COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF KENTUCKY UTILITIES COMPANY AND LOUISVILLE GAS AND ELECTRIC COMPANY FOR CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND APPROVAL OF A DEMAND SIDE MANAGEMENT PLAN	**)** **)** **)** **)** **)** **)** **)**	**CASE NO. 2022-00402**

RESPONSE OF
KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY
TO
THE COMMISSION STAFF'S THIRD REQUEST FOR INFORMATION
DATED APRIL 17, 2023

FILED: MAY 5, 2023

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Tim A. Jones**, being duly sworn, deposes and says that he is Manager – Sales Analysis and Forecast for LG&E and KU Services Company, 220 West Main Street, Louisville, KY 40202, 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.

Tim A. Jones

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 5th day of May 2023.

Caroline J. Davison
Notary Public

Notary Public ID No. KYNP63286

My Commission Expires:

January 22, 2027

CAROLINE J. DAVISON
COMM EXPIRES
01/22/2027
NOTARY
PUBLIC
ID # KYNP63286
STATE AT LARGE, KENTUCKY

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Stuart A. Wilson**, being duly sworn, deposes and says that he is Director, Energy Planning, Analysis & Forecasting for LG&E and KU Services Company, 220 West Main Street, Louisville, KY 40202, 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.

Stuart A. Wilson

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 5th day of May 2023.

Notary Public

Notary Public ID No. KYNP63286

My Commission Expires:

January 22, 2027

KENTUCKY UTILITIES COMPANY
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LOUISVILLE GAS AND ELECTRIC COMPANY

Response to Commission Staff's Third Request for Information
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Question No. 1

Responding Witness: Stuart A. Wilson

Q-1. Refer to the Direct Testimony of Stuart A. Wilson (Wilson Direct Testimony), Exhibit SAW-2 Confidential Workpapers Folder, 02_Plesox, 01_Results, CONFIDENTIAL_20221212_Combined_Solution_Views_2061-2073.xlsx, Summary tab. Explain the significance of the colored cells in this Excel file.

A-1. Cells are colored as an aid in visual interpretation of the spreadsheet to indicate the year in which a particular resource is built or retired. Cells are colored green, light green, yellow, and red based on a retirement or build date in the year 2027, 2028, 2029, and 2030, respectively.

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Question No. 2

Responding Witness: Stuart A. Wilson

Q-2. Refer to Stuart Direct Testimony, Exhibit SAW-2, Public Workpapers Folder, 02_PLEXOS\ folder, RetirementSavings.csv.

a. Provide a detailed explanation of how these savings were calculated, including a breakdown of all associated savings.

b. Explain whether the savings were calculated prior to Stage One, Step One and then used as inputs in the PLEXOS model (or other step/model) or whether those savings are calculated based on model outputs.

c. Provide all additional workpapers that support this calculation in a live, unlocked Excel document with all formulas and links intact.

d. This spreadsheet includes retirement savings values for all LG&E/KU's coal units. Confirm that the only units that the model was given the option to retire were Brown 3, Ghent 2, and Mill Creek 2. If not confirmed, list any other units that were available for the model to retire.

A-2.

a. These savings reflect the revenue requirements that would be avoided in the years leading up to a unit's retirement. For example, the Companies would not incur the cost of a turbine overhaul if a unit were to be retired in the following year. Annual costs in PLEXOS reflect the operating costs for continued operation, and by default PLEXOS assumes all future operating costs can be avoided. The retirement credit calculates the incremental revenue requirement savings associated with a unit's retirement in a given year to allow PLEXOS to accurately consider these savings.

This calculation requires identifying cost reductions in their respective years, escalating those reductions to the future value in the retirement year, and if applicable, scaling capital costs into a single future value of revenue requirements. Retirement savings include reduced stay-open capital, stay-open O&M, and overhaul costs. Retirement savings for Mill Creek 2 and

Ghent 2 in 2027 and 2028 also include avoided SCR capital and O&M, effectively assuming that an SCR would only be required if one of these units operated beyond 2028.

b. The retirement savings were calculated prior to Stage One, Step One and were an input to the PLEXOS model.

c. The calculations for these costs can be found on the RetirementCreditCalcs tab of "\04_FinancialModel\Support\StayOpenCosts\20221207_StayOpenSummary_0308.xlsx" in Exhibit SAW-2. The results are translated into a PLEXOS format on the PLEXOS_Inputs tab.

d. Confirmed.

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Question No. 3

Responding Witness: Stuart A. Wilson

Q-3. Refer to Wilson Direct Testimony, Exhibit SAW-2 Confidential Workpapers folder, 02_Plexos, CONFIDENTIAL_20221212_2022RFP_PLEXOS_Screening_Inputs_0308.xlsx, DataTable tab. Also refer Wilson Direct Testimony, Exhibit SAW-2 Confidential Workpapers folder, 02_Plexos, 01_Results,CONFIDENTIAL_20221212_Combined_Solution_Views_2061-2073.xlsx, NewUnits tab.

a. Explain why Brown battery energy storage system (BESS) (Project ID: 15a-B) is not marked as "In_Plexos" in the RFP screening workbook but is included in the combined solution views workbook.

b. Confirm that Brown BESS was not included as a resource option in either of the PLEXOS modeling steps. If not, explain when the decision was made to include it among the resources proposed in this case, and provide the reasoning behind that decision.

c. State whether there were any other resources that were similarly eliminated during the screening step and still entered into PLEXOS and, if so, provide a list of those resources.

A-3. Note that all references to Exhibit SAW-1 herein and throughout the Companies' responses are to the updated May 2023 Exhibit SAW-1 provided in response to JI 2-60(a).

a. Brown BESS was not marked as "In Plexos" because the Companies did not model it in PLEXOS. It was inadvertently included in the combined solution views workbook, which had no impact on the summarization of the PLEXOS model results.

b. Confirmed. See the response to PSC 2-56. The Stage Three, Step Two analysis summarized in Section 4.6.2 of Exhibit SAW-1 provides the basis for including Brown BESS in the recommended portfolio.

c. For the reasons discussed in the response to PSC 2-56, proposals for Companies-owned solar were also excluded from the Stage One and Stage Two analyses. See Exhibit SAW-1 at page 12.

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Question No. 4

Responding Witness: Stuart A. Wilson

Q-4. Refer to Wilson Direct Testimony, Exhibit SAW-2 Confidential Workpapers folder, Confidential_03_PROSYM, Modelinputs, Support, 20221208_NGCC_SCCT_Specs_0308.xlsx, PROSYM Inputs tab. Explain the assumptions regarding the cost adder for each of the resources modeled.

A-4. The Companies assume the "cost adder" is in reference to the Start Cost Adder in row 14. The Start Cost Adder is a costless adder (i.e., PROSYM considers the cost in unit commitment and dispatch, but does not include it in the final production costs) that is intended to instruct the model regarding the extent to which each unit start contributes to future maintenance costs. NGCCs are expected to operate at high capacity factors with Long-Term Service Agreement (LTSA) maintenance costs being a function of hourly generation and not unit starts, so the Start Cost Adder does not apply. Maintenance costs for SCCTs are expected to be a function of unit starts, so the Companies calculated forecasted LTSA costs into a cost per start and reflected this cost as a Start Cost Adder in PROSYM. Both proposals provided LTSA costs as a component of variable O&M, which is how the actual costs were reflected in the analysis.

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Question No. 5

Responding Witness: Stuart A. Wilson

Q-5. Refer to Wilson Direct Testimony, Exhibit SAW-2 Confidential Workpapers folder, Confidential_03_PROSYM, ModelInputs, ExpPlans folder. List the information that can be found in each of the files with the .dat extension.

A-5. Each of the files in this folder contains a list of units for a given portfolio and instructs PROSYM whether a given unit is active or inactive beginning in a specific year using the Units variable. A value of 1 indicates a unit is active, and a value of 0 indicates a unit is inactive. Note that within PROSYM an exclamation point (!) acts as a comment, and text to the right of an exclamation point is ignored by PROSYM.

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Question No. 6

Responding Witness: Stuart A. Wilson

Q-6. Refer to Wilson Direct Testimony, Exhibit SAW-2 Public Workpapers folder, 02_Plexos, 2022RFP (8.300 R08)_PLEXOS_Database_Export_ExcelFormat.xlsx.

a. Confirm that this file represents the inputs for Stage One, Step One.

b. Provide a description of the contents of each of the tabs listed below:

(1) Objects;

(2) Categories;

(3) Memberships;

(4) CustomColumns;

(5) Attributes;

(6) Properties;

(7) Reports; and

(8) Config.

c. Provide a similar file for Stage Two, Step Two.

A-6.

a. Confirmed. However, it also covers the inputs for Stage Two, Step One. The referenced file is an auto-generated database export created by PLEXOS detailing all Objects, Categories, Memberships, Attributes, Properties, Reports, and Configurations.

b.

(1) Objects: PLEXOS is configured on an object-oriented database. This tab provides high-level detail on each object in the PLEXOS database. PLEXOS objects cover a broad range of purposes within the software.

- The "class" column specifies the type of object in each row, the "GUID" is a PLEXOS-specific internal ID used in the User Interface.
- The "name" column contains the name of the object in PLEXOS
- "Category" is the folder the object resides in in the PLEXOS GUI.
- The "description" column contains a limited description for some objects.

(2) Categories: In the PLEXOS graphical user interface ("GUI"), objects may be organized in folders called "categories." This tab is a list of those category names along with the "rank" attribute, which specifies the order of display within the GUI.

(3) Memberships: Memberships within PLEXOS are used to associate a "parent" object with a "child" object. Memberships allow for logical organization and association of the many details that go into model runs.

(4) CustomColumns: PLEXOS allows users to create custom columns in the Desktop Interface. This tab is empty because the Companies' have not created any custom columns.

(5) Attributes: This tab is an export of the attributes for each object specified in the "name" column. These attributes primarily relate to "model objects" such as "Long-Term Reports" and "Time Period Horizons" rather than system objects like generating units.

(6) Properties: Each object in the PLEXOS database has a set of properties that define it. This tab is a compendium of those properties for each system object.

(7) Reports: This tab specifies the properties associated with each report that has been configured in PLEXOS.

(8) Config: This tab displays the version of the PLEXOS software that was used to create the database.

c. Stage Two, Step Two was performed using PROSYM, which does not produce a database export file. See the response to part (a).

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Question No. 7

Responding Witness: Stuart A. Wilson

Q-7. Refer to Wilson Direct Testimony, Exhibit SAW-2 Public Workpapers folder, 02_PLEXOS, 2022RFP (8.300 R08)_PLEXOS_Database_Export_ExcelFormat.xlsx. Explain why the following two battery options are not included in the file:

a. NewStorage4_15a-B;

b. NewStorage4_6g-SB_st.

A-7.

a-b. The Companies did not model these storage asset resources in PLEXOS.[2]

[2] *See* Exhibit SAW-1 at 12 ("The Companies excluded proposals for the purchase or development of solar and battery storage assets from advancing to the modeling analysis due to the economics of the proposals. The Companies revisited these proposals in Stage Three of the analysis described below.").

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Question No. 8

Responding Witness: Stuart A. Wilson

Q-8. Refer to Wilson Direct Testimony, Exhibit SAW-2 Public Workpapers folder, 02_PLEXOS, 2022RFP (8.300 R08)_PLEXOS_Database_Export_ExcelFormat.xlsx. When filtering data for "Spinning Reserves," the only objects that show up are thermal resources including existing and new resources.

a. Describe all the ancillary services modeled in PLEXOS (capacity expansion) and provide the required levels for all portfolios.

b. Provide a list of all resources that can provide each of the ancillary services.

c. If energy storage is not allowed to provide ancillary services, explain why.

d. Explain whether ancillary service requirements differ in PROSYM.

e. Explain whether the ability to provide ancillary services differs by resource between PLEXOS and PROSYM.

A-8.

a. The Companies modeled spinning reserves in PLEXOS with a requirement of 318 MW for all portfolios.

b. The Companies modeled the ability for spinning reserves to be provided by the RFP responses for SCCT and NGCC units and the Companies' existing thermal resources that were not assumed to be retired. The following table lists each of these units.

Brown 3	Ghent 2	Trimble 5
Brown 5	Ghent 3	Trimble 6
Brown 6	Ghent 4	Trimble 7
Brown 7	Mill Creek 1	Trimble 8
Brown 8	Mill Creek 2	Trimble 9
Brown 9	Mill Creek 3	Trimble 10
Brown 10	Mill Creek 4	RFP - Brown 12 NGCC
Brown 11	Paddy's Run 13	RFP - Brown SCCTs
Cane Run 7	Trimble County 1	RFP - Mill Creek 5 NGCC
Ghent 1	Trimble County 2	RFP - Mill Creek SCCTs

c. While batteries can certainly provide instant energy when charged, the Companies are uncertain to what degree energy storage can reliably provide ancillary services as a quick-start source of operating reserves on the Companies' system. As discussed in Mr. Sinclair's testimony, the Companies need operational experience with battery storage resources to learn about the issues of operating a battery asset.[2]

d. The spinning reserves requirement is the same in PROSYM.

e. The resources that are configured to contribute to ancillary services in PROSYM is the same as the list of resources for PLEXOS in part (b).

[2] *See* Sinclair Testimony at 24-26 and Exhibit SAW-1 at the bottom of page 38.

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Question No. 9

Responding Witness: Stuart A. Wilson

Q-9. Refer to Wilson Direct Testimony, Exhibit SAW-2 Public Workpapers folder, 02_PLEXOS, 2022RFP (8.300 R08).xml. Confirm that this file is the same as 2022RFP (8.300 R08)_PLEXOS_Database_Export_ExcelFormat.xlsx. If not confirmed, provide this file in Excel format.

A-9. The Companies' use the PLEXOS software to open the "02_PLEXOS, 2022RFP (8.300 R08).xml" file. The "2022RFP (8.300 R08)_PLEXOS_Database_Export_ExcelFormat.xlsx" file is an automated export of the exact data contained in the ".xml" file, but it is in Excel format to provide a transparent view of the database without the need for the PLEXOS software.

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Question No. 10

Responding Witness: Tim A. Jones / Stuart A. Wilson

Q-10. Refer to the Direct Testimony of Tim A. Jones (Jones Direct Testimony), CONFIDENTIAL-Exhibit TAJ-3, Confidential Workpapers folder, Hourly_Forecast_Updates, PV, Price Needed to Meet Total Project Costs, Price Needed for Energy Exported to Grid to Meet Total Project Costs_SAW.xlsx, Model tab. Provide the source and justification for the assumptions in capital escalation for solar capital cost.

A-10. All costs in the 2022 NREL ATB are provided in real terms in 2020 dollars. To convert solar costs from real to nominal dollars, the Companies estimated inflation rates that cause the levelized cost of energy for utility-scale solar projects to align with the cost of solar PPAs received in response to the Companies' RFP. The results indicate that utility-scale solar costs have increased by 30-40% in nominal terms since 2020, which is consistent with the Companies' experience. Because utility-scale and private solar installations use similar materials, the Companies used these inflation rates to convert private solar costs from real to nominal dollars. The Excel workbook that contains this analysis is located in Exhibit SAW-2 at 01_Screening/Support/ CONFIDENTIAL_20221209_ResourceScreeningModel_0308_Inflation.xlsx.