

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)	CASE NO. 2020-00402
CONVENIENCE AND NECESSITY AND)	
APPROVAL OF A DEMAND SIDE)	
MANAGEMENT PLAN AND APPROVAL OF)	
FOSSIL FUEL-FIRED GENERATING UNIT)	
RETIREMENTS)	

RESPONSE OF
KENTUCKY UTILITIES COMPANY
AND
LOUISVILLE GAS AND ELECTRIC COMPANY
TO
THE METROPOLITAN HOUSING COALITION, KENTUCKIANS FOR THE
COMMONWEALTH, KENTUCKY SOLAR ENERGY SOCIETY AND
MOUNTAIN ASSOCIATION'S
THIRD SET OF DATA REQUESTS
DATED MAY 31, 2023

FILED: JUNE 9, 2023

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

**Response to Metropolitan Housing Coalition, Kentuckians for the Commonwealth,
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Dated May 31, 2023**

Case No. 2020-00402

Question No. 3-1

Responding Witness: Robert M. Conroy

- Q-3-1. Please produce all redacted documents included in this filing in non-redacted, electronic versions (machine readable, unprotected, with formulas intact), to the extent such documents have not already been provide to the Joint Intervenors.
- A-3-1. On February 15, 2023 Metropolitan Housing Coalition, Kentuckians for the Commonwealth, Kentucky Solar Energy Society, and Mountain Association (collectively, the "Joint Intervenors") entered into a Confidentiality Agreement with Kentucky Utilities Company and Louisville Gas and Electric Company (collectively "the Companies") for certain information that the Companies have requested confidential protection for in this proceeding. The Companies have made the confidential non-redacted documents available to the Joint Intervenors throughout this proceeding.

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Case No. 2020-00402

Question No. 3-2

Responding Witness: Lonnie E. Bellar / Stuart A. Wilson

- Q-3-2. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, at 10-11. Please describe the anticipated benefits and value of the Companies' full right to dispatch the two Companies-owned solar facilities between their economic minimum and maximum outputs.
- a. Please indicate how this value is represented in the Companies' Financial Model. If it is not considered to be a quantifiable financial benefit, please explain why not.
 - b. Please explain why the Companies have not negotiated for the right to control the solar PPA facilities' output ranges.
- A-3-2.
- a. Once constructed, owned solar has zero marginal cost (marginal cost is negative for the 10-year duration of the IRA's production tax credit) and will be among the first assets to be dispatched. As such, the Companies would not plan to curtail owned solar under normal operating conditions and did not attempt to quantify any financial benefit in the Financial Model. However, the Companies will have the opportunity to curtail or re-dispatch these assets when they are able to produce energy.
 - b. The Companies have not yet integrated sufficient solar resources to justify any additional expense for the right to curtail the solar PPA facilities' output.

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Question No. 3-3

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

- Q-3-3. Please refer to Companies response to Staff Request 2-60, filed in Case. No. 2022-00402, which states that, "The energy from the Companies-owned facilities in Mercer and Marion counties will be dispatchable within the output range allowed by solar irradiance. However, given the marginal energy cost from the owned solar facilities is \$0/MWh, the Companies would not anticipate curtailing their output under normal operating conditions."
- a. Please state whether the Companies anticipate that they will have the capability to operate their solar panels in downward dispatch or fully flexibility operating mode. (These terms are defined in: Energy and Environmental Economics, *Investigating the Economic Value of Flexible Solar Power Plant Operation* (2018), available at: <https://www.ethree.com/projects/investigating-the-economic-value-of-flexible-solar-plants/>)
 - b. If the Companies anticipated capability is confirmed in (a), please explain why the Companies would not choose to voluntarily curtail the output of solar facilities in order to obtain the value represented by flexible solar plant operation.
 - c. In response to Attorney General Request 1-49 in Case. No. 2022-00402, Mr. Bellar states that, "The need for load-following dispatchable generation increases in conjunction with the increased penetration of intermittent renewable generation. Yes, the proposed J or H class NGCCs can conduct quicker and larger load following the Cane Run Unit 7 installed nearly 9 years ago."
 - i. Please provide a comparison of the load-following capabilities of the Companies-owned solar generation with that of the proposed J or H class NGCCs.

- ii. Please provide a comparison of the load-following capabilities of the Companies-owned solar generation with that of Cane Run 7 after completion of the upgrade from the OEM planned for spring 2024.

A-3-3.

- a. See the response to AG-KIUC 3-12.
- b. See the responses to part (a) and to Question No. 3-2 part (a).
- c.
 - i. Each of the proposed NGCCs is capable of following load at a ramp rate of 85 MW per minute, with a total dispatchable range per unit of 395 MW in summer and 380 MW in winter. The ramp rates and dispatchable ranges of each of the proposed owned solar facilities will be a function of availability of solar irradiance and will vary up to each unit's nameplate capacity of 120 MW.
 - ii. Cane Run 7 is currently capable of following load at a ramp rate of 30 MW per minute, with a total dispatchable range of 353 MW. The OEM upgrade will not impact unit ramp rate. The ramp rates and dispatchable ranges of each of the proposed owned solar facilities will be a function of availability of solar irradiance and will vary up to each unit's nameplate capacity of 120 MW.

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Question No. 3-4

Responding Witness: Lonnie E. Bellar / Stuart A. Wilson

Q-3-4. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, at 16-17. Please provide a list of all incidents over the past 20 years in which coal piles froze, resulting in reduced generation at any of the Companies' coal units or any coal unit that the Companies relied upon.

a. Please explain how the forced outage rates included in the Companies' SERVVM reliability analysis account for the risk of coal piles freezing. Please provide all supporting analyses, in excel format where available, such as calculations of the expected risk of outage or reduced generation and the duration of such outages or reduced generation periods.

A.3-4. The Companies have no record of derates due to frozen coal piles. Minimal freezing of the top layer of coal piles is manageable. However, there is greater potential for coal piles to sufficiently freeze and cause operational problems when inventory levels are extremely low. The Companies have been successful in prudently managing coal inventories to avoid such events. Other plant issues related to frozen coal in feeders, mills, and bunkers occasionally occur. The Companies found 24 such events in the last 20 years resulting in derates, of which 22 ranged from 4 MW to 105 MW. The remaining two derates were 422 MW for 0.6 hours and 530 MW for 2.1 hours. The most recent event occurred in January 2014.

a. Forced outage rates for the SERVVM analysis are developed based on multiple years of historical forced outage rates. Therefore, the impacts of frozen coal and other weather-related issues are captured in forecasted forced outage rates to the extent these issues have impacted unit availability historically.

The forced outage rates in SERVVM were derived in "\06_ModelInputs\EFOR\20220628_CHW_EFORTemplateForPROSYM.xlsx" in Exhibit SAW-2. The file used five years of GADS (Generating Availability Data System) data. See "INPUT-GADS DATA" tab in the file.

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Case No. 2020-00402

Question No. 3-5

Responding Witness: Lonnie E. Bellar

- Q-3-5. Please refer to Companies response to Staff Request 1-1(b), filed in Case No. 2022-00402, in which Mr. Bellar stated that LG&E/KU's current units with black start capabilities are Cane Run 7 and Brown CT units 5-11 (in conjunction with Dix Dam Hydro units 1-3). Among the proposed resources, which are black start capable, if any?
- A-3-5. The proposed units will not change either the LG&E or the KU black start resources and will therefore not affect the response to Staff Request 1-1(b).

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Case No. 2020-00402

Question No. 3-6

Responding Witness: Lonnie E. Bellar

- Q-3-6. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, at 18. Please provide a comprehensive summary of the services provided by TVA related to reliability coordination.
- a. Please provide a copy of each relevant contract or agreement.
 - b. If the service agreement(s) with TVA were approved by the Commission, please provide relevant references to the dockets and decisions.
- A-3-6. See the referenced agreements for a description of the services provided.
- a. See the response to SC 3-4. See the response to AG-KIUC 3-21 regarding the Joint Reliability Coordination Agreement.
 - b. By an Order dated July 6, 2006, in Case No. 2005-00471, the Commission approved the Companies' application for TVA to be their reliability coordinator.¹ That application included the Companies' first reliability coordinator agreement with TVA.²

¹ *Application of Louisville Gas and Electric Company and Kentucky Utilities Company to Transfer Functional Control of their Transmission Facilities*, Case No. 2005-00471, Order (Ky. PSC July 6, 2006).

² Case No. 2005-00471, Amended Application Exhibit 1 (Feb. 3, 2006), available at https://psc.ky.gov/PSCSCF/2005%20cases/2005-00471/LGEKU_AmendedApplicationExhibit1_020306.pdf.

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Case No. 2020-00402

Question No. 3-7

Responding Witness: Stuart A. Wilson

- Q-3-7. Please refer to Companies response to Staff Request 2-66(a), filed in Case No. 2022-00402, in which Mr. Wilson states that, “The Companies have not calculated ELCC values for any of their existing or proposed units. The Companies are not aware of cases where ELCC is computed for thermal resources. The capacity contributions computed for limited-duration resources (i.e., dispatchable DSM and battery storage) are similar to ELCC, but the calculation is not the same.”
- a. Is Mr. Wilson familiar with PJM’s proposed Marginal Accreditation Framework (Marginal ELCC or Marginal Reliability Impact)? (See, PJM, Critical Issue Fast Path stakeholder process, *Capacity Market Reform: PJM’s Initial Proposal*. Available at: <https://www.pjm.com/committees-and-groups/cifp-ra> - meeting materials, March 29, 2023, Item O4 – PJM CIFP-RA Initial Proposal, slide 9).
 - b. Does Mr. Wilson agree that it is a best practice to characterize generation resources’ historical performance based on both of the following metrics:
 - i. Individual performance (forced outages, ambient de-rates, production capacity, etc.) as a function of temperature (and other weather for wind/solar back-casts).
 - ii. Class and fleet performance as a function of temperature (recognizing that correlated outages are observed in historical datasets).
 - c. Is Mr. Wilson familiar with the Astrape Report, *Accrediting Resource Adequacy Value to Thermal Generation* (2022)? (See, Astrape Consulting, *Accrediting Resource Adequacy Value to Thermal Generation*, available at: <https://www.astrape.com/publications/>)

- d. Does Mr. Wilson agree that LG&E/KU and many other utilities' current methods do not account for a portion of the thermal resource uncertainty in an individual unit's capacity accreditation, but rather that "uncertainty is being socialized to load"? (Astrape, p. 8) If you disagree, please explain the basis for your disagreement in full.
- e. Does Mr. Wilson agree that accounting for uncertainty in categories such as outage variability, outage correlation, weather-dependent outages, and fuel availability would result in a more consistent approach for determining capacity accreditation between resources currently assessed via ELCC (wind, solar, storage) and thermal resources? If you disagree, please explain the basis for your disagreement in full.
- f. Does Mr. Wilson anticipate that LG&E/KU will calculate ELCC values, or perform some similar calculation, for thermal units as a part of future planning efforts? Please explain.

A-3-7.

- a. The Companies reviewed this report in the context of responding to this request.
- b. In assessing resource adequacy (e.g., in the Companies' analysis of minimum reserve margins and capacity contributions), the Companies' goal is to model all aspects of existing and new resources that materially affect their availability.
 - i. The Companies agree that modeling individual unit performance as a function of temperature is important. For example, the Companies model seasonal capacity ratings for their thermal units.
 - ii. Aside from the rolling service interruptions on December 23, 2022, caused by a drop in pressure on the Texas Gas Transmission system, the Companies have not experienced correlated outages that have materially impacted unit availability or reliability, and therefore do not model correlated outages (e.g., related to weather, fuel supply, or other factors) when assessing resource adequacy. The Companies have firm gas transportation contracts and cold weather operating procedures that limit the potential for correlated outages, so their experience is different from some RTOs.
- c. The Companies reviewed this report in the context of responding to this request.
- d. The Companies do not disagree with the statement, but the RTO concept of capacity accreditation for thermal resources is not applicable to the Companies or this proceeding. After an RTO performs a resource adequacy

study to determine a capacity need, capacity accreditation is the framework that determines how much of the capacity need a particular resource can be credited for meeting. The report referenced in part (c) discusses several aspects of modeling thermal resources in the context of both resource adequacy modeling and capacity accreditation. The Companies' resource adequacy modeling is consistent with the report and reasonable, but not all the issues discussed are applicable to the Companies. See the response to part (b).

- e. The RTO concept of capacity accreditation for thermal resources is not applicable to the Companies or this proceeding. When assessing resource adequacy, the Companies' goal is to model all aspects of both thermal and non-thermal resources that materially impact their reliability. Based on the referenced documents, there is nothing about the Companies' resource adequacy modeling that needs to be changed or that favors thermal resources over non-thermal resources.
- f. No. See the responses to parts (d) and (e).

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Question No. 3-8

Responding Witness: Lonnie E. Bellar / Stuart A. Wilson

Q-3-8. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, at 16-17.

- a. Please provide LG&E/KU's equivalent forced outage rates for each unit proposed for retirement for each year in the past decade.
- b. Please provide LG&E/KU's assumptions regarding equivalent forced outage rates during the forecast period for each unit proposed for retirement. Please include all variations that may exist across the portfolios. (See, Exhibit SB4-1, Table 4, p. 12)

A-3-8.

- a. The table below includes EFOR_d data for PR12, HF1, and HF2. EFOR_d, or EFOR during periods when the unit is called upon, is the relevant outage metric for peaking units.

Year	<u>MC1</u>	<u>MC2</u>	<u>GH2</u>	<u>BR3</u>	<u>PR12</u>	<u>HF1</u>	<u>HF2</u>
2013	3.8%	6.3%	1.7%	14.3%	33.0%	22.0%	20.6%
2014	2.5%	6.4%	0.7%	8.1%	59.0%	45.7%	9.7%
2015	4.1%	4.3%	1.9%	3.5%	61.4%	4.7%	2.5%
2016	1.7%	1.6%	1.1%	9.7%	45.0%	16.2%	10.8%
2017	2.1%	2.4%	1.0%	3.1%	0.0%	0.0%	25.6%
2018	1.2%	2.3%	1.9%	12.5%	41.3%	51.6%	39.3%
2019	2.9%	1.8%	0.7%	6.4%	18.6%	22.1%	0.0%
2020	1.2%	0.5%	0.6%	3.3%	25.5%	16.9%	51.4%
2021	2.6%	4.2%	0.3%	3.2%	1.8%	24.5%	14.8%
2022	1.2%	6.7%	0.7%	5.0%	0.2%	0.3%	1.4%

- b. The assumptions for equivalent forced outage rates (“EFOR”) are the same for all the portfolios in Table 4. See the table below.

Resource	EFOR
Brown 3	5.8%
Ghent 2	3.2%
Mill Creek 1	3.2%
Mill Creek 2	3.2%
Paddy’s Run 12	50%
Haefling 1-2	50%

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Question No. 3-9

Responding Witness: Lonnie E. Bellar / Christopher M. Garrett

Q-3-9. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, at 22. Mr. Bellar's testimony states that tax advantages for renewable generation resources "inure completely to the benefit of customers."

- a. Please provide supporting evidence that such tax advantages inure *completely* to the benefit of customers. Please state whether this evidence precludes the possibility that a substantial portion of those tax advantages are captured in the form of transaction costs or retained by the solar developer or owner?
- b. Please state whether the following Kentucky tax expenditures would also "inure completely [or partially] to the benefit of customers," provide an estimate of the benefit to customers, and provide a brief explanation for each response. (See, Office of the State Budget Director, *Tax Expenditure Analysis, Fiscal Years 2022-2024*, available at: <https://osbd.ky.gov/Publications/Pages/Special-Reports.aspx>).
 - i. Sales and Use Tax Expenditure for Coal Used in the Manufacture of Electricity (p. 54)
 - ii. Corporation Income and LLE Tax Expenditure for Cryptocurrency Incentives (pp. 107-108)
 - iii. Property Tax Expenditure for Clean Coal Incentive Credit (pp. 121)
 - iv. Coal Severance and Processing Tax Expenditure for Transportation Expense Incurred in Transporting Coal (p. 163)
 - v. Coal Severance and Processing Tax Expenditure for Thin Seam Tax Credit (p. 164)

- c. Please state whether the federal tax expenditure known as “excess of percentage over cost depletion” would also “inure completely [or partially] to the benefit of customers,” provide an estimate of the benefit to customers, and provide a brief explanation. (See, Green Scissors, database entry available at: <https://greenscissors.com/program/excess-of-percentage-over-cost-depletion-other-fuels/>)

A-3-9.

- a. See the response to PSC 1-47 for evidence supporting the inclusion of the tax benefits in the PVRR calculations for the two Companies-owned solar projects. This evidence precludes any tax benefits associated with the four PPAs.
- b.
 - i. The Companies confirm that coal used in the manufacture of electricity is exempt from sales and use tax. For 2022, total Kentucky sales and use tax savings on coal purchases were approximately \$31.8 million, which inured completely to customers in the form of lower fuel costs.
 - ii. The crypto tax benefits inure only to the crypto mining companies and not KU and LG&E.
 - iii. The Companies generate approximately \$1.5 million of Kentucky Clean Coal Incentive tax credits annually on their purchases of Kentucky coal used for the Trimble County 2 plant. The credit is first applied against the Kentucky corporate income tax liability and any unused credit can then be applied against the Kentucky property tax liability. The benefit inures completely to customers in the form of lower tax expense.
 - iv. and v. The coal severance tax benefits inure to the coal mining companies and not KU and LG&E. Whether such tax benefits are included in the price of fuel purchased by the Companies is beyond KU and LG&E’s control and knowledge.
- c. The excess depletion tax benefits inure to the mining companies and not KU and LG&E.

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Question No. 3-10

Responding Witness: Lonnie E. Bellar

Q-3-10. Please refer to Mr. Bellar's Direct Testimony, filed in Case No. 2023-00122, Table 1 at 7 and Table 3 at 11. Please provide the following information for each distinct investment activity modeled in the No Retirements portfolio for the units proposed for retirement.

- a. Investment cost
- b. Anticipated in-service date
- c. The requirement associated with the investment activity (e.g., Good Neighbor Rule, facility reliability, etc.) – if more than one reason applies, please explain whether the reasons are cumulative or severable (e.g., if one of the reasons were to no longer apply, would the investment requirement still exist)
- d. Documentation of alternatives analyses (if already provided in 2022-00402, please provide a reference).

A-3-10. See the table below.

Response to Question No. 3-10
Page 2 of 2
Bellar

Project	Investment Cost, \$M (a)	Anticipated In-Service Date (b)	Requirement (c)	Documentation of Alternatives (d)
MC1 ELG	9.0	2024	ELG Rule	Exhibit SB4-1
MC1 Cooling Tower	25.0	2026	316(b)	
MC1 SCR	109.8	2026	Good Neighbor Plan ³	
MC1 Major Overhaul	8.9	2027	Reliability	
MC2 SCR	109.8	2026	Good Neighbor Plan	Exhibit SAW-1, Stage One and Stage Two Analyses
MC2 Major Overhaul	7.6	2026	Reliability	
BR3 Major Overhaul	17.3	2027	Reliability	
GH2 SCR	125.9	2026	Good Neighbor Plan	
GH2 Major Overhaul	26.5	2027	Reliability	

³ Installing SCR on MC1 and/or MC2 will also contribute to local NAAQS compliance for Ozone, which is the driver behind the current agreement with the Jefferson County Air Pollution District to limit MC station NO_x emissions on a daily basis during the Ozone Season.

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Question No. 3-11

Responding Witness: Lonnie E. Bellar

Q-3-11. Please refer to the Companies' response to Joint Intervenors' request No. 2-107, filed in Case No. 2022-00402.

- a. Please confirm what level of hydrogen co-firing OEM's offer as part of their "standard package," and whether Companies believe that is sufficient to comply with EPA's proposed greenhouse gas new source performance standards.
- b. Please confirm whether Companies have identified a commercial source of hydrogen. If so, please provide information regarding the hydrogen source, its production method (e.g. whether it is "green hydrogen" produced by renewable resources), and any information obtained related to costs, transportation, or storage relevant to the proposed NGCCs.

A-3-11.

- a. See the responses to PSC 1-5 and AG 1-22, which note that current capabilities vary between OEMs. Blending capability achievable with standard offerings similarly vary between OEMs. The Companies have not determined whether or when they will combust hydrogen in either or both of their proposed NGCC units because it is not a determination they must make at this time. See the response to KCA 3.3.
- b. As discussed in response to KCA 3.3, should the proposed 111(b) regulations become effective, utilization of hydrogen in new NGCC units would only be required beginning in 2032 if the annual capacity factor exceeded 50 percent. Given the other large changes in the Companies' generation portfolio that would result from the proposed 111(d) regulation of existing coal units, it is not clear at this time how the Companies would choose to utilize generation technologies, at what locations, and in what quantities of hydrogen. Thus, it

is premature to seek to develop specific fuel supply options, limitations, or to speculate on the timeline expectation for adequate demonstration and achievability of hydrogen blending and co-firing which must occur for the proposed greenhouse gas new source performance standards to remain intact. Finally, the Companies also note that EPA treated hydrogen as an exogenous input into its planning model (“IPM”) and did not attempt to model its production. The EPA’s assumptions include that hydrogen will be available and cost-effective after contemplated tax credits.

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Question No. 3-12

Responding Witness: Lonnie E. Bellar

- Q-3-12. Please refer to the Companies' response to Joint Intervenors' request No. 2-108, filed in Case No. 2022-00402. Please confirm whether Companies are relying on approval of the Southeast Hydrogen Hub in any manner related to the NGCC proposals, such as for future hydrogen production, delivery, or budget estimates. If so, please explain in detail and explain how Companies' assumptions will change if the application is denied.
- A-3-12. Not confirmed. See the response to Question No. 3-11(b).

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Question No. 3-13

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

- Q-3-13. Please refer to the Companies' response to Staff request 1-5(a), filed in Case No. 2022-00402. Please confirm the timeline Companies believe OEMs will be capable of hydrogen blending beyond 50% to 100%, and whether Companies believe that is sufficient to comply with EPA's proposed greenhouse gas new source performance standards.
- A-3-13. The Companies have not speculated on the timeline expectation for adequate demonstration and achievability of hydrogen blending and co-firing. These technologies must be achievable and adequately demonstrated for the proposed greenhouse gas new source performance standards to remain intact. According to the proposed rule, baseload natural gas units (greater than 50% capacity factor) under 111(b) [new units] and 111(d) [existing units] will require 96% hydrogen blended operation in 2038. This hydrogen requirement is not applicable to intermediate load (between 20% and 50% capacity factor) and low-load (less than 20% capacity factor) natural gas units.

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Question No. 3-14

Responding Witness: Lonnie E. Bellar

- Q-3-14. Please refer to the Companies' response to Staff request 1-5(b), filed in Case No. 2022-00402. Please confirm whether Companies intend to produce hydrogen on site at either of the proposed NGCCs? If so, please explain. If not, please provide any information regarding the potential transportation and delivery of hydrogen for use at either of the proposed NGCCs.
- A-3-14. Not confirmed. See the response to Question No. 3-11 (b).

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Question No. 3-15

Responding Witness: Lonnie E. Bellar

- Q-3-15. Please refer to the Companies' response to Staff request 1-5(c), filed in Case No. 2022-00402. Please explain whether and to what extent Companies anticipate having to make a capital investment to their current SCCT fleet to increase hydrogen combustion capabilities.
- A-3-15. No, because the proposed 111(b) regulations would only require hydrogen for existing SCCT units if they operate over a 20 percent annual capacity factor. The EPA's modeling shows the Companies' existing SCCT fleet operating well below a 20% capacity factor. See the response to KCA 3.3.

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Question No. 3-16

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

Q-3-16. Please refer to the Companies' response to Staff request 1-93, filed in Case No. 2022-00402.

- a. Please explain how Companies intend to comply with EPA's proposed greenhouse gas new source performance standards that are based on CCS and hydrogen co-firing technologies.
- b. Have the Companies changed their position that EPA's proposed greenhouse gas new source performance standards will not make NGCCs uneconomical? If so, please explain. If not, please explain why not.
- c. Have the Companies performed or do the Companies intend to perform an analysis to understand the economic impact of EPA's proposed greenhouse gas new source performance standards on the proposed NGCC plants?

A-3-16.

- a. See the response to KCA 3.3.
- b. No. See the response to KCA 3.3. The EPA's modeling of the proposed standards shows new NGCC capacity in excess of what the Companies have proposed that is installed in 2028 and operates through the end of the EPA study period without CCS or hydrogen co-firing.
- c. See the responses to part (b), KCA 3.3, and Question No. 3-11(b). The Companies will conduct appropriate analyses as needed to make future resource decisions, including the impact of greenhouse gas new source performance standards, particularly when they become final.

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Case No. 2020-00402

Question No. 3-17

Responding Witness: Lonnie E. Bellar

Q-3-17. Please refer to the Companies' response to Attorney General request 1-22 and KCA request 1-46, filed in Case No. 2022-00402.

- a. Have Companies estimated the costs required for additional infrastructure and necessary modifications needed to accommodate hydrogen by the proposed NGCCs?
- b. Please explain what future infrastructure the Companies anticipate will be necessary to accommodate hydrogen.
- c. Please explain whether the Companies have evaluated any other costs associated with burning hydrogen. If not, please explain why not and when the Companies anticipate evaluating these costs.

A-3-17.

- a. The Companies have not estimated the required costs for the proposed NGCC units to co-fire hydrogen. As part of the ongoing NGCC request for proposals, the Companies are requesting cost estimates from the NGCC suppliers based on their current hydrogen co-firing capabilities.
- b. At a minimum, the Companies anticipate new or upgraded combustors, upgraded gas supply piping size and material of construction, larger gas turbine enclosures, fuel blending skids, larger Heat Recovery Steam Generator ("HRSG") to accommodate additional Selective Catalytic Reduction ("SCR") equipment, as well as significant upgrades to the existing natural gas pipelines to support the supply and transport of hydrogen to the extent it is required.

- c. The Companies have not evaluated other costs associated with the proposed NGCCs burning hydrogen because the hydrogen resources are not currently available and the costs are unknown. Moreover, the Companies have not determined whether or when they will combust hydrogen in either or both of their proposed NGCC units, and it is not a determination they must make at this time. See the response to KCA 3.3. Also, hydrogen co-firing at the levels in the EPA's recent rulemaking must be achievable and adequately demonstrated for the proposed greenhouse gas new source performance standards to remain intact. See the responses to Question Nos. 3-11 and 3-13.

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Case No. 2020-00402

Question No. 3-18

Responding Witness: Lonnie E. Bellar / Stuart A. Wilson

Q-3-18. Please refer to the Companies' response to Attorney General request 2-7(b), filed in Case No. 2022-00402.

- a. Please explain whether the increase in nitrous oxide emissions expected from hydrogen combustion will impact the Companies' ability to comply with applicable environmental rules and how the Companies intend to mitigate any increases in emissions resulting from the combustion of hydrogen.
- b. Please explain whether the Companies have estimated the increase in cost that may result from burning hydrogen produced from renewable resources.
- c. Please confirm whether compliance with EPA's proposed greenhouse gas new source performance standards is expected to result in increased costs.

A-3-18.

- a. The Companies have not determined whether or when they will combust hydrogen in either or both of their proposed NGCC units, and it is not a determination they must make at this time. The NGCCs are specified with SCR technology for NO_x mitigation and can be modified to accommodate hydrogen co-firing. See the response to KCA 3.3.
- b. See the response to Question No. 3-11(b).
- c. By limiting a unit's annual capacity factor, it is possible to comply with the proposed greenhouse gas new source performance standard without an increase in the capital cost of the proposed units. See the response to KCA 3.3.

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Case No. 2020-00402

Question No. 3-19

Responding Witness: Lonnie E. Bellar

- Q-3-19. Please refer to the Companies' response to Walmart request 2-1(a), filed in Case No. 2022-00402. Please state whether the Companies expect the supply of commercially available hydrogen will be the primary limiting factor in adoption of hydrogen and not the capability of any selected OEM to blend hydrogen.
- A-3-19. See the response to Question No. 3-11(b). The Companies note that EPA's assumptions include that hydrogen will be available and cost-effective after contemplated tax credits.

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Case No. 2020-00402

Question No. 3-20

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

- Q-3-20. Please refer to the Companies' response to KCA request 2-34, filed in Case No. 2022-00402. Please explain whether the Companies understand the EPA's proposed greenhouse gas new source performance standards as requiring carbon capture or green hydrogen. If so, please explain the Companies plan for compliance.
- A-3-20. No, the EPA's proposed greenhouse gas new source performance standards do not require carbon capture or green hydrogen per se. See the response to KCA 3.3.

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Case No. 2020-00402

Question No. 3-21

Responding Witness: Lonnie E. Bellar

Q-3-21. Please refer to the Companies' response to KCA request 2-51, filed in Case No. 2022-00402.

- a. Was hydrogen dual fuel capability requested in the April 25 Request for Proposals to NGCC unit vendors? If not, why not? If so, what do the Companies expect to require with regards to hydrogen dual fuel capability (e.g., blending capability, derates at maximum blending, and costs with and without blending)?
- b. Would the contingency included in the estimates for the NGCC projects adequately address a hydrogen dual fuel option?
- c. Please explain whether the cost of utilizing hydrogen as a fuel option will be addressed in this proceeding. If not, please explain why not and whether the Companies anticipate addressing the recovery of that cost in a future rate proceeding.

A-3-21.

- a. Yes. The Request for Proposals included option pricing for hydrogen blending at multiple levels. The needs requested cannot be reasonably determined until the Companies select a bidder and determine the required blending level.
- b. This cannot be determined prior to the selection of a bidder and a determination of required blending level.
- c. See the responses to AG 1-22, KCA 3.3, and Question No. 3-17(c). To the extent the responses to the Request for Proposals and the selected hydrogen capabilities in those responses result in a material change to the expected costs of the proposed NGCCs beyond existing contingency amounts, the

Companies will address that in this proceeding or subsequent proceedings as appropriate. As with any capital investment, the cost of the NGCCs, including any hydrogen capabilities, will be included for proposed rate recovery in future rate proceedings.

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Case No. 2020-00402

Question No. 3-22

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

- Q-3-22. Please refer to the Companies' response to KCA request 2-52(a), filed in Case No. 2022-00402. Please confirm whether only green hydrogen would be viable for use at the proposed NGCCs to comply with applicable environmental rules. If not, please explain why not and whether Companies are evaluating other types of commercial hydrogen sources.
- A-3-22. Confirmed. As proposed, the rule requires co-firing of only "clean hydrogen". The rule defines clean hydrogen that is produced through a process that has a GHG emission rate of 0.45 kg CO₂e/kg H₂ or less, from well-to-gate. The EPA is taking comment on alternative approaches or definitions of "clean hydrogen."

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Question No. 3-23

Responding Witness: Lonnie E. Bellar

Q-3-23. Please refer to the Companies' response to KCA request 2-52(d), filed in Case No. 2022-00402. Please confirm whether companies are currently seeking Firm Transportation of hydrogen. If so, please explain in detail.

A-3-23. See the response to Question No. 3-11(b).

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Case No. 2020-00402

Question No. 3-24

Responding Witness: Stuart A. Wilson

Q-3-24. Please refer to Exhibit SB4-1. With respect to Table 5, please answer the following:

- a. Did the Companies use the same scarcity pricing given in Exhibit SAW-1?
- b. Please provide the workbook with all formulas and links used to produce the scarcity pricing curve utilized in SERVVM.

A-3-24.

- a. Yes.
- b. See the response to SC 1-8.

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Case No. 2020-00402

Question No. 3-25

Responding Witness: John Bevington / Robert M. Conroy

- Q-3-25. Please provide a copy of the Blue Oval contract mentioned in the response to PSC 2-43(a).
- A-3-25. See attachment being provided in a separate file. Certain information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

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Case No. 2020-00402

Question No. 3-26

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

Q-3-26. Please refer to Exhibit SB4-1 and answer the following requests.

- a. Did the Companies use the same load forecast in PLEXOS as given in "Load2023PlanCC_IRA_DSM_20221026" in Mr. Wilson's confidential workpapers in Case No. 2022-00402?
- b. Please provide the workbook(s) with all formulas and links used to make the hourly adjustments to the load forecast for the energy efficiency savings.

A-3-26.

- a. Yes.
- b. See the Jones Testimony beginning at the bottom of page 16 and continuing through the top of page 21. In the Companies' standard load forecasting process, there is already a significant amount of energy efficiency assumed in the monthly load forecast, which is demonstrated by Figures 9 and 10 of the Jones Testimony. There are no hourly adjustments for these base forecast energy efficiency assumptions as they are used to get to a monthly forecast that is then allocated to produce the hourly forecast.⁴

As a result of the IRA and the Companies' proposed DSM-EE programs, energy efficiency assumptions were accelerated as described on lines 11-16 of page 17 of the Jones Testimony. For the hourly adjustments associated with this energy efficiency acceleration, see Exhibit TAJ-3 at "Hourly_Forecast_Updates\CONFIDENTIAL_tbl10_OvernightCharging_Final_D03.xlsx." Specifically, see columns K, L, and M of the first tab.

⁴ See Section 5.2 of Exhibit TAJ-2.

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Case No. 2020-00402

Question No. 3-27

Responding Witness: Charles R. Schram / David S. Sinclair / Stuart A. Wilson

Q-3-27. Please refer to Exhibit SB4-1 and answer the following requests.

- a. Did the Companies use the same firm gas transmission costs as were contained in Mr. Wilson's financial model workpapers in Case No. 2022-00402?
- b. Are the firm gas transmission costs based on those given in response to KCA 1-51 in Case No. 2022-00402?
- c. Please provide the workpaper(s) with all formulas and links intact used to calculate the firm gas transmission costs.
- d. Did the letter from Texas Gas given in response to JI 2-66 influence the estimation of firm gas transmission costs? If so, how so?
- e. Has any gas supplier indicated to the Companies that upgrades to interstate gas pipeline(s) would be needed to supply the Mill Creek and/or Brown NGCCs? If so, please provide any documents describing the upgrades needed and/or their costs.

A-3-27.

- a. Yes.
- b. Yes.
- c. There are no workpapers calculating firm gas transportation costs.
- d. The referenced letter from Texas Gas included costs that were consistent with the firm gas transportation costs included in the Companies' analysis.

- e. Texas Gas and Tennessee Gas, the gas transportation providers to the Mill Creek and E.W. Brown NGCCs, respectively, have not indicated that upgrades to the interstate pipelines are needed.

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Case No. 2020-00402

Question No. 3-28

Responding Witness: Stuart A. Wilson

Q-3-28. Please refer to Exhibit SB4-1, Table 5. The LOLE of the current system with no retirements is 0.45. In Table 15 of the 2021 IRP Reserve Margin Analysis, the LOLE of the existing system is given as 1.42. With respect to these differences please answer the following:

- a. Why, in the Companies' opinion is the LOLE of the current system between these two analyses so different?
- b. In addition to the DSM added to the current system and shown in Table 5 of Exhibit SB4-1, please list the changes between the SB application and the 2021 IRP that the Companies believe would have led to these differences.

A-3-28.

- a. Unlike the "Existing" portfolio evaluated in the 2021 IRP, Mill Creek Unit 1 and the small-frame combustion turbines (Haefling Units 1-2 and Paddy's Run Unit 12) are not retired in the "No Retirements; Add DSM" portfolio in Exhibit SB4-1. In addition, the "No Retirements; Add DSM" portfolio has more dispatchable DSM than the 2021 IRP's "Existing" portfolio and reflects marginally higher Cane Run Unit 7 capacities (29 MW summer; 8 MW winter) due to efficiency improvements. These differences contribute to a lower LOLE and are partially offset by a higher CPCN load forecast. The table below compares the reserve margins for these portfolios. Note that study year in the 2021 IRP is 2025 while study year in the pending application is 2028. For reserve margins in the 2021 IRP, see Table 13 in the 2021 IRP Reserve Margin Analysis. For reserve margins in this analysis, see Table 7 in Exhibit SB4-1.

2021 IRP		Pending Application	
Summer	Winter	Summer	Winter
22.3%	32.8%	27.4%	34.7%

- b. See the response to part (a). The detailed differences in reserve margins between the 2021 IRP and the pending application are shown in the table below.

	2021 IRP (2025)		Pending Application (2028)	
	Summer	Winter	Summer	Winter
Net Peak Load	6,150	5,831	6,319	6,104
Generation Resources	7,688	7,973	7,717	7,981
CSR	127	127	128	128
DCP	56	0	208	111
Retirements				
Coal	-300	-300	0	0
Small-Frame SCCTs	-47	-55	0	0
Total Supply	7,524	7,744	8,053	8,220
Reserve Margin	1,374	1,913	1,734	2,116
Reserve Margin %	22.3%	32.8%	27.4%	34.7%

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Case No. 2020-00402

Question No. 3-29

Responding Witness: Stuart A. Wilson

Q-3-29. Please refer to page 13 of Exhibit SB4-1 where it states “In this analysis, the Companies treat an LOLE of 3.57 as consistent with maintaining adequate reliability because this LOLE is aligned with the Companies’ minimum reserve margin targets, i.e., any portfolio with a lower LOLE than 3.57 provides more than adequate reliability” and the Companies response to Joint Intervenors Question number 2-67 subpart a in Case No. 2022-00402, which states that “The Companies do not have a minimum LOLE standard.”

- a. Please explain how the Companies arrived at the LOLE of 3.57.
- b. Please explain if the Companies consider an LOLE of 3.57 to be a minimum LOLE standard.

A-3-29.

- a. See the response to PSC 4-6.
- b. For the purpose of demonstrating compliance with SB4 requirements, the Companies used an LOLE of 3.57 as a reasonable proxy for a minimum LOLE standard, but as noted in Exhibit SB4-1, an LOLE of 3.57 does not correspond precisely with the Companies’ minimum reserve margin targets (17% summer; 24% winter). The Companies have not computed an LOLE for a generation portfolio with reserve margins precisely equal to 17% in the summer and 24% in the winter. Assuming a similar composition of resources, the LOLE for this portfolio would be slightly higher.

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Case No. 2020-00402

Question No. 3-30

Responding Witness: Stuart A. Wilson

Q-3-30. Please refer to Table 5 on page 14 of Exhibit SB4-1 and Table 11 on page 32 of Witness Wilson's testimony in Case No. 2022-00402.

- a. Please confirm that the only changes made to the SERVVM database (provided in response to Staff Question 1-106 in Case No. 2022-00402) that resulted in the different LOLE for the Companies' final CPCN portfolio are the hourly load inputs discussed in the Companies' response to Joint Intervenors Question 2-60 in Case No. 2022-00402.
- b. If any other changes were made to the SERVVM database (provided in response to Staff Question 1-106 in Case No. 2022-00402) in order to produce the results shown in Table 5 of Exhibit SB4-1, please provide each change made and the supporting workbooks for those changes.

A-3-30.

- a. Not confirmed. The Companies also made an immaterial change to correct the assumed capacity of the owned solar assets. See the response to JI 2-77.
- b. See the response to JI 2-77. There are no supporting workbooks for the change to capacity of the owned solar assets. The change was made in the SERVVM's interface.

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Case No. 2020-00402

Question No. 3-31

Responding Witness: Stuart A. Wilson

Q-3-31. [REDACTED]

[REDACTED]

[REDACTED]

A-3-31.

- a. DSM resources were assumed to have the same costs across all portfolios and were not included in the Financial Model.
- b. For a given capital expenditure, the K value is the present value of revenue requirements for \$1 of that expenditure. K values are computed in the Financial Model based on the capital expenditure's revenue requirement profile, which contain annual revenue requirements for \$1 of the expenditure.

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Case No. 2020-00402

Question No. 3-32

Responding Witness: Stuart A. Wilson

Q-3-32. [REDACTED]

[REDACTED]

[REDACTED]

A-3-32.

- a. The 2028 peak load in the "RMTable" is the average summer peak demand in the CPCN load forecast under 20-year normal weather conditions (2002-2021). The 2028 peak load in the "Region Forecast Table" is approximately the median of the annual weather year peak demands. Note that the median annual peak demand should not equal the average summer peak demand.
- b. Peak load in Cell B3 represents the average summer peak demand. The value in Cell G3 equals the average summer peak demand in Cell B3 plus 150 MW. 150 MW is the load increment in the Companies' reserve margin analysis that would cause the addition of SCCT capacity to be economic (see Section 5.1 of the May 2023 Update to Exhibit SAW-1, Appendix D).

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Case No. 2020-00402

Question No. 3-33

Responding Witness: Stuart A. Wilson

- Q-3-33. Please refer to the Companies response to JI Question 2-74 subpart a and b.
- a. Please provide the years over which the Companies sent hourly weather data to the respondents.
 - b. Please confirm which year of weather data is used to develop the hourly profiles modeled in SERVM.

A-3-33.

- a. The Companies sent actual weather data for 1998 through 2020 and forecasted weather data for 2022 through 2052.
- b. Weather data for 1998 through 2020 was used to develop the solar profiles in SERVM.