KyPSC Case No. 2024-00197
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VERIFICATION

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

The undersigned, Matt Kalemba, Vice President Integrated Resource Planning, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing post hearing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Matt Kalemba Affiant

Subscribed and sworn to before me by Matt Kalemba on this 16 day of January 2024. 5 81

Sheila Lemoine
NOTARY PUBLIC

My Commission Expires: July 21, 2029

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

Duke Energy Kentucky
Case No. 2024-00197
STAFF's First Set Post Hearing Data Requests
Date Received: December 16, 2024

STAFF-PHDR-01-009

REQUEST:

Refer to Case No. 2024-00285,[1] Application, page 11. Duke Kentucky indicates that the transfer to full Reliability Pricing Model (RPM) participation in PJM best protects customers from the risk of a large energy intensive customer locating in its service territory and requiring service prior to Duke Kentucky being able to build or acquire generation.

a. Provide an updated load forecast based upon a hypothetical energy intensive customer locating in Duke Kentucky's service territory and requiring service prior to it being able to build or acquire generation. The response should include two different forecasts, one with the customer being a large industrial or manufacturing entity that will require more than one hundred of long-term employees located in the territory after construction and the other being a large load customer, such as a data center, requiring less than 50 long-term employees located in the territory after construction.

b. Utilizing each of the two updated hypothetical load forecasts and all else being equal, rerun the EnCompass model's resource optimization and production cost routines for Duke Kentucky's six optimized portfolios represented in IRP table 6.1-6.6, pages 43-45.

[1] Case No. 2024-00285 *Electronic Application of Duke Energy Kentucky, Inc. to Become a Full Participant in the PJM Interconnection LLC, Base Residual, and Incremental Auction Construct for the 2027/2028 Delivery Year and for Necessary Accounting and Tariff Changes* (filed Sep. 6, 2024) at 11.

c. Also provide the associated present value revenue requirement (PVRR) for the new analyses run similar to that provided in Duke Kentucky's response to Staff's First Request, Item 18.

RESPONSE:

a. Please see STAFF-PHDR-01-009(a) Attachment for the two updated load forecasts, one that includes a hypothetical industrial entity and a second that includes a hypothetical data center. In each case, the hypothetical energy intensive customer ramps up operations over several years, beginning in 2026.

b. Please see STAFF-PHDR-01-009(b) Attachment for the optimized portfolios developed for the two load forecasts described in part (a) above. As expected, considerable additional capacity is required to serve the new hypothetical loads, including battery energy storage (both stand-alone and paired with solar) and, in some cases, additional combustion turbines. All six cases for the hypothetical data center load include a 50 MW market capacity purchase in 2028 to serve additional load in 2028, which is prior to the point by which new resources can be brought online. Note that these portfolios are based on the "optimized" portfolios developed for the IRP. The model was allowed to select new resources without consideration of market risk, technology risk, or the specific considerations required by Kentucky Senate Bill 4 or Kentucky Senate Bill 349. One notable risk is the selection of a combined cycle generator with carbon capture and sequestration capability as a replacement for East Bend 2 when the unit retires. The Preferred Portfolio for the 2024 IRP, which is one of the "alternate" (rather than "optimized") portfolios, prudently mitigates these risks.

c. Please see STAFF-PHDR-01-009(c) Attachment for cumulative PVRRs through 2040 for the portfolios developed using the updated load forecasts that include the hypothetical energy intensive customers. As expected, the PVRRs for the high load cases are substantially higher than for the cases presented in the IRP, reflecting the cost of the additional resources required to serve the additional hypothetical load.

PERSON RESPONSIBLE: Matt Kalemba

	Summer Peak Load After EE, Before DR	Incremental Load from Data Center (MW)	Summer Peak Load with Data Center (MW)	% Increase Over Base Load
2025	810	0	810	0.0%
2026	812	10	823	1.3%
2027	812	53	865	6.5%
2028	812	158	970	19.4%
2029	812	209	1,022	25.8%
2030	822	416	1,238	50.6%
2031	827	419	1,246	50.6%
2032	831	422	1,254	50.8%
2033	838	419	1,257	50.0%
2034	844	421	1,265	49.9%
2035	862	419	1,281	48.6%
2036	872	419	1,291	48.0%
2037	882	418	1,300	47.4%
2038	892	422	1,314	47.4%
2039	902	419	1,321	46.5%
2040	910	419	1,328	46.0%

	Summer Peak Load After EE, Before DR	Incremental Load from High Industrial (MW)	Summer Peak Load with High Industrial Load (MW)	% Increase Over Base Load
2025	810	0	810	0.0%
2026	812	10	822	1.2%
2027	812	27	839	3.3%
2028	812	40	852	4.9%
2029	812	200	1,013	24.7%
2030	822	304	1,126	37.0%
2031	827	296	1,123	35.8%
2032	831	299	1,130	36.0%
2033	838	301	1,140	35.9%
2034	844	301	1,145	35.7%
2035	862	299	1,161	34.7%
2036	872	296	1,168	33.9%
2037	882	299	1,181	33.8%
2038	892	299	1,191	33.6%
2039	902	301	1,203	33.4%
2040	910	299	1,209	32.9%

	Winter Peak Load After EE, Before DR (MW)	Incremental Load from Data Center (MW)	Winter Peak Load with Data Center (MW)	% Increase Over Base Load
2025	737	0	737	0.0%
2026	738	10	748	1.4%
2027	740	50	790	6.8%
2028	740	152	892	20.5%
2029	739	204	943	27.5%
2030	747	385	1,132	51.6%
2031	749	402	1,151	53.6%
2032	746	404	1,150	54.1%
2033	755	405	1,160	53.6%
2034	759	407	1,167	53.6%
2035	774	407	1,181	52.6%
2036	777	385	1,163	49.6%
2037	779	404	1,182	51.8%
2038	778	403	1,181	51.7%
2039	798	405	1,203	50.7%
2040	808	407	1,215	50.4%

	Winter Peak Load After EE, Before DR (MW)	Incremental Load from High Industrial (MW)	Winter Peak Load with High Industrial Load (MW)	% Increase Over Base Load
2025	737	0	737	0.0%
2026	738	10	748	1.3%
2027	740	27	766	3.6%
2028	740	40	780	5.3%
2029	739	195	934	26.4%
2030	747	280	1,027	37.5%
2031	749	301	1,051	40.2%
2032	746	306	1,052	41.0%
2033	755	296	1,052	39.2%
2034	759	298	1,057	39.2%
2035	774	293	1,067	37.8%
2036	777	280	1,057	36.0%
2037	779	298	1,076	38.2%
2038	778	300	1,078	38.6%
2039	798	296	1,095	37.1%
2040	808	298	1,106	36.9%

	Net Energy for Load (GWh after EE)	Incremental Energy from Data Center (GWh)	Net Energy with Data Center (GWh after EE)	% Increase Over Base Load
2025	4,284	0	4,284	0.0%
2026	4,291	90	4,380	2.1%
2027	4,285	449	4,734	10.5%
2028	4,291	1,351	5,642	31.5%
2029	4,282	1,796	6,079	41.9%
2030	4,363	3,593	7,955	82.4%
2031	4,370	3,593	7,963	82.2%
2032	4,390	3,603	7,992	82.1%
2033	4,400	3,593	7,993	81.6%
2034	4,420	3,593	8,013	81.3%
2035	4,525	3,593	8,118	79.4%
2036	4,561	3,603	8,163	79.0%
2037	4,577	3,593	8,170	78.5%
2038	4,603	3,593	8,196	78.1%
2039	4,630	3,593	8,222	77.6%
2040	4,677	3,603	8,279	77.0%

	Net Energy for Load (GWh after EE)	Incremental Energy from High Industrial GWh)	Net Energy with High Industrial Load (GWh after EE)	% Increase Over Base Load
2025	4,284	0	4,284	0.0%
2026	4,291	76	4,366	1.8%
2027	4,285	204	4,489	4.8%
2028	4,291	303	4,594	7.1%
2029	4,282	1,513	5,795	35.3%
2030	4,363	2,269	6,632	52.0%
2031	4,370	2,269	6,639	51.9%
2032	4,390	2,275	6,665	51.8%
2033	4,400	2,269	6,670	51.6%
2034	4,420	2,269	6,689	51.3%
2035	4,525	2,269	6,794	50.1%
2036	4,561	2,275	6,836	49.9%
2037	4,577	2,269	6,846	49.6%
2038	4,603	2,269	6,872	49.3%
2039	4,630	2,269	6,899	49.0%
2040	4,677	2,275	6,952	48.7%

High Data Center Load

Table 1: With EPA CAA Section 111 Update: East Bend DFO Conversion by 2030

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 w/CCS (1x1)															591	591
Capacity Purchase				50												
Battery					50	300	300	300	300	300	300	300	300	300	400	400
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	9	9	9	9	9	9	109	109	159	159	209	359
Solar + Storage: Solar					210	490	560	560	560	560	560	630	630	700	770	770
Solar + Storage: Battery					75	175	200	200	200	200	200	225	225	250	275	275

Table 2: With EPA CAA Section 111 Update - East Bend Natural Gas Conversion by 2030

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 NGC						600	600	600	600	600	600	600	600	600	600	600
Capacity Purchase				50												
Battery					150	400	400	400	400	400	400	400	400	400	400	400
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	9	9	209	209	209	259	409	609	709	709	759	909
Solar + Storage: Solar						280	280	280	280	280	280	280	280	350	350	350
Solar + Storage: Battery						100	100	100	100	100	100	100	100	125	125	125

Table 3: With EPA CAA Section 111 Update - East Bend Retirement by 2032

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	600	600									
New CT							426	851	851	851	851	851	851	851	851	851
Capacity Purchase				50												
Battery					150	300	300	300	300	300	300	300	300	300	300	300
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	9	259	259	259	259	259	309	409	559	609	609	609
Solar + Storage: Solar						420	420	420	420	420	420	420	420	420	420	490
Solar + Storage: Battery						150	150	150	150	150	150	150	150	150	150	175

Table 4: Without EPA CAA Section 111 Update - East Bend DFO Conversion by 2030

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 w/CCS (1x1)															591	591
Capacity Purchase				50												
Battery					50	300	300	300	300	300	300	300	300	350	400	400
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
Wind																50
Solar	9	9	9	9	9	9	9	9	9	9	109	109	159	159	209	209
Solar + Storage: Solar					210	490	560	560	560	560	560	630	630	630	770	770
Solar + Storage: Battery					75	175	200	200	200	200	200	225	225	225	275	275

Table 5: Without EPA CAA Section 111 Update - East Bend Natural Gas Conversion by 2030

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 NGC						600	600	600	600	600	600	600	600	600	600	600
Capacity Purchase				50												
Battery					150	450	450	450	450	450	450	450	450	450	450	450
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	9	59	309	359	359	359	459	659	809	809	859	1,009
Solar + Storage: Solar						140	140	140	140	140	140	140	140	210	210	210
Solar + Storage: Battery						50	50	50	50	50	50	50	50	75	75	75

Table 6: Without EPA CAA Section 111 Update - East Bend Retirement by 2036

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	600	600	600	600	600	600					
East Bend CC w/CCS (1x1)												591	591	591	591	591
Capacity Purchase				50												
Battery					150	400	400	400	400	400	400	500	500	500	500	500
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	9	9	9	9	9	9	9	9	9	9	59	209
Solar + Storage: Solar						280	350	350	350	350	350	490	490	560	560	560
Solar + Storage: Battery						100	125	125	125	125	125	175	175	200	200	200

High Industrial Load

Table 7: With EPA CAA Section 111 Update: East Bend DFO Conversion by 2030

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 w/CCS (1x1)															591	591
Battery					100	200	200	200	200	200	200	200	200	200	350	350
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	9	9	9	9	9	9	9	9	9	9	9	59
Solar + Storage: Solar					70	280	280	280	280	350	420	420	490	490	490	490
Solar + Storage: Battery					25	100	100	100	100	125	150	150	175	175	175	175

Table 8: With EPA CAA Section 111 Update - East Bend Natural Gas Conversion by 2030

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 NGC						600	600	600	600	600	600	600	600	600	600	600
Battery					100	200	200	200	200	200	200	200	200	200	200	200
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	9	9	9	9	109	109	109	209	459	459	509	609
Solar + Storage: Solar					70	280	280	280	280	280	350	350	350	420	420	420
Solar + Storage: Battery					25	100	100	100	100	100	125	125	125	150	150	150

Table 9: With EPA CAA Section 111 Update - East Bend Retirement by 2032

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	600	600									
New CT								851	851	851	851	851	851	851	851	851
Battery					100	200	200	200	200	200	200	200	200	200	200	200
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	9	209	259	259	259	259	259	259	359	359	359	409
Solar + Storage: Solar					70	210	210	210	210	210	210	210	210	210	210	280
Solar + Storage: Battery					25	75	75	75	75	75	75	75	75	75	75	100

Table 10: Without EPA CAA Section 111 Update - East Bend DFO Conversion by 2030

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 w/CCS (1x1)															591	591
Battery					100	300	300	300	300	300	300	300	300	300	450	450
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	9	9	9	9	59	59	109	109	159	159	159	259
Solar + Storage: Solar					70	70	70	70	70	70	140	140	210	210	210	210
Solar + Storage: Battery					25	25	25	25	25	25	50	50	75	75	75	75

Table 11: Without EPA CAA Section 111 Update - East Bend Natural Gas Conversion by 2030

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 NGC						600	600	600	600	600	600	600	600	600	600	600
Battery					100	200	200	200	200	200	200	200	200	200	200	200
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	9	9	9	59	59	109	109	259	259	309	559	659
Solar + Storage: Solar					70	280	280	280	280	280	350	350	420	420	420	420
Solar + Storage: Battery					25	100	100	100	100	100	125	125	150	150	150	150

Table 12: Without EPA CAA Section 111 Update - East Bend Retirement by 2036

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	600	600	600	600	600	600					
East Bend CC w/CCS (1x1)												591	591	591	591	591
Battery					100	300	300	300	300	300	300	450	450	450	450	450
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	9	9	9	9	9	9	9	9	59	59	159	259
Solar + Storage: Solar					70	70	70	70	70	70	140	140	140	210	210	210
Solar + Storage: Battery					25	25	25	25	25	25	50	50	50	75	75	75

Figure 1: PVRR ($000) – Optimized With EPA CAA Section 111 Update with High Data Center Load

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
111 Scenario with DFO Conversion 2030	$430,619	$686,279	$856,677	$1,072,044	$1,297,660	$1,715,395	$2,051,464	$2,351,480	$2,637,777	$2,886,690	$3,169,248	$3,397,983	$3,615,482	$3,826,328	$4,031,244	$4,235,044
111 Scenario 100% Natural Gas Conversion	$430,210	$680,742	$847,342	$1,063,014	$1,275,614	$1,731,428	$2,073,773	$2,388,435	$2,668,465	$2,935,955	$3,182,692	$3,411,699	$3,630,103	$3,841,828	$4,040,185	$4,236,484
111 Scenario East Bend 2 Retires 2032	$438,424	$693,728	$860,019	$1,053,135	$1,268,362	$1,601,128	$1,924,241	$2,242,541	$2,539,712	$2,821,442	$3,096,354	$3,356,839	$3,602,545	$3,838,008	$4,061,289	$4,297,198

Figure 2: PVRR ($000)– Optimized Without EPA CAA Section 111 Update with High Data Center Load

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Optimized - East Bend DFO Conversion by 2030	$434,560	$688,211	$858,357	$1,076,133	$1,300,974	$1,709,425	$2,036,256	$2,320,963	$2,597,643	$2,839,494	$3,111,322	$3,332,537	$3,542,666	$3,747,048	$3,952,924	$4,158,613
Optimized - East Bend Natural Gas Conversion by 2030	$427,998	$668,181	$831,834	$1,042,061	$1,250,121	$1,706,186	$2,050,497	$2,356,830	$2,632,780	$2,892,114	$3,152,866	$3,388,006	$3,610,220	$3,823,149	$4,023,843	$4,219,067
Optimized - East Bend Retirement by 2036	$438,976	$691,722	$862,461	$1,079,382	$1,300,174	$1,631,373	$1,941,153	$2,212,950	$2,462,502	$2,696,057	$2,918,981	$3,157,027	$3,382,929	$3,601,404	$3,807,711	$4,009,591

Figure 3: PVRR ($000) – Optimized With EPA CAA Section 111 Update with High Industrial Load

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
111 Scenario with DFO Conversion 2030	$428,802	$680,437	$842,460	$1,020,400	$1,229,650	$1,570,568	$1,830,728	$2,067,145	$2,296,437	$2,501,156	$2,743,581	$2,934,855	$3,117,314	$3,291,474	$3,462,518	$3,630,920
111 Scenario 100% Natural Gas Conversion	$431,005	$681,169	$841,001	$1,016,652	$1,220,063	$1,606,259	$1,877,696	$2,135,034	$2,362,346	$2,582,263	$2,784,639	$2,975,760	$3,156,368	$3,331,737	$3,496,757	$3,659,494
111 Scenario East Bend 2 Retires 2032	$436,865	$689,790	$848,525	$1,002,354	$1,210,391	$1,467,683	$1,703,397	$1,969,639	$2,217,239	$2,451,930	$2,681,721	$2,900,550	$3,107,301	$3,305,909	$3,495,195	$3,689,703

Figure 4: PVRR ($000)– Optimized Without EPA CAA Section 111 Update with High Industrial Load

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Optimized - East Bend DFO Conversion by 2030	$433,002	$687,739	$850,090	$1,027,255	$1,238,592	$1,567,843	$1,817,338	$2,049,928	$2,278,977	$2,470,761	$2,698,671	$2,877,297	$3,049,168	$3,211,657	$3,381,266	$3,544,555
Optimized - East Bend Natural Gas Conversion by 2030	$427,053	$670,165	$825,506	$1,000,207	$1,201,325	$1,589,432	$1,863,771	$2,113,499	$2,340,517	$2,552,730	$2,771,429	$2,969,578	$3,156,143	$3,334,729	$3,502,307	$3,666,811
Optimized - East Bend Retirement by 2036	$441,230	$693,741	$852,412	$1,030,891	$1,241,961	$1,497,090	$1,730,655	$1,944,503	$2,142,148	$2,324,960	$2,501,792	$2,696,993	$2,882,451	$3,061,532	$3,231,081	$3,394,644