engagement by voluntary participants (who purchased almost 20% of allowances), and recent regulatory developments likely increase interest in RGGI as a trend-setter and foundation for future legislation.

Buyers from the voluntary carbon market may produce additional demand for RGGI allowances, especially if doubts about the validity of voluntary offsets continue and RGGI allowance prices remain low. Offset projects generating credits for the Chicago Climate Exchange (CCX) and other sources have come under increasing scrutiny of late<sup>10</sup> due to weak additionality standards that award emission reduction credits for activities already taking place. Businesses purchasing emissions offsets on a voluntary basis may become wary of the dubious environmental integrity of some voluntary offsets and attendant public relations concerns. If these participants determine that modestly priced RGGI allowances are more appropriate to their environmental objectives, demand could increase, especially at lower price ranges.

### ***Financial Market Conditions***

Two additional factors that may influence the second auction are: 1) the extreme volatility of financial markets and 2) the credit crunch, both of which have increased in severity since the first auction on September 25<sup>th</sup>. While in-depth financial analysis is outside ENE's expertise, we raise the following as important considerations for market participants:

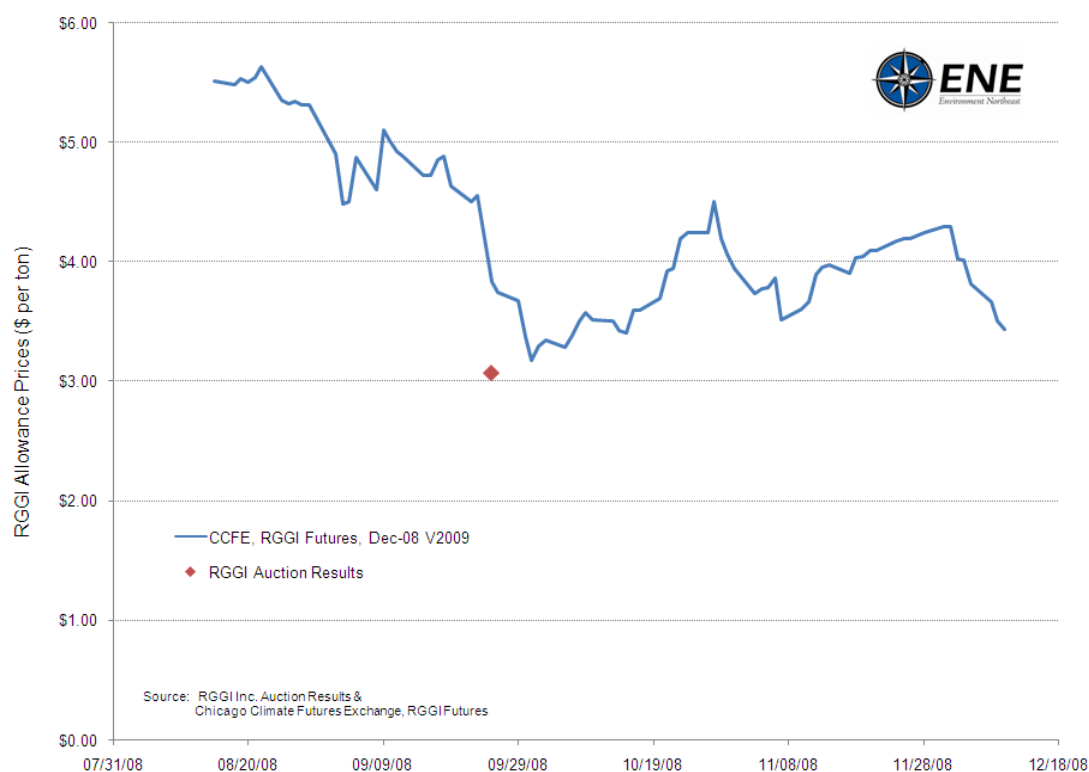
- Will credit constraints affect bidding behavior? Recall that bidders may only bid up to the amount of financial security provided in advance of the auction, so any financial security dependent on external credit may be more expensive and/or unavailable.
- Will financial volatility increase or decrease the willingness of voluntary participants to invest in the novel RGGI market?

## ***RGGI Market Volatility***

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 and initial years of the program. The New York Mercantile Exchange<sup>11</sup> and Chicago Climate Exchange<sup>12</sup> 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.

On December 12, 2008 RGGI futures (12/08 delivery) were trading at \$3.38 per ton on the CCX and at \$3.55 on NYMEX. However, on the date of the first auction (September 25<sup>th</sup>, 2008) RGGI futures traded at \$3.95 per ton, so the indicative value of futures prices should not be overstated.

**Figure 12: RGGI Futures and Auction Prices**



## ***State Climate Legislation***

Several RGGI member states have passed climate legislation that sets emission reduction targets more ambitious than RGGI’s 10% reduction by 2019. The Massachusetts *Global Warming Solutions Act* requires that the state’s emissions be at least 80% below 1990 levels by 2050, with an interim target for 2020 of 10-25% below 1990 emissions. In Connecticut, the *Act Concerning Connecticut Global Warming Solutions* caps emissions and requires cuts to 10% below 1990 levels by 2020 and 80% reductions from 2001 levels by 2050. The New Jersey *Global Warming Response Act* requires emissions in the state to be rolled back to at least 1990 levels by the year 2020 and to 80% below 2006 levels by 2050.

Though implementation plans for this new legislation have yet to be presented the signal to emitters is clear: emissions will be constrained into the foreseeable future. The certainty of emissions constraints at state level may increase the perceived value of RGGI allowances (the RGGI cap may be reduced in the future or the market could be expanded to include other emitters). Emitting generators may consider

RGGI a useful test-run for future climate regulation and seek to gain early experience by purchasing and trading RGGI allowances. Generators (and potentially other emitters) may also perceive an opportunity to purchase RGGI allowances at modest prices in expectation that they will be honored in any future regulation at the state or federal level.

### ***Federal Climate Legislation***

In recent months climate policy has assumed an increasingly prominent role at the federal level, and this could have indirect effects on RGGI allowance value. Akin to the impact of state climate legislation, discussion of federal cap-and-trade schemes could encourage generators and other interested parties to gain early experience or invest in RGGI allowances in expectation of increases in allowance value under more comprehensive programs. Unlimited banking of RGGI allowances (meaning allowances can be used for compliance in any year subsequent to purchase) facilitates such speculation, as allowances will not expire. Nonetheless, such investments would carry significant regulatory risk, as the details of federal climate regulation (and corresponding value of allowances) remain unclear. However, recent developments in the Federal policy arena provide more detail than existed before the September 25<sup>th</sup> auction, and deserve attention.

The election of Barack Obama and the expansion of the Democratic majority in Congress suggest that stringent federal climate legislation may be enacted in the 111<sup>th</sup> Congress. Both Obama and John McCain called for emissions cuts through cap-and-trade, but Obama's goal of reducing emissions 80% below 1990 levels is more ambitious than McCain's proposal of a 60% reduction over the same period. While there is no guarantee that Congress will adopt President-elect Obama's targets, stringent climate legislation stands a better chance of enactment in the post-election political landscape than it did before.

The climate bill to get the most attention in the last year was the Boxer-Lieberman-Warner bill, which does not force Federal pre-emption of state programs but rather offers incentives (in the form of allowances) to states that discontinue existing programs. Specifically it provides allowances under an Early Action Program "sufficient to compensate...*for the cost to the eligible entity of obtaining and holding the emission allowances.*"<sup>13</sup> The quantity of incentive allowances begins at 5% of the cap in 2012 and decreases to 1% by 2018, and covers California and RGGI. While this early action provision indicates that RGGI allowances would not be worthless, its limited and decreasing allocation could raise doubts that sufficient allowances would be available to honor RGGI allowance value under a federal program.

The latest piece of climate legislation to come out of Congress, the Dingell-Boucher Discussion Draft<sup>14</sup>, preempts pre-existing state and regional initiatives such as RGGI, but contains a similar provision to Boxer-Lieberman-Warner awarding early action credits in the form of allowances "sufficient to compensate any entity located in the United States that, as of December 31, 2011, holds emission allowances issued by the State of California or for the Regional Greenhouse Gas Initiative *for the cost of obtaining and holding such allowances*"<sup>15</sup>. The early action allocation is set at 3% of allowances, and does not decrease. 3% of the proposed cap in the first year of the program would total 150 million tons, less than RGGI's cap of 188 million tons, and presumably well below the combined total of RGGI and a comprehensive California cap. Thus the preservation of pre-existing allowances value would depend on federal allowances being significantly more valuable than RGGI allowances, which cleared at \$3.07/ton in the first auction. While the Dingell-Boucher draft is not likely to be debated or passed – particularly since Henry Waxman (D-CA) has supplanted John Dingell (D-MI) as Chairman of the Senate Energy and Commerce Committee – this model of allowance conversion indicates that RGGI allowances may preserve value under a federal system. These early action provisions do not appear to create incentive to buy RGGI allowances now with an eye on future regulation (as a set conversion might), but they indicate that federal programs will somehow honor pre-existing allowance and may thus encourage early market participation through RGGI.

## Conclusion

Recent data (through September) indicate that 2008 emissions from RGGI units are trending 16% below the RGGI cap. Regional emissions remain below peak levels in 2005, and emissions drivers such as declining electricity consumption, increasing fuel price diversity, slowing economic growth, and increased non-emitting generation provide ample reason for this decline in emissions.

Lower emissions are a favorable trend, but ENE believes this trend may not continue into 2009 – it is important to remember that the RGGI program begins in January 2009 and only emissions in that year forward are relevant to the final supply and demand dynamics of the market.

Based on our analysis the primary drivers of lower than expected emissions have been:

- The high price of oil in relation to the price of natural gas and corresponding decline in oil utilization in favor of natural gas – this price trend has reversed in the last month and could lead to significant additional emissions from oil fired plants.
- The high price of coal in the summer of 2008 and corresponding decrease in combustion of this carbon-intensive fuel – the price trend for coal has also reversed, which could lead coal emissions to return to their prior levels.
- Increased availability of wind, hydro, and nuclear – this increase in non-emitting generation will likely continue at a modest pace as more wind power comes online in the future.
- Electricity consumption has been stable in recent years – consumption will likely remain stable owing to economic conditions and expanded efficiency investments; but hotter, more humid summers could drive up consumption and emissions in future years.

ENE believes that demand for allowances in the second auction on December 17<sup>th</sup>, 2008 will remain strong. Demand will likely be driven by: 1) compliance entities (generators) who sat out the first auction but now realize that RGGI is here to stay and that allowances may be cheaper now than in future auctions; and 2) voluntary participants who interpret recent climate policy discussions as harbingers of a more comprehensive system and seek advantage through early participation.

Factors that may dampen demand in the early auctions include low emissions and the three year compliance period (which removes urgency from early purchasing of allowances).

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



Rockport, ME / Portland, ME / Hartford, CT / Boston, MA / Providence, RI /  
Charlottetown, PEI, Canada  
[www.env-ne.org](http://www.env-ne.org)

Derek K. Murrow, Director Policy Analysis, 203-495-8224, [dmurrow@env-ne.org](mailto:dmurrow@env-ne.org)  
Jamie Howland, Policy Analyst – Data and Energy, 860-246-7121, [jhowland@env-ne.org](mailto:jhowland@env-ne.org)  
Peter Shattuck, Research Analyst, 617-742-0064, [pshattuck@env-ne.org](mailto:pshattuck@env-ne.org)

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## Endnotes:

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<sup>1</sup> The RGGI region includes both the NY ISO and a portion of the PJM ISO, but data is not as readily available for these regions.

<sup>2</sup> Weighted temperature-humidity index (wTHI): A measure of how hot and humid a location is over a period of time relative to a base level at which air conditioning is first needed. The temperature-humidity index (THI) is computed for each day by multiplying the day's average temperature by 0.55, adding it to the day's dew point multiplied by 0.2, and adding 17.5. The base level, 65, is then subtracted, with negative values set equal to zero. The weighted temperature humidity index takes into account the past two days' weather, which also impacts cooling loads, as the third day of a heat wave typically requires more cooling than the first. The weighted figure is calculated by multiplying a day's THI by 10 and adding the two previous day's THI's multiplied by 5 and 2, respectively. Each day's weighted THI is summed to create a wTHI measure for a specified time period. Weighted temperature-humidity indices are used in energy analysis as an indicator of air conditioning energy requirements or use.

<sup>3</sup> 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/](http://www.federalreserve.gov/FOMC/BeigeBook/2008/)

<sup>4</sup> Market data for the NEPOOL region available at: <http://www.eia.doe.gov/cneaf/electricity/wholesale/wholesale.html>

<sup>5</sup> 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.

<sup>6</sup> EIA, Appendix H of the instructions to Form EIA-1605, Available at: [www.eia.doe.gov/oiaf/1605/excel/Fuel%20Emission%20Factors.xls](http://www.eia.doe.gov/oiaf/1605/excel/Fuel%20Emission%20Factors.xls)

<sup>7</sup> Information on nuclear uprates available from EIA at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/power-uprates.html>.

<sup>8</sup> Available at: [www.rggi.org/docs/Auction\\_1\\_PostSettlement\\_Report\\_from\\_Market\\_Monitor.pdf](http://www.rggi.org/docs/Auction_1_PostSettlement_Report_from_Market_Monitor.pdf).

<sup>9</sup> Market data available at: [www.ccf.com/mktdata\\_ccfe/futuresSummary.jsf?symbol=rggi](http://www.ccf.com/mktdata_ccfe/futuresSummary.jsf?symbol=rggi)

<sup>10</sup> Ball, J., *Pollution Credits Let Dumps Double Dip: Landfills Find New Revenue Stream in Trading Market Meant to Curb Greenhouse Emissions*, Wall Street Journal, October 20, 2008.

<sup>11</sup> 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>.

<sup>12</sup> [earth2tech.com/2008/08/18/us-cap-and-trade-launch-highlights-hurdles/](http://earth2tech.com/2008/08/18/us-cap-and-trade-launch-highlights-hurdles/)

<sup>13</sup> See section 702 through 704 of S. 3036, the Lieberman-Warner-Boxer Climate Security Act of 2008, available at: <http://thomas.loc.gov/cgi-bin/query/z?c110:S.3036>:

<sup>14</sup> Available at: <http://energycommerce.house.gov>

<sup>15</sup> See Section 725(b)(1) on page 168 of the discussion draft, available at: [energycommerce.house.gov](http://energycommerce.house.gov).



## Attachment 1: Emissions Data Methodology

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### *Data Sources*

ENE compiled emissions data from two sources for this analysis. Facility level data was collected for all power plants that report CO<sub>2</sub> emissions under the EPA Acid Rain Program (ARP).<sup>1</sup> 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<sup>2</sup> or through direct communication with RGGI state regulators.

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 CO<sub>2</sub> 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.

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<sup>1</sup> EPA Clean Air Markets, ARP Data, Available at: <http://camddataandmaps.epa.gov/gdm/>

<sup>2</sup> Regional Greenhouse Gas Initiative (RGGI). Available at [http://www.rggi.org/docs/CO2\\_2000\\_2006.xls](http://www.rggi.org/docs/CO2_2000_2006.xls)