

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC TARIFF FILINGS OF)	
LOUISVILLE GAS AND ELECTRIC COMPANY)	
AND KENTUCKY UTILITIES COMPANY TO)	
REVISE PURCHASE RATES FOR SMALL)	CASE NO. 2023-00404
CAPACITY AND LARGE CAPACITY)	
COGENERATION AND POWER PRODUCTION)	
QUALIFYING FACILITIES AND NET)	
METERING SERVICE-2 CREDIT RATES)	

RESPONSE OF
KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY
TO
THE COMMISSION STAFF'S THIRD REQUEST FOR INFORMATION
DATED MARCH 11, 2024

FILED: March 22, 2024

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 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.

Stuart A. Wilson

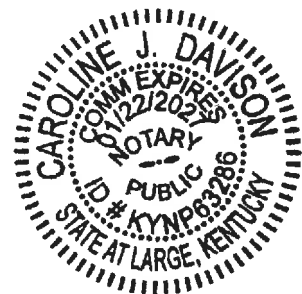
Subscribed and sworn to before me, a Notary Public in and before said County and State, this 15th day of March 2024.

Notary Public

Notary Public ID No. KYNP63286

My Commission Expires:

January 22, 2027



KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Response to Commission Staff's Third Request for Information
Dated March 11, 2024

Case No. 2023-00404

Question No. 1

Responding Witness: Stuart A. Wilson

- Q-1. Refer to Tariff Filing, 2024-2025 Qualifying Facilities Rates & Net Metering Service-2 Bill Credit, Generation Planning & Analysis, October 2023, Table 4.
- a. Provide Table 4 with an updated Scenario #1 to represent the approved resource portfolio in the Commission's Order in Case No. 2022-00402.¹
 - b. Explain why equal weighting was assigned to Scenarios #1 and #2 when calculating the average capacity need in Table 4. Include in this explanation whether LG&E/KU consider these scenarios to be equally likely to occur.
 - c. Explain how the magnitude of the annual capacity need impacts the avoided capacity cost on both a \$/MW-year and \$/MWh basis.
 - d. Provide updated Tables 22 and 23 for the approved resource portfolio in Case No. 2022-00402.
- A-1.
- a. In the referenced report, the seasonal capacity needs in Table 4 are computed based on assumed generation retirements versus minimum reserve margin targets. When the Companies updated QF rates in their response to PSC 1-1 to be consistent with the Commission's Order in Case No. 2022-00402, they assumed Brown 12 would replace Brown 3 in 2030 and Ghent 2 would retire in 2034. If the process used to compute seasonal capacity needs is updated to reflect these retirements, the timing of the next capacity need is unchanged from 2032 (see table below). However, the Companies assumed a 2030 capacity need in their response to PSC 1-1 (i.e., they assumed Brown 12 would replace Brown 3 in 2030) to be consistent with the Commission's

¹ Case No. 2022-00402 *Electronic Joint Application of Kentucky Utilities Company and Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity and Site Compatibility Certificates and Approval of a Demand Side Management Plan and Approval of Fossil Fuel-Fired Generating Unit Retirements* (Ky. PSC Nov. 6, 2023), Order.

Order and the requirements of KRS 278.264(2) and (3) concerning replacement generation. See attached for the supporting workpaper.

Table 4: Seasonal Capacity Need (MW)

Year	Summer			Winter		
	Scen 1: End of Depr Life	Scen 2: Section 111(d)	Average of Scen 1 and 2	Scen 1: End of Depr Life	Scen 2: Section 111(d)	Average of Scen 1 and 2
2024	0	0	0	0	0	0
2025	0	0	0	0	0	0
2026	0	0	0	0	0	0
2027	0	0	0	0	0	0
2028	0	0	0	0	0	0
2029	0	0	0	0	0	0
2030	0	0	0	0	0	0
2031	0	0	0	0	0	0
2032	0	2,529	1,265	0	2,938	1,469
2033	0	2,521	1,261	0	2,938	1,469
2034	0	2,635	1,318	788	3,562	2,175
2035	131	2,876	1,503	1,054	3,828	2,441
2036	251	2,996	1,624	1,183	3,956	2,569
2037	1,210	2,997	2,103	2,137	3,957	3,047
2038	1,208	2,995	2,102	2,139	3,959	3,049
2039	2,368	3,286	2,827	3,361	4,301	3,831
2040	2,516	3,435	2,975	3,520	4,460	3,990
2041	2,820	3,738	3,279	3,857	4,797	4,327
2042	3,297	4,216	3,756	4,401	5,341	4,871
2043	3,296	4,215	3,755	4,402	5,342	4,872
2044	3,773	4,692	4,233	4,940	5,880	5,410

- b. The Companies do not have an opinion regarding which scenario is more likely. The retirement dates for fossil resources are uncertain and depend on a number of factors including future environmental regulations, customer load, and the resources' operating costs relative to replacement resources. An equal weighting is consistent with the approach used in Case Nos. 2020-00349 and 2020-00350. Moreover, unless the weighting (i.e., likelihood) of the 111(d) scenario is zero, the scenario weighting has no impact on QF rates.
- c. The magnitude of the annual capacity need has no impact on avoided capacity costs. Only the timing (year) of capacity need impacts this cost.
- d. Scenarios 1 and 2 in the tables below reflect changes consistent with the Commission's Order in Case No. 2022-00402 and the Companies' response

to PSC 1-1. See the attachment provided in response to part a for the supporting workpaper.

Table 22: 17% Summer Reserve Margin Need (MW)

	2024	2026	2028	2032	2034	2036	2040	2044
Peak Load	6,206	6,286	6,355	6,316	6,301	6,297	6,289	6,282
Dispatchable Generation Resources								
Existing Resources	7,612	7,612	7,612	7,612	7,612	7,612	7,612	7,612
New NGCCs	0	0	621	621	621	621	621	621
Intermittent/Limited-Duration Resources								
Existing Resources	105	105	105	105	105	105	105	105
Existing CSR	128	128	128	128	128	128	128	128
Existing Dispatchable DSM ²	60	52	46	38	35	32	28	26
New Solar ³	0	681	866	866	866	866	866	866
New Battery Storage	0	125	125	125	125	125	125	125
New Dispatchable DSM ²	14	44	102	127	127	127	127	127
Total Resources Before Ret.	7,918	8,748	9,606	9,622	9,619	9,617	9,613	9,610
Retirements								
Scenario 1: End of Depreciable Lives								
Small CTs	0	(47)	(47)	(47)	(47)	(47)	(47)	(47)
Coal ⁴	(300)	(300)	(597)	(1,494)	(1,969)	(1,969)	(3,796)	(3,796)
Large CTs	0	0	0	0	(121)	(484)	(776)	(2,007)
OVEC	0	0	0	0	0	0	(152)	(152)
Hydro	0	0	0	0	0	0	0	(32)
Total Cumulative Ret.	(300)	(347)	(644)	(1,541)	(2,137)	(2,500)	(4,771)	(6,034)
Resources Net of Ret.	7,618	8,401	8,962	8,081	7,482	7,117	4,842	3,577
Reserve Margin Need	0	0	0	0	0	251	2,516	3,773
Scenario 2: Section 111 (d)								
Small CTs	0	(47)	(47)	(47)	(47)	(47)	(47)	(47)
Coal ⁴	(300)	(300)	(597)	(4,715)	(4,715)	(4,715)	(4,715)	(4,715)
Large CTs	0	0	0	0	(121)	(484)	(776)	(2,007)
OVEC	0	0	0	0	0	0	(152)	(152)
Hydro	0	0	0	0	0	0	0	(32)
Total Cumulative Ret.	(300)	(347)	(644)	(4,762)	(4,883)	(5,246)	(5,690)	(6,952)
Resources Net of Ret.	7,618	8,401	8,962	4,860	4,736	4,371	3,923	2,658
Reserve Margin Need	0	0	0	2,529	2,635	2,996	3,435	4,692

² Dispatchable DSM reflects expected load reductions under normal peak weather conditions.

³ Solar capacity values reflect 78.6% expected contribution to summer peak capacity.

⁴ Mill Creek 1 and 2 cannot be operated simultaneously during ozone season due to NOx limits, which results in a reduction of available summer capacity through 2024, after which Mill Creek 1 is assumed to be retired. The Companies also assume Ghent 2 cannot operate during ozone season starting in 2030 due to the Good Neighbor Plan.

Table 23: 24% Winter Reserve Margin Need (MW)

	2024	2026	2028	2032	2034	2036	2040	2044
Peak Load	5,957	6,052	6,154	6,142	6,143	6,143	6,146	6,154
Dispatchable Generation Resources								
Existing Resources	7,909	7,909	7,909	7,909	7,909	7,909	7,909	7,909
New NGCCs	0	0	641	641	641	641	641	641
Intermittent/Limited-Duration Resources								
Existing Resources	72	72	72	72	72	72	72	72
Existing CSR	128	128	128	128	128	128	128	128
Existing Dispatchable DSM ²	22	22	22	22	22	22	22	22
New Solar ⁵	0	0	0	0	0	0	0	0
New Battery Storage	0	125	125	125	125	125	125	125
New Dispatchable DSM ²	13	40	89	104	104	104	104	104
Total Resources Before Ret.	8,143	8,294	8,985	9,000	9,000	9,000	9,000	9,000
Retirements								
Scenario 1: End of Depreciable Lives								
Small CTs	0	(55)	(55)	(55)	(55)	(55)	(55)	(55)
Coal	0	(300)	(597)	(1,013)	(1,978)	(1,978)	(3,812)	(3,812)
Large CTs	0	0	0	0	(138)	(532)	(874)	(2,253)
OVEC	0	0	0	0	0	0	(158)	(158)
Hydro	0	0	0	0	0	0	0	(32)
Total Cumulative Ret.	0	(355)	(652)	(1,068)	(2,171)	(2,565)	(4,899)	(6,310)
Resources Net of Ret.	8,143	7,939	8,333	7,932	6,829	6,435	4,101	2,690
Reserve Margin Need	0	0	0	0	788	1,183	3,520	4,940
Scenario 2: Section 111 (d)								
Small CTs	0	(55)	(55)	(55)	(55)	(55)	(55)	(55)
Coal	0	(300)	(597)	(4,266)	(4,752)	(4,752)	(4,752)	(4,752)
Large CTs	0	0	0	0	(138)	(532)	(874)	(2,253)
OVEC	0	0	0	0	0	0	(158)	(158)
Hydro	0	0	0	0	0	0	0	(32)
Total Cumulative Ret.	0	(355)	(652)	(4,321)	(4,945)	(5,339)	(5,839)	(7,250)
Resources Net of Ret.	8,143	7,939	8,333	4,679	4,055	3,661	3,161	1,750
Reserve Margin Need	0	0	0	2,938	3,562	3,956	4,460	5,880

⁵ Solar capacity values reflect 0% expected contribution to winter peak capacity.

The attachment is being provided in a separate file in Excel format.

KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Response to Commission Staff's Third Request for Information
Dated March 11, 2024

Case No. 2023-00404

Question No. 2

Responding Witness: Stuart A. Wilson

- Q-2. Refer to Tariff Filing, 2024-2025 Qualifying Facilities Rates & Net Metering Service-2 Bill Credit, Generation Planning & Analysis, October 2023, Table 6.
- a. Provide a breakdown of the costs included in the annual economic carrying charge for a new Combustion Turbine (CT) (e.g., capital costs, operational costs, maintenance costs, expected lifespan).
 - b. Provide the same table and breakdown for the annual economic carrying charge for a new Natural Gas Combined Cycle (NGCC) unit.
 - c. Perform a sensitivity analysis considering a 50 percent cost increase to the economic carrying charge for both the CT and NGCC unit. Provide the updated avoided capacity rates and all-in avoided cost rates.
- A-2.
- a. The table below reflects a breakdown of annual economic carrying charge for a CT, which has an expected life of 30 years. See attached for supporting workpapers.

Table 6: CT Economic Carrying Charge (\$/MW-Year)

Year	Capital	Fixed O&M	Firm Gas Transport	Total
2024	81,640	23,983	20,896	126,519
2025	82,503	24,463	21,105	128,071
2026	83,375	24,952	21,316	129,644
2027	84,257	25,451	21,529	131,237
2028	85,148	25,960	21,744	132,853
2029	86,048	26,480	21,962	134,490
2030	86,958	27,009	22,181	136,149
2031	87,878	27,549	22,403	137,830
2032	88,807	28,100	22,627	139,535
2033	89,746	28,662	22,854	141,262
2034	90,695	29,236	23,082	143,013
2035	91,654	29,820	23,313	144,787
2036	92,624	30,417	23,546	146,586
2037	93,603	31,025	23,781	148,409
2038	94,593	31,645	24,019	150,258
2039	95,593	32,278	24,259	152,131
2040	96,604	32,924	24,502	154,030
2041	97,625	33,582	24,747	155,955
2042	98,658	34,254	24,995	157,906
2043	99,701	34,939	25,245	159,885
2044	100,755	35,638	25,497	161,890

- b. The table below reflects a breakdown of annual economic carrying charge for a NGCC, which has an expected life of 40 years. See attached for supporting workpapers.

Table 6: NGCC Economic Carrying Charge (\$/MW-Year)

Year	Capital	Fixed O&M	Firm Gas Transport	Total
2024	83,150	29,820	18,210	131,180
2025	84,058	30,416	18,392	132,867
2026	84,977	31,025	18,576	134,577
2027	85,905	31,645	18,762	136,312
2028	86,843	32,278	18,949	138,071
2029	87,792	32,924	19,139	139,855
2030	88,751	33,582	19,330	141,663
2031	89,721	34,254	19,523	143,498
2032	90,701	34,939	19,719	145,358
2033	91,692	35,638	19,916	147,245
2034	92,694	36,350	20,115	149,159
2035	93,706	37,077	20,316	151,100
2036	94,730	37,819	20,519	153,068
2037	95,765	38,575	20,724	155,064
2038	96,811	39,347	20,932	157,089
2039	97,868	40,134	21,141	159,143
2040	98,938	40,936	21,352	161,227
2041	100,018	41,755	21,566	163,340
2042	101,111	42,590	21,782	165,483
2043	102,216	43,442	21,999	167,657
2044	103,332	44,311	22,219	169,863

- c. The tables below reflect updated avoided capacity rates and all-in avoided rates for a CT assuming a 50 percent cost increase to the economic carrying charge based on the 2023 NREL ATB and 2032 capacity need. Avoided energy costs are unchanged. See attached for supporting workpapers.

Table 14: Qualifying Facility Avoided Energy Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Energy (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	29.05	30.51	30.90
Solar: Fixed Tilt	29.33	30.89	31.28
Wind	27.94	29.90	30.33
Other Technologies	28.05	30.27	30.74

Table 15: Qualifying Facility Avoided Capacity Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Capacity, 2032 Need (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	0.00	16.23	18.31
Solar: Fixed Tilt	0.00	19.54	22.05
Wind	0.00	12.80	14.44
Other Technologies	0.00	11.32	12.77

Table 16: Qualifying Facility Avoided Cost Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF All-In Avoided Cost Rates (without line losses for transmission connected projects)	
	2-Year PPA	2024/2025 Avoided Cost Rate
Solar: Single-Axis Tracking	29.05	47.98
Solar: Fixed Tilt	29.33	51.88
Wind	27.94	43.73
Other Technologies	28.05	42.55

Table 18: Qualifying Facility Avoided Energy Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Energy, KU (with line losses)			QF Avoided Energy, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	30.43	31.96	32.36	29.86	31.36	31.75
Solar: Fixed Tilt	30.73	32.35	32.76	30.15	31.74	32.15
Wind	29.27	31.32	31.77	28.72	30.72	31.17
Other Technologies	29.39	31.71	32.20	28.83	31.11	31.59

Table 19: Qualifying Facility Avoided Capacity Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Capacity, KU (with line losses)			QF Avoided Capacity, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	0.00	17.28	19.49	0.00	16.90	19.07
Solar: Fixed Tilt	0.00	20.80	23.47	0.00	20.35	22.96
Wind	0.00	13.62	15.37	0.00	13.33	15.04
Other Technologies	0.00	12.05	13.59	0.00	11.79	13.30

Table 20: Qualifying Facility All-In Avoided Cost Rates for 2-Year and 7-Year PPAs by Company, with Line Losses (\$/MWh)

	QF All-In Avoided Cost Rate, KU		QF All-In Avoided Cost Rate, LG&E	
	2-Year PPA	2024/2025 Avoided Cost Rate	2-Year PPA	2024/2025 Avoided Cost Rate
Solar: Single-Axis Tracking	30.43	50.55	29.86	49.54
Solar: Fixed Tilt	30.73	54.70	30.15	53.60
Wind	29.27	46.04	28.72	45.13
Other Technologies	29.39	44.77	28.83	43.89

The tables below reflect updated avoided capacity rates and all-in avoided rates for a NGCC assuming a 50 percent cost increase to the economic carrying charge based on the 2023 NREL ATB and 2032 capacity need. Avoided energy costs are unchanged. See attached for supporting workpapers.

Table 14: Qualifying Facility Avoided Energy Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Energy (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	29.05	30.51	30.90
Solar: Fixed Tilt	29.33	30.89	31.28
Wind	27.94	29.90	30.33
Other Technologies	28.05	30.27	30.74

Table 15: Qualifying Facility Avoided Capacity Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Capacity, 2032 Need (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	0.00	16.96	19.14
Solar: Fixed Tilt	0.00	20.42	23.04
Wind	0.00	13.37	15.09
Other Technologies	0.00	11.82	13.34

Table 16: Qualifying Facility Avoided Cost Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF All-In Avoided Cost Rates (without line losses for transmission connected projects)	
	2-Year PPA	2024/2025 Avoided Cost Rate
Solar: Single-Axis Tracking	29.05	48.75
Solar: Fixed Tilt	29.33	52.81
Wind	27.94	44.34
Other Technologies	28.05	43.09

Table 18: Qualifying Facility Avoided Energy Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Energy, KU (with line losses)			QF Avoided Energy, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	30.43	31.96	32.36	29.86	31.36	31.75
Solar: Fixed Tilt	30.73	32.35	32.76	30.15	31.74	32.15
Wind	29.27	31.32	31.77	28.72	30.72	31.17
Other Technologies	29.39	31.71	32.20	28.83	31.11	31.59

Table 19: Qualifying Facility Avoided Capacity Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Capacity, KU (with line losses)			QF Avoided Capacity, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	0.00	18.05	20.37	0.00	17.66	19.93
Solar: Fixed Tilt	0.00	21.74	24.53	0.00	21.26	24.00
Wind	0.00	14.23	16.06	0.00	13.93	15.72
Other Technologies	0.00	12.59	14.20	0.00	12.31	13.90

Table 20: Qualifying Facility All-In Avoided Cost Rates for 2-Year and 7-Year PPAs by Company, with Line Losses (\$/MWh)

	QF All-In Avoided Cost Rate, KU		QF All-In Avoided Cost Rate, LG&E	
	2-Year PPA	2024/2025 Avoided Cost Rate	2-Year PPA	2024/2025 Avoided Cost Rate
Solar: Single-Axis Tracking	30.43	51.37	29.86	50.35
Solar: Fixed Tilt	30.73	55.69	30.15	54.57
Wind	29.27	46.69	28.72	45.77
Other Technologies	29.39	45.35	28.83	44.46

The attachments are
being provided in
separate files.

**KENTUCKY UTILITIES COMPANY
AND
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**Response to Commission Staff's Third Request for Information
Dated March 11, 2024**

Case No. 2023-00404

Question No. 3

Responding Witness: Stuart A. Wilson

- Q-3. Refer to LG&E/KU's response to Commission Staff's First Request for Information (Staff's First Request), Item 1.
- a. In calculating this new capacity need, explain whether this assumes that Brown 3 is retired in 2030 with no replacement capacity. If not, explain the assumptions resulting in the conclusions asserted in the response.
 - b. Confirm that the capacity need is calculated solely on the approved resource portfolio, or confirm that it is calculated as an average between the approved portfolio and Scenario 2: Section 111(d). If neither apply, explain the approach used and provide justification.
- A-3.
- a. No. As stated in the referenced response, "[F]or the purposes of this response, to account for the cited Order the Companies assumed Brown 12 would replace Brown 3 in 2030..." The footnote in the same response includes, "[F]rom page 137 of the Commission's Order... 'The Commission reiterates that the denial of the CPCN for Brown 12 is wholly based on the Commission's finding that the construction of Brown 12 should be deferred with the construction beginning on a date that provides for an in-service date in 2030.' Note also that the Companies assumed Brown 3 would retire in 2030 because the Companies cannot operate Brown 3 and Brown 12 simultaneously without certain transmission upgrades." See also the response to Question No. 1 (a).
 - b. The timing of the 2030 capacity need is based on the assumption that Brown 12 will replace Brown 3 in 2030. See the response to Question No. 1(a). The Commission has not approved this assumed change.

**KENTUCKY UTILITIES COMPANY
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**Response to Commission Staff's Third Request for Information
Dated March 11, 2024**

Case No. 2023-00404

Question No. 4

Responding Witness: Stuart A. Wilson

Q-4. Refer to LG&E/KU's response to the Attorney General's First Request for Information, Item 3. Refer also to LG&E/KU's response to Joint Intervenors' First Request for Information, Item 3, Attachment 5.

- a. Confirm that a portion of Qualified Facilities (QF) generation is being curtailed in the avoided energy cost calculation. If not confirmed, explain why not.
- b. If the QF generation is being curtailed in the avoided energy cost calculation, then explain what factors are required or was considered for LG&E/KU to consider curtailment of the QF generation. Include in the response whether the QF generation is being curtailed due to the only units running at those hours are thermal units that cannot be ramped down because they are at their minimum operating capacity. If not because of the units minimum operating capacity, then explain which other circumstances led to the curtailment of QF generation in the avoided energy cost calculation.

A-4.

- a. Confirmed, as it pertains to the avoided energy cost calculation. In practice, the Companies will not have the ability to curtail the output of a QF. As noted in the response to AG 1-3(b), due to the small size of QFs and the uncertainty in forecasting their output, the Companies compute avoided energy costs with the assumption that QFs will not impact the way other resources are committed. The concept of "curtailed MWhs" exists entirely for the purpose of computing avoided energy costs with this assumption.
- b. To compute avoided energy costs, the Companies first develop an hourly generation forecast with no QFs. Then, for each hour and QF, they identify the most expensive MWhs that would be avoided by the QF. The avoided energy cost for each year is the average marginal cost of these MWhs, computed as the sum of marginal energy costs divided by the sum of avoided MWhs. In a limited number of hours, the forecasted QF output exceeds the number of avoidable MWhs due to insufficient downward ramping capability.

Therefore, the sum of marginal energy costs is divided by the sum of avoided MWhs and not the annual QF output, which would produce a lower result.

In the referenced Attachment 5, the “curtailed_MWh” variable is used to track the difference between avoided MWhs and annual output for each QF, so that the difference can be properly accounted for when computing avoided energy costs. The Companies also review these differences to ensure they are small. As seen in the table below, these differences are 0.5% or less of the total output for each QF. The percentage is lower for wind and other QF technologies primarily because these technologies produce more energy (i.e., the denominator in the calculation is higher).

QF Technology	“Curtailed_MWh” as a Percent of QF Output
Solar: Single-Axis Tracking	0.5%
Solar: Fixed Tilt	0.4%
Wind	0.1%
Other Technologies	0.2%

KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Response to Commission Staff's Third Request for Information
Dated March 11, 2024

Case No. 2023-00404

Question No. 5

Responding Witness: Stuart A. Wilson

- Q-5. Calculate the avoided energy cost using the following methodology and provide the new avoided energy cost as well as the all-in avoided cost rates. Provide the calculations for each step.
- a. Step 1: Run a production cost study for the years 2024-2044 with the Commission-approved portfolio from Case 2022-00402.
 - b. Step 2: Run a production cost study for the years 2024-2044 with the Commission-approved portfolio from Case 2022-00402 plus 80 MW of QF solar. Assign the QF solar a cost of \$0.
 - c. Step 3: Calculate the total annual portfolio cost in each study. Subtract the annual cost of Study #2 from Study #1.
 - d. Step 4: Calculate the total energy generated by QF solar by year.
 - e. Step 5: Divide the cost differential in Step 3 by the total energy (Step 4) to determine avoided energy cost \$/MWh.
- A-5. As noted in the response to AG 1-3(b), the Companies computed avoided energy costs with the assumption that QFs will not impact the way other resources are committed. The primary difference between the requested methodology and the Companies' methodology is the requested methodology allows QFs to impact unit commitment. This is not a reasonable assumption given the small size of QFs and the uncertainty in forecasting their output. This notwithstanding, the tables below show the impact of the requested methodology on avoided energy costs and all-in avoided cost rates. Avoided capacity costs are unchanged. See attached for the supporting workpaper.

Table 14: Qualifying Facility Avoided Energy Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Energy (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	31.38	32.29	32.66
Solar: Fixed Tilt	31.12	32.16	32.72
Wind	31.14	34.65	35.35
Other Technologies	30.95	34.56	35.18

Table 15: Qualifying Facility Avoided Capacity Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF Avoided Capacity, 2032 Need (without line losses for transmission connected projects)		
	2-Year PPA	7-Year PPA Beginning:	
		2024	2025
Solar: Single-Axis Tracking	0.00	10.82	12.21
Solar: Fixed Tilt	0.00	13.03	14.70
Wind	0.00	8.53	9.63
Other Technologies	0.00	7.55	8.51

Table 16: Qualifying Facility Avoided Cost Rates for Transmission Connected Projects, without Line Losses (\$/MWh)

Technology	QF All-In Avoided Cost Rates (without line losses for transmission connected projects)	
	2-Year PPA	2024/2025
		Avoided Cost Rate
Solar: Single-Axis Tracking	31.38	43.99
Solar: Fixed Tilt	31.12	46.31
Wind	31.14	44.08
Other Technologies	30.95	42.90

Table 18: Qualifying Facility Avoided Energy Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Energy, KU (with line losses)			QF Avoided Energy, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	32.87	33.82	34.21	32.25	33.18	33.56
Solar: Fixed Tilt	32.60	33.69	34.28	31.98	33.05	33.63
Wind	32.62	36.29	37.03	32.01	35.61	36.33
Other Technologies	32.42	36.21	36.85	31.81	35.52	36.15

Table 19: Qualifying Facility Avoided Capacity Rates by Company, with Line Losses (\$/MWh)

Technology	QF Avoided Capacity, KU (with line losses)			QF Avoided Capacity, LG&E (with line losses)		
	2-Year PPA	7-Year PPA Beginning:		2-Year PPA	7-Year PPA Beginning:	
		2024	2025		2024	2025
Solar: Single-Axis Tracking	0.00	11.52	12.99	0.00	11.27	12.71
Solar: Fixed Tilt	0.00	13.87	15.65	0.00	13.57	15.31
Wind	0.00	9.08	10.25	0.00	8.89	10.03
Other Technologies	0.00	8.03	9.06	0.00	7.86	8.87

Table 20: Qualifying Facility All-In Avoided Cost Rates for 2-Year and 7-Year PPAs by Company, with Line Losses (\$/MWh)

	QF All-In Avoided Cost Rate, KU		QF All-In Avoided Cost Rate, LG&E	
	2-Year PPA	2024/2025 Avoided Cost Rate	2-Year PPA	2024/2025 Avoided Cost Rate
Solar: Single-Axis Tracking	32.87	46.27	32.25	45.36
Solar: Fixed Tilt	32.60	48.74	31.98	47.78
Wind	32.62	46.33	32.01	45.42
Other Technologies	32.42	45.07	31.81	44.20

- a. See the workpapers provided in response to PSC 2-1.
- b. See attachment being provided in a separate file for all workpapers updated for this response. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

c. See the tables below.

Annual System Cost (\$ Millions)

Year	Base Case	Solar: Single-Axis Tracking	Solar: Fixed Tilt	Wind	Other Technologies
2024	856	850	852	851	834
2025	922	916	918	916	900
2026	976	971	973	971	954
2027	1,012	1,006	1,008	1,006	988
2028	1,036	1,030	1,032	1,030	1,013
2029	1,041	1,035	1,037	1,035	1,018
2030	1,035	1,030	1,032	1,030	1,012
2031	1,047	1,041	1,043	1,041	1,024
2032	1,073	1,067	1,069	1,067	1,049
2033	1,091	1,086	1,088	1,085	1,067
2034	1,098	1,092	1,094	1,091	1,073
2035	1,123	1,117	1,119	1,117	1,098
2036	1,146	1,140	1,142	1,140	1,121
2037	1,154	1,148	1,150	1,148	1,127
2038	1,179	1,173	1,175	1,172	1,152
2039	1,194	1,187	1,190	1,187	1,165
2040	1,195	1,188	1,191	1,189	1,168
2041	1,215	1,208	1,210	1,208	1,186
2042	1,238	1,231	1,234	1,230	1,210
2043	1,263	1,256	1,259	1,256	1,234
2044	1,295	1,288	1,290	1,287	1,265

Annual System Cost Difference from Base Case (\$ Millions)

Year	Solar: Single-Axis Tracking	Solar: Fixed Tilt	Wind	Other Technologies
2024	-5.3	-3.1	-4.8	-21.1
2025	-6.0	-4.1	-6.1	-22.4
2026	-5.4	-3.5	-5.8	-22.8
2027	-5.9	-3.9	-6.3	-23.7
2028	-6.0	-3.7	-6.6	-23.0
2029	-5.5	-3.5	-5.8	-22.6
2030	-5.3	-3.2	-5.4	-22.9
2031	-5.4	-3.5	-5.9	-23.2
2032	-5.7	-3.7	-6.2	-23.9
2033	-5.5	-3.4	-6.1	-24.1
2034	-5.8	-3.8	-6.4	-24.7
2035	-6.5	-4.3	-6.3	-25.7
2036	-5.9	-4.0	-6.1	-25.0
2037	-6.2	-4.0	-6.5	-26.8
2038	-6.4	-4.0	-6.8	-26.9
2039	-6.4	-4.2	-7.3	-28.7
2040	-6.8	-4.4	-6.6	-27.1
2041	-6.4	-4.1	-6.8	-28.1
2042	-6.8	-4.3	-7.7	-28.6
2043	-7.0	-4.4	-7.3	-29.5
2044	-7.0	-4.4	-7.3	-29.8

d. See the table below.

Annual QF Energy (GWh)

Year	Solar: Single-Axis Tracking⁶	Solar: Fixed Tilt⁶	Wind⁶	Other Technologies
2024	176	114	165	703
2025	183	117	182	701
2026	176	114	172	701
2027	187	120	187	701
2028	180	116	193	703
2029	190	123	171	701
2030	178	114	169	701
2031	183	117	182	701
2032	186	119	185	703
2033	176	113	177	701
2034	185	118	183	701
2035	190	123	171	701
2036	183	117	176	703
2037	176	114	172	701
2038	187	120	187	701
2039	176	113	177	701
2040	191	123	179	703
2041	178	114	169	701
2042	183	117	182	701
2043	176	114	172	701
2044	183	116	174	703

e. See the table below.

⁶ Variations in annual solar and wind generation reflect variations in solar irradiance and wind levels, respectively, in the data used to align solar and wind profiles with temperature in the Companies’ hourly load forecast. Table 1 in the “2024-2025 Qualifying Facilities Rates & Net Metering Service-2 Bill Credit” report contains average capacity factors for each QF technology.

Annual Avoided Energy Cost (\$/MWh)

Year	Solar: Single-Axis Tracking	Solar: Fixed Tilt	Wind	Other Technologies
2024	29.83	27.59	29.01	30.00
2025	32.93	34.65	33.27	31.91
2026	30.87	30.98	33.79	32.60
2027	31.39	32.54	33.84	33.80
2028	33.33	31.89	34.09	32.69
2029	28.98	28.34	34.16	32.31
2030	30.04	28.13	32.16	32.71
2031	29.28	29.85	32.25	33.09
2032	30.88	31.35	33.43	33.99
2033	30.96	30.28	34.51	34.41
2034	31.25	31.78	34.82	35.20
2035	34.23	35.09	36.86	36.75
2036	32.35	33.79	34.59	35.53
2037	35.52	35.48	37.62	38.31
2038	34.12	33.01	36.66	38.41
2039	36.36	37.12	41.32	41.03
2040	35.87	35.43	36.84	38.62
2041	35.71	36.26	39.98	40.08
2042	37.30	37.02	42.11	40.75
2043	39.83	38.47	42.47	42.06
2044	38.04	37.80	41.85	42.35

The attachment is being provided in a separate file in Excel format.

The entire attachment is
Confidential and
provided separately
under seal.