KyPSC Case No. 2024-00152
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VERIFICATION

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG)

SS:

The undersigned, John Verderame, VP Fuels & Systems Optimization, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing supplemental data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

John Verderame, Affiant

Subscribed and sworn to before me by John Verderame on this 25th day of October, 2024.

NOTARY PUBLIC

My Commission Expires:

SHAMELL M WILSON
My Comm. Expires
NOTARY PUBLIC
July 06, 2026
MECKLENBURG COUNTY, NC

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG)

SS:

The undersigned, Ryan Trogstad, Senior Data Science Consultant, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing supplemental data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Ryan Trogstad, Affiant

Subscribed and sworn to before me by Ryan Trogstad on this 24th day of October, 2024.

LUCAS K SMITH NOTARY PUBLIC MECKLENBURG COUNTY, NC

NOTARY PUBLIC

My Commission Expires: June 5, 2029

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-002

REQUEST:

Refer to the Verderame Direct Testimony, page 16, lines 22-24 and page 17, lines 1-8.

a. Compare and contrast the assumptions used in the production cost modeling of the two scenarios.

b. Explain whether the forecast PJM energy and capacity market prices modeled in the present proceeding are the same as those used in Duke Kentucky's Integrated Resource Plan Case No. 2024-00197.2 If not, explain any differences and the reasons for those differences in the assumptions used.

c. Explain how the recent results of the PJM 2024/2025 Base Residual Auction affect Duke Kentucky's analysis in the present proceeding.

d. Explain how, if at all, the Duke Energy Ohio Kentucky (DEOK) PJM Load Zone being constrained affects Duke Kentucky's ability to acquire replacement capacity if the Limestone Conversion project is not approved.

ORIGINAL RESPONSE:

a. To calculate the East Bend dispatch cost a basket of market coals is optimized to derive a blended product that serves as a least-cost market dispatch coal, inclusive of coal cost, reagent costs, and transportation. This process was performed for both the quicklime and limestone cases, with the quicklime case using reagent consumption rates representative of the existing emissions control process and limestone using reagent assumptions based on guidance from plant engineering staff.

For quicklime this resulted in a blended coal that had a #5.62 SO2 content and a heat content of 11703 btu/lb. Dispatch costs (inclusive of reagents and transport) escalated from $3.83/mmbtu to $4.19/mmbtu over the model horizon.

For limestone, the modeled coal was a #6 SO2 product at 11782 btu/lb, with dispatch costs escalating from $2.77/mmbtu to $2.97/mmbtu over the model horizon.

This market dispatch price difference (fuel cost and reagent O&M) was the only change between the two model runs used for projecting energy costs. Non reagent O&M costs, unit outage rates, etc. were assumed to be negligibly different between the two scenarios. Power and gas prices, forced outages distributions, and planned outage assumptions were held constant in each case.

b. Energy prices were modeled for this proceeding, capacity prices were not.

The energy prices that informed the 2027-2029 model projections in this proceeding are a product of Duke Energy's mid-horizon (typically current year plus five (5) calendar years) production cost model, PowerSIMM. Duke Energy's configuration of the PowerSIMM model simulates future power prices starting from monthly forward pricing curves, specifically PJM AD Hub for Duke Energy Kentucky. These monthly power prices are then scaled to hourly, unit-level price shapes based on historical relationships between weather, gas, and power. This analysis used forward commodity pricing as of a 4-1-2024 close-of-business (COB) date. Policy and market hypotheticals such as the new EPA 111 rules, carbon regulations, etc., are only included in the power pricing insofar as they influenced market participant buying and selling behavior, which would be captured in the traded market forward prices as of the given COB date.

In the case of Integrated Resource Plan Case No. 2024-00197.2 Encompass would have been used. Encompass is Duke Energy's long term (typically further than five year) model utilizing entirely different methodologies for price formation. As an example, depending on the scenario presented Encompass may factor estimated impacts from EPA 111 explicitly, in contrast to PowerSIMM. The focus of the two models is on different parameters and windows of time, making direct comparisons of simulated prices not particularly meaningful.

c. Assuming that the question was meant to refer to the recent PJM 2025/2026 Base Residual Auction (BRA) results that were posted in late July 2024, the capacity clearing price of $269.92/MW-Day reflects almost a 10-fold increase in the BRA clearing price of $28.92/MW-Day for the 2024/2025 PJM BRA.

Additionally, as the Staff is aware, East Bend is an important resource in the Company's Fixed Resource Requirement (FRR) plan. The Company believes that due to various factors, a trend of higher capacity prices is likely to be seen in future auctions. The impact to Duke Energy Kentucky's FRR plan depends on the Company's capacity position. If Duke Energy Kentucky maintains its slightly long capacity position, the Duke Energy Kentucky customer will benefit due to higher capacity prices since excess capacity not utilized for its FRR plan is generally sold into either the BRA or Incremental Auctions. However, if Duke Energy Kentucky were to have a short capacity position, this general increasing capacity price trend and availability of capacity can negatively impact Duke Energy Kentucky due to higher cost bilaterial capacity purchases and less bilaterial capacity availability. Additionally, in the case that Duke Energy Kentucky is not able to

meet its FRR plan and must rely on a bilaterial capacity purchase, the unavailability of bilaterial capacity could lead to a significant a FRR deficiency penalty assessment.

Since East Bend's capacity amount does not change because of the limestone conversion, the higher capacity price in this auction was not factored into the analysis. However, the higher capacity prices do highlight the importance of East Bend as a Company capacity resource.

d. Since the limestone conversion project does not impact the capacity value of the unit, there is no impact to the Company's ability to acquire replacement capacity if the project is not approved.

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss the potential for [redacted]

The Company has updated its response to this data request as a result.

a. To calculate the East Bend dispatch cost the Company continued to utilize a basket of optimized market coals to derive a blended product that serves as a least-cost market dispatch coal, inclusive of coal cost, reagent costs, and transportation. This process was rerun for the quicklime case using reagent consumption rates representative of the existing emissions control process. Rerunning the quicklime case continued to result in a blended coal that had a #5.62 SO2 content and a heat content of 11703 btu/lb with dispatch costs (inclusive of reagents and transport) escalating from $3.39/mmbtu in January 2027 to $3.63/mmbtu in December 2029.

For limestone, the modeled coal remains a #6 SO2 product at 11782 btu/lb, with dispatch costs escalating from $2.77/mmbtu to $2.97/mmbtu over the model horizon.

This update to the quicklime case and the resulting change in the blended coal market dispatch price was the only change in the supplemental projections. Non reagent O&M costs, unit outage rates, etc. were assumed to be negligibly different between the two scenarios. Power and gas prices, forced outages distributions, and planned outage assumptions were held constant in each case.

PERSON RESPONSIBLE: Ryan Trogstad – a., b.
John Swez – c., d.

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-003

REQUEST:

Refer to the Verderame Direct Testimony, page 17, lines 12-14.

a. Explain whether the modeled PJM purchase volume prices are premised on no other generator in the DEOK PJM Load Zone having the same MEL issues, and thus, PJM energy prices are not affected by this particular environmental reagent issue.

b. In addition to reducing higher cost PJM energy purchase volumes, explain what other factors will lead to an estimated $1.48/MWh decline in the system average fuel rate.

c. Confirm that reagent costs are recovered in the environmental surcharge rate and not the fuel adjustment clause. If not confirmed, explain why not.

ORIGINAL RESPONSE:

a. As discussed in STAFF-DR-01-002, the modeled PJM energy prices were based on the monthly forward PJM AD Hub price curve. These monthly power prices are then scaled to hourly, unit-level price shapes based on historical relationships between weather, gas, and power. Any impacts from reagent costs are only included in the power pricing insofar as they influenced market participant buying and selling behavior, which would be captured in the traded forwards as of the given COB date.

Additionally, modeled PJM energy prices were held constant between the two scenarios. The displaced purchases result from the increased dispatch of East Bend

resulting in a reduction of PJM energy market purchases required to meet Duke Energy Kentucky customer demand.

b. Displaced purchases are the predominant savings. A slightly cheaper fuel blend is assumed in the limestone case based on the economics of using higher sulfur coals, which amounts to around a 1% coal fuel savings relative to the fuel blend cost optimized for quicklime. Additionally, about $700,000 annually of gas fuel cost at Woodsdale is being shifted from serving native load to nonnative sales, with that peaking generation being replaced by East Bend coal generation which is roughly half as expensive. These two considerations amount to approximately 10% of the $1.48/MWh system average fuel rate reduction.

c. Confirmed**.**

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss the potential for [redacted]

The Company has updated its response to this data request as a result.

b. As a result of the proposed lower MEL commodity cost discussed in Company's supplemental response to STAFF-DR-01-005, the supplemental analysis produces a net decline of $0.75/MWh in the native component of the system average fuel rate. The supplemental analysis continues to assume a slightly cheaper fuel blend in the limestone case based on the economics of using higher sulfur coals, which amounts to around a 1% coal fuel savings relative to the fuel blend cost optimized for quicklime. The

remaining savings continues to come from displaced purchases. See STAFF-DR-01-021 Confidential Supplemental Attachment Native Fuel Cost Impact tab for the projected impact the reduction in MEL commodity costs has on native fuel costs.

PERSON RESPONSIBLE: Ryan Trogstad – a., b.
John A. Verderame – c.

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-005

REQUEST:

Refer to the Duke Kentucky Application, page 5, Item 12.

a. Explain the specific additional limitations to MEL supply that are referred to here.

b. Explain how the limitations may lead to material cost increases and a risk in availability of supply alternatives.

ORIGINAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

a. As stated in Mr. Verderame's Direct Testimony, page 5, lines 1 through 8, the limited availability of the reagent product in conjunction with the rapidly increasing costs may adversely affect not only the competitiveness of East Bend Station in today's power markets, but also pose continued risks to the East Bend Station from a reliability, compliance and economic perspective.

b. As stated in Mr. Verderame's Direct Testimony, page 6, lines 12 through 22, the lack of a competitive market for the MEL product and the [redacted] presents a significant risk of further cost increases. The lack of a functioning competitive market as stated in Mr. Verderame's Direct Testimony, page 7, lines 20 through 24, places the company at a significant disadvantage in pricing negotiations. In addition, there is fuel security risk stemming from the scarcity of the MEL product that has the correct chemical content required to operate the WFGD which places

the continued operation of the station at risk. If the Company is unable to secure the necessary reagents to operate the WFGD, East Bend will be unable to comply with required environmental regulations and be forced to shut down prematurely, and possibly permanently.

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

a. Currently, there remains only [redacted] with availability to supply the MEL product to the station. However, after Duke Energy Kentucky filed its Limestone Conversion CPCN Application, its current MEL supplier became interested in discussing a potential supply offer that would reduce the MEL commodity price beginning in 2025 for a period [redacted]. While the offer reduces the risk of supply availability and commodity pricing over the [redacted] it does not negate the continued fuel security risk stemming from the scarcity of the MEL product that has the correct chemical content required to operate the WFGD which places the continued operation of the station at risk from a reliability, compliance and economic perspective. In addition, the Limestone Conversion project includes upgrades to the existing scrubber units that would meet the new MATS standard for fine particulate. If the Company does not perform the Limestone Conversion, it would still have to undertake a project to upgrade the scrubbers to comply with MATS. The Company has not performed the engineering for the upgrades required to provide the same MATs benefits as the Limestone Conversion Project but estimates its scope is approximately 25% of the current CPCN project, which would equate to an approximately $25.0 to $30.0 million stand-alone project.

PERSON RESPONSIBLE: John A. Verderame

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-009

REQUEST:

Refer to the Verderame Direct Testimony, page 14, line 21 and page 15, line 8, where two alternatives to the proposed project were discussed.

a. Explain whether any other alternatives were considered beyond these.

b. If so, list those alternatives and discuss why they were not included here.

ORIGINAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

a. As stated in Mr. Verderame's Direct Testimony, East Bend's WFGD process relies upon a highly specialized version of quicklime to control SO2 emissions. The company issued a public request for proposal in 2023 [redacted]. Over the past year, the Company has made numerous attempts to locate an alternative supply of high magnesium lime, or alternatively, an alternative supply of standard quicklime that could be combined with magnesium hydroxide slurry for use at the station to no avail. In negotiations with the current supplier, discussions regarding the possibility of a longer-term agreements were denied by the supplier based on market uncertainty. As the East Bend Station requires this specific MEL product, these were the only viable options for consideration.

b. N/A

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

Please see Supplemental Testimony of John A. Verderame and Company's supplemental response to STAFF-DR-01-005. After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss a new MEL supply contract from its existing supplier consisting of a [redacted]

PERSON RESPONSIBLE: John A. Verderame

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-021

REQUEST:

Refer to the Application, page 6, paragraph 14. Provide the analysis that was conducted to support the impact the higher cost of lime-based reagent has on the unit's capacity factor.

ORIGINAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET (As to Attachment only)

Please see STAFF-DR-01-021 Confidential Attachment.

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss the potential for [redacted]

The Company has updated its response to this data request as a result. Please see STAFF-DR-01-021 Confidential Supplemental Attachment.

PERSON RESPONSIBLE: Ryan Trogstad

CONFIDENTIAL PROPRIETARY TRADE SECRET

STAFF-DR-01-021 SUPPLEMENTAL CONFIDENTIAL ATTACHMENT

FILED UNDER SEAL

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-022

REQUEST:

Refer to the Application, page 6, paragraph 15. Provide a detailed financial and benefit/cost analysis for each of the three alternatives that were considered for the Limestone Conversion Project.

ORIGINAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

1) **Limestone Conversion Project:** Please see STAFF-DR-01-021 Confidential Attachment.
2) **RFP exploring alternative sources**: Duke Energy Kentucky solicited the market for available lime through a Request for Proposal on March 29, 2023. The solicitation was sent to eleven potential lime suppliers which included the major known producers of the product needed for East Bend Station. In response to the RFP, Duke Energy Kentucky received two responses for potential supply to the station, however [redacted] with availability to supply the product to the station.
3) **On-site mixing of magnesium hydroxide with hi-calcium quicklime to create a replacement mag-lime product:** First, [redacted] as discussed in Verderame direct pg. 16, lines 7 through 8.

Second, [redacted] yields ~212lbs of Mg(OH)2 per ton on lime. A typical high calcium lime/low mag lime supply (Example St. Genevieve) yields ~22lbs of Mg(OH)2 for a difference/deficit of 190lbs Mg(OH)2 / TN of Lime. Commercially produced magnesium hydroxide comes in a 60% slurry by weight with a bulk density of 12.8lb/gallon, of that 7.68lbs are magnesium hydroxide due to 40% being water. Previous cost on a as delivered basis was $0.267/lb. and $0.50/lb. on a dry basis. So, multiplying the 190lb deficit of mag hydroxide by the dry mag hydroxide product cost (190lb * 0.50), would equal ~$95/TN of lime in mag hydroxide cost or an additional $5.7M/yr. in reagent cost for a 60K TN/Yr. usage rate. Breaking this down for a mag hydroxide usage, it would take ~9,522 tons of mag hydroxide / year or roughly 432 trucks / year.

Finally, no equipment renovations are needed for this alternative.

SUPPLMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss the potential for [redacted]

The Company has updated its response to this data request as a result.

1) **Limestone Conversion Project:** Please see STAFF-DR-01-021 Confidential Supplemental Attachment. In addition, as discussed in Company's supplemental response to STAFF-DR-01-005 the Limestone Conversion project includes upgrades to the existing scrubber units that would meet the new MATS standard for fine particulate. If the Company does not perform the Limestone Conversion, it

would still have to undertake a project to upgrade the scrubbers to comply with MATS. The Company has not performed the engineering for the upgrades required to provide the same MATs benefits as the Limestone Conversion Project but estimates its scope is approximately 25% of the current CPCN project, which would equate to an approximately $25.0 to $30.0 million stand-alone project.

2) **RFP exploring alternative sources**: See Company's response to STAFF-DR-01-005 as well as STAFF-DR-01-021 Confidential Supplemental Attachment for the projected impact the reduction in MEL commodity costs has on dispatch cost and native fuel costs.

PERSON RESPONSIBLE: John A. Verderame
Ryan Trogstrad
Adam Prichard

Duke Energy Kentucky
Case No. 2024-00152
STAFF First Set of Data Requests
Date Received: August 23, 2024

PUBLIC SUPPLEMENTAL STAFF-DR-01-027

REQUEST:

Refer to the Verderame Direct Testimony, page 16, line 16. Provide details that support the $18.6 million in annual reagent savings. Include any supporting documentation or calculations.

ORIGINAL RESPONSE:

Please see STAFF-DR-01-021 Confidential Attachment.

SUPPLEMENTAL RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

After Duke Energy Kentucky filed its Limestone Conversion CPCN Application in late July 2024, its current MEL supplier approached the Company to discuss the potential for [redacted]

The Company has updated its response to this data request as a result.

See STAFF-DR-01-021 Confidential Supplemental Attachment DEK Cost Breakdowns Tab for the projected change in annual reagent savings from $18.6 million to $11.6 million as a result of the reduction in the MEL commodity costs discussed in the supplemental response to STAFF-DR-01-005.

PERSON RESPONSIBLE: Ryan Trogstad (Original response)
John A. Verderame (Supplemental response)