

COMMONWEALTH OF KENTUCKY  
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF LOUISVILLE GAS AND )  
ELECTRIC COMPANY FOR )  
CERTIFICATES OF PUBLIC )  
CONVENIENCE AND NECESSITY AND ) CASE NO. 2011-00162  
APPROVAL OF ITS 2011 COMPLIANCE )  
PLAN FOR RECOVERY BY )  
ENVIRONMENTAL SURCHARGE )

COMMISSION STAFF'S SECOND REQUEST FOR INFORMATION  
TO LOUISVILLE GAS AND ELECTRIC COMPANY

Louisville Gas and Electric Company ("LG&E"), pursuant to 807 KAR 5:001, is to file with the Commission the original and 10 copies of the following information, with a copy to all parties of record. The information requested herein is due no later than September 1, 2011. Responses to requests for information shall be appropriately bound, tabbed and indexed. Each response shall include the name of the witness responsible for responding to the questions related to the information provided.

Each response shall be answered under oath or, for representatives of a public or private corporation or a partnership or association or a governmental agency, be accompanied by a signed certification of the preparer or person supervising the preparation of the response on behalf of the entity that the response is true and accurate to the best of that person's knowledge, information, and belief formed after a reasonable inquiry.

LG&E shall make timely amendment to any prior response if it obtains information which indicates that the response was incorrect when made or, though

correct when made, is now incorrect in any material respect. For any request to which LG&E fails or refuses to furnish all or part of the requested information, LG&E shall provide a written explanation of the specific grounds for its failure to completely and precisely respond.

Careful attention should be given to copied material to ensure that it is legible. When the requested information has been previously provided in this proceeding in the requested format, reference may be made to the specific location of that information in responding to this request. When applicable, the requested information shall be separately provided for total company operations and jurisdictional operations.

1. Refer to LG&E's response to Item 18.c. of Commission Staff's First Request for Information ("Staff's First Request") and page 3 of the Direct Testimony of Charles R. Schram.

a. The response to 18.c. states that the two analyses referred to in the Schram Testimony did not consider power purchases, renewable or otherwise. Page 3 of the testimony, at lines 21-24, indicates that the second analysis performed compared whether it would be more cost effective to install the control facilities or to retire the unit and purchase replacement power or generation. Clarify and explain the apparent discrepancy between the testimony and the response.

b. The response states: "Ultimately, market availability of suitable replacement capacity and energy is determined through the RFP process when replacing generation." Explain why LG&E believes there will be available capacity and energy through the Request for Proposals ("RFPs") process when other utilities, who

are installing air quality control systems, will be competing for the same available suitable replacement capacity and energy.

2. Refer to LG&E's response to Item 3 of Staff's First Request. Due to the nation's electric industry's need to meet more stringent environmental standards, the potential exists for a surge in construction of new gas-fired generating units or conversion of existing coal-fired generating units.

a. State whether the contractors that perform the air quality control system construction described in the response are, for the most part, the same contractors that will be involved in the construction of gas-fired generation units, or conversion of coal-fired generation units. Explain.

b. Identify those contractors known by LG&E to be likely bidders, or industry leaders, in the area of engineering and construction of air quality control systems.

c. The response states that LG&E is concerned about securing the best experienced contractors to install the air quality control systems due to other utilities competing for the same resources. Aside from competing against utilities for the same resources, what other potential barriers may LG&E encounter when installing the air quality control systems? Explain.

3. Refer to LG&E's response to Item 15.d. of Staff's First Request and the response of LG&E and Kentucky Utilities Company ("KU") to Item 6 of Staff's First Request in Case No. 2011-00140.<sup>1</sup> The response to Item 15.d. states that "[t]he RFP

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<sup>1</sup> Case No. 2011-00140, The 2011 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company (Ky. PSC filed Apr. 21, 2011).

for new capacity and energy issued in December 2010 resulted in multiple responses from parties marketing renewable generation resources.” The response in Case No. 2011-00140 states: “The Companies completed the RFP analysis in May and anticipate beginning negotiation of an agreement with the selected bidder(s) in June. The Companies expect to file applications for certificates of public convenience and necessity with the Commission later this year.”

a. State whether agreements with the selected bidders have been executed by LG&E and KU.

b. State when LG&E and KU plan to file the referenced applications for certificates of public convenience and necessity with the Commission.

c. State whether the RFP process undertaken by KU and LG&E has resulted in the selection of:

(1) Self-build options;

(2) Acquiring existing generation capacity; or

(3) Purchasing power from a third party.

d. Provide the responses received by KU and LG&E to the RFP issued in December 2010 for new capacity and energy.

4. Refer to LG&E's response to Item 19 of Staff's First Request in which LG&E states: “Because the majority of the costs evaluated in the decisions to install controls or retire/ replace capacity are non-ECR costs, the Companies utilized a weighted average cost of capital for non-ECR projects in its analysis.”

a. List and describe the non-Environmental Cost Recovery (“ECR”) costs that would be incurred related to the installation of controls.

b. List and describe the ECR costs that would be incurred related to the retirement/replacement of capacity.

5. Refer to page 12 of LG&E's Supplemental Response to Item 39 of Staff's First Request and the Environmental Cost Recovery Surcharge Summary on page 8 of the Direct Testimony of Robert Conroy. Page 12 of the Supplemental Response states: "Those increases do not take into account the costs associated with retiring generating units with a current book value of over \$100 million--units the MACT rule will make uneconomical to run beginning in 2016--nor do they account for the additional costs of replacing the retired units."

a. Provide an update to the Environmental Cost Recovery Surcharge summary by year, through 2020, to include the projected costs associated with the retirement of generating units, the additional costs of replacing the retired units, and any cost savings resulting from the retirement of generating units.

b. Provide the impact the cost in 5.a. above will have on the incremental billing factor and residential customer impact listed in the Summary.

6. For each fossil generation unit in the system:

a. Provide a timeline, out to the year 2020, showing the tonnage amount of emission allowances granted by the U.S. Environmental Protection Agency ("EPA") for the Cross-State Air Pollution Rule ("CSAPR"), the Hazardous Air Pollutants ("HAPs") rule under the Clean Air Act, and the tonnage amount of projected emissions generated by the unit assuming that LG&E's mitigation strategy is implemented as proposed.

b. To the extent that surplus allowances exist in any given year, describe how these surplus allowances will be utilized and under what conditions.

c. Indicate whether there is currently, or likely to be, a means of sequestering CO<sub>2</sub> should future regulations require reductions. If there is currently, or likely to be, a means of sequestering CO<sub>2</sub>, provide any cost estimates that have been performed.

7. Indicate if LG&E has performed any preliminary research on meeting future CO<sub>2</sub> reduction goals in the proposed cap and trade regulations or other, more restrictive, regulations.

8. Refer to LG&E's response to Item 22.f. of Staff's First Request. The response states that no Black and Veatch expenses have been assigned to Projects 26 and 27. Identify the specific accounts in which the Black and Veatch expenses have been recorded.

9. Refer to LG&E's response to Item 26 of Staff's First Request. Provide a revenue allocation that LG&E believes would "balance the interests of all customers" and explain why the allocation would do so.

10. Refer to LG&E's response to Item 35 of Staff's First Request. The response states: "Relying on purchased power as a compliance measure would create market risk that could have a detrimental impact on customers." Once LG&E is compliant after the installation of the air quality control systems, does LG&E anticipate having excess generation for off systems sales to utilities who are not compliant? Explain.

11. Refer to LG&E's response to Items 37 and 46 of Staff's First Request. The response to 37 states that LG&E expects that its coal units that will be fitted with pollution control equipment will continue to produce power at a lower cost than market power prices. The response also refers to market power prices provided in response to Item 46. For each LG&E unit to be fitted with pollution control equipment, provide the calculations that compare the cost to produce power with market power prices.

12. Refer to LG&E's response to Item 58 of Staff's First Request. State whether LG&E has any concern about or is aware of any reports by other utilities of excessive corrosion in using lime injection methodologies.

13. a. For the Cane Run units that have been mentioned as potential candidates for retirement, explain whether environmental remediation costs resulting from decommissioning have been included in any cost/benefit analysis performed in the formulation of the compliance plan. If the remediation costs are known, or can be estimated, provide those costs by unit.

b. If environmental remediation costs for retired units occur, state whether LG&E believes any or all of the costs would be recovered through the environmental surcharge. Explain.

14. Describe how possible price volatility of natural gas, due to increased demand for electric generation or from possible increased regulation due to environmental concerns, was considered in modeling for the 2011 Compliance Plan.

15. Refer to the LG&E's response to Item 17 of Drew Foley, Janet Overman, Gregg Wagner, Sierra Club, and the Natural Resource Defense Council's Request for

Production of Documents. The response states that LG&E's Transmission group examined the impact on the transmission system of potential power plant retirements.

a. State whether the examination included the effect of power purchases necessary to replace retired generation upon the transmission system. State whether the effect upon the transmission system is considered significant. Explain.

b. State whether LG&E has studied, or is aware of any studies concerning, the possible effect on the regional electric grid of the retirement of a sizeable portion of the country's coal-fired electric generation. Provide a copy of each article, or study, on this subject, that LG&E has examined, reviewed, or otherwise considered.

c. Describe the possible effect of the redirection of power flows upon the regional power grid if the existing grid was engineered in part to deliver loads from existing units that are to be retired.

16. a. For each unit in the system for which new technology is being added in the current Compliance Plan, state whether any analysis has been conducted to determine if there would be stranded costs should the unit be forced to retire prior to its newly projected life.

b. For each unit in the system for which new technology is being added in the current Compliance Plan, indicate what the stranded costs would be if the unit is forced to retire for any reason after:

- (1) ten years;
- (2) 20 years.



c. Provide the length of time each unit would need to operate to achieve a breakeven Net Present Value ("NPV").

17. Since the development of LG&E's 2011 Compliance Plan, state whether the EPA or other federal agencies have indicated a willingness to relax implementation schedules for the new regulations.

18. Refer to the Black & Veatch Due Diligence Report provided in LG&E's response to Staff's First Request, at Item 32.h.

a. For each unit, provide, yearly, the following 2008 thru 2010 historical performance data including:

- (1) Net generation;
- (2) Net heat rate;
- (3) Capacity factor;
- (4) Equivalent Availability Factor; and
- (5) Equivalent Forced Outage Rate.

b. Refer to page 2-10 of the Black & Veatch Due Diligence Report. State whether the replacement of the Trimble County 1 boiler slope tube was implemented. If yes, state whether the station experienced a reduction in boiler tube leaks.

c. Refer to page 2-11 of the Black & Veatch Due Diligence Report. State whether modifications were made to the Trimble County 1 turbine to enable the unit output to reach the design gross output of 546.7 MW. State the current gross and net output of the unit. Describe the modifications that were completed during the 2009 turbine overall outage.

d. Refer to page 2-20 of the Black & Veatch Due Diligence Report. State whether the Mill Creek 3 & 4 GE Mark II, EHC turbine control system has been upgraded. If the upgrade has been made, state whether the project met expectations.

e. Refer to page 2-25 of the Black & Veatch Due Diligence Report. What is the status of the planned Preventative Maintenance and root cause analysis programs for Mill Creek?

f. Refer to page 2-27 of the Black & Veatch Due Diligence Report. What is the status of the boiler tube replacement and overlay projects?

g. Refer to page 2-28 of the Black & Veatch Due Diligence Report. What is the status of the high vibration on the Unit 2 turbine, as noted in the post 2003 outage findings?

h. Refer to page 2-28 of the Black & Veatch Due Diligence Report. What is the status of the high vibration on the Unit 4 generator bearings, as noted in the post 2006 outage finding?

i. Refer to page 2-29 of the Black & Veatch Due Diligence Report. Provide the status of the condenser leak issues on all four units. Explain why erosion is an issue on a closed-loop circulating water system.

19. Refer to LG&E's 2011 Air Compliance Plan, Table 1, "Capital Costs for Environmental Controls". Provide an explanation of why Sulfuric Acid Mist, sorbent injection, and powdered activated carbon systems are not included for Mill Creek 1 & 2.

20. Refer to LG&E's Response to Staff's First Request, Item 6.b.(2). Provide an update to the RFP process to replace the capacity and energy due to retirements of Cane Run 4-6 units.

21. Refer to LG&E's Response to Staff's First Request, Item 31.
- a. Have any of the cost estimates for Projects 26 or 27 been updated since the original filing? If so, provide all of the updated cost estimates.
  - b. If LG&E cannot provide a probable range of cost estimates at this time, at what stage of the construction process will LG&E be able to provide a more definitive range of cost estimates?
22. Refer to LG&E's response to Staff's First Request, Item 39. If not already filed, provide a copy of the comments filed by the PPL entities on EPA's HAPs proposed rulemaking.
23. Refer to LG&E's response to Staff's First Request, Item 45. The footnotes to the table refer to the 2010 Wood-MacKenzie forecast for coal and PIRA's Spring 2010 natural gas forecast.
- a. Provide the 2010 Wood-MacKenzie price forecast.
  - b. Provide an update to the table using the most recent Wood-MacKenzie forecasts. Provide the range of the price forecasts (e.g., high-low).
  - c. Provide the PIRA Spring 2010 natural gas forecast.
  - d. Provide an update to the table using the most recent PIRA forecasts. Also, provide the range of the price forecasts (e.g., high-low).
  - e. Provide any additional studies, other than the Wood-MacKenzie 2010 price forecast and the PIRA Spring 2010 natural gas forecast, used to develop natural gas and coal prices for modeling purposes.

f. Provide the description, and results, of any methodology used to adjust the forecasts for coal or natural gas modeling prices to be Kentucky-specific. If such adjustments were made, provide the underlying data.

24. Project 26 in the LG&E 2011 Environmental Compliance Plan is estimated to have a capital cost of \$1,268 million. From this total, provide the dollar estimate and the percent of total needed to comply with:

- a. The recently finalized CSAPR; and
- b. The proposed HAPs rules.

25. Project 27 in the LG&E 2011 Environmental Compliance Plan is estimated to have a capital cost of \$124 million. From this total, provide the dollar estimate and the percent of total needed to comply with:

- a. The recently finalized CSAPR; and
- b. The proposed HAPs rules.

26. Refer to the Appendix to this request, which consists of Vantage Energy Consultant's ("Vantage") preliminary analysis of the LG&E/KU cost estimates versus an industry benchmark. The estimated costs of the Fabric Filters appear to consistently exceed the industry benchmark. Provide an explanation.

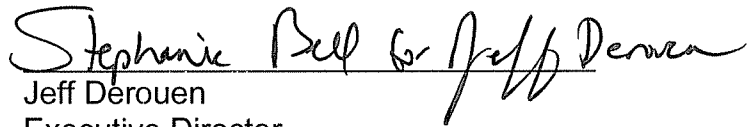
27. Identify and describe all other differences in the Vantage analysis and LG&E/KU values.

28. Refer to LG&E's 2011 Air Compliance Plan, Table 1, "Capital Costs for Environmental Controls" and the Black & Veatch Capital Cost Estimates, included in JNV-2, Appendix B, which detail the summarized direct, indirect, and overall capital costs for each unit.

a. Describe how the Black & Veatch Capital Costs roll up to the capital costs in the Compliance Plan.

b. Include a cost breakdown for each of the units in the Air Compliance Table in \$/kW.

29. Refer to pages 5 and 6 of the Direct Testimony of John N. Voyles, Jr. Explain, based on now having more specific information on the sources and cost of the power that will substitute for the generation of the units planned for retirement, whether LG&E and KU have updated their NPV analysis of the "add controls" and "retire" alternatives. If an updated NPV analysis has been performed, provide the results therefrom. If such an analysis has not yet been performed, explain when it will be performed.

  
Jeff Derouen  
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Public Service Commission  
P.O. Box 615  
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DATED AUG 18 2011

cc: Parties of Record

APPENDIX

APPENDIX TO AN ORDER OF THE KENTUCKY PUBLIC SERVICE  
COMMISSION IN CASE NO. 2011-00162 DATED **AUG 18 2011**

Trimble County Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)		
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Trimble County 1 547 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference
Wet Scrubber	\$538	\$485	\$622	\$580	\$850	\$762	\$512	n/a	n/a
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$460	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$183	n/a	n/a
Fabric Filter (see note 5)	\$170	\$78	\$187	\$78	\$230	\$78	\$154	\$227	\$73
Dry Sorbent Injection	\$43	n/a	\$61	n/a	\$134	n/a	\$43	n/a	n/a
Powdered Activated Carbon	\$8	\$6	\$12	\$6	\$30	\$6	\$7	n/a	n/a
	Industry Benchmark in 2010 \$/kw (see note 3)								
Low Nox Burners	\$48						\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a
Trona Injection	\$90						\$90	n/a	n/a
CO2 Capture/Sequestration	\$1,300						\$1,300	n/a	n/a

Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) The KU/LG&E cost estimate for the fabric filter is 32% above the industry benchmark.

Tyrone Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)		
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Tyrone 3 75 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see Note 4)	Difference
Wet Scrubber	\$538	\$485	\$622	\$580	\$850	\$762	\$806	n/a	n/a
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$727	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$247	n/a	n/a
Fabric Filter (see note 5)	\$170	\$78	\$187	\$78	\$230	\$78	\$154	\$600	\$446
Dry Sorbent Injection	\$43	n/a	\$61	n/a	\$134	n/a	\$134	n/a	n/a
Powdered Activated Carbon	\$8	\$6	\$12	\$6	\$30	\$6	\$18	n/a	n/a
	Industry Benchmark in 2010 \$/kw (see note 3)								
Low Nox Burners	\$48						\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a
Trona Injection	\$90						\$90	n/a	n/a
CO2 Capture/Sequestration	\$1,300						\$1,300	n/a	n/a

Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) The KU/LG&E cost estimate for the fabric filter is 75% above the industry benchmark.



Brown Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)								
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Brown 1 110 mw			Brown 2 110 mw			Brown 3 457 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference
Wet Scrubber	\$538	\$485	\$622	\$580	\$850	\$762	\$601	n/a	n/a	\$601	n/a	n/a	\$512	n/a	n/a
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$532	n/a	n/a	\$532	n/a	n/a	\$460	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$201	n/a	n/a	\$201	n/a	n/a	\$183	n/a	n/a
Fabric Filter (see note 5)	\$170	\$78	\$187	\$78	\$230	\$78	\$133	\$1,000	\$867	\$133	\$1,000	\$867	\$124	\$258	\$134
Dry Sorbent Injection (see note 6)	\$43	n/a	\$61	n/a	\$134	n/a	\$61	\$33	\$28	\$61	\$33	\$28	\$43	n/a	n/a
Powdered Activated Carbon (see note 7)	\$8	\$6	\$12	\$6	\$30	\$6	\$9	\$8	\$1	\$9	\$8	\$1	\$7	n/a	n/a
	Industry Benchmark in 2010 \$/kw (see note 3)														
Low Nox Burners	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a
Improvements	\$24						\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a
Rehabilitation	\$73						\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a
Trona Injection	\$90						\$90	TBD	TBD	\$90	TBD	TBD	\$90	TBD	TBD
CO2 Capture/ Sequestration	\$1,300						\$1,300	n/a	n/a	\$1,300	n/a	n/a	\$1,300	n/a	n/a

- Notes:
- 1) Data taken from recent EPA and EIA reports.
  - 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
  - 3) Data taken from various industry sources.
  - 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
  - 5) The KU/LG&E cost estimates for the fabric filter are 52% to 87% above the industry benchmark.
  - 6) The KU/LG&E cost estimates for the dry sorbent injection systems are 45% below the industry benchmark.
  - 7) The KU/LG&E cost estimates for the powered activated carbon systems are 11% below the industry benchmark.

Cane Run Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)								
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Cane Run 4 168 mw			Cane Run 5 181 mw			Cane Run 6 261 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference
Wet Scrubber (see note 5)	\$538	\$485	\$622	\$580	\$850	\$762	\$601	\$1,077	\$476	\$601	\$1,050	\$449	\$601	\$927	\$326
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$532	n/a	n/a	\$532	n/a	n/a	\$532	n/a	n/a
SCR (see note 6)	\$201	\$165	\$217	\$184	\$268	\$225	\$201	\$423	\$222	\$201	\$414	\$213	\$201	\$372	\$171
Fabric Filter (see note 7)	\$170	\$78	\$187	\$78	\$230	\$78	\$133	\$238	\$105	\$133	\$232	\$99	\$133	\$211	\$78
Dry Sorbent Injection (see note 8)	\$43	n/a	\$61	n/a	\$134	n/a	\$61	\$18	\$43	\$61	\$17	\$44	\$61	\$15	\$46
Powdered Activated Carbon	\$8	\$6	\$12	\$6	\$30	\$6	\$9	n/a	n/a	\$9	n/a	n/a	\$9	n/a	n/a
	Industry Benchmark in 2010 \$/kw (see note 3)														
Low Nox Burners	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a
Trona Injection	\$90						\$90	n/a	n/a	\$90	n/a	n/a	\$90	n/a	n/a
CO2 Capture/ Sequestration	\$1,300						\$1,300			\$1,300	n/a	n/a	\$1,300	n/a	n/a

Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) The KU/LG&E cost estimates for the wet scrubbers are 35% to 44% above the industry benchmark.
- 6) The KU/LG&E cost estimates for the SCR are 44% above the industry benchmark.
- 7) The KU/LG&E cost estimates for the fabric filter are 37% to 44% above the industry benchmark.
- 8) The KU/LG&E cost estimates for the dry sorbent injection systems are 18% below the industry benchmark.

## Ghent Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)											
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Ghent 1 541 mw			Ghent 2 517 mw			Ghent 3 523 mw			Ghent 4 526 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (note 4)	Difference
Wet Scrubber	\$538	\$485	\$622	\$580	\$850	\$762	\$512	n/a	n/a	\$512	n/a	n/a	\$512	n/a	n/a	\$512	n/a	n/a
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$460	n/a	n/a	\$460	n/a	n/a	\$460	n/a	n/a	\$460	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$183	n/a	n/a	\$183	n/a	n/a	\$183	n/a	n/a	\$183	n/a	n/a
Fabric Filter (see note 5)	\$170	\$78	\$187	\$78	\$230	\$78	\$124	\$273	\$149	\$124	\$303	\$179	\$124	\$348	\$224	\$124	\$321	\$197
Dry Sorbent Injection (see note 6)	\$43	n/a	\$61	n/a	\$134	n/a	\$43	\$8	\$35	\$43	\$8	\$35	\$43	\$8	\$35	\$43	\$8	\$35
Powdered Activated Carbon	\$8	\$6	\$12	\$6	\$30	\$6	\$7	\$7	\$0	\$7	\$7	\$0	\$7	\$7	\$0	\$7	\$7	\$0
	Industry Benchmark in 2010 \$/kw (see note 3)																	
Low Nox Burners	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a
Trona Injection	\$90						\$90	TBD	TBD	\$90	TBD	TBD	\$90	TBD	TBD	\$90	TBD	TBD
CO2 Capture/ Sequestration	\$1,300						\$1,300	n/a	n/a	\$1,300	n/a	n/a	\$1,300	n/a	n/a	\$1,300	n/a	n/a

### Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) The KU/LG&E cost estimates for the fabric filter are 55% to 65% above the industry benchmark.
- 6) The KU/LG&E cost estimates for the dry sorbent injection system are 80% below the industry benchmark.

Green River Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)					
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Green River 3 71 mw			Green River 4 109 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference
Wet Scrubber	\$538	\$485	\$622	\$580	\$850	\$762	\$806	n/a	n/a	\$601	n/a	n/a
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$727	n/a	n/a	\$532	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$247	n/a	n/a	\$201	n/a	n/a
Fabric Filter (see note 5)	\$170	\$78	\$187	\$78	\$230	\$78	\$154	\$634	\$480	\$133	\$605	\$472
Dry Sorbent Injection	\$43	n/a	\$61	n/a	\$134	n/a	\$134	n/a	n/a	\$61	n/a	n/a
Powdered Activated Carbon	\$8	\$6	\$12	\$6	\$30	\$6	\$18	n/a	n/a	\$9	n/a	n/a
	Industry Benchmark in 2010 \$/kw (see note 3)											
Low Nox Burners	\$48						\$48	n/a	n/a	\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a	\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a	\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a	\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a	\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a	\$61	n/a	n/a
Trona Injection	\$90						\$90	n/a	n/a	\$90	n/a	n/a
CO2 Capture/ Sequestration	\$1,300						\$1,300	n/a	n/a	\$1,300	n/a	n/a

Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) The KU/LG&E cost estimates for the fabric filter are 75% above the industry benchmark.

Mill Creek Air Quality Control System Cost Profile (\$/kw)

Air Quality Control System	Industry Benchmark in 2010 \$/kw (see note 1)						Specific Unit / Costs in \$/kw (see note 2)											
	301 - 1500 mw		101 - 300 mw		1 - 100 mw		Mill Creek 1 330 mw			Mill Creek 2 330 mw			Mill Creek 3 425 mw			Mill Creek 4 525 mw		
	EPA	EIA	EPA	EIA	EPA	EIA	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference	Industry Average Benchmark	KU/LG&E Estimate (see note 4)	Difference
Wet Scrubber (see note 7)	\$538	\$485	\$622	\$580	\$850	\$762	\$512	\$544	\$32	\$512	\$544	\$32	\$512	(See note 5)		\$512	\$415	\$97
Spray Dryer Absorber	\$460	n/a	\$532	n/a	\$727	n/a	\$460	n/a	n/a	\$460	n/a	n/a	\$460	n/a	n/a	\$460	n/a	n/a
SCR	\$201	\$165	\$217	\$184	\$268	\$225	\$183	n/a	n/a	\$183	n/a	n/a	\$183	n/a	n/a	\$183	(See note 6)	
Fabric Filter (see note 8)	\$170	\$78	\$187	\$78	\$230	\$78	\$124	\$465	\$341	\$124	\$465	\$341	\$124	\$329	\$205	\$124	\$289	\$165
Dry Sorbent Injection (see note 9)	\$43	n/a	\$61	n/a	\$134	n/a	\$43	n/a	n/a	\$43	n/a	n/a	\$43	\$6	\$37	\$43	\$5	\$38
Powdered Activated Carbon (see note 10)	\$8	\$6	\$12	\$6	\$30	\$6	\$7	n/a	n/a	\$7	n/a	n/a	\$7	\$6	\$1	\$7	\$5	\$2
	Industry Benchmark in 2010 \$/kw (see note 3)																	
Low Nox Burners	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
Low Nox Burners with Overfired Air	\$48						\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a	\$48	n/a	n/a
SNCR	\$36						\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a	\$36	n/a	n/a
ESP Improvements	\$24						\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a	\$24	n/a	n/a
ESP Rehabilitation	\$73						\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a	\$73	n/a	n/a
ESP Expansion	\$61						\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a	\$61	n/a	n/a
Trona Injection	\$90						\$90	TBD	TBD	\$90	TBD	TBD	\$90	TBD	TBD	\$90	TBD	TBD
CO2 Capture/ Sequestration	\$1,300						\$1,300	n/a	n/a	\$1,300	n/a	n/a	\$1,300	n/a	n/a	\$1,300	n/a	n/a

Notes:

- 1) Data taken from recent EPA and EIA reports.
- 2) For each specific unit utilized the average of the EPA and EIA costs for the specific unit's industry benchmark.
- 3) Data taken from various industry sources.
- 4) Estimate based on the KU/LG&E 2011 Air Compliance Plan, dated May 2011.
- 5) Mill Creek 4 scrubber to be upgraded and reused as the Unit 3 scrubber at a cost of \$74M (\$174/kw).
- 6) Mill Creek 4 to be upgraded at a cost of \$6M (\$11/kw).
- 7) The KU/LG&E cost estimates for the unit 1&2 wet scrubber is 5% below industry benchmarks, while the cost estimate for the Unit 4 wet scrubber is 19% below the industry benchmark.
- 8) The KU/LG&E cost estimates for the fabric filter are 57% to 73% above the industry benchmark.
- 9) The KU/LG&E cost estimates for the dry sorbent injection systems are 88% below the industry benchmark.
- 10) The KU/LG&E cost estimates for the powdered activated carbon systems are 29% below the industry benchmark.

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