COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF	**)**	
KENTUCKY UTILITIES COMPANY AND	**)**	
LOUISVILLE GAS AND ELECTRIC	**)**	
COMPANY FOR CERTIFICATES OF	**)**	
PUBLIC CONVENIENCE AND NECESSITY	**)**	**CASE NO. 2022-00402**
AND SITE COMPATIBILITY	**)**	
CERTIFICATES AND APPROVAL OF A	**)**	
DEMAND SIDE MANAGEMENT PLAN AND	**)**	
APPROVAL OF FOSSIL FUEL-FIRED	**)**	
GENERATING UNIT RETIREMENTS	**)**	

REBUTTAL TESTIMONY OF
TIM JONES
MANAGER, SALES ANALYSIS AND FORECASTING
KENTUCKY UTILITIES COMPANY AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: August 9, 2023

TABLE OF CONTENTS

I. BACKGROUND

Q. Please state your name, position, and business address.

A. My name is Tim Jones. I am the Manager of Sales Analysis and Forecasting for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "Companies") and an employee of LG&E and KU Services Company, which provides services to KU and LG&E. My business address is 220 West Main Street, Louisville, Kentucky 40202.

Q. What is the purpose of your rebuttal testimony?

A. My testimony will address a few discrete intervenor comments and criticisms of the load forecast used in the Companies' resource analysis in this case. I will respond to four specific points: (1) Witness Medine's assertion that the CPCN load forecast failed to consider the new load from the BlueOval SK electric battery facility; (2) Witness Goggin's assertion that the load forecast fails to consider efficiency benefits from replacement of electric resistance heating resources with more efficient heat pumps; (3) Witness Sommer's assertion that the Companies should be curious about customers' energy consumption patterns and what drives demand during cold periods in the winter; and (4) Witness McDonald's assertion that the Companies understated the growth of distributed solar generation in the load forecast.

II. RESPONSE TO CRITICISMS OF LOAD FORECAST

A. KCA Witness Emily Medine

Q. Ms. Medine asserts in her testimony that the Companies failed to consider the load associated with BlueOval SK in their load forecast as one of its shortcomings. How do you respond?

A. Ms. Medine is mistaken. The Companies considered the BlueOval SK load in the CPCN load forecast. The Companies' response to KCA 2-8, which Ms. Medine cites to support her assertion, refers to the load forecast for the 2021 IRP. The 2021 IRP load forecast did not consider the BlueOval load because the project was not yet announced when that forecast was completed. The response goes on to state that "BlueOval's load is included in the CPCN forecast, which is summarized in Mr. Jones's testimony." In fact, in my direct testimony I observed that "[i]t is difficult to overstate the impact of BlueOval on this load forecast."[1] I also stated in my testimony that the BlueOval SK load of up to 260 MW summer peak and 225 MW winter peak with a capacity factor near 90% was "the most impactful change to the load forecast by a wide margin" between the 2021 IRP load forecast and load forecast presented in this case.[2] The forecast presented in this case fully incorporates the expected impact of the BlueOval load.

B. Sierra Club Witness Michael Goggin

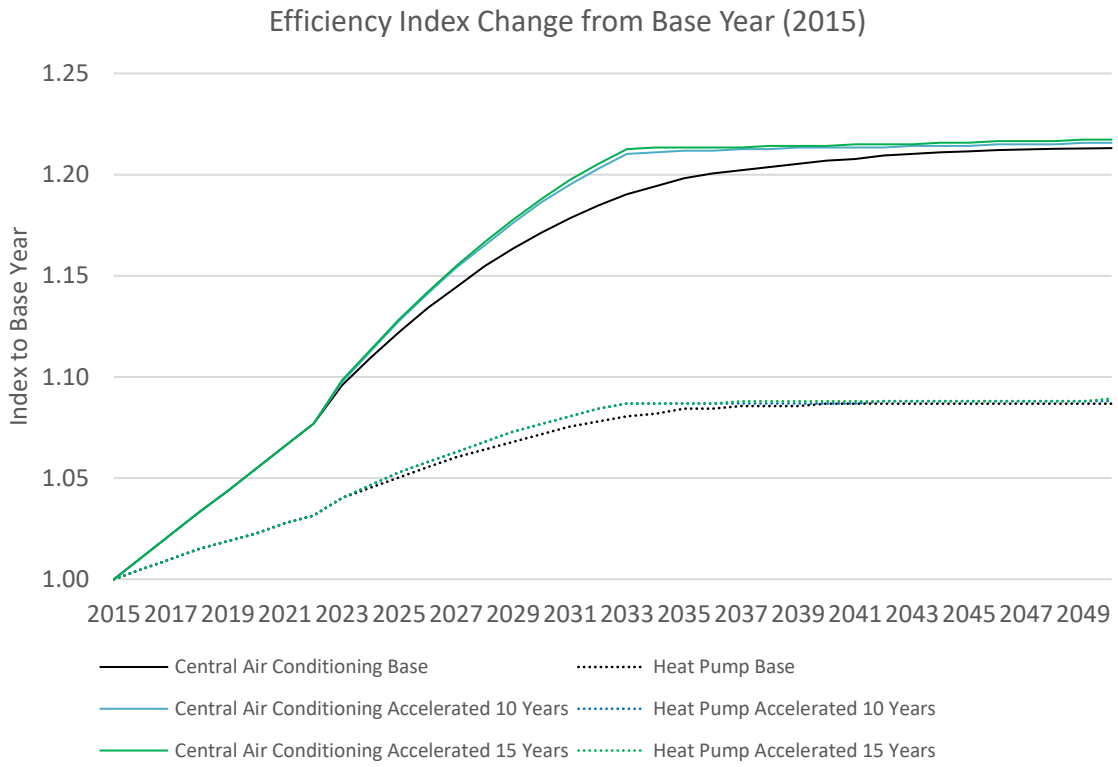
Q. Mr. Goggin asserts in his testimony that the Companies have failed to consider in the load forecast the efficiencies created by replacing inefficient resistance heating with heat pumps. Is he correct?

A. No. The shares of electric furnaces that use resistance heating decline in this forecast while shares of heat pumps increase. Efficiencies created by adoption of electric heat pumps were also considered in the load forecast and are captured in the acceleration of the EIA/Itron forecast of energy efficiency improvements by 10 years. Specifically, Figure 9 on p. 18 of my direct testimony, reproduced as Figure 1 below, shows an index

[1] Jones Direct Testimony, p.14.
[2] Jones Direct Testimony, p.6.

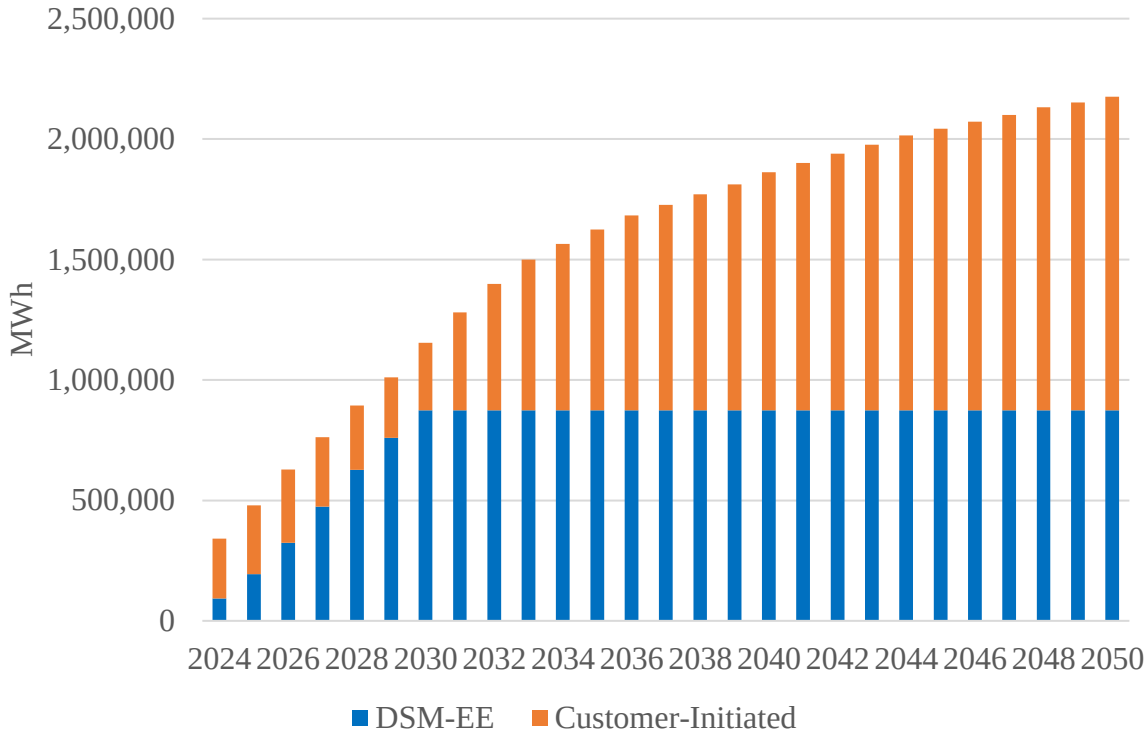
of air conditioning *and heat pump efficiencies* over time according to EIA, and then shows the impact of accelerating the efficiency curves by 10 years. By accelerating the EIA forecast by 10 years, the Companies have considered the effect of heat pump efficiencies created by faster adoption of heat pumps incentivized by the IRA and the proposed DSM-EE portfolio.

Figure 1: Residential Central Air Conditioning and Heat Pump Efficiency Index



Because this 10-year acceleration assumption is applied to all end-uses, including heat pumps as mentioned above, there is a *significant* amount of energy efficiency in this load forecast. Figure 11 in my Direct Testimony, reproduced as Figure 2 below, shows that total residential and commercial energy efficiency accounts for a more than 1,000 GWh reduction to the annual load forecast by 2029.

Figure 2: Estimate of DSM-EE vs. Customer Initiated Energy Efficiency (Residential and Commercial)



C. Joint Intervenors Witness Anna Sommer

Q. On page 52 of her testimony, Witness Sommer states, "It is important for the Companies to be curious about what drives load during these events and confirm its belief so that we are making informed decisions about how to manage these particular loads. If true, the Companies' most recent appliance saturation study would suggest that a minority of the Companies' residential load is responsible and that there is significant work to do in order to make sure this problem is not exacerbated as more heating load transitions to electricity." How do you respond?

A. I agree with Ms. Sommer that it is important to be curious about what is driving load in all hours of the day and all seasons of the year. That is why the Companies perform significant analysis to try to answer that question so forecasting and resource planning can be as accurate as possible. I also agree that electric space heating could materially

impact system planning moving forward if it grows beyond what the Companies have projected in the CPCN load forecast, and I stated as much in the load forecast.[3]

The Companies' load forecast attributes a gradual increase in winter peak load from 2027 to 2052 in part to the increase in electric heating which, as my testimony points out, is difficult to offset with distributed solar generation because winter peaks tend to occur in non-daylight hours.[4] Growth in electric space heating as a percentage of all residential electric consumption is part of a larger national trend that the Companies considered carefully in choosing to accelerate adoption rates beyond what is projected in the EIA.[5] As Ms. Sommer suggests, identifying the driving causes behind increased demand at certain times is important to ensure, for example, that the right resources are in place to meet that demand. The Companies have done that in this load forecast and will continue to do so.

Q. Did the Companies also address the topics of extreme cold events, winter peaks, electric heating, or electric resistance heating in the most recent IRP?

A. Yes, in the 2021 IRP the Companies recognized the winter load variability imposed by electric heating systems, especially during extreme cold events when electric heat pumps rely on backup resistance heating.[6] The variability in energy requirements due to weather is a key consideration in resource planning. Due to increased variability in winter peaks and as more solar resources are integrated into the Companies' resource

[3] Exhibit TAJ-1 to Jones Direct Testimony, at p.12 ("Thus, if a higher percentage of customers adopt electric heating than projected in this forecast, winter peak and non-daylight energy requirements could be markedly higher than forecasted here.")
[4] Jones Direct Testimony, at p.7.
[5] Jones Direct Testimony, at p.28.
[6] *Electronic 2021 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company*, Case No. 2021-00393, IRP Vol. 1, p.5-16 (filed Oct. 19, 2021).

portfolio, which contribute primarily to summer reserve margin, the Companies expressed the need to communicate resource planning in the context of both summer and winter peak reserve margin.[7] The Companies further noted in the IRP, as they have in this load forecast, that solar resources are not well-positioned to serve winter peak because winter peak occurs during non-daylight hours.[8]

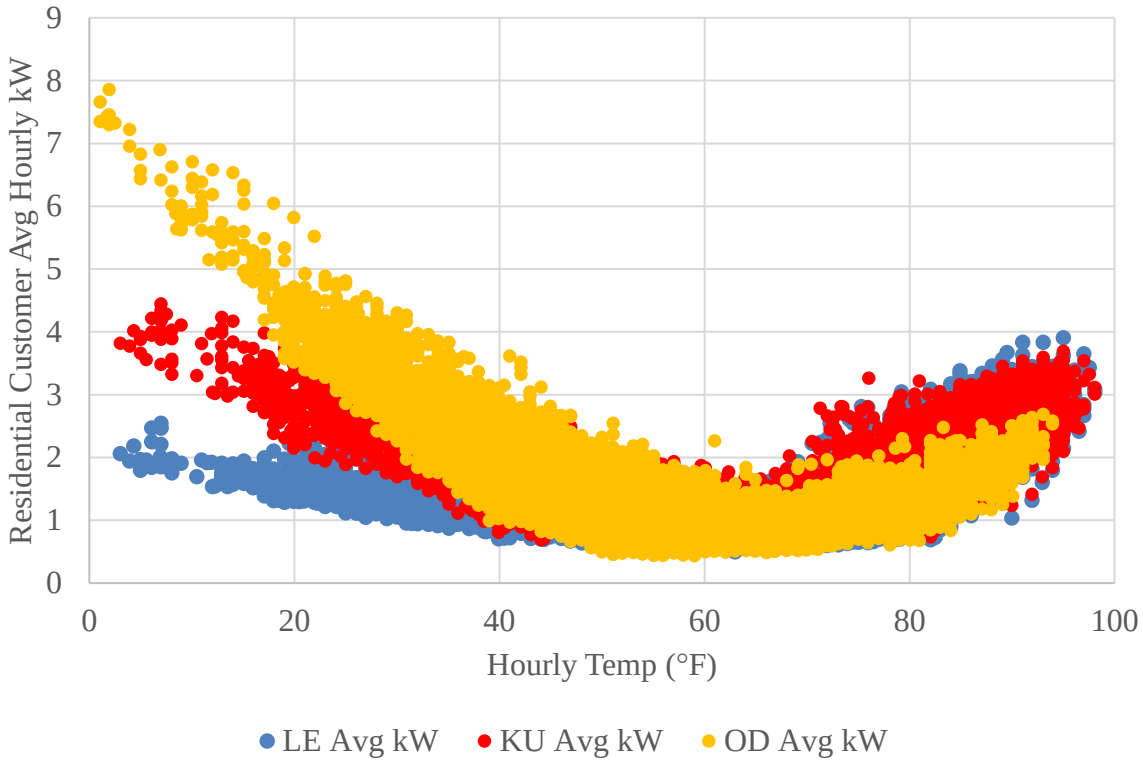
Q. Is electric heating a primary driver of increased demand in extreme cold weather events?

A. Yes, as expected the Companies' data suggests a strong correlation between use of electric heating and peak demand during very cold weather events. Customers want their residences to be warm during periods of very cold weather. A scatter plot using residential load shapes from recent regulatory filings in each company's service territory clearly demonstrates the relationship between the saturation of electric space heating and load response at cold temperatures. Among LG&E, KU, and ODP, ODP has the highest penetration of electric space heating and resistance heating followed by KU. LG&E has the lowest penetration of electric space heating. Consistent with Tables 4 and 5 of Exhibit TAJ-1, the majority of LG&E's residential customers use natural gas furnaces to heat their residences. Unsurprisingly, the figure below shows that ODP residential customers, on average, have the highest load response in cold weather conditions followed by KU and then LG&E. Therefore, similar to what was demonstrated in the IRP High Case Load Scenario, if in the future LG&E and KU residential customers respond to cold weather more like ODP residential customers do

[7] *Id.*, p.5-11.
[8] *Id.*, p.5-13, n.15.

today (with higher penetrations of electric space heating), winter peaks and overnight energy would substantially increase.

Figure 3: Residential Load per Customer vs. Temperature Scatter by Company[9]



Q. What does this analysis say about the Companies' approach to investigating the drivers of peak demand?

A. It demonstrates that the Companies are curious about the drivers of peak demand because reasonable and prudent load forecasting demands it. By understanding major contributors to peak load, the Companies can arrive at a more accurate load forecast and, by extension, plan their resource portfolio in a way that meets the challenges presented by changing load in the future.

[9] KU and LG&E shapes derived from load shapes used in the 2020 Rate Case; ODP shapes derived from 2023 VA Annual Information Filing (AIF).

D. Joint Intervenors Witness Andy McDonald

Q. Witness McDonald asserts that the Companies have been too conservative in forecasting the growth of distributed solar generation resources. First, please respond by summarizing how the projected growth of distributed generation impacts the load forecast.

A. As summarized in my direct testimony, the Companies project a growth in distributed generation capacity, including NMS and QF resources, to nearly 220 MW by 2052.[10] While distributed generation resources are cumulatively modeled as a reduction to load, their expected impact on projected summer peak demands in excess of 6,000 MW in 2052 remains relatively small (about 3 percent of overall). Furthermore, distributed solar generation will not make a meaningful impact in serving winter peak demand periods, which is driving much of the need for the resource portfolio the Companies have proposed.[11]

Q. How do the economics of distributed solar generation resources influence growth rates?

A. As I mentioned in my testimony and in Exhibit TAJ-1, there are a variety of factors that influence adoption of distributed solar resources. Along with the cost of a solar installation, an important economic factor is retail rates for electricity, which customers consider when evaluating the ROI/payback period on a solar installation. On page 14 of his testimony, Mr. McDonald compares Kentucky to Rhode Island, Maine, and Hawaii as examples of what distributed solar growth could look like. While the solar

[10] Jones Direct Testimony, pp. 24-25.
[11] See also the Companies' responses to PSC 2-64(b) and JI 1-77.

irradiance Rhode Island and Maine experience is relatively similar to what Kentucky experiences, both states' electricity rates are higher than Kentucky's:

State	**Average retail price of electricity (cents/kWh)[12]**
Kentucky	9.12
Hawaii	30.31
Rhode Island	18.44
Maine	13.96

All else equal, customers in Rhode Island and Maine will be able to recover the costs of solar installations faster than customers in Kentucky because they are offsetting higher cost electricity, naturally leading to greater adoption rates.

Average disposable income of customers is also shown in modeling to impact adoption of distributed solar resources, with higher disposable incomes positively correlating to higher solar adoption. Residents in Hawaii, Rhode Island, and Maine, as used in Mr. McDonald's example, have higher median incomes and higher average disposable incomes than residents of Kentucky:

State	**Real Median Household Income, Annual[13]**	**Per Capita Disposable Personal Income, 2022[14]**
Kentucky	$55,629	$46,016
Rhode Island	$74,982	$56,289
Maine	$71,139	$52,236
Hawaii	$82,199	$52,515

[12] Source: U.S. EIA State Electricity Profiles 2021, available at: https://www.eia.gov/electricity/state/.
[13] Source: FRED, Real Median Household Income by State, 2021 Annual, available at: https://fred.stlouisfed.org/release/tables?eid=259515&rid=249.
[14] Source: U.S. Bureau of Economic Analysis, "SAINC51 State annual disposable personal income summary: disposable personal income, population, and per capita disposable personal income." (last visited Aug. 8, 2023).

Q. What other factors differentiate Mr. McDonald's referenced states from Kentucky in terms of growth of solar resources?

A. As discussed in my direct testimony, solar irradiance is important factor in the economics of distributed solar adoption.[15] Hawaii, for example, experiences average horizontal solar irradiance of over 5 kWh/m^2/day whereas Kentucky experiences averages between 4 and 4.5 kWh/m^2/day.[16] Higher solar irradiance means more efficient solar generating systems (higher capacity factor) and thus a shorter return on investment.

Finally, state government-sponsored incentives and programs can reduce the up-front costs of solar installations. Rhode Island, New Mexico, and Hawaii are states that Mr. McDonald references in testimony that have offered or still offer incentives for adopting distributed solar.

Q. Does Mr. McDonald consider these important differences in the various states compared to Kentucky in his testimony?

A. No, the Joint Intervenors have confirmed that Mr. McDonald acknowledges these differences but did not attempt to account or control for them in his analysis.[17]

Q. Is it reasonable for the Companies to extrapolate historic growth rates of Net Metered Solar to future growth of distributed solar capacity as Mr. McDonald suggests? Please explain your answer.

A. No, not in my opinion. Mr. McDonald should have instead looked for explanatory variables, such as those previously mentioned, and then used a model that captures the

[15] Jones Direct Testimony, pp. 33-34.
[16] Source: NREL GIS Global Horizontal Solar Irradiance, available at: https://www.nrel.gov/gis/assets/images/solar-annual-ghi-2018-usa-scale-01.jpg.
[17] *See* Joint Intervenors' Response to Companies' Data Requests, 1-51.

relationship between solar adoptions and those explanatory variables. Mechanically projecting the historical growth rate into the future ignores the reasons that growth has occurred. From 2010 to 2021, solar installation costs dropped dramatically. According to the most recent NREL ATB (2023), from 2010 to 2021, the median residential solar CAPEX declined by 9.2% per year. From 2021 to 2028, however, residential solar CAPEX in the moderate scenario is only projected to decline by 3.0% per year.[18] Based upon only this data, a linear regression model with solar installation cost as the only independent variable would capture this smaller rate of change relative to history and project a smaller rate of growth for solar adoptions in the future.

Additionally, it is important to check the results for reasonableness. Currently the Companies have around 4,000 distributed solar customers. This represents about 0.5% of residential customers today. Even assuming the 1% cap, the Companies' base solar forecast suggests a little more than 2% of residential customers will have distributed solar by 2028 – this means that the Companies are projecting 4 times the current number of distributed solar customers in just the next 5 years. This projected growth is not conservative as Mr. McDonald suggests but instead reflects a steady incremental growth in the number of customers and amount of distributed solar capacity. Conversely, Mr. McDonald's method contemplates more aggressive growth to over 6% of the Companies' residential customers adopting solar by 2028. His projection that the Companies will get to 12 times current levels of adoption in just the next 5 years does not align with the Companies' expectations of reasonable growth.

[18] https://atb.nrel.gov/electricity/2023/residential_pv. The model used in the CPCN load forecast was based upon adjusted 2022 NREL ATB figures, as described at page 29 of Exhibit TAJ-1, and had multiple independent variables: retail electric rate, disposable income, and the grid-to-LCOE ratio (retail rate/LCOE of solar install).

Finally, while distributed solar adoption in the LG&E and KU service territories has grown since 2021, the year-over-year growth rate in incremental capacity and customers, especially in 2023 year-to-date, has slowed. The Companies predicted this slowdown in the growth rate in the CPCN load forecast, and it is likely attributable to higher installed solar costs and the general state of the economy with higher inflation and higher interest rates. Over the first seven months of 2023, the Kentucky service territories experienced just 0.4% growth in NMS distributed solar capacity and 3% growth in NMS distributed solar customers year over year, far lower than Mr. McDonald's 57% annual growth projection.

Q. If the growth of distributed solar generation is higher than the Companies' load forecast has assumed, would it materially affect the Companies' ability to meet winter peak demand?

A. No. As I testified previously and as the Companies have indicated in discovery, solar resources are not expected to meaningfully contribute to winter peak demand based upon the hours in which winter peaks most commonly occur.[19]

Q. Does this conclude your testimony?

A. Yes, it does.

[19] Companies' responses to PSC 2-64(b); JI 1-77.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Tim A. Jones**, being duly sworn, deposes and says that he is Manager – Sales Analysis and Forecast for Louisville Gas and Electric Company and Kentucky Utilities Company, an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge, and belief.

Tim A. Jones

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 3rd day of August 2023.

Notary Public

Notary Public ID No. KYNP63286

My Commission Expires:

January 22, 2027

CAROLINE J. DAVISON
NOTARY PUBLIC
ID # KYNP63286
COMM EXPIRES 01/22/2027
STATE AT LARGE, KENTUCKY