

RGGI

Break-even Analysis of the Sensitivity of NYISO Fossil Generating Units to Variations in the Costs of CO₂ Allowances and Fuel

Draft-For Discussion Purposes Only

July 26, 2007

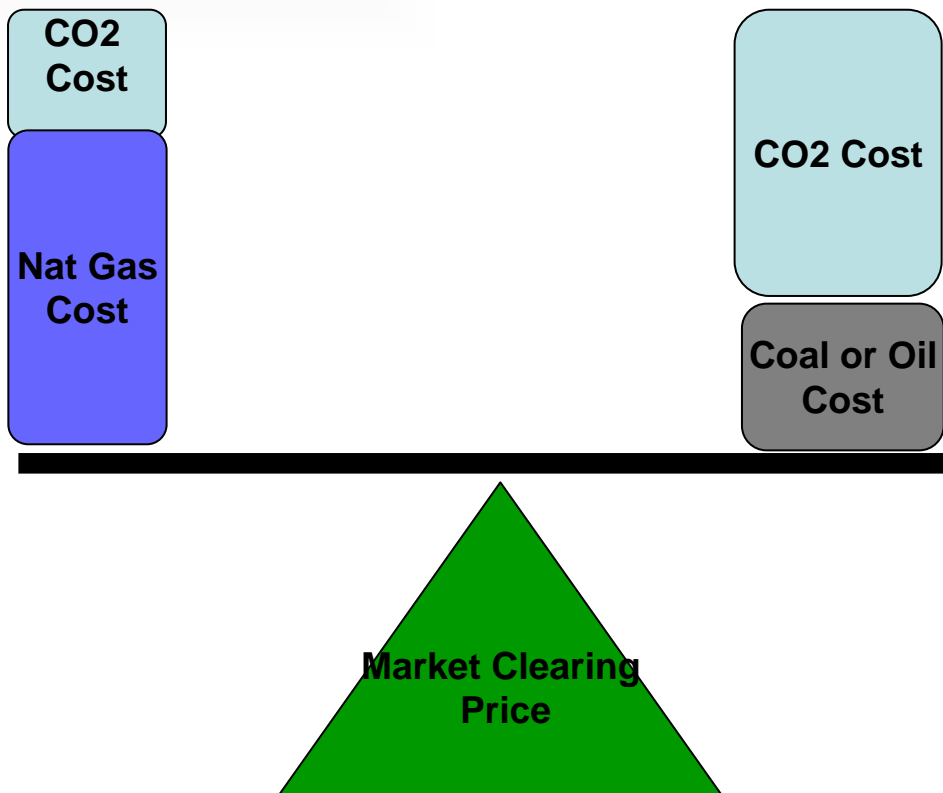
Draft – for discussion purposes only.

*The study conclusions and illustrations are intended for use only in a
Market Participant/Public Policy discussion,*

Study Purpose

- ◆ To determine what combinations of fuel and allowance costs would produce break-even operating margins for various classes of units.
- ◆ The study does not
 - *forecast load*
 - *Forecast market clearing price*
 - *Examine the impact of Capacity Prices*
- ◆ The study does look for changes in the relatively competitive positions of classes of units

Break-even Methodology



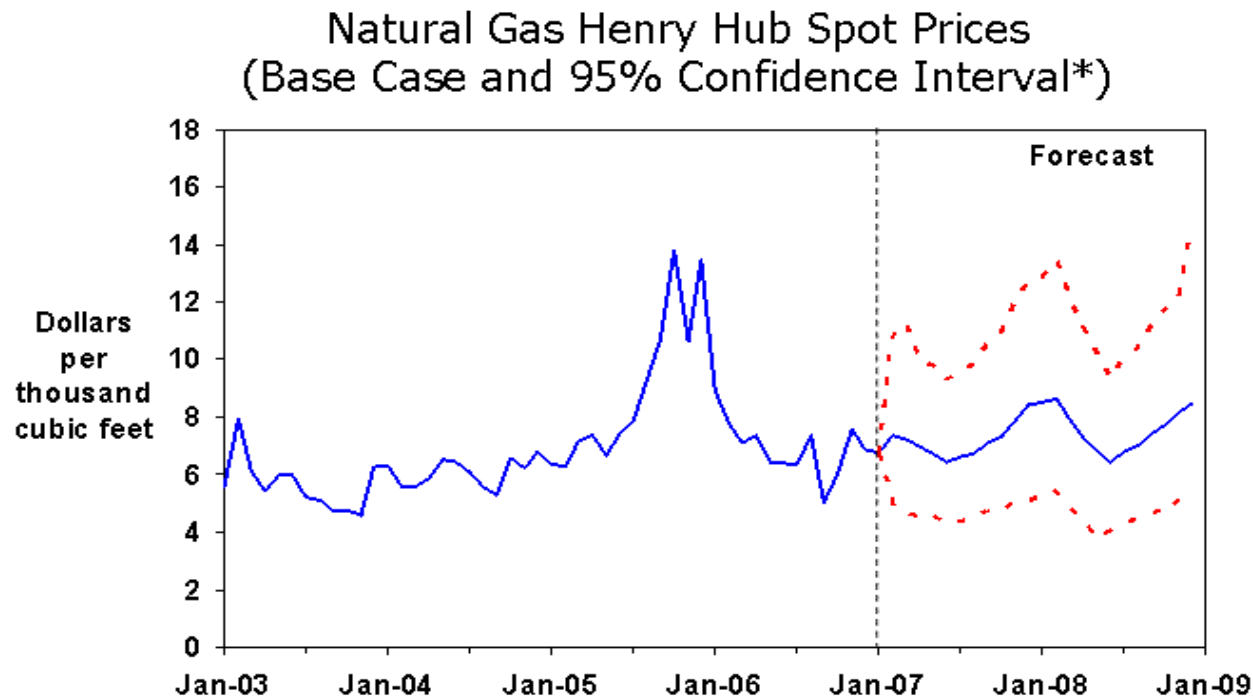
Is the Coal or Oil Cost Less Than the Future Price?

If so, the Coal or Oil Unit will continue to run

If not, the Coal or Oil Unit will not run and there may be a Resource Adequacy Problem

Draft – for discussion purposes only

The Price of Natural Gas Sets the Cost of Compliance Initially. The Analysis Used a Range of Prices from \$4-\$14/DTH



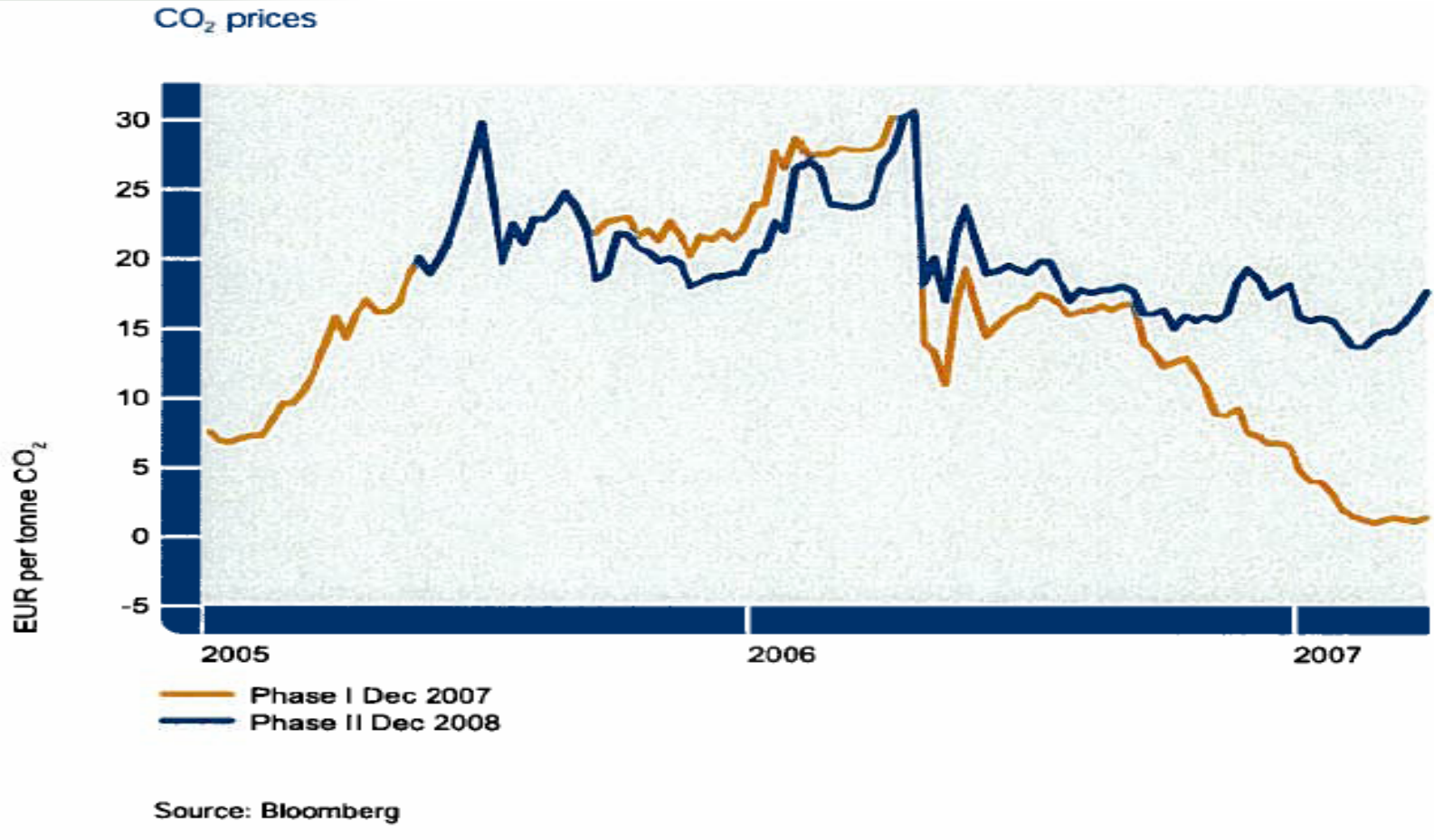
*The confidence intervals show ± 2 standard errors based on the properties of the model.

Short-Term Energy Outlook, February 2007



Draft – for discussion purposes only

Allowance Prices in the EU have been Volatile. The Analysis uses a range of \$0-\$30/T



Draft – for discussion purposes only

Efficient Coal Units continue to have positive operating margins

Breakeven Analysis for Coal at \$3 per mmBTU											
Coal (9500 Heat Rate) vs Natural Gas CC (7500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$3.2	\$3.9	\$4.7	\$5.5	\$6.3	\$7.1	\$7.9	\$8.7	\$9.5	\$10.3	\$11.1
\$1	\$3.1	\$3.9	\$4.7	\$5.5	\$6.3	\$7.1	\$7.8	\$8.6	\$9.4	\$10.2	\$11.0
\$5	\$2.9	\$3.7	\$4.5	\$5.3	\$6.0	\$6.8	\$7.6	\$8.4	\$9.2	\$10.0	\$10.8
\$10	\$2.6	\$3.4	\$4.2	\$5.0	\$5.8	\$6.6	\$7.4	\$8.1	\$8.9	\$9.7	\$10.5
\$20	\$2.1	\$2.9	\$3.7	\$4.5	\$5.2	\$6.0	\$6.8	\$7.6	\$8.4	\$9.2	\$10.0
\$30	\$1.5	\$2.3	\$3.1	\$3.9	\$4.7	\$5.5	\$6.3	\$7.1	\$7.9	\$8.7	\$9.4

Draft – for discussion purposes only

Older Reheat Coal Units will continue to have positive operating margins under the most likely scenarios

Breakeven Analysis for Coal at \$3 per mmBTU											
Coal (10500 Heat Rate) vs Natural Gas (6500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$2.9	\$3.6	\$4.3	\$5.0	\$5.7	\$6.4	\$7.1	\$7.9	\$8.6	\$9.3	\$10.0
\$1	\$2.8	\$3.5	\$4.2	\$4.9	\$5.7	\$6.4	\$7.1	\$7.8	\$8.5	\$9.2	\$9.9
\$5	\$2.5	\$3.3	\$4.0	\$4.7	\$5.4	\$6.1	\$6.8	\$7.5	\$8.3	\$9.0	\$9.7
\$10	\$2.2	\$3.0	\$3.7	\$4.4	\$5.1	\$5.8	\$6.5	\$7.2	\$8.0	\$8.7	\$9.4
\$20	\$1.6	\$2.3	\$3.0	\$3.8	\$4.5	\$5.2	\$5.9	\$6.6	\$7.3	\$8.0	\$8.8
\$30	\$1.0	\$1.7	\$2.4	\$3.1	\$3.9	\$4.6	\$5.3	\$6.0	\$6.7	\$7.4	\$8.1

Draft – for discussion purposes only

Non-reheat Coal units will have positive operating margins under many scenarios

Breakeven Analysis for Coal at \$3 per mmBTU											
Coal (12500 Heat Rate) vs Natural Gas CC (7500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$2.4	\$3.1	\$3.7	\$4.3	\$4.9	\$5.5	\$6.1	\$6.7	\$7.3	\$8.0	\$8.6
\$1	\$2.4	\$3.0	\$3.6	\$4.2	\$4.8	\$5.4	\$6.1	\$6.7	\$7.3	\$7.9	\$8.5
\$5	\$2.1	\$2.7	\$3.3	\$4.0	\$4.6	\$5.2	\$5.8	\$6.4	\$7.0	\$7.6	\$8.2
\$10	\$1.8	\$2.4	\$3.0	\$3.6	\$4.2	\$4.8	\$5.5	\$6.1	\$6.7	\$7.3	\$7.9
\$20	\$1.1	\$1.7	\$2.4	\$3.0	\$3.6	\$4.2	\$4.8	\$5.4	\$6.0	\$6.6	\$7.2
\$30	\$0.5	\$1.1	\$1.7	\$2.3	\$2.9	\$3.5	\$4.1	\$4.8	\$5.4	\$6.0	\$6.6

Draft – for discussion purposes only

Efficient Coal Units will retain positive operating margins against the newest NG CC units for the most likely fuel and carbon costs

Breakeven Analysis for Coal at \$3 per mmBTU											
Coal (9500 Heat Rate) vs Natural Gas CC (6500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$2.7	\$3.4	\$4.1	\$4.8	\$5.5	\$6.2	\$6.8	\$7.5	\$8.2	\$8.9	\$9.6
\$1	\$2.7	\$3.4	\$4.0	\$4.7	\$5.4	\$6.1	\$6.8	\$7.5	\$8.1	\$8.8	\$9.5
\$5	\$2.4	\$3.1	\$3.8	\$4.5	\$5.2	\$5.8	\$6.5	\$7.2	\$7.9	\$8.6	\$9.3
\$10	\$2.1	\$2.8	\$3.5	\$4.2	\$4.8	\$5.5	\$6.2	\$6.9	\$7.6	\$8.3	\$8.9
\$20	\$1.5	\$2.2	\$2.8	\$3.5	\$4.2	\$4.9	\$5.6	\$6.3	\$6.9	\$7.6	\$8.3
\$30	\$0.8	\$1.5	\$2.2	\$2.9	\$3.6	\$4.3	\$4.9	\$5.6	\$6.3	\$7.0	\$7.7

Draft – for discussion purposes only

Oil Steam Units will be challenged

Breakeven Analysis for Oil at \$7.50 per mmBTU											
Oil (12600 Heat Rate) vs Natural Gas CC (7500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$3.3	\$4.2	\$5.0	\$5.8	\$6.7	\$7.5	\$8.3	\$9.2	\$10.0	\$10.8	\$11.7
\$1	\$3.3	\$4.1	\$5.0	\$5.8	\$6.6	\$7.5	\$8.3	\$9.1	\$10.0	\$10.8	\$11.6
\$5	\$3.2	\$4.0	\$4.8	\$5.7	\$6.5	\$7.3	\$8.2	\$9.0	\$9.8	\$10.7	\$11.5
\$10	\$3.0	\$3.8	\$4.7	\$5.5	\$6.3	\$7.2	\$8.0	\$8.8	\$9.7	\$10.5	\$11.3
\$20	\$2.6	\$3.5	\$4.3	\$5.1	\$6.0	\$6.8	\$7.6	\$8.5	\$9.3	\$10.1	\$11.0
\$30	\$2.3	\$3.1	\$4.0	\$4.8	\$5.6	\$6.5	\$7.3	\$8.1	\$9.0	\$9.8	\$10.6

Draft – for discussion purposes only

More efficient Oil Steam Units will also be challenged

Breakeven Analysis for Oil at \$7.50 per mmBTU											
Oil Steam (11700 Heat Rate) vs Natural Gas GT (10500 Heat Rate)											
CO2 \$/ton	Gas Price \$/mmBTU										
	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14
\$0	\$3.6	\$4.5	\$5.4	\$6.3	\$7.2	\$8.1	\$9.0	\$9.9	\$10.8	\$11.7	\$12.6
\$1	\$3.6	\$4.5	\$5.4	\$6.3	\$7.2	\$8.0	\$8.9	\$9.8	\$10.7	\$11.6	\$12.5
\$5	\$3.4	\$4.3	\$5.2	\$6.1	\$7.0	\$7.9	\$8.8	\$9.7	\$10.6	\$11.5	\$12.4
\$10	\$3.3	\$4.2	\$5.1	\$6.0	\$6.9	\$7.8	\$8.7	\$9.6	\$10.5	\$11.4	\$12.3
\$20	\$3.0	\$3.9	\$4.8	\$5.7	\$6.6	\$7.5	\$8.4	\$9.3	\$10.2	\$11.1	\$12.0
\$30	\$2.7	\$3.6	\$4.5	\$5.4	\$6.3	\$7.2	\$8.1	\$9.0	\$9.9	\$10.8	\$11.7

Draft – for discussion purposes only

Findings

- ◆ Coal units will continue to have positive operating margins within the range of allowances prices currently studied by RGGI
- ◆ Gas vs. Oil decisions will be driven more by relative fuel costs than by CO2 allowance costs.
- ◆ Oil Fired Units will be challenged

How will Generators Comply with RGGI?

- ◆ Switch to lower carbon fuels
- ◆ Improve efficiency
- ◆ Buy Allowances
- ◆ Buy Offsets
 - Landfill gas
 - Afforestation
 - SF6
 - End use efficiency
 - Manure management

RGGI Implications 2009-2015

- ◆ RGGI plants will have an additional cost in their energy offers 2009
- ◆ The CO₂ Compliance Cost for Coal and Oil plants will have higher CO₂ adders than gas plants due to their higher CO₂ emission rates (lbsCO₂/MWh)
- ◆ Imports and the use of non-RGGI-affected in state units may increase (Leakage)
 - *Load-side Caps are currently under study to control leakage*

RGGI

Auction and Carbon Market Issues

Draft – for discussion purposes only.

*The study conclusions and illustrations are intended for use only in a
Market Participant/Public Policy discussion,*

RGGI Allowance Market Concerns

- ◆ There is no available control technology
- ◆ 100% Auction is a First
 - *Auction failure results in allowances being given to EE/DR providers, no assured access for generators*
- ◆ Very limited and delayed access to Offsets
 - *limited to 3.3%, 5% @\$7/Ton, 10% @\$10Ton*
- ◆ Auction and Secondary markets must be properly designed to Monitor for and Mitigate against Market Power Abuses in BOTH the Carbon and Electricity Markets
- ◆ Must be coordinated with NYISO markets
- ◆ Coordination Across Ten States
 - *Which States will participate to what extent in which auctions?*
 - *What is the legal framework among the states?*
 - *What are the legal attributes of an Allowance?*

Draft – for discussion purposes only

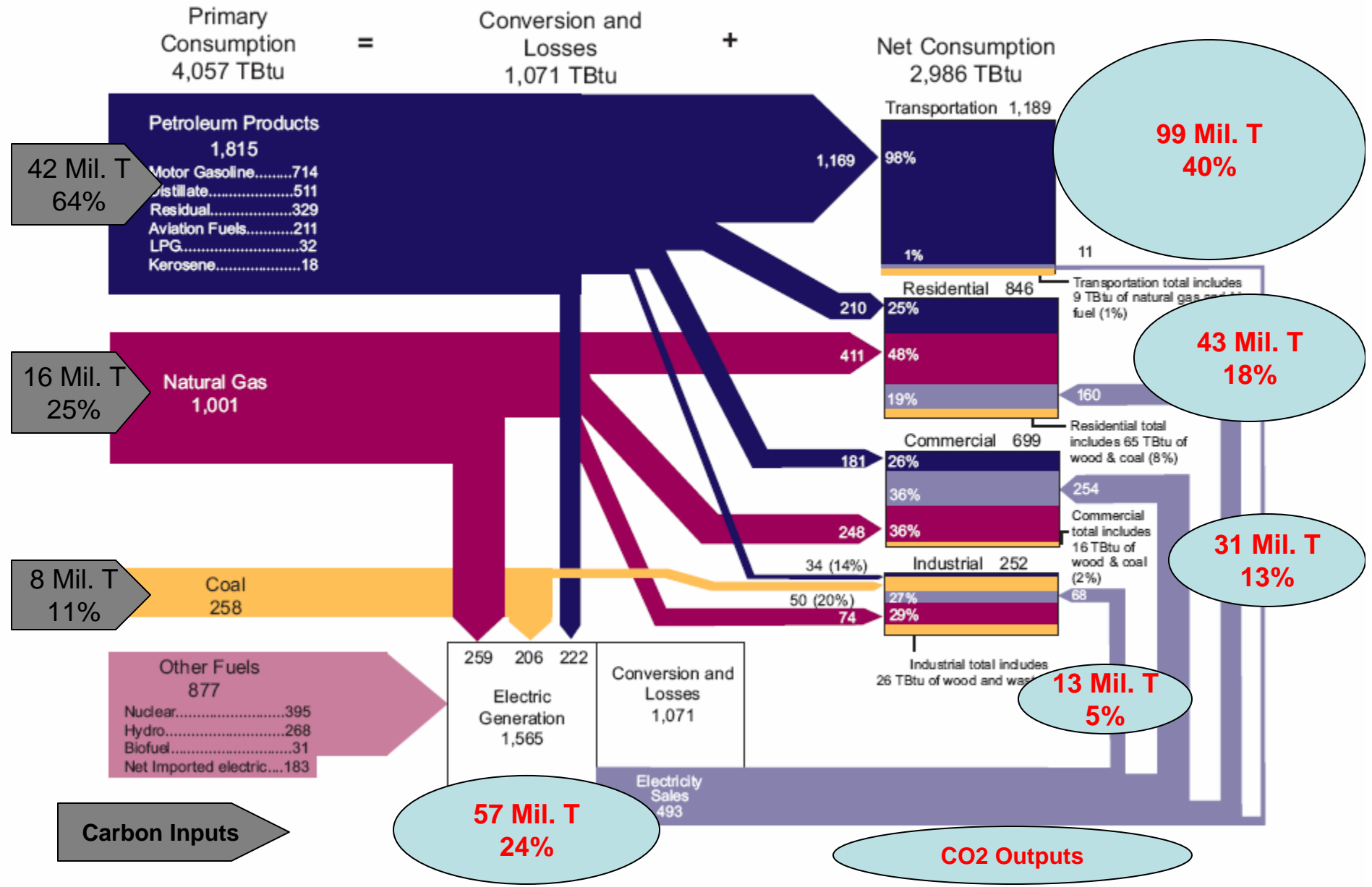
Recommended NYISO Action Plan for RGGI

- ◆ The NYISO should remain active in the rulemaking process
 - *Incorporate RGGI in the CRPP/RNA process*
 - *Provide Assessments of the Impact of the Proposals on NYISO's System.*
 - *Provide Assistance in Auction Design and Market Monitoring Processes*
 - *Coordinate (or Lead) ISO's Common Responses*
 - *Develop suitable "safety valves"*
 - *Support the NYS Implementation of GATS or GIS to Monitor Leakage*
 - *Work to assure the final RGGI Design is compatible with NYISO Markets and Schedules and is Attractive to New Generation Investment*

Appendix

Draft – for discussion purposes only

2004 NEW YORK STATE ENERGY FLOW (TBtu)



Carbon Sources

- ◆ Carbon in Fuel

- *Natural Gas* 120 #CO₂/mmBTU
- *LSRFO* 170 “
- *High Vol. Eastern Coal* 220 “
- *Western Coal* 260 “

- ◆ Carbon In Electricity

- *NGCC* = 1/2 Ton CO₂/MWHr
- *Oil Steam* = 3/4 “
- *Coal Steam* = 1 “

Draft – for discussion purposes only

Proposed RGGI Caps are Derived from Historical Emissions and Negotiations



State	CO ₂ Cap Million Tons
Connecticut	10.70
Maine	5.95
Massachusetts	26.66
New Hampshire	8.62
Rhode Island	2.66
Vermont	1.23
New York	64.31
New Jersey	22.89
Delaware	7.56
Maryland	37.52
Total (10 States)	188.1

Pennsylvania discussion purposes only

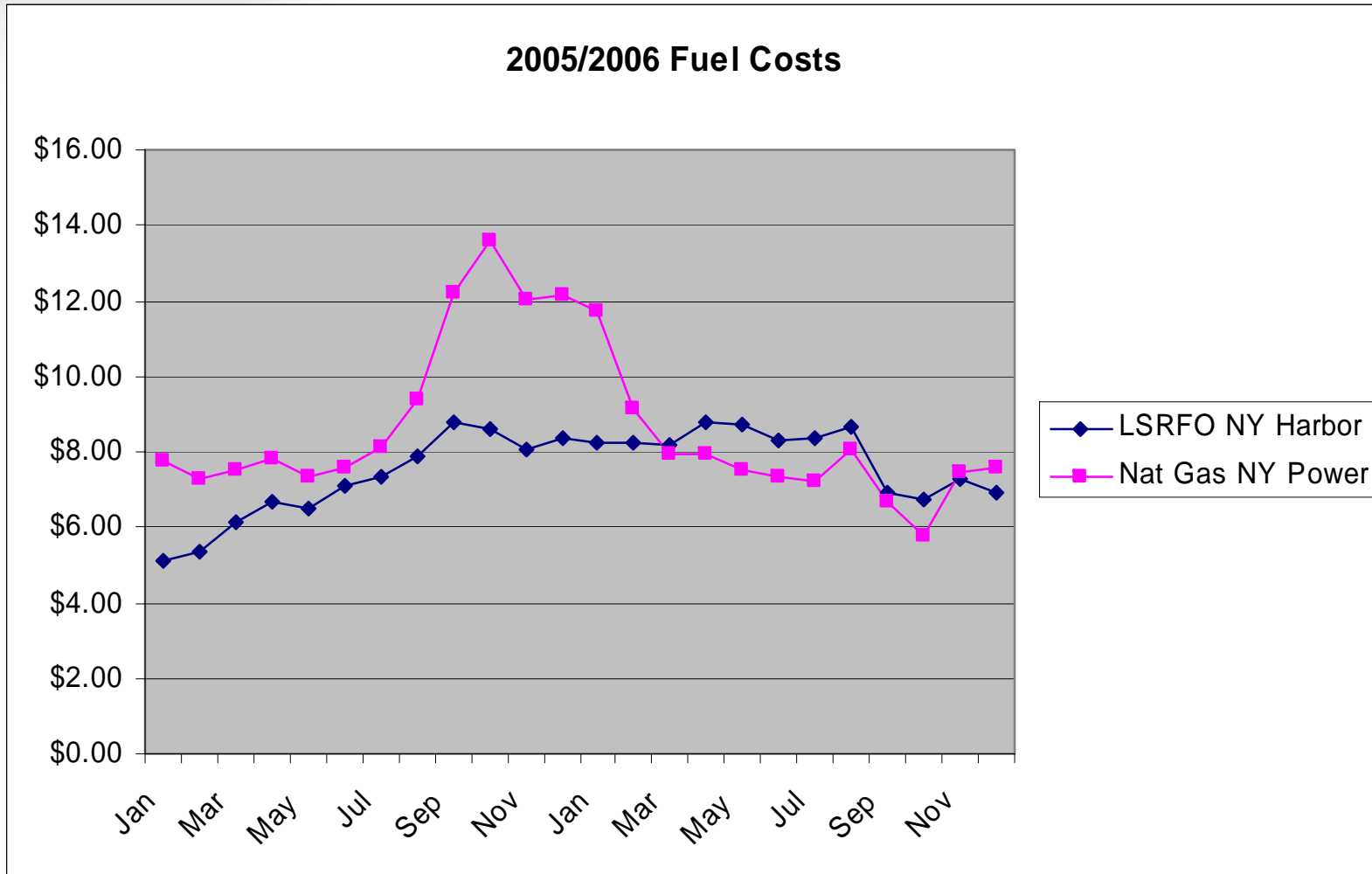
125.1

NY CO2 Emission Estimates and Forecasts Vary Widely

Data Source	2000	2001	2002	2003	2004	2005	2006
RGGI-eGRID	69.8	65.5	61.3	61.8	62.2		
NYISO-eGRID					61.2	64.1	57.0
RGGI-ICF							53
NYSERDA Trends					55		

Draft – for discussion purposes only

2005/2006 Volatile Fuel Prices



NYCA Generation is Very Sensitive to the Relative Prices of Oil and Gas

Primary Fuel	2005 MWH	Preliminary 2006 MWH	delta
Coal	21,052,572	21,012,268	-40,304
Nat Gas	35,181,671	41,305,974	6,124,303
FO 6	19,037,672	11,805,744	-7,231,928
Hydro	27,582,740	28,422,089	839,349
FO 2	598,017	242,102	-355,915
Kero	652,813	340,432	-312,381
Refuse	1,899,156	1,902,261	3,105
Wood	253,121	260,292	7,171
Wind	100,937	518,427	417,490
Biogas	242,995	325,609	82,614
Nuclear	42,431,568	42,223,256	-208,312
Total	149,033,262	148,358,454	-674,808
NG+FO6	54,219,343	53,111,718	-1,107,625
FO6+FO2+Kero	20,288,502	12,388,278	-7,900,224
Fossil	78,421,901	76,608,781	-1,813,120
RGGI Affected	75,140,234	71,329,021	-3,811,213
RGGI Affected % of All Fossil	95.8%	93.1%	-2.7%
RGGI Affected % of Total	50.4%	48.1%	-2.3%
Renewable	28,179,793	29,526,417	1,346,624

Draft – for discussion purposes only

Study Methodology

- ◆ Assume the lower CO₂ emitting natural gas fired unit sets the Market Clearing Price (MCP)
- ◆ Calculate MCP for various combinations of carbon allowance and natural gas prices
- ◆ Determine the break-even operating costs of the coal or oil fired unit
- ◆ Compare results to forward fuel prices
- ◆ Identify classes of units that lose all margins under combinations of probable fuel and CO₂ allowance prices

Draft – for discussion purposes only

Break-even Calculations

- ◆ $MCP \text{ \$/MWH} = (\text{Gas Price \$/DTH}) * (\text{Heat Rate Gas} * 1000) + (\text{CO2 Emission Rate Gas T/MWH}) * (\text{Allowance Price \$/Ton})$
- ◆ $\text{CO2 Emission Rate T/MWH} = (\text{CO2\#/mmBTU} * \text{Heat Rate} * 1000) / 2000$
 - *Gas 120 #CO2/mmBTU*
 - *Oil 170 #CO2/mmBTU*
 - *Coal 220 #CO2/mmBTU*
- ◆ Solve for Higher Carbon Fuel Price at various combinations of CO2 Allowance Costs and Fuel Costs

Breakeven Analysis Results

Coal Heat Rate 9500 vs Nat Gas CC Heat Rate 7500				Coal Heat Rate 12250 vs Nat Gas CC Heat Rate 7500				Coal Heat Rate 9500 vs Nat Gas CC Heat Rate 6500			
Gas Price \$/DTH	Carbon Allowance Price \$/T	Market Price \$/MWH	Breakeven Equivalent Coal Price \$/mmBTU	Gas Price \$/DTH	Carbon Allowance Price \$/T	Market Price \$/MWH	Breakeven Equivalent Coal Price \$/mmBTU	Gas Price \$/DTH	Carbon Allowance Price \$/T	Market Price \$/MWH	Breakeven Equivalent Coal Price \$/mmBTU
\$4.00	\$0.00	\$30.00	\$3.16	\$4.00	\$0.00	\$30.00	\$2.45	\$4.00	\$0.00	\$26.00	\$2.74
\$4.00	\$1.00	\$30.44	\$3.10	\$4.00	\$1.00	\$30.44	\$2.38	\$4.00	\$1.00	\$26.35	\$2.67
\$4.00	\$5.00	\$32.20	\$2.89	\$4.00	\$5.00	\$32.20	\$2.12	\$4.00	\$5.00	\$27.75	\$2.42
\$4.00	\$10.00	\$34.40	\$2.62	\$4.00	\$10.00	\$34.40	\$1.79	\$4.00	\$10.00	\$29.50	\$2.11
\$4.00	\$20.00	\$38.80	\$2.08	\$4.00	\$20.00	\$38.80	\$1.13	\$4.00	\$20.00	\$33.00	\$1.47
\$4.00	\$30.00	\$43.20	\$1.55	\$4.00	\$30.00	\$43.20	\$0.47	\$4.00	\$30.00	\$36.50	\$0.84
\$5.00	\$0.00	\$37.50	\$3.95	\$5.00	\$0.00	\$37.50	\$3.06	\$5.00	\$0.00	\$32.50	\$3.42
\$5.00	\$1.00	\$37.94	\$3.89	\$5.00	\$1.00	\$37.94	\$3.00	\$5.00	\$1.00	\$32.85	\$3.36
\$5.00	\$5.00	\$39.70	\$3.68	\$5.00	\$5.00	\$39.70	\$2.73	\$5.00	\$5.00	\$34.25	\$3.11
\$5.00	\$10.00	\$41.90	\$3.41	\$5.00	\$10.00	\$41.90	\$2.40	\$5.00	\$10.00	\$36.00	\$2.79
\$5.00	\$20.00	\$46.30	\$2.87	\$5.00	\$20.00	\$46.30	\$1.74	\$5.00	\$20.00	\$39.50	\$2.16
\$5.00	\$30.00	\$50.70	\$2.34	\$5.00	\$30.00	\$50.70	\$1.08	\$5.00	\$30.00	\$43.00	\$1.53
\$6.00	\$0.00	\$45.00	\$4.74	\$6.00	\$0.00	\$45.00	\$3.67	\$6.00	\$0.00	\$39.00	\$4.11
\$6.00	\$1.00	\$45.44	\$4.68	\$6.00	\$1.00	\$45.44	\$3.61	\$6.00	\$1.00	\$39.35	\$4.04
\$6.00	\$5.00	\$47.20	\$4.47	\$6.00	\$5.00	\$47.20	\$3.34	\$6.00	\$5.00	\$40.75	\$3.79
\$6.00	\$10.00	\$49.40	\$4.20	\$6.00	\$10.00	\$49.40	\$3.01	\$6.00	\$10.00	\$42.50	\$3.47
\$6.00	\$20.00	\$53.80	\$3.66	\$6.00	\$20.00	\$53.80	\$2.35	\$6.00	\$20.00	\$46.00	\$2.84
\$6.00	\$30.00	\$58.20	\$3.13	\$6.00	\$30.00	\$58.20	\$1.69	\$6.00	\$30.00	\$49.50	\$2.21
\$7.00	\$0.00	\$52.50	\$5.53	\$7.00	\$0.00	\$52.50	\$4.29	\$7.00	\$0.00	\$45.50	\$4.79
\$7.00	\$1.00	\$52.94	\$5.47	\$7.00	\$1.00	\$52.94	\$4.22	\$7.00	\$1.00	\$45.85	\$4.73
\$7.00	\$5.00	\$54.70	\$5.26	\$7.00	\$5.00	\$54.70	\$3.96	\$7.00	\$5.00	\$47.25	\$4.47
\$7.00	\$10.00	\$56.90	\$4.99	\$7.00	\$10.00	\$56.90	\$3.62	\$7.00	\$10.00	\$49.00	\$4.16
\$7.00	\$20.00	\$61.30	\$4.45	\$7.00	\$20.00	\$61.30	\$2.96	\$7.00	\$20.00	\$52.50	\$3.53
\$7.00	\$30.00	\$65.70	\$3.92	\$7.00	\$30.00	\$65.70	\$2.30	\$7.00	\$30.00	\$56.00	\$2.89
\$8.00	\$0.00	\$60.00	\$6.32	\$8.00	\$0.00	\$60.00	\$4.90	\$8.00	\$0.00	\$52.00	\$5.47
\$8.00	\$1.00	\$60.44	\$6.26	\$8.00	\$1.00	\$60.44	\$4.83	\$8.00	\$1.00	\$52.35	\$5.41
\$8.00	\$5.00	\$62.20	\$6.05	\$8.00	\$5.00	\$62.20	\$4.57	\$8.00	\$5.00	\$53.75	\$5.16
\$8.00	\$10.00	\$64.40	\$5.78	\$8.00	\$10.00	\$64.40	\$4.24	\$8.00	\$10.00	\$55.50	\$4.84
\$8.00	\$20.00	\$68.80	\$5.24	\$8.00	\$20.00	\$68.80	\$3.58	\$8.00	\$20.00	\$59.00	\$4.21
\$8.00	\$30.00	\$73.20	\$4.71	\$8.00	\$30.00	\$73.20	\$2.91	\$8.00	\$30.00	\$62.50	\$3.58
\$9.00	\$0.00	\$67.50	\$7.11	\$9.00	\$0.00	\$67.50	\$5.51	\$9.00	\$0.00	\$58.50	\$6.16
\$9.00	\$1.00	\$67.94	\$7.05	\$9.00	\$1.00	\$67.94	\$5.44	\$9.00	\$1.00	\$58.85	\$6.09
\$9.00	\$5.00	\$69.70	\$6.84	\$9.00	\$5.00	\$69.70	\$5.18	\$9.00	\$5.00	\$60.25	\$5.84
\$9.00	\$10.00	\$71.90	\$6.57	\$9.00	\$10.00	\$71.90	\$4.85	\$9.00	\$10.00	\$62.00	\$5.53
\$9.00	\$20.00	\$76.30	\$6.03	\$9.00	\$20.00	\$76.30	\$4.19	\$9.00	\$20.00	\$65.50	\$4.89
\$9.00	\$30.00	\$80.70	\$5.49	\$9.00	\$30.00	\$80.70	\$3.53	\$9.00	\$30.00	\$69.00	\$4.26
\$10.00	\$0.00	\$75.00	\$7.89	\$10.00	\$0.00	\$75.00	\$6.12	\$10.00	\$0.00	\$65.00	\$6.84
\$10.00	\$1.00	\$75.44	\$7.84	\$10.00	\$1.00	\$75.44	\$6.06	\$10.00	\$1.00	\$65.35	\$6.78
\$10.00	\$5.00	\$77.20	\$7.63	\$10.00	\$5.00	\$77.20	\$5.79	\$10.00	\$5.00	\$66.75	\$6.53
\$10.00	\$10.00	\$79.40	\$7.36	\$10.00	\$10.00	\$79.40	\$5.46	\$10.00	\$10.00	\$68.50	\$6.21
\$10.00	\$20.00	\$83.80	\$6.82	\$10.00	\$20.00	\$83.80	\$4.80	\$10.00	\$20.00	\$72.00	\$5.58
\$10.00	\$30.00	\$88.20	\$6.28	\$10.00	\$30.00	\$88.20	\$4.14	\$10.00	\$30.00	\$75.50	\$4.95

Draft – for discussion purposes only

Breakeven Analysis Results cont.

Coal Heat Rate 10500 vs Nat Gas CC Heat Rate 7500				Oil Heat Rate 12600 vs Nat Gas GT Heat Rate 10500				Oil Heat Rate 11700 vs Nat Gas GT Heat Rate 10500			
Gas Price \$/DTH	Carbon Allowanc e Price \$/T	Market Price \$/MWH	Breakeven Equivalent Coal Price \$/mmBTU	Gas Price \$/DTH	Carbon Allowanc e Price \$/T	Breakeven Equivalent Oil Price \$/mmBTU	Breakeven Equivalent Oil Price \$/gal	Gas Price \$/DTH	Carbon Allowanc e Price \$/T	Breakeven Equivalent Oil Price \$/mmBTU	Breakeven Equivalent Oil Price \$/gal
\$4.00	\$0.00	\$30.00	\$2.86	\$4.00	\$0.00	\$3.33	\$0.46	\$4.00	\$0.00	\$3.59	\$0.50
\$4.00	\$1.00	\$30.44	\$2.80	\$4.00	\$1.00	\$3.30	\$0.46	\$4.00	\$1.00	\$3.56	\$0.49
\$4.00	\$5.00	\$32.20	\$2.55	\$4.00	\$5.00	\$3.16	\$0.44	\$4.00	\$5.00	\$3.44	\$0.48
\$4.00	\$10.00	\$34.40	\$2.24	\$4.00	\$10.00	\$2.98	\$0.41	\$4.00	\$10.00	\$3.30	\$0.46
\$4.00	\$20.00	\$38.80	\$1.62	\$4.00	\$20.00	\$2.63	\$0.36	\$4.00	\$20.00	\$3.01	\$0.42
\$4.00	\$30.00	\$43.20	\$1.00	\$4.00	\$30.00	\$2.29	\$0.32	\$4.00	\$30.00	\$2.72	\$0.38
\$5.00	\$0.00	\$37.50	\$3.57	\$5.00	\$0.00	\$4.17	\$0.58	\$5.00	\$0.00	\$4.49	\$0.62
\$5.00	\$1.00	\$37.94	\$3.51	\$5.00	\$1.00	\$4.13	\$0.57	\$5.00	\$1.00	\$4.46	\$0.62
\$5.00	\$5.00	\$39.70	\$3.26	\$5.00	\$5.00	\$3.99	\$0.55	\$5.00	\$5.00	\$4.34	\$0.60
\$5.00	\$10.00	\$41.90	\$2.95	\$5.00	\$10.00	\$3.82	\$0.53	\$5.00	\$10.00	\$4.20	\$0.58
\$5.00	\$20.00	\$46.30	\$2.33	\$5.00	\$20.00	\$3.47	\$0.48	\$5.00	\$20.00	\$3.91	\$0.54
\$5.00	\$30.00	\$50.70	\$1.71	\$5.00	\$30.00	\$3.12	\$0.43	\$5.00	\$30.00	\$3.62	\$0.50
\$6.00	\$0.00	\$45.00	\$4.29	\$6.00	\$0.00	\$5.00	\$0.69	\$6.00	\$0.00	\$5.38	\$0.74
\$6.00	\$1.00	\$45.44	\$4.22	\$6.00	\$1.00	\$4.97	\$0.69	\$6.00	\$1.00	\$5.36	\$0.74
\$6.00	\$5.00	\$47.20	\$3.98	\$6.00	\$5.00	\$4.83	\$0.67	\$6.00	\$5.00	\$5.24	\$0.72
\$6.00	\$10.00	\$49.40	\$3.67	\$6.00	\$10.00	\$4.65	\$0.64	\$6.00	\$10.00	\$5.09	\$0.70
\$6.00	\$20.00	\$53.80	\$3.05	\$6.00	\$20.00	\$4.30	\$0.59	\$6.00	\$20.00	\$4.80	\$0.66
\$6.00	\$30.00	\$58.20	\$2.43	\$6.00	\$30.00	\$3.95	\$0.55	\$6.00	\$30.00	\$4.51	\$0.62
\$7.00	\$0.00	\$52.50	\$5.00	\$7.00	\$0.00	\$5.83	\$0.81	\$7.00	\$0.00	\$6.28	\$0.87
\$7.00	\$1.00	\$52.94	\$4.94	\$7.00	\$1.00	\$5.80	\$0.80	\$7.00	\$1.00	\$6.25	\$0.86
\$7.00	\$5.00	\$54.70	\$4.69	\$7.00	\$5.00	\$5.66	\$0.78	\$7.00	\$5.00	\$6.14	\$0.85
\$7.00	\$10.00	\$56.90	\$4.38	\$7.00	\$10.00	\$5.48	\$0.76	\$7.00	\$10.00	\$5.99	\$0.83
\$7.00	\$20.00	\$61.30	\$3.76	\$7.00	\$20.00	\$5.13	\$0.71	\$7.00	\$20.00	\$5.70	\$0.79
\$7.00	\$30.00	\$65.70	\$3.14	\$7.00	\$30.00	\$4.79	\$0.66	\$7.00	\$30.00	\$5.41	\$0.75
\$8.00	\$0.00	\$60.00	\$5.71	\$8.00	\$0.00	\$6.67	\$0.92	\$8.00	\$0.00	\$7.18	\$0.99
\$8.00	\$1.00	\$60.44	\$5.65	\$8.00	\$1.00	\$6.63	\$0.92	\$8.00	\$1.00	\$7.15	\$0.99
\$8.00	\$5.00	\$62.20	\$5.40	\$8.00	\$5.00	\$6.49	\$0.90	\$8.00	\$5.00	\$7.03	\$0.97
\$8.00	\$10.00	\$64.40	\$5.10	\$8.00	\$10.00	\$6.32	\$0.87	\$8.00	\$10.00	\$6.89	\$0.95
\$8.00	\$20.00	\$68.80	\$4.48	\$8.00	\$20.00	\$5.97	\$0.82	\$8.00	\$20.00	\$6.60	\$0.91
\$8.00	\$30.00	\$73.20	\$3.86	\$8.00	\$30.00	\$5.62	\$0.78	\$8.00	\$30.00	\$6.31	\$0.87
\$9.00	\$0.00	\$67.50	\$6.43	\$9.00	\$0.00	\$7.50	\$1.04	\$9.00	\$0.00	\$8.08	\$1.11
\$9.00	\$1.00	\$67.94	\$6.37	\$9.00	\$1.00	\$7.47	\$1.03	\$9.00	\$1.00	\$8.05	\$1.11
\$9.00	\$5.00	\$69.70	\$6.12	\$9.00	\$5.00	\$7.33	\$1.01	\$9.00	\$5.00	\$7.93	\$1.09
\$9.00	\$10.00	\$71.90	\$5.81	\$9.00	\$10.00	\$7.15	\$0.99	\$9.00	\$10.00	\$7.79	\$1.07
\$9.00	\$20.00	\$76.30	\$5.19	\$9.00	\$20.00	\$6.80	\$0.94	\$9.00	\$20.00	\$7.50	\$1.03
\$9.00	\$30.00	\$80.70	\$4.57	\$9.00	\$30.00	\$6.45	\$0.89	\$9.00	\$30.00	\$7.21	\$0.99
\$10.00	\$0.00	\$75.00	\$7.14	\$10.00	\$0.00	\$8.33	\$1.15	\$10.00	\$0.00	\$8.97	\$1.24
\$10.00	\$1.00	\$75.44	\$7.08	\$10.00	\$1.00	\$8.30	\$1.15	\$10.00	\$1.00	\$8.95	\$1.23
\$10.00	\$5.00	\$77.20	\$6.83	\$10.00	\$5.00	\$8.16	\$1.13	\$10.00	\$5.00	\$8.83	\$1.22
\$10.00	\$10.00	\$79.40	\$6.52	\$10.00	\$10.00	\$7.98	\$1.10	\$10.00	\$10.00	\$8.68	\$1.20
\$10.00	\$20.00	\$83.80	\$5.90	\$10.00	\$20.00	\$7.63	\$1.05	\$10.00	\$20.00	\$8.39	\$1.16
\$10.00	\$30.00	\$88.20	\$5.29	\$10.00	\$30.00	\$7.29	\$1.01	\$10.00	\$30.00	\$8.10	\$1.12

Draft – for discussion purposes only

NY RFO and NG Prices

New York Harbor Residual Fuel Oil 1.0 % Sulfur LP Spot Price CIF (Cents per Gallon)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	38.25	35.58	46.07	32.89	55.26	34.16	33.73	60.54	61.66	62.81	57.23	63.74
2003	75.3	83.1	75.6	56.99	58.32	59.59	65.4	65.75	59.88	61.8	62.06	61.59
2004	66.98	62.93	58.86	61.01	71.85	70.65	66.69	66.59	66.2	78.49	68.49	60.28
2005	70.87	73.99	84.61	92.59	89.9	97.68	101.02	108.63	121.48	119.12	110.91	115.09
2006	113.69	114.21	113.16	121.57	120.43	115.02	115.77	119.7	95.11	93.11	100.9	95.6
2007	88.2	95.54	101.49	112.24	124.33							

New York Harbor Residual Fuel Oil 1.0 % Sulfur LP Spot Price CIF \$/mmBTU												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	\$2.77	\$2.58	\$3.34	\$3.83	\$4.00	\$3.92	\$3.89	\$4.38	\$4.47	\$4.55	\$4.14	\$4.62
2003	\$5.45	\$6.02	\$5.47	\$4.13	\$4.22	\$4.32	\$4.74	\$4.76	\$4.34	\$4.48	\$4.49	\$4.46
2004	\$4.85	\$4.56	\$4.26	\$4.42	\$5.20	\$5.12	\$4.83	\$4.82	\$4.79	\$5.68	\$4.96	\$4.37
2005	\$5.13	\$5.36	\$6.13	\$6.70	\$6.51	\$7.07	\$7.32	\$7.87	\$8.80	\$8.63	\$8.03	\$8.33
2006	\$8.23	\$8.27	\$8.19	\$8.80	\$8.72	\$8.33	\$8.38	\$8.67	\$6.89	\$6.74	\$7.31	\$6.92
2007												

New York Natural Gas Price Sold to Electric Power Generators (Dollars per Thousand Cubic Feet)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	\$3.42	\$3.13	\$3.55	\$4.16	\$4.14	\$4.02	\$3.92	\$3.87	\$4.18	\$4.69	\$4.94	\$5.21
2003	\$6.29	\$7.26	\$8.71	\$6.18	\$6.11	\$6.77	\$5.89	\$5.67	\$5.54	\$5.40	\$5.41	\$6.11
2004	\$7.16	\$6.55	\$6.06	\$6.18	\$6.77	\$6.87	\$6.60	\$6.27	\$5.72	\$6.72	\$7.46	\$7.88
2005	\$7.75	\$7.27	\$7.54	\$7.83	\$7.31	\$7.58	\$8.11	\$9.36	\$12.19	\$13.58	\$12.06	\$12.17
2006	\$11.71	\$9.15	\$7.95	\$7.93	\$7.52	\$7.34	\$7.19	\$8.06	\$6.66	\$5.75	\$7.48	\$7.56
2007												

Ratio RFO/Nat Gas Power Prices NY State												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	0.81	0.82	0.94	0.92	0.97	0.98	0.99	1.13	1.07	0.97	0.84	0.89
2003	0.87	0.83	0.63	0.67	0.69	0.64	0.80	0.84	0.78	0.83	0.83	0.73
2004	0.68	0.70	0.70	0.71	0.77	0.74	0.73	0.77	0.84	0.85	0.66	0.55
2005	0.66	0.74	0.81	0.86	0.89	0.93	0.90	0.84	0.72	0.64	0.67	0.68
2006	0.70	0.90	1.03	1.11	1.16	1.13	1.17	1.08	1.03	1.17	0.98	0.92
2007												

U.S. Natural Gas Wellhead Price (Dollars per Thousand Cubic Feet)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	\$2.50	\$2.19	\$2.40	\$2.94	\$2.94	\$2.96	\$2.92	\$2.76	\$2.97	\$3.24	\$3.59	\$3.96
2003	\$4.43	\$5.05	\$6.96	\$4.47	\$4.77	\$5.41	\$5.08	\$4.46	\$4.59	\$4.32	\$4.26	\$4.76
2004	\$5.21	\$5.02	\$5.12	\$5.03	\$5.40	\$5.82	\$5.62	\$5.52	\$5.06	\$5.43	\$6.21	\$6.01
2005	\$5.80	\$5.74	\$5.95	\$6.58	\$6.24	\$6.09	\$6.71	\$6.48	\$8.96	\$10.35	\$9.91	\$9.08
2006	\$8.66	\$7.28	\$6.52	\$6.59	\$6.19	\$5.80	\$5.82	\$6.51	\$5.51	\$5.03	\$6.43	\$6.65
2007												

Nat Gas Delivery Basis NY State \$/MCF												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	\$0.92	\$0.94	\$1.15	\$1.22	\$1.20	\$1.06	\$1.00	\$1.11	\$1.21	\$1.45	\$1.35	\$1.25
2003	\$1.86	\$2.21	\$1.75	\$1.71	\$1.34	\$1.36	\$0.81	\$1.21	\$0.95	\$1.08	\$1.15	\$1.35
2004	\$1.95	\$1.53	\$0.94	\$1.15	\$1.37	\$1.05	\$0.98	\$0.75	\$0.66	\$1.29	\$1.25	\$1.87
2005	\$1.95	\$1.53	\$1.59	\$1.25	\$1.07	\$1.49	\$1.40	\$2.88	\$3.23	\$3.23	\$2.15	\$3.09
2006	\$3.05	\$1.87	\$1.43	\$1.34	\$1.33	\$1.54	\$1.37	\$1.55	\$1.15	\$0.72	\$1.05	\$0.91
2007												

Nat Gas Delivery Basis Ratio												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	0.37	0.43	0.48	0.41	0.41	0.38	0.34	0.40	0.41	0.45	0.38	0.32
2003	0.42	0.44	0.25	0.38	0.28	0.25	0.16	0.27	0.21	0.25	0.27	0.28
2004	0.37	0.30	0.18	0.23	0.25	0.18	0.17	0.14	0.13	0.24	0.20	0.31
2005	0.34	0.27	0.27	0.19	0.17	0.24	0.21	0.44	0.36	0.31	0.22	0.34
2006	0.35	0.26	0.22	0.20	0.21	0.27	0.24	0.24	0.21	0.14	0.16	0.14
ave	0.37	0.34	0.28	0.28	0.27	0.26	0.22	0.30	0.26	0.31	0.27	0.31
2007												

Cushing, OK WTI Spot Price FOB (Dollars per Barrel)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	\$29.95	\$35.83	\$35.51	\$28.17	\$28.11	\$30.66	\$30.75	\$31.57	\$28.31	\$30.34	\$31.11	\$32.13
2003	\$4.31	\$4.68	\$6.74	\$6.75	\$40.28	\$8.03	\$40.78	\$4.9	\$5.94	\$3.28	\$8.47	\$3.15
2004	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15	\$15.15
2005	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63	\$18.63
2006	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51
2007	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51	\$4.51

Draft - for discussion purposes only

Coal Costs

Estimated Cost of Coal As Burned				
Contract	\$/ton on the warf	Freight \$/T	SOx NOx ROx \$/Ton Coal	As Burned \$/mmBTU
May 2007 (E)	\$38.80	\$12.00	\$13.00	\$2.66
Jun 2007 (E)	\$38.80	\$12.00	\$13.00	\$2.66
Jul 2007 (E)	\$39.60	\$12.00	\$13.00	\$2.69
Aug 2007 (E)	\$39.60	\$12.00	\$13.00	\$2.69
Sep 2007 (E)	\$39.60	\$12.00	\$13.00	\$2.69
Oct 2007 (E)	\$40.50	\$12.00	\$13.00	\$2.73
Nov 2007 (E)	\$40.50	\$12.00	\$13.00	\$2.73
Dec 2007 (E)	\$40.50	\$12.00	\$13.00	\$2.73
Jan 2008 (E)	\$42.30	\$12.50	\$13.50	\$2.85
Feb 2008 (E)	\$42.30	\$12.50	\$13.50	\$2.85
Mar 2008 (E)	\$42.30	\$12.50	\$13.50	\$2.85
Apr 2008 (E)	\$43.30	\$12.50	\$13.50	\$2.89
May 2008 (E)	\$43.30	\$12.50	\$13.50	\$2.89
Jun 2008 (E)	\$43.30	\$12.50	\$13.50	\$2.89
Jul 2008 (E)	\$44.30	\$12.50	\$13.50	\$2.93
Aug 2008 (E)	\$44.30	\$12.50	\$13.50	\$2.93
Sep 2008 (E)	\$44.30	\$12.50	\$13.50	\$2.93
Oct 2008 (E)	\$45.20	\$12.50	\$13.50	\$2.97
Nov 2008 (E)	\$45.20	\$12.50	\$13.50	\$2.97
Dec 2008 (E)	\$45.20	\$12.50	\$13.50	\$2.97
Jan 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Feb 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Mar 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Apr 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
May 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Jun 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Jul 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Aug 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Sep 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Oct 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Nov 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03
Dec 2009 (E)	\$45.80	\$13.00	\$14.00	\$3.03

Data for discussion purposes only

Cost to Burn Coal

Coal Quality Assumptions NYMEX Central App							
12.500 BTU/#							
13.5% Ash							
1%Sulfur							
Sulfur and Nitrogen Costs from evolution Markets, Inc.							
SO2	\$550/T						
NOx	\$900/T						
NOx Producti 0.6#NOx/mmBTU							
NOx Emission Rate 0.15#NOx/mmBTU							
SO2 Removal Rate 95%							
NOx C	\$4.95/Ton of coal						
SO2 C	\$5.50/Ton of coal						
Ash C	\$2.55/Ton of coal						
Cost	\$13.00/Ton of coal						

Draft – for discussion purposes only

Oil Costs

		NYMEX Crude Feb 28, 2007					
		\$/BBL	\$/mmBTU	RFO/Crude Ratio	NY RFO	NY Nat Gas	Ratio RFO/Nat
CL.F09	Jan-09	67.63	\$12.08	0.65	\$7.79	\$12.47	0.62
CL.G09	Feb-09	67.62	\$12.08	0.60	\$7.22	\$12.16	0.59
CL.H09	Mar-09	67.6	\$12.07	0.59	\$7.18	\$11.38	0.63
CL.J09	Apr-09	67.58	\$12.07	0.60	\$7.23	\$9.48	0.76
CL.K09	May-09	67.56	\$12.06	0.62	\$7.49	\$9.21	0.81
CL.M09	Jun-09	67.55	\$12.06	0.60	\$7.29	\$9.25	0.79
CL.N09	Jul-09	67.54	\$12.06	0.59	\$7.14	\$9.08	0.79
CL.Q09	Aug-09	67.53	\$12.06	0.60	\$7.21	\$9.70	0.74
CL.U09	Sep-09	67.52	\$12.06	0.65	\$7.82	\$9.49	0.82
CL.V09	Oct-09	67.51	\$12.06	0.66	\$7.96	\$10.00	0.80
CL.X09	Nov-09	67.49	\$12.05	0.63	\$7.54	\$10.19	0.74
CL.Z09	Dec-09	67.6	\$12.07	0.64	\$7.69	\$11.10	0.69

Draft - for discussion purposes only

Gas Cost

Henry Hub NYMEX Feb 28 2007			Basis to Meter %	Basis to Meter \$/DTH	Burner Tip \$/DTH
NG.F09	Jan-09	\$9.10	37%	\$3.37	\$12.47
NG.G09	Feb-09	\$9.08	34%	\$3.08	\$12.16
NG.H09	Mar-09	\$8.89	28%	\$2.49	\$11.38
NG.J09	Apr-09	\$7.38	28%	\$2.10	\$9.48
NG.K09	May-09	\$7.27	27%	\$1.93	\$9.21
NG.M09	Jun-09	\$7.34	26%	\$1.91	\$9.25
NG.N09	Jul-09	\$7.42	22%	\$1.66	\$9.08
NG.Q09	Aug-09	\$7.47	30%	\$2.23	\$9.70
NG.U09	Sep-09	\$7.52	26%	\$1.98	\$9.49
NG.V09	Oct-09	\$7.62	31%	\$2.38	\$10.00
NG.X09	Nov-09	\$8.05	27%	\$2.14	\$10.19
NG.Z09	Dec-09	\$8.46	31%	\$2.64	\$11.10

Draft – for discussion purposes only