COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE 2014 JOINT INTEGRATED RESOURCE PLAN OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY	**)** **)** **)** **)** **)**	**CASE NO. 2014-00131**

RESPONSE OF
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
TO WALLACE MCMULLEN'S AND SIERRA CLUB'S
THIRD REQUEST FOR INFORMATION
DATED FEBRUARY 4, 2015

FILED: FEBRUARY 18, 2015

VERIFICATION

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

The undersigned, **Charles R. Schram**, being duly sworn, deposes and says that he is Director – Energy Planning, Analysis and Forecasting for 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.

Charles R. Schram

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 18th day of February 2015.

(SEAL)
Notary Public

My Commission Expires:

SUSAN M. WATKINS
Notary Public, State at Large, KY
My Commission Expires Mar. 19, 2017
Notary ID # 485723

LOUISVILLE GAS AND ELECTRIC COMPANY
KENTUCKY UTILITIES COMPANY

Response to Wallace McMullen's and Sierra Club's
Third Request For Information
Dated February 4, 2015

Case No. 2014-00131

Question No. 3.1

Witness: Charles R. Schram

Q-3.1. Please refer to the Companies' response to Sierra Club's data request 2.3(a).

a. Are the Companies stating that they did not consider capital and fixed O&M costs for existing units because the Companies believe that such costs would be the same across all scenarios?

    i. If not, explain the statement that "capital and fixed O&M costs for existing generating units are not impacted by the scenarios evaluated."

b. Please confirm that while capital and fixed O&M costs for existing units were not inputs in the Strategist modeling, the Companies used capital and/or fixed O&M costs for existing units to calculate the PVRR of portfolios.

    i. If denied, please explain

c. Please describe each way in which capital and fixed O&M costs for existing units were used to calculate the PVRR of portfolios.

d. Please confirm that in the Resource Assessment, the Companies used capital and fixed costs (as well as variable costs) for new resources to determine the levelized cost of energy in order to screen out new resources.

e. Please describe each way in which capital and/or fixed costs for new units were used to either screen out new resources or calculate the PVRR of portfolios in which new resources were available to the model.

A-3.1.

a. Yes. For the scenarios evaluated in the 2014 IRP, the Companies assume that the capital and fixed O&M costs would not be materially different. The Companies acknowledge changes in dispatch can affect a unit's capital and fixed

O&M costs. For example, certain capital and fixed O&M costs could potentially decrease for units operating at lower-than-historical capacity factors. Should the Companies reasonably anticipate that a unit could experience a material change in its operating profile, then it would be necessary to reevaluate the planned staffing and maintenance of the unit. For example, prior to its retirement, Tyrone Unit 3 was operated seasonally during periods of higher load and therefore shared staff with the Brown station. In summary, when a unit's dispatch is anticipated to materially change, the Companies' objective in resource decisions is to minimize customers' costs while maintaining reliability.

b. The capital and fixed O&M costs for existing units were not used to calculate the PVRR of portfolios.

    i. See the Companies' response to Sierra Club 2-14(b). The 2014 IRP process did not include an explicit retirement analysis where existing units were iteratively removed from the Companies' generation portfolio to compare the costs of continued operation to the costs of capacity replacement. Since the capital and fixed O&M costs for existing units are the same for each portfolio, they do not contribute to differences between the PVRRs of the various expansion plans as determined in the 2014 IRP.

c. See the response to part b.

d. Confirmed.

e. The capital and fixed costs for new units were used in both parts of the resource assessment: the supply-side screening analysis and the expansion planning analysis. See the 2014 Resource Assessment in Volume III of the 2014 IRP for more details on the supply-side screening and expansion planning analysis inputs and methodology.

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Response to Wallace McMullen's and Sierra Club's
Supplemental Data Requests
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Case No. 2014-00131

Question No. 3.2

Witness: Charles R. Schram

Q-3.2. Please refer to the Companies' response to Sierra Club's data request 2.3(b). Please confirm that in this IRP, the Companies did not evaluate whether any future capital and/or fixed costs could make existing units uneconomic to operate relative to alternative supply-side and/or demand-side resources.

a. If denied, please identify the economic analysis in the 2014 IRP in which the Companies used capital and/or fixed O&M costs for existing units as part of an evaluation of whether existing units may become less economic to operate than alternative resources.

b. Is it the Companies' position that capital and fixed O&M costs can never cause an existing unit to become uneconomic to operate?

i. If not, why did the Companies not evaluate how future capital and fixed O&M costs will impact the economics of existing units relative to alternative resources?

A-3.2. Confirmed.

a. Not applicable. See the response to Question No. 1.

b. No. The Companies are always looking for ways to reliably meet customers' energy needs at the lowest reasonable cost. The Companies have previously considered these types of costs and will continue to consider these costs when evaluating decisions to meet customers' future energy needs. See the Companies' 2011 IRP (Case No. 2011-00140) and the 2011 ECR filings (Case Nos. 2011-00161 and 2011-00162) for examples. However, there are no current or pending environmental regulations that would result in a choice between increased capital and/or fixed O&M costs and retiring units. Instead, the scenarios included in the 2014 IRP were related to CO_2 emissions in anticipation of the EPA's proposed greenhouse gas regulations for existing units. As proposed, these regulations do not necessarily result in capital and

fixed O&M cost changes. Instead, units may need to be dispatched differently to meet broader CO_2 emissions limits.

i. See part b. and the Companies' response to Question No. 1(b).

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Supplemental Data Requests
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Case No. 2014-00131

Question No. 3.3

Witnesses: Charles R. Schram

Q-3.3. Please refer to the response to Sierra Club's data request 2.5. Please confirm that in the mid gas, base load scenarios Brown Unit 3's capacity factor stays close to the level at which the Companies designated the unit as must-run.

a. Please confirm that this indicates that in these scenarios, the Strategist model rarely selected Brown Unit 3 to run on an economic basis above the minimum capacity segment for which the Companies designated Brown 3 as must-run.

A-3.3. In the Strategist model, Brown Unit 3 was designated as a must-run unit based on transmission requirements to ensure reliability. Brown Unit 3 runs slightly above its minimum capacity factor annually in the referenced scenarios.

a. The Companies are unable to confirm this statement. Without the must-run constraint, the Companies would expect the capacity factor for Brown Unit 3 to be lower. However, the Companies would need to model the unit without the must-run constraint to assess the extent to which Brown Unit 3 would potentially be dispatched above its minimum output level in an unconstrained setting.

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Response to Wallace McMullen's and Sierra Club's
Supplemental Data Requests
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Case No. 2014-00131

Question No. 3.4

Witness: Charles R. Schram

Q-3.4. Please refer to the response to Sierra Club's data request 2.5. Please confirm that in the mid gas, base load, and zero carbon scenario, from 2020 to 2028, Brown Unit 1 increases its capacity factor from 11.5% to 30.8% and Brown Unit 2 increases its capacity factor from 16.8% to 44.7%.

a. Do LG&E and KU believe that Brown Units 1 and 2 are likely to nearly triple their generation between 2020 and 2028?

b. Please confirm that the model results referenced above do not take into account any capital and fixed costs that might make Brown Units 1 and/or 2 uneconomic to operate prior to 2028.

A-3.4. Confirmed.

a. The Companies believe that these capacity factors are reasonable given the scenario's load, gas price, and carbon inputs. Note that the price differential between the Mid natural gas price forecast and the price forecast for coal delivered to the E.W. Brown Station increases by 105 percent from 2020 to 2028 in this scenario (see Table 14 and Table 29 on pages 20 and 38, respectively, in the Resource Assessment). Therefore, it is not surprising that this change results in more economic generation coming from coal units.

b. Confirmed; please see the Companies' response to Question No. 1(b) for the discussion of capital and fixed costs. A primary benefit of scenario analysis in both the IRP process and specific resource commitment decisions is to consider uncertainty and risk, ensuring that decisions are robust across a range of inputs. The 2014 IRP included scenarios with ranges of inputs for fuel price, load, and carbon. While the IRP is a snapshot in time of potential future resource needs, the actual decision process for meeting customers' future energy needs would include all relevant costs, including capital and fixed O&M costs, to ensure robust decisions that result in an optimum resource portfolio for a wide range of possible scenarios. The Companies have previously demonstrated this approach in evaluating existing units in the 2011 ECR filings (Case Nos. 2011-00161 and 2011-00162).

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Response to Wallace McMullen's and Sierra Club's
Supplemental Data Requests
Dated February 4, 2015

Case No. 2014-00131

Question No. 3.5

Witness: Charles R. Schram

Q-3.5. Please refer to the response to Sierra Club's data request 2.14. Please confirm that the Companies calculated the average capacity factor for each year by weighting the 3 gas price scenarios equally.

a. If denied, please explain how the Companies weighted each gas price scenario.

b. Do the Companies believe that the high and low gas prices they used are each as equally likely to occur as the mid gas price?

i. If so, explain why.
ii. If not, explain the basis for the Companies' weighting of the gas price scenarios.

c. Please explain why the Companies did not weight the mid gas price as more likely to occur than either the high or low gas price, given that the AEO Reference case is a projection of business-as-usual trends based on known technological and demographic trends.

A-3.5. Confirmed.

a. Not applicable.

b. The Companies have not taken a position regarding the probability of the high and low natural gas price forecasts occurring. In the 2014 IRP's Resource Assessment, the high and low gas price scenarios represent a reasonable range of potential natural gas prices that is used to demonstrate the robustness of the Companies' resource planning under a wide range of scenarios. The EIA presented 31 alternative cases in its 2014 AEO that address many of the key uncertainties that shape the energy markets. However, the EIA did not assign a probability to any of its AEO cases, including the Reference Case. In the absence of reasons to give any gas price

scenario more weight than another, the Companies assigned an equal probability to each gas price scenario.

c. See response to part b.

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KENTUCKY UTILITIES COMPANY

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Supplemental Data Requests
Dated February 4, 2015

Case No. 2014-00131

Question No. 3.6

Witness: Charles R. Schram

Q-3.6. Please refer to the Resource Assessment at p. 6. Please confirm that the Companies set up the Strategist modeling in such a way that distributed solar generation was not available as an existing or new resource for the model to select.

A-3.6. The only solar generation option considered in the both the technology screening and the expansion planning analysis was based on a utility-scale solar photovoltaic ("PV") option developed by Burns & McDonnell. The Companies have not studied their customers' interest in installing distributed residential solar, but have had a net metering tariff in place since 2002. Distributed solar generation still costs more than utility scale solar, based on cost estimates from EIA's 2014 Annual Energy Outlook report. The table below includes cost estimates from EIA, Burns & McDonnell, and the Companies estimate for the Brown solar project. The estimates for utility scale solar generation are 6 to 34 percent less than the EIA estimate for distributed residential solar installations.

Solar PV	**Gen Capacity**	**Capital Cost ($2013, $/kW)**	**Source**
Distributed Residential	4 kW	4,519	EIA - 2014 AEO
Utility Scale	20 MW	4,242	EIA - 2014 AEO
Utility Scale	150 MW	3,927	EIA - 2014 AEO
Utility Scale	50 MW	2,990	Burns & McDonnell- 2014 IRP
Utility Scale	10 MW	3,318	Brown Solar - 2013 CPCN Filing

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Supplemental Data Requests
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Case No. 2014-00131

Question No. 3.7

Witness: Charles R. Schram

Q-3.7. Have the Companies reviewed the Southeast Wind Energy Fact Sheet (December 2014), *available at* http://www.eenews.net/assets/2014/12/10/document_ew_01.pdf?

a. If so, do the Companies agree with the Fact Sheet referenced above that the potential to generate wind energy in Kentucky has increased based on the development of larger wind turbines?

A-3.7. Yes, but please note that the cited document is dated December 2014; the Companies filed their IRP in April 2014, more than seven months before the date of the cited document. Therefore, the Companies could not have taken into account the cited report when performing the analysis for or drafting their 2014 IRP.

Also, please note that the IRP is a snapshot view of an ongoing planning process, and is not a proposal for the Companies to implement any particular generating resource approach. As the first page of the Companies' IRP states:

> This Integrated Resource Plan represents a snapshot of an ongoing resource planning process using current business assumptions. The planning process is constantly evolving and may be revised as conditions change and as new information becomes available. Before embarking on any final strategic decisions or physical actions, the Companies will continue to evaluate alternatives for providing reliable energy while complying with all regulations in a least-cost manner. Such decisions or actions will be supported by specific analyses and will be subject to the appropriate regulatory approval processes.

Therefore, when the Companies conduct the analyses necessary for their next triennial IRP, they will take into account the then-current state of wind power and other generating technologies.

a. The Companies do not have sufficient information to opine definitively upon the amount of potential wind energy that could be generated in Kentucky. That aside, assuming that (1) wind-power technology has progressed rather than regressed since the Companies' analyses in the 2014 IRP and (2) wind patterns have not changed materially during the relevant times, it seems reasonable to assume that there is more technically achievable wind-energy potential in Kentucky now than there was almost a year ago.

But it is noteworthy that the cited "Fact Sheet" says nothing about the cost of achieving the asserted potential. Instead the "Fact Sheet" asserts that wind turbines become "economically viable" when they receive a 35% gross capacity factor. But merely knowing the gross capacity factor of a generating unit is not sufficient to determine whether the unit is economical to build or operate; the "Fact Sheet" does not state its assumed costs to build or operate such units, and does not state its assumptions about avoided costs of capacity or energy. The latter omission is a particularly noteworthy omission because wind-powered generators have notoriously low capacity factors when they are most needed, namely during summer demand peaks.[1] Furthermore, the "Fact Sheet" does not indicate whether it has accounted for the cost of having other generating units available to provide energy to smooth the inevitable output fluctuations of wind-powered generators. The "Fact Sheet" further does not indicate whether it has accounted for other costs utilities can face when deploying wind power, such as the recent $2.5 million settlement PacifiCorp paid to federal authorities resulting from bird kills at its wind farms.[2] Therefore, the Companies have no basis upon which to evaluate the claims of the "Fact Sheet" concerning the wind-energy potential in Kentucky as economical.

Instead of relying on "Fact Sheets" lacking important facts, the Companies' 2014 IRP contains cost information from a reputable third-party consultant, Burns & McDonnell, for numerous generating technologies, including wind power. In addition, when the Companies need to acquire additional generating resources, they issue requests for proposals to a broad spectrum of potential vendors to determine what is actually available, not merely theoretically available, and at what cost.[3] Thus far, the wind based

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[1] *See* "ERCOT Finally Values Wind Peak Capacity Using Actual Data," available at: http://texas2.sierraclub.org/texas-green-report/ercot-finally-values-wind-peak-capacity-using-actual-data. Note in particular the non-coastal ELCC average of just 10.3%, which might be a reasonable proxy for Kentucky given its decidedly non-coastal location.

[2] *See* "Buffett's PacifiCorp fined $2.5m for bird deaths at Wyoming wind farms," available at: http://www.rechargenews.com/wind/1387234/Buffetts-PacifiCorp-fined-2.5m-for-bird-deaths-at-Wyoming-wind-farms.

[3] For example, in the Companies' most recent round of requests for proposals for additional generating resources, they sent their request to 165 potential suppliers, including a number of renewable energy suppliers, and received 72 proposals. *See In the Matter of: Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for Certificates of Public Convenience and Necessity for the Construction of a Combined Cycle Combustion Turbine at the Green River Generating Station and a Solar Photovoltaic Facility at the E.W. Brown Generating Station*, Case No. 2014-00002, Testimony of David S. Sinclair, Exhibit DSS-1 at 1 (Jan. 17, 2014).

proposals received have generally been from wind generation located or proposed in Indiana and Illinois.