2004 SO_2 Compliance Strategy for Kentucky Utilities and Louisville Gas and Electric

November 2004

Sulfur Dioxide Compliance Strategy

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Executive Summary

The Companies' banked SO_2 allowances, reached a peak of 297,000 tons in 1999. However, by 2003 the bank had decreased to 202,000 allowances. By year-end 2004, the number of credits will decrease to just over 160,000, and before the end of 2007 the bank is expected to be fully depleted. Once depleted the Companies must either reduce SO_2 emissions, purchase SO_2 allowances from the SO_2 allowance market or a combination of both. The total number of allowances projected to be purchased through 2025, in absence of implementing additional SO_2 controls, would exceed 2.7 million tons.

As recently as November 15, 2004, SO_2 allowances were priced at $697/ton, or almost 78% above the forecasted 2005 price of $392/ton used in this analysis. The EPA has estimated the price of an allowance in 2010 to range from $700 to $900 per ton.

Construction of wet flue gas desulfurization ("FGD") systems on Ghent Units 2, 3 and 4 and E.W. Brown Units 1, 2 and 3 and the simultaneous switching of the units to high sulfur coal is the most reasonable least cost plan for continued environmental compliance. While the addition of the FGD systems do not eliminate the need to purchase SO_2 allowances, the installation of controls reduces the purchase of SO_2 allowances and are required for continued economical compliance with the SO_2 emission reduction requirements of the Clean Air Act Amendments of 1990 ("CAAA").

Numerous strategies utilizing wet FGD processes, dry FGD processes and fuel switching were evaluated. The Ghent 2-4 and Brown 1-3 locations account for over 55% of the Companies' future SO_2 emissions and thus were selected for analysis. These are the only large coal-fired generating units on the Companies' generation system currently operating without FGD systems.

Compared to purchasing SO_2 allowances, the construction of the wet FGD systems and the simultaneous conversion of the units to high sulfur coal provide the following ratepayer benefits over the 20 year analysis period:

(1) Decreases the cost of SO_2 compliance by more than $110 million
(2) Limits significant exposure to the volatile SO_2 allowance market by reducing the anticipated allowance shortfall from 2.7 million tons to approximately 690,000 tons over the next 20 years
(3) Increase fuel procurement flexibility
(4) Position the Companies for the SO_2 reduction requirements associated with the Clean Air Interstate Rule (CAIR) and future regulations targeting fine particulates and mercury
(5) Delay depletion of the Companies' SO_2 allowance bank.

Background

The Clean Air Act Amendments ("CAAA") of 1990 sought to reduce the effects of acid deposition through a reduction in SO_2 and NOx emissions from 1980 levels in the 48 contiguous states. Phase I (Jan 1995-Dec 1999) of the CAAA of 1990 affected all generating units greater than 100MW with SO_2 emissions greater than 2.5 lbs/mmBtu. Kentucky Utilities ("KU") began to analyze SO_2 emissions reduction options prior to the passage of the CAAA of 1990 and concluded that the installation of a flue gas desulfurization ("FGD" or "scrubber") system on Ghent 1, KU's single largest source of sulfur dioxide emissions, would be a cost effective component in any plan to meet Phase I reduction requirements. Thus on January 2, 1992, an application was filed with the Kentucky Public Service Commission ("KPSC") for a Certificate of Public Convenience and Necessity ("CCN") to construct an FGD at Ghent 1. Louisville Gas and Electric ("LG&E") had no Phase I affected units under the CAAA of 1990 and thus no obligations to further reduce sulfur dioxide before 2000.

In 1999, KU and LG&E (the Companies) reviewed the SO_2 compliance plan and began implementation of an "over-scrubbing" management plan. Over-scrubbing was accomplished, where economically feasible, by increasing the SO_2 removal efficiency on the large coal-fired units with existing FGD systems in place (Ghent 1, Trimble Co 1, Mill Creek 1-4 and Cane Run 4-6). This action allowed LG&E to meet CAAA Phase II requirements as expected and also provided a bank of SO_2 allowances. Over-scrubbing continues to be an economic part of the Companies' overall SO_2 compliance plan and is economic in all forward projections when compared to purchasing allowances.

KU has met the CAAA Phase II requirements by relying on the allowances banked during CAAA Phase I. However, this bank is rapidly depleting and further SO_2 control measures are necessary. The Companies' joint planning process assumes that allowances banked by either utility can be utilized by either Company. The joint planning methodology utilizes the combined resources of both utilities to meet the regulatory requirements in a least cost manner. The current study reviewed all economically viable alternatives as part of the Companies' on-going development of a least cost SO_2 compliance strategy.

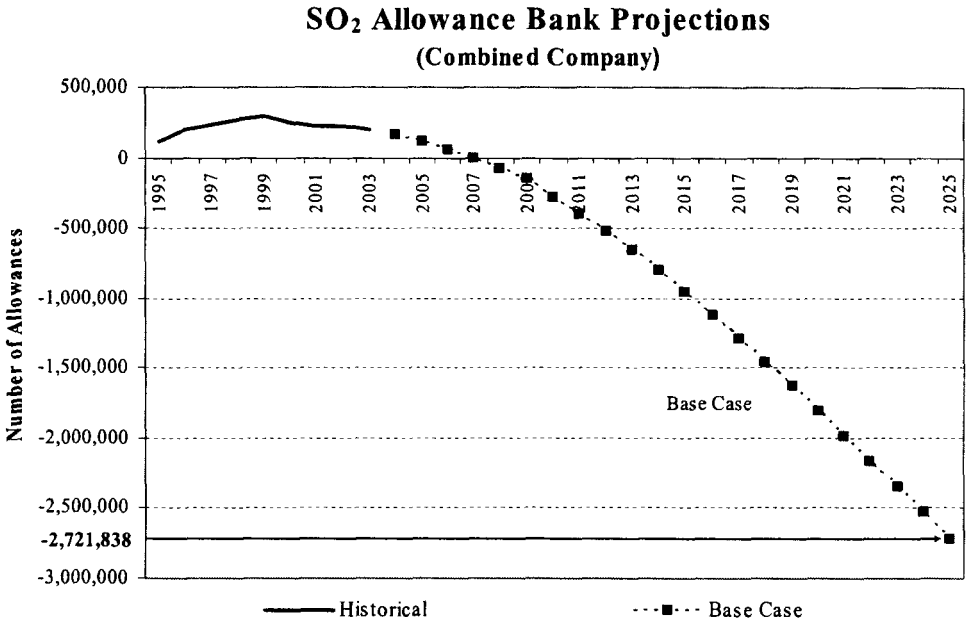
The Clean Air Interstate Rule ("CAIR", formerly called the Interstate Air Quality Rule-IAQR), was proposed by the Environmental Protection Agency ("EPA") in December of 2003 and is "scheduled" to become final before the end of 2004. The Companies do not anticipate any major change in the content of the final regulation.

This regulation will require significant additional reductions/limits for SO_2 and NO_x emissions beginning in 2010. The CAIR is expected to be implemented in phases. CAIR Phase I spans the years 2010-2014 and is expected to reduce the Companies' annual SO_2 allowance allocation by 50% during this period. In CAIR Phase II (2015 and beyond), a further reduction to 35% of the Companies' current allowance allocation is expected.

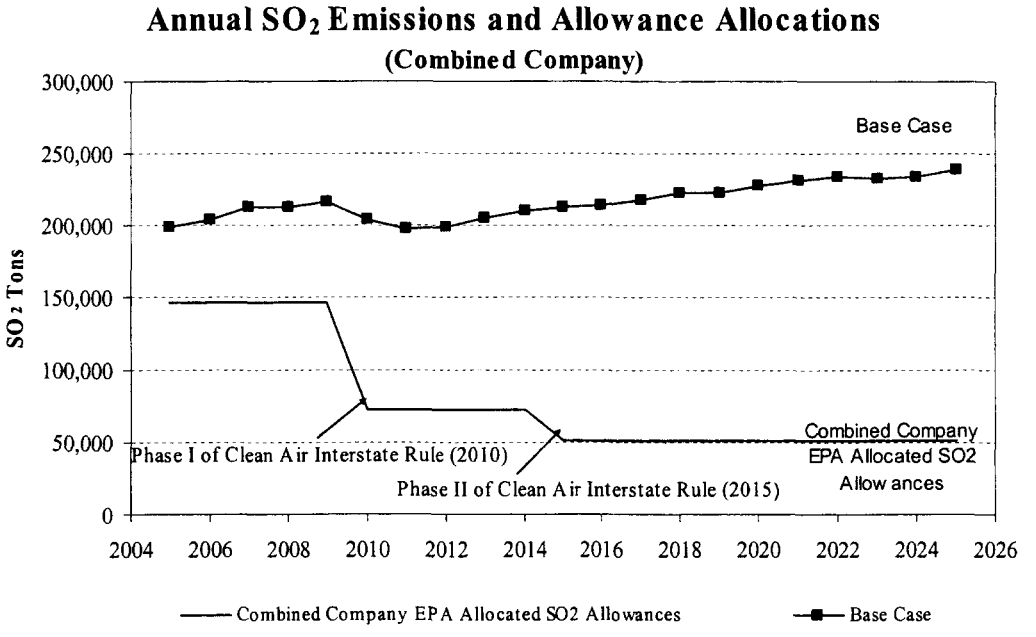
Current SO_2 Allowance Position

Allowances are a limited authorization for a utility's generating unit to emit, during a calendar year, one ton of SO_2. All affected generating units are required to hold, and subsequently surrender to the EPA, sufficient allowances to cover their annual level of SO_2 emissions. Once allocated, allowances can be used to cover emissions, banked for future use or sold. Allowances may not be used prior to the calendar year for which they are allocated. Allowances retained for future use are commonly referred to as "banked" allowances.

Beginning in 2000, it became necessary for the Companies to begin using banked SO_2 allowances for compliance. The Companies' banked SO_2 allowances, once in excess of 297,000 tons (during 1999) was over 202,000 allowances by year end 2003. Projections are that by year end 2004 those credits will decrease to just over 160,000, and before the end of 2007 the bank is expected to be fully depleted. Once depleted the Companies must either reduce SO_2 emissions, purchase SO_2 allowances from the SO_2 allowance market

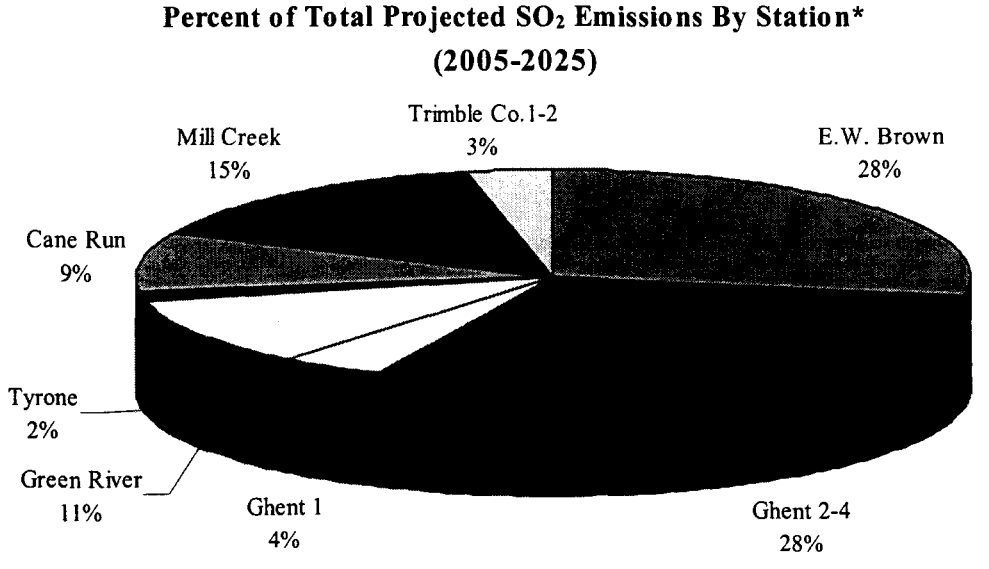


or a combination of both. The total number of allowances projected to be purchased in absence of implementing additional SO_2 controls would exceed 2.7 million tons. The following figure depicts the Companies' projected annual SO_2 emissions and the Companies' anticipated annual allowance allocations. The difference between SO_2 emissions and allowance allocations is currently being covered by banked allowances. The implementation of the CAIR in 2015 significantly widens the gap between the number of allowances allocated vs. the number of allowances needed. The following graphically illustrates the difference between allocated allowances and emissions.



Projected Unit SO_2 Emissions

Logically, SO_2 control technologies should be constructed on those units which are projected to be the major contributors to the Companies' SO_2 allowance shortfall.



*Coal-fired units only

The most significant contributors to the Companies' SO_2 emissions are Ghent 2-4 and Brown 1-3. These units are the largest, coal-fired generating units on the Companies' generation system currently operating without scrubbers. These six generating units are projected to account for over 55% of the Companies' future SO_2 emissions. Any long-

term compliance strategy must, at a minimum, address the emissions from these six generating units.

Environmental Compliance Alternatives

The Companies have considered five different categories of alternatives for achieving compliance. These five categories are:

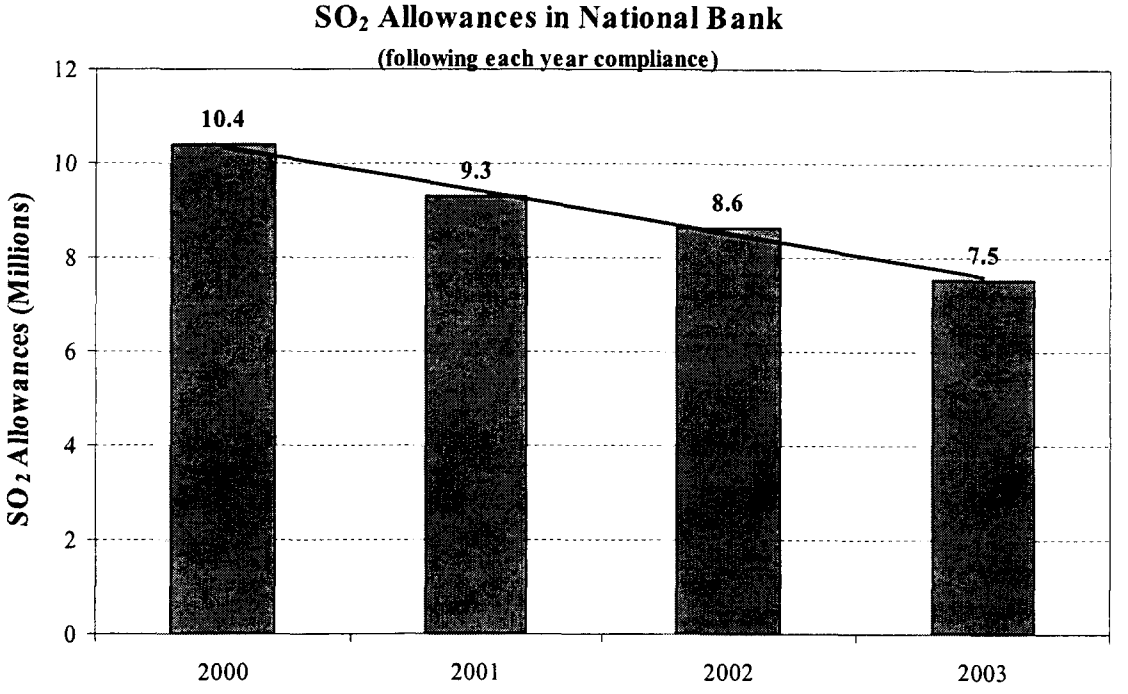
1. Purchase Allowances
2. New Control Technology
3. Wet FGD
4. Dry FGD
5. Fuel Switching

Purchase Allowances:

Complete dependence on the SO_2 allowance market results in the Companies being exposed to a volatile allowance market with significant price risk and the possibility that there will be minimal volumes of allowances available at any price.

Allowance Availability

The long-term availability of allowances is questionable. Nationally, in the years 2000 to 2003, generating units emitted, on average, 1 million more tons of SO_2 than the EPA-granted number of SO_2 allowances for each year in that period. As a result, the nationwide SO_2 allowance bank, in general, decreased by 1 million tons each year through the period. Continuation of this trend will deplete the national allowance bank in 2010. While the EPA is still expected to make 250,000 allowances available for auction each year, the market depth would be greatly reduced as the primary source for allowance trades are eliminated. Companies would first utilize the allowances they own to cover emissions before investing additional monies in SO_2 reduction technologies.

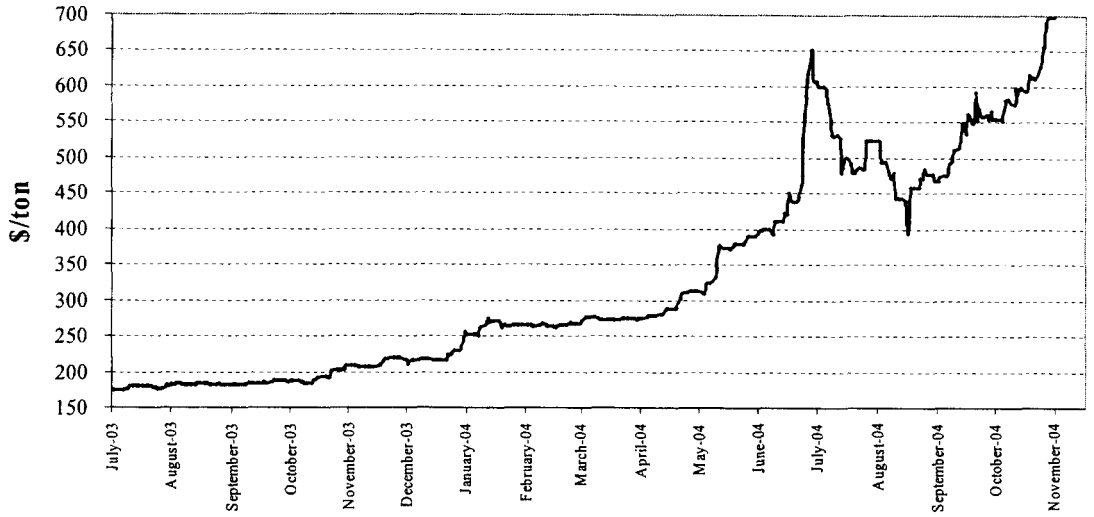


In absence of implementing any additional SO_2 reduction techniques beyond those currently operating, the Companies are projected to require in excess of 2.7 million purchased allowances over the 2005 to 2025 time period. Annual SO_2 purchases are expected to increase to almost 190,000 allowances per year by the end of the study period. This large allowance need only serves to magnify the potential negative impacts of a shallow and volatile allowance market.

Allowance Price Uncertainty

In 2004, the market price of SO_2 allowances has ranged from $250/ton to over $697/ton, representing an increase of 278%. The graph below clearly displays the recent volatility associated with the spot SO_2 allowance market.

SO_2 Spot Daily Market Price Indicators
(July 16, 2003 to November 15, 2004)



This information was provided by Cantor Fitzgerald.

New Technology

In December 2001, the Companies' partnered with Airborne Pollution Control, Babcock and Wilcox, and US Filter's HPD Systems to build a small scale demonstration plant to test the "Airborne Process" technology at the Ghent Station. The Airborne Process was advertised as a groundbreaking, multi-pollutant control process that targets reduction in both SO_x and NO_x emissions while producing a high-quality granular fertilizer. While certain aspects of the process, such as control of SO_2 emissions showed promise, other areas such as NO_x control and power consumption, were unable to achieve their design expectations. As a result, by mid-2003 the Companies had ceased considering the process offered by Airborne Pollution Control for controlling emissions and began pursuing proven SO_2 control technologies.

FGD Alternatives

The large allowance shortfall expected by the Companies necessitates that commercially proven technologies capable of significant SO_2 reductions be considered. Alternatives 3 and 4, Wet and Dry FGD systems would fall into the commercially proven category. FGD systems utilize a process by which slurry is placed in contact with the flue gas stream of a generating unit to allow removal of specific pollutants contained within the flue gas stream. Wet and dry scrubbing are two types of FGD systems. Removal rates of 98% are possible in newly constructed wet FGD systems and there is often beneficial re-use of the byproduct of the scrubbing process. Dry FGD systems typically have less SO_2 removal capability and fewer byproduct beneficial reuse possibilities. Additionally, the wet FGD alternative increases fuel procurement flexibility as a wide range of coal qualities can be utilized.

The Companies have accumulated a great deal of experience in operating wet FGD systems as Cane Run 4-6, Mill Creek 1-4, Trimble County 1 and Ghent 1 are each currently operating with wet FGD systems.

While differences do exist when comparing specific dry FGD systems or wet FGD systems, detailed discussions of those processes are not included here, however, they can be found in **Appendix 1** of this document. The following table conveys some generalities of the wet and dry FGD processes.

Scrubber Generalities

FGD Type	Design Fuel Sulfur Content	Achievable SO_2 Removal
Wet	Low, Medium, High	98%
Dry	Low, Medium	95%

Fuel Switching Alternative

The uncontrolled (i.e. no SO_2 reduction technology) SO_2 emission rate of a unit is directly proportional to the sulfur content of the fuel burned in the boiler. Varying levels of costs, depending on plant design and configuration, would be associated with switching to a lower sulfur fuel. The design of the boiler and the plant's fuel handling and delivery system dictate how much investment would be required to allow a fuel switch to occur.

Ghent 2-4 are currently burning eastern compliance coal with an SO_2 content of less than 1.2 lbs of SO_2 per mmbtu (#SO_2/mmbtu). The only fuel switching alternative at Ghent 2-4 is the burning of PRB fuel at 0.9# SO_2/mmbtu. Brown 1-3 are currently burning a medium sulfur (2.75# SO_2/mmbtu) coal, so the opportunity does exist to switch those units to either compliance or PRB coal.

Cost of SO_2 Control Alternatives

In cooperation with outside architects and engineering firms such as Flour and Riley Power, location specific cost estimates for the appropriate technologies from those listed above were developed. Specifically, cost estimates were developed for wet scrubbing at Ghent and Brown and dry scrubbing at Brown. The FGD alternatives at Ghent allow construction of the first scrubber as soon as possible recognizing the Companies' large SO_2 allowance need, while both a base and an accelerated construction timeline were developed for the scrubbing options at Brown. The table below enumerates the thirteen options considered and includes, as Option 0, an option which models the Companies' generation system as it exists today.

Individual SO_2 Control Alternatives

Option	Long Description	Short Description	In-Service Date				Total Capital Cash Flow ($000)
			Unit 1	Unit 2	Unit 3	Unit 4	
0	Basecase with Environmental Dispatch	BASE CASE					
1	Install Wet Scrubber on Ghent Units 3-4	WFGD HS GH34			May-07	May-08	$289,229
2	Install Wet Scrubber on Ghent Unit 3	WFGD HS GH3			May-07		$130,757
3	Install Wet Scrubber on Ghent Units 2-4	WFGD HS GH234		May-08	May-07	May-09	$424,743
4	Install a Wet Scrubber on E.W. Brown Units 1-3 (accelerated)	WFGD HS BR123x	Dec-08	Dec-08	Dec-08		$227,368
5	Install a Wet Scrubber on E.W. Brown Units 1-3	WFGD HS BR123	May-09	May-09	May-09		$234,189
6	Install a Dry Scrubber on E.W. Brown Units 1-3 (accelerated)	DFGD MS BR123x	Dec-08	Dec-08	Dec-08		$197,887
7	Install a Dry Scrubber on E.W. Brown Units 1-3	DFGD MS BR123	May-10	May-10	May-09		$206,319
8	Install a Dry Scrubber on E.W. Brown Unit 3 (accelerated)	DFGD MS BR3x			Dec-08		$104,002
9	Install a Dry Scrubber on E.W. Brown Unit 3	DFGD MS BR3			May-09		$107,024
10	Fuel Switch E.W. Brown Units 1-3 to Eastern Compliance Coal	FS E.COMP BR123	Dec-07	Dec-09	Dec-08		$58,901
11	Install a Dry Scrubber on E.W. Brown Units 2-3	DFGD MS BR23		Dec-09	Dec-09		$142,826
12	Install a Dry Scrubber on E.W. Brown Units 2-3 (accelerated)	DFGD MS BR23x		Dec-08	Dec-08		$138,792

Notes: (1) "Total Capital Cash Flow ($000)" represents the sum of annual construction costs.
(2) Costs exclude any E.W. Brown ash pond related expenses.

Note: Alternatives at the same location (i.e. Ghent, Brown) are mutually exclusive, meaning that implementing Option 1 and Option 2 simultaneously would not be valid. Summary capital cost and operational information of each of the above options can be found in **Appendix 2 and Appendix 3**. The information includes

- *SO_2 Removal Percentage*- See **Appendix 2**.
- *Fuel Sulfur Content*- See **Appendix 2**.
- *SO_2 Emission Rate*- See **Appendix 2**.
- *Capacity Derate (MW)* - See **Appendix 2**.
- *Total Incremental Variable O&M* – See **Appendix 2** for a summary and **Appendix 3** for a more detailed breakdown of the total incremental variable O&M for each option.
- *Total Incremental Fixed O&M* – See **Appendix 2** for a summary and **Appendix 3** for a more detailed breakdown of the total incremental fixed O&M for each option.
- *Total Annual Capital Construction Expenses* - The table above shows the total capital cost for each Option. **Appendix 4** breaks out the annual capital cost cash flows of each major capital project comprising the option (i.e. scrubber) as well as the capital costs of balance of plant/common items.

Brown Ash Pond Costs

The engineering firm of Fuller, Mossbarger, Scott and May has indicated that the ash pond at Brown is currently being filled at an average rate of 138.5 acre-ft/year. At this rate, the pond will achieve its maximum volume in approximately 5.5 years (**See Appendix 5**). In absence of augmenting the capacity of the current ash pond, the existing site would not represent a long-term storage repository for the plant. Approximately $19.3 million (PVRR) is necessary for increasing the capacity of the ash pond in absence of any SO_2 control being implemented. Should the rate of fill increase, as would occur with any of the SO_2 emission reduction alternatives considered for Brown, more than

$19.3 million would be required. The cost estimates noted previously do not reflect any incremental charges for work required to increase the storage capacity of the ash pond for scrubber byproducts.

The appropriate ash pond cost, as outlined in the table below, has been added to accurately reflect the total cost of each alternative.

Brown Option		Incremental Capital PVRR Cost ($000)		Total Capital PVRR Cost ($000)
Option 0- Base Brown Ash Pond Cost				$19.3
Options 4 & 5- Ash Pond est with Brown 1, 2, 3 Wet FGD	Base cost +	$31.1	=	$50.4
Options 6 & 7- Ash Pond est with Brown 1, 2, 3 Dry FGD	Base cost +	$19.5	=	$38.8
Options 8 & 9- Ash Pond est with Brown 3 Dry FGD	Base cost +	$17.0	=	$36.3
Options 11 & 12- Ash Pond est with Dry FGD on Brown 1, 2	Base cost +	$18.7	=	$37.9

Alternative Screening

Consistent with recent evaluations of this type, the Companies evaluated the above alternatives using the PROSYM™ detailed hourly production costing computer model and the Strategist Capital Expenditure and Recovery (CER) module. Used together, these tools have the capability of simulating the hourly production costs (fuel, fixed and variable operation and maintenance, emissions, etc) and quantifying the revenue requirements impact associated with each capital project. **Appendix 6** contains economic and forward looking assumptions used in this analysis. Each alternative was independently evaluated within PROSYM™ using the above estimates for capital construction costs and the Companies' base price forecast for SO_2 and NO_x allowances.

In the screening portion of the analysis each case represents implementation of one and only one of the thirteen alternatives with any shortfall in SO_2 or NO_x allowances made up by purchasing the required number of allowances from the allowance market on an as-needed basis. The first year that the Companies would have to purchase any SO_2 or NO_x allowances and the volume of purchased allowances over the period can also be observed. Some cases rely heavily on SO_2 allowance purchases for compliance and presume an unlimited number of allowances are available at the projected allowance price. The total present value revenue requirement (PVRR) of each case has been categorized into four areas:

1. *Production Costs:* represent the revenue requirements associated with fuel, fixed and variable operation and maintenance expenses and purchased power expenses
2. *NO_x Allowance Costs:* represent the revenue requirements associated with the purchasing of any NO_x allowances. Note that NO_x emission levels are quantified because the retrofitting of an SO_2 control technology impacts how that unit is dispatched, which in turn, affect NO_x tonnage emissions.
3. *SO_2 Allowance Costs:* represent the revenue requirements associated with the purchasing of any SO_2 allowances.
4. *Capital Costs:* represent the revenue requirements associated with any capital expenditures for the case.

Alternative Screening

(Assuming: Base Capital Costs, Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case00: BASE CASE

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital Cost	Total Cost	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	711,926	25,444	14,910,754	Base	2007	2010	2,721,838
Case03- Option 3: WFGD HS GH234	13,674,349	144,422	433,097	537,313	14,789,180	(121,574)	2008	2010	1,688,511
Case01- Option 1: WFGD HS GH34	13,761,762	140,471	508,732	384,847	14,795,811	(114,942)	2008	2011	1,974,944
Case02- Option 2: WFGD HS GH3	13,889,994	143,198	605,628	192,492	14,831,312	(79,442)	2008	2010	2,334,147
Case05- Option 5: WFGD HS BR123	14,004,995	152,415	440,152	301,129	14,898,690	(12,064)	2007	2010	1,692,501
Case04- Option 4: WFGD HS BR123x	14,005,792	152,434	432,394	313,194	14,903,814	(6,940)	2007	2010	1,667,779
Case09- Option 9: DFGD MS BR3	14,067,907	147,929	551,439	141,281	14,908,556	(2,198)	2007	2010	2,113,444
Case12- Option 12: DFGD MS BR23x	14,088,874	148,867	481,468	190,741	14,909,950	(803)	2007	2010	1,853,233
Case08- Option 8: DFGD MS BR3x	14,072,240	147,942	546,669	146,909	14,913,760	3,006	2007	2010	2,098,295
Case11- Option 11: DFGD MS BR23	14,083,383	148,748	497,711	183,997	14,913,838	3,085	2007	2010	1,905,654
Case10- Option 10: FS E. COMP BR123	14,141,223	146,228	555,307	93,310	14,936,068	25,314	2007	2010	2,129,732
Case07- Option 7: DFGD MS BR123	14,093,924	149,325	458,332	247,694	14,949,275	38,521	2007	2010	1,755,243
Case06- Option 6: DFGD MS BR123x	14,099,335	149,456	442,748	262,550	14,954,089	43,335	2007	2010	1,706,944

The PVRR of each Case is compared to that of the Base Case. The Base Case is the first case listed in the table. All other cases follow in increasing order of PVRR. As can be observed in the Alternative Screening, the addition of a wet FGD system on Ghent 2, 3 and 4 (Case03-Option 03) is the best single alternative of those evaluated and results in PVRR decreasing $121.5 million from the Base Case. While the addition of only one or two scrubbers at Ghent (Option 1 and Option 2 respectfully) has less capital, the savings are not sufficient to offset the increased production and SO_2 allowance purchase costs. Each of the Ghent alternatives (Options 1-3) allows the postponement of the Companies' initial SO_2 allowance purchases. The least cost option at Brown is the addition of a wet FGD system on Brown 1, 2 and 3. No alternatives provide 100% of the SO_2 allowances required to comply without using the SO_2 allowance market; the market is still relied upon to provide at least 1.5 million allowances over the period. The table above is a summary of the annual data contained in **Appendices 7 and 8. Appendix 7** presents the annual results of all Cases evaluated in this evaluation and compares them to the Base Case while **Appendix 8** details the SO_2 emissions associated with each case.

Development of Compliance Strategies

In order to develop a least cost compliance strategy, individual alternatives were combined in an effort to further reduce the revenue requirements associated with SO_2 compliance. As such, the following SO_2 compliance strategies were developed based on the results of the individual alternative screening previously conducted.

Case13 (Option 3 + Option 5): Combines the most economical alternative at Ghent (Option 03-construct three wet FGD systems on Ghent 2-4 in May '08, May '07 and May '09 respectively) with the most economical alternative at Brown (Option 5- construct three wet FGD systems on Brown 1-3 in May '09). Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case14 (Option 1 + Option 5): Combines the second least cost alternative at Ghent (Option 1- construct two wet FGD systems on Ghent 3-4 in May '07 and May '08 respectively) with the most economical alternative at Brown (Option 5-

construct three wet FGD systems on Brown 1-3 in May '09). Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case15 (Option 2 + Option 5): Combines the third least cost alternative at Ghent (Option 2- construct a single wet FGD system on Ghent 3 in May '07 with the most economical alternative at Brown (Option 5- construct three wet FGD systems on Brown 1-3 in May '09). Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case16 (Option 1 + Option 9): Combined the second least cost alternative at Ghent (Option 1- construct two wet FGD systems on Ghent 3-4 in May '07 and May '08 respectively) with the least cost dry FGD alternative on a single unit at Brown in May '09. Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case17 (Option 3 + Option 11): Combines the most economical alternative at Ghent (Option 03-construct three wet FGD systems on Ghent 2-4 in May '08, May '07 and May '09 respectively) with a dry FGD alternative on two units at Brown in Dec '09. Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case18 (Option 01 + Option 11): Combines the second least cost alternative at Ghent (Option 1- construct two wet FGD systems on Ghent 3-4 in May '07 and May '08 respectively) with the with a dry FGD alternative on two units at Brown in Dec '09. Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case13 through Case18 were evaluated in the same manner as the individual alternatives (Case00-Case12) using the detailed hourly production costing computer model and Strategist's CER module. The following table summarizes the results of the detailed modeling of each compliance strategy and includes the stand-alone options.

Case Summary

(Assuming: Base Capital Costs, Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

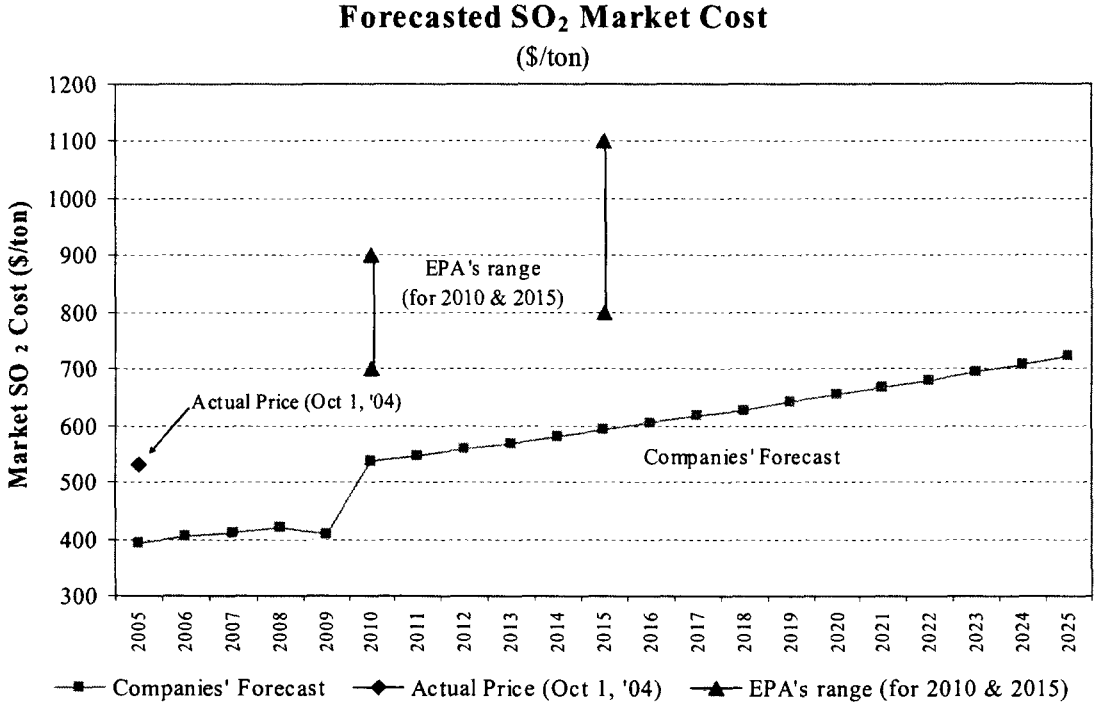
ALL CASES COMPARED TO Case00: BASE CASE

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	711,926	25,444	14,910,754	Base	2007	2010	2,721,838
Case03- Option 3: WFGD HS GH234	13,674,349	144,422	433,097	537,313	14,789,180	(121,574)	2008	2010	1,688,511
Case14- Option 0105: WFGD HS GH34,WFGD HS BR123	13,751,217	142,628	240,719	660,531	14,795,095	(115,659)	2008	2011	961,930
Case01- Option 1: WFGD HS GH34	13,761,762	140,471	508,732	384,847	14,795,811	(114,942)	2008	2011	1,974,944
Case16- Option 0109: WFGD HS GH34,DFGD MS BR3	13,805,543	139,891	350,673	500,683	14,796,790	(113,964)	2008	2011	1,374,627
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	188,963	813,000	14,800,722	(110,031)	2008	2010	692,249
Case17- Option 0311: WFGD HS GH234,DFGD MS BR23	13,736,871	144,055	226,198	695,868	14,802,992	(107,762)	2008	2010	897,6[illegible]
Case18- Option 0111: WFGD HS GH34,DFGD MS BR23	13,822,713	139,862	298,395	543,399	14,804,370	(106,384)	2008	2011	1,171,9[illegible]
Case15- Option 0205: WFGD HS GH3,WFGD HS BR123	13,873,066	147,754	336,243	468,179	14,825,242	(85,512)	2008	2010	1,313[illegible]
Case02- Option 2: WFGD HS GH3	13,889,994	143,198	605,628	192,492	14,831,312	(79,442)	2008	2010	2,33[illegible]
Case05- Option 5: WFGD HS BR123	14,004,995	152,415	440,152	301,129	14,898,690	(12,064)	2007	2010	1,69[illegible]
Case04- Option 4: WFGD HS BR123x	14,005,792	152,434	432,394	313,194	14,903,814	(6,940)	2007	2010	1,66[illegible]
Case09- Option 9: DFGD MS BR3	14,067,907	147,929	551,439	141,281	14,908,556	(2,198)	2007	2010	2,113,[illegible]
Case12- Option 12: DFGD MS BR23x	14,068,874	148,867	481,468	190,741	14,909,950	(803)	2007	2010	1,853,233
Case08- Option 8: DFGD MS BR3x	14,072,240	147,942	546,669	146,909	14,913,760	3,006	2007	2010	2,098,295
Case11- Option 11: DFGD MS BR23	14,083,383	148,748	497,711	183,997	14,913,838	3,085	2007	2010	1,905,654
Case10- Option 10: FS E. COMP BR123	14,141,223	146,228	555,307	93,310	14,936,068	25,314	2007	2010	2,129,732
Case07- Option 7: DFGD MS BR123	14,093,924	149,325	458,332	247,694	14,949,275	38,521	2007	2010	1,755,243
Case06- Option 6: DFGD MS BR123x	14,099,335	149,456	442,748	262,550	14,954,089	43,335	2007	2010	1,706,944

Discussion of Base Results

The stand-alone alternative of Case03- Option 3 (wet scrubbing of Ghent 2, 3 and 4 in May '08, May '07 and May '09, respectively, and purchasing allowances) continues to be, as in the results of the screening analysis, the lowest cost case with a $121.5 million lower PVRR than the Base Case. Note the SO_2 allowance market is heavily relied upon requiring almost 1.7 million tons of SO_2 allowances purchased over the study period. Case13- the combination of the least cost alternative at Ghent (Option 3) and the least cost alternative at Brown (Option 5) - costs $11.5 million more in PVRR than Case03, but significantly limits the exposure to the SO_2 allowance market. When compared to Case03, Case13 decreases the expected number of SO_2 allowance purchases by almost 1 million more tons over the study period to 692,000 allowances. The scrubbing of Ghent 2, 3 and 4 alone without reducing emission at Brown exposes the ratepayer to a significant number of allowances (1 million) not only whose availability is questionable but also whose price is highly volatile.

As recently as November 15, 2004, SO_2 allowance prices were $697/ton or almost 78% above the forecasted 2005 price of $392/ton used in this analysis. The EPA has estimated the price of an allowance in 2010 to range from $700 to $900 per ton. Relevant allowance cost information is provided in the figure below. The Phase I impact of CAIR is evident in the Companies' forecast in 2010 as a sharp upward move in the forecasted price of allowances.



Because of the wide variance in forecasted SO_2 prices, an SO_2 price sensitivity was conducted.

Sensitivities Evaluated

Sensitivity: Market Price of SO_2

The following table summarizes the impact to each Case of only a 10% increase in the SO_2 market price curve.

Case Summary

(Assuming: Base Capital Costs, 1.10 x Base SO2 Forward Price Forecast)

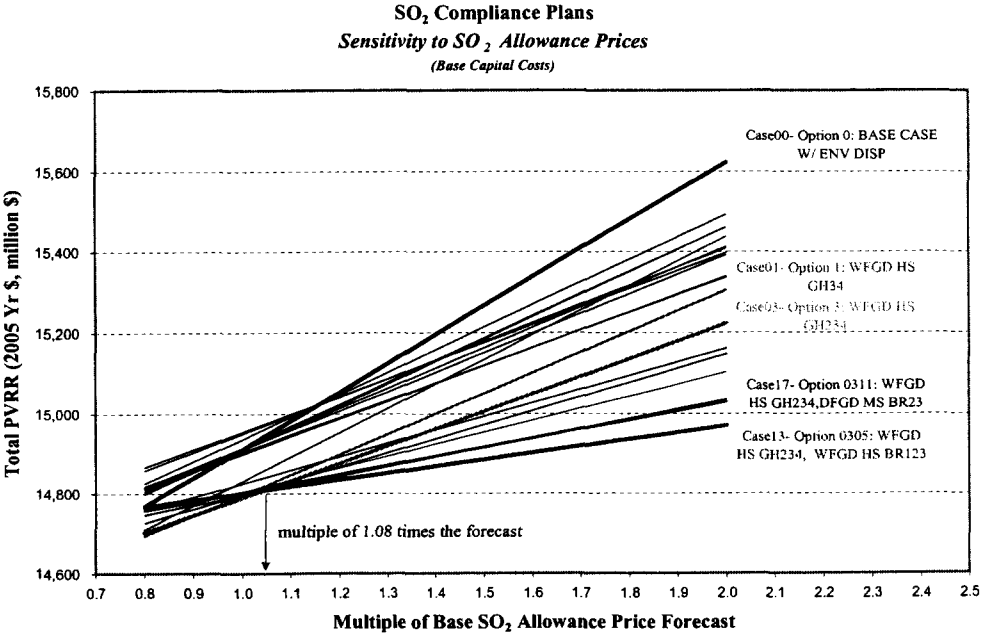
(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case00: BASE CASE

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	783,119	25,444	14,981,946	Base	2007	2010	2,721,838
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	185,859	813,000	14,817,618	(164,328)	2008	2010	692,249
Case14- Option 0105: WFGD HS GH34,WFGD HS BR123	13,751,217	142,628	264,791	660,531	14,819,167	(162,780)	2008	2011	961,930
Case17- Option 0311: WFGD HS GH234,DFGD MS BR23	13,736,871	144,055	248,817	695,868	14,825,611	(156,335)	2008	2010	897,689
Case16- Option 0109: WFGD HS GH34,DFGD MS BR3	13,805,543	139,891	385,740	500,683	14,831,857	(150,089)	2008	2011	1,374,627
Case03- Option 3: WFGD HS GH234	13,674,349	144,422	476,406	537,313	14,832,490	(149,457)	2008	2010	1,688,511
Case18- Option 0111: WFGD HS GH34,DFGD MS BR23	13,822,713	139,862	328,235	543,399	14,834,209	(147,737)	2008	2011	1,171,988
Case01- Option 1: WFGD HS GH34	13,761,762	140,471	559,605	384,847	14,846,684	(135,262)	2008	2011	1,974,944
Case15- Option 0205: WFGD HS GH3,WFGD HS BR123	13,873,066	147,754	369,867	468,179	14,858,866	(123,080)	2008	2010	1,313,173
Case02- Option 2: WFGD HS GH3	13,889,994	143,198	666,190	192,492	14,891,874	(90,072)	2008	2010	2,334,147
Case05- Option 5: WFGD HS BR123	14,004,995	152,415	484,167	301,129	14,942,705	(39,241)	2007	2010	1,692,501
Case04- Option 4: WFGD HS BR123x	14,005,792	152,434	475,633	313,194	14,947,053	(34,893)	2007	2010	1,667,779
Case12- Option 12: DFGD MS BR23x	14,088,874	148,867	529,615	190,741	14,958,097	(23,849)	2007	2010	1,853,233
Case11- Option 11: DFGD MS BR23	14,083,383	148,748	547,482	183,997	14,963,609	(18,337)	2007	2010	1,905,654
Case09- Option 9: DFGD MS BR3	14,067,907	147,929	606,583	141,281	14,963,700	(18,246)	2007	2010	2,113,444
Case08- Option 8: DFGD MS BR3x	14,072,240	147,942	601,336	146,909	14,968,427	(13,519)	2007	2010	2,098,295
Case10- Option 10: FS E. COMP BR123	14,141,223	146,228	610,837	93,310	14,991,598	9,652	2007	2010	2,129,732
Case07- Option 7: DFGD MS BR123	14,093,924	149,325	504,165	247,694	14,995,108	13,162	2007	2010	1,755,243
Case06- Option 6: DFGD MS BR123x	14,099,335	149,456	487,023	262,550	14,998,364	16,418	2007	2010	1,706,944

The impact of market prices going up by only 10% over those used in this analysis is significant. Case13, which includes the scrubbing of both Ghent and Brown, is the least cost strategy and is $164.3 million less than the Base Case.

The following figure graphically relates the sensitivity of each Case to the market price of SO_2 allowances. It is apparent that Case13 is the least cost plan for mitigating upward movements in the SO_2 allowance market. Note that the transition from Case03 being the less cost under the base market price assumptions to Case13 being the least cost case occurs when market prices exceed those used in this analysis by only 8%.



Sensitivity: Capital Cost

Similar to the above sensitivity, a capital cost decrease of 10% was also evaluated. The results of that sensitivity are tabulated below.

Case Summary

(Assuming: Capital Costs less 10%, Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case00: BASE CASE

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	711,926	22,898	14,908,208	Base	2007	2010	2,721,838
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	168,963	731,699	14,719,421	(188,786)	2008	2010	692,249
Case14- Option 0105: WFGD HS GH34,WFGD HS BR123	13,751,217	142,628	240,719	594,479	14,729,043	(179,165)	2008	2011	961,930
Case17- Option 0311: WFGD HS GH234,DFGD MS BR23	13,736,871	144,055	226,198	626,279	14,733,403	(174,805)	2008	2010	897,689
Case03- Option 3: WFGD HS GH234	13,674,349	144,422	433,097	483,580	14,735,447	(172,761)	2008	2010	1,688,511
Case16- Option 0109: WFGD HS GH34,DFGD MS BR3	13,805,543	139,891	350,673	450,613	14,746,720	(161,488)	2008	2011	1,374,627
Case18- Option 0111: WFGD HS GH34,DFGD MS BR23	13,822,713	139,862	298,395	489,058	14,750,029	(158,179)	2008	2011	1,171,988
Case01- Option 1: WFGD HS GH34	13,761,762	140,471	508,732	346,360	14,757,324	(150,883)	2008	2011	1,974,944
Case15- Option 0205: WFGD HS GH3,WFGD HS BR123	13,873,066	147,754	336,243	421,360	14,778,423	(129,785)	2008	2010	1,313,173
Case02- Option 2: WFGD HS GH3	13,889,994	143,198	605,628	173,244	14,812,064	(96,144)	2008	2010	2,334,147
Case05- Option 5: WFGD HS BR123	14,004,995	152,415	440,152	271,016	14,868,577	(39,631)	2007	2010	1,692,501
Case04- Option 4: WFGD HS BR123x	14,005,792	152,434	432,394	281,875	14,872,495	(35,713)	2007	2010	1,667,779
Case12- Option 12: DFGD MS BR23x	14,088,874	148,867	481,468	171,663	14,890,872	(17,335)	2007	2010	1,853,233
Case09- Option 9: DFGD MS BR3	14,067,907	147,929	551,439	127,156	14,894,431	(13,777)	2007	2010	2,113,444
Case11- Option 11: DFGD MS BR23	14,083,383	148,748	497,711	165,595	14,895,436	(12,771)	2007	2010	1,905,654
Case08- Option 8: DFGD MS BR3x	14,072,240	147,942	546,669	132,218	14,899,069	(9,139)	2007	2010	2,098,295
Case07- Option 7: DFGD MS BR123	14,093,924	149,325	458,332	222,922	14,924,503	16,295	2007	2010	1,755,243
Case10- Option 10: FS E. COMP BR123	14,141,223	146,228	555,307	83,977	14,926,735	18,527	2007	2010	2,129,732
Case06- Option 6: DFGD MS BR123x	14,099,335	149,456	442,748	236,298	14,927,837	19,629	2007	2010	1,706,944

Sensitivity: Market Price and Capital Cost

One final sensitivity combines both the market and the capital cost sensitivities.

Case Summary

(Assuming: Capital Costs less 10%, 1.10 x Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case00: BASE CASE

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	783,119	22,898	14,979,400	Base	2007	2010	2,721,838
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	185,859	731,699	14,736,317	(243,083)	2008	2010	692,249
Case14- Option 0105: WFGD HS GH34,WFGD HS BR123	13,751,217	142,628	264,791	594,479	14,753,115	(226,286)	2008	2011	961,930
Case17- Option 0311: WFGD HS GH234,DFGD MS BR23	13,736,871	144,055	248,817	626,279	14,756,022	(223,378)	2008	2010	897,689
Case03- Option 3: WFGD HS GH234	13,674,349	144,422	476,406	483,580	14,778,757	(200,644)	2008	2010	1,688,511
Case18- Option 0111: WFGD HS GH34,DFGD MS BR23	13,822,713	139,862	328,235	489,058	14,779,868	(199,532)	2008	2011	1,171,988
Case16- Option 0109: WFGD HS GH34,DFGD MS BR3	13,805,543	139,891	385,740	450,613	14,781,787	(197,613)	2008	2011	1,374,627
Case01- Option 1: WFGD HS GH34	13,761,762	140,471	559,605	346,360	14,808,197	(171,203)	2008	2011	1,974,944
Case15- Option 0205: WFGD HS GH3,WFGD HS BR123	13,873,066	147,754	369,867	421,360	14,812,047	(167,353)	2008	2010	1,313,173
Case02- Option 2: WFGD HS GH3	13,889,994	143,198	666,190	173,244	14,872,626	(106,774)	2008	2010	2,334,147
Case05- Option 5: WFGD HS BR123	14,004,995	152,415	484,167	271,016	14,912,592	(66,808)	2007	2010	1,692,501
Case04- Option 4: WFGD HS BR123x	14,005,792	152,434	475,633	281,875	14,915,734	(63,666)	2007	2010	1,667,779
Case12- Option 12: DFGD MS BR23x	14,088,874	148,867	529,615	171,663	14,939,019	(40,381)	2007	2010	1,853,233
Case11- Option 11: DFGD MS BR23	14,083,383	148,748	547,482	165,595	14,945,207	(34,193)	2007	2010	1,905,654
Case09- Option 9: DFGD MS BR3	14,067,907	147,929	606,583	127,156	14,949,575	(29,825)	2007	2010	2,113,444
Case08- Option 8: DFGD MS BR3x	14,072,240	147,942	601,336	132,218	14,953,736	(25,664)	2007	2010	2,098,295
Case07- Option 7: DFGD MS BR123	14,093,924	149,325	504,165	222,922	14,970,336	(9,064)	2007	2010	1,755,243
Case06- Option 6: DFGD MS BR123x	14,099,335	149,456	487,023	236,298	14,972,112	(7,288)	2007	2010	1,706,944
Case10- Option 10: FS E. COMP BR123	14,141,223	146,228	610,837	83,977	14,982,265	2,865	2007	2010	2,129,732

Discussion of 100% Powder River Basin Fuel

Fuel switching to 100% Powder River Basin (PRB) fuel was not considered a viable SO_2 compliance alternative for the following reasons. See **Appendix 9** for a more thorough discussion of the impacts of PRB fuel.

1. *Insufficient SO_2 Reduction:* Switching to PRB coal is not an SO_2 compliance option, it is a fuel choice. Negligible reductions in SO_2 emissions result from switching to PRB coal. To control SO_2, FGD systems would still be required even after converting to burn PRB fuel. As an example, consider Ghent 2-4 currently burning 1.2 # SO_2/mmbtu fuel. Switching to PRB (a 0.7-0.9# SO_2/mmbtu fuel) would reduce emissions by only 5,000 tons annually on each

unit while an FGD would reduce SO_2 emissions by over 18,000 tons annually per unit. Ultimately, the Companies would still be exposed to a large cost (estimated at over $454 million) associated with the purchasing of 1,754,000 allowances if both Ghent and Brown were fuel switched to PRB coal.

2. *Fuel Flexibility:* Fuel switching to PRB coal would reduce flexibility in subsequent fuel sourcing options while providing no opportunity to consume coal mined in Kentucky. FGD systems will be able to accommodate any Eastern bituminous fuel and would retain the option to blend PRB fuel in the future.
3. *Fuel Delivery Issues:* Converting to burn PRB coal would force dependence on fuel transported thousands of miles on a rail system currently experiencing constraints on shipping coal from the PRB to existing PRB coal users (in the east). This is in contrast to the hundreds of miles current fuel deliveries travel from multiple locations including Kentucky, southern Indiana, West Virginia and western Pennsylvania.
4. *Fuel Inventory Issues:* To compensate for the transportation risk and insure adequate supply, coal inventory levels would need to increase.
5. *Fuel Handling Issues:* An additional 35% of coal by volume/weight (above that required to mitigate transportation risk) would have to be contracted, delivered and unloaded to compensate for the lower heating value of PRB fuel.
6. *Plant Logistics:* Coal yard layout for belt systems, transfer points and stacker/reclaim areas would undergo major revisions at a significant expense.
7. *Future Environmental Compliance:* Retrofitting a unit to 100% PRB is not self-compliant and would be poorly positioned to address the challenges emanating from the CAIR in 2010.

In light of the above limitations, however, options for converting Ghent 2-4 and Brown 1-3 to burn 100% PRB coal were explored. Cost estimates for two PRB coal alternatives were determined and evaluated. As with Options 1 through 12, more detailed information on the PRB alternatives may be found within the Appendices.

100% PRB Fuel Alternatives

			In-Service Date				Total Capital
Option	Long Description	Short Description	Unit 1	Unit 2	Unit 3	Unit 4	Cash Flow ($000)
13	Fuel Switch Ghent Units 2-4 to PRB Coal	FS PRB GH234		May-08	May-07	Dec-07	$400,903
14	Fuel Switch E.W. Brown Units 1-3 to PRB Coal	FS PRB BR123	Dec-08	Dec-08	Dec-08		$200,168

Notes: (1) "Total Capital Cash Flow ($000)" represents the sum of annual construction costs.
(2) Costs exclude any E.W. Brown ash pond related expenses.

As with the non-PRB alternatives, incremental ash pond expenses would be expected at Brown if the units were converted to burn 100% PRB coal. The cost would be dependant on the volume of byproduct expected to be produced. The following table shows the projected cost (present value) of the ash pond work necessary at Brown under several different SO_2 control plans at Brown. The total capital costs of the PRB alternatives above were adjusted by the appropriate present value cost of the necessary Brown ash pond work.

Brown Option		Incremental Capital PVRR Cost ($000)		Total Capital PVRR Cost ($000)
Option 0- Base Brown Ash Pond Cost				$19.3
Options 13- Ash Pond est with Brown123 100% PRB	Base cost +	$18.2	=	$37.5

We can now define the following three Cases and evaluated each against the sensitivities previously established.

Case19 (Option 13): Fuel switches Ghent 2 through 4 to PRB fuel in May '08, May '07 and Dec '07, respectively. Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case20 (Option 14): Fuel switches Brown 1 through 3 to PRB fuel in Dec '08. Allowances are purchased on an as-needed basis and environmental dispatch continues.

Case21 (Option 13 + Option 14): Fuel switches Ghent 2 through 4 and Brown 1 through 3 to PRB coal. Ghent 2-4 in May '08, May '07 and Dec '07 respectively and Brown 1-3 all are converted in Dec '08. Allowances are purchased on an as-needed basis and environmental dispatch continues.

The tables below summarize the results of the PRB sensitivity.

Case Summary- PRB Comparison

(Assuming: Base Capital Costs, Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case13- Option 03+05: WFGD HS GH234, WFGD HS BR123

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	168,963	813,000	14,800,722	Base	2008	2010	692,249
Case19- Option 13: FS PRB GH234	13,531,875	118,048	639,280	498,319	14,787,523	(13,200)	2007	2013	2,453,369
Case21- Option 1314: FS PRB GH234,FS PRB BR123	13,552,040	89,523	454,766	723,444	14,819,773	19,051	2007	2015	1,754,737
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	711,926	25,444	14,910,754	110,031	2007	2010	2,721,838
Case20- Option 14: FS PRB BR123	14,032,395	119,743	523,986	250,567	14,926,691	125,969	2007	2012	2,011,221

Case Summary- PRB Comparison

(Assuming: Base Capital Costs, 1.10 x Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case13- Option 03+05: WFGD HS GH234, WFGD HS BR123

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	185,859	813,000	14,817,618	Base	2008	2010	692,249
Case19- Option 13: FS PRB GH234	13,531,875	118,048	703,208	498,319	14,851,451	33,832	2007	2013	2,453,369
Case21- Option 1314: FS PRB GH234,FS PRB BR123	13,552,040	89,523	500,242	723,444	14,865,249	47,631	2007	2015	1,754,737
Case20- Option 14: FS PRB BR123	14,032,395	119,743	576,384	250,567	14,979,090	161,471	2007	2012	2,011,221
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	783,119	25,444	14,981,946	164,328	2007	2010	2,721,838

Case Summary- PRB Comparison

(Assuming: Capital Costs less 10%, Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case13- Option 03+05: WFGD HS GH234, WFGD HS BR123

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	168,963	731,699	14,719,421	Base	2008	2010	692,249
Case19- Option 13: FS PRB GH234	13,531,875	118,048	639,280	448,489	14,737,693	18,271	2007	2013	2,453,369
Case21- Option 1314: FS PRB GH234,FS PRB BR123	13,552,040	89,523	454,766	651,099	14,747,428	28,007	2007	2015	1,754,737
Case20- Option 14: FS PRB BR123	14,032,395	119,743	523,986	225,511	14,901,635	182,214	2007	2012	2,011,221
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	711,926	22,898	14,908,208	188,786	2007	2010	2,721,838

Case Summary- PRB Comparison

(Assuming: Capital Costs less 10%, 1.10 x Base SO_2 Forward Price Forecast)

(All Costs in 2005 PVRR $1000)

ALL CASES COMPARED TO Case13- Option 03+05: WFGD HS GH234, WFGD HS BR123

Case	Production Cost	NOx Allowance Cost	SO2 Allowance Cost	Capital	Total	Incremental over Base	First Year of SO2 Allowance Purchase	First Year of NOx Allowance Purchase	Total SO2 Allowances Purchased
Case13- Option 0305: WFGD HS GH234, WFGD HS BR123	13,671,906	146,853	185,859	731,699	14,736,317	Base	2008	2010	692,249
Case21- Option 1314: FS PRB GH234,FS PRB BR123	13,552,040	89,523	500,242	651,099	14,792,904	56,587	2007	2015	1,754,737
Case19- Option 13: FS PRB GH234	13,531,875	118,048	703,208	448,489	14,801,621	65,303	2007	2013	2,453,369
Case20- Option 14: FS PRB BR123	14,032,395	119,743	576,384	225,511	14,954,034	217,716	2007	2012	2,011,221
Case00- Option 0: BASE CASE W/ ENV DISP	14,027,565	145,818	783,119	22,898	14,979,400	243,083	2007	2010	2,721,838

Implementation of the PRB alternative is not the most reasonable least cost approach to SO_2 compliance because it does not provide significant benefits in the way of SO_2 reductions. In the first PRB Comparison table (above) the PRB alternative is marginally less expensive ($13.2 million NPVRR) than the construction of wet scrubbing of Ghent and Brown while only minimally decreasing the volume of SO_2 allowance purchases. Significant SO_2 market exposure remains under the PRB coal option. Furthermore, a small increase (+10%) in the SO_2 market price forecast or decrease (-10%) in the capital costs of the scrubbers would not favor the PRB alternative as can be seen in the 2nd through 4th PRB Comparison Tables (above).

Discussion of Fuel Gap

The addition of the scrubbers at Ghent and Brown are economic, in part, due to the fuel cost savings associated with scrubber operation. The tables below show the fuel savings between the forecasted price of the current fuel and the forecasted price of the fuel burned at each location once scrubbed. This difference or "fuel gap" varies by year. For example, in 2007, Eastern compliance coal at Ghent is 66 cents/mmBtu more expensive than high sulfur fuel. Scrubbing the units with the fuel gaps as shown (the base gap) reduce the PVRR associated with SO_2 compliance by $121.6 million at Ghent ($12.1 million at Brown) over the BaseCase.

Ghent/Brown Fuel Gap Summary
(cents/mmBtu)

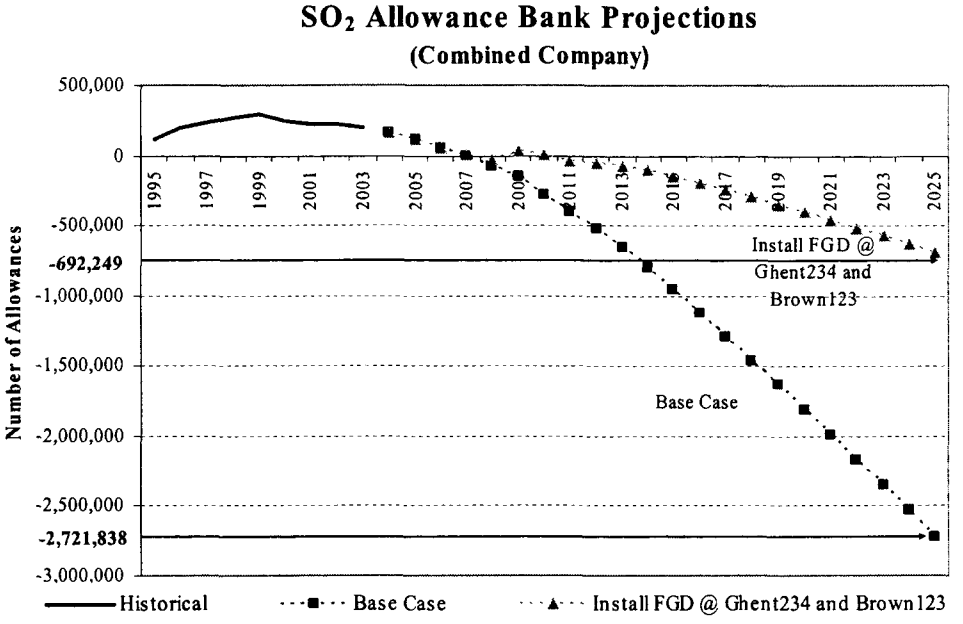
Year	Ghent Base Gap*	Brown Base Gap**
2007	66	No FGD
2008	53	No FGD
2009	51	11
2010	55	11
2011	56	11
2012	58	15
2013	59	23
2014	60	27
2015	61	28
2016	62	31
2017	64	33
2018	65	36
2019	66	36
2020	67	38
2021	69	42
2022	70	43
2023	72	49
2024	73	58
Delta PVRR ($000)	-$121,574	-$12,064

*Ghent Gap = Eastern Compliance Coal - High Sulfur Coal
**Brown Gap = Medium Sulfur Coal - High Sulfur Coal

The required fuel gap to allow the scrubbing alternative to be economically equivalent to the purchasing of SO_2 allowances alternative can be found through linear extrapolation. See **Appendix 10** for details surrounding this process. Results indicate that at Ghent, the gap between Eastern compliance coal and high sulfur coal would have to be reduced by approximately 17 cents/mmBtu each year, or 26% of the average annual forecasted gap. At Brown, the gap between medium sulfur coal and high sulfur coal would have to be reduced by approximately 4 cents/mmBtu, or 12% of the average annual forecasted gap. It is important to remember that significant SO_2 market exposure would remain if the breakeven fuel gap was realized and FGD systems were not added at both Brown and Ghent. Also, the construction of wet FGD systems would not limit the ability of the units to burn lower sulfur fuels should the fuel gap dissipate.

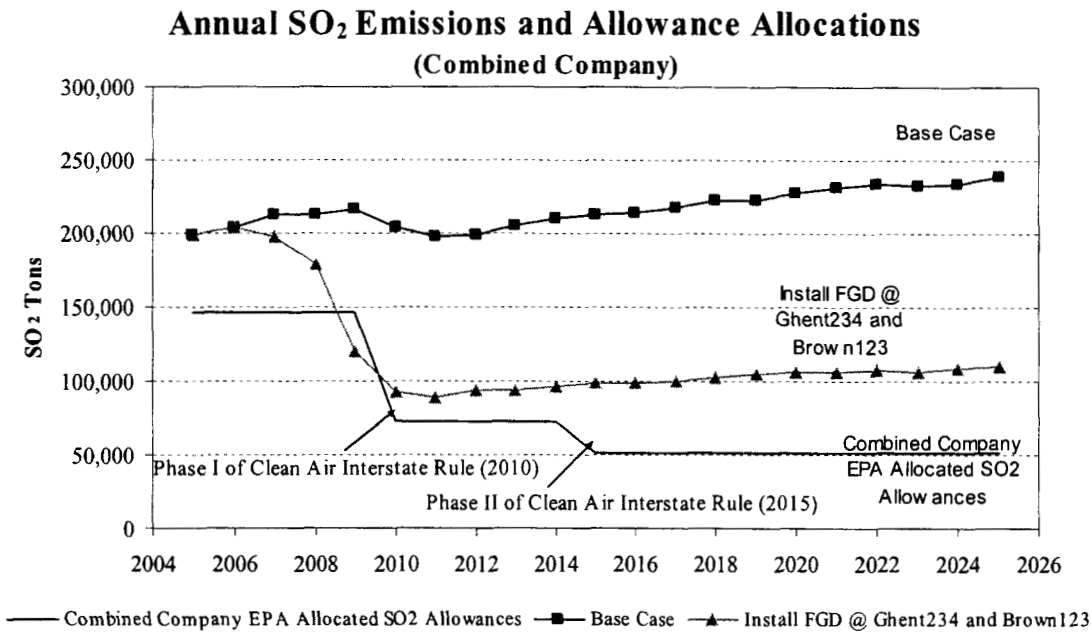
Conclusions and Recommendation

The Companies face a significant SO_2 allowance shortfall totaling over 2.7 million tons for the period 2005-2025. While wet FGD technology allows 2.1 million tons of allowance shortfall to be economically mitigated, future allowance purchases of 690,000 are still expected.



Construction of wet FGD systems at Ghent and at Brown and the simultaneous conversion of these units to high sulfur coal provides the most reasonable least cost plan with the following benefits over the 20 year analysis period:

(1) Decreases the cost of SO_2 compliance by more than $110 million
(2) Significantly limits exposure to the volatile SO_2 allowance market by reducing the anticipated allowance shortfall to approximately 690,000 tons
(3) Increases fuel procurement flexibility
(4) Positions the Companies for the SO_2 reduction requirements associated with the CAIR and future regulations targeting fine particulates and mercury
(5) Delays the depletion of the Companies' SO_2 allowance bank.

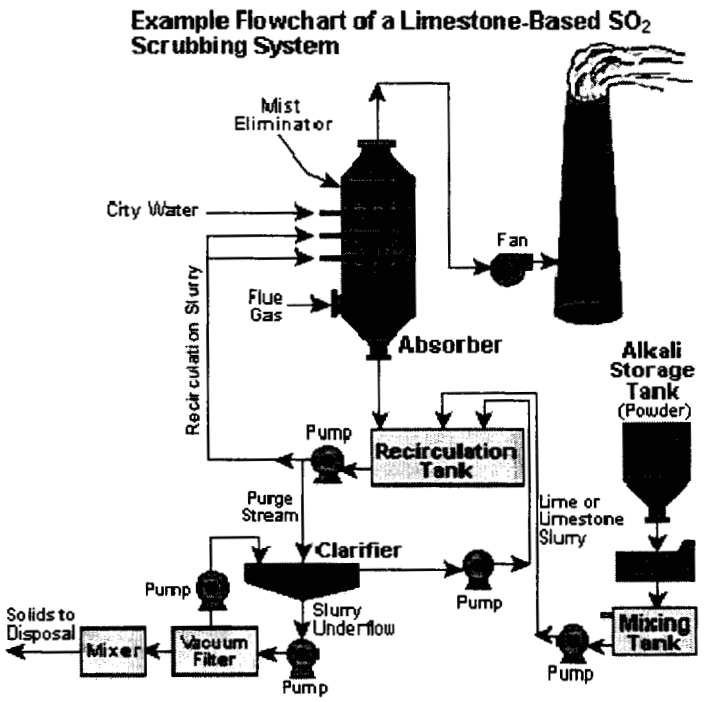


It is recommended that the Companies proceed with the construction/implementation of Case13. Construct wet FGD systems at Ghent 2, 3 and 4 (May '08, May '07, May '09) and Brown 1, 2 and 3 (May '09), purchase allowances on an as needed basis and continue the practice of environmental dispatching.

Appendix 1

Wet Scrubbing

The wet scrubbing process is applicable to low, medium or high sulfur coals and typically achieves relatively high removal efficiency for SO_2. Limestone is the alkali most often used to react with the dissolved sulfur dioxide. Limestone slurry is re-circulated from a tank and is continually sprayed into an "absorber module" with the SO_2 laden gas stream. The direction of spray is counter to the direction of the flue gas flow. The flue gas enters the absorber from the boiler and exits to the chimney via "inlet" and "outlet" ductwork. The chemistry of the re-circulating limestone slurry must be carefully controlled in order to maintain the desired sulfur dioxide removal efficiency. Removal rates of 98% are possible in newly constructed wet FGD systems and there is often a high likelihood of beneficial re-use of the byproduct of the scrubbing process.



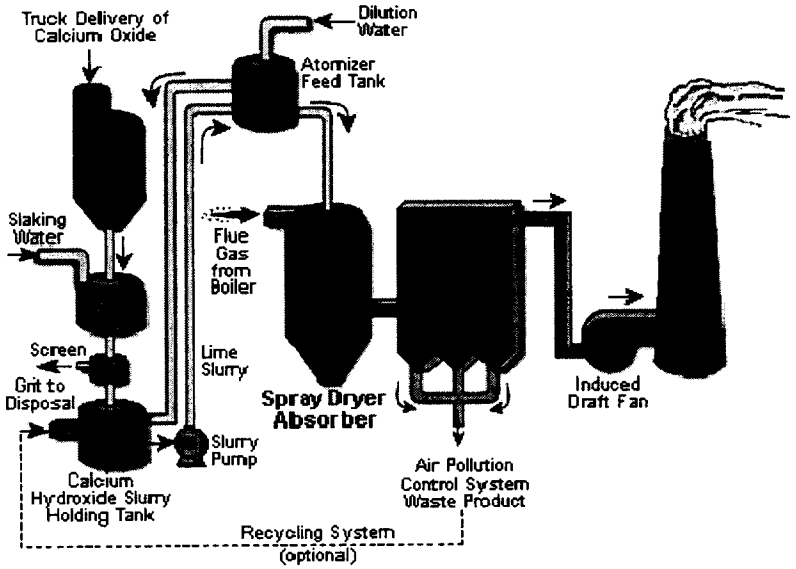
Source: www.epa.gov

Dry Scrubbing

While wet FGD technology can be applied to a wide variety of fuels, the dry scrubbing process is applicable to low to medium sulfur coals. The term "dry scrubber" refers to the condition of the dried particles approaching the particulate control system. Fabric filters or electrostatic precipitators are often used for high efficiency particulate control. The system shown below has a fabric filter.

Dry scrubbers generate a waste stream that is dry. Spray-dryer-type absorption systems operate at higher gas temperatures than wet scrubbers and are less effective for the removal of other pollutants in the gas stream such as condensable particulate matter (PM2.5). This makes them less flexible for addressing future environmental challenges.

Spray-Dryer-Type Dry Scrubber



Source: www.epa.gov

Appendix 2

Detailed Cost and Operational Info on SO_2 Compliance Alternatives

Option	Short Description	Affected Units						
		Unit 1	Unit 2	Unit 3	Unit 4			
1	**WFGD HS GH34**							
	Control Tech Installed Year			May-07	May-08			
	SO2 Removal (%)			98%	98%			
	Fuel Sulfur Content (#SO2/mmBtu)			6.10	6.10			
	SO2 Emisson Rate (#SO2/mmBtu)			0.122	0.122			
	Variable O&M ($/MWH), nominal yr $			0.172	0.175			
	Derate, MW			15	15			
	Fixed O&M ($000/yr), nominal yr $			$1,804	$1,840			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)	$68,964	$115,691	$81,209	$23,364	$0	$0	$289,229
2	**WFGD HS GH3**							
	Control Tech Installed Year			May-07				
	SO2 Removal (%)			98%				
	Fuel Sulfur Content (#SO2/mmBtu)			6.10				
	SO2 Emisson Rate (#SO2/mmBtu)			0.122				
	Variable O&M ($/MWH), nominal yr $			0.172				
	Derate, MW			15				
	Fixed O&M ($000/yr), nominal yr $			$2,122				
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)	$52,303	$52,303	$26,151	$0	$0	$0	$130,757
3	**WFGD HS GH234**							
	Control Tech Installed Year			May-08	May-07	May-09		
	SO2 Removal (%)			98%	98%	98%		
	Fuel Sulfur Content (#SO2/mmBtu)			6.10	6.10	6.10		
	SO2 Emisson Rate (#SO2/mmBtu)			0.122	0.122	0.122		
	Variable O&M ($/MWH), nominal yr $			0.175	0.172	0.179		
	Derate, MW			15	15	15		
	Fixed O&M ($000/yr), nominal yr $			$1,732	$1,698	$1,767		
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$72,417	$121,841	$133,689	$72,769	$24,028	$0	$424,743
4	**WFGD HS BR123x**							
	Control Tech Installed Year		Dec-08	Dec-08	Dec-08			
	SO2 Removal (%)		98%	98%	98%			
	Fuel Sulfur Content (#SO2/mmBtu)		6.36	6.36	6.36			
	SO2 Emisson Rate (#SO2/mmBtu)		0.127	0.127	0.127			
	Variable O&M ($/MWH), nominal yr $		0.293	0.293	0.293			
	Derate, MW		7	7	7			
	Fixed O&M ($000/yr), nominal yr $		$1,135	$1,135	$1,135			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$90,947	$90,947	$45,474	$0	$0	$227,368
5	**WFGD HS BR123**							
	Control Tech Installed Year		May-09	May-09	May-09			
	SO2 Removal (%)		98%	98%	98%			
	Fuel Sulfur Content (#SO2/mmBtu)		6.36	6.36	6.36			
	SO2 Emisson Rate (#SO2/mmBtu)		0.127	0.127	0.127			
	Variable O&M ($/MWH), nominal yr $		0.298	0.298	0.298			
	Derate, MW		7	7	7			
	Fixed O&M ($000/yr), nominal yr $		$1,158	$1,158	$1,158			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$0	$93,676	$93,676	$46,838	$0	$234,189

Detailed Cost and Operational Info on SO_2 Compliance Alternatives (cont.)

Option	Short Description		Affected Units Unit 1	Unit 2	Unit 3	Unit 4		
6	**DFGD MS BR123x**							
	Control Tech Installed Year		Dec-08	Dec-08	Dec-08			
	SO2 Removal (%)		93%	93%	93%			
	Fuel Sulfur Content (#SO2/mmBtu)		2.75	2.75	2.75			
	SO2 Emisson Rate (#SO2/mmBtu)		0.193	0.193	0.193			
	Variable O&M ($/MWH), nominal yr $		1.059	1.059	1.059			
	Derate, MW		1	1	4			
	Fixed O&M ($000/yr), nominal yr $		$790	$790	$790			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$79,155	$79,155	$39,577	$0	$0	$197,887
7	**DFGD MS BR123**							
	Control Tech Installed Year		May-10	May-10	May-09			
	SO2 Removal (%)		93%	93%	93%			
	Fuel Sulfur Content (#SO2/mmBtu)		2.75	2.75	2.75			
	SO2 Emisson Rate (#SO2/mmBtu)		0.193	0.193	0.193			
	Variable O&M ($/MWH), nominal yr $		1.102	1.102	1.080			
	Derate, MW		1	1	4			
	Fixed O&M ($000/yr), nominal yr $		$822	$822	$806			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$0	$44,587	$82,528	$60,234	$18,970	$206,319
8	**DFGD MS BR3x**							
	Control Tech Installed Year				Dec-08			
	SO2 Removal (%)				93%			
	Fuel Sulfur Content (#SO2/mmBtu)				2.75			
	SO2 Emisson Rate (#SO2/mmBtu)				0.193			
	Variable O&M ($/MWH), nominal yr $				1.059			
	Derate, MW				4			
	Fixed O&M ($000/yr), nominal yr $				$1,396			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$41,601	$41,601	$20,800	$0	$0	$104,002
9	**DFGD MS BR3**							
	Control Tech Installed Year				May-09			
	SO2 Removal (%)				93%			
	Fuel Sulfur Content (#SO2/mmBtu)				2.75			
	SO2 Emisson Rate (#SO2/mmBtu)				0.193			
	Variable O&M ($/MWH), nominal yr $				1.080			
	Derate, MW				4			
	Fixed O&M ($000/yr), nominal yr $				$1,424			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$0	$42,810	$42,810	$21,405	$0	$107,024
10	**FS E.COMP BR123**							
	Control Tech Installed Year		Dec-07	Dec-09	Dec-08			
	SO2 Removal (%)		0%	0%	0%			
	Fuel Sulfur Content (#SO2/mmBtu)		1.20	1.20	1.20			
	SO2 Emisson Rate (#SO2/mmBtu)		1.200	1.200	1.200			
	Variable O&M ($/MWH), nominal yr $		0.000	0.000	0.000			
	Derate, MW		0	0	0			
	Fixed O&M ($000/yr), nominal yr $		$0	$0	$0			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$3,258	$10,921	$22,543	$11,776	$10,402	$0	$58,901

Detailed Cost and Operational Info on SO_2 Compliance Alternatives (cont.)

Option	Short Description	Affected Units Unit 1	Unit 2	Unit 3	Unit 4			
11	**DFGD MS BR23**							
	Control Tech Installed Year		Dec-09	Dec-09				
	SO2 Removal (%)		93%	93%				
	Fuel Sulfur Content (#SO2/mmBtu)		2.75	2.75				
	SO2 Emisson Rate (#SO2/mmBtu)		0.193	0.193				
	Variable O&M ($/MWH), nominal yr $		1.080	1.080				
	Derate, MW		1	4				
	Fixed O&M ($000/yr), nominal yr $		$1,043	$1,043				
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$0	$57,130	$57,130	$28,565	$0	$142,826
12	**DFGD MS BR23x**							
	Control Tech Installed Year		Dec-08	Dec-08				
	SO2 Removal (%)		93%	93%				
	Fuel Sulfur Content (#SO2/mmBtu)		2.75	2.75				
	SO2 Emisson Rate (#SO2/mmBtu)		0.193	0.193				
	Variable O&M ($/MWH), nominal yr $		1.059	1.059				
	Derate, MW		1	4				
	Fixed O&M ($000/yr), nominal yr $		$1,023	$1,023				
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$0	$55,517	$55,517	$27,758	$0	$0	$138,792
13	**FS PRB GH234**							
	Control Tech Installed Year		May-08	May-07	Dec-07			
	SO2 Removal (%)		0%	0%	0%			
	Fuel Sulfur Content (#SO2/mmBtu)		0.90	0.90	0.90			
	SO2 Emisson Rate (#SO2/mmBtu)		0.900	0.900	0.900			
	Variable O&M ($/MWH), nominal yr $		0.000	0.000	0.000			
	Derate, MW*		8	8	8			
	Fixed O&M ($000/yr), nominal yr $		$1,353	$1,327	$1,327			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$30,510	$101,110	$205,854	$63,429	$0	$0	$400,903
14	**FS PRB BR123**							
	Control Tech Installed Year		Dec-08	Dec-08	Dec-08			
	SO2 Removal (%)		0%	0%	0%			
	Fuel Sulfur Content (#SO2/mmBtu)		0.90	0.90	0.90			
	SO2 Emisson Rate (#SO2/mmBtu)		0.900	0.900	0.900			
	Variable O&M ($/MWH), nominal yr $		0.000	0.000	0.000			
	Derate, MW*		1	6	28			
	Fixed O&M ($000/yr), nominal yr $		$941	$941	$941			
		2005	2006	2007	2008	2009	2010	Total
	Cash Flow ($000)**	$10,008	$20,017	$50,042	$116,038	$4,063	$0	$200,168

Notes:
* PRB fuel increases heat rate (1% @ Ghent, 6% @ Brown) and decreases availability at full load.
** The cash flows for these alternatives at E.W. Brown exclude ash pond related expenses.

Appendix 3

Fixed and Variable O&M and Derate Estimates

Updated 10/25/2004

All costs are in 2004 yr $

Variable O&M esc rate: 2.00%
Fixed O&M esc rate: 2.00%

GHENT - Wet FGD install

Variable:	
Reactant Prep, $/ton	2.7
Limestone Use Rate, tons/MWH	0.06
Reactant Prep, $/MWH	0.162
Disposal cost, $/MWH	
Total Variable cost, $/MWH	**0.162**
Fixed:	
Additional Unit O&M Cost, $000	$4,200
Dewatering Plant, $000	$600
Total Fixed O&M, $000 (for 3 WFGDs)	$4,800
Fixed O&M, $000 each WFGD (given 3 WFGDs)	**$1,600**
Fixed O&M, $000 each WFGD (given 2 WFGDs)	**$1,700**
Fixed O&M, $000 (given 1 WFGD)	**$2,000**
Aux Power Use, MW (each WFGD)	**15**

BROWN - WET FGD install

Variable:		
Reactant Prep, $/ton	2.7	
Limestone Use Rate, tons/MWH	0.06	
Reactant Prep, $/MWH	0.162	
Disposal cost, $/MWH	$0.11	not inclusive of ash
Total Variable cost, $/MWH	**0.270**	
Fixed:		
Additional Unit O&M Cost, $000	$2,846	based on cost for 3 units
Dewatering Plant, $000	$300	
Total Fixed O&M, $000 (for 3 WFGDs)	$3,146	
Fixed O&M, $000 each WFGD (given 3 WFGDs)	**$1,049**	
Aux Power Use, MW (each WFGD)	**7**	

GHENT - PRB

Variable:	
Total Variable cost, $/MWH	0
Fixed:	
Total Fixed O&M, $000 (convert 3 units)	$3,750
Fixed O&M, $000 each convert (given 3 conversions)	**$1,250**
Fixed O&M, $000 each convert (given 2 conversions)	**$1,550**
Aux Power Use, MW (each conversion)	8
Milling/Coal thru-put detate, MW	0
Total Derate (MW), each conversion**	**8**
Heatrate Impact (%), each boiler	**1%**

* PRB @ Ghent eliminates spare mill. As a result it is estimated that unit generation @ Ghent will decrease by 23040 MWh.

Impact of loss of single mill (MW)	80
Duration of mill loss (hrs)	24
Frequency of event (x /month)	1
MWh Reduction (Annual), each unit	23,040

BROWN - PRB

Variable:			
Total Variable cost, $/MWH	0		
Fixed:			
Total Fixed O&M, $000 (convert 3 units)	$2,608		
Fixed O&M, $000 each convert (given 3 conversions)	**$869**		
	Brown 1	**Brown 2**	**Brown 3**
Aux Power Use, MW	1	3	8
Milling/Coal thru-put detate, MW	0	3	20
Total Derate (MW)	**1**	**6**	**28**
Heatrate Impact (%), each boiler	**6%**	**6%**	**1%**

BROWN - DRY FGD

Variable:	**Brown 123**	**Brown 3**	**Brown 12**	**Brown 23**
Dry Lime Cost ($/ton)	$45	$45	$45	$45
Lime Use Rate (tons/MWH)	0.021	0.021	0.021	0.021
Reactant Prep $/MWH	$0.9450	$0.9450	$0.9450	$0.9450
Disposal cost, $/MWH	$0.0336	$0.0336	$0.0336	$0.0336
Total Variable cost, $/MWH	**$0.9786**	**$0.9786**	**$0.9786**	**$0.9786**
Fixed:				
Additional Unit O&M Cost, $000	$1,900	$1,000	$900	$1,600
Reactant Prep O&M Cost, $000	$90	$90	$90	$90
Fixation Plant O&M	$200	$200	$200	$200
Fixed O&M, $000	$2,190	$1,290	$1,190	$1,890
Fixed O&M, $000 each Unit	**$730**	**$1,290**	**$595**	**$945**
Aux Power Use, MW				
Brown 1	1		1	
Brown 2	1		1	1
Brown 3	4	4		4

Appendix 4

	Option Name	Detailed Cash Flow ($ x 1000) 2004	2005	2006	2007	2008	2009	2010	Total	In Service Date
Option 1	**Gh34WFGD**									
	Common FGD	$0	$27,882	$27,882	$13,941	$0	$0		$69,706	May-07
	Unit 3	$0	$41,082	$41,082	$20,541	$0	$0		$102,705	May-07
	Unit 4	$0	$0	$46,727	$46,727	$23,364	$0		$116,818	May-08
	Total	$0	$68,964	$115,691	$81,209	$23,364	$0		**$289,229**	
Option 2	**Gh3WFGD**									
	Common FGD	$0	$10,507	$10,507	$5,253	$0	$0		$26,267	May-07
	Unit 3	$0	$41,796	$41,796	$20,898	$0	$0		$104,490	May-07
	Total	$0	$52,303	$52,303	$26,151	$0	$0		**$130,757**	
Option 3	**Gh234WFGD**									
	Common FGD	$0	$31,214	$31,214	$15,607	$0	$0		$78,036	May-07
	Unit 3	$0	$41,202	$41,202	$20,601	$0	$0		$103,006	May-07
	Unit 1 & 2	$0	$0	$49,424	$49,424	$24,712	$0		$123,560	May-08
	Unit 4	$0	$0	$0	$48,056	$48,056	$24,028		$120,141	May-09
	Total	$0	$72,417	$121,841	$133,689	$72,769	$24,028		**$424,743**	
Option 4	**Br123WFGD Accelerated**									
	Common - FGD	$0	$0	$22,366	$22,366	$11,183	$0		$55,914	Dec-08
	Unit 1,2,3	$0	$0	$68,582	$68,582	$34,291	$0		$171,454	Dec-08
	Total	$0	$0	$90,947	$90,947	$45,474	$0		**$227,368**	+Ash Pond
Option 5	**Br123WFGD**									
	Common - FGD	$0	$0	$0	$23,037	$23,037	$11,518		$57,592	May-09
	Unit 1,2,3	$0	$0	$0	$70,639	$70,639	$35,319		$176,597	May-09
	Total	$0	$0	$0	$93,676	$93,676	$46,838		**$234,189**	+Ash Pond
Option 6	**Br123DFGD Accelerated**									
	Common	$0	$0	$8,981	$8,981	$4,491	$0		$22,453	Dec-08
	Unit 3	$0	$0	$34,346	$34,346	$17,173	$0		$85,866	Dec-08
	Unit 1/2	$0	$0	$35,827	$35,827	$17,913	$0		$89,567	Dec-08
	Total	$0	$0	$79,155	$79,155	$39,577	$0		**$197,887**	+Ash Pond
Option 7	**Br123DFGD**									
	Common	$0	$0	$0	$9,242	$9,242	$4,621	$0	$23,106	May-09
	Unit 3	$0	$0	$0	$35,345	$35,345	$17,672	$0	$88,362	May-09
	Unit 1/2	$0	$0	$0	$0	$37,941	$37,941	$18,970	$94,852	May-10
	Total	$0	$0	$0	$44,587	$82,528	$60,234	$18,970	**$206,319**	+Ash Pond
Option 8	**Br3DFGD Accelerated**									
	Common	$0	$0	$7,254	$7,254	$3,627	$0		$18,136	Dec-08
	Unit 3	$0	$0	$34,346	$34,346	$17,173	$0		$85,866	Dec-08
	Total	$0	$0	$41,601	$41,601	$20,800	$0		**$104,002**	+Ash Pond
Option 9	**Br3DFGD**									
	Common	$0	$0	$0	$7,465	$7,465	$3,733		$18,663	May-09
	Unit 3	$0	$0	$0	$35,345	$35,345	$17,672		$88,362	May-09
	Total	$0	$0	$0	$42,810	$42,810	$21,405		**$107,024**	+Ash Pond
Option 10	**Br123EComp**									
	Common	$0	$0	$0	$0	$0	$0		$0	Jan-00
	Unit 1	$0	$1,769	$7,078	$2,949	$0	$0		$11,796	Dec-07
	Unit 2	$0	$0	$867	$1,734	$4,334	$10,402		$17,337	Dec-09
	Unit 3	$0	$1,488	$2,977	$17,861	$7,442	$0		$29,768	Dec-08
	Total	$0	$3,258	$10,921	$22,543	$11,776	$10,402		**$58,901**	
Option 11	**Br23DFGD**									
	Common	$0	$0	$0	$8,633	$8,633	$4,317		$21,583	Dec-09
	Unit 2&3	$0	$0	$0	$48,497	$48,497	$24,249		$121,243	Dec-09
	Total	$0	$0	$0	$57,130	$57,130	$28,565		**$142,826**	+Ash Pond
Option 12	**Br23DFGD Accelerated**									
	Common	$0	$0	$8,389	$8,389	$4,195	$0		$20,973	Dec-08
	Unit 2&3	$0	$0	$47,128	$47,128	$23,564	$0		$117,819	Dec-08
	Total	$0	$0	$55,517	$55,517	$27,758	$0		**$138,792**	+Ash Pond
Option 13	**Gh234PRB Accelerated**									
	Common	$0	$6,433	$19,298	$38,595	$0			$64,325	May-07
	Unit 2	$0	$0	$9,580	$28,741	$57,482			$95,803	May-08
	Unit 3	$0	$12,183	$36,550	$73,101	$0			$121,834	May-07
	Unit 4	$0	$11,894	$35,682	$65,417	$5,947			**$118,940**	Dec-07
	Total	$0	$30,510	$101,110	$205,854	$63,429	$0		$400,903	
Option 14	**Br123PRB Accelerated**									
	Common	$0	$1,633	$3,266	$8,166	$19,599	$0		$32,665	Dec-08
	Unit 1	$0	$1,907	$3,814	$9,534	$20,975	$1,907		$38,137	Dec-08
	Unit 2	$0	$2,156	$4,312	$10,779	$23,714	$2,156		$43,116	Dec-08
	Unit 3	$0	$4,312	$8,625	$21,562	$51,750	$0		$86,249	Dec-08
	Total	$0	$10,008	$20,017	$50,042	$116,038	$4,063		**$200,168**	+Ash Pond

Notes: 1. All cash flows exclude any costs for wet ESP completion and AFUDC
2. For PV purposes, all cash flows occurring in 2004 were moved into 2005.
3. Total Cash flows associated with Brown scrubbing have NOT been adjusted for incremental Brown ash pond related expenses.

Appendix 5

July 26, 2004 LX2004114

Mr. Bob Webb
E.W. Brown Generating Station
815 Dix Dam Road
Harrodsburg, Kentucky 40330

Re: Hydrographic Survey Report
Ash Pond
E.W. Brown Generating Station
Burgin, Kentucky

Dear Mr. Webb:

Fuller, Mossbarger, Scott and May Engineers, Inc. (FMSM) surveyed the Ash Pond using a combination of GPS and Sonar as described in our proposal of June 25, 2004. The results have been placed in an ESRI ArcGIS project along with data from our previous survey of the Ash Pond of January 28, 2002. Attached please find two drawings showing the measured surface and underwater contours of all items within the reservoir boundary at elevation 900 feet or below. Additionally, the contours have been underlain by Aerial Photography obtained from Kentucky Utilities and the US Geological Survey. The photograph provided by Kentucky Utilities plainly shows the ash above the water level along the northern side of the pond. Furthermore, a blue contour on the map shows the water's edge at the time of the survey. It should be noted that the water level in the pond was raised to facilitate hydrographic surveying in shallow areas, thereby creating a greater area of water coverage than is visible in the photograph.

On January 28, 2002, the available design volume of the pond (level ash fill to elevation 890 feet) was 1,106.5 acre-ft. On July 16, 2004, the available volume was 765.1 acre-ft. Thus, 341.4 acre-ft were filled in 900 days indicating an annual filling rate of 138.5 acre-ft/year. Therefore, the remaining design life of the pond is 5.5 years.

FMSM appreciates the opportunity to submit this information. If needed, the data obtained from this survey can be provided in other digital formats. Finally, if you have any questions or need additional information, please call.

Respectfully submitted,

FULLER, MOSSBARGER, SCOTT AND MAY
ENGINEERS, INC.

KOH
/rws/bjb

Appendix 6

General Assumptions

- Study Period: 20-year period for Production Cost impacts (2005-2025)
  30-year period for Capital Costs impacts (2005-through book life of project)

  The production costs include items such as fuel, O&M, purchase power etc and are estimated using the PROSYM production model. This model was run for the 2005-2025 time period.

  The revenue requirements associated with capital costs are determined via the Capital Expenditure and Recovery module of the Strategist production and capital costing software. Capital projects with a 20 year book/tax life and an in service date after 2005 would have the last years of their life excluded from the revenue requirement calculation if capital costs impacts were halted at 2025. Doing so would have the affect of underestimating the capital cost of alternatives and would favor construction of new projects. Therefore, to completely account for capital projects costs over their lifetime, the revenue requirements associated with new capital projects were extended through the end of their book life.

- KU/LGE continues as a regulated entity subject to the oversight of the Kentucky Public Service Commission and that the Commission continues the requirement of the Companies implementing the least cost strategy to the benefit of the native load ratepayers.

- The capital costs, O&M costs and the costs of increased emissions (both NO_x and SO_2) associated with the addition of new environmental projects will be subject to recovery through the Environmental Cost Recovery mechanism.

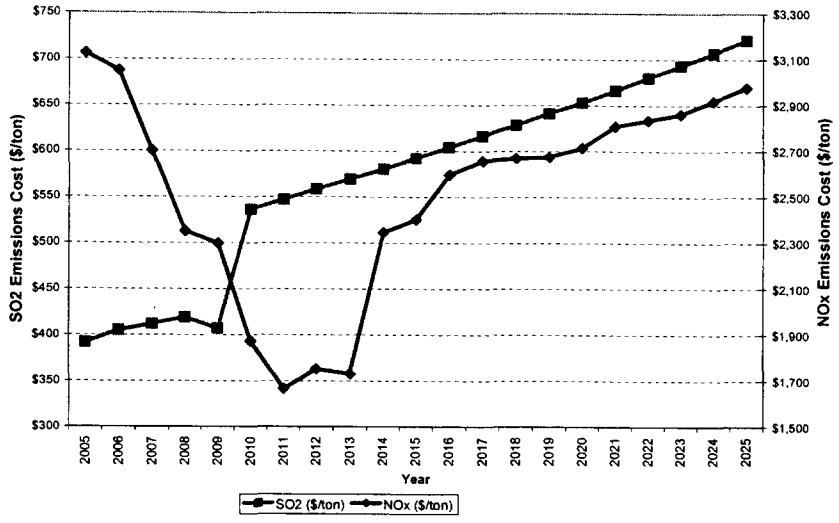
- Financial Data

➢ Discount Rate (%):	7.26 %
➢ Federal Income Tax Rate (%)	40.36 %
➢ AFUDC Rate (%):	7.26 %
➢ Insurance Rate (%):	7.00 %
➢ Property Tax Rate (%):	18.0 %
➢ Percentage of Debt in Capital Structure (%):	46.06 %
➢ Debt Interest Rate/Weighted Cost of Debt (%):	3.16 %
➢ Desired Return on Rate base (%):	7.26 %
➢ Capitalized Interest Debt Rate (%):	3.16 %
➢ Environmental Projects Book Life (years):	20 years
➢ Environmental Projects Tax Life (years):	20 years
➢ Annual capital cost escalation rate (%):	3.0%
➢ Annual Fixed O&M escalation rate (%):	2.0% (prorated for mid-year installs)
➢ Annual Variable O&M escalation rate (%):	2.0%

- No unit retirements occur on the Companies' generating system within the study period.

- SO_2 and NO_x Emission Costs (Base Assumptions)
  Note that the effects of CAIR can be seen in the forecast price of SO_2 in 2010 and beyond.

	Market Cost per ton of SO2 ($/ton)	NOx ($/ton)
2005	392	3125
2006	405	3050
2007	412	2700
2008	419	2350
2009	407	2298
2010	536	1874
2011	547	1666
2012	558	1752
2013	569	1731
2014	580	2344
2015	592	2400
2016	604	2596
2017	616	2656
2018	628	2668
2019	641	2674
2020	653	2713
2021	666	2807
2022	680	2833
2023	693	2861
2024	707	2918
2025	721	2977



- Fuel Forecast (Base Assumptions)
  - Any and all fuel cost savings associated with serving native load will be returned to the ratepayer though the Fuel Adjustment Clause mechanism.

Annual Average Fuel Forecast
(cents/mmBtu)

	Brown				Ghent 1	Ghent 2-4			Gr River	Tyrone 3	Cane Run	Mill Creek	Trimble			HAEF
SO_2 content >	0.9 #	1.20#	2.75 #	6.36#	6.10#	0.9#	1.20#	6.10#	4.56#	1.80#	6.05#	6.09#	6.50#	Oil	Gas	Gas
2005	[redacted]															
2006																
2007																
2008																
2009																
2010																
2011																
2012																
2013																
2014																
2015																
2016																
2017																
2018																
2019																
2020																
2021																
2022																
2023																
2024																
2025																

Appendix 7

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case01- Option 1: WFGD HS GH34

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
WFGD HS GH34
0

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	FS HS+Wet FGD	98%	289M$ GH34	2007
Ghent 4	FS HS+Wet FGD	98%	289M$ GH34	2008

SO_2 Allowances Purchased: 1,974,944
SO_2 Tons Emitted: 3,798,334
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 283%
NO_x Allowances Purchased: 146,044
NO_x Tons Emitted: 598,859

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838
SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964
NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	9,502	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	7,277	7,277
2006	3063	405		-	-	21,040		3063	405		-	-	2,873		18,167	25,444
2007	2599	412		-	-	33,205		2599	412		-	3,822	2,566		15,970	41,414
2008	2350	419		-	9,295	38,439		2349	419		-	22,343	2,291		5,621	47,035
2009	2308	407		-	9,061	35,895		2309	407		-	21,311	2,044		3,149	50,184
2010	1874	536		-	34,549	32,027		1874	536		526	49,224	1,823		(4,287)	45,897
2011	1666	547		1,931	30,645	28,564		1666	547		3,095	44,970	1,625		(6,961)	38,935
2012	1752	558		2,695	29,251	25,461		1752	558		3,333	43,099	1,448		(8,067)	30,868
2013	1731	569		3,690	29,739	22,679		1731	569		4,235	42,880	1,287		(8,892)	21,976
2014	2344	580		5,796	29,821	20,184		2344	580		6,280	42,415	1,141		(10,160)	11,816
2015	2400	592		11,413	35,514	17,936		2400	592		11,772	47,599	1,010		(11,057)	759
2016	2596	604		12,136	34,588	15,901		2596	604		12,409	45,578	890		(10,188)	(9,429)
2017	2656	616		12,440	33,741	14,059		2656	616		12,742	44,246	783		(10,580)	(20,008)
2018	2668	628		11,852	32,749	12,394		2668	628		12,112	43,338	685		(12,266)	(32,275)
2019	2674	641		11,219	30,891	10,890		2674	641		11,411	41,055	598		(12,547)	(44,822)
2020	2713	653		11,383	30,596	9,532		2713	653		11,583	40,253	519		(12,706)	(57,529)
2021	2807	666		11,955	29,960	8,309		2807	666		12,085	39,240	448		(13,071)	(70,600)
2022	2833	680		11,386	28,764	7,207		2833	680		11,466	37,635	384		(13,144)	(83,744)
2023	2861	693		11,007	27,512	6,217		2861	693		11,077	35,515	327		(12,011)	(95,756)
2024	2918	707		10,918	26,450	5,327		2918	707		10,996	34,106	276		(11,988)	(107,743)
2025	2977	721		10,651	25,604	4,500		2977	721		10,695	33,297	201		(12,778)	(120,521)
2026				-	-	3,626					-	-	-		3,626	(116,895)
2027				-	-	1,703					-	-	-		1,703	(115,192)
2028				-	-	250					-	-	-		250	(114,942)
2029				-	-	-					-	-	-		-	(114,942)
2030				-	-	-					-	-	-		-	(114,942)
Totals			13,761,762	140,471	508,732	384,847	14,795,811			14,027,565	145,818	711,926	25,444	14,910,754	(114,942)	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case02- Option 2: WFGD HS GH3

Fuel Forecast: Base — Capital Cost Sensitivity:
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR WFGD HS GH3

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	FS HS+Wet FGD	98%	131M$ GH3	2007
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,334,147 — SO_2 Tons Emitted: 4,157,537
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 325%
NO_x Allowances Purchased: 148,588 — NO_x Tons Emitted: 601,403

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base — Capital Cost Sensitivity:
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392		-	-	7,744		3146	392		-	-	2,225		5,519	5,519
2006	3063	405		-	-	13,164		3063	405		-	-	2,873		10,291	15,810
2007	2599	412		-	-	19,301		2599	412		-	3,822	2,566		2,274	18,084
2008	2351	419		-	13,769	19,134		2349	419		-	22,343	2,291		(2,447)	15,637
2009	2309	407		-	14,720	17,077		2309	407		-	21,311	2,044		(1,283)	14,354
2010	1874	536		23	42,196	15,234		1874	536		526	49,224	1,823		(2,950)	11,404
2011	1666	547		2,780	37,779	13,584		1666	547		3,095	44,970	1,625		(4,594)	6,810
2012	1752	558		3,002	36,144	12,105		1752	558		3,333	43,099	1,448		(5,327)	1,482
2013	1731	569		3,954	36,261	10,778		1731	569		4,235	42,880	1,287		(5,614)	(4,132)
2014	2344	580		6,071	36,059	9,588		2344	580		6,280	42,415	1,141		(6,049)	(10,181)
2015	2400	592		11,591	41,509	8,511		2400	592		11,772	47,599	1,010		(6,318)	(16,499)
2016	2596	604		12,266	39,722	7,536		2596	604		12,409	45,578	890		(6,598)	(23,097)
2017	2656	616		12,606	39,242	6,654		2656	616		12,742	44,246	783		(5,194)	(28,291)
2018	2668	628		11,979	38,002	5,856		2668	628		12,112	43,338	685		(6,730)	(35,021)
2019	2674	641		11,311	35,938	5,137		2674	641		11,411	41,055	598		(6,772)	(41,794)
2020	2713	653		11,491	35,379	4,487		2713	653		11,583	40,253	519		(6,776)	(48,570)
2021	2807	666		12,018	34,567	3,903		2807	666		12,085	39,240	448		(6,860)	(55,430)
2022	2833	680		11,431	33,185	3,376		2833	680		11,466	37,635	384		(6,884)	(62,314)
2023	2861	693		11,048	31,276	2,904		2861	693		11,077	35,515	327		(6,727)	(69,041)
2024	2918	707		10,958	30,460	2,479		2918	707		10,996	34,106	276		(5,726)	(74,767)
2025	2977	721		10,669	29,419	2,070		2977	721		10,695	33,297	201		(6,544)	(81,312)
2026				-	-	1,570					-	-	-		1,570	(79,742)
2027				-	-	300					-	-	-		300	(79,442)
2028				-	-	-					-	-	-		-	(79,442)
2029				-	-	-					-	-	-		-	(79,442)
2030				-	-	-					-	-	-		-	(79,442)
Totals			13,869,994	143,198	605,628	192,492	14,831,312			14,027,565	145,818	711,926	25,444	14,910,754	(79,442)	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs In 2005 PVRR $ x1000

Case03- Option 3: WFGD HS GH234

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR WFGD HS GH234

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	FS HS+Wet FGD	98%	425M$ Gh234	2008
Ghent 3	FS HS+Wet FGD	98%	425M$ Gh234	2007
Ghent 4	FS HS+Wet FGD	98%	425M$ Gh234	2009

SO_2 Allowances Purchased: 1,688,511 — SO_2 Tons Emitted: 3,511,901
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 246%
NO_x Allowances Purchased: 149,748 — NO_x Tons Emitted: 602,563

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	9,867	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	7,642	7,642
2006	3063	405		-	-	21,984		3063	405		-	-	2,873		19,111	26,753
2007	2599	412		-	-	39,212		2599	412		-	3,822	2,566		21,908	48,661
2008	2352	419		-	9,513	48,575		2349	419		-	22,343	2,291		15,293	63,954
2009	2309	407		-	4,764	51,063		2309	407		-	21,311	2,044		7,738	71,693
2010	1874	536		256	28,462	47,087		1874	536		526	49,224	1,823		(2,279)	69,413
2011	1666	547		2,859	25,095	42,003		1666	547		3,095	44,970	1,625		(4,687)	64,726
2012	1752	558		3,121	24,420	37,450		1752	558		3,333	43,099	1,448		(5,899)	58,827
2013	1731	569		4,069	24,467	33,368		1731	569		4,235	42,880	1,287		(8,813)	50,014
2014	2344	580		6,107	24,722	29,710		2344	580		6,280	42,415	1,141		(11,286)	38,727
2015	2400	592		11,734	30,629	26,417		2400	592		11,772	47,599	1,010		(12,824)	25,904
2016	2596	604		12,352	29,831	23,446		2596	604		12,409	45,578	890		(12,608)	13,296
2017	2656	616		12,634	29,119	20,757		2656	616		12,742	44,246	783		(13,296)	(0)
2018	2668	628		12,029	28,414	18,325		2668	628		12,112	43,338	685		(15,294)	(15,295)
2019	2674	641		11,376	27,074	16,127		2674	641		11,411	41,055	598		(15,151)	(30,446)
2020	2713	653		11,512	26,525	14,142		2713	653		11,583	40,253	519		(16,438)	(46,884)
2021	2807	666		12,070	25,990	12,352		2807	666		12,085	39,240	448		(17,305)	(64,189)
2022	2833	680		11,496	24,969	10,740		2833	680		11,466	37,635	384		(17,541)	(81,730)
2023	2861	693		11,093	23,853	9,289		2861	693		11,077	35,515	327		(16,561)	(98,291)
2024	2918	707		10,988	22,974	7,986		2918	707		10,996	34,106	276		(16,503)	(114,794)
2025	2977	721		10,726	22,276	6,787		2977	721		10,695	33,297	201		(17,406)	(132,200)
2026				-	-	5,579					-	-	-		5,579	(126,621)
2027				-	-	3,290					-	-	-		3,290	(123,331)
2028				-	-	1,518					-	-	-		1,518	(121,813)
2029				-	-	239					-	-	-		239	(121,574)
2030				-	-	-					-	-	-		-	(121,574)
Totals			13,674,349	144,422	433,097	537,313	**14,789,180**			14,027,565	145,818	711,926	25,444	**14,910,754**	**(121,574)**	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case04- Option 4: WFGD HS BR123x

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR WFGD HS BR123x
Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	FS HS+Wet FGD	98%	227M$ Br123	2008
Brown 2	FS HS+Wet FGD	98%	227M$ Br123	2008
Brown 3	FS HS+Wet FGD	98%	227M$ Br123	2008
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 1,667,779 — SO_2 Tons Emitted: 3,491,168
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 235%
NO_x Allowances Purchased: 157,339 — NO_x Tons Emitted: 610,155

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0
Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	3,592	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	1,367	1,367
2006	3063	405		-	-	13,585		3063	405		-	-	2,873		10,712	12,079
2007	2599	412		-	3,822	20,826		2599	412		-	3,822	2,566		18,260	30,339
2008	2349	419		-	20,691	25,356		2349	419		-	22,343	2,291		21,400	51,739
2009	2308	407		-	1,770	31,159		2309	407		-	21,311	2,044		12,535	64,274
2010	1874	536		1,364	27,249	27,818		1874	536		526	49,224	1,823		7,008	71,282
2011	1666	547		3,579	24,820	24,827		1666	547		3,095	44,970	1,625		5,341	76,623
2012	1752	558		3,765	24,860	22,147		1752	558		3,333	43,099	1,448		4,216	80,839
2013	1731	569		4,658	24,412	19,742		1731	569		4,235	42,880	1,287		(428)	80,410
2014	2344	580		6,761	24,079	17,585		2344	580		6,280	42,415	1,141		(3,061)	77,349
2015	2400	592		12,258	30,357	15,649		2400	592		11,772	47,599	1,010		(3,621)	73,728
2016	2596	604		12,919	28,550	13,897		2596	604		12,409	45,578	890		(5,359)	68,369
2017	2656	616		13,144	27,613	12,311		2656	616		12,742	44,246	783		(6,758)	61,611
2018	2668	628		12,512	27,520	10,876		2668	628		12,112	43,338	685		(7,571)	54,040
2019	2674	641		11,727	26,598	9,579		2674	641		11,411	41,055	598		(6,881)	47,159
2020	2713	653		11,909	25,776	8,407		2713	653		11,583	40,253	519		(8,145)	39,014
2021	2807	666		12,399	24,905	7,350		2807	666		12,085	39,240	448		(9,696)	29,318
2022	2833	680		11,768	24,172	6,398		2833	680		11,466	37,635	384		(9,557)	19,761
2023	2861	693		11,372	22,368	5,541		2861	693		11,077	35,515	327		(10,748)	9,013
2024	2918	707		11,312	21,579	4,771		2918	707		10,996	34,106	276		(11,909)	(2,895)
2025	2977	721		10,987	21,252	4,032		2977	721		10,695	33,297	201		(11,790)	(14,686)
2026				-	-	3,154					-	-	-		3,154	(11,532)
2027				-	-	2,658					-	-	-		2,658	(8,874)
2028				-	-	1,934					-	-	-		1,934	(6,940)
2029				-	-	-					-	-	-		-	(6,940)
2030				-	-	-					-	-	-		-	(6,940)
Totals			14,005,792	152,434	432,394	313,194	14,903,814			14,027,565	145,818	711,926	25,444	14,910,754	(6,940)	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case05- Option 5: WFGD HS BR123

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR WFGD HS BR123
Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	FS HS+Wet FGD	98%	234M$ Br123	2009
Brown 2	FS HS+Wet FGD	98%	234M$ Br123	2009
Brown 3	FS HS+Wet FGD	98%	234M$ Br123	2009
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 1,692,501 — SO_2 Tons Emitted: 3,515,891
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 235%
NO_x Allowances Purchased: 157,324 — NO_x Tons Emitted: 610,140

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0
Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	3,592	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	1,367	1,367
2006	3063	405		-	-	4,637		3063	405		-	-	2,873		1,764	3,131
2007	2599	412		-	3,822	12,734		2599	412		-	3,822	2,566		10,168	13,299
2008	2349	419		-	22,343	19,719		2349	419		-	22,343	2,291		17,428	30,727
2009	2310	407		-	7,877	29,353		2309	407		-	21,311	2,044		16,053	46,780
2010	1874	536		1,345	27,248	29,165		1874	536		526	49,224	1,823		8,333	55,113
2011	1666	547		3,579	24,820	26,026		1666	547		3,095	44,970	1,625		6,537	61,651
2012	1752	558		3,765	24,860	23,215		1752	558		3,333	43,099	1,448		5,282	66,933
2013	1731	569		4,658	24,412	20,694		1731	569		4,235	42,880	1,287		521	67,454
2014	2344	580		6,761	24,079	18,434		2344	580		6,280	42,415	1,141		(2,214)	65,240
2015	2400	592		12,258	30,357	16,406		2400	592		11,772	47,599	1,010		(2,866)	62,374
2016	2596	604		12,919	28,550	14,587		2596	604		12,409	45,578	890		(4,671)	57,703
2017	2656	616		13,144	27,613	12,941		2656	616		12,742	44,246	783		(6,130)	51,573
2018	2668	628		12,512	27,520	11,452		2668	628		12,112	43,338	685		(6,997)	44,576
2019	2674	641		11,727	26,598	10,105		2674	641		11,411	41,055	598		(6,357)	38,219
2020	2713	653		11,909	25,776	8,888		2713	653		11,583	40,253	519		(7,666)	30,554
2021	2807	666		12,399	24,905	7,789		2807	666		12,085	39,240	448		(9,258)	21,295
2022	2833	680		11,768	24,172	6,798		2833	680		11,466	37,635	384		(9,158)	12,137
2023	2861	693		11,372	22,368	5,906		2861	693		11,077	35,515	327		(10,384)	1,753
2024	2918	707		11,312	21,579	5,104		2918	707		10,996	34,106	276		(11,577)	(9,824)
2025	2977	721		10,987	21,252	4,335		2977	721		10,695	33,297	201		(11,489)	(21,313)
2026				-	-	3,430					-	-	-		3,430	(17,883)
2027				-	-	2,909					-	-	-		2,909	(14,974)
2028				-	-	2,443					-	-	-		2,443	(12,531)
2029				-	-	467					-	-	-		467	(12,064)
2030				-	-	-					-	-	-		-	(12,064)
Totals			14,004,995	152,415	440,152	301,129	14,898,690			14,027,565	145,818	711,926	25,444	14,910,754	(12,064)	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case06- Option 6: DFGD MS BR123x

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
DFGD MS BR123x

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	FS MS+Dry FGD	93%	198M$ Br123	2008
Brown 2	FS MS+Dry FGD	93%	198M$ Br123	2008
Brown 3	FS MS+Dry FGD	93%	198M$ Br123	2008
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 1,706,944 — SO_2 Tons Emitted: 3,530,333
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 239%
NO_x Allowances Purchased: 154,478 — NO_x Tons Emitted: 607,294

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392		-	-	2,249		3146	392		-	-	2,225		24	24
2006	3063	405		-	-	10,691		3063	405		-	-	2,873		7,818	7,842
2007	2599	412		-	3,822	17,114		2599	412		-	3,822	2,566		14,548	22,390
2008	2349	419		-	20,752	21,165		2349	419		-	22,343	2,291		17,819	40,209
2009	2307	407		-	2,408	26,312		2309	407		-	21,311	2,044		11,875	52,084
2010	1874	536		1,029	27,942	23,492		1874	536		526	49,224	1,823		6,187	58,271
2011	1666	547		3,408	25,499	20,967		1666	547		3,095	44,970	1,625		4,907	63,178
2012	1752	558		3,579	25,493	18,704		1752	558		3,333	43,099	1,448		4,261	67,439
2013	1731	569		4,467	25,109	16,675		1731	569		4,235	42,880	1,287		2,408	69,847
2014	2344	580		6,527	24,849	14,855		2344	580		6,280	42,415	1,141		949	70,796
2015	2400	592		12,000	31,073	13,222		2400	592		11,772	47,599	1,010		302	71,098
2016	2596	604		12,652	29,259	11,744		2596	604		12,409	45,578	890		(961)	70,137
2017	2656	616		12,958	28,271	10,406		2656	616		12,742	44,246	783		(1,897)	68,240
2018	2668	628		12,330	28,146	9,195		2668	628		12,112	43,338	685		(2,447)	65,792
2019	2674	641		11,576	27,136	8,101		2674	641		11,411	41,055	598		(2,484)	63,308
2020	2713	653		11,752	26,324	7,112		2713	653		11,583	40,253	519		(3,330)	59,979
2021	2807	666		12,255	25,449	6,221		2807	666		12,085	39,240	448		(4,179)	55,799
2022	2833	680		11,630	24,663	5,417		2833	680		11,466	37,635	384		(4,285)	51,514
2023	2861	693		11,240	22,850	4,694		2861	693		11,077	35,515	327		(4,766)	46,748
2024	2918	707		11,184	22,027	4,043		2918	707		10,996	34,106	276		(4,991)	41,757
2025	2976	721		10,868	21,675	3,430		2977	721		10,695	33,297	201		(5,163)	36,594
2026				-	-	2,745					-	-	-		2,745	39,339
2027				-	-	2,313					-	-	-		2,313	41,652
2028				-	-	1,683					-	-	-		1,683	43,335
2029				-	-	-					-	-	-		-	43,335
2030				-	-	-					-	-	-		-	43,335
Totals			14,099,335	149,456	442,748	262,550	14,954,089			14,027,565	145,818	711,926	25,444	14,910,754	43,335	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case07- Option 7: DFGD MS BR123

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
DFGD MS BR123

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	FS MS+Dry FGD	93%	206M$ Br123	2010
Brown 2	FS MS+Dry FGD	93%	206M$ Br123	2010
Brown 3	FS MS+Dry FGD	93%	206M$ Br123	2009
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 1,755,243 — SO_2 Tons Emitted: 3,578,633
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 239%
NO_x Allowances Purchased: 154,379 — NO_x Tons Emitted: 607,194

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

Capital Cost Sensitivity: _____

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	DIFFERENCE CALCULATIONS Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	2,249	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	24	24
2006	3063	405		-	-	2,903		3063	405		-	-	2,873		30	54
2007	2599	412		-	3,822	6,683		2599	412		-	3,822	2,566		4,117	4,171
2008	2349	419		-	22,343	13,185		2349	419		-	22,343	2,291		10,894	15,065
2009	2309	407		-	13,267	20,517		2309	407		-	21,311	2,044		12,818	27,883
2010	1874	536		899	31,078	24,162		1874	536		526	49,224	1,823		9,093	36,976
2011	1666	547		3,407	25,499	22,683		1666	547		3,095	44,970	1,625		6,624	43,600
2012	1752	558		3,579	25,493	20,237		1752	558		3,333	43,099	1,448		5,795	49,395
2013	1731	569		4,467	25,109	18,045		1731	569		4,235	42,880	1,287		3,779	53,174
2014	2344	580		6,527	24,849	16,080		2344	580		6,280	42,415	1,141		2,175	55,349
2015	2400	592		12,000	31,074	14,318		2400	592		11,772	47,599	1,010		1,399	56,748
2016	2596	604		12,652	29,259	12,738		2596	604		12,409	45,578	890		34	56,782
2017	2656	616		12,958	28,271	11,315		2656	616		12,742	44,246	783		(987)	55,794
2018	2668	628		12,330	28,146	10,027		2668	628		12,112	43,338	685		(1,614)	54,180
2019	2674	641		11,576	27,136	8,861		2674	641		11,411	41,055	598		(1,723)	52,457
2020	2713	653		11,752	26,324	7,807		2713	653		11,583	40,253	519		(2,634)	49,823
2021	2807	666		12,255	25,449	6,856		2807	666		12,085	39,240	448		(3,544)	46,279
2022	2833	680		11,630	24,663	5,997		2833	680		11,466	37,635	384		(3,704)	42,575
2023	2861	693		11,240	22,850	5,223		2861	693		11,077	35,515	327		(4,237)	38,339
2024	2918	707		11,184	22,027	4,527		2918	707		10,996	34,106	276		(4,506)	33,833
2025	2977	721		10,868	21,675	3,871		2977	721		10,695	33,297	201		(4,721)	29,111
2026				-	-	3,147					-	-	-		3,147	32,258
2027				-	-	2,680					-	-	-		2,680	34,938
2028				-	-	2,262					-	-	-		2,262	37,200
2029				-	-	1,145					-	-	-		1,145	38,345
2030				-	-	176					-	-	-		176	38,521
Totals			14,093,924	149,325	458,332	247,694	14,949,275			14,027,565	145,818	711,926	25,444	14,910,754	38,521	

Cost Comparison of Alternative SO_2 Compliance Plans

All Costs in 2005 PVRR $ x1000

Case08- Option 8: DFGD MS BR3x

Fuel Forecast: Base — Capital Cost Sensitivity: _____
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
DFGD MS BR3x

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	FS MS+Dry FGD	93%	104M$ Br3	2008
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,098,295 — SO_2 Tons Emitted: 3,921,685
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 289%
NO_x Allowances Purchased: 152,990 — NO_x Tons Emitted: 605,806

Case00- Option 0: BASE CASE W/ ENV DISP

Fuel Forecast: Base — Capital Cost Sensitivity: _____
Load Forecast: Base
SO2 Price Forecast: Base
NOx Price Forecast: Base
Other Description: SO2 Dispatch, TC2 2010, No Br3 SCR
0
0

SO_2 Environmental Controls:

Unit	SO2 Tech	SO2 Rem %	Cost (M$)	In-Service
Brown 1	n/a	0%	0	0
Brown 2	n/a	0%	0	0
Brown 3	n/a	0%	0	0
Ghent 2	n/a	0%	0	0
Ghent 3	n/a	0%	0	0
Ghent 4	n/a	0%	0	0

SO_2 Allowances Purchased: 2,721,838 — SO_2 Tons Emitted: 4,545,227
Largest Annual SO_2 Purchase (as a % of EPA Allocation): 368%
NO_x Allowances Purchased: 150,964 — NO_x Tons Emitted: 603,779

SO_2 Price Curve Multiplier: 1.00

DIFFERENCE CALCULATIONS

Year	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Allowance Price ($Nominal/ton) NOx	SO2	Production $	Combined Company Allow. Purchases NOx $	SO2 $	Capital $	NPV Total $	Total $	Cumulative Total $
2005	3146	392	[redacted]	-	-	1,962	[redacted]	3146	392	[redacted]	-	-	2,225	[redacted]	(263)	(263)
2006	3063	405		-	-	6,626		3063	405		-	-	2,873		3,753	3,490
2007	2599	412		-	3,822	9,894		2599	412		-	3,822	2,566		7,328	10,818
2008	2349	419		-	21,163	11,927		2349	419		-	22,343	2,291		8,816	19,634
2009	2308	407		-	9,677	14,546		2309	407		-	21,311	2,044		4,706	24,340
2010	1874	536		856	36,256	12,986		1874	536		526	49,224	1,823		1,775	26,114
2011	1666	547		3,296	33,000	11,589		1666	547		3,095	44,970	1,625		1,151	27,266
2012	1752	558		3,484	32,860	10,338		1752	558		3,333	43,099	1,448		1,361	28,626
2013	1731	569		4,403	31,795	9,215		1731	569		4,235	42,880	1,287		(120)	28,506
2014	2344	580		6,424	31,598	8,207		2344	580		6,280	42,415	1,141		(685)	27,821
2015	2400	592		11,908	37,268	7,303		2400	592		11,772	47,599	1,010		(1,127)	26,694
2016	2596	604		12,550	35,561	6,484		2596	604		12,409	45,578	890		(1,611)	25,083
2017	2656	616		12,862	34,418	5,743		2656	616		12,742	44,246	783		(2,112)	22,971
2018	2668	628		12,238	34,044	5,073		2668	628		12,112	43,338	685		(2,282)	20,689
2019	2674	641		11,503	32,923	4,467		2674	641		11,411	41,055	598		(1,901)	18,788
2020	2713	653		11,677	31,577	3,920		2713	653		11,583	40,253	519		(2,725)	16,064
2021	2807	666		12,162	30,732	3,426		2807	666		12,085	39,240	448		(3,113)	12,950
2022	2833	680		11,542	29,437	2,982		2833	680		11,466	37,635	384		(3,285)	9,665
2023	2861	693		11,152	27,715	2,582		2861	693		11,077	35,515	327		(3,330)	6,335
2024	2918	707		11,102	26,691	2,222		2918	707		10,996	34,106	276		(3,416)	2,919
2025	2977	721		10,783	26,131	1,873		2977	721		10,695	33,297	201		(3,457)	(538)
2026				-	-	1,443					-	-	-		1,443	905
2027				-	-	1,216					-	-	-		1,216	2,121
2028				-	-	885					-	-	-		885	3,006
2029				-	-	-					-	-	-		-	3,006
2030				-	-	-					-	-	-		-	3,006
Totals			14,072,240	147,942	546,669	146,909	**14,913,760**			14,027,565	145,818	711,926	25,444	**14,910,754**	**3,006**	