



**Northeast
Utilities System**

ORIGINAL	
N.H.P.U.C. Case No.	DE 11-230
Exhibit No.	#1/2
Witness	Thomas C. Franz
DO NOT REMOVE FROM FILE	



Public Service Company of New Hampshire

Clean Air Project

Capital Project Review and Approval

Northeast Utilities

Board of Trustees

Gary Long/Cameron Bready

July 15, 2008



Executive Summary

- **New Hampshire legislation mandates compliance to mercury emissions standards set forth in the NH Mercury Reduction Act**
 - Wet scrubber technology will reduce power plant mercury emissions required by New Hampshire law and is the technology specified by the law
 - There is no other technology which will guarantee capture of 80% of the mercury input of our coal fleet

- **Cost estimates have been defined by a competitive bidding process**
 - Prices have escalated from original estimates made in 2006 due to much higher raw material pricing and higher costs of engineering service

- **Bid proposals indicate that an in-service date of mid-2012 is achievable**
 - Earlier in-service date reduces cost (AFUDC), risk, and allows PSNH to take advantage of incentives built into the New Hampshire legislation for “early reductions” of mercury

- **Despite the capital cost increases, Merrimack Station remains economic for customers under expected conditions and provides a significant investment opportunity for PSNH**
 - The NPV of Revenue Requirements of adding the Scrubber versus replacing Merrimack Station energy and capacity supply with market purchases is a benefit to customers of \$132 Million
 - The scrubber avoids about \$15 Million in sulfur credit purchases annually, included in the customer benefit above
 - Incremental Net Income estimated at \$18.5 M in 2013 – first full year of operation

Background – Merrimack Station Benefits PSNH's Customers



- Merrimack Station produces 3 million MWh of low cost power annually, about 35% of PSNH's total energy service requirement. The low cost energy produced at Merrimack Station off-sets the higher cost of market purchases in the overall energy service rate
- Operating Merrimack Station in a cost-effective manner has been one of the major reasons why PSNH's energy service rate is the lowest in the region, as much as 25% lower than the average of energy service supply that we track in NE
- Merrimack Station has control technology to satisfy NOx and particulate emissions requirements. With a scrubber, SO₂ and Mercury emissions will be controlled and Merrimack will be among the cleanest coal burning plants nationally
- Coal is the most abundant domestic fossil fuel resource in the United States supplying more than 50% of the nation's power generation fleet, but only 15% of New England's generation. Maintaining the use of this secure fuel resource is important for the diversity of the region's future energy supply
- Historically, coal has maintained a price advantage over oil or natural gas as fuel for the power generation sector. Operated as Regulated Generation, this cost savings flows directly to customers

Continued operation of Merrimack Station with a scrubber will maintain fuel diversity and security of domestic fuel supply in the ISO-NE region, while providing PSNH's customers with low cost energy.

Financial Assessment – Summary Metrics

Total Installed Capital Costs	\$457M
Capital Cost \$ / kW	\$1,000¹
NPV of Base Case Customer Benefit	\$132M
2013 Net Income Contribution	\$18.5M
2013 EPS Contribution (Diluted)	\$.04/share
Busbar Cost (2013)	\$94.55/MWh

Key assumptions :

- Project in-service on June 30, 2012
- 9.81% ROE on 47.23% equity component of capital structure
- Base case natural gas price of \$11/mmbtu, coal of \$4.82/mmbtu and carbon of \$7/ton

Note:

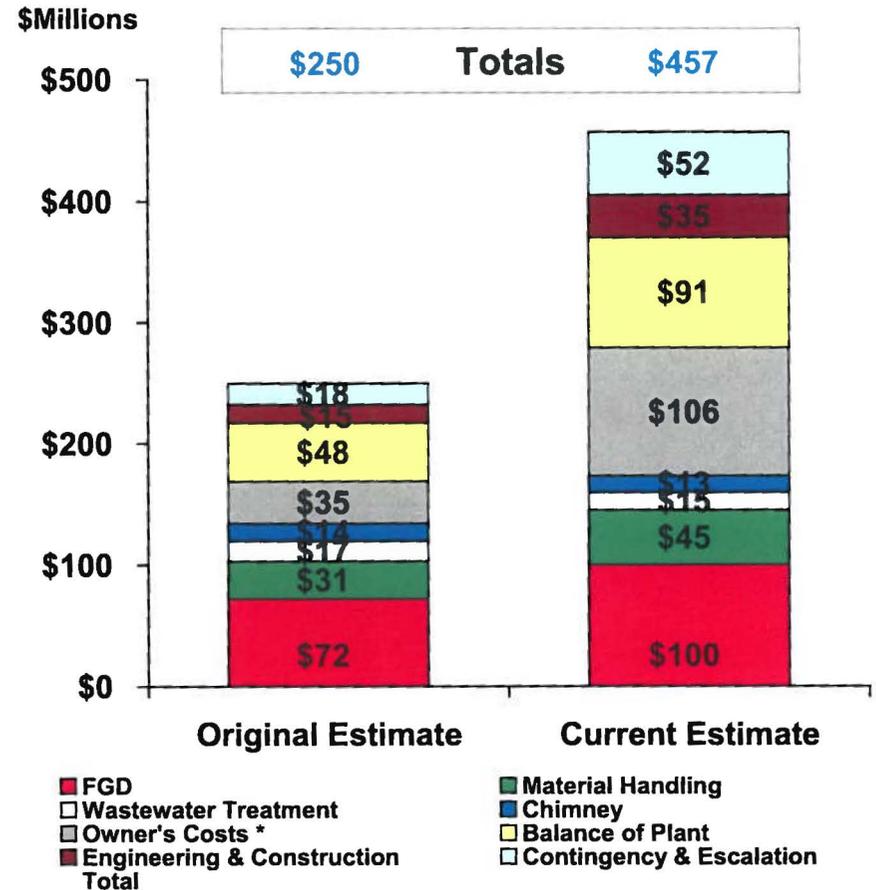
1. For reference, capital costs for a new CCGT would be approximately \$1,600 - \$1,700/kw. A new peaker would be approximately \$950 – 1,000/kw.



Estimate of Project Costs

Major Island Contracts (Firm-Price Bids)	
FGD System	\$100M
Material Handling	\$45M
Waste-water Treatment	\$15M
Chimney	\$13M
PSNH Project Costs	\$44M
Other Program Manager Costs	
Balance of Plant and Interconnection	\$91M
Engineering and Construction	\$35M
Contingency and Escalation	\$52M
AFUDC	\$57M
Total Direct Costs	\$452M
NU Indirect Costs \$5M	
Project Total	\$457M

Project Costs by Component



* Includes PSNH Project Costs, Indirect Costs, and AFUDC

Financial Assessment - Overview

- Customer benefit/cost of scrubber installation is dependent upon customer alternatives for securing the energy and capacity provided by Merrimack
 - Analysis assumes that customers will procure energy and capacity from the market if Merrimack is not operational
 - Market price for energy will likely continue to be set by natural gas units for the foreseeable future
 - Expected future price for natural gas and the spread between natural gas prices and coal prices are critical to assessment of customer impacts
- Financial customer benefit/cost determined as follows:
 - PV of net revenue requirements of Merrimack facility (including new scrubber) – PV of market energy and market capacity costs
 - Customer benefit is achieved when the revenue requirements of Merrimack are lower than the costs of procuring the energy and capacity that would otherwise be provided by Merrimack from the market
- Future impact of carbon may play an important role in determining ultimate customer benefit/cost
 - Carbon costs are expected to impact electricity rates, but coal plants will likely be disproportionately affected given their emission rates versus natural gas plants

Financial Sensitivities

- Base-case assumptions result in net customer benefit of \$132 million
- Net customer benefit is most sensitive to expected future natural gas and coal prices and the relative spread between the two commodities

Assumption Category	Assumptions			2008 PV of Net Customer Cost ¹					Net Customer Impact Break-Even Rates
				2012-2027 (\$Mil)					
	Downside	Base	Upside	(\$300)	(\$180)	(\$132)	(\$50)	\$40	
Capital Cost	+10%	\$457 mil	-10%			\$27	\$27	(\$105)	\$684 mil
2012 gas Prices, MMBTU ²	-10%	\$11.00	+10%	\$(295)	\$(163)		\$163	\$31	\$10.10
2012 coal prices, MMBTU ²	+10%	\$4.82	-10%	\$(228)	\$(96)		\$96	\$(36)	\$5.49
Implied Gas/coal Spread	\$4.60	\$6.18	\$7.76			N/A ⁴			\$5.29 ⁴
2012 Carbon Costs ^{2,3}	+50%	\$7	-50%	\$(167)	\$(35)		\$35	\$(97)	\$30.13

Text in bars represents change in values;
text beside bars represents sensitivity result.

Notes:

1. NPV Net Customer Cost = (2008 Present Value of Merrimack Plant Revenue Requirements from 2012 to 2027) minus (2008 Present Value of Market Energy plus 2008 Present Value of Capacity Payments from 2012 to 2027).
2. Fuel and carbon costs are escalated at 2.5% per annum off of the 2012 estimate.
3. Reflects net impact on a \$/ton basis for either RGGI or Federal policies excluding any allocations of allowances.
4. Spread not sensitized as impact depends on underlying natural gas and coal prices. Break even is based on a \$4.82/mmbtu Coal Price (~\$130 per delivered ton).



Financial Scenarios

- The following scenarios, denoted by their assumed probability of occurrence, demonstrate the compounding impacts of a variety of assumption changes on the key financial metrics for the project:

	Unlikely Low	Possible Low	Base	Possible High	Unlikely High
NPV - Net Customer Cost	\$481 MIL	\$194 MIL	(\$132 MIL)	(\$413 mil)	(\$719 mil)
Monthly Residential Customer Cost Impact	\$3.70	\$1.49	(\$1.01)	(\$3.17)	(\$5.52)
2013 Plant Busbar Cost (\$/MWH)	\$102.41	\$100.37	\$94.55	\$87.86	\$79.44
Net Income - 2013 (First full Year In-Service)	\$21.5 mil	\$20.1 MIL	\$18.5 MIL	\$18.1 mil	\$17.7 mil
Assumed probability	5%	25%	-	25%	5%
Parameters					
Capital Costs, Millions	\$532	\$497	\$457	\$447	\$437
2012 Gas Prices, MMBTU	\$8.80	\$9.90	\$11.00	\$12.10	\$13.20
2012 Coal Prices, MMBTU	\$5.78	\$5.30	\$4.82	\$4.34	\$3.86
2012 Carbon Costs, Ton	\$30	\$20	\$7	\$5	\$0

Case Legend

Unlikely Low	Case reflects project in-service delayed one year and cost overrun (\$45M), cooling tower addition (\$30M), minimal Gas/coal Spread
Possible Low	Case reflects project in-service on-time with cost overrun (\$10M), cooling tower addition (\$30M), decreased Gas/coal Spread
Base	Current assumptions
Possible High	Case reflects project in-service 6 months early (\$10M), project costs as expected, benign carbon legislation, increased gas/coal spread
Unlikely High	Case reflects project in-service 6 months early (\$10M) with lower than expected costs (\$10M), no carbon legislation, maximum gas/coal spread

- Other scenarios considered:

- \$200 Oil Scenario:
- \$50 Carbon Cost:

Customer Cost/(Benefit)

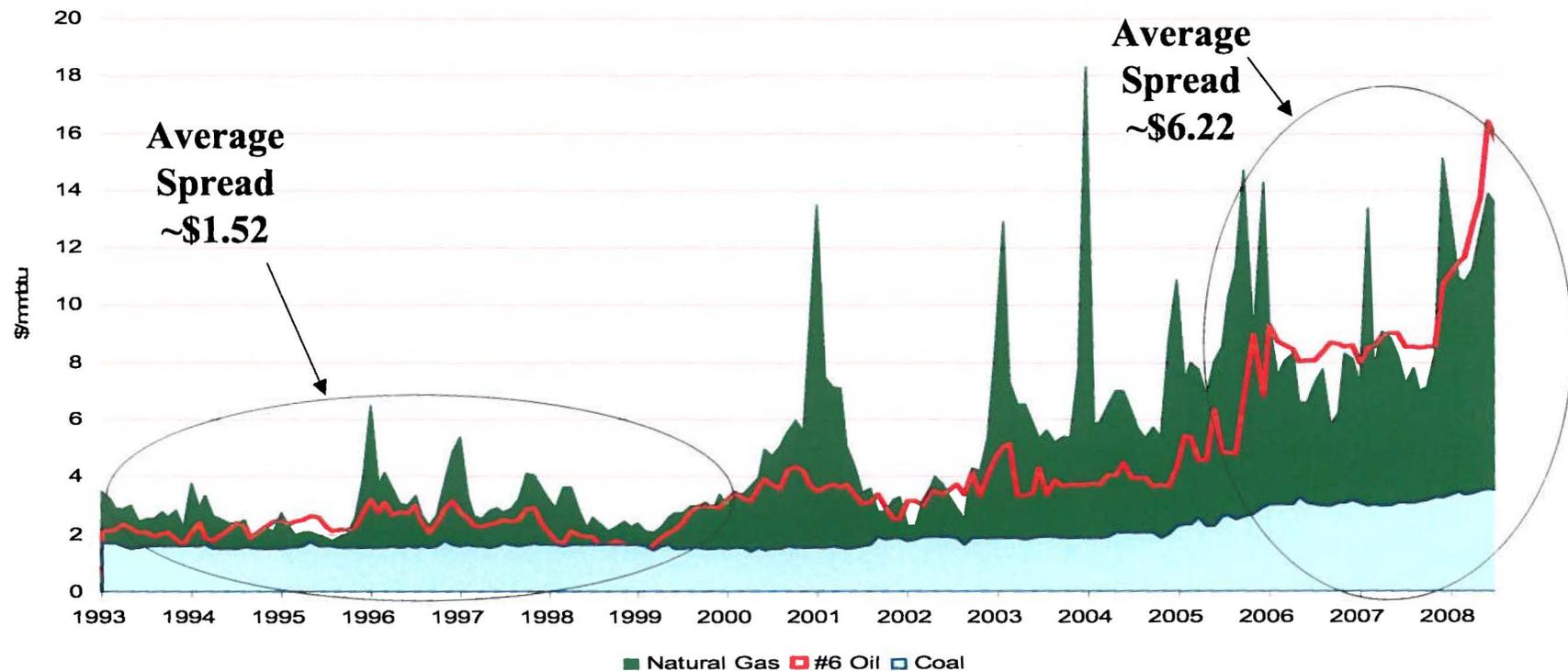
(\$437 million)
\$70 million



Historic Fuel Spreads

- Gas/Coal spread has averaged \$3.18/mmbtu over the last 15 years, as compared to the required customer break-even level of \$5.29/mmbtu (based on current price levels)
 - However, post the hurricane season of 2005, the spread has averaged \$6.22/mmbtu
- Since January 2007, the spread has averaged nearly \$6.63/mmbtu and current spreads are more than ~\$9/mmbtu

PSNH Actual/Quoted Delivered Fuel Costs



Key Financial Takeaways

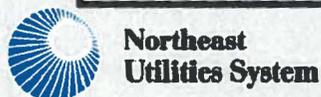
- Customer value of scrubber installation extremely sensitive to future expected natural gas/coal price spread
 - At assumed 2012 natural gas and coal price levels and other base case parameters, a spread of approximately \$5.29/mmbtu (escalating) is required to create customer benefits
 - Recent spreads suggest that this level is realistic; however, historic spread levels have averaged lower
- Impact of carbon legislation is not expected to render scrubber investment uneconomic to customers at current projected costs under RGGI
 - Absent allocations, assuming all other base case assumptions, a net carbon cost of \$30/ton (escalating) or greater would diminish customer value of scrubber installation
- Assuming base case fuel and carbon assumptions, capital cost estimates have meaningful headroom before rendering investment uneconomic
 - All other base case assumptions being held constant, capital costs can increase to ~\$684 million before eliminating customer economic benefits
 - However, reductions in natural/gas coal spread and increases in carbon costs would put pressure on base case capital cost estimates
- Generation ratemaking making structure allows for PSNH to earn 9.81% ROE on equity invested in the project under all scenarios presented
 - Assumes that project capital costs are deemed prudent

Investment is essentially a long spread position on natural gas/coal
with carbon and construction risk

Revised Project Schedule



Project	2006	2007	2008	2009	2010	2011	2012
NH Mercury Reduction Act	▲						
Preliminary Engineering	■■■■■	■■■■■					
Program Manager Hired		▲					
Detailed Engineering		■■■■■	■■■■■	■■■■■			
Major Contracts Awarded			■■■				
Permitting		■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■
Preliminary Site Prep.			■■■				
Major Construction				■■■■■	■■■■■	■■■■■	■■■
Testing & Commissioning						■■■	■■■
In Service							▲





Conclusion

- Installation of the scrubber is required by NH law to meet mercury emissions requirements
- Merrimack Clean Air Project capital costs have increased significantly since the original project costs estimates were prepared in 2006, and stand at \$457M
- Under the base case, continued operation of Merrimack Station with the Clean Air Project remains economically beneficial for customers
- State law allows for recovery of prudently incurred costs to construct and operate the scrubber
- The project team is in place and prepared to execute contracts now and begin construction in earnest late this year, with a project in-service date of mid-2012
- The proposal to construct and operate a scrubber at Merrimack Station, in conformance with the NH Mercury Reduction Law, is in the best interest of PSNH's customers and shareholders



**Northeast
Utilities System**



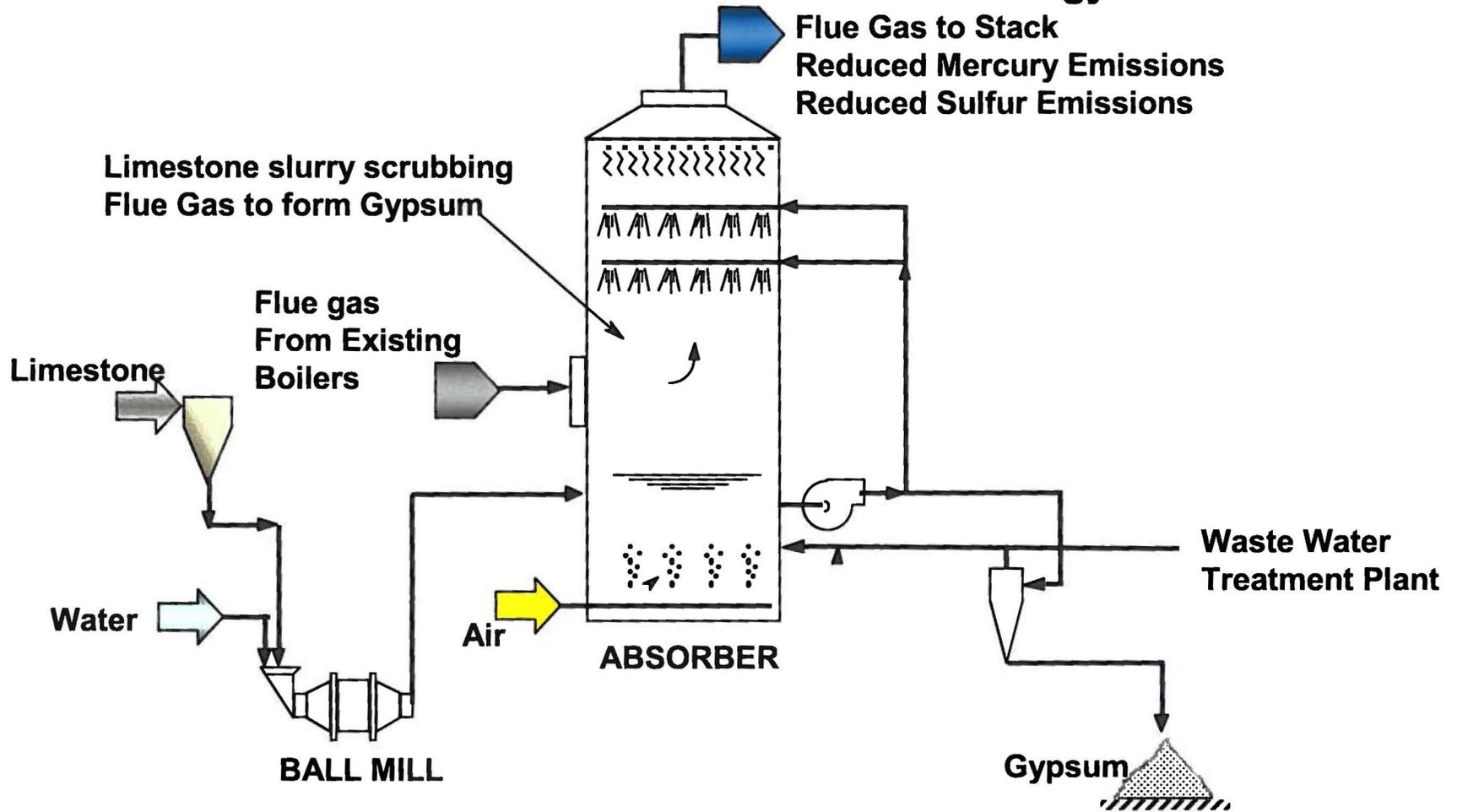
Appendix Materials

**PSNH Clean Air Project
July 15, 2008**

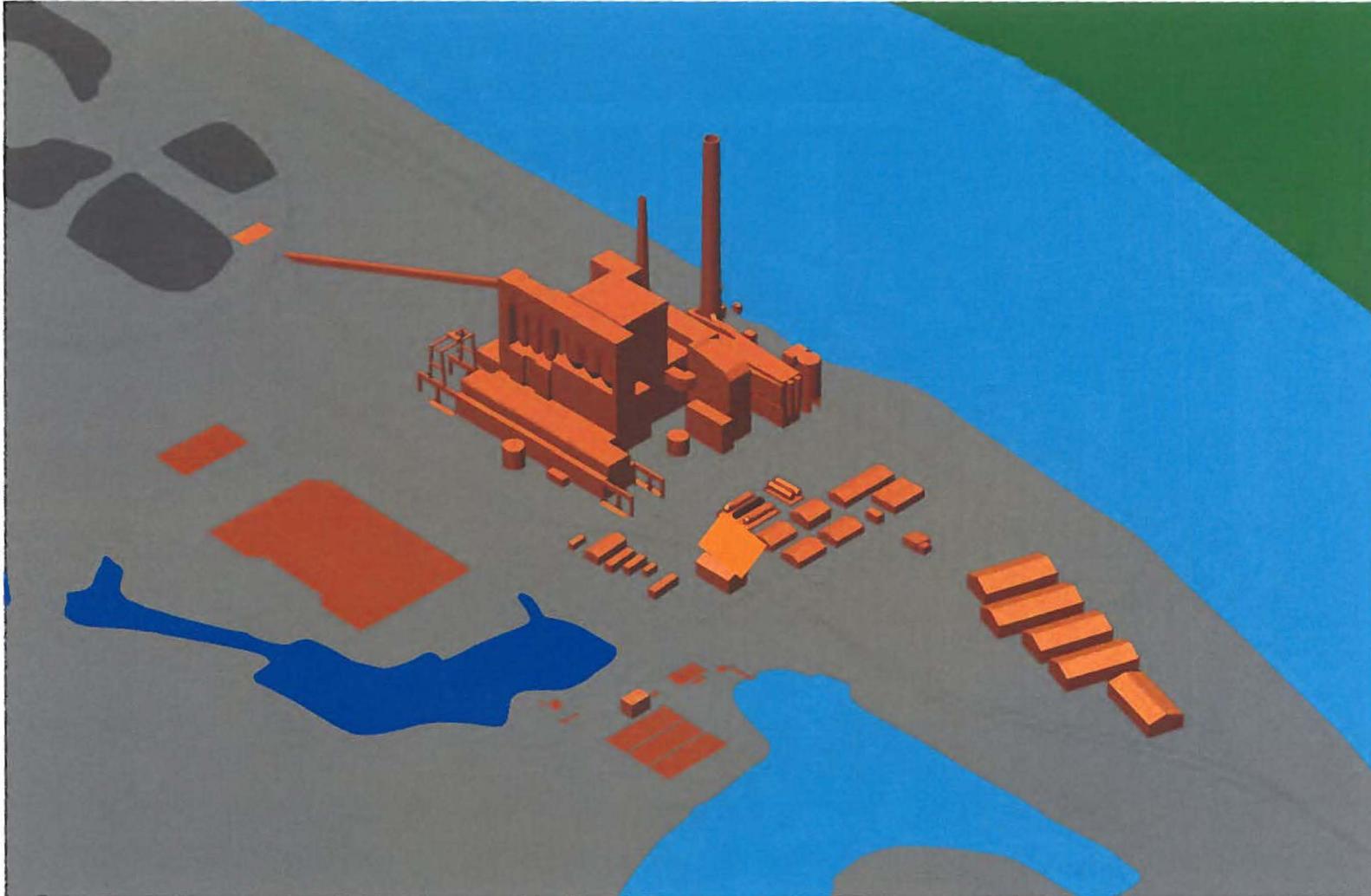
Scrubber Schematic



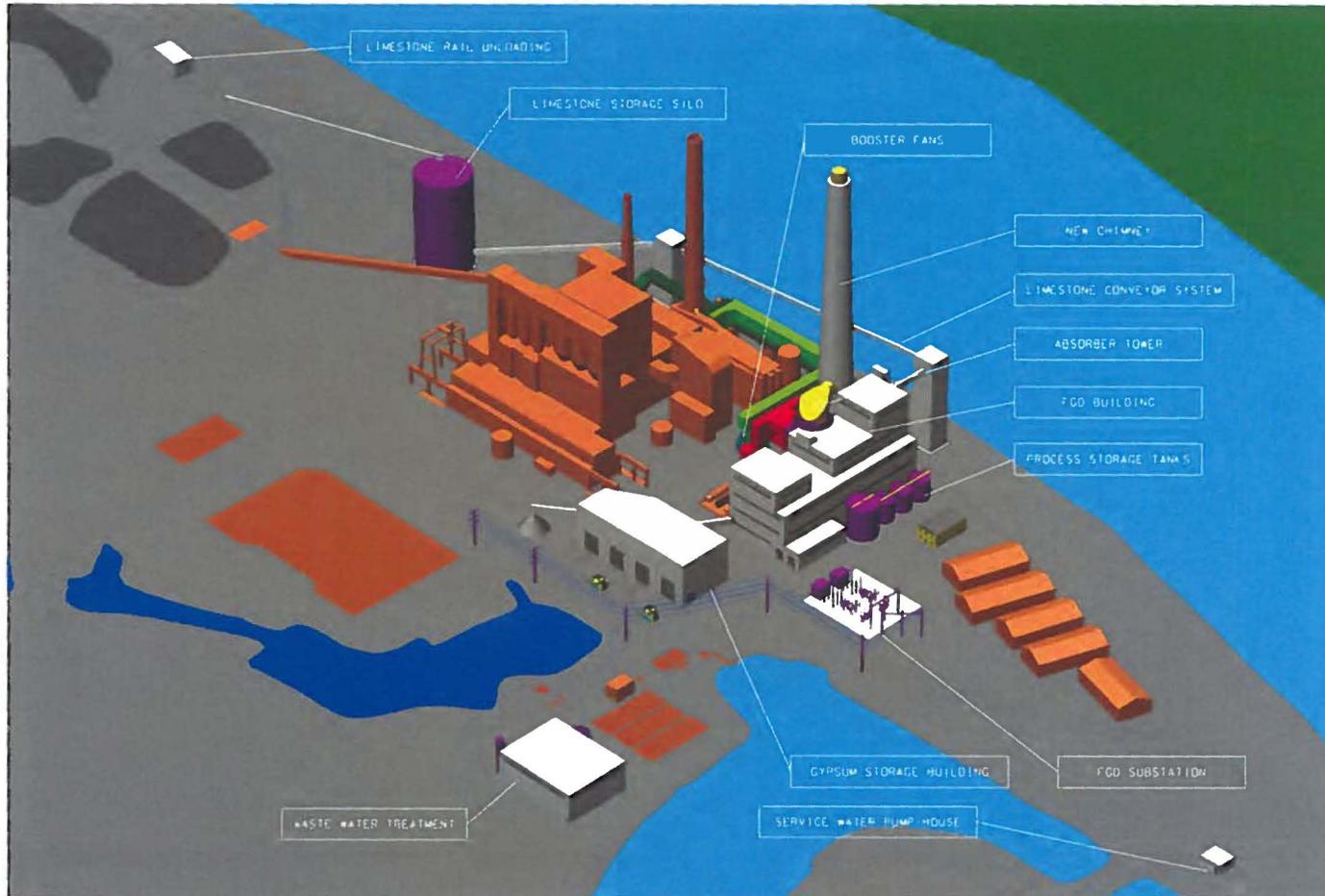
Wet Flue Gas Desulfurization Technology



Merrimack Station: 2008



Merrimack Station: 2013



Risk Assessment, Major Risk Concerns

Risk Event	Risk Horizon	Potential Project Capital Cost Impact	Likelihood of Occurrence (%)	Expected Value Capital Cost Exposure	Mitigation Plan
Remaining bids received from vendors are significantly higher than expected related to material and handling costs. Note: The bids on the major equipment have been received.	2008	\$10 million	20%	\$2 million	Currently carrying out the procurement schedule. The Purchasing area is trying to stimulate competition during the bid process. Lastly as the required implementation date allows for some slippage in the schedule.
Lack of sufficient, qualified construction labor results in increased costs to import labor resources, schedule delays to wait for resources to become available.	2009-12	\$50 million	10%	\$5 million	WGI will initiate the National Maintenance Agreement. Meetings have been held with the union trades to discuss the project and labor requirements up front.
Inability to lock in firm prices during contracting phase exposes the project to price volatility and currency risk.	2008-9	\$25 million	20%	\$5 million	The RFP is being structured for fixed/lump sum pricing. The contract will be negotiated to try and include these parameters.

Risk Assessment, Major Risk Concerns



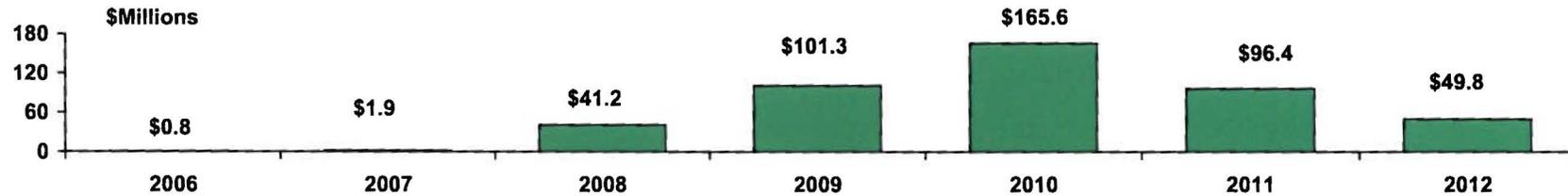
Risk Event	Risk Horizon	Potential Project Capital Cost Impact	Likelihood of Occurrence (%)	Expected Value Capital Cost Exposure	Mitigation Plan
Vendors unable to meet project design criteria resulting in non-conforming bids. Note: bids received with mercury criteria. Risk relates to remaining design specifications.	2008-9	\$25 million	25%	\$6.25 million	In the event this occurs, an acceptable outcome will be negotiated during the procurement process.
Inability to design appropriate plant integration plans resulting in MK1 bypass, boiler implosion and noise issues.	2008-9	\$12.5 million	50%	\$6.25 million	PSNH contracted with experienced contract program manager in Scrubber installations. Additionally, NU personnel will be reviewing design specifications for reasonableness.
Scope definition changes drastically during construction resulting in additional expenditures and/or potential schedule delays.	2008-12	\$18.75 million	20%	\$3.75 million	PSNH team will work closely with WGI & EPC contractors to minimize the impact.
Proposed design is inadequate and does not meet operability/reliability/constructability requirements resulting in complete redesign.	2008-9	\$12.5 million	30%	\$3.75 million	PSNH contracted with experienced contract program manager in Scrubber installations. Additionally, NU personnel will be reviewing design specifications for reasonableness.



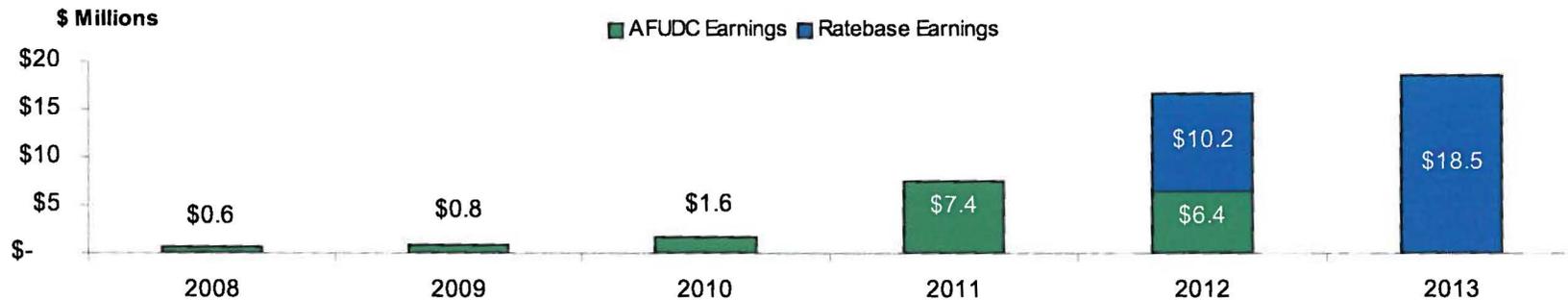


Cashflow and Earnings Projection

Capital Spending by Year



Estimated Earnings By Year



Year	2008	2009	2010	2011	2012	2013
EPS	\$0.00	\$0.00	\$0.01	\$0.02	\$0.03	\$0.04

Assumptions:

- Base-case project costs are estimated at \$457M
- Project expected to be in-service on June 30, 2012
- Assumes 9.81% ROE on 47.23% of Capital Structure
- Average Shares outstanding per 2009-2013 Forecast

Project Benefits are Accentuated by Advancing the In-Service Date to mid-2012



- Financial
 - Reduces AFUDC cost by \$10 Million
 - Limits exposure to material or labor cost escalation for project elements not covered by firm price contracts
 - Generates real earnings one year sooner
- Environmental
 - Eliminates an additional 31,350 tons of SO₂
 - Eliminates an additional 229 pounds of Mercury
 - Reduces particulate emissions to less than 1% one year sooner
- Customer
 - Produces “early reduction mercury credits” that can be used for
 - Compliance in future years if operational issues with the scrubber arise
 - Conversion to fungible SO₂ allowances (estimated at 12,500 allowances)

