**COMMONWEALTH OF KENTUCKY**

**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

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|---|---|---|
| **INVESTIGATION OF KENTUCKY UTILITIES COMPANY'S AND LOUISVILLE GAS & ELECTRIC COMPANY'S RESPECTIVE NEED FOR AND COST OF MULTIPHASE LANDFILLS AT THE TRIMBLE COUNTY AND GHENT GENERATING STATIONS** | ) ) ) ) ) ) | **CASE NO. 2015-00194** |

# RESPONSE OF KENTUCKY UTILITIES COMPANY AND LOUISVILLE GAS AND ELECTRIC COMPANY

## TO COMMISSION STAFF'S POST-HEARING REQUEST FOR INFORMATION DATED OCTOBER 26, 2015

**CONFIDENTIAL INFORMATION REDACTED**

**FILED: NOVEMBER 2, 2015**

**VERIFICATION**

**COMMONWEALTH OF KENTUCKY** )
) **SS:**
**COUNTY OF JEFFERSON** )

The undersigned, **David S. Sinclair**, being duly sworn, deposes and says that he is Vice President, Energy Supply and Analysis for Kentucky Utilities Company and Louisville Gas and Electric Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the responses for which he is identified as the witness, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

**David S. Sinclair**

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 2nd day of November 2015.

Notary Public (SEAL)

My Commission Expires:
JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

**VERIFICATION**

**COMMONWEALTH OF KENTUCKY )**
**) SS:**
**COUNTY OF JEFFERSON )**

The undersigned, **John N. Voyles, Jr.**, being duly sworn, deposes and says that he is the Vice President, Transmission and Generation Services for Louisville Gas and Electric Company and Kentucky Utilities Company and an employee of LG&E and KU Services Company, that he has personal knowledge of the matters set forth in the responses for which he is identified as the witness, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

**John N. Voyles, Jr.**

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 2nd day of November 2015.

(SEAL)
Notary Public

My Commission Expires:
JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

**KENTUCKY UTILITIES COMPANY**
**LOUISVILLE GAS AND ELECTRIC COMPANY**

**Response to Commission Staff's Post-Hearing**
**Request for Information Dated October 26, 2015**

**Case No. 2015-00194**

**Question No. 1**

**CONFIDENTIAL INFORMATION REDACTED**

**Witness: David S. Sinclair / John N. Voyles**

Q-1. Refer to the Companies' Joint Application, Exhibit 5, regarding the Trimble County Coal Combustion Residual Storage Project Update - Generation Planning & Analysis May 2015 ("May 2015 Analysis").[1] The May 2015 Analysis evaluated the cost of the Trimble County Landfill project against the cost of retiring the Trimble County Generating Station and replacing the capacity and energy. The May 2015 Analysis valuated the landfill and retirement alternatives under three gas price scenarios with limits on CO2 emissions consistent with the U.S. Environmental Protection Agency's ("EPA") 2014 Clean Power Plan ("CPP") proposal. For the CO2 limits, the Companies utilized the proposed CPP rate-based goals of 1,844 lbs/MWh during the interim period 2020-2029 and 1,763 lbs/MWh beginning in 2030 and beyond in modeling proposed state wide limits as a carbon-cap scenario for the Companies' generating fleet such that the units are economically dispatched to ensure that CO2 emissions do not exceed the proposed cap.

a. All else remaining the same, revise the May 2015 Analysis utilizing the CO2 rates established by the CPP that was finalized on August 3, 2015. For Kentucky, the final CPP rule established an interim rate-based goal of 1,509 lbs/MWh and a final rate-based goal in 2030 and beyond of 1,286 lbs/MWh.

b. The landfill alternative evaluated under the 2015 Analysis included the cost of the landfill as well as an assumed cost of $220 million by 2020 to comply with the EPA's proposed effluent limitation guidelines ("ELG").

i. Provide a detailed breakdown of the items included in the ELG compliance costs and explain how the Companies arrived at this estimate.

ii. The EPA finalized the ELG rule for steam electric-power generators on September 30, 2015. Explain whether the final ELG rule has any impact on the

[1] Originally filed as Case No. 2015-00156, *Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Declaratory Order Concerning Construction of the Trimble County Landfill and Related Cost Recovery* (Filed May 22, 2015), and physically consolidated into the instant case by Order entered June 16, 2015.

ELG cost assumption used in the May 2015 Analysis. If so, include any necessary revisions in the updated analysis filed in response to part a. above.

A-1. a. Although the final CPP includes a tighter restriction on Kentucky's $CO_2$ emissions from existing electric generating units than the proposed CPP, several factors are important to note concerning the ultimate finality of the CPP and how it might apply to Kentucky. First, 24 states, including Kentucky, and a number of private entities have initiated serious legal challenges to the CPP, which could result in no change at all to the CPP, a loosening of the restriction on Kentucky, or vacating the CPP entirely; the outcomes of these actions will not be known for some time.[2] Second, it is not yet clear whether or when Kentucky will file a state implementation plan to comply with the CPP. Notably, both of the major-party candidates in Kentucky's current governor's race have expressed opposition to Kentucky developing a state implementation plan to comply with the CPP.[3] If Kentucky does not submit a state implementation plan, a federal implementation plan may be imposed, the criteria of which are unknown at this time because that particular rule has not been finalized. Third, assuming some form of the CPP remains in place after legal challenges are exhausted, either a state or federal implementation plan will ultimately dictate the level of $CO_2$ emission reductions for which the Companies would be responsible as it is part of meeting the state's compliance plan. Therefore, the precise level of $CO_2$ emission reductions the Companies will eventually have to achieve, if any, are uncertain at this time.

Nonetheless, the EPA's final CPP, released in August 2015, did indeed significantly reduce Kentucky's $CO_2$ emission limits from the limits stated in the EPA's proposed CPP. With the originally proposed limits, modifying unit dispatch to meet $CO_2$ emission limits was lower-cost than replacing coal generation with lower $CO_2$ emitting resources. However, some changes in the Companies' generating portfolio will likely be required to meet the final CPP's lower limit, assuming the uncertainties discussed above are resolved to require compliance with this standard. The Companies have begun to consider how their generation portfolio could be optimized to meet the new limits, but this is a much more complex and time-consuming analysis than the May 2015 evaluation and requires at least more resolution of the legal challenges, as well as the path the state will ultimately pursue, than presently exists. The requested analysis therefore does not exist and would require significant original work that cannot be completed within the time requested.

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[2] *See, e.g.*, http://www.nbcnews.com/business/energy/states-industry-groups-sue-block-obamas-clean-power-plan-n450216.

[3] *See, e.g.*, Statement from Attorney General Conway Regarding New EPA Rules (Aug. 3, 2015) ("I again ask Gov. Beshear to direct his Environmental Cabinet to stop developing a state plan that attempts to comply with this illegal rule. Doing so is a waste of time and resources.") *available at:* http://kentucky.gov/Pages/Activity-Stream.aspx?viewMode=ViewDetailInNewPage&eventID={0E1E698E-9C8A-4FDD-B2E9-945D8DF3ABDF}&activityType=PressRelease; Matt Bevin Says EPA Can't Force States to Cut Carbon Pollution (Sept. 16, 2015) *available at:* http://wfpl.org/bevin-says-epa-cant-force-states-cut-carbon-pollution/.

More importantly, given the significant uncertainties today and the final CPP's significantly reduced $CO_2$ emission limits, the Companies do not believe an "all other things equal" analysis (i.e., one that limits its compliance alternative to the retirement and replacement of the Trimble County coal units) is likely to provide reasonable and meaningful information. This is so because a more comprehensive analysis is needed that would consider multiple alternatives for the fleet beyond simply retiring the two newest coal units in the Companies' generation portfolio – the Trimble County coal units.

The Companies respectfully submit, however, that the following information demonstrates that the conclusions from the May 2015 Analysis evaluation, even with the changes in the limits on $CO_2$ emissions in the final CPP, remain valid.

The following table includes the commissioning date, summer net capacity, summer net heat rate, $CO_2$ emission rate, and dispatch cost for each of the Companies' coal units. All data is taken from the May 2015 analysis. Considering the units with FGD, SCR, and baghouse, the Trimble County coal units have among the lowest dispatch costs. Trimble County Unit 2 has the lowest $CO_2$ emissions rate among the Companies' coal units, about 10% below the next unit. Assuming an 80% capacity factor, Trimble County Unit 2's annual $CO_2$ emissions would be approximately 400,000 tons lower than $CO_2$ emissions from an equal amount of capacity from the Companies' other coal units. The favorable efficiency would also result in annual coal expense about $10 million less than other units.

With a full suite of emissions reduction equipment, the Trimble County coal units are well positioned to operate economically past 2030. It would be difficult to envision the retirement of the Trimble County coal units in the absence of a mandate to retire all coal units.

| Emission Controls as of June 2016 | Coal Unit | Commission Date | Net Summer Capacity (MW) | Summer Net Heat Rate (Max Load, mmBtu/MWh) | $CO_2$ Emission Rate (Max Load, lbs/MWh) | Average Dispatch Cost ($/MWh) |
|---|---|---|---|---|---|---|
| FGD | Brown 1 | 5/1/1957 | 106 | 10.4 | 2,128 | [redacted] |
| | Brown 2 | 6/1/1963 | 166 | 10.3 | 2,110 | |
| FGD, Baghouse | Ghent 2 | 4/20/1977 | 495 | 10.7 | 2,187 | |
| | Mill Creek 1 | 7/11/1972 | 300 | 10.4 | 2,142 | |
| | Mill Creek 2 | 6/11/1974 | 297 | 10.6 | 2,177 | |
| FGD, SCR, Baghouse | Brown 3 | 7/19/1971 | 410 | 10.9 | 2,241 | |
| | Ghent 1 | 2/19/1974 | 474 | 10.9 | 2,228 | |
| | Ghent 3 | 5/31/1981 | 485 | 11.0 | 2,263 | |
| | Ghent 4 | 8/18/1984 | 465 | 11.0 | 2,248 | |
| | Mill Creek 3 | 6/28/1978 | 391 | 10.7 | 2,195 | |
| | Mill Creek 4 | 7/15/1982 | 477 | 11.0 | 2,255 | |
| | Trimble 1 | 12/23/1990 | 383 | 10.6 | 2,181 | |
| | Trimble 2 | 1/22/2011 | 549 | 9.3 | 1,899 | |

For these reasons, the Companies respectfully submit that the conclusions from the May 2015 Analysis evaluation remain valid. Even with the changes in the limits on $CO_2$ emissions in the final CPP, the Trimble County Landfill project remains the least-cost option when compared to the cost of retiring the Trimble County Generating Station and replacing its capacity and energy.

b. i. The initial conceptual estimate for Trimble County Station's ELG compliance was prepared by CH2M, a large engineering and construction company with extensive industrial water treatment experience. The estimate was developed at a preliminary conceptual level based on CH2M's broad experience and its initial reviews of station chemistry, water consumption and usages, and balance of plant system designs. The estimate is very conceptual in nature given that it was developed without on-site pilot scale testing and prior to more detailed engineering. The details of the CH2M estimate of $186 million for the treatment facility only are shown in the attached table and does not include balance of plant modifications.

CH2M escalated the estimate of $186 million at 3 percent annually to arrive at a total nominal estimate of $203 million gross. The Companies netted out IMEA and IMPA's share of the cost to yield $152 million, and then added $46 million (30% of net CH2M estimate) as a reasonable conceptual estimate for balance of plant modification scopes, $15 million (10% of net CH2M estimate) for project execution contingency, and $7 million (3.5% of project estimate) for internal labor and project management expenses resulting in a total of $220 million for the project. The estimate and scope will be further refined through mid-2017 as the Companies intend to perform pilot-scale testing in 2016, followed by additional engineering performed to incorporate pilot-scale test findings.

ii. The Companies and CH2M have reviewed the recently released final ELG rule which has not yet been published in the Federal Register as of the date of this response. The Companies and CH2M believe the changes in the released final ELG rule fall within the conceptual framework on which the CH2M estimate was based and thus have no material impact on the CH2M conceptual estimate. Given this, there has been no update to the CH2M estimate with respect to the final ELG rule.

## Conceptual Estimated Capital Cost

CLIENT: Louisville Gas & Electric
LOCATION: Trimble County Generating Station
OPTION: FGD - FBR, ASH - RECYCLE, OTHER - TANK

| Item | | Total Installed Cost |
|---|---|---|
| **FGD Wastewater Treatment** | | |
| FGD Clarifier | | $340,000 |
| FGD Sludge Pump | | $280,000 |
| FGD FBR | | $15,000,000 |
| FGD Methanol Chemical Feed System | | $50,000 |
| FGD Ballasted Sand Clarifier | | $1,400,000 |
| FGD Sand Filtration | | $1,190,000 |
| FGD Waste Solids Sump | | $30,000 |
| FGD Equalization Tank (Concrete) | | $1,300,000 |
| FGD Influent Pump | | $140,000 |
| FGD Influent Heat Exchanger | | $230,000 |
| FGD Mixed Tank Reactor (Steel) | | $240,000 |
| FGD pH Adjustment Tank (Steel) | | $210,000 |
| FGD Biological Influent Pump | | $30,000 |
| FGD Phosphoric Acid Chemical Feed System | | $30,000 |
| FGD MicroC 4100 Chemical Feed System | | $40,000 |
| FGD Ammonium Chloride Chemical Feed System | | $30,000 |
| FGD Aerobic MBBR | | $940,000 |
| FGD Effluent Pump | | $30,000 |
| FGD Gravity Thickener | | $490,000 |
| FGD Filtrate Sump | | $20,000 |
| FGD Waste Solids Pump | | $50,000 |
| **Ash Transport Water Treatment** | | |
| Ash Collection Pump (Sump) | | $90,000 |
| Ash Low Pressure Transfer Pump | | $20,000 |
| Ash Effluent Mix Tank (Steel) | | $680,000 |
| **Other Wastewater Treatment** | | |
| Other Feed Pump | | $30,000 |
| Other Blower | | $30,000 |
| Other Effluent Pump | | $100,000 |
| Other Equalization Tank (Concrete) | | $6,000,000 |
| Other Influent Pump | | $130,000 |
| Other Clarifier | | $560,000 |
| Other Sludge Pump | | $140,000 |

| | | |
|---|---|---|
| Other Mixed Tank Reactor (Steel) | | $470,000 |
| **Common Equipment** | | |
| Common Solid Storage Tank (Steel) | | $2,100,000 |
| Common Caustic Chemical Feed System | | $70,000 |
| Common Acid Chemical Feed System | | $30,000 |
| Common Organosulfide Chemical Feed System | | $60,000 |
| Common Ferric Chloride Chemical Feed System | | $70,000 |
| Common Polymer Chemical Feed System | | $100,000 |
| Common Sludge Filter Press | | $4,300,000 |
| **Total Equipment Cost (TEC)** | | **$37,100,000** |
| Freight | 4.0% | $1,490,000 |
| Sales Tax | 1.0% | $1,100,000 |
| **Purchased Equipment Costs - Delivered (PEC_D)** | | **$39,700,000** |
| Civil Sitework | | $13,100,000 |
| Instrumentation and Controls | | $4,200,000 |
| Mechanical | | $4,700,000 |
| Electrical | | $4,700,000 |
| Finishes | | $2,600,000 |
| Other | | $4,800,000 |
| **Total Direct Costs (TDC)** | | **$73,800,000** |
| Overall Sitework | 10.0% | $7,100,000 |
| Yard Electrical | 18.0% | $12,800,000 |
| Yard Piping | 18.0% | $12,800,000 |
| Electrical Feed (New or Retrofit) | Allowance | $3,500,000 |
| Pipe Racks | Allowance | $800,000 |
| Special Coatings | Allowance | $400,000 |
| **TDC + Additional Project Costs** | | **$111,200,000** |
| Contractor Overhead | 10.0% | $11,100,000 |
| ***Subtotal*** | | $122,300,000 |
| Contractor Profit | 5.0% | $6,100,000 |
| ***Subtotal*** | | $128,400,000 |
| Contractor Mob/Bonds/Insurance | 5.0% | $6,400,000 |
| ***Subtotal*** | | $134,800,000 |
| Contingency | 15.0% | $20,200,000 |
| ***Subtotal*** | | $155,000,000 |
| **Total Construction, Indirects, and Escalation** | | **$155,000,000** |
| Engineering | 10.0% | $15,500,000 |
| Services During Construction | 5.0% | $7,700,000 |
| Commissioning and Startup | 5.0% | $7,700,000 |
| **Total Capital Cost (Present Value 2015 Dollars)** | | **$186,000,000** |