COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF DUKE ENERGY KENTUCKY, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONVERT ITS WET FLUE GAS DESULFURIZATION SYSTEM FROM A QUICKLIME REAGENT PROCESS TO A LIMESTONE REAGENT HANDLING SYSTEM AT ITS EAST BEND GENERATING STATION AND FOR APPROVAL TO AMEND ITS ENVIRONMENTAL COMPLIANCE PLAN FOR RECOVERY BY ENVIRONMENTAL SURCHARGE MECHANISM	)	CASE NO. 2025-00002

DIRECT TESTIMONY OF

NATHAN GAGNON

ON BEHALF OF

DUKE ENERGY KENTUCKY, INC.

January 28, 2025

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I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Nathan Gagnon, and my business address is 525 South Tryon Street, Charlotte, North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Duke Energy Business Services LLC (DEBS) as Managing Director, Integrated Resource Planning & Analytics. DEBS provides various administrative and other services to Duke Energy Kentucky and other affiliated companies of Duke Energy Corporation (Duke Energy).

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Science in Biology in 2004 and a Master of Science in Environmental Science in 2008 from the State University of New York College of Environmental Science and Forestry. I received a Master of Business Administration from the New York University Stern School of Business in 2015. From 2008 to 2014 I held several analyst roles with IHS (now a unit of S&P Global) covering North American power and renewable energy markets. In 2014, I joined Public Service Enterprise Group (PSEG) as a Senior Project Valuation Analyst, performing due diligence and cash flow analytics for potential new power generation projects and acquisitions. I joined Duke Energy in 2016 as a Lead Planning Analyst on the Midwest Integrated Resource Planning team, moved to Integrated System and Operations Planning team as a Principal Coordinator in 2019, and in 2021 joined Duke Energy's Carolinas Integrated Resource Planning team, first as Principal Planning Analyst and then as Director of IRP Regulatory &

Policy Strategy. In 2024 I became Managing Director, IRP & Analytics, for the Company's Midwest regulated utilities. I took this role as the Company was developing its 2024 Integrated Resource Plan (IRP) and was directly involved in its preparation

Q. PLEASE DESCRIBE YOUR RESPONSIBILITIES AS MANAGING DIRECTOR INTEGRATED RESOURCE PLANNING.

A. I lead the development of the long-term resource plans for Duke Energy's electric utility operating companies in Kentucky and Indiana. The overriding objective of those plans is to provide customers with a generating system that is mindful of costs and risks, is increasingly diverse and environmentally sustainable.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THESE PROCEEDINGS?

A. My testimony is to summarize and explain the analysis that was performed in the Company's most recent IRP filed in Case No. 2024-00197 and explain how that analysis included the Company's Application in this case to convert East Bend's lime-based reagent handling system to a limestone-based reagent handling process (Limestone Conversion). In doing so, I discuss Duke Energy Kentucky's modeling as it relates to its generation supply portfolio forecasts, which include the estimated life of the Company's electric generating fleet and how the Company will eventually replace those assets.

II. DISCUSSION

Q. ARE YOU FAMILIAR WITH THE INTEGRATED RESOURCE PLANNING PROCESS FOR DUKE ENERGY KENTUCKY?

A. Yes. Duke Energy Kentucky files its IRP approximately every three years. The Company recently filed its current IRP with the Commission in Case No. 2024-00197 in June 2024 (2024 IRP). This IRP provides a snapshot of Duke Energy Kentucky's resource planning at that point in time.

Q. WERE YOU INVOLVED WITH THE CREATION OF DUKE ENERGY KENTUCKY'S MOST RECENTLY FILED IRP?

A. Yes. I contributed to the development of the Duke Energy Kentucky's IRP including evaluating the various portfolio scenarios that were developed for the IRP.

Q. PLEASE GENERALLY DESCRIBE THE IRP PLANNING PROCESS.

A. The IRP planning process assesses various supply-side, demand-side and emission compliance alternatives to develop a long-term, cost-effective portfolio to provide customers with reliable service at reasonable costs. The IRP planning process involves various assumptions such as future energy prices, future environmental compliance requirements and reliability constraints.

Duke Energy Kentucky's load forecasting group develops the load forecast by: (1) obtaining service area economic forecasts primarily from Moody's Analytics; (2) preparing an energy forecast by applying statistical analysis to certain variables such as number of customers, economic measures, energy prices, weather conditions, *etc.;* and (3) developing monthly peak demand forecasts by statistically analyzing weather data. The Company updates the load forecasts on a regular basis

and the updated load forecasts are used for all modeling analysis. It is important to note that while Duke Energy Kentucky develops internal load forecasts for system planning purposes, the actual load forecast and the Duke Energy Kentucky PJM Interconnection, L.L.C (PJM) load obligation, which includes peak coincidence factors and system reserve requirements, is calculated by PJM and can differ slightly from the Company's internal forecast.

Q. PLEASE BRIEFLY DESCRIBE WHAT THE COMPANY'S 2024 IRP DETERMINED AS IT RELATES TO THE COMPANY'S GENERATING PORTFOLIO, AND PARTICULARLY, THE EAST BEND GENERATING STATION.

A. The Company's 2024 IRP shares some of the characteristics of its previous IRPs. It represents Duke Energy Kentucky's proposed roadmap to meet future energy and demand requirements without compromising reliability of service, energy affordability or the power demands of a growing region. The 2024 IRP reflects updated fuel and load forecasts, as well as updated new generation capital costs reflecting a dynamic macroeconomic and inflationary environment impacting supply chain and resource costs. Additionally, the 2024 IRP includes updated policies at both the state and federal level including:

- The Inflation Reduction Act (IRA) particularly expanded investment and production tax credits for non-CO_2 emitting generating resources;
- The Environmental Protection Agency (EPA) Clean Air Act (CAA) Section 111 April 2024 Updates (EPA CAA Section 111 Update) regulating existing coal and new natural gas generation facilities;

- Updates to Effluent Limitation Guidelines (ELG); 316 a & b (thermal discharge limits and fish impingement/entrainment at water intakes); and tightened Mercury & Air Toxics Standards (MATS); and
- Removal of a CO_2 tax on plant emissions as a likely future policy primarily due to the inclusion of the IRA and EPA CAA Section 111 Update provisions.

Importantly, the 2024 IRP reflects Duke Energy Kentucky's conversion of East Bend from 100% coal generation to coal generation with gas co-firing capabilities, or dual fuel operation (DFO) to be in service as of December 31, 2029. The 2024 IRP includes continued operation of the Woodsdale CT's and the addition of a combined cycle (CC) at East Bend beginning on January 1, 2039. The resource mix is supplemented by demand response and solar resources. A summary of the preferred portfolio of resources through 2040 as modeled in the IRP is provided as follows:

Resources (MW)	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
East Bend (coal)	600	600	600	600	600											
East Bend DFO						600	600	600	600	600	600	600	600	600		
East Bend CC (1x1)															664	664
Woodsdale CTs	564	564	564	564	564	564	564	564	564	564	564	564	564	564	564	564
Demand Response	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Solar	9	9	9	9	59	59	109	109	159	159	209	209	259	259	309	309

The primary difference between the 2021 plan and the 2024 plan is the conversion of East Bend from 100% coal generation to coal generation with natural gas co-firing capabilities, or DFO. This change is driven by environmental regulations, primarily the EPA CAA Section 111 Update that was not in place in 2021. EPA CAA 111 Update limits coal plants to four compliance pathways:

1. Retire by January 1, 2032, without restriction on operation until retirement;
2. Convert the unit to full natural gas operation by January 1, 2030;
3. Convert to at least 40% gas-cofiring by January 1, 2030; or
4. Add Carbon Capture and Sequestration (CCS) by January 1, 2032.

As part of its modeling, the Company determined that natural gas-cofiring was the preferred strategy because it adds needed fuel diversity and security to the Duke Energy Kentucky system, reduces customers' exposure to PJM market prices, provides for a measured energy transition while allowing time for technological advancements related to permanent replacement generation, and is in line with Kentucky's energy policies and priorities.

The 2024 IRP analyzes the portfolio beyond the life of East Bend's December 31, 2038, estimated retirement date as a result of the EPA CAA 111 Update, and includes a 1x1 CC as the optimal replacement resource for East Bend at the time of its retirement. Additionally, the IRP also includes renewable resource assumptions. While the 2024 IRP identifies replacement generation as a 1x1 CC, there is time between this filing and East Bend's compliance-driven retirement to allow other technologies such as nuclear small modular reactors (SMR) or CC

paired with CCS (CC w/ CCS) to evolve such that these other technologies may be used as a replacement for East Bend.

Q. PLEASE EXPLAIN WHY A FULL CONVERSION OF EAST BEND TO 100 PERCENT NATURAL GAS FIRING WAS NOT SELECTED AS A PREFERRED STRATEGY?

A. Full conversion of East Bend to 100 percent natural gas would imprudently expose customers to unreasonable risks in the form of greater energy market exposure and potential exposure to PJM capacity penalties. East Bend is the largest single source of energy for Duke Energy Kentucky customers. Converting the unit to natural gas, a more expensive fuel than coal, would raise the dispatch cost of the unit, making it less economically competitive in the PJM energy market. That cost increase would be passed on to Duke Energy Kentucky's customers either directly, at times when the unit is running, or in the form of greater energy price risk when the unit is not running. The energy price risk would be greater because the price at which East Bend would be competitive when burning gas would be higher than the price at which the unit would compete could it still burn coal. In addition, because the unit would be less economic to operate if converted to gas, it would be called upon in fewer hours. This would increase the risk that when it was called upon, the time to start up would be considerable and the risk of failure to start would increase, which in turn could increase the risk of incurring PJM penalties.

Q. COULD THE COMPANY RETIRE EAST BEND AS SOON AS POSSIBLE AND REPLACE IT WITH A NATURAL GAS COMBINED CYCLE AND THUS AVOID THE NEED FOR THE LIMESTONE CONVERSION? PLEASE EXPLAIN.

A. No, for two primary reasons. First, such an approach would not be cost-effective. The Company evaluated two cases in the 2024 IRP in which East Bend was retired by 2032, the earliest possible date by which a combined cycle project could be completed as of the time the IRP was developed. Both were more expensive than the comparable DFO alternative, as measured by PVRR. Second, as more fully explained by other Company witnesses, the duration of a long-term lime supply agreement currently being offered may not cover the Company's reagent needs to keep East Bend operational long enough to have a seamless replacement with a Combined Cycle generator. And assuming the lime supply is available beyond the term of the currently offered agreement, the price of such reagent is unknown and may be significant. Therefore, over the roughly seven or eight years it would take to complete a combined cycle project, it would likely be long enough for the limestone conversion project to still be economically beneficial for customers.

Finally, such a strategy of an accelerated coal retirement and natural gas replacement could not occur prior to the effective compliance date of the new Mercury Air Toxics Standard (MATs) of July 2027. As explained by Company witnesses Donner and Geers, an upgrade to East Bend's Wet Flue Gas Desulfurization system would still need to occur for the unit to operate in MATs compliance.

Q. PLEASE EXPLAIN WHETHER AND HOW THE COMPANY'S LIMESTONE CONVERSION WAS INCLUDED IN COMPANY'S 2024 IRP.

A. The limestone conversion project, including all capital and operating costs, was included as a base assumption in each of the portfolios evaluated in the 2024 IRP. The capital cost associated with the project can be found in confidential Table H.2 – Generation Operational Characteristics on page 151 of the IRP.

Q. PLEASE SUMMARIZE THE IRP'S EVALUATION OF EAST BEND'S COMPLIANCE WITH ENVIRONMENTAL REGULATIONS, AND SPECIFICALLY, THE MERCURY AIR TOXICS STANDARDS AS AMENDED IN APRIL 2024.

A. The IRP assumed compliance with all applicable environmental regulations. The fact that the IRP included the Limestone Conversion as a base assumption in each of the portfolios evaluated, the investments necessary to comply with the newly enacted MATS revision were also thus assumed in each scenario. The Limestone Conversion had the added benefit of reducing filterable PM meeting the new MATS standard, a separate large scale MATS compliance project was not modeled or necessary to consider. Only minor incremental upgrades to a few components are anticipated.

Q. DOES THE IRP SUPPORT THE LIMESTONE CONVERSION EVEN THOUGH THE CONVERSION WAS INCLUDED AS A BASE ASSUMPTION IN ALL PORTFOLIOS EVALUATED?

A. As explained by Witness Verderame, the support for the Limestone Conversion project is included in the analysis as part of this CPCN docket. The IRP includes the limestone conversion project as a base planning assumption. The purpose of the

IRP is to develop a plan for meeting the Company's Kentucky load requirements over a defined planning horizon based upon information known at the time of the analysis. A reasonable base assumption, given Kentucky's energy policy, at the time of the IRP analysis was that the Company's existing dispatchable fossil generation will be used to meet our Kentucky demand as long as economically and reasonably feasible. A key to that assumption for East Bend, was that the unit would need to take reasonable steps to continue to comply with known environmental regulations in the near term. The limestone conversion provides a reasonable assumption to address supply risks and meet those known compliance obligations and can be viewed as a proxy for other environmental investments that may be necessary should the Commission ultimately deny the Company's CPCN in this case.

At the time that forecasts and assumptions were developed for the IRP (late 2023), the economics of the conversion project were favorable in comparison to the cost of reagents that would be required without the conversion even if the unit were to stop burning coal by 2030. In other words, it would be in the best interest of customers for the Company to undertake the Limestone Conversion project regardless of whether the unit would be converted to natural gas fuel by 2030. However, since the forecasts and assumptions were developed for the IRP, the estimated costs of conversion have increased, and the forecasted cost of reagents required without the conversion has decreased. It remains true that failing to pursue the conversion project would expose customers to future cost and supply risk associated with reagent procurement in a future in which the unit continues to burn

coal into the 2030s, including in the event that the EPA CAA Section 111d Update is reversed.

Q. PLEASE EXPLAIN WHY IT IS REASONABLE TO INCLUDE THE LIMESTONE CONVERSION AS A BASE ASSUMPTION.

A. As explained above, the limestone conversion project was assessed to be the best alternative at the time the inputs to the IRP were developed, and as such, the project was included as a base assumption. As Mr. Verderame explains, the Company continues to believe that the conversion remains a reasonable and beneficial investment for customers.

Q. PLEASE EXPLAIN HOW THE IRP ADDRESSES CHANGES IN FIXED OPERATIONS AND MAINTENANCE AND MAINTENANCE CAPITAL FOR EAST BEND.

A. The IRP analysis, specifically the PVRR, accounts for differences in fixed O&M and maintenance capital when coal is no longer available and/or when gas is available at East Bend. In fact, there is a significant decrease in costs in 2033 in the NGC case versus the DFO case that is accounted for in the PVRR for those cases.

Q. HOW DOES THE IRP ADDRESS THE INCLUSION OF SOLAR AS A POTENTIAL RESOURCE FOR THE COMPANY?

A. The Company's optimized DFO portfolio selected solar beginning in 2039 with a total of 250 MW being selected by 2040. The Company tested accelerating, and more evenly distributing those renewables over the portfolio. When the Company compared PVRRs in those DFO cases, there was a negligible impact to PVRR (approximately $2 million more expensive in the accelerated renewables case over the 15-year planning horizon). Given the fuel and resource diversity benefits of

accelerating solar, and the minimal impact to overall cost to customers, the Company's preferred plan included 50 MW of solar being added to the system every other year beginning in 2029 for the remainder of the planning horizon. On the other hand, the optimized Natural Gas Conversion case selected solar beginning in 2037, with a total of 50 MW being selected by 2040. There was no cause for testing similar acceleration of solar in the Natural Gas Conversion case because only 50 MW of solar was selected over the entire planning horizon.

Q. DO YOU BELIEVE THAT THE COMPANY'S 2024 IRP PRESENTS A REASONABLY COMPLETE ANALYSIS UNDER KENTUCKY REGULATIONS?

A. Yes. Appendix G of the IRP provides a detailed account of where in the document each Commission requirement of the IRP is met, and Appendix F details the Company's responses to the Commission Staff's comments regarding the 2021 IRP. Additionally, as detailed in Chapter 6 of the IRP, the Company provides a robust analysis of potential generation portfolios, including an assessment of East Bend configuration and retirement alternatives in futures where EPA CAA Section 111 Update remains in place and where the Update is repealed.

Q. IS ADDITIONAL RESOURCE PLANNING ANALYSIS NECESSARY TO SUPPORT THE LIMESTONE CONVERSION PROJECT?

A. No. Conducting additional resource planning analysis at this time would not provide this Commission with additional actionable information. Removing the Limestone Conversion project from the Natural Gas Conversion case *might* improve the PVRR of that case, but it would certainly increase reliance on the PJM market beginning in the 2027 timeframe which would add more evidence for not

pursuing the NGC alternative. Accelerating renewables in the NGC case, when the model is not selecting more than 50 MW of renewables over the planning horizon in that case to begin with may slightly reduce reliance on the market, but it would certainly increase the cost of the portfolio. Finally, future operating costs and investments at East Bend are already included in the IRP and those investments are both incorporated in the PVRR and vary between the NGC, DFO, and early retirement cases. Additional resource planning analysis would not lead to additional meaningful information in this docket.

In addition, as explained by Mr. Geers, the Company would still have to make investments to meet the MATs update, which the Limestone Conversion already includes.

III. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes

VERIFICATION

STATE OF NORTH CAROLINA)
) SS:
COUNTY OF MECKLENBURG)

The undersigned, Nathan Gagnon, Managing Director, Integrated Resource Planning & Analytics, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony, and that the information contained therein is true and correct to the best of his knowledge, information, and belief.

Nathan Gagnon, Affiant

Subscribed and sworn to before me by Nathan Gagnon on this 23 day of JAN, 2025.

NOTARY PUBLIC

SHEILA LEMOINE
Notary Public, North Carolina
Lincoln County
My Commission Expires
July 21, 2029

My Commission Expires: July 21, 2029