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 SIERRA CLUB'S
SUPPLEMENTAL REQUEST FOR INFORMATION
DATED APRIL 14, 2023

FILED: MAY 4, 2023

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Lonnie E. Bellar**, being duly sworn, deposes and says that he is Chief Operating Officer for Louisville Gas and Electric Company and Kentucky Utilities Company and an employee of 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.

Lonnie E Bellar

Lonnie E. Bellar

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 1st day of May 2023.

Caroline J. Dawson

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, **Philip A. Imber**, being duly sworn, deposes and says that he is Director – Environmental and Federal Regulatory Compliance 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.

Philip A. Imber

Philip A. Imber

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 2nd day of May 2023.

Caroline J. Dawson

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, **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, 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.

David S. Sinclair

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 1st 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
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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 1st day of May 2023.

Caroline J. Davison
Notary Public

Notary Public ID No. KYNP 63286

My Commission Expires:

January 22, 2027

CAROLINE J. DAVISON
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STATE AT LARGE, KENTUCKY

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

**Response to Sierra Club's Supplemental Request for Information
Dated April 14, 2023**

Case No. 2022-00402

Question No. 2-1

Responding Witness: Lonnie E. Bellar

Q.2-1. For each of the Companies' existing gas generating units, please indicate:

a. The gas line serving that generating unit.

b. Whether the generating unit has dual fuel capability with onsite fuel storage.

c. What percentage of the generating unit's peak gas consumption is supplied via firm gas transportation contracts.

d. The geographic area from which gas supply for that generating unit is sourced.

e. What percentage of the generating unit's peak gas consumption comes from supply contracts that are longer than one year in duration.

f. What, if any, impacts were observed on gas supply or transportation to that generating unit during Winter Storm Elliott (December 21-27, 2022)?

g. If there were any impacts to that generating unit during the period December 21- 27, 2022, please quantify the reduction in the generating unit's output due to the disruption to gas supply or transportation, and the start and end time for that reduction.

A.2-1.

a. The Texas Gas Transmission pipeline serves Cane Run 7, Paddy's Run 12-13, and Trimble County 5-10. Either the Texas Eastern or Tennessee Gas pipeline is capable of serving the seven E.W. Brown combustion turbines (Brown 5-11). Haefling 1-2 are connected to the Columbia Gas of Kentucky distribution system.

b. Four units at E.W. Brown, Brown 8-11 have dual fuel capability with onsite fuel oil storage.

c. The Companies have firm gas transportation contracts for Cane Run 7 and the Trimble County combustion turbines. These contracts also enable gas to be burned at Paddy's Run 12-13. Contracted hourly rights are sufficient to meet full-load usage of Cane Run 7 on a year-round basis. At Trimble County, the agreements for summer allow the hourly operation of five of six CTs at maximum load. Winter Trimble County agreements allow the operation of six CTs at maximum load for 16 hours and minimum load for eight hours. The E.W. Brown CTs do not have firm gas transportation.

d. See the response to PSC 2-73.

e. None of the Companies' gas supply contracts have terms longer than one year.

f. No gas purchases were cut by suppliers. The Companies experienced low pressure on the Texas Gas Transmission interstate pipeline. See the response to PSC 1-58 (a), particularly the second paragraph.

g. See the response to PSC 1-99 covering the period of 12/23/2022 through 12/26/2022. No additional gas pressure impacts occurred prior to, or beyond this period.

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Question No. 2-2

Responding Witness: Lonnie E. Bellar

Q.2-2. Please refer to the direct testimony of Lonnie Bellar at page 7, which indicates that the proposed gas combined cycle units could be served by the Texas Gas, Texas Eastern, or Tennessee Gas pipelines.

a. Please confirm that each of those pipelines is primarily supplied from gas fields in the Gulf of Mexico. If not, please explain where the gas supply is sourced from.

b. Are the Companies aware of past events in which there were simultaneous disruptions to supply on more than one of those pipelines, such as a hurricane shutting down gas production in the Gulf of Mexico?

c. If the Companies are aware of such past events, please state the event and, to the extent known to the Companies, the duration of the disruption to each pipeline's supply.

A.2-2.

a. All three pipelines are bi-directional, meaning they flow both from the south (Gulf of Mexico/Texas supply) and from the north (primarily the Marcellus region). The Companies do not have information identifying the null point on each pipeline.

b. The Companies do not have records identifying any supply issues that affected the Companies' units during such events. Prior to 2010, storm impacts to off-shore Gulf of Mexico production were a significant concern to the gas supply markets and likely affected supply feeding most natural gas pipelines in the region. Since that time, gas production from shale areas, primarily in Texas, Oklahoma, Arkansas, Pennsylvania, and Ohio, has grown significantly. Gulf of Mexico production is now less than two percent of U.S. gas production[1].

[1] https://www.eia.gov/energyexplained/natural-gas/where-our-natural-gas-comes-from.php

c. The Companies have not been affected by supply disruptions.

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Question No. 2-3

Responding Witness: Lonnie E. Bellar

Q.2-3. For each of the Companies' existing generating units, please provide GADS data showing all forced outage events from 2018 to 2022, including the start and end time for the outage, the megawatts (MW) on outage, and the cause code or any other information reported to NERC about the cause of the outage.

A.2-3. See attachment being provided in Excel format.

The attachment is being provided in a separate file.

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Question No. 2-4

Responding Witness: Stuart A. Wilson

Q.2-4. Please see the reserve margin targets shown on pages D3-D4 of Exhibit SAW-1.

a. Please provide the worksheets, with formulae intact, for the analysis used to arrive at the reserve margin targets used in the Companies' Plexos analysis.

b. Please document why the target reserve margin includes separate components for "fully dispatchable" and "intermittent and limited-duration" resources, and how the Companies arrived at those percentages.

c. Please explain whether Plexos uses a seasonal capacity constraint or an annual constraint.

d. Please state whether the hourly load values in each year of the Plexos model are summer peaking or winter peaking.

e. Please confirm that the Plexos modeling uses a reserve margin of approximately 20%. If not confirmed, please state the approximate reserve margin.

f. Please explain the discrepancy between the Plexos reserve margin of approximately 20% and the values for target summer reserve margin (17%) and winter reserve margin (24%).

A.2-4.

a. Both ELDCM and SERVM were used to determine minimum reserve margin targets for PLEXOS. For ELDCM, see "\Reliability\ELDC\CONFIDENTIAL_20221206_CHW_SeasonalELDC_0308.xlsx" in Exhibit SAW-2. For SERVM, see "\Reliability\SERVM\SERVM_runs\20221106_ForMinRM.xlsx" in Exhibit SAW-2.

b. The Companies split the minimum reserve margin targets between dispatchable and intermittent resources for informational purposes. See RMTablefor2028 tab in "\Tables\CONFIDENTIAL_20221209_ResourceAssessmentTables_0308.xlsx" in Exhibit SAW-2.

c. The Companies modeled both annual and seasonal minimum reserve margin constraints in PLEXOS. To reduce model runtimes, some cases were evaluated with either a winter or summer reserve margin constraint when solving for both seasons was unnecessary. However, when solving for both summer and winter minimum reserve margin was necessary, both the summer and winter minimum reserve margins were used as simultaneous constraints.

d. The load forecast used in PLEXOS is summer peaking.

e. Not confirmed. The PLEXOS model does not use a reserve margin input of 20%. The minimum reserve margin constraints are 24% in winter and 17% in summer. See the response to part (c).

f. PLEXOS has the flexibility to add economic resources beyond what is required to meet the minimum seasonal reserve margin constraints. It does not target meeting the minimum constraints exactly. So, it may result in a summer reserve margin that is greater (such as the 20% reserve margin referenced in this question, for example) than the 17% minimum summer reserve margin constraint.

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Question No. 2-5

Responding Witness: Stuart A. Wilson

Q.2-5. Please see the Available Transmission Capacity analysis described at pages D15-D16 of Exhibit SAW-1, and documented in the Companies' response to Sierra Club Question No. 1-7.

a. Please describe how that analysis was used to arrive at the assumption that "during peak hours when ATC is most likely needed to ensure reliable supply, ATC in ELDCM is assumed to be approximately 500 MW two-thirds of the time and zero MW one-third of the time."

b. Alternatively, if that analysis was not used to arrive at the assumption, please describe how the Companies arrived at that assumption.

A.2-5.

a. ATC is uncertain, and as shown in Table 7, the distribution of ATC has a wide range. For the ELDCM, 500 MW was chosen because it is the midpoint of the range in Table 7. One third was used in the ELDCM as a conservative estimate of the likelihood of zero ATC as the likelihood of zero ATC in Table 7 is 42%.

b. See the response to part (a).

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Question No. 2-6

Responding Witness: Stuart A. Wilson

Q.2-6. Please see the discussion of Neighboring Regions at pages D11-D12 of Exhibit SAW-1.

a. Please describe how the assumed reserve margins in neighboring regions were used to determine the availability of imports during the Companies' peak demand periods, including how the calculated availability of supply from those neighboring regions is integrated with the Available Transmission Capacity analysis.

b. Please provide the worksheets, with formulae intact, for that analysis.

A.2-6.

a. In SERVM, the assumed reserve margins for neighboring regions are used to determine the amount of generation resources to include in the analysis. For each neighboring region, SERVM simulates the availability of resources for serving its load and then compares any excess capacity to ATC to determine the availability of imports for the Companies.

b. This analysis is completed in SERVM and is not available in a spreadsheet format.

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Question No. 2-7

Responding Witness: Stuart A. Wilson

Q.2-7. Please see the capacity contribution analysis described at pages D15-D16 of Exhibit SAW-1.

a. Please describe what if any assumptions for forced outage rates or derates were used to reduce the estimated capacity contribution of the 480 MW of SCCTs.

b. Please describe what if any assumptions for correlations in forced outage rates between the 480 MW of SCCTs and the Companies' other generating units were used to reduce the estimated capacity contribution of the 480 MW of SCCTs.

A.2-7.

a. The SCCTs were modeled with a 4.9% forced outage rate.

b. The analysis assumed no correlation between forced outage for these SCCTs and other units.

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Question No. 2-8

Responding Witness: Stuart A. Wilson

Q.2-8. Please provide any analysis the Companies directed to determine that retiring Haefling 1- 2 and Paddy's Run 12 in 2025 and replacing that capacity with new resources was more economic than continuing to operate those units. If that analysis was not conducted, please explain why.

A.2-8. These units are between 53 and 55 years old and operate very infrequently, averaging 12 operating hours per unit in 2022. The Companies have assumed that a mechanical failure will occur on these units and that it will likely be uneconomical to make the needed repairs, as has been the case in recent years with similar small-frame CTs. For an analysis comparing the retirement and repair of Paddy's Run 11, which LG&E retired in March 2021, see attached. The Companies have not performed a similar analysis for Halfling 1-2 and Paddy's Run 12 because the assumed failures of these units have not occurred. The Companies do not intend to retire these units until such failures occur. The timing and costs of such assumed failures are unknown but are assumed for the purposes of this analysis to occur by 2025.

The attachment is being provided in a separate file.

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Question No. 2-9

Responding Witness: Philip A. Imber

Q.2-9. Please refer to Exhibit 5, Mill Creek NGCC Site Assessment Report.

a. Have the Companies conducted any analysis or assessment of the public health impacts of the proposed Mill Creek NGCC?

i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment.

ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

b. Have the Companies conducted any analysis or assessment of the economic impacts of public health impacts that will be generated by the proposed Mill Creek NGCC?

i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment.

ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

A.2-9.

a. No.

i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis. The proposed project reduces the air, water, and waste related impacts of operations at the Mill Creek Site. As a result, the project provides a positive benefit to public health.

b. No.

i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis. The proposed project reduces the air, water, and waste related impacts of operations at the Mill Creek Site. As a result, the project has a net positive economic impact to public health.

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Question No. 2-10

Responding Witness: Philip A. Imber

Q.2-10. Please refer to Exhibit 6, Brown NGCC Site Assessment Report.

a. Have the Companies conducted any analysis or assessment of the public health impacts of the proposed Brown NGCC?

   i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment.

   ii. If not, please explain why the Companies have chosen not to conduct such an analysis or assessment.

b. Have the Companies conducted any analysis or assessment of the economic impacts of public health impacts that will be generated by the proposed Brown NGCC?

   i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment.

   ii. If not, please explain why the Companies have chosen not to conduct such an analysis or assessment.

A.2-10.

a. No.

   i. Not applicable.

   ii. The Companies are not aware of a requirement to perform this type of analysis. The proposed project reduces the air, water, and waste related impacts of operations at the E.W. Brown Site. As a result, the project provides a positive benefit to public health.

b. No.

i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis. The proposed project reduces the air, water, and waste related impacts of operations at the E.W. Brown Site. As a result, the project has a net positive economic impact to public health.

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Question No. 2-11

Responding Witness: Philip A. Imber

Q.2-11. For each of the four units Mill Creek Units 1 and 2, Ghent Unit 2, and Brown Unit 3:

a. Have the Companies conducted any analysis or assessment of the public health impacts of the unit?

   i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment. Please provide such copies for either 2018 to the present or, if there is no such analysis or assessment in that time frame, of the most recent analysis or assessment and all associated communications.

   ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

b. Have the Companies conducted any analysis or assessment of the economic impacts of public health impacts of the unit?

   i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment. Please provide such copies for either 2018 to the present or, if there is no such analysis or assessment in that time frame, of the most recent analysis or assessment and all associated communications.

   ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

A.2-11.

a. No.

   i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis.

b. No.

i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis.

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Question No. 2-12

Responding Witness: Lonnie E. Bellar

Q.2-12. For each proposed solar PPA and for the Rhudes Creek and Ragland PPAs:

a. Have the Companies conducted any analysis or assessment of the public health impacts of the underlying solar generation?

    i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment.

    ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

b. Have the Companies conducted any analysis or assessment of the economic impacts of public health impacts of the underlying solar generation?

    i. If so, please provide all copies of such analysis or assessment and all communications regarding such analysis or assessment. Please provide such copies for either 2018 to the present or, if there is no such analysis or assessment in that time frame, of the most recent analysis or assessment and all associated communications.

    ii. If not, please explain why the Companies have chosen not to conduct such analysis or assessment.

A.2-12.

a. No.

    i. Not applicable.

    ii. The Companies are not aware of a requirement to perform this type of analysis.

b. No.

i. Not applicable.

ii. The Companies are not aware of a requirement to perform this type of analysis,.

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Question No. 2-13

Responding Witness: Lonnie E. Bellar

Q.2-13. Please see the Companies' response to the Attorney General's initial request for information, number 23, which states "the LG&E-KU transmission planning team reached out to EKPC to review respective resource and transmission plans and coordinate, as needed" and that "there has been . . . agreement to schedule a follow up meeting in April." Please provide an update on the status of any resource and transmission coordination and planning with EKPC, including any planning or coordination regarding transmission improvements or upgrades.

A.2-13. The LG&E/KU Transmission Planning team met with the EKPC Transmission Planning team on April 26, 2023, to coordinate long-term transmission planning activities, including model development, significant system changes in both load and generation, information sharing, and joint analyses. It was also agreed to hold a coordination meeting annually for the foreseeable future, as well as smaller semi-annual meetings.

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Question No. 2-14

Responding Witness: Lonnie E. Bellar / Philip A. Imber

Q.2-14. Please refer to the Companies' response to LFUCG/LJCM's initial request for information, number 15, which states: "The proposed retirement of Mill Creek Unit 1 is an example where significant new regulatory requirements (Effluent Limitation Guidelines) and extraordinary investment needs (cooling tower to meet 316b requirements incur capital and operating costs that outweigh the costs incurred by transitioning to alternative energy supplies. Examples of regulatory requirement could be National Ambient Air Quality Standards, Cross State Air Pollution Rules, Effluent Guidelines, Regional Haze, Hazardous Air Pollution, or greenhouse gas standards of performance that are not achievable or the capital and operating costs of compliance technologies are higher than alternative generation sources." On April 3, 2023, the Environmental Protection Agency released its proposed rule, "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review."[2]

a. Please provide any assessments or analyses of the impact of the proposed rule on Mill Creek Units 1 and 2, Ghent Unit 2, and/or Brown Unit 3, including on capital and operating costs.

b. Please explain whether the proposed rule is anticipated to impact Mill Creek Units 1 and 2, Ghent Unit 2, and/or Brown Unit 3 and, if so, how.

A.2-14.

a. The proposed MATS rule requires effected units (which include Mill Creek Units 1 and 2, Ghent Unit 2, and Brown Unit 3) to meet a particulate matter limit of 0.010 lbs/MMBtu, a reduction from the existing 0.30 lbs/MMBtu standard. The proposed rule requires particulate matter (PM) continuous emissions monitoring systems (CEMS). The control equipment LKE installed

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[2] This proposed rule is available at https://www.epa.gov/system/files/documents/2023-04/EPA%20OAR%20NESHAP%20MATS RTR Proposal%20%282060-AV53%29 EPA 3.31.23 Signature.pdf.

under the 2012 version of MATS achieves this new standard. The units in reference all have PM CEMS. The proposed rule has testing protocols that will be challenging and more costly. The proposed testing is three times longer and has tighter margins.

b. While the exact impact will depend on the provisions of a final rule, the proposed rule does not require significant operational changes or additional controls. Although the testing issues add cost and complexity, they are not a material impact.

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Question No. 2-15

Responding Witness: Lonnie E. Bellar / David S. Sinclair

Q.2-15. Please refer to the Companies' response to the Commission Staff's first request for information, question 58.

a. Please confirm that the SERC Reliability Corporation is the North American Electric Reliability Corporation (NERC) regional entity responsible for ensuring reliability within the LG&E/KU balancing authority. If not confirmed, please state which NERC regional entity is responsible for this task and what, if any, relationship exists between SERC and LG&E/KU.

b. Please describe what, if any, role SERC played in LG&E/KU's response to Winter Storm Elliott.

c. Please confirm that the Tennessee Valley Authority (TVA) is the reliability coordinator for LG&E/KU. If not confirmed, please state the individual or entity that is the reliability coordinator for LG&E/KU.

d. Please describe what, if any, role LG&E/KU's reliability coordinator played in LG&E/KU's response to Winter Storm Elliott.

e. Please explain whether SERC, LG&E/KU's reliability coordinator, or another entity is responsible for setting a contingency reserve or minimum reserve capacity requirement for LG&E/KU.

f. Please describe any such contingency reserve or minimum reserve capacity requirement from 2018 to the present.

A.2-15.

a. SERC is responsible for overseeing LG&E/KU's compliance with reliability standards. It is not responsible for "ensuring reliability" within the LG&E/KU balancing area.

b. SERC played no role in real-time operations during Winter Storm Elliott.

c. Confirmed.

d. The role of the TVA Reliability Coordinator ("RC"), including during Winter Storm Elliott, is to help ensure the reliable operation of the bulk electric system within the RC's footprint, which encompasses a larger area than just the LGE/KU Balancing Authority ("BA"). The Reliability Coordinator is responsible for issuing Energy Emergency Alerts ("EEAs") on behalf of the BA as required to attempt to address energy supply and demand imbalances in real-time. EEAs provide a standardized framework for communication and coordination among the RC, BA, and other entities involved in the energy market. The RC and BA work together in real-time to ensure that the necessary actions are taken to maintain the reliability and security of the transmission system and to avoid potential widespread power outages or other system failures. As detailed in the RC agreement, "[T]he Reliability Coordinator is authorized to, and shall, direct and coordinate timely and appropriate actions by LG&E/KU, including curtailing transmission service or energy schedules, redispatching generation, and shedding load, in each case, in order to avoid adverse effects on interregional bulk power reliability."

e. The Companies' contingency reserve level is updated annually per the Companies' participation requirements in their Contingency Reserve Sharing Group. If by "minimum reserve capacity" the question refers to summer and winter reserve margins, SERC and the Reliability Coordinator (TVA) play no role.

f. The following table shows the Companies target reserve margin ranges from the 2018 and 2021 IRPs.

Reserve Margin %	Summer	Winter
2018 IRP[3]	17 – 25	
2021 IRP	17 – 24	26 – 35

The Companies' contingency reserve requirements from 2018-2023:

2018	251 MW
2019	237 MW
2020	254 MW
2021	252 MW
2022	243 MW
2023	238 MW

[3] The 2018 IRP did not establish separate seasonal target reserve margin ranges, but it did show that winter needs drove the high end of the range. *See The 2018 Joint Integrated Resource Plan of Kentucky Utilities Company and Louisville Gas and Electric Company*, Case No. 2018-00348, IRP Vol. I at 5-31 – 5-37 (Oct. 19, 2018).

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Question No. 2-16

Responding Witness: David S. Sinclair

Q-2-16. For each of the four units Mill Creek Units 1 and 2, Ghent Unit 2, and Brown Unit 3:

a. Please state the source of the coal used by the unit in the past year.

b. Please describe how coal is transported to the unit, including the amount of coal transported by barge and the amount of coal transported by rail, in the past year.

A-2-16.

a-b. See the table below.

Data for 2022	(a) Coal Source	(b) Barge Tons	(b) Rail Tons
Ghent Unit 2	Illinois Basin and Northern Appalachian Basin	954,223	-
Brown Unit 3	Illinois Basin	-	524,923
Mill Creek Unit 1	Illinois Basin	162,890	396,293
Mill Creek Unit 2	Illinois Basin	212,087	515,984

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Question No. 2-17

Responding Witness: David S. Sinclair

Q.2-17. Please refer to Table 8 at page 26 of the "2022 RTO Membership Analysis" (cited in the Direct Testimony of David S. Sinclair at page 26, lines 17-19 as KU/LG&E's "recently filed RTO study"):

a. Table 8 is titled "Total Incremental Benefits/(Costs) by Case (Nominal $M)". Please confirm that the data in Table 8 actually reflects only the net benefits of energy and capacity values of joining PJM. If not confirmed, please state what benefits and costs this data reflects.

A.2-17.

a. Confirmed. This table has been updated in Attachment 1 to Question No. 26.

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Response to Sierra Club's Supplemental Request for Information
Dated April 14, 2023

Case No. 2022-00402

Question No. 2-18

Responding Witness: David S. Sinclair

Q.2-18. Please refer to "2022 RTO Membership Analysis," Exhibit 2 "Guidehouse Energy Markets Analysis," at pages 3-35. For the referenced capacity expansion assessment:

a. Please confirm that Guidehouse used Power System Optimizer to perform the capacity expansion assessment. If not confirmed, please provide the name of the software used to perform the capacity expansion assessment. If the tool is proprietary, please explain the method it uses.

b. Please provide all input and output files supporting the capacity expansion assessment (in electronic, machine readable format with formulae intact).

c. Please describe any methods and assumptions used in the capacity expansion model to adjust costs and benefits that occur in different years in order to optimize net benefits, such as calculations of present value, annualization or levelizing of capital costs, capital recovery factors, etc. Among the assumptions provided, please include the discount rate, whether the discount rate used reflects real vs. nominal, assumed useful life or depreciation schedule of capital investments if applicable, and any other assumed parameters used for these calculations. Please provide descriptions and citations to support the assumptions, together with any documents, analyses, or forecasts relied upon to calculate such parameters.

A.2-18. In the interest of performing more expansive, detailed energy and capacity market modeling, as well as to obtain independent, objective analysis concerning possible RTO membership, the Companies engaged Guidehouse, Inc. to assist the Companies in developing the energy and capacity market costs and benefits reported in the 2022 RTO Membership Analysis. Because Guidehouse is an independent, third-party consultant with the requisite expertise to perform detailed RTO market modeling, the Companies did not possess the requested documents prior to receiving this request. In addition, certain other Sierra Club requests seek information the Companies did not possess at the time of these requests. Therefore, in this request and the requests that follow, the Companies have indicated that they obtained the requested information from Guidehouse as appropriate.

Note that all references to "PSO" are to Power System Optimizer.

Guidehouse has provided the following responses:

a. Confirmed. Guidehouse used PSO's Capex capabilities to approximate capacity expansion results. Manual adjustments were made as necessary in order to streamline production cost modeling and avoid unrealistic reserve penalties.

b. See the attachments being provided in Excel format by Guidehouse.

c. As described above, Guidehouse used PSO's capabilities to create initial results. Manual adjustments were occasionally made following the capacity expansion runs prior to running the production cost runs. Inputs generally rely on NREL's Annual Technology Baseline https://data.openei.org/submissions/5716, and are combined with Guidehouse's independent views which are shaped by professional opinion and client interactions.

   Manual adjustments were made to the results of the capacity expansion runs for a couple reasons. Firstly, adjustments were made to compensate for various anomalous production cost outputs. For example, if production cost runs yielded a noticeable number of hours with reserve violations it would be indicative that the reserve margin was likely too small. In this case some capacity would be added in order to reduce and/or eliminate any hours during which these violations were occurring. Secondly, adjustments were made because the capacity expansion and production cost simulations in PSO are not performed concurrently. It can be onerous in PSO to translate the Capacity Expansion outputs to Production Cost inputs. This can lead to potentially slow and costly iterations between model runs.

The attachments are being provided in separate files.

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Question No. 2-19

Responding Witness: David S. Sinclair

Q.2-19. Please refer to "2022 RTO Membership Analysis," Exhibit 2, Appendix B, Table B4 "RTO Capacity Expansion and Reserve Margins" at pages 4-69:

a. Please confirm that, in the RTO case, the capacity expansion model was constrained to add resources in KU/LG&E such that effective summer UCAP each year equals FPR*(1+9.18%), where FPR is as listed in Table B4 and 9.18% is the assumption for PJM's required UCAP reserve margin. If not confirmed, please provide the accounting used to calculate the UCAP constraint in the RTO case of the capacity expansion model in terms of KU/LG&E peak load, coincidence factor, PJM Forecast Pool Requirement, and any other applicable parameters.

b. Please explain why the capacity expansion model produces an effective margin to FPR (as shown in Table B4) that in all years exceeds 10%.

A.2-19. Guidehouse has provided the following responses:

a. Not confirmed. See section 3.2 on page 3-37 of Guidehouse's report.

b. The capacity requirement is a minimum requirement, not an exact requirement. Because new capacity is added in the sizes of actual units not in sizes to meet the exact minimum, the margin will be greater than the minimum. Additionally, if a small amount of extra capacity was needed in order to avoid reserve violations in the outputs this would increase the reserve margin further.

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Question No. 2-20

Responding Witness: David S. Sinclair

Q.2-20. Please refer to "2022 RTO Membership Analysis," Exhibit 2, Appendix B "Capacity Additions and Retirements," Table B2 at pages 4-68 and Table B5 at pages 4-69:

a. Please confirm that a single generator entry/exit schedule was developed across Cases 1-3 in the capacity expansion model for the RTO scenario, and a second entry/exit schedule was developed for the Standalone scenario. If not, please state which of RTO Cases 1-3 use different entry/exit schedules, and provide those schedules with relevant year, fuel type, and nameplate capacity. Likewise, if not, please state which of Standalone Cases 1-3 use different entry/exit schedules, and provide those schedules.

b. Please explain which set of Case assumptions (fuel price, CO2 price, emissions reductions, etc.) was used to develop this entry/exit schedule, or (if different from the Case assumptions), what assumptions (such as fuel price, CO2 price, emissions reductions, etc.) were used in the capacity expansion model in its development of a cost-optimal generator entry schedule.

A.2-20. Guidehouse has provided the following responses:

a. All cases used the same LG&E/KU expansion plans when out of the RTO. When in the RTO, Cases 1-4 used the same LG&E/KU expansion plan across the cases, but a different one compared to the plan when standalone. See sections 3.1 and 3.2 on pages 3-35 and 3-36 of Guidehouse's report.

b. The assumptions for base fuel with no CO_2 price/reductions were used to develop the LG&E/KU capacity expansion scenarios.

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Question No. 2-21

Responding Witness: David S. Sinclair

Q.2-21. Please refer to "KU/LG&E 2022 RTO Membership Analysis" at Exhibit 2, Section 3.3 "Carbon PJM Build" at page 3-39, and to Attachment 1 in response to Sierra Club's Initial Request for Information question 12a, file "*20221026_2022RTO_SummaryofGuidehouseResults_D02.xlsx"* therein:

a. Please explain whether any of the RTO Cases 1-3 has different generator entry than RTO Case 4. If so, referring to worksheet "Summary" in the referenced Excel file, please explain why the net benefits of each Case in the RTO scenario is calculated using the same avoided capacity savings.

b. On the referenced page, Exhibit 2 states that "Along with the carbon prices and regulation, discussed in Section 2.3.8, the PJM build was adjusted to meet the required targets." Please explain how this adjustment was calculated, providing all documents, analyses, or forecasts relied upon in making such calculation.

A.2-21. Guidehouse has provided the following responses:

a. No. Cases 1-4 use the same capacity expansion plan for the Companies.

b. Guidehouse developed the CO_2 emissions prices shown in Table 9 on page 2-33 of the Guidehouse report that resulted in the assumed CO_2 emissions reductions in PJM. The CO_2 prices were fed into the capacity expansion model which adjusted the build relative to the base case by generally retiring thermal units earlier and adding additional renewables. The CO_2 emissions reduction assumptions are discussed on pages 15 and 40 of the "2022 LG&E and KU RTO Membership Analysis."

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Question No. 2-22

Responding Witness: David S. Sinclair

Q.2-22. Please refer to "2022 RTO Membership Analysis" at page 14, at page 39, and Exhibit 2 "Guidehouse Energy Markets Analysis", Appendix B, Table B3 at page 4-68 and Table B6 at page 4-70.

a. Noting that the schedule of KU/LG&E generator retirements is identical between the Standalone case and the RTO case, please confirm that the capacity expansion model was not able to select any generator retirements in KU/LG&E as part of its cost optimization. If not, please explain.

A.2-22.

a. Confirmed. The assumed coal unit retirement schedule was held consistent with the Companies' 2021 IRP, as noted on p. 18 of the "2022 RTO Membership Analysis."

Guidehouse has provided the following response:

The capacity expansion model intended to analyze the most optimal ways for KU / LGE&E to serve its growing load while realistically representing its operations. As such, coal units retired in both the RTO and the Standalone cases and were replaced by more efficient generation as part of the capacity expansion model.

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Question No. 2-23

Responding Witness: David S. Sinclair

Q.2-23. Please refer to "2022 RTO Membership Analysis", Exhibit 2, Section 2.3.1 "Production Cost Modeling", at page 2-30. For the referenced production cost modeling:

a. For each Case in both the Standalone and RTO scenarios, please provide all input and output files supporting the production cost model (in electronic, machine readable format with formulae intact). Please include among these the following:

i. The list of all generators modeled in PJM, their IDs, and their assumed characteristics such as full load heat rate, variable operations and maintenance cost, fuel cost, nameplate capacity, etc.

ii. A list of the generators that retire and enter service in the PJM model, including generator ID, fuel type, nameplate capacity, year of entry or exit, and whether the entry or exit was provided as an input to the model or selected by the model as part of the capacity expansion model's cost optimization.

iii. The modeled annual generation in PJM, in MWh and by fuel type.

iv. The load in PJM, by annual energy and peak winter and summer load (or just peak summer load if all years are summer peaking). Please also include hourly PJM load and KU/LG&E for each year if available.

v. The modeled average annual load LMP and generator LMP in PJM. Please include this data by PJM zone if available.

vi. The modeled hourly load LMP and generator LMP in PJM and KU/LG&E. Please include this data by PJM zone if available.

vii. The supply curve consisting of aggregate $/MWh variable costs of each generator in the case for each year. Please provide this separately for PJM and KU/LG&E.

viii. A list of the generators in KU/LG&E that are forced to exit service and those that are forced to enter service as an input to the model, including the year of entry or exit and other relevant characteristics if not already provided.

ix. Any constraints limiting the model's ability to add new cost effective generation.

x. The hourly solar and wind curtailment in KU/LG&E for all years.

b. Please provide the dollar value of relevant penalty factors utilized in the production cost model, such as for simulated reserve shortages, load shed, emergency imports, etc.

c. Please state whether an evaluation was performed of congestion surplus rents in the RTO cases associated with congested interchange between KU/LG&E and PJM. If so, please provide that evaluation.

A.2-23. Guidehouse has provided the following responses.

a.

i. Guidehouse cannot provide this information for PJM Generators, as this comes from third parties and contractual limitations prohibit the sharing of third party proprietary information at this level of detail. See attachment being provided by Guidehouse. See the UnitTypes.csv file for variable operations and maintenance costs. See the Fuels.csv and Schedules.csv files for fuel costs.

ii. Unit additions and retirements by Unit Type have been provided in Appendix B of the Guidehouse report. All new additions are assumed to come online on January 1 of the specified year. Guidehouse cannot provide this information for PJM Generators, as this comes from third parties and contractual limitations prohibit the sharing of third party proprietary information at this level of detail.

iii. See attachment being provided in Excel format by Guidehouse.

iv. See attachments being provided by Guidehouse for hourly PJM load by area, summer and winter peaks, and LG&E/KU load. These values are the same for all cases modeled. The 2021 load templates (Templates.csv) provided keep the same shape but scale according to the provided peak and energy forecasts (Forecasts.csv). LG&E/KU load forecast is modeled hourly, in contrast to the PJM areas (Schedules.csv).

v. See attachment being provided in Excel format by Guidehouse for annual LMP data broken out by PJM Area. The average annual generator LMPs are not readily available.

vi. See the response to part (a)(v) for LG&E/KU Annual LMPs.

vii. The data to produce a supply curve consisting of aggregate $/MWh variable costs of each generator are not readily available.

viii. See the responses to Question No. 18. No LG&E/KU units were forced to enter or exit the model, except in manual modifications of the capacity expansion output.

ix. See response to Question No. 18(a). Guidehouse first modeled Capacity Expansion runs with limitations described above. The Production Cost runs all had fixed expansion plans as determined in the Capacity Expansion phase and were not able to add any new generation.

x. See attachment being provided in Excel format by Guidehouse.

b. The following penalties are included in all model runs.
   a. Load Shed Penalty - $5,000/MWh
   b. Reserve Violations - $1,000/MWh
   c. Transmission Violations - $1,000/MWh
   d. Over-generation Penalty - $1,500/MWh
   e. Ramp Violations - $11,000/MW
   f. Minimum Up/Down Time Violations - $1,000/MWh

c. This evaluation was not performed.

The attachments are being provided in separate files.

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Case No. 2022-00402

Question No. 2-24

Responding Witness: David S. Sinclair

Q.2-24. Please refer to "2022 RTO Membership Analysis" Exhibit 2, Appendix C "Production Costs", Table C1 at page 4-1 and Table C5 at page 4-5.

a. Please explain why the imports cost and exports revenue in RTO Case 1 in Table C5 is the same as imports cost and exports revenue in the Standalone Case 1 in Table C1.

b. Please explain how imports cost and exports revenue is calculated in the RTO cases, and how it is accounted for in adjusted production cost in the RTO cases.

c. Please provide the imports cost and exports revenue and MWh quantities in the RTO cases for each year, and for each hour of each year.

A.2-24. Guidehouse has provided the following responses:

a. The presented imports volume and cost and exports volume and revenue in RTO Case 1 in Table C5 were presented in error. The remainder of the table is correct. Table C8 was also presented in error. For the corrected figures, see the response to part (c).

b. These values are the product of the modeled net energy interchanged between the Companies' area and the existing PJM footprint and the energy price. For the RTO cases, these data are not directly included in production costs and are provided for information only.

Imports cost is calculated by:

- Calculating the hourly import volume by taking the difference between the hourly area load and the hourly area generation, if that difference is positive
- Multiplying the hourly import volume by the hourly area load price
- Summing the resulting hourly import cost for each analyzed year

Exports revenue is calculated by:

- Calculating the hourly export volume by taking the difference between the hourly area load and the hourly area generation, if that difference is negative
- Multiplying the hourly export volume by the hourly area load price
- Summing the resulting hourly import cost for each analyzed year

Total production costs are reported for the RTO cases as the total cost to serve load less the generator margin.

c. For the annual figures see the updated *2022 RTO Membership Analysis,* Exhibit 2, Appendix C, Tables C5, C6, C7 and C8, provided in response to Question No 26(b), in which Tables C5 and C8 have been corrected. For corrected annual and hourly figures in RTO cases for each year, and for each hour of each year, see the attachment being provided by Guidehouse.

The attachment is being provided in a separate file.

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Case No. 2022-00402

Question No. 2-25

Responding Witness: David S. Sinclair

Q.2-25. Please refer to "2022 RTO Membership Analysis" Exhibit 2, Section 2.3.7 "Interchange Limits" at page 2-32.

a. The Exhibit states that "Only the handful of paths in the topographical vicinity of LG&E / KU are focused on in this analysis." Please explain which paths and the transfer capability of those paths.

b. The Exhibit states, "The export capability of LG&E / KU is capped at 300 MW which is consistent with historical transactions." In 2021, PJM reported a Total Transfer Capability for transfers from KU/LG&E to PJM of 1,927 MW.[4] Please explain the difference.

c. Please state the assumed import capability from PJM to KU/LG&E in the production cost model.

A.2-25. Guidehouse has provided the following responses.

a. The primary paths that are utilized during the production cost runs for transmitting power between LGE and PJM are the Ghent <> Gallatin 345 kV line which has a rating of 717 MW, and the Ghent <> Gallatin 138 kV line which has a rating of 229 MW. Additionally, there are thirty-eight 69 kV lines that connect EKPC and LGE that total 1,670 MW in capacity.

b. As noted in the referenced section, 300 MW was assumed to be the transfer capability in order to be consistent with typical historical transfers. Assuming the reported figure capability figure of 1,927 MW would overstate the typical actual available transferability of energy between the Companies and PJM.

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[4] PJM, *Data Analysis*, (Aug. 27, 2021), *available at* https://pjm.com/-/media/committeesgroups/committees/pc/2021/20210827-workshop-4/20210827-item-04-data-analysis-presentation.ashx

The question conflates transmission line ratings with economic transfers. Although there is technically a much larger transmission capacity between LGE and PJM than 300 MW, only a portion is available for economic transfers.

The source referenced to provide the Total Transfer Capability for Transfers from KU/LG&E (PJM, Data Analysis, (Aug. 27, 2021), available at https://pjm.com/-/media/committeesgroups/committees/pc/2021/20210827-workshop-4/20210827-item-04-data-analysis-presentation.ashx.) is not publicly available.

PSO is a cost optimization model. Without capping export capability, the optimal solution is one in which LGEE exports its generation to take advantage of higher prices within PJM than in LGEE's territory. The modeled export volume in the absence of the cap on exports was inconsistent with transmission capacity and transactional limits. The 300 MW limit was advised and approved by LGE&E / KU.

Using this source: http://dataminer2.pjm.com/feed/act_sch_interchange. To be consistent with the date listed in the Sierra Club's referenced link, which is now unreachable, we use 2021 interchange data published by PJM to illustrate the reasoning for the 300 MW cap. The hourly actual flow data between the LGEE tie line and PJM for 2021 shows that the average exports for 2021 is 146.74 MW per hour, and the average imports is 256.06 MW per hour. As such, the 300 MW cap is not unrealistic in representing actual operations.

c. In the standalone cases, imports were limited to 300 MW. In the RTO cases, imports were effectively unlimited, with 10,000 MW used as a modeling input.

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Question No. 2-26

Responding Witness: David S. Sinclair

Q.2-26. Please refer to Attachment 1 in response to Sierra Club's Initial Request for Information question 12a, and to file 20221017_LAK_ExpPlanFixedCosts_2022RTOAnalysis_D02.xlsx therein, as well as "2022 RTO Membership Analysis", Exhibit 2, Appendix B "Capacity Additions and Retirements", Table B5 at page 4-69:

a. On worksheet "RRProfiles" of the referenced file, rows 2 – 6 contain an annualization profile for the capital costs of each of five types of new entrant generator, reflecting the percent of capital cost accrued in each of many years. Please provide the method for developing each of these capital annualization profiles, including input parameters (such as discount rate, depreciation schedule, etc.), real vs. nominal, descriptions and citations supporting those input parameters, and all input files supporting calculation of the annualization profile (in electronic, machine readable format with formulae intact).

b. On worksheet "RTO" of the referenced file, please confirm that the capacity additions by year labeled "wind" in column E in fact refer to the capacity expansion model results for utility-scale solar, or if not, then please explain the discrepancy relative to Table B5. Please confirm that the capital costs of wind were applied to utility solar entry in the calculation of net benefits for the RTO case, or it not, please explain.

A.2-26.

a. See attached. The referenced annualized profiles reflect the calculation of revenue requirements for a generic capital expenditure with applicable economic assumptions, as a percentage of total capital spent.

b. Confirmed. This file includes an error in that the expansion plan data for the RTO cases were transposed among the storage, solar, and wind columns on the "RTO" worksheet. After making this correction and the corrections noted in the response to Question No. 24, the Companies continue to conclude that

RTO membership is not in customers' best interest at this time. For an updated *2022 RTO Membership Analysis*, see attached. Certain information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection. For updated workpapers, see attachments being provided in Excel format.[5] Revisions are highlighted in blue.

[5] Attachments 2-6 are updates to specific workpapers (as indicated in the filenames) that were provided in Attachment 1 to SC 1-12(a). Attachments 5-6 are provided by Guidehouse.

Attachment 1 is confidential and provided separately under seal.

The attachments are being provided in separate files.

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Question No. 2-27

Responding Witness: David S. Sinclair

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

A.2-27. Guidehouse has provided the following responses:

a. Confirmed.

b. Confirmed. In addition to the fuel costs and VOM, the model accounts for startup costs ($/MW-start).

c. We confirm that the heat rate and VOM values for the "NewGeneric" combined cycle generators listed in the worksheet "Generator List LKEedits" are the ones used for new entrant combined cycle generators in the production cost model. The NewGeneric generators listed in "Generator List LKEedits" do not directly correspond to the new entrant combined cycle generators in the RTO cases and the Standalone cases. "Generator List LKEedits" is an early document from the benchmarking stage of the analysis, prior to finalizing the capacity expansion. The units in the "Generator List LKEedits" had not been finalized at the time the document was created and therefore should not directly correspond to the new entrant generators in the final production cost model. The new entrant capacity additions in the final production model are available in Tables B2 and B6 of "2022 RTO Membership Analysis". Tables B2 and B6 represent the final capacity additions in the production cost model for the Standalone and RTO cases respectively, and include the results from the capacity expansion model. The applied heat rate, VOM, and other relevant inputs are available in the UnitTypes.csv file referenced in Question No. 23(a)(i).

d. The VOM used for LGE generators was provided by LGE as part of benchmarking the model to LGE's portfolio. For any units outside of LGE, the same method is used to develop the VOM values across all generators in the model, regardless of their location. The applied values are available in the UnitTypes.csv file referenced in Question No. 23(a)(i).

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Question No. 2-28

Responding Witness: David S. Sinclair

Q.2-28. Please refer to Attachment 1 in response to Sierra Club's Initial Request for information question 12a, and to files LGE Case 1 RTO Output 10242022.xlsx and LGE Case 3 RTO Output 10242022.xlsx therein, as well as confidential Attachment 4 in response to Sierra Club's Initial Request for Information question 12a:

a. Exhibit 2 of the 2022 RTO Membership Analysis describes Case 1 as the "baseline market scenario based on Guidehouse's Spring 2022 Reference Case and LG&E / KU provided fuel prices" It then describes Case 3 as "high fuel with no additional carbon emission regulation". Please confirm that the first referenced file corresponds to Case 1, and the second to Case 3, or if not them please explain. On worksheet "NG Prices" of each of the referenced files, please explain why the Mill Creek natural gas prices in the high-price Case 3 file are the same as those in the base-price Case 1 file.

b. Please explain the discrepancies between the gas prices listed in Attachment 1 (as described immediately above) and [redacted] Please state which fuel price assumptions were used in Power System Optimizer.

A.2-28.

a. Confirmed. The discrepancy between the base and high Mill Creek gas price is due to an input error in the gas price forecasts the Companies provided to Guidehouse. However, the impact on the results for the RTO study is immaterial as the Mill Creek Gas fuel is only used for startup and stabilization of the Mill Creek coal units, which represents a negligible amount of total fuel costs in the context of the RTO study.

b. Attachment 1 shows prices in real dollars whereas Attachment 4 is in nominal terms. Guidehouse used real prices in their models.

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Question No. 2-29

Responding Witness: Stuart A. Wilson

Q.2-29. Please refer to Exhibit SAW-1, sponsored by Stuart A. Wilson, at page D-3, and Table 10 at page D-18.

a. With reference to Table 10: please confirm that the capacity cost used to calculate the target reserve margin was $73.90/kW-year. If not, please state the capacity cost used.

A.2-29

a. Confirmed. $73.90/kW-year is the SCCT's economic carrying charge in 2028.

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Question No. 2-30

Responding Witness: Stuart A. Wilson

Q.2-30. Please refer to Exhibit SAW-1, sponsored by Stuart A. Wilson, Table 14 at page D-23 and Table 15 at page D-24.

a. Please confirm that the Reference Portfolio described in row 1 of Table 14 plus 480 MW of SSCT exceeds the target summer and winter reserve margin. With reference to Table 15, please confirm that your analysis shows that the loss-of load- expectation (LOLE) of that portfolio is 3.87 days in 10 years (or, if not, please state the LOLE of that portfolio).

b. Please confirm that the LOLE analysis shows that the Reference Portfolio with supply additions to meet the 17% and 24% target reserve margin would yield an LOLE reliability metric more than three times worse than the 1-in-10 guideline set by NERC. If not, please state what the LOLE is at the 17% and 24% target reserve margins.

A.2-30

a. Both statements are confirmed.

b. Confirmed. Please note that 17% and 24% are the minimums of the summer and winter target reserve margin ranges, respectively, and are determined as the Companies' "economic" reserve margins. In the 2021 IRP, the Companies determined the high end of the target reserve margin range as 24% in the summer and 35% in the winter. Those reserve margin levels meet the 1-in-10 reliability guideline.

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Question No. 2-31

Responding Witness: Stuart A. Wilson

Q.2-31. Please refer to the Attachment in response to question 53(f) of the Commission Staff's first Request for Information, available at: https://psc.ky.gov/pscecf/2022 00402/rick.lovekamp%40lge-ku.com/03102023102544/07-PSC_DR1_LGE_KU_Attach_to_Q53%28f%29_-_Peak_Demand_and_Resource_Summary.pdf.

a. Please confirm that the summer reserve margin for the proposed resource portfolio ranges from 40.7% in 2027, the year proposed for the first NGCC addition, to no lower than 36.4% through 2050. If not, please provide the calculation for the summer reserve margin, explain how it is different from the value in the referenced Attachment, and provide the summer reserve margins of the proposed resource portfolio that correspond to each year from 2023 through 2050.

b. Please explain why a reserve margin above the 17% summer target has been selected.

c. The reserve margin analysis in the 2021 Integrated Resource Plan found that a 24% summer reserve margin was required to meet a 1-in-10 LOLE.[6] Please explain whether the Companies selected a reserve margin above that needed to reach 1-in-10, and if so how much higher, and why.

A.2-31

a. Confirmed.

b. 17% is the minimum summer reserve margin target used in PLEXOS. PLEXOS identifies the lowest-cost portfolio subject to minimum reserve margin constraints, thus the reference to "minimum levels of reliability." See the response to Question No. 4(f).

[6] LG&E-KU, "2021 IRP Resource Screening Analysis", at page 4, (Oct. 2021), *available at* https://psc.ky.gov/pscecf/2021-00393/rick.lovekamp%40lge-ku.com/10192021013101/5-LGE KU 2021 IRP Volume III.pdf.

c. The Companied did not use 24% for portfolio optimization in PLEXOS. See the response to part (b).

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AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Response to Sierra Club's Supplemental Request for Information
Dated April 14, 2023

Case No. 2022-00402

Question No. 2-32

Responding Witness: Stuart A. Wilson

Q.2-32. Please refer to the Direct Testimony of Stuart A. Wilson, Table 5 at 23:

a. Please confirm that the 30.1% summer reserve margin and 28.4% winter reserve margin listed in Table 5 in the row "Portfolio 1: MC5 & BR12" in the section "Total Reserve Margin" corresponds to the reserve margins for the portfolio selected by the Plexos capacity expansion model. If not, please describe the origin of Portfolio 1, and please state the reserve margin that corresponds to the portfolio that Plexos selected.

b. Please state whether the Plexos model exceeded its capacity requirement in 2028. If so, please explain why.

c. The reserve margin analysis in the 2021 Integrated Resource Plan found that a 24% summer reserve margin was required to meet a 1-in-10 LOLE.[7] Please state whether the 2022 analysis for the CPCN has yielded an updated value for the summer and winter reserve margins needed to meet 1-in-10 LOLE, and if so, please state those reserve margins.

A.2-32 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. Not confirmed. The amount of solar PPAs in Portfolio 1 (637 MW) was determined outside of PLEXOS in the Stage One, Step Two analysis (see Section 4.4.2 of Exhibit SAW-1 beginning at 24). In the Stage One, Step One analysis, depending on the level of fuel prices, PLEXOS included between zero and 2,322 MW of solar in the least-cost portfolio. The summer reserve margins for these portfolios range between 22.2% and 51.1%. The winter reserve margin of 28.4% is the winter reserve margin for the portfolio selected

[7] LG&E-KU, "2021 IRP Resource Screening Analysis", at page 4, (Oct. 2021), *available at* https://psc.ky.gov/pscecf/2021-00393/rick.lovekamp%40lge-ku.com/10192021013101/5-LGE KU 2021 IRP Volume III.pdf.

by PLEXOS because the assumed contribution of solar resources to winter peak is 0%.

b. Portfolio optimization in PLEXOS determines the least-cost resource portfolios subject to the minimum reserve margin constraints, which means selected resource portfolios all have reserve margin levels greater than or equal to the minimum targets.

c. No, the CPCN analysis has not yielded updated reserve margin values for meeting a 1-in-10 LOLE. These values depend on the composition of fully dispatchable, intermittent, and limited-duration resources.

KENTUCKY UTILITIES COMPANY
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Response to Sierra Club's Supplemental Request for Information
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Case No. 2022-00402

Question No. 2-33

Responding Witness: Lonnie E. Bellar

Q.2-33. Refer to the Companies' response to Joint Intervenors' Request for Information 1-1 and accompanying attachments. Confirm that the Attachments to Q1-1(c) include all documents evaluating the economic or technical feasibility of converting any of the Companies' coal-fired units (including units at Brown, Mill Creek, and Ghent) to burn gas. If not confirmed, please provide all such analyses.

A.2-33. Confirmed.

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Response to Sierra Club's Supplemental Request for Information
Dated April 14, 2023

Case No. 2022-00402

Question No. 2-34

Responding Witness: Lonnie E. Bellar

Q.2-34. Refer to the Companies' response to Joint Intervenors' Request for Information 1-1, Attachment 6, CO2 Reduction Alternatives, at page 11.

a. Please provide all documents supporting the referenced costs of converting the Companies' coal units to gas.

b. Do the costs listed on page 11 include costs of modifying the boilers or units to burn gas? If not, please provide those costs and all supporting documentation.

A.2-34

a. The cost of converting Brown 3 to gas is supported by the Brown Gas Conversion Study provided as Attachment 1 to JI 1-1(c). The cost of converting Mill Creek 2 to gas is supported by the Gas Conversion Technical Summary provided as Attachment 4 to JI 1-1(c), which analyzed the cost of converting both Mill Creek 1 and 2 to gas. The Companies did not specifically analyze the cost of Mill Creek 2 gas conversion alone and assumed 60% of the Mill Creek 1 and 2 gas conversion cost as a simplifying assumption. The Companies did not perform detailed engineering analysis for the remaining coal units, but as stated in the first bullet on page 11 of the referenced Attachment 6, the gas conversion cost for other units was scaled based on Brown 3's max summer capacity.

b. Yes. The costs of modifying the boilers or units to burn gas would be included in gas conversion capital.

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Case No. 2022-00402

Question No. 2-35

Responding Witness: Stuart A. Wilson

Q.2-35. Please see the statement in footnote 3 on page 9 of the Companies' application that "Capacity values reflect 78.6% expected contribution to summer peak capacity and 0% expected contribution to winter peak capacity."

a. Please provide the worksheets, with formulae intact, that were used to determine solar's capacity value contribution.

b. Please confirm what capacity value assumptions were used for solar in the Companies' Plexos modeling.

A.2-35

a. See attachments being provided in Excel format.

b. Consistent with the referenced footnote, the Companies' assumed in PLEXOS that solar capacity values were 78.6% of nameplate AC capacity in summer and 0% in winter.

The attachments are being provided in separate files.

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Response to Sierra Club's Supplemental Request for Information
Dated April 14, 2023

Case No. 2022-00402

Question No. 2-36

Responding Witness: Stuart A. Wilson

Q.2-36. Please refer to the Companies' response to the Commission Staff's First Request for Information, No. 94, stating, "None of the evaluated solar asset projects meet the requirements for the Energy Community Bonus." Please confirm whether this statement remains true in light of the release of the U.S. Department of Energy's Energy Community Tax Credit Bonus map. If not, please state which evaluated solar asset projects meet the requirements.[8]

A.2-36. See response to Joint Intervenors 2-92.

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[8] *See* Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization, *Energy Community Tax Credit Bonus*, https://energycommunities.gov/energy-community-tax-creditbonus/.