COMMONWEALTH OF KENTUCKY BEFORE THE PUBLIC SERVICE COMMISSION

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ELECTRONIC 2021 JOINT INTEGRATED)	
RESOURCE PLAN OF LOUISVILLE GAS AND)	CASE NO.
ELECTRIC COMPANY AND KENTUCKY)	2021-00393
UTILITIES COMPANY	j	

COMMISSION STAFF'S FIRST REQUEST FOR INFORMATION TO LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY

Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU) (collectively, LG&E/KU), pursuant to 807 KAR 5:001, are to file with the Commission an electronic version of the following information. The information requested is due on February 11, 2022. The Commission directs LG&E/KU to the Commission's July 22, 2021 Order in Case No. 2020-00085¹ regarding filings with the Commission. Electronic documents shall be in portable document format (PDF), shall be searchable, and shall be appropriately bookmarked.

Each response shall include the question to which the response is made and shall include the name of the witness responsible for responding to the questions related to the information provided. Each response shall be answered under oath or, for representatives of a public or private corporation or a partnership or association or a governmental agency, be accompanied by a signed certification of the preparer or the person supervising the preparation of the response on behalf of the entity that the

¹ Case No. 2020-00085, *Electronic Emergency Docket Related to the Novel Coronavirus COVID-19* (Ky. PSC July 22, 2021), Order (in which the Commission ordered that for case filings made on and after March 16, 2020, filers are NOT required to file the original physical copies of the filings required by 807 KAR 5:001, Section 8).

response is true and accurate to the best of that person's knowledge, information, and belief formed after a reasonable inquiry.

LG&E/KU shall make timely amendment to any prior response if LG&E/KU obtain information that indicates the response was incorrect when made or, though correct when made, is now incorrect in any material respect. For any request to which LG&E/KU fail or refuse to furnish all or part of the requested information, LG&E/KU shall provide a written explanation of the specific grounds for its failure to completely and precisely respond.

Careful attention shall be given to copied material to ensure that it is legible. When the requested information has been previously provided in this proceeding in the requested format, reference may be made to the specific location of that information in responding to this request. When applicable, the requested information shall be separately provided for total company operations and jurisdictional operations. When filing a paper containing personal information, LG&E/KU shall, in accordance with 807 KAR 5:001, Section 4(10), encrypt or redact the paper so that personal information cannot be read.

- 1 Refer to the IRP, Volume 1, Section 5, Plan Summary, page 1. Explain the metrics and service used to determine the ranking and overall satisfaction of LG&E/KU's customer service, and explain how LG&E/KU works to improve satisfaction in customer service.
- 2 Refer to the IRP, Section 5, Plan Summary, pages 3–4 and Figure 5-5, page 5. Page 3 states that 7,175 MW in 2010 was the highest hourly demand and that an annual peak of 7,114 MW occurred on January 2014. Also, page 4 states that the 7,114

MW was an average, but that the maximum 4-second demand was more than 150 MW higher. This also seems to be evident from Figure 5-5.

- a. Explain how 7,175 MW can be the highest hourly demand if the maximum demand was higher than 7,264 MW from 6:00 to 7:00 p.m. and Figure 5-5 appears to show a 4-second peak of about 7,350 MW in the 5:00 to 6:00 p.m. timeframe on January 6, 2014.
- b. Provide a table showing the annual system peaks, summer peaks and winter peaks beginning with the stated highest hourly demand in year 2010 to the present.
- c. If not explained above, explain why the highest system peak would not be equivalent to the maximum 4-second demand, regardless of season.
- 3 Refer to the IRP, Volume I, Section 5, Plan Summary, page 8 in which LG&E/KU states that new forecasting approaches are continually evaluated.
 - a. Provide a list of these new forecasting approaches and supporting literature summarizing them.
 - b. Explain why the new forecasting approach was not chosen.
 - 4 Refer to the IRP, Volume I, Section 5, Plan Summary, page 10.
- a. Explain why LG&E/KU did not directly evaluate new demand-side management (DSM) programs for this IRP.
- b. Explain whether the IRP only identified DSM programs associated with the implementation of AMI.
- c. Provide the list of programs evaluated that were associated with the implementation of AMI.

- d. Provide the list of programs evaluated that were not associated with the implementation of AMI.
- 5 Refer to the IRP, Volume I, Section 5, Plan Summary, page 11. LG&E/KU have experience with and have implemented multiple prior DSM programs that did not rely on AMI.
- a. Explain why LG&E/KU are ignoring what were previously costeffective and viable DSM programs in its resource screening analyses.
- b. Explain why those DSM programs that are not necessarily dependent upon AMI would not be cost-effective today and going forward.
- 6 Refer to the IRP, Volume I, Section 5, Plan Summary, Figure 5-10, page 17. Provide an updated Figure showing the peaks in chronological order.
- 7 Refer to the IRP, Volume I, Section 5, Plan Summary, Table 5-6, and footnote, page 21. Explain the expected additional load from the Ford vehicle battery plants and provide an update to Table 5-6.
- Refer to the IRP, Volume I, Section 5, Plan Summary, page 20. Recent IRPs from other Kentucky-based electric companies have presumed a carbon tax in the future for their analyses. Identify and explain each basis for LG&E/KU's determination that a carbon tax is unlikely.
- 9 Provide an estimate for a CO2 price LG&E/KU contend would be most reasonable, explain why LG&E/KU contend that price represents the most reasonable estimate of a CO2 price, and explain any issues or uncertainties with such an estimated CO2 price.
- 10 Refer to the IRP, Volume I, Section 5, Plan Summary, page 24. Provide the supporting calculations for the class-specific price elasticity estimates for each class.

- 11 Refer to the IRP, Volume I, Section 5, Plan Summary, Figure 5-11, page 26.
 - a. Confirm that the vertical axis represent GWh.
- b. The historical trend shows decreasing industrial sales. Explain how LG&E/KU can forecast a jump in sales and then have to forecast remain relatively flat.
- Refer to the IRP, Volume I, Section 5, Plan Summary, page 26. With efficiency improvements lowering the forecasted use per customer and offsetting in usage gains achieved from increased customers, explain whether the increased use of home offices that has occurred since the COVID-19 pandemic and the increased use of home electronics is modeled and, if so, why it does not contribute to increased usage.
 - Refer to the IRP, Volume I, Section 5, Plan Summary, page 26.
 - a. Identify the company-sponsored DSM-EE programs modeled.
- b. Explain what "accelerated efficiency gains" as used on Section 5, page 26 refers to.
 - Refer to the IRP, Volume I, Section 5, Plan Summary, pages 21 and 27.
- a. Explain why the generation cost forecast is based upon moderate case forecast from NREL's 2021 ATB, but the distributed generation forecast is based upon NREL's 2020 ATB.
- b. Provide an updated distributed generation forecast based upon the 2021 ATB, and explain whether and, if so, how this updated forecast makes a difference in Tables 5-9 and 5-10 on page 28.
- c. Provide a table showing the effects of the updated distributed generation on forecasted demand.
 - Refer to the IRP, Volume I, Section 5, Plan Summary, page 29.

- a. Explain whether LG&E is aware of any pending or proposed legislation that would remove the 1 percent cap on total installed net metering capacity. If not, explain LG&E/KU's basis for this assumption.
- b. Confirm that the base and low forecasts shown in Table 5-13 assume that the 1 percent cap remains in place.
- Refer to the IRP, Volume I, Section 5, Plan Summary, Figure 5-13 and footnote 33, page 29. Provide an updated Figure 5-13 based on the September 24, 2021 Order concerning LG&E/KU's NMS-2 compensation rates and netting interval for new net metering customers, and provide a table showing the data points used in the updated Figure 5-13.
- 17 Refer to the IRP, Volume I, Section 5, Plan Summary, page 29. Explain whether the term "instantaneous netting of usage and generation" is equivalent to netting over the billing period as reflected in LG&E/KU's' tariffs. If not, provide an updated forecast based upon LG&E/KU's tariffs.
 - 18 Refer to the IRP, Volume I, Section 5, Plan Summary, page 31 and 32.
- a. Explain what methods LG&E/KU use to encourage electric vehicle charging during off-peak times and what methods they expect to use during the planning period.
- b. Explain what LG&E/KU could do to offset the possibility of the need for additional peaking capacity due to EV charging.
- c. Explain whether the expected load profile of EV charging is a function of the type of charger (level) used, if so explain or graphically show the differences in load profiles by charger type, and explain whether LG&E/KU's modeling assumes a uniform or "typical" charger type.

- d. Explain whether and to what extent EV charging load profiles are affected by temperature.
- e. Explain whether and to what extent a high penetration of EVs can used to maintain grid stability.
 - 19 Refer to the IRP, Volume I, Section 5, Plan Summary, page 34.
- a. Provide the basis for the 180 MW growth assumption in industrial load for the high case and removal in the low case.
- b. Explain why LG&E/KU choose to model a scenario in which electric furnaces in LG&E's territories replace gas furnaces, and explain in detail each basis for LG&E/KU's assumptions regarding the increase in use of electric furnaces in LG&E's service territory.
- c. Explain the basis for assuming that EVs will account for 50 percent of new car sales by 2030.
- 20 Refer to the IRP, Volume I, Section 5, Plan Summary, footnote 35, page 35. Explain why residential use per customer for KU residential customers is nearly 70 percent higher in January than LG&E residential customers. Include in the response a monthly use per customer comparison between LG&E's and KU residential customers.
- 21 Refer to the IRP, Volume I, Section 5, Plan Summary, page 39, Footnote 36. Generally describe the historic energy efficiency improvements that have been made to LG&E/KU's existing resources.
- Refer to the IRP, Volume I, Section 5, Plan Summary, pages 39–41. Explain whether LG&E/KU evaluated renewable resources outside of the Commonwealth of Kentucky. If so, explain why such resources are not included. If not, explain why such resources are excluded.

- 23 Refer to the IRP, Volume I, Section 5, Plan Summary, page 40, footnotes 37 and 40. Explain why LG&E/KU modeled both battery storage resources and solar and wind resources in 100 MW increments, as opposed to smaller units.
- 24 Refer to the IRP, Volume I, Section 5, Plan Summary, Tables 5-13, page 35, and Table 5-14, page 37, and Table 5-18, page 42. Confirm that the forecasts represent LG&E/KU's Kentucky service territories only. If not, provide updates to the Tables with the Kentucky and Virginia service territories broken out separately. Include in the explanation where the FERC Wholesale customers are located and how they impact the forecasts.
- 25 Refer to the IRP, Volume I, Section 5, Plan Summary, Figure 5-20, page 36.
- Explain what factors are driving the jump in industrial load beginning a. in 2026.
- b. Explain what actions LG&E/KU are assuming will be taken to manage EV charging as assumed in the High scenario.
- 26 Refer to the IRP, Volume I, Section 5, Plan Summary, Tables 5-15 and 5-16, pages 39–40. The list of resource options considered appears to be unnecessarily limited for a long range planning study.
- Explain why power purchase agreements (PPAs) were not a. considered as a resource option.
- b. The inclusion of capture and sequestration (CCS) in the base resource options as opposed to including it as a sensitivity scenario option skews the study results.

-8-

- (1) Provide support including any published market studies for the assumption that CCS technology is a viable market add-on to fossil-fueled electric generation.
- (2) Explain how LG&E/KU would dispose of the captured CO₂ and whether the disposal cost was figured into the analysis.
- (3) Explain the timing of when LG&E/KU realistically expect carbon capture and sequestration (CCS) will be mandated. Include in the explanation an allowance for potential court challenges and an implementation period if LG&E/KU are including those potential actions occurring after a federal mandate.
- c. Provide the cost characteristics used in the analysis for natural gas combined cycle with CCS (NGCC w/ CCS) and for NGCC without CCS.
- d. Explain the cost differences between assuming NGCC w/CCS as a resource option as compared to NGCC that has to have CCS added at a later date.
- e. Explain why LG&E/KU assumed that a CCS mandate would not be applicable to simple cycle combustion turbines (SCCTs) as well as NGCCs.
- f. Explain whether LG&E/KU assumed that all non-dispatchable resources were assumed physically present in its service territory.
- g. Provide the cost characteristics of the solar resources used in the IRP analysis, and explain how these cost characteristics compare to cost of recent solar projects locating in Kentucky, including the expected cost of LG&E/KU 125 MW solar PPA referred in the IRP at Section 5, page 42, footnote 44.
 - h. Provide an updated Table 5-15 including NGCC.
- 27 Refer to the IRP, Volume I, Section 5, Plan Summary, page 41. Explain reliability costs and how those costs differ from production costs.

- Refer to the IRP, Volume I, Section 5, Plan Summary, Table 5-13, page 35, and Section 6, Table 6-3, page 3. Explain the differences between the 2021 IRP forecasts in these two Tables.
- 29 Refer to the IRP, Volume I, Section 6, Significant Changes, pages 6–8, and the Volume III, 2021 IRP Reserve Margin Analysis (RMA), page 10.
- a. Explain how the Ohio Valley Electric Corporation capacity is included in the Tables 6-5 and 6-6.
- b. Explain why the Generation Resources amounts in Tables 6-5 and 6-6 do not match the Total Generation Resources amounts in Section 5, Table 5-1, page 6.
- c. In Tables 6-5 and 6-6, since Mill creek 1 and 2 cannot be run simultaneously in the summer, explain how the lower capacity of Mill Creek is reflected.
- d. In Table 6-6, confirm that the negative 300 MW in 2025 in the Coal row signifies the retirement of Mill Creek 1 and that the additional negative 709 MW in 2028 signifies the retirement of Mill Creek 2 and Brown 3.
- e. Explain how Tables 6-5 and 6-6 will change after LG&E/KU account for the additional demand from the new Ford plant and provide updates to these Tables with the inclusion of the new ford plant.
- f. Explain whether Ford requested or has required that any portion of the capacity or energy supplied to its new plant be supplied by renewable resources. If so, explain the total amount of capacity and energy that will be required for the new plant, when the resources will be required, and the amounts of renewable and non-renewable energy and capacity that will be required.

- Refer to the IRP, Volume I, Section 6, Significant Changes, page 1. Provide support for projected load reductions associated with conservation voltage reduction after AMI is fully implemented.
 - Refer to the IRP, Volume I, Section 7, Load Forecasts, page 13.
 - a. Provide the most recent residential survey results.
- b. Provide the estimated date of the commercial survey and a sample of what type of questions and information LG&E/KU is intending to gather.
- 32 Refer to the IRP, Volume I, Section 8, Resource Assessment and Acquisition Plan, page 10. Provide the expected implementation of the online DER interconnection application portal.
- 33 Refer to the IRP, Volume I, Section 8, Resource Assessment and Acquisition Plan, page 33.
- a. Regarding vegetation management, explain how effective was using sheep compared to standard vegetation management practices.
- b. Explain how the costs of using grazing generally compare to standard vegetation management practices.
- 34 Refer to the IRP, Volume III, 2021 RMA in general. Provide a list of significant differences in key inputs and uncertainties between the 2019 IRP and the current IRP.
- Refer to the IRP, Volume III, 2021 RMA, page 17. Explain why available transmission capacity is assumed to be 500 MW two-thirds of the time and zero MW one-third of the time.

- Refer to the IRP, Volume III, 2021 RMA, Table 11 and footnote 23, page 21. Explain why NREL's 2021 ATB was not used as a source of data and provide an update using the most current ATB data.
- 37 Refer to the IRP, Volume II, Electric Sales & Demand Forecast Process, Section 3.1, page 6.
- a. Explain whether LG&E/KU ran the models using 10- or 30-year weather data. If it used both, explain whether the differences were significant.
- b. Explain why LG&E/KU utilized 20 years of weather data to determine "weather normal" as opposed to a longer or shorter timeframe.
- c. Explain whether the Companies modeled severe weather events in their demand forecasting or in their Reserve Margin Analysis.
- d. Explain the purpose and benefit of smoothing the daily normal weather values.
- Refer to the IRP, Volume II, Electric Sales & Demand Forecast Process, Section 3.1, page 12. Provide the analysis used to blend the consumer choice model output with the EIA adapted forecast output for the EV Forecast.
- Refer to the IRP, Volume II, Electric Sales and Demand Forecast Process, Section 4, pages 7–13. For each of the Forecast models listed in Sections 4.1–4.7, provide each model regression output equation and identify the variables in each equation.
- 40 Refer to the IRP, Volume II, Electric Sales and Demand Forecast Process, Section 4.1.2, page 8.
- a. Provide a detailed explanation of how each of the independent variables, XHeat, XCool, and XOther are constructed.

- b. Appendix A appears to have been omitted from the document. Provide a copy of Appendix A, which contains a more detailed discussion of the variables and the methodology used to construct the variables comprising the residential use per customer variable.
- c. Explain why the Statistically Adjusted End-Use model was not used for the Commercial customer class.
- Refer to the IRP, Volume II, Electric Sales & Demand Forecast Process, page 12. Explain whether LG&E/KU is aware of any pending or proposed legislation regarding renewal of the Investment Tax Credit (ITC) for solar installations or expansion to standalone battery storage facilities. If not, explain each basis for LG&E/KU's assumption that the ITC will be extended for another 10 years.
- 42 Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis in general.
- a. Explain why LG&E/KU did not directly evaluate new DSM programs but just identified potential opportunities related to the implementation of AMI.
- b. For the evaluated technologies, explain in what manner fixed operating and maintenance cost have increased from the 2018 IRP, and why wind did not similarly increase.
- c. Explain whether or not LG&E/KU evaluated PPOs as opposed to company owned resources for supply side energy and capacity.
- d. Explain whether LG&E/KU evaluated supply-side resources outside of their service territory. If so, provide a list and explain why the supply side resource was considered to be not be cost effective. If not, explain why.

- Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 2.1.3, page 7. Explain how LG&E/KU arrived at the conclusion that 4- and 8-hour batteries were the optimal choice for serving its customers.
- Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 2.1.3, page 8. Given that states of charge (SOC) is typically limited to between 5 percent and 95 percent, explain the results of the LG&E/KU energy storage testing that led it to limit the SOC to between 10 percent and 90 percent.
- 45 Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 2.2.1, pages 9–10.
- 46 Provide a map that overlays solar irradiance in LG&E/KU's service territory with current and planned solar resources.
- 47 Based upon the levelized cost of energy (LCOE) in Table 5, explain how LG&E/KU determines optimal locations for solar resources, and whether there is a minimum level of solar irradiance necessary for solar resources to be economical.
- 48 Explain whether the solar irradiance values given for Kentucky are based on a "weather normal" average.
- 49 Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 2.2.1, page 10. Explain why it is reasonable to align the cost of solar energy to the Rhudes Creek price throughout the IRP planning period.
- Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 2.2.2, page 10. Explain why areas with wind speeds of at least 14.5 mph are better suited for wind generation. If LG&E/KU relied on a source for this conclusion, provide the source.

- Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 3.1, page 11. Provide the LCOE of installing nuclear units in 2022 and 2031, and explain whether, when, and under what circumstances nuclear units become economical, including an explanation of whether they become economical under a carbon tax scenario.
- 52 Refer to the IRP, Volume III, 2021 IRP Resource Screening Analysis, Section 3.2, page 11.
- a. Provide the LCOE of installing Combined Cycle with Hydrogen units
 in 2022 and 2031.
- b. Explain whether, when, and under what circumstances Combined Cycle with Hydrogen units become economical, including an explanation of whether they become economical under a carbon tax scenario.
 - c. Provide a fuel cost comparison of hydrogen fuel versus natural gas.
 - Refer to the 2021 IRP Resource Screening Analysis, Section 3.4, page 12.
- a. Provide examples of Integrated Gasification Combined-Cycle units exceeding costs.
- b. Provide the LCOE of installing Integrated Gasification Combined-Cycle units in 2022 and 2031, and explain whether, when, and under what circumstances Integrated Gasification Combined-Cycle units become economical, including an explanation of whether they become economical under a carbon tax scenario.
 - Refer to the 2021 IRP Resource Screening Analysis, Section 3.7, page 12.
- a. Explain whether Biopower is a clean energy resource, and whether it is more or less clean than natural gas units and nuclear.

- b. Provide the LCOE of installing Biopower units in 2022 and 2031, and explain whether under a carbon tax scenario, if and when Biopower units become economical.
- Refer to the 2021 IRP Resource Screening Analysis, Section 4.1 page 16. Explain why LG&E/KU assumed 160 MW for Green Tariff Option 3.
- Refer to the 2021 IRP Long-Term Resource Planning Analysis, Section 3.3, page 11. Provide support for LG&E/KU's assumption that the capital cost of constructing two or more SCCTs at an existing site would 25 percent less than constructing a single SCCT at a greenfield site.
 - 57 Refer to the 2021 RTO Membership Analysis, Appendices A and C.
- a. Provide a more detailed explanation of the cost and benefit assumptions in Appendix A.
- b. Explain why using the PJM incremental BRA capacity auction prices is appropriate and provide the market clearing prices used.
- c. Identify and explain each of the PJM and MISO service categories used in the study. Include all ancillary service categories in the response.
- d. For the PJM portion of the study, explain whether the Companies investigated both FRR and RPM status options. Include in the response the rationale and cost/benefits of choosing one or the other.
- Refer to the article titled "LG&E and KU Plan to Burn Coal for Another Four Decades," which represents that LG&E's Vice President of Energy Supply and Analysis stated that the forecast provided to the Commission as part of the IRP was a simple analysis that is not reflective of how the company plans to implement renewable

resources.² Identify, describe, and explain the differences between how the company actually plans to implement renewable resources and how it indicated renewable resources would be implemented in the IRP.

² Van Velzer, Ryan, "LG&E and KU Plan to Burn Coal for Another Four Decades," NPR WFPL (January 12, 2022) https://wfpl.org/lge-and-ku-plan-to-burn-coal-for-another-four-decades/ (last accessed January 18, 2022).

Linda C. Bridwell

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DATED <u>JAN 21 2022</u>

cc: Parties of Record

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