

**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

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

**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**  
**INITIAL REQUEST FOR INFORMATION**  
**DATED FEBRUARY 17, 2023**

**FILED: MARCH 10, 2023**

























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

**Response to Metropolitan Housing Coalition, Kentuckians for the Commonwealth,  
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Initial Request for Information  
Dated February 17, 2023**

**Case No. 2022-00402**

**Question No. 1.1**

**Responding Witness: Lonnie E. Bellar / Philip A. Imber / David S. Sinclair**

Q-1.1. Please refer to Mr. Crockett's Direct Testimony, page 4, lines 14–17.

- a. Prior to issuing the June 2022 Request for Proposals ("RFP"), did the Companies consider converting any of its coal-fired units to run as gas-fired units, as an alternative to a new self-build gas unit or procurement of a different resource? Please explain in detail the extent of any such consideration, including whether the Companies performed any analysis of any such potential conversion, and the timeframe over which such consideration occurred. If not, please explain in detail why not.
- b. Prior to issuing the June 2022 RFP, did the Companies consider acquiring energy or capacity resources from one or more gas-fired units in the region that were either already constructed or in the process of construction? Please explain in detail the extent of any such consideration, including whether the Companies performed any analysis of any such potential conversion, and the timeframe over which such consideration occurred. If not, please explain in detail why not.
- c. Please produce copies of any documents in the Companies' possession that reflect any analyses identified in response to paragraphs (a) or (b) above.

A-1.1.

- a. Yes. The Companies began evaluating such conversions at least as early as 2017. See the documents attached in response to part (c) below for descriptions of the Companies' considerations. See also the response to SC 1-20.
- b. No. Furthermore, an RFP would be necessary before the acquisition of any generation resource in order to demonstrate that it was the least-cost option to meet the proposed need.

- c. See attached. Attachment five is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

The attachments are  
being provided in  
separate files.

The entire attachment 5  
is confidential and  
provided separately  
under seal.



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**Question No. 1.2**

**Responding Witness: Lonnie E. Bellar**

Q-1.2. Please refer to Mr. Crockett's Direct Testimony, page 8, lines 16–17, which states that the Companies recently joined the Southeast Hydrogen Hub to pursue federal financial support for the regional hub.

- a. Please identify when the Companies joined the Southeast Hydrogen Hub coalition.
- b. Please explain the nature and extent of the Companies' involvement in the Southeast Hydrogen Hub coalition, including the Companies' involvement in developing the application, concept papers, or other supporting documentation submitted to the U.S. Department of Energy.
- c. Please provide any concept papers, applications, or other documentation submitted to the U.S. Department of Energy in support of the Southeast Hydrogen Hub, including any correspondence or response received from the U.S. Department of Energy.
- d. Please explain whether the Companies, in connection with the Southeast Hydrogen Hub coalition, will be submitting a formal proposal for the Southeast Hydrogen Hub. If so, please provide the anticipated timeline for submission, review, and decision on the proposal.

A-1.2.

- a. The Companies joined the Southeast Hydrogen Hub coalition on November 1, 2022. More information is available on our public website at <https://lgeku.com/newsroom/press-releases/2022/11/01/major-southeast-utilities-establish-hydrogen-hub-coalition>.
- b. The Companies are one of five Utility Partners and Original Parties (LG&E and KU, TVA, Duke Energy, Dominion Energy, Southern Company, in

addition to Battelle Memorial Institute as Prime Applicant) to the Southeast Hydrogen Hub Coalition. The Companies have supported the development of both the Southeast Hydrogen Hub Concept Paper and Phase I Application. Support of Concept Paper included proposal of hydrogen production and offtake node locations and capacity, in addition to concepts for hydrogen utilization for power generation within the service territory of the Companies. Representatives of the Companies' Research and Development department have engaged with Southeast Hydrogen Hub member organization representatives on an almost weekly basis to provide technical feedback. To date, the Companies have provided zero financial support to the initiative.

- c. The Companies are not Prime Applicant on the Southeast Hydrogen Hub and have not had direct communication or correspondence with the U.S. Department of Energy in relation to the DE-FOA-0002779 Regional Clean Hydrogen Hub Funding Opportunity Announcement. Battelle Memorial Institute, on behalf of the Southeast Hydrogen Hub, submitted the Concept Paper to the U.S. Department of Energy on November 4th, 2022. The U.S. Department of Energy provided written encouragement to proceed with Phase I Application, to Battelle, on December 27th, 2022 as stated publicly online at <https://lge-ku.com/newsroom/press-releases/2023/01/19/us-department-energy-encourages-southeast-hydrogen-hub-submit>.
- d. Battelle Memorial Institute on behalf of the Southeast Hydrogen Hub coalition, which includes the Companies, will be submitting a formal proposal for the Southeast Hydrogen Hub on, or before, April 7th, 2023. The U.S. Department of Energy proposed timeline for review and target decision date is September 2023.

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**Question No. 1.3**

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

Q-1.3. Please refer to Mr. Crockett's Direct Testimony, at page 8, line 21 through page 9, line 1.

- a. Please provide further information about the full-scale carbon capture feasibility study that will be conducted at the Cane Run gas plant, including the proposed scope of the study, timelines, and anticipated costs.

A-1.3.

- a. The Electric Power Research Institute ("EPRI"), in collaboration with the University of Kentucky ("UK"), Bechtel, and Vogt Power, will conduct a front-end engineering design ("FEED") study for UK's solvent-agnostic, low-cost CO<sub>2</sub> capture process retrofitted to Cane Run 7. The process will capture approximately 1,700,000 tons of CO<sub>2</sub> per year at a greater than 95% capture rate, suitable for permanent geologic CO<sub>2</sub> storage along the Ohio River corridor.

The Cane Run FEED study proposal was submitted to the U.S. Department of Energy ("DOE") on April 11, 2022. DOE selected the study for funding on August 26, 2022. The project kickoff meeting with DOE was on January 31, 2023. The planned project duration is until June 30, 2024.<sup>1</sup> See also the responses to KCA 1-4 and LFUCG/Louisville Metro 1-11.

The total project cost is \$7,303,164, of which DOE funded \$5,842,517 (80%), and \$1,060,647 (14.5%) was provided by others, including EPRI, Bechtel, and Vogt Power. The Companies' financial contribution was \$400,000 (5.5%). UK will receive \$1,002,720 to work on the study.

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<sup>1</sup> Project status reports are available at <https://netl.doe.gov/project-information?p=FE0032223>.

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**Question No. 1.4**

**Responding Witness: John R. Crockett III / Lonnie E. Bellar / David S. Sinclair**

Q-1.4. Please refer to Mr. Crockett's Direct Testimony, page 9, lines 1–4, which states, "with our existing carbon capture site . . . our joint research and development team has simulated net negative emissions from natural gas by capturing carbon from both the flue gas and carbon from the ambient air." Please answer the following requests:

- a. Please explain what the word "simulate" means, as used by Mr. Crockett in the above-quoted testimony.
- b. Please confirm that LG&E/KU have not captured carbon from an operating combined cycle gas plant. If anything but confirmed, please explain in detail and provide supporting documentation.
- c. Please confirm that LG&E/KU have not captured carbon from the ambient air. If anything but confirmed, please explain in detail and provide supporting documentation.

A-1.4.

- a. "Simulate" in the quote above refers to simulating the flue gas conditions of a natural gas combined cycle plant. The Companies, together with our research partners at the University of Kentucky, diluted coal-derived flue gas with ambient air to reduce the carbon dioxide concentration to that of the concentration in natural-gas derived flue gas for research at our carbon capture unit at E.W. Brown, which is discussed in additional detail at: <https://uknow.uky.edu/research/lge-and-ku-uk-caer-collaborate-create-net-negative-co2-emissions>. The U.S. Department of Energy has awarded the University of Kentucky, in partnership with the Companies, an estimated \$3.7 million for their net-negative emissions direct air carbon dioxide project at E.W. Brown.

- b. Confirmed. The Companies, and the University of Kentucky working on behalf of the Companies, have captured carbon dioxide from simulated natural gas combined cycle flue gas, but not from an operating combined cycle plant.
  
- c. The University of Kentucky, working in partnership with the Companies, has captured carbon dioxide from the ambient air.<sup>2</sup> The direct air carbon dioxide capture with green hydrogen production project was funded with a \$1,263,887 award from the U.S. Department of Energy.<sup>3</sup> The University of Kentucky, in partnership with the Companies, also received another award for the direct air carbon dioxide capture project that was part of the net-negative emissions direct air carbon dioxide project at E.W. Brown discussed in part (a).

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<sup>2</sup> See: <https://uknow.uky.edu/research/caer-project-seeks-capture-carbon-directly-atmosphere>.

<sup>3</sup> See Capture R&D: Bench Scale Testing of Direct Air Capture Components, agreement number FE0032125, available at <https://netl.doe.gov/project-information?p=FE0032125>.

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**Question No. 1.5**

**Responding Witness: John R. Crockett III / Philip A. Imber / David S. Sinclair**

Q-1.5. Please refer to Mr. Crockett's Direct Testimony at page 9, lines 17–19, which states that “the Companies’ proposals would reduce carbon emissions by over 6 million metric tons or nearly 25 percent annually compared to the Companies’ carbon emissions in 2021.”

- a. Please confirm that the referenced statement refers to carbon dioxide emissions. If anything but confirmed, please explain in full.
- b. Please confirm that the referenced statement estimates the Companies’ direct carbon emissions and does not include upstream emissions. If anything but confirmed, please explain in full.
- c. Have the Companies estimated the change in emissions for any greenhouse gas other than carbon dioxide? If so, please provide each such estimate, including supporting workpapers in native format with formulas intact. If not, please explain why not.
- d. Have the Companies attempted to estimate upstream emissions from their existing or proposed resource portfolio, including but not limited to upstream methane emissions? If so, please provide each such estimate, including supporting workpapers in native format with formulas intact. If not, please explain why not.

A-1.5.

- a. Confirmed.
- b. Confirmed.
- c. No. Carbon dioxide is the predominant greenhouse gas resulting from the combustion of fossil fuels. The combustion of fossil fuels results in carbon

dioxide, methane, and nitrous oxide. Methane and nitrous oxide are a small percentage of the overall carbon dioxide equivalence (CO<sub>2</sub>e) that are reported from our operations per electronic Greenhouse Gas Reporting Rule. For example, methane and nitrous oxide were 0.1% of the total CO<sub>2</sub>e from CR7 in 2021.

- d. No. The Companies have not estimated upstream greenhouse gas emissions. Evaluation of upstream greenhouse gas emissions, a subset of Scope 3 emission for sustainability reporting, is not a regulatory requirement.

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**Question No. 1.6**

**Responding Witness: Lonnie E. Bellar**

- Q-1.6. Please refer to Mr. Bellar's Direct Testimony, page 2, lines 11–19.
- a. Please produce copies of any documents in the Companies' possession reflecting the updated analysis for E.W. Brown Unit 3, Mill Creek Unit 2, and Ghent Unit 2 that is referenced in the testimony or, for any such documents that have already been filed with the Commission in this case, please identify those documents.
- A-1.6.
- a. The updated analysis referenced by Mr. Bellar's testimony is the 2022 Resource Assessment described in Exhibit SAW-1.



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**Question No. 1.7**

**Responding Witness: Lonnie E. Bellar**

Q-1.7. Please refer to Mr. Bellar's Direct testimony, page 3, lines 12–14, which states that the continued operation of E.W. Brown Unit 3 beyond 2028 was "reevaluated utilizing updated information, most significantly the responses from the June 2022 Request for Proposals. Retiring E.W. Brown Unit 3 in 2028 continues to result in a least cost plan for serving customer requirements."

- a. Please explain what "updated information" was obtained from the RFP responses and how it changed the retirement date calculus for E.W. Brown Unit 3.
- b. Please produce copies of any documents in the Companies' possession reflecting the "updated information" referenced in the testimony or, for any such documents that have already been filed with the Commission in this case, please identify those documents.

A-1.7.

- a. The updated information obtained from the RFP responses was the cost of replacement generation resources, predominantly the costs associated with NGCC. The updated information reinforced the prior assessment that retiring E.W. Brown Unit 3 in 2028 continues to result in a least cost plan.
- b. See Exhibit SAW-1.

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**Question No. 1.8**

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

Q-1.8. Please refer to Mr. Bellar’s Direct Testimony at page 11, lines 17–18, which states: “The proposed NGCCs will reduce carbon emissions by up to 65% compared to the coal-fired units the Companies propose to retire by 2028.”

- a. Please provide any documents reflecting calculations supporting this statement, in native format, with formulas intact.
- b. Please describe each assumption implicit in the above-referenced statement (e.g., carbon intensity of fuel source; duration and frequency of unit use).
- c. Mr. Bellar’s testimony states an upper bound for emission reductions (“up to 65%); did Mr. Bellar’s supporting analysis identify a lower bound for emission reductions? If so, please provide that estimate.

A.1.8.

- a. The Companies assess carbon emission reductions between the proposed NGCC and the anticipated Unit retirements. The Companies opted to quote a conservative value from the calculations performed.

Unit	CO <sub>2</sub> Emission Rate (lb/MMBtu)	Summer Heat Rate at Max Load (MMBtu/MWh)	CO <sub>2</sub> Emission Rate (lb/MWh)	% of New NGCC CO <sub>2</sub> Emission Rate	% Reduction
Brown 3	205.2	10.987	2,255	33%	67%
Ghent 2	205.2	10.299	2,113	35%	65%
Mill Creek 2	205.2	10.466	2,148	34%	66%
New NGCC	119	6.21	739	100%	0%

- b. The New NGCC CO<sub>2</sub> emissions rate is from the National Renewable Energy Laboratory's Annual Technology Baseline and the net summer heat rate is provided by turbine vendors. The calculation uses a bituminous coal factor for CO<sub>2</sub> emissions and historical summer heat rate operations data from each specific unit.
  
- c. The comparison was performed with net summer heat rate information based on data collected from the turbine suppliers. Heat rate impacts are seasonal, bounding the emissions reduction as a function of seasonal variations or annual averages is not available.

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**Question No. 1.9**

**Responding Witness: Lonnie E. Bellar**

- Q-1.9. Please refer to Mr. Bellar's Direct Testimony, page 12, lines 11–16.
- a. Why are the Companies seeking CPCN approvals for the Mill Creek and Brown NGCCs before having an EPC contractor in place?
  - b. Why are the Companies seeking CPCN approvals for the Mill Creek and Brown NGCCs before having specified the power island technology including turbine type?
  - c. Why are the Companies selecting the OEM for the power islands rather than also considering the option of having the EPC contractor procure that equipment?
  - d. What type of EPC contract do the Companies intend to solicit? E.g., lump sum turn key (less the cost of the power island)?
  - e. Has the Company conducted a front-end engineering and design or similar study? If so, please provide a copy.
- A.1.9.
- a. As with all major generation projects implemented over the last few decades, approval of the CPCN is required prior to executing the EPC Agreement. The Companies will be issuing to the market the OEM and EPC agreement for bids during the CPCN proceedings to allow execution of the agreement soon after obtaining regulatory approval to implement the projects.
  - b. See the response to part (a). Approval of the CPCN is required prior to final selection of the power island technology.

- c. Selection of the power island OEM is critical to the Companies to ensure selection of the lowest lifecycle costs OEM, including the Long Term Service Agreement on the gas-fired turbines. The selection of the equipment that will be operated over decades is a more strategic decision than who installs it. Allowing the EPC contractor to select the OEM would likely result in selecting the lowest installed cost OEM, which may or may not be the lowest lifecycle cost OEM. Another factor in choosing the OEM is the avoidance of additional markup on the OEM equipment by the EPC company to cover their wrapping of the equipment performance. The Companies have historically made the technology choices on major generation equipment.
- d. Lump sum.
- e. Yes. See attached. Certain information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

The attachment is being  
provided in a separate  
file.

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**Question No. 1.10**

**Responding Witness: Lonnie E. Bellar**

Q-1.10. Please refer to Mr. Bellar's Direct Testimony, page 14, lines 13–17, which states: "We also know from experience that the large scope of the projects requested will require an intensive process of qualifying suppliers, evaluation of bids and earnest negotiations. In light of the complexity of the construction project and the anticipated market impacts due to the EPA regulations, difficulties and resulting delays are possible."

- a. Please provide any analyses, assessments, etc. in the Companies' possession that evaluate the potential impact of other proposed combined cycle facilities on any aspect of constructing new combined cycle projects such as cost, timeframe, competition for equipment, competition for specialized labor, etc.
- b. What contingencies does Mr. Bellar expect the Companies will build into cost estimates and project schedules to account for the factors listed in these statements?

A-1.10.

- a. The Companies do not possess analysis or assessments on other proposed combined cycle facilities on any aspect of constructing new combined cycle projects such as cost, timeframe, competition for equipment, competition for specialized labor, etc.
- b. Costs estimates include approximately 10% contingency.

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**Question No. 1.11**

**Responding Witness: Lonnie E. Bellar / Robert M. Conroy**

- Q-1.11. Please refer to Mr. Bellar's Direct Testimony, page 17, lines 13–15, which states that the cost of the Mill Creek NGCC is expected to be \$662 million and the Brown NGCC is expected to be \$700 million.
- a. What is the basis for the current cost estimate for the NGCCs? In which Association for the Advancement of Cost Engineering (AACE) cost estimate class does the current estimate fall in? Please provide all documents that serve as the basis for your response.
  - b. Please provide any spreadsheet(s) or other documents reflecting the calculations used to create these estimates.
  - c. What cost guarantees, if any, are the Companies prepared to offer ratepayers for these projects?
  - d. In the event that costs increase, what steps, if any, would the Companies take to seek Commission approval of those additional costs?
- A-1.11.
- a. The current cost estimates were provided by HDR and based on recent project data and current OEM indicative costs. The current estimate is at an AACE Class 3.
  - b. See the response to Question No. 1.9 part (e).
  - c. See the response to KCA 1-55.
  - d. See the response to KCA 1-55.



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**Question No. 1.12**

**Responding Witness: Lonnie E. Bellar / Robert M. Conroy**

- Q-1.12. Please refer to Mr. Bellar's Direct Testimony, page 20, line 3, which states that the cost of the Mercer County solar project is expected to be \$243 million.
- a. Please provide any spreadsheet(s) or other documents reflecting the calculations used to create this estimate.
  - b. What cost guarantees, if any, are the Companies prepared to offer ratepayers for this project?
  - c. In the event that costs increase, what steps, if any, would the Companies take to seek Commission approval of those additional costs?
- A-1.12.
- a. See the attachment being provided in Excel format.
  - b. See the response to KCA 1-55.
  - c. See the response to KCA 1-55.

The attachment is being  
provided in a separate  
file.

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**Question No. 1.13**

**Responding Witness: Lonnie E. Bellar**

Q-1.13. Please refer to Mr. Bellar's Direct Testimony, page 18, lines 6–11.

- a. Please define "significant system upgrade" as used in the referenced testimony.
- b. Please explain in full the basis for the Companies' belief that "significant system upgrades" will not be needed to integrate the Mill Creek NGCC with the transmission network.
- c. Please explain in full the basis for the Companies' belief that "significant system upgrades" will not be needed to integrate the Brown NGCC with the transmission network.
- d. Please produce copies of any documents in the Companies' possession that support the statement that "[r]equired electric transmission modifications represent approximately 1% of the total cost of the Mill Creek and Brown NGCC units."

A-1.13.

- a. "Significant system upgrade" as used in the referenced testimony would be an upgrade that would require new right-of-way acquisition or electric transmission CPCNs.
- b. Due to the Companies' "retire and replace" plan, significant system upgrades are not expected to be needed to integrate the Mill Creek NGCC with the transmission network.
- c. Due to the Companies' "retire and replace" plan, significant system upgrades are not expected to be needed to integrate the Brown NGCC with the transmission network.

- d. The Companies expect transmission upgrade costs of \$3.42 million in 2022 dollars, as shown in Scenario 11 in “\04\_FinancialModel\Support\TransmissionCapital\CONFIDENTIAL\_Generation Replacement Scenarios - Impacts on the Transmission System\_2022.docx” in Exhibit SAW-2, and also in Table 35 in Exhibit SAW-1. As stated in Mr. Bellar’s testimony on page 17, lines 12 through 15, the Mill Creek NGCC and Brown NGCC are expected to cost approximately \$662 million and \$700 million, respectively. These transmission costs are less than 1% of the combined cost of transmission and construction costs of the NGCCs.

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**Question No. 1.14**

**Responding Witness: Lonnie E. Bellar**

- Q-1.14. Please refer to Mr. Bellar's Direct Testimony, page 19, lines 20–22, which states: "The facility will interconnect with the Companies' existing transmission and distribution network per the signed large generator interconnection agreement LGE-GIS-2019-025 that will be assigned to the Companies."
- a. Please confirm that the referenced interconnection agreement provides for a maximum output capacity of 98.42 MW. If anything but confirmed, please explain and provide supporting documentation, if any.
  - b. What changes, if any, to the referenced interconnection agreement will be necessary. If any changes will be needed, please explain the process required for each change.
- A-1.14.
- a. Confirmed, the referenced interconnection agreement provides for a maximum output capacity of 98.42 MWac.
  - b. In order to obtain an additional 21.58MW of generating capacity, a new generator interconnection request must be submitted to the LG&E/KU generator interconnection queue and processed in accordance with the OATT generator interconnection process. Once the study process is completed, the existing interconnection agreement can be amended to reflect the full 120MW interconnection capacity.

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**Question No. 1.15**

**Responding Witness: Lonnie E. Bellar**

- Q-1.15. On June 21, 2022, the Companies submitted an NGCC project to the generation interconnection queue, LGE-GIS-2022-004, with the point of interconnection identified as "Brown North Substation 345 kV bus."
- a. Please confirm that the Companies withdrew that project from the generation interconnection queue after the scoping meeting.
    - i. If confirmed, please explain the reason(s) that the Companies withdraw that project.
    - ii. If anything but confirmed, please explain in full.
  - b. On October 28, 2022, the Companies submitted an NGCC project to the generation interconnection queue, LGE-GIS-2022-011, with the point of interconnection identified as "Brown North Substation 138 kV bus." Is the generation resource in LGE-GIS-2022-004 identical to the generation resource in LGE-GIS-2022-011? If not, please explain each difference.
  - c. Please identify each available point of interconnection at the E.W. Brown Plant.
  - d. Please explain each material difference, as understood by the Companies, between connecting the proposed Brown NGCC via "Brown North Substation 345 kV bus" as opposed to via "Brown North Substation 138 kV bus." If the Companies have estimated cost implications of using one point of interconnection over the other, please provide each such estimate.

A-1.15.

- a. Confirmed, the Companies withdrew LGE-GIS-2022-004 from the generation interconnection queue after conceptually reviewing that location against the final chosen location on the plant site.
  - i. The Companies chose the alternative location of the proposed Brown NGCC which changed the interconnection from 345kV to a 138kV interconnect, thus requiring a new interconnection review.
  - ii. Not applicable.
- b. Yes, the generation resource in LGE-GIS-2022-004 is identical to the generation resource in LGE-GIS-2022-011.
- c. There are multiple interconnection points available at the E.W. Brown Plant include the Brown North, Brown South, and Dix Dam Substations.
- d. During the Companies' initial review of the LGE-GIS-2022-004, it was determined that significant modifications were required to the 345kV substation along with significant relocation and/or re-alignment of existing transmission infrastructure. The Companies then evaluated interconnecting at the 138kV buss (LGE-GIS-2022-011) and determined that the modifications to the substation were significantly less. As engineering continues, the Companies will make further changes to the generator interconnection request and the queue, if needed.

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**Case No. 2022-00402**

**Question No. 1.16**

**Responding Witness: Lonnie E. Bellar**

Q-1.16. Please refer to Mr. Conroy's Direct Testimony at page 3, lines 7–8. Please provide the anticipated construction schedule for each of the four projects: (a) Mill Creek NGCC; (b) E.W. Brown NGCC; (c) Mercer County Solar; and (d) E.W. Brown BESS.

A-1.16. See attached.



The attachment is being  
provided in a separate  
file.

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**Question No. 1.17**

**Responding Witness: Robert M. Conroy / Christopher M. Garrett**

Q-1.17. Please refer to Mr. Conroy's Direct Testimony at page 4, lines 3–4, which states: "The Companies do not project finance and use all forms of capital to finance their construction projects."

- a. Please define "project finance," as used by Mr. Conroy.
- b. Is Mr. Conroy suggesting that "project finance" necessarily forecloses the availability of certain forms of capital? If so, please explain in full, including identification of specific forms of capital unavailable to "project finance," if any.

A-1.17.

- a. The statement in Mr. Conroy's testimony, "The Companies do not project finance" was referring to the concept that the Companies have historically utilized debt and equity and not "project finance" for similar capital investments.
- b. No, there is no suggestion that project finance forecloses the availability of certain forms of capital. Instead, all components of the Companies' capital structure (i.e., debt and equity) are typically used to fund capital expenditures.

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**Question No. 1.18**

**Responding Witness: Philip A. Imber / Stuart A. Wilson**

Q-1.18. Please refer to Mr. Imber's Direct Testimony at page 9, line 11, through page 10, line 2.

- a. Have the Companies done any analysis of the potential impacts of the IRA's Methane Emissions Reduction Program on the resource plans in this case? If so, please provide each such analysis, including supporting documentation and workpapers in native format with formulas intact.
- b. Please confirm that the identified testimony reports on the full extent of the Companies' accounting for the IRA's Methane Emissions Reduction Program. If anything but confirmed, please describe any additional attempts to account for impacts of the IRA's Methane Emissions Reduction Program (such as impacts to natural gas prices) and produce supporting documentation, if any.
- c. Please confirm that the Companies' fuel price forecasts in this matter do not account for impacts of the IRA's Methane Emissions Reduction Program. If not confirmed, please explain in full how each fuel price forecast accounts for impacts of the IRA's Methane Emissions Reduction Program.

A-1.18.

- a. No. The large end-user gas pipelines supplying the proposed NGCC units are not subject to 40 CFR 98 Subpart W. The projects will not impact the applicability of the IRA's Methane Emissions Reduction Act to the Companies.
- b. Confirmed. 40 CFR 98 Subpart W data is publicly available through the electronic Greenhouse Gas Reporting process.

- c. Confirmed, but the Companies' fuel price forecasts cover a wide range of possible fuel prices, which a broad array of factors can affect. The Companies' overall range of modeled fuel prices remains reasonable.

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**Question No. 1.19**

**Responding Witness: Philip A. Imber**

- Q-1.19. Please refer to Mr. Imber's Direct Testimony, page 10, line 24 through page 11, line 2. Have the Companies submitted applications for a Title V air construction permit for each NGCC? If yes, please produce a copy of each application, any accompanying submissions to the permitting agency, and any correspondence with the permitting agency concerning each application. If no, please explain in detail why not.
- A-1.19. Yes. The Title V air construction permit for the planned Mill Creek and E.W. Brown NGCC are attached as Attachment 1 and Attachment 2. The subsequent correspondences the Companies have with a permitting agency are attached as Attachment 3, 4 and 5.

The attachments are  
being provided in  
separate files.

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**Question No. 1.20**

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

- Q-1.20. Please refer to Mr. Sinclair's Direct Testimony at page 7, lines 10–14. Please produce any documents in the Companies' possession that were created by the Project Engineering group in support of, or reflecting the results of, its evaluation of "alternative generation and storage technologies that could be installed at the Mill Creek and Brown sites to take advantage of existing infrastructure to reduce future costs and identify potential new sites for solar generation."
- A-1.20. See the response to Question No. 1.9 part (e).

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**Question No. 1.21**

**Responding Witness: David S. Sinclair**

Q-1.21. Please refer to Mr. Sinclair's Direct Testimony at page 10, lines 9–11. Please produce copies of any final agreements, to the extent that they have not already been filed in the docket of this proceeding. If any of the agreements have not yet been finalized, please explain in detail why not.

A-1.21. See the response to PSC 1-27a.



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**Question No. 1.22**

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

- Q-1.22. Please refer to Mr. Sinclair's Direct Testimony, page 14, lines 8–10, which states: "The Companies know from experience that their current generating fleet is capable of meeting such ramping needs reliably day-in, day-out throughout the year across a broad range of weather events."
- a. Data reported by the Companies in EIA Form 930, show that during the three day period from December 23–25, 2022, net interchange was negative, i.e., more power was imported into the Companies' balancing authority than was exported, in all hours except two. Please explain the circumstances that led to this outcome during that period and provide any documents that support your response.
  - b. Data reported by the Companies in EIA Form 930, show that on December 23, 2022, the Companies' balancing authority experienced demand that was, on average, 18% higher than forecasted. Please explain the circumstances that led to this outcome during that period and provide any documents that support your response.
  - c. Data reported by the Companies in EIA Form 930, show that between December 22, 2022, hour ending 8 pm E.T., and December 23, 2022, hour ending 10 am E.T., that demand with the Companies' balancing authority experienced grew by 60%.
    - i. Please explain what end-uses, in the Companies' view, drove this increase in demand.
    - ii. Please explain what steps, if any, the Companies took to manage this additional load.
    - iii. Please provide all documents that support your response to subparts i and ii.

- d. Please provide the hourly availability status, e.g., available, forced outage, planned outage, etc. of the Companies' generating units during the period from December 1, 2022, to January 31, 2023. If any unit was in partial outage during this period, please provide the MW portion of the unit that was available to generate.

A-1.22.

- a. Per EIA-930 reporting instructions (EIA-930 Instructions), "Physical vs. commercial operations," LG&E Energy ("LGEE") is required to exclude dynamic transfer arrangements implemented as either pseudo-ties or dynamic schedules. As a result, reported interchange and demand for LGEE includes up to approximately 700 MW of other balancing authorities' customer load physically located on LGEE's system and excludes up to approximately 100 MW of LGEE customer load physically located on a neighboring balancing authority's system. When only LGEE customer load is taken into account, during the three-day period from December 23-25, 2022, net interchange was positive for seven hours rather than two. During the three-day time period from December 23-25, 2022, net imports to the LG&E/KU Balancing Authority (BA) included approximately 400 MW of load not supplied by the LG&E/KU Load Serving Entity (LSE). It should be noted that the LG&E/KU BA is comprised of the following LSEs: LG&E/KU, OMU, KMPA and KYMEA. OMU, KMPA and KYMEA rely on firm imports (typically from outside of the BA) to serve their load. Therefore, unless the LG&E/KU LSE exports more than the other three LSEs import (combined) to serve their load, the LG&E/KU BA net interchange would be negative.
- b. The demand data the Companies are required to provide to EIA represent the demand within the physical boundaries of the Companies' metered tie-lines for the Balancing Authority ("BA"), not taking into account the fact that the Companies move generation and load in and out of the Balancing Authority with Pseudo Ties and Dynamic Schedules. Because of this the Demand Forecast is not comparable with the Actual Demand in the EIA graph on the EIA site. It should be noted that EIA's site includes an "about" section that states, "[F]or some BAs, where a significant portion of their demand is outside their system or where other BAs control a significant amount of demand inside their system, the comparison between actual and forecast demand is not very meaningful."<sup>4</sup>
- c. The responses in part (c) apply to LG&E and KU. The Companies do not have this information for other entities in the BA.
  - i. With the rapid drop in temperatures (upper thirty degrees to five below zero) from the evening of December 22, 2022 to the late morning of

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<sup>4</sup> See <https://www.eia.gov/electricity/gridmonitor/about>

December 23, 2022, the Companies believe electric heating was the primary driver of the increased LG&E and KU customer demand.

- ii. Several days prior, the Companies forecasted higher loads during the morning of December 23, 2022 and began preparing to bring their natural gas simple cycle combustion turbine (“SCCT”) generators online prior to the extreme cold. The Companies purchased natural gas and scheduled it for transportation on the interstate transmission pipeline for use by the SCCTs. Several of the SCCTs were online prior to midnight. The Companies also began curtailing CSR tariff customers and purchasing power on the morning of 12/23/22 when low gas pressure on an interstate pipeline prevented the full-load operation of the Trimble County SCCT and, at times, the Cane Run 7 NGCC.
- iii. See attachment containing the December 22, 2022 Power Supply Morning Meeting material. Each non-holiday weekday, the Companies’ Power Supply department produces a packet of information for morning review. The information includes weather forecasts, a short-term load forecast, and generating unit status and commitment plans as of approximately 7:00 a.m.
- d. See attachment being provided in Excel format.

The attachments are  
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**Question No. 1.23**

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

- Q-1.23. Please refer to Mr. Sinclair's Direct Testimony at page 20, lines 14–15.
- a. Does the “general rising cost environment” also affect the costs of a self-build NGCC?
  - b. Please identify when the pricing information for the 620 MW self-build NGCC options submitted by the Companies' Project Engineering group in response to the June 2022 RFP was developed.
  - c. Please identify all data sources that the Companies' Project Engineering group relied on to develop the pricing information for the 620 MW self-build NGCC options submitted in response to the June 2022 RFP. Please produce copies of any such data sources, to the extent that they have not already been produced in this case.
  - d. Please provide the Companies' current cost estimate for the two proposed self-build NGCC units in this case, and please explain in detail how that cost estimate has been updated since the Companies' Project Engineering group submitted a response to the June 2022 RFP.
- A-1.23.
- a. No, because NGCC technology had not been experiencing large declines in the cost / kW installed over the last decade.
  - b. Costs were finalized in August 2022.
  - c. See the response to Question No. 1.9 part (e).
  - d. See the response to Question No. 1.9 part (e). The cost estimates have not been updated since they were provided in response to the June 2022 RFP.

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**Question No. 1.24**

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

Q-1.24. Please refer to Mr. Sinclair's Direct Testimony at page 25, lines 5–10.

- a. Please explain in detail any factors that led to the choice of a 125 MW BESS, other than that it is approximately the same size as a 11N2 existing gas turbine. Did the Company consider building a larger BESS, and/or more than one similarly sized BESS? Why or why not? If yes, what factor(s) informed the Company's decision to propose only a single 125 MW BESS in this case?
- b. Please describe the construction process for the BESS. Will the Companies contract construction of the batteries? If yes, please describe the process used to select the contractor. If not, will the Companies' engineers oversee the construction?

A-1.24.

- a. From a discharge perspective, a li-ion battery performs similar grid services as a simple cycle gas turbine. Hence, to have a comparable impact and to obtain operational experience at the system level, the BESS needed to be comparable in size to a simple cycle gas turbine. Given the system needs and the economics of BESS, as demonstrated in Section 4.6.2 of Exhibit SAW-1, there is no need to increase the size of the BESS or for additional energy storage at this time. Please note that this section of Exhibit SAW-1 was updated in the response to PSC 1-47(a).
- b. The Companies will develop a project specific set of specifications to support a lump sum Engineering, Procurement, and Construction ("EPC") Agreement. The EPC contractor will be responsible for all aspects of the project, with the exception of battery procurement. The Companies are evaluating a direct purchase of the batteries to avoid price markup from the EPC company should that markup be deemed high.

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**Question No. 1.25**

**Responding Witness: David S. Sinclair**

Q-1.25. Please refer to Mr. Sinclair’s Direct Testimony, page 29, lines 1–8.

- a. Please explain in detail why the pumped storage proposal “was viewed as not far along enough in its development to be a viable resource to address the timing of the Companies’ current energy and capacity needs.”
- b. Please explain in detail why, “even if the project was assumed to be viable, the economics as proposed were not competitive with other peaking resources, including lithium-ion batteries.”
- c. Please explain in detail how the “typical” ratio of 1.25 MWh of energy to pump water into the reservoir for every one MWh it produces is “consistent with the pumped hydro proposal to the Companies’ RFP,” as stated in footnote 16.

A-1.25.

- a. The project as proposed by the developer would not have been available to meet the proposed Good Neighbor Plan timelines.
- b. As proposed, the cost per kW-month of the pumped hydro storage PPA proposal was approximately 1.8 times higher than the average of all battery storage PPA proposals received and evaluated. The energy cost and continuous hours of operation for the pumped hydro project would not be significantly different than a li-ion battery, and its hours of continuous operation would be restricted as compared to a simple cycle gas turbine.
- c. The 1.25 ratio implies an 80% round trip efficiency, which was provided in the pumped hydro RFP response and is supported by historical EIA data for other pumped hydro resources.<sup>5</sup>

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<sup>5</sup> See <https://www.eia.gov/todayinenergy/detail.php?id=46756#>.

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**Question No. 1.26**

**Responding Witness: David S. Sinclair**

- Q-1.26. Please refer to Mr. Sinclair's Direct Testimony, page 33, line 13, which describes the process to come to the approvals sought in this proceeding as "comprehensive and thoughtful".
- a. Please explain why, in Mr. Sinclair's view, the approvals sought in this proceeding differ from any plan analyzed in the Companies' Joint 2021 IRP.
  - b. When did the Companies' first start considering the construction of the two NGCCs included in the current proposal? Please provide any documents that support your response.
- A-1.26.
- a. See the response to PSC 1-92(a).
  - b. The Companies first started considering NGCC options after the U.S. Environmental Protection Agency issued its proposed Good Neighbor Plan in April 2022. See attached.



The attachment is being  
provided in a separate  
file.

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**Question No. 1.27**

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

- Q-1.27. What fuel supply limitations, if any, effected the Companies' generating units during the month of December 2022? Please provide all documents in the Companies' possession that describe such limitations.
- A-1.27. There were no fuel supply limitations during December 2022. The Companies experienced reduced pipeline pressure on the Texas Gas Transmission pipeline on December 23<sup>rd</sup> that limited the ability of certain natural gas units to achieve full load. See attached. See also attachment to response to PSC 1-58.

The attachments are  
being provided in  
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**Question No. 1.28**

**Responding Witness: Lonnie E. Bellar / Tim A. Jones / Charles R. Schram /  
David S. Sinclair**

Q-1.28. Please refer to the Mr. Schram's Direct Testimony at page 2, lines 11–16, which states: "The Companies have experienced hourly winter load that varies up to 2,760 MW in a day and hourly summer load that varies 3,220 MW in a day. Furthermore, intra-hour load can swing by several hundred megawatts over the course of an hour and more than 100 MW over a period of seconds, highlighting the importance of generation assets with ramping capabilities to meet these changes in demand."

- a. What steps have the Companies undertaken to dampen these swings in demand?
- b. What analysis have the Companies undertaken to understand the causes of these swings in demand?
- c. Please provide all documents that support your responses to subparts a and b.

A-1.28.

- a. The following are examples of rate schedules and programs the Companies have implemented to reduce the level of peak demands, which have the effect of dampening load swings: TOD rates, CSR, and non-dispatchable and dispatchable DSM programs.
- b. Regarding the 100 MW load change over a period of seconds, this is driven in significant part by industrial processes with highly variable demands.

The cited daily and hourly demand swings are neither surprising nor unique to the Companies' system. These extreme demand swings have occurred in 24-hour periods that have seen extreme temperature changes. See the table below. The summer day mentioned in the quote above was June 28, 2012,

when the morning low temperature was 65°F and the afternoon high temperature was 101°F. Inversely similar is the winter day mentioned above, which was January 6, 2014 (also referenced in Figure 12 on page 11 of Exhibit TAJ-1, but that figure includes departed municipal customer load). Temperatures to begin that day were 19°F, dropping from the previous day's high of 54°F, which occurred at 2PM. Temperatures on the 6<sup>th</sup> dropped to 0°F by 8AM and were down to -3°F by 8PM.

Hour Beginning	January 6, 2014 MW*	June 28, 2012 MW
0	4,056	3,455
1	4,189	3,252
2	4,291	3,103
3	4,445	3,018
4	4,687	3,125
5	4,975	3,263
6	5,374	3,494
7	5,746	3,802
8	5,927	4,153
9	6,022	4,515
10	6,116	4,875
11	6,138	5,251
12	6,231	5,614
13	6,241	5,887
14	6,221	6,076
15	6,223	6,216
16	6,340	6,240
17	6,606	6,190
18	6,781	6,020
19	6,742	5,817
20	6,819	5,654
21	6,673	5,337
22	6,495	4,901
23	6,389	4,514
<b>Daily Min</b>	<b>4,056</b>	<b>3,018</b>
<b>Daily Max</b>	<b>6,819</b>	<b>6,240</b>
<b>Daily Range</b>	<b>2,763</b>	<b>3,221</b>

\*Excluding departed municipal customer load

Customer behavior patterns throughout a typical winter or summer weekend or weekday are also factors to consider. These behaviors could include turning the lights on, turning the heat or air conditioning on, taking a shower, cooking, watching television, charging a vehicle or device, etc. This could also include whether industrial and commercial businesses are operating.

- c. See the response to part (b).

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**Question No. 1.29**

**Responding Witness: Charles R. Schram**

Q-1.29. Please refer to Mr. Schram's Direct Testimony at page 5, line 18. Please identify the five respondents who provided updated information.

A-1.29. See the response to PSC 1-69.

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**Question No. 1.30**

**Responding Witness: Charles R. Schram**

- Q-1.30. Please refer to Mr. Schram's Direct Testimony at page 6, lines 1–3, which states: "Despite the IRA legislation, respondents' solar PPA offer prices were generally at least 30 percent higher than similar offers the Companies received in response to their 2021 RFP." Please provide the information upon which Mr. Schram drew this conclusion.
- A-1.30. The Companies' executed PPAs from 2019 and 2021 are in the \$28/MWh range; the competitive responses the Companies received to their 2021 RFP were also in that range. A 30 percent increase would result in prices at the \$36/MWh level. The 2022 RFP resulted in offers with pricing in excess of \$36/MWh.



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**Question No. 1.31**

**Responding Witness: Charles R. Schram**

Q-1.31. Please refer to Mr. Schram's Direct Testimony at page 6, lines 15–18, which states: "Under my supervision, the Companies' Power Supply group reviewed each RFP response for the required data and addressed any missing information with the applicable respondent(s). We then submitted the data to the Generation Planning group for analysis."

- a. Was the purpose of the Power Supply group's review only to identify missing information or were any bid eliminated from further consideration in this step? If bids were eliminated, please provide the information upon which that decision was based.

A-1.31.

- a. No bids were eliminated in the Power Supply review.

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**Question No. 1.32**

**Responding Witness: Charles R. Schram**

- Q-1.32. Please refer to Mr. Schram's Direct Testimony at page 12, lines 11–24.
- a. Please explain what is meant by the statement the “Brown NGCC will require a suite of firm transport services similar to Mill Creek NGCC”.
  - b. Please provide the documentation from Texas Gas, Texas Eastern, and Tennessee Gas detailing the terms and pricing of the gas transportation services offered.
- A-1.32.
- a. Both NGCC units will require firm gas transportation services to ensure their availability when generation is needed. Depending on an individual pipeline's tariff provisions, firm transport services may include daily or hourly limits, storage services for imbalance management, and notice requirements for scheduling delivery.
  - b. The Companies have held initial discussions with the interstate pipelines about the availability of firm transportation but have not reached final agreements and do not have written documentation of detailed terms and pricing at this time. Each of the gas transportation pipeline tariffs can be found at the links listed below.

Texas Gas Transmission:

<https://infopost.bwpipelines.com/Posting/DisplayPostingDocumentPage.aspx?PostingMenuItemID=37&tspid=100000>

Tennessee Gas Pipeline:

[https://pipeline2.kindermorgan.com/Documents/TGP/TGP\\_EntireTariff.pdf](https://pipeline2.kindermorgan.com/Documents/TGP/TGP_EntireTariff.pdf)

Texas Eastern Pipeline:

<https://infopost.enbridge.com/regulatory/tariff/TETLPVolumeNo1.pdf>

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**Question No. 1.33**

**Responding Witness: Charles R. Schram**

- Q-1.33. Please refer to Mr. Schram's Direct Testimony at page 13, lines 11–12, which states: "Texas Gas's nine gas storage fields in western Kentucky and southern Indiana further support system reliability and supply flexibility." Please explain how the storage fields would help ensure supply to the Mill Creek NGCC. For example, will Mill Creek have rights to any gas stored in those fields or would that gas be subject to apportionment amongst all customers taking firm gas transport from Texas Gas?
- A-1.33. See the response to KCA 1-62. The Companies would be able to use gas stored in the interstate pipeline's storage fields for the Mill Creek NGCC subject to the terms and conditions of the firm transportation agreement's storage and imbalance provisions.

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**Question No. 1.34**

**Responding Witness: Charles R. Schram**

Q-1.34. Please refer to Mr. Schram’s Direct Testimony at page 14, lines 2–7, which states: “To hedge against fuel price volatility for Cane Run Unit 7, the Companies currently purchase up to 50 percent of the unit’s forecasted gas burn on a forward basis for the current year. The balance of natural gas is purchased daily on the spot market. For the following years one, two, and three the Companies purchase 40-60 percent, 20-40 percent, and 0-20 percent, respectively, of the unit’s minimum forecasted burn on a forward basis.” Please provide the commodity purchase cost and MMBTU delivered by quarter in each of the last three years to Cane Run Unit 7. Please divide the data by timeframe of the purchase, e.g., forward purchased gas, spot gas, etc.

A-1.34. See the table below for the requested data.

<b>Cane Run 7 NGCC Gas Purchase by Flow Quarter</b>					
		Volume (MMBtu)	Volume (MMBtu)	Avg. Price (\$/MMBtu)	Avg. Price (\$/MMBtu)
<b>Year</b>	<b>Quarter</b>	<b>Forward</b>	<b>Spot</b>	<b>Forward</b>	<b>Spot</b>
2019	Quarter1	6,319,646	4,596,995	\$ 2.89	\$ 2.72
2019	Quarter2	3,929,482	4,304,147	\$ 2.58	\$ 2.40
2019	Quarter3	4,298,358	4,640,606	\$ 2.55	\$ 2.11
2019	Quarter4	2,425,613	5,195,305	\$ 2.64	\$ 2.13
2020	Quarter1	3,319,083	2,006,664	\$ 2.78	\$ 1.83
2020	Quarter2	4,249,415	4,075,791	\$ 2.26	\$ 1.57
2020	Quarter3	4,298,994	4,986,837	\$ 2.27	\$ 1.82
2020	Quarter4	4,298,514	4,235,700	\$ 2.39	\$ 2.15
2021	Quarter1	4,438,415	4,576,664	\$ 2.64	\$ 2.84
2021	Quarter2	4,246,628	4,460,961	\$ 2.39	\$ 2.70
2021	Quarter3	4,297,955	3,588,268	\$ 2.53	\$ 4.19
2021	Quarter4	3,569,679	3,921,733	\$ 2.76	\$ 4.39

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**Case No. 2022-00402**

**Question No. 1.35**

**Responding Witness: Charles R. Schram**

- Q-1.35. Please refer to Exhibit CRS-1 to Mr. Schram's Direct Testimony, page 2 of 10.
- a. Please explain in detail why the Companies required RFP responses to have at least 100 MW of nameplate rated capacity.
  - b. Please explain in detail why, for renewable and storage combined proposals, the Companies required RFP responses to include a minimum of 100 MW capacity with four-hour battery storage.
  - c. Please explain in detail why, for standalone energy storage, the Companies required RFP responses to include a minimum of 100 MW of capacity and 400 MWh of energy.
  - d. Did the Companies consider inviting proposals by third parties to build new generation at its existing power plant sites and/or with a tie-in interconnecting new generation to existing injection points? If not, why not? If so, why did the Companies decide not to do so? Please provide any copies of any documents in the Companies' possession that support your response.
- A-1.35.
- a. The proposed Good Neighbor Plan would require retiring and replacing 785 MW of the Companies' existing generating fleet or retrofitting it with SCR. In addition, the potential to economically retire Brown Unit 3 would result in the loss of 412 MW. The potential need to replace 1,197 MW of generation in such a short period (by 2028) meant that the Companies needed to focus on large projects. In addition, the Companies' experience from prior RFPs was that the economics of proposed projects less than 100 MW were typically unfavorable to those of larger proposals.

- b. See the response to part (a). In addition, past experience with two renewable RFPs indicated that there was significantly better pricing with projects over 100 MW.
- c. See the response to part (a).
- d. The Companies developed RFP proposals to utilize their own sites, so there was no material benefit to opening the Companies' existing properties to third party developers.

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**Question No. 1.36**

**Responding Witness: Stuart A. Wilson**

Q-1.36. Please refer to Appendix A of Mr. Wilson’s Direct Testimony. Please provide, unredacted, all table and figures contained therein, in Excel format with all formulas and links intact.

A-1.36. Appendix A to Mr. Wilson’s Direct Testimony is his statement of education and work experience. It contains no tables or figures. Therefore, the Companies assume this request pertains to Appendix A of Exhibit SAW-1.

See attachments being provided in Excel format. Certain information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

<b>Table/Figure</b>	<b>Support File</b>
Table 25	See Exhibit SAW-2 at “Load2023PlanCC_IRA_DSM_20221026” in 02_PLEXOS\00_Support\20221027_2023BPLoad_IRA_DSM_20221026_24WRM_0308.xlsx
Table 26	See Exhibit SAW-2 at “RMTable” in Tables\20221209_ResourceAssessmentTables_0308.xlsx
Table 27	See Exhibit SAW-2 at “RMTable” in Tables\20221209_ResourceAssessmentTables_0308.xlsx
Table 28	See Att 1 being provided in Excel format.
Figure 8	See Exhibit TAJ-3 at Hourly_Forecast_Updates\CONFIDENTIAL_tbl10_OvernightCharging_Final_D03.xlsx; Hourly_Forecast_Updates\Testimony_Support\DayNight_Consumption_2023BP_2028.xlsx Note that this figure was created using R. The data being provided in Excel is the underlying input data that created this figure.

<b>Table/Figure</b>	<b>Support File</b>
Figure 9	See Exhibit TAJ-3 at Hourly_Forecast_Updates\WY\results\2028_weather_years_final_peak_adjusted_mean_10282022.csv Note that this figure was created using R. The data being provided in Excel is the underlying results data that corresponds with this figure. The R environments can be loaded from Exhibit TAJ-3 at Hourly_Forecast_Updates\WY\results\weather_years_final_10282022.Rda.
Table 29	See Exhibit SAW-2 at “UnitRatings” in Tables\20221209_ResourceAssessmentTables_0308.xlsx
Table 30	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format.
Table 31	See Exhibit SAW-2 at “StayOpenCosts” in 04_FinancialModel\Support\StayOpenCosts\20221207_StayOpenSummary_0308.xlsx
Table 32	See Exhibit SAW-2 at “Summary” in 06_ModelInputs\CONFIDENTIAL_CCR\Support\20220629_LAK_CCRSalesPrices_2023BP.xlsx
Table 33	See Exhibit SAW-2 at “CCR\$perton” in 06_ModelInputs\CONFIDENTIAL_CCR\20220629_LAK_CCRRatesandPrices_2023BP_D02.xlsx
Table 34	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format.
Table 35	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format.
Figure 10	This figure was created directly in Exhibit SAW-1. The underlying data is in Exhibit SAW-2 at “2023BP Annual, Monthly” in 06_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL_Natural_Gas_Forecast.xlsx
Figure 11	This figure was created directly in Exhibit SAW-1. The underlying data is in Exhibit SAW-2 at “HistoricalCoalGasRatios” in 06_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL_Price_Forecast_Coal.xlsx
Table 36	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format. The underlying data is in Exhibit SAW-2 at “HistoricalCoalGasRatios” in 06_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL_Price_Forecast_Coal.xlsx
Table 37	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format.



<b>Table/Figure</b>	<b>Support File</b>
Table 38	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format. The underlying data is in Exhibit SAW-2 at 06_Workpapers\CommodityPriceForecasts\CONFIDENTIAL_Price Forecast_Coal.xlsx
Table 39	See Exhibit SAW-2 at 06_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL_Price Forecast_Ammonia.xlsx
Table 40	See Exhibit SAW-2 at 06_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL_Price Forecast_Emissions.xlsx
Table 41	This table was created directly in Exhibit SAW-1. See Att 2 being provided in Excel format.

The attachments are  
being provided in  
separate files.

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**Case No. 2022-00402**

**Question No. 1.37**

**Responding Witness: Stuart A. Wilson**

Q-1.37. Please refer to Appendix B of Mr. Wilson's Direct Testimony.

- a. Please confirm that all cost data from the request for proposals ("RFP") is contained therein.
- b. Please indicate where the Companies used the cost data from the RFP in its PLEXOS modeling.
- c. Please provide all tables and figures contained in Appendix B, unredacted, in Excel format with all formulas and links intact.

A-1.37. Mr. Wilson's Direct Testimony does not include an Appendix B. Therefore, the Companies assume this request pertains to Appendix B of Exhibit SAW-1.

- a. Not confirmed. The cost components listed in Appendix B include purchase price (\$/kW), capacity price (\$/kW-month), and energy price (\$/MWh). Other cost components not listed include fixed O&M, firm gas transportation, fuel, variable O&M, and start fuel. All cost components are included in the Companies' resource screening model in Exhibit SAW-2 at 01\_Screening\CONFIDENTIAL\_20221209\_ResourceScreeningModel\_0308.xlsx in the "Resources" worksheet. Please note that the resource screening model was updated in the response to PSC 1-47(a).
- b. The following .csv files, located in Exhibit SAW-2, contain cost data from the RFP that was used in PLEXOS:
  - \02\_PLEXOS\CONFIDENTIAL\VOM\_22RFP.csv
  - \02\_PLEXOS\CONFIDENTIAL\FOM\_22RFP\_AssetsInclBuildCostEC C.csv
  - \02\_PLEXOS\Variable\_OM\_NewGas.csv

The .csv file named “VOM\_22RFP.csv” contains PPA prices for solar and wind proposals and is incorporated in the “VO&M Charge” property in PLEXOS.

The .csv file named “FOM\_22RFP\_AssetsInclBuildCostECC.csv” contains fixed O&M costs for Battery PPAs and the self-build NGCC and SCCT proposals and is incorporated in the “FO&M Charge” property in PLEXOS.

The .csv file named “Variable\_OM\_NewGas.csv” contains variable O&M costs for the self-build NGCC and SCCT proposals and is incorporated in the “VO&M Charge” property in PLEXOS.<sup>6</sup>

- c. See Exhibit SAW-2 at “RFPResponses” and “DSMPrograms” worksheets in Tables\20221209\_ResourceAssessmentTables\_0308.xlsx.

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<sup>6</sup> The public version of this data is available on the Commission’s web site in the zip file Exhibit SAW-2 Vol. 1.

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**Case No. 2022-00402**

**Question No. 1.38**

**Responding Witness: Stuart A. Wilson**

- Q-1.38. Please refer to Appendix E of Mr. Wilson's Direct Testimony. Please provide the following, unredacted:
- a. Figures 2 and 3; and
  - b. For the coal price forecast, the bid data and S&P Global forecast data.
- A-1.38. Mr. Wilson's Direct Testimony does not include an Appendix E. Therefore, the Companies assume this request pertains to Appendix E of Exhibit SAW-1.
- a. Figure 2 is unredacted in the public version of Exhibit SAW-1 Appendix E. Therefore, the Companies assume the request pertains to Figures 1 and 3. Both of those figures contain confidential information that was redacted from the public version of Exhibit SAW-1 Appendix E. The Joint Intervenors have access to the unredacted versions of Figures 1 and 3 under their confidentiality agreement with the Companies.
  - b. See Exhibit SAW-2 at:  
06\_ModelInputs\CommodityPriceForecasts\CONFIDENTIAL\_Price\_Forecast\_Coal.xlsx, "2023 BP BID SUMMARY" and "SPG Coal\_Prices" worksheets.

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**Case No. 2022-00402**

**Question No. 1.39**

**Responding Witness: Stuart A. Wilson**

Q-1.39. Please refer to Mr. Wilson's Direct Testimony, at page 16. Please provide:

- a. The "11 different combinations of the solar PPAs PLEXOS selected in the first step" referenced in lines 3 through 5 of witness Wilson's testimony; and
- b. The "22 portfolios" created and referred to in lines 5 through 7 of witness Wilson's testimony.

A-1.39.

- a. As stated in section 4.4.2 of Exhibit SAW-1, the Companies identified all of the solar PPA proposals that PLEXOS selected by 2028, listed in Table 6 in order of increasing PPA price per MWh. The Companies then created 11 PPA combination options, the first of which had 0 solar, with each subsequent PPA combination option adding the next most economical PPA from Table 6.
- b. As stated in section 4.4.2 of Exhibit SAW-1, each portfolio was a combination of one of the two NGCC combinations from the PLEXOS modeling (i.e., Mill Creek NGCC plus Brown NGCC or Mill Creek NGCC plus Ghent 2 with SCR) and one of the 11 PPA combinations described in part (a). A list of these portfolios is available in Table 7 of Exhibit SAW-1.

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**Question No. 1.40**

**Responding Witness: Stuart A. Wilson**

Q-1.40. For all PLEXOS runs referenced in Mr. Wilson's Direct Testimony, please provide the following:

- a. The zipped output solution files for each run and associated portfolio containing the log files and other relevant output;
- b. The summarized output of the model run including but not limited to annual generation, annual build costs, capacity factors, fuel expense, variable and fixed O&M, etc.
- c. All data files referenced in the PLEXOS (.xml) database and used in the PLEXOS modeling runs sorted by the following categories:
  - i. "Load" for the load forecast data files including any Demand Side Management, Electric Vehicle, or other forecast adjustments;
  - ii. "Fuel" for the fuel cost data files modeled; and
  - iii. "Resource" for all data files related to the new and existing resources modeled including but not limited to all file related to capital, fixed, variable O&M, emissions, production profiles, firm capacity, etc.
- d. The source files for the information contained in (b)(i).

A-1.40.

- a. See attached. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.

Note that the Companies typically do not create these files and did not create them in preparing their analyses or application in this proceeding because they

are functional only in their native format for use in the PLEXOS software. Instead, the Companies use PLEXOS’s Connect server platform from which the solution data is queried directly, obviating the need for the zipped solution files. That is why the Companies did not previously provide them in the Exhibit SAW-2 workpapers. Nonetheless, in response to this request the Companies have created and are now providing the PLEXOS zipped output solution files.

See the table below for a guide to the solution file associated with each attachment.

Attachment	Solution for PLEXOS Model:
Att 1 Model 01a	01a_OpenB3M2G2_L5F2_LGLC_1G24SBpM_HR3_24WRM
Att 2 Model 01b	01b_OpenB3M2G2_L5F2_LGHR_1G24SBpM_HR3_24WRM
Att 3 Model 01c	01c_OpenB3M2G2_L5F2_MGMC_1G24SBpM_HR3_24WRM
Att 4 Model 01d	01d_OpenB3M2G2_L5F2_HGLR_1G24SBpM_HR3_24WRM
Att 5 Model 01e	01e_OpenB3M2G2_L5F2_HGHC_1G24SBpM_HR3_24WRM
Att 6 Model 01f	01f_OpenB3M2G2_L5F2_HGH2_1G24SBpM_HR3_24WRM
Att 7 Model 03	03_RetM2_G2NonOz_HGHC_1G24SBpM_HR3_Renew_17SRM
Att 8 Model 04	04_RetB3M2_G2NonOz_HGHC_1G24SBpM_HR3_Renew_17SRM
Att 9 Model 05	05_NoRet_L5F2_HGHC_1G24SBpM_HR3_24WRM
Att 10 Model 06	06_NoRet_M2G2-NonOz_HGHC_1G24SBpM_HR3_Renew_17SRM
Att 11 Model 07	07_RetB3_M2G2-NonOz_HGHC_1G24SBpM_HR3_Renew_SRM
Att 12 Model 08	08_RetB3M2G2-28_HGHC_1G24SBpM_HR3_Renew_24WRM
Att 13 Model 09	09_RetB3M2G2-28_HGHC_1G24SBpM_HR3_AllowCT_24WRM

- b. See the summary file located in Exhibit SAW-2 at  
 \02\_PLEXOS\01\_Results\CONFIDENTIAL\_20221212\_Combined\_Solution\_Views\_2061-2073.xlsx.
- c. See the database export excel file located in Exhibit SAW-2 at  
 \02\_PLEXOS\2022RFP (8.300 R08)\_PLEXOS\_Database\_Export\_ExcelFormat.xlsx

The above referenced file contains an export of all properties defined in the database and the associated value for those properties or, alternatively, the .csv file that contains the associated value for a given property.

- i. See the file in Exhibit SAW-2 at  
 \02\_PLEXOS\Load2023PlanCC\_IRA\_DSM\_20221026.csv.
- ii. See all files starting with “CoalPrices” and “GasPrices” in Exhibit SAW-2 at \02\_PLEXOS\CONFIDENTIAL.



iii. Data files for the requested properties can be found in Exhibit SAW-2 at the following locations:

- See \02\_PLEXOS\BuildCost\_GasTransmission.csv for transmission capital costs.
- See \02\_PLEXOS\CONFIDENTIAL\FOM\_22RFP\_AssetsInclBuildCostECC.csv, \02\_PLEXOS\StartPenalty.csv and \02\_PLEXOS\StartPenalty\_NewSCCT.csv for Fixed O&M and \02\_PLEXOS\RetirementSavings.csv for savings from avoided Fixed O&M due to unit retirement.
- See \02\_PLEXOS\RunningCostOpCharge.csv for Fixed and Variable O&M related to the Companies' existing Cane Run 7 NGCC unit.
- See \02\_PLEXOS\CONFIDENTIAL\VOM\_22RFP.csv and all files in \02\_PLEXOS starting with "Variable\_" for Variable O&M.
- For emissions, see the database export file referenced at the beginning of the response to part (c) of this question. See also \02\_PLEXOS\CCR\_ProductionRates.csv and \02\_PLEXOS\SO2Content.csv.
- See \02\_PLEXOS\RenewableProfiles.csv and \02\_PLEXOS\CONFIDENTIAL\RenewableProfiles\_22RFP.csv for renewable production profiles.
- See all files in both \02\_PLEXOS and \02\_PLEXOS\CONFIDENTIAL starting with "FirmCapacity" for firm capacity.

d. The Companies assume this request is for files contained in (c)(i). See Exhibit TAJ-3 at:  
Hourly\_Forecast\_Updates\CPCN\_Hourly\_Forecast\_20221026.xlsx.

The attachments are  
confidential and  
provided separately  
under seal.

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**Case No. 2022-00402**

**Question No. 1.41**

**Responding Witness: Stuart A. Wilson**

Q-1.41. Please provide a key to all acronyms used in the Companies’ PLEXOS modeling for this case.

A-1.41. The following acronyms are used in the Companies’ PLEXOS modeling files:

Acronym	Definition
RFP	Request for Proposal
DSM	Demand Side Management
DR	Demand Reduction
SCR	Selective Catalytic Reduction
MC2	Mill Creek Unit 2
GH2	Ghent Unit 2
CCR	Coal Combustion Residuals
EFOR	Equivalent Forced Outage Rate
MW	Megawatt
FOM	Fixed Operating and Maintenance Expense
VOM	Variable Operating and Maintenance Expense
OM	Operating and Maintenance
IRA	Inflation Reduction Act
WMR	Winter Reserve Margin
SRM	Summer Reserve Margin
CC	Combined Companies
NGCC	Natural Gas Combined Cycle
CT	Combustion Turbine
SCCT	Simple Cycle Combustion Turbine
SO2	Sulfur Dioxide
VOLL	Value of Lost Load
SOC	State of Charge

PPA	Power Purchase Agreement
CTG	Coal-to-Gas Ratio as described in section 2.2 of Appendix E in Exhibit SAW-2
LGMR or LGLC	Low Gas Mid CTG Ratio fuel price forecast
LGHR	Low Gas High CTG Ratio fuel price forecast
MGMR or MGMC	Mid Gas Mid CTG Ratio fuel price forecast
HGMR or HGHC	High Gas Mid CTR Ratio fuel price forecast
HGLR	High Gas Low CTG Ratio fuel price forecast
HGH2	High Gas Current CTG Ratio fuel price forecast

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**Case No. 2022-00402**

**Question No. 1.42**

**Responding Witness: Stuart A. Wilson**

Q-1.42. Please provide a key to all acronyms used in the Companies' PROSYM modeling for this case.

A-1.42. See the table below.

Acronym	Definition
2023BP	2023 Business Plan
BL	Base Load Forecast
LG	Low Gas Price Scenario
MG	Mid Gas Price Scenario
HG	High Gas Price Scenario
LGLC	Low Gas, Mid CTG Ratio Fuel Price Scenario
MGMC	Mid Gas, Mid CTG Ratio Fuel Price Scenario
HGHC	High Gas, Mid CTG Ratio Fuel Price Scenario
LGHR	Low Gas, High CTG Ratio Fuel Price Scenario
HGLR	High Gas, Low CTG Ratio Fuel Price Scenario
HGH2	High Gas, Current CTG Ratio Fuel Price Scenario
SCR_G2	Scenarios with Ghent 2 SCR
SCR_G2M2	Scenarios with Ghent 2 and Mill Creek 2 SCRs
C000	Zero CO <sub>2</sub> Price Scenario
C015	\$15/ton CO <sub>2</sub> Price Scenario
C025	\$25/ton CO <sub>2</sub> Price Scenario
PH1	Stage One of Resource Assessment
PH2	Stage Two of Resource Assessment
PH3	Stage Three of Resource Assessment

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**Case No. 2022-00402**

**Question No. 1.43**

**Responding Witness: Stuart A. Wilson**

Q-1.43. Please provide a key to all acronyms used in the Companies' SERVVM modeling for this case.

A-1.43. See the table below.

Acronym	Definition
ATC	Available Transmission Capacity
ELCC	Effective Load Carrying Capability
ELDCM	Equivalent Load Duration Curve Model
EUE	Expected Unserved Energy
LOLE	Loss of Load Expectation
Rel_Prod_Costs	Reliability and Production Costs
RM	Reserve Margin
SERVVM	Strategic Energy & Risk Valuation Model

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**Question No. 1.44**

**Responding Witness: Stuart A. Wilson**

Q-1.44. Please provide a copy of the PROSYM user guide.

A-1.44. The Companies are working with the PROSYM user guide copyright holder to obtain permission to provide the guide in response to this request. The Companies will supplement this response when they obtain the requisite permission.

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**Case No. 2022-00402**

**Question No. 1.45**

**Responding Witness: Stuart A. Wilson**

Q-1.45. Please provide a copy of the SERVVM user guide.

A-1.45. See attached. The information requested is confidential and proprietary and is being provided under seal pursuant to a petition for confidential protection.



The entire attachment is  
confidential and  
provided separately  
under seal.

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**Case No. 2022-00402**

**Question No. 1.46**

**Responding Witness: Stuart A. Wilson**

- Q-1.46. Please refer to the PROSYM file entitled "MarketAdders\_2023BP.dat".
- a. To which stations do these adders apply?
  - b. Please explain how PROSYM interprets the date and time stamps associated with each adder. E.g. for an adder following the stamp of "[2022] [m1] [WKD12AM]" does the adder apply in every hour until 7 am on a weekday when the next adder value is given?
  - c. What is the purpose of these adders?
  - d. Please provide the information serving as the basis for the adders.
- A-1.46. This request pertains to PROSYM inputs related to the modeling of off-system sales. These inputs were deactivated in all PROSYM modeling for the CPCN. See the response to JI 1-165.
- a. These adders are applied to the market electricity price during the hours when off system sales occur in PROSYM.
  - b. Yes, PROSYM will apply the peak-type specific adder to the hourly market electricity price in each hour an off-system sale occurs.
  - c. These adders account for various costs associated with making off system sales.
  - d. The costs included in these adders are peak and off-peak transmission costs as well as losses. A minimum profitability margin is also included as a required threshold before any off-system sale can occur to account for potential differences between real-time and settled market prices.

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**Case No. 2022-00402**

**Question No. 1.47**

**Responding Witness: Stuart A. Wilson**

Q-1.47. Please refer to the PROSYM file entitled "GasPrices\_2023BP\_Mid.dat".

- a. In what units are these prices given?
- b. Please break out the prices by commodity and delivery charges.

A-1.47.

- a. Cents/MMBtu.
- b. For commodity charges see Exhibit SAW-2 at:  
06\_ModelInputs\CONFIDENTIAL\_Fuel\Gas\CONFIDENTIAL\_20220722  
\_2023BP\_GasforPROSYM\_2020-2050\_Base.xlsx, column c in the  
"Commodity Input" worksheet. Delivery costs are derived by subtracting  
the commodity charges from the unit specific costs in the "PROSYM  
Output" worksheet.

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**Question No. 1.48**

**Responding Witness: Stuart A. Wilson**

Q-1.48. Please provide the spreadsheet(s) with all formulas and links intact used to create the inputs contained in "BuildCost\_GasTransmission 2.csv".

A-1.48. See Exhibit SAW-2 at:  
\\04\_FinancialModel\Support\TransmissionCapital\20221206\_TransmissionCapital\_0308.xlsx.

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**Question No. 1.49**

**Responding Witness: Lana Isaacson / Stuart A. Wilson**

- Q-1.49. Please provide the information that serves as the basis for the data contained in "20221116 DR Capacity and Cost D04.xlsx". If any of that information is in spreadsheet format, please provide it, with all formulas and links intact.
- A-1.49. See attachment being provided in Excel format. The values for the Capacity and Dispatch Costs worksheet are elements from the Plan inputs and budgets for the proposed demand response programs. The maximum customer incentive available per program measure divided by the forecasted energy reduced per event equates to the dispatch cost.

The attachment is being  
provided in a separate  
file.

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**Question No. 1.50**

**Responding Witness: Stuart A. Wilson**

Q-1.50. Please refer to Mr. Wilson's Direct Testimony at pages 7–9.

- a. Mr. Wilson states that the first step in the Resource Assessment was to update the load forecast to account for three specific adjustments: (1) BlueOval SK Battery Park load; (2) the effects of the IRA; and (3) the effects of the Companies' proposed 2024-2030 DSM-EE Program Plan. Please confirm that the load forecast Mr. Wilson refers to is the same load forecast presented in Exhibit TAJ-1, "2022 CPCN Load Forecast," dated December 2022. If anything but confirmed, please produce the specific load forecast used in the Resource Assessment and please identify the approximate date on which that load forecast was completed.
- b. At page 7, line 16, to page 8, line 3, Mr. Wilson discusses how the Companies next "gathered information regarding the costs and operating characteristics of potential supply-side and demand-side replacement resources." Approximately when did this phase of the Companies' resource assessment take place?
- c. At page 8, lines 4–15, Mr. Wilson explains that, finally, the Companies pursued a three-stage resource analysis. Approximately when did this phase of the Companies' resource assessment begin?
- d. Approximately when did the Companies determine the methodology for the three-stage resource assessment summarized by Mr. Wilson on page 8, lines 4–15?

A-1.50. The order of events described in Mr. Wilson's testimony is presented in a linear conceptual fashion to simplify the explanation of a complex process. In practice, a team of subject matter experts worked on the many components of this complex undertaking in parallel and refined analyses as information became available.

- a. Confirmed. The load forecast report was completed in December 2022. However, the hourly load forecast data was finalized in late October 2022.
- b. This process began in August 2022 with the receipt of RFP responses and was completed in December 2022 after dispatchable DSM-EE programs were finalized.
- c. The development of inputs for this analysis began in August 2022, but portfolio modeling did not begin until after the CPCN load forecast was received in late October 2022.
- d. The models and methods used in this analysis (i.e., portfolio screening in PLEXOS, detailed production cost modeling in PROSYM, reliability modeling in SERVVM) are consistent with the Companies' 2021 IRP. Decisions regarding specific cases and scenarios were made as the analysis was completed from August 2022 to December 2022.



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**Question No. 1.51**

**Responding Witness: Stuart A. Wilson**

- Q-1.51. Please refer to Mr. Wilson's Direct Testimony, page 13. Please explain in detail how the constraints imposed by the Good Neighbor Plan were modeled in PLEXOS.
- A-1.51. The Companies' two non-SCR-equipped units were modeled with the base assumption that SCR and its associated fixed and variable costs would be required by 2028 in order to continue operating during the ozone season. The Companies modeled the potential to avoid those costs through one-time retirement savings if PLEXOS chose to retire these units. All units' ozone-season NO<sub>x</sub> emissions were subject to an emissions allowance price forecast reflecting the impact of the Good Neighbor Plan.

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**Question No. 1.52**

**Responding Witness: Stuart A. Wilson**

Q-1.52. Please refer to Mr. Wilson's Direct Testimony, page 14, line 16. Please provide the Excel Financial Model referred to therein, including but not limited to:

- a. Any user documentation; and
- b. The financial models containing the financial scenarios modeled and the corresponding present value revenue requirements with all formulas and links intact.

A-1.52.

- a. The Companies have not developed any user documentation for the Financial Model.
- b. See the response to PSC 1-48(d).

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**Question No. 1.53**

**Responding Witness: Stuart A. Wilson**

Q-1.53. Please refer to Mr. Wilson's Direct Testimony, page 14.

- a. Please provide all of the modeling output files for each run conducted within PROSYM.
- b. Please provide all of the modeling output files for each run conducted within SERVVM.
- c. If they have not been previously provided, please provide all SERVVM files necessary to execute runs within the SERVVM software.

A-1.53.

- a. The Companies completed the PROSYM runs in three phases. The first phase corresponds to Stage One, Step Two of the Resource Assessment. The second phase corresponds to Stage Two. The third phase corresponds to Stage Three, Steps One and Two. See Exhibit SAW-2 at:
  - \CONFIDENTIAL\_03\_PROSYM\Phase1\CaseFolders
  - \CONFIDENTIAL\_03\_PROSYM\Phase2\CaseFolders
  - \CONFIDENTIAL\_03\_PROSYM\Phase3\CaseFolders
- b. All output files are in "\Reliability\SERVVM\SERVVM\_runs" folder in Exhibit SAW-2.
- c. Input files are in "\Reliability\SERVVM\Inputs" folder in Exhibit SAW-2.

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**Question No. 1.54**

**Responding Witness: Stuart A. Wilson**

Q-1.54. Please refer to Mr. Wilson's Direct Testimony, page 15, line 1.

- a. Please explain if 43 individual RFP bids were modeled as individual resources available for selection within PLEXOS or if another approach was used to model the RFP bids (i.e., weighted average cost across technology types).
- b. Please confirm that the energy efficiency from the 2024-2030 DSM-EE Program Plan was modeled as a reduction to the load forecast and not as a supply side resource within PLEXOS.

A-1.54.

- a. All 43 individual bids were modeled as individual resources.
- b. Confirmed. The non-dispatchable energy efficiency programs were included in the load forecast input into PLEXOS. The dispatchable programs were modeled as resources in PLEXOS.

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**Question No. 1.55**

**Responding Witness: Stuart A. Wilson**

- Q-1.55. Please refer to Mr. Wilson's Direct Testimony, page 23, lines 3–6. Please explain how existing dispatchable DSM in every portfolio was retired in the PLEXOS model.
- A-1.55. PLEXOS determined that the cost of the existing dispatchable DSM outweighed its benefits compared to other alternatives for capacity and energy in each model run. In this stage of the analysis, the Companies used PLEXOS to screen portfolios for cost-effectively meeting minimum reserve margin targets.

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**Question No. 1.56**

**Responding Witness: Stuart A. Wilson**

Q-1.56. Please refer to 2022RFP (8.300 R08)\_PLEXOS\_Database\_Export\_ExcelFormat. Please confirm the Companies performed all PLEXOS modeling using the load duration curve based "Partial" setting in the capacity expansion planning runs.

A-1.56. Confirmed.

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**Question No. 1.57**

**Responding Witness: Stuart A. Wilson**

Q-1.57. Please refer to 2022RFP (8.300 R08)\_PLEXOS\_Database\_Export\_ExcelFormat. Please provide a detailed narrative describing why the Company did not use the "Fitted" optionality to model the load chronologically over the planning horizon.

A-1.57. See the response to Question No. 56. Because the Companies used the "Partial" setting, the "Fitted" setting was not an option to use simultaneously. Once PLEXOS defined the optimal portfolios, the Companies used PROSYM to evaluate each hour of the planning horizon chronologically.

Expansion planning models are by nature extremely complex. The size of the models are too large to model every hour in the full planning horizon using the "Fitted" setting. The models include all of the Companies' existing units, 43 RFP proposals, 5 existing and proposed dispatchable DSM programs, plus the potential for managing battery charging and discharging. Therefore, the models must be simplified to create runs that can be executed on the Companies' computers, which have large amounts of added memory and multiple processors. After discussion with the PLEXOS vendor, Energy Exemplar, the Companies decided to use the "Partial" setting to practically balance run-execution time with model granularity. The details of the "Partial" setting included one duration curve each month with 24 blocks in each duration curve, which effectively simulated a typical day per month with hourly chronology to capture the hourly intermittency of renewables and hourly battery charging and discharging. This would potentially have been oversimplified with the "Fitted" setting using granularity greater than one hour.

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**Question No. 1.58**

**Responding Witness: Stuart A. Wilson**

- Q-1.58. Please refer to Mr. Wilson's Direct Testimony, page 10, lines 10–12, which states: "Therefore, any portfolio that achieves a total summer reserve margin of 17% but includes significantly less than a 12% reserve margin consisting of fully dispatchable resources raises reliability concerns."
- a. Please produce any documents in the Companies' possession that support this contention.
  - b. Is Mr. Wilson's statement applicable irrespective of the makeup of load, e.g., the proportion of residential, commercial, and industrial customers; the proportion of interruptible load; the proportion of sales by end-use type, etc.?
  - c. What portion of generators up to peak load, but excluding those satisfying the reserve margin, would have to be dispatchable according to Mr. Wilson? Please explain your answer in detail.
- A-1.58.
- a. Intermittent and limited-duration resources such as battery storage and dispatchable DSM programs do not contribute to reliability in the same way that fully dispatchable resources do. See Appendix D (Minimum Reserve Margin Analysis) to Exhibit SAW-1, Section 5.2. The Companies' analysis shows that battery storage and dispatchable DSM have a less favorable impact on loss of load expectation ("LOLE") than a SCCT with the same capacity.
  - b. No. The Companies developed minimum reserve margin targets specifically in the context of their projected resource mix and load. Significant changes to either variable will impact the Companies' minimum reserve margin targets.
  - c. The Companies are not suggesting a particular portion of load must be served by dispatchable resources. See the response to parts (a) and (b).



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**Question No. 1.59**

**Responding Witness: Lonnie E. Bellar**

- Q-1.59. During the period from December 17 through December 31, 2022, please provide the total energy and its hourly cost imported into the Companies' balancing authority by source and by type, if available, e.g., x MWh imported from MISO at \$Y per MWh.
- A-1.59. See attachments being provided in Excel format for a listing of transactions initiated by the Companies. The Companies do not have commercial information on transactions initiated by other entities in their balancing authority.

The attachment is being  
provided in a separate  
file.

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**Question No. 1.60**

**Responding Witness: David S. Sinclair / Charles R. Schram**

- Q-1.60. Please produce any documents in the Companies' possession explaining how spot and/or short-term imports into and exports from the Companies' balancing authority are priced.
- A-1.60. The Companies have no knowledge of how other entities in the balancing area price their transactions. The Companies seek to make off-system sales when prices are greater than their marginal generation cost and seek to purchase energy from others at less than our marginal cost of generation. Sales to counterparties outside the balancing area are subject to market based pricing, while prices for sales within the balancing area are subject to cost based regulation.

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**Question No. 1.61**

**Responding Witness: Stuart A. Wilson / David S. Sinclair**

- Q-1.61. Please refer to Mr. Wilson's Direct Testimony, page 29, lines 3–5, which states: "One means of mitigating actual, non-zero solar PPA execution risk would be to add solar capacity the Companies would own, either through acquisition or self-building." Please explain in detail the belief that ownership would mitigate solar execution risk.
- A-1.61. See the responses to PSC 1-27(e)(1-3).

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**Question No. 1.62**

**Responding Witness: Stuart A. Wilson**

Q-1.62. Please explain how to interpret the “Counter/Case (N+1)” value given on tabs “Model Counter” of the Financial Model spreadsheets in Exhibit SAW-2 Confidential.

A-1.62. Within the Financial Model, the Model tab calculates the costs associated with a specific case, and if desired, compares them to another case. The “Counter Framework” and associated data table in the ModelCounter tab is used to summarize the PVRR for all cases modeled. As an example, see the following Financial Model provided in Exhibit SAW-2 and used to compute revenue requirements for the portfolios evaluated in Stage Two of the resource assessment:

\\04\_FinancialModel\CONFIDENTIAL\_20221209\_FinancialModel\_0308\_Ph2\_D01.xlsx” in Exhibit SAW-2.

In Stage Two of the resource assessment, the Companies evaluated revenue requirements for nine portfolios over six fuel price scenarios and three CO<sub>2</sub> price scenarios (162 cases in total). In the ModelCounter tab, the total number of cases in cell B15 is 162. Inputs in the Model tab for Portfolio (i.e., GenAlt) in cell D18, fuel price in cell D24, and CO<sub>2</sub> price in cell D22 are linked to the Counter Framework. In the ModelCounter tab, the Counter/Case (N+1) variable in cell B3 determines which of the 162 cases is being evaluated in the Financial Model. With cell B3 as the column input to the data table, the data table in the ModelCounter tab summarizes the PVRR for all cases modeled.

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**Question No. 1.63**

**Responding Witness: Stuart A. Wilson**

Q-1.63. Please provide a copy of "CONFIDENTIAL\_20221209\_ResourceScreeningModel\_0308" populated with the data for all RFP responses.

A-1.63. The copy provided in Exhibit SAW-2 at 01\_Screening\CONFIDENTIAL\_20221209\_ResourceScreeningModel\_0308 contains data for all RFP responses. Please note that the resource screening model was updated in the response to PSC 1-47(a).

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**Question No. 1.64**

**Responding Witness: Tim A. Jones**

Q-1.64. Please provide a copy of the Companies' most recent appliance saturation study.

A-1.64. See attached. The Companies completed the most recent appliance saturation survey in May 2022.

The attachments are  
being provided in  
separate files.



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**Question No. 1.65**

**Responding Witness: Tim A. Jones**

Q-1.65. Please refer to page 22 of Exhibit SAW-1, which states: "The load scenarios were developed based on the weather in each of the last 49 years." Please provide all spreadsheets, changing nothing and with formulas and links intact, used to develop these 49 load scenarios.

A-1.65. See Exhibit TAJ-3 at: Hourly\_Forecast\_Updates\WY.

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**Question No. 1.66**

**Responding Witness: Stuart A. Wilson**

Q-1.66. Please provide all spreadsheets, changing nothing and with formulas and links intact, used to develop the unit outage inputs for analysis in SERVM in this case including the temporal distribution of those outages.

A-1.66. See  
“\06\_ModelInputs\EFOR\20220628\_CHW\_EFORTemplateForPROSYM.xlsx”  
in Exhibit SAW-2.

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**Question No. 1.67**

**Responding Witness: Stuart A. Wilson**

Q-1.67. Please see the Companies' response to Joint Intervenors' Q-1.76 in Case No. 2021-00393.

- a. Please confirm that the Companies stated in that response that they did not conduct any renewable sampling in SERVVM. If anything but confirmed, please explain.
- b. Did the Companies add renewable sampling as part of the analysis in this case? If yes, please provide the spreadsheet(s) changing nothing and with formulas and links intact, used to develop those inputs. If not, please explain in detail why not.

A-1.67.

- a. Confirmed. Where possible, based on the availability of historical solar irradiance data, solar profiles are correlated with temperatures underlying the load forecast.
- b. No. See the response to part (a).

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**Question No. 1.68**

**Responding Witness: Stuart A. Wilson**

- Q-1.68. Please provide the date and time stamp of each of the loss of load hours identified in the SERVVM modeling in this case.
- A-1.68. The Companies do not have hourly SERVVM output data. SERVVM evaluated 300 unit availability scenarios for each of 49 weather year scenarios on an hourly basis. However, only average monthly and annual results are included in SERVVM output files for each weather year scenario.

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**Question No. 1.69**

**Responding Witness: Stuart A. Wilson**

Q-1.69. Did Astrape or the Companies conduct the SERVVM modeling for this case?  
Please explain your answer.

A-1.69. The Companies conducted the SERVVM modeling.

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**Question No. 1.70**

**Responding Witness: Stuart A. Wilson**

Q-1.70. Did the Companies consider evaluating fuel supply risk in SERVVM for this case?  
If so, why did the Companies ultimately choose not to do so? If not, why not

A-1.70. No. The Companies have firm fuel transportation contracts in place and do not  
expect fuel supply issues.

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**Question No. 1.71**

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

- Q-1.71. What steps, if any, do the Companies intend to take to weatherize the Mill Creek and Brown NCGGs and the gas transmission lines serving those units? Please explain in detail.
- A-1.71. The design basis for the NGCC projects, including the Company owned natural gas infrastructure, will be based on the extreme hot and cold temperatures recorded at the project site area. Appropriate levels of weatherization will be installed to support operation during these extreme conditions.

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**Question No. 1.72**

**Responding Witness: Stuart A. Wilson**

Q-1.72. Please see the Companies' response to Joint Intervenors' Q-2.1 in Case No. 2021-00393. In that response the Companies state that they have "been testing the production cost capabilities of PLEXOS since January 2021 in parallel with use of PROSYM. The Companies have not estimated work hours associated with this evaluation and have not yet confirmed if or when PLEXOS will be appropriate to serve the Companies' production cost modeling needs." What is the current status of the Companies' effort to evaluate moving to PLEXOS for production costing needs?

A-1.72. This effort is ongoing and is not complete.



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**Question No. 1.73**

**Responding Witness: Robert M. Conroy**

- Q-1.73. Please refer to Mr. Conroy's Direct Testimony, which includes proposed tariff sheets adjusting certain rates for DSM expenditures as shown in RMC-1, RMC-2, and RMC-3.
- a. Please explain why Mr. Conroy did not also include tariff sheets showing the impacts of the supply-side investments proposed by the Companies?
  - b. Have the Companies conducted any rate and/or bill impact analyses of the proposed package of investments? If not, why not? If so, please provide such analyses in spreadsheet format changing nothing and keeping all formulas and links intact.
- A-1.73.
- a. The Companies are requesting approval of the 2024-2030 Demand-Side Management and Energy Efficiency Program Plan pursuant to KRS 278.285 and for specific cost recovery through the Demand-Side Management Cost Recovery Mechanism under the tariff sheets contained in Exhibits RMC-1, RMC-2, and RMC-3. The Companies are not seeking cost recovery at this time for the proposed supply-side investments. Such cost recovery would be through a future application for a change in base rates that will include other changes in the cost of providing safe and reliable energy to customers. Therefore, no specific tariff changes are included in this application.
  - b. See the response to KCA 1-68.

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**Question No. 1.74**

**Responding Witness: Stuart A. Wilson**

- Q-1.74. Please refer to Exhibit SAW-1, page 13, which states: "The dispatchable DSM portion of the 2024-2030 DSM-EE Program Plan, including the existing dispatchable DSM programs the Companies currently have in place, advanced for further analysis to determine their role in the optimal resource portfolio." Please explain if this means that the Companies existing dispatchable DSM programs were modeled as selectable resources within PLEXOS.
- A-1.74. The Companies' existing dispatchable direct load control program was modeled as an existing resource that could be retired in PLEXOS based on its economics compared to other resource alternatives.

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**Question No. 1.75**

**Responding Witness: Lana Isaacson**

- Q-1.75. Please refer to Exhibit SAW-1. Table 2. Please explain why the summer capacity for the DLC-AC program is declining from 2024 to 2030.
- A-1.75. This decline reflects the age of the switches and the expected failure in either the switches themselves, or in conjunction with the communication channels such as the 3G network for CSE devices or paging systems. For additional information on the 3G issue, see Exhibit LI-2, in the addendum paragraph at the end of the memo.

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**Case No. 2022-00402**

**Question No. 1.76**

**Responding Witness: Stuart A. Wilson**

Q-1.76. Please refer to Exhibit SAW-1, page 16. Please confirm if the level of selectable resources modeled in the Economic Optimization Stage were limited to the capacity of the RFP bids.

A-1.76. Confirmed.

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

**Response to Metropolitan Housing Coalition, Kentuckians for the Commonwealth,  
Kentucky Solar Energy Society and Mountain Association's  
Initial Request for Information  
Dated February 17, 2023**

**Case No. 2022-00402**

**Question No. 1.77**

**Responding Witness: Stuart A. Wilson**

- Q-1.77. Please refer to Exhibit SAW-1, page 46, footnote 31. Please provide all supporting workbooks, with formulas and links intact, used to develop the assumption that the solar capacity value reflects 0% expected contribution to winter peak capacity.
- A-1.77. See attachment being provided in Excel format, which the Companies previously provided in response to PSC 7-34 in Case Nos. 2020-00349 and 2020-00350.

The attachment is being  
provided in a separate  
file.

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**Case No. 2022-00402**

**Question No. 1.78**

**Responding Witness: Charles R. Schram / Stuart A. Wilson**

- Q-1.78. Please refer to Exhibit SAW-1, Table 34. Please explain if all of the battery storage projects bid into the RFP qualified for the 50% Investment Tax Credit or if this only applied to the Brown battery storage project.
- A-1.78. The 50% ITC was applied to the Brown BESS proposal. See also the response to PSC 1-47(a). For battery storage PPAs, the impact of IRA incentives is reflected in the PPA price.

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**Case No. 2022-00402**

**Question No. 1.79**

**Responding Witness: Stuart A. Wilson**

Q-1.79. Please refer to Exhibit SAW-1, page D-4. Please explain if the referenced 85%, 94%, and 69% capacity contributions for 4-hour battery storage, 8-hour battery storage, and dispatchable DSM were modeled in PLEXOS for both the summer and the winter reserve margin requirement.

A-1.79. Confirmed.



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**Case No. 2022-00402**

**Question No. 1.80**

**Responding Witness: Stuart A. Wilson**

Q-1.80. Please refer to Exhibit SAW-1, page 11, Table 1.

- a. Please explain whether, or to what extent, the numbers presented in the "Price" column reflect the impacts from the IRA tax credit assumptions.
- b. Please explain whether, or to what extent, the solar bid proposals included assumptions for the Investment Tax Credit or the Production Tax Credit.

A-1.80.

- a. For PPAs, the impact of the IRA incentives is reflected in the PPA price received from respondents and presented in Table 1. For owned solar and battery storage proposals, no IRA incentives are included in Table 1.
- b. See the response to PSC 1-47(a).

**KENTUCKY UTILITIES COMPANY  
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**Case No. 2022-00402**

**Question No. 1.81**

**Responding Witness: Lonnie E. Bellar / Charles R. Schram / David S. Sinclair**

Q-1.81. Please refer to Exhibit SAW-1, page 12, which states that “[c]ertain of the Companies’ self-build NGCC and SCCT proposals for the E.W. Brown Generating Station (“Brown”) would have required additional land acquisitions. The Companies excluded those proposals due to the development risk associated with land acquisition.”

- a. Please identify each of the referenced NGCC and SCCT proposals.
- b. For each proposal identified in response to subpart (a), please also explain the specific land acquisition requirements including location of parcel, size of parcel, current ownership of parcel, and assumed cost of acquisition, along with any other material detail.

A-1.81.

- a. The referenced proposals are Nos. 100, 105, and 106 in Table 43 in Appendix B of Exhibit SAW-1.
- b. To comply with the 1,000-foot setback from the stack for the proposed Brown NGCC and SCCT located on the Webb farm (owned by the Companies), the Companies would have been required to acquire additional land from the parcels listed below. The assumed value of land was \$800,000 and did not include acquisition of the entire parcel.
  - Douglass Bagan – total parcel is approximately 16.26 acres
  - William Curry – total parcel is approximately 69.30 acres

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**Case No. 2022-00402**

**Question No. 1.82**

**Responding Witness: Stuart A. Wilson**

- Q-1.82. Please refer to Exhibit SAW-1, Section 4.4.1, addressing "Stage One, Step One." Please confirm that the new supply-side resource options available to be selected by PLEXOS at Stage One, Step One of the modeling were limited to projects bid into the Companies June 2022 Request for Proposals. If anything but confirmed, please explain in full.
- A-1.82. Confirmed.