

**COMMONWEALTH OF KENTUCKY  
BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

<b>ELECTRONIC APPLICATION OF KENTUCKY</b>	)	
<b>POWER COMPANY FOR APPROVAL OF A</b>	)	
<b>CERTIFICATE OF PUBLIC CONVENIENCE</b>	)	
<b>AND NECESSITY FOR ENVIRONMENTAL</b>	)	
<b>PROJECT CONSTRUCTION AT THE</b>	)	<b>CASE NO.</b>
<b>MITCHELL GENERATING STATION, AN</b>	)	<b>2021-00004</b>
<b>AMENDED ENVIRONMENTAL COMPLIANCE</b>	)	
<b>PLAN, AND REVISED ENVIRONMENTAL</b>	)	
<b>SURCHARGE TARIFF SHEETS</b>	)	

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**SIERRA CLUB’S RESPONSES TO  
KENTUCKY POWER COMPANY’S DATA REQUESTS TO SIERRA CLUB**

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Intervenor Sierra Club hereby provides its Responses, set forth below, to Kentucky Power Company’s (“KPC” or “the Company”) Data Requests to Sierra Club, dated May 28, 2021, in the above-captioned matter. Sierra Club’s Responses are sponsored by Sierra Club expert witness Rachel Wilson, whose sworn Affidavit is being filed contemporaneously herewith. Please note that two of Ms. Wilson’s workpapers, which KPC requested in its Request No. 1, contain **confidential** information, and are being filed and distributed accordingly.

**Request No. 1**

Please provide all supporting documents and work papers in machine readable format, with cells unlocked and formulas intact, that were used in the preparation of testimony of Rachel Wilson (“Ms. Wilson”), including all charts and tables, filed by Sierra Club on May 12, 2021.

**Response**

As KPC acknowledges in a footnote to this request, Sierra Club provided responsive workpapers to KPC on May 21, 2021. These workpapers were seven Excel spreadsheet attachments, **two of which are designated CONFIDENTIAL**. Sierra Club is filing the workpapers herewith, for completeness of the record. Sierra Club is providing the workpapers in digital format, as Excel files, and not converting them into PDFs—both to be responsive to the instructions in this request, and for clarity and precision, which a PDF-converted workpaper could lack.

**Request No. 2**

Please refer to page 6 and Table 1 of Ms. Wilson’s testimony. Please confirm that, in connection with the Synapse Analysis, the EnCompass model was allowed to optimize the mix of resources to create the lowest cost resource plan in the process of producing the Synapse BAU and Synapse 2028 Retirement cases? If the response is anything other than an unconditional confirmation please identify how in connection with the Synapse Analysis the EnCompass Model selected or identify the sources for these cases, including but not limited to, whether the resources were “forced” into the model?

**Response**

KPC’s modeling analysis of the ongoing operation of Mitchell versus its retirement and replacement in 2028 is complicated by the retirement, and need for replacement, of other resources in its portfolio, namely the termination of the Rockport PPA at the end of 2022 and the retirement of the Big Sandy gas unit at the end of 2030. Given the loss of these resources, it becomes more challenging to isolate the effects of the early retirement of the Mitchell plant and its replacement with alternative resources. For that reason, Synapse imposed certain specific constraints to its scenarios, intended to match KPC’s model results in the years prior to the coal retirements, specifically:

- 1) Synapse Retirement with Carbon forces 200 MW of wind in 2023 and 200 MW of wind in 2025. No other resource builds were allowed prior to 2025.
- 2) Synapse BAU with Carbon forces 200 MW of wind in 2023, 200 MW of wind in 2025, 160 MW of solar in 2036, 160 MW of solar in 2038, and 160 MW of solar in 2040. No other resource builds were allowed prior to 2031.
- 3) All scenarios force in a 125 MW CT in 2031.

**Request No. 3**

Please confirm that in connection with the Synapse Analysis the EnCompass model optimized the resource mix to meet a user-defined minimum reserve margin requirement? If the response is anything other than an unconditional confirmation please describe in detail the use of minimum reserve margin requirements in the Synapse Analysis.

**Response**

In addition to the resources described in the Response to KPC Request No. 2, above, the Synapse Analysis optimized the resource mix to meet a user-defined minimum reserve margin requirement of 14.9%.

**Request No. 4**

Please confirm that in connection with the Synapse Analysis the EnCompass model had the capability of adding resources once the minimum reserve margin is met if the addition of those resources reduced the plan's overall cost? If the response is anything other than an unconditional confirmation please describe in detail the use of minimum reserve margin requirements by the Encompass model in connection with the Synapse Analysis.

**Response**

Confirmed.

**Request No. 5**

Please confirm that in connection with the Synapse Analysis the EnCompass model dispatched the Mitchell units economically at all loading levels. If the response is anything other than an unconditional confirmation please describe in detail the manner in which the EnCompass model dispatched the Mitchell units, including whether the minimum loading level was required to run (i.e. must-run requirement).

**Response**

Per KPC's response to Sierra Club RFI 2-1, the Mitchell units were required to run at their minimum loading level of 300 MW.

**Request No. 6**

Please confirm that in connection with the Synapse Analysis the EnCompass model there was no limitation or restriction on the model's ability to add both physical resources and market purchases to meet the Company's energy requirements. If the response is anything other than an unconditional confirmation please describe in detail any such limitation or restriction.

**Response**

The Synapse Analysis included annual limits for physical resource types. These are described in the response to KPC Request No. 7, below. The Synapse Analysis included hourly energy import/export limits from the market of 1,000 MW.

**Request No. 7**

Please provide the following information for each new resource type Ms. Wilson elected to make available to the EnCompass model in connection with the Synapse Analysis in each of the two cases presented in her Direct Testimony:

- a. Any annual limit for the addition of each resource.
- b. Any cumulative limits for the addition of each resource.
- c. If there were any annual or cumulative limit with respect to any resource please provide the basis for the imposition of each limit and the amount of the limit.

**Response**

- a. Annual limits were imposed as in the table below, subject to the limits on individual scenarios described in the Response to KPC Request No. 2, above:

Year	Standalone battery	Paired battery	Paired solar	Standalone solar	Wind
2021	800	120	100	100	0
2022	800	180	100	100	0
2023	800	240	200	200	100
2024	800	300	200	200	100
2025	800	360	400	400	200
2026	800	420	400	400	100
2027	800	480	500	500	100
2028	800	540	500	500	200
2029	800	600	500	500	200
2030	800	660	600	600	200
2031	800	720	600	600	200
2032	800	780	600	600	300
2033	800	840	600	600	300
2034	800	900	600	600	300
2035	800	960	600	600	300
2036	800	960	600	600	400
2037	800	960	600	600	500
2038	800	960	600	600	600
2039	800	960	600	600	700
2040	800	960	600	600	800
2041	800	960	600	600	900
2042	800	960	600	600	1000
2043	800	960	600	600	1100
2044	800	960	600	600	1200



2045	800	960	600	600	1300
2046	800	960	600	600	1400
2047	800	960	600	600	1500
2048	800	960	600	600	1600
2049	800	960	600	600	1700
2050	800	960	600	600	1800

- b. There were no cumulative limits placed on any resource additions.
- c. Annual limits take into account the amount of capacity each resource provides in a given year, the amount of capacity needed to replace Mitchell, energy output and generating profile of each resource, etc.

**Request No. 8**

Please refer to Table 1 “Summary of Synapse modeling results (2050)” on page 6 of Ms. Wilson's testimony and the workpaper titled Scenario\_Comparison — KPCO + CT (20210506).xlsx (provided by Sierra Club to Kentucky Power on May 21, 2021 as a courtesy).

- a. On a total system capacity basis, please explain the reasons for the additional resource capacity added in the 2041 to 2050 timeframe for the Synapse BAU case compared to the Synapse 2028 Retirement case under the “Base No Carbon” scenario. For example, additional PPA and Battery capacity is added in the 2041 to 2050 timeframe for the BAU case compared to the 2028 Retirement case.
- b. In the 2041 to 2050 timeframe, please explain the basis for the additional 700 MW of additional wind resources, 12 MW of Battery and 50 MW to 250 MW of Capacity PPA for the Synapse BAU case compared to the Synapse 2028 Retirement case under “Base With Carbon” scenario.

**Response**

- a. In the 2028 Retirement case under the “Base No Carbon” scenario, the Mitchell units are retired in 2028. The model builds utility-scale solar in the late 2020s and through the 2030s to meet the reserve margin requirements upon the retirement of the Mitchell units. Because of this, it does not need to add as much additional resource capacity in the 2041 to 2050 timeframe as the BAU case, which adds additional resource capacity—including PPA and battery capacity—to meet reserve margin requirements upon the retirement of the Mitchell units in 2040.
- b. This is for a similar reason as described in the response to (a), above. In the 2028 Retirement case under the “Base With Carbon” scenario, the Mitchell units are retired in 2028, and the model builds utility-scale solar in the late 2020s and through the 2030s to meet the reserve margin requirements upon the retirement of the Mitchell units. Because of this, it does not need to add as much additional resource capacity in the 2041 to 2050 timeframe as the BAU case, which adds additional resource capacity to meet reserve margin requirements upon the retirement of the Mitchell units in 2040.

**Request No. 9**

Please refer to Table 9 (identified as Table 8 in the text) “Net present value of revenue requirements, Synapse modeling scenarios” on page 26 of Ms. Wilson’s testimony. Please provide the annual total plan costs that were used to develop the NPVRR for the BAU and Synapse 2028 Retirement Scenarios under both the Base No Carbon and Base with Carbon cases.

**Response**

The costs that were used to develop the NPVRR for the BAU and Synapse 2028 Retirement Scenarios under both the Base No Carbon and Base with Carbon cases can be found in the Wilson workpaper titled Attachment 4\_Scenario\_Comparison — KPCO + CT (20210506).xlsx. (The ordering of the workpapers as differently numbered attachments after their creation was random, and has no significance other than for convenience in referencing them.) Specifically, they are summarized in the “NPV” tab, which relies on data in the “Company Capital” tab.

**Request No. 10**

Please refer to Figure 6 (identified as Figure 5 in the text) “Comparison of nameplate capacity in Synapse modeled scenarios, Base No Carbon” on page 29 of Ms. Wilson's testimony. Please provide a table of the annual resource additions by type of resource for the BAU and Retirement scenarios.

**Response**

Year	BAU			Retirement	
	Utility Solar	Battery Storage	Capacity Only PPA	Utility Solar	Capacity Only PPA
2021	-	-	-	-	-
2022	-	-	-	-	-
2023	100	-	-	100	-
2024	-	-	-	-	-
2025	-	-	-	-	-
2026	-	-	-	400	-
2027	-	-	-	500	-
2028	-	-	-	500	-
2029	-	-	-	280	-
2030	-	-	-	-	-
2031	600	-	-	140	100
2032	600	-	-	-	-
2033	300	-	-	-	-
2034	20	-	-	160	-
2035	-	-	-	-	-
2036	-	-	-	-	-
2037	-	-	-	-	-
2038	20	-	-	-	-
2039	-	-	-	-	-
2040	20	-	-	-	-
2041	400	-	300	120	-
2042	-	-	-	-	-
2043	-	-	-	-	-
2044	120	-	-	-	-
2045	-	-	-	-	-
2046	-	-	-	-	-
2047	-	-	-	-	-
2048	-	-	-	-	-

2049	-	-	-	-	-
2050	60	36	-	-	-

**Case No. 2021-00004**  
**Sierra Club Response to KPC Request No. 11**  
**Respondent: Rachel Wilson**

**Request No. 11**

Please refer to Figure 8 (identified as Figure 7 in the text) “Comparison of nameplate capacity in Synapse modeled scenarios, Base with Carbon” on page 31 of Ms. Wilson's testimony. Please provide a table of the annual resource additions by type of resource for the BAU and Retirement scenarios.

**Response**

Year	BAU				Retirement		
	Utility Solar	Onshore Wind	Battery Storage	Capacity Only PPA	Utility Solar	Onshore Wind	Capacity Only PPA
2021	-	-	-	-	-	-	-
2022	-	-	-	-	-	-	-
2023	-	200	-	-	-	200	-
2024	-	-	-	-	-	-	-
2025	-	200	-	-	-	200	-
2026	-	-	-	-	400	-	-
2027	-	-	-	-	500	-	-
2028	-	-	-	-	500	-	-
2029	-	-	-	-	400	-	-
2030	-	-	-	-	-	-	-
2031	600	-	-	-	240	-	50
2032	600	-	-	-	-	-	-
2033	460	-	-	-	-	-	-
2034	-	-	-	-	-	-	-
2035	-	-	-	-	100	-	-
2036	160	-	-	-	-	-	-
2037	-	-	-	-	-	-	-
2038	160	-	-	-	-	-	-
2039	-	-	-	-	-	-	-
2040	160	-	-	-	-	-	-
2041	20	-	12	250	20	-	-
2042	-	-	-	-	-	-	-
2043	-	-	-	-	-	-	-
2044	-	-	-	-	-	-	-
2045	-	400	-	-	-	-	-
2046	-	400	-	-	-	-	-
2047	-	400	-	-	-	-	-
2048	-	300	-	-	-	-	-

2049	-	-	-	-	-	600	-
2050	-	100	-	-	-	300	-

**Request No. 12**

Please provide the following inputs in nominal dollar terms as they were entered into the Encompass Model in connection with the Synapse Analysis for each year from 2021 to 2050 by resource type for every resource option available to the model:

- a. Resource block size in megawatts.
- b. Overnight construction costs in \$ per KW. All-in construction costs in \$ per KW. All-in costs are defined as overnight costs plus construction overheads, construction financing costs (i.e. AFUDC), and owners costs.
- c. Transmission interconnection costs, including the assumed length of any tie-line needed for interconnection.
- d. Gas interconnection costs.
- e. Fixed O&M costs in \$/KW by year.
- f. Variable O&M costs in \$/MWh by year.
- g. Useful life in years.
- h. Equivalent Availability Factor as a percentage.
- i. Equivalent Forced Outage rate percentage.
- j. Planned Outage factor percentage.
- k. Annual performance degradation percentage.

**Response**

See the Wilson workpapers titled Attachment 5\_Renewable LCOE.xlsx and Attachment 3\_Storage LCOE.xlsx. (The ordering of the workpapers as differently numbered attachments after their creation was random, and has no significance other than for convenience in referencing them.)



**Request No. 13**

Please provide the following information regarding the assumptions or inputs for transmission and congestion costs for each resource type available to the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony:

- a. Interconnection cost (\$/kW).
- b. Length of any tie line(s) needed for interconnection.
- c. Amount of acres of land needed for rights of way for any required transmission.
- d. The percentage of any required transmission investment allocated to Kentucky Power versus the percentage of required transmission investment allocated to other entities within PJM?
- e. Please confirm that the fundamental forecasts relied upon by the Synapse Analysis included capital investment for the transmission required and the expected levels of congestion charges in the PJM region that would result from the addition of the wind, solar, and storage resources presented in the Synapse Analysis? If the response is anything other than an unconditional confirmation please provide a detailed explanation of the basis for not including transmission capital investment and congestion charges in the PJM region.

**Response**

- a. Interconnection costs were not explicitly considered in the levelization calculation for replacement resources. In KPC's response to Sierra Club RFI 2-9, in which the Company was asked about the interconnection costs included as part of its PLEXOS modeling, KPC responded that the EIA estimates of the cost of new resources, used by Witness Becker in this proceeding, includes EIA's estimates of transmission interconnection costs. The EIA report provided as SC RFI 2-9 Attachment 1, "Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies" does not provide an estimate of interconnection costs for solar PV and battery storage technologies, and KPC response to SC RFI 2-9 states that these resources are assumed by EIA to be located near existing substations and interconnected without the need for a new substation or new lines. While interconnection costs for wind are included in the EIA report, the EnCompass optimization selects no new wind in the Retire 2028 under a No Carbon commodity forecast.
- b. Synapse did not make any assumptions about the length of any tie line needed for interconnection.
- c. Synapse did not make any assumptions about the acres of land needed for rights of way for any required transmission.
- d. Synapse did not make any assumptions about allocation of transmission between KPC and PJM.

- e. Synapse did not make any assumptions about the cost of additional transmission beyond the inclusion of KPC's assumed additional transmission costs associated with the retirement of the Mitchell units.

**Request No. 14**

Please confirm that the EnCompass model used in connection with the Synapse Analysis computed carrying costs on invested capital using levelized fixed charge rates. If the response is anything other than an unconditional confirmation please identify and describe in detail the methodology and the bases for using it.

**Response**

Renewable costs were included in the EnCompass modeling on a \$/MWh basis using the same levelization calculations used by NREL in the 2020 ATB. A description of NREL's methodology on the financing component of the calculation can be found here:  
<https://atb.nrel.gov/electricity/2020/finance-impact.php>.

**Request No. 15**

Please provide the pre-tax and after-tax cost of capital used in computing the carrying costs on invested capital employed by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony.

**Response**

See Wilson workpapers titled Attachment 5\_Renewable LCOE.xlsx and Attachment 3\_Storage LCOE.xlsx for the financial assumptions used in the levelization calculations. (The ordering of the workpapers as differently numbered attachments after their creation was random, and has no significance other than for convenience in referencing them.)

**Request No. 16**

Please provide the discount rate(s) employed by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony. If the rate(s) is different from the cost of capital used to compute carrying costs on capital investments, please provide a detailed explanation of all bases for using different discount rates.

**Response**

Synapse used KPC's value of 7.07%.

**Request No. 17**

Please provide the following inputs for each year of each scenario presented in Ms. Wilson's direct testimony:

- a. Hourly energy market prices. If hourly, energy prices were not used, please describe the market energy prices that were used and how they were developed
- b. Monthly energy prices, segregated into peak and off-peak blocks;
- c. PJM Capacity market prices;
- d. Annual Henry Hub natural gas prices.

**Response**

The information referenced in (a)-(d) came directly from the AEP Fundamentals Forecast, provided by KPC in response to KIUC-AG RFI 1-2.

**Request No. 18**

Please provide the annual delivered gas price by year used for the gas employed by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony.

**Response**

The Synapse Analysis relied on annual Dominion South Point Pool gas prices as provided in the AEP Fundamentals Forecast provided by KPC in response to KIUC-AG RFI 1-2.

**Request No. 19**

Please provide the following information regarding the carbon cost assumptions employed by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony:

- a. The type and amount of carbon cost assumed (i.e., an emissions tax or some other type of cost and if so the specific type, cost, and corresponding amounts).
- b. Please explain whether this carbon cost levied is on only electricity generation, or on the economy as a whole, or some other section of the United States economy?
- c. Please identify the total amount of carbon for the coal fired resources by year for each year of each of the cases (BAU and Synapse 2028 Retirement) included in Ms. Wilson's direct testimony?
- d. Please state whether this carbon cost was expressed in short tons or metric tons.
- e. Please state the amount of the carbon cost per MWh of output of coal-fired resources?
- f. Please state the amount of the carbon cost per ton (and identify whether metric tons or short tons are used) that was added to the cost of natural gas-fired resources by year for each year of each of the scenarios included in Ms. Wilson's direct testimony?
- g. The amount of the carbon cost per MWh of output of natural gas-fired simple cycle resources.
- h. The amount of the carbon cost per MWh of output of natural gas-fired combined cycle resources?

**Response**

- a. The EnCompass model is agnostic as to the type of carbon cost.
- b. The EnCompass model was used to exclusively model KPC's service territory and made no assumptions about other sectors to which the cost might apply.
- c. Total amount of carbon can be found in the Wilson workpaper titled Attachment 4\_Scenario\_Comparison — KPCO + CT (20210506).xlsx.
- d. Per the AEP Fundamentals Forecast, the carbon cost is expressed in \$/short ton.
- e. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison — KPCO + CT (20210506).xlsx to determine the requested values.
- f. The assumed carbon cost applied to those scenarios designated as having a carbon cost and came directly from the AEP Fundamentals Forecast, Base with Carbon, provided by KPC in response to KIUC-AG RFI 1-2.
- g. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison — KPCO + CT (20210506).xlsx to determine the requested values.
- h. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison — KPCO + CT (20210506).xlsx to determine the requested values.



**Request No. 20**

Please provide the annual capacity reserve margin percentage (both in terms of ICAP and UCAP) computed for Kentucky Power in each year for both Base No Carbon and Base with Carbon scenarios of the two cases presented in the Synapse Analysis.

**Response**

See the Wilson workpaper Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx for the annual reserve margins. These values are in ICAP. EnCompass is not currently configured to perform its optimization using UCAP values.

**Request No. 21**

In the event either of the two scenarios for the Synapse 2028 retirement case presented by Ms. Wilson in her direct testimony results in UCAP capacity margins greater than 8.6 percent for more than one consecutive year over the analysis period beginning with 2029 after the Mitchell units were assumed to retire, please provide a detailed explanation of the basis for the UCAP capacity margins in excess of 8.6 percent.

**Response**

Capacity and reserve margins in the Synapse Analysis were modeled on an ICAP basis. Generally, the actual reserve margin might exceed the ICAP reserve margin of 14.9% for the following reasons: 1) the EnCompass model builds resources ahead of the Mitchell retirement in order to cover the future capacity deficit and still meet annual resource build limits; or 2) the model is building resources for energy and not capacity purposes, resulting in a reserve margin that is higher than the requirement.

**Request No. 22**

Please confirm that the EnCompass model used in connection with the Synapse Analysis sold UCAP capacity in excess of 8.6 percent into the PJM market., please provide the annual number of megawatts sold and capacity revenues modeled for each scenario presented in Ms. Wilson's direct testimony. If capacity revenue was not modeled please state so.

**Response**

Capacity revenue was not modeled.

**Request No. 23**

Please provide the following information:

- a. The PJM percentage capacity credit that solar, wind, storage, paired solar/storage, paired wind/storage, and gas combustion turbines received each year in the EnCompass model used in connection with the Synapse Analysis presented in Ms. Wilson's testimony.
- b. Please confirm the percentages presented in the response to subpart (a) were based on the assumed adoption by PJM of the ELCC capacity credit methodology. If the response is anything other than an unconditional confirmation please identify and describe in detail the basis of the PJM percentage capacity credit described in the response to subpart (a).
- c. Please provide copies of all PJM documents, and the date they were published, that support or were relied on in connection with the assumed adoption by PJM of the ELCC capacity credit methodology.
- d. If the PJM percentage capacity credit that solar, wind, storage, paired solar/storage, paired wind/storage, and gas combustion turbines received each year in the EnCompass model used in connection with the Synapse Analysis were not based on publicly available PJM guidance, please provide a detailed explanation for the use of the PJM percentage capacity credit that solar, wind, storage, paired solar/storage, paired wind/storage, and gas combustion turbines, including any documentation.
- e. Please provide the assumed level or penetration of wind, solar, storage, and paired solar and storage resources in PJM in terms of total megawatts placed in service within PJM for each year of the Synapse Analysis presented in Ms. Wilson's testimony. Please provide the source of these forecasts.
- f. Please provide the UCAP megawatts of every new resource added, by resource, for each year of each scenario presented in Ms. Wilson's direct testimony.

**Response**

- a. Synapse used the same percentage capacity credit assumed by KPC in its analysis.
- b.-e. In light of the response to (a), above, KPC already has the information requested in each subpart.
- f. Resources in the Synapse Analysis were modeled on an ICAP basis. Assuming that the UCAP value for new wind and solar resources in PJM is based on capacity factor, those values can be found in Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.



**Request No. 24**

Please explain in detail how forecasted PJM capacity market prices were used by the EnCompass model used in connection with the Synapse Analysis presented in Ms. Wilson's testimony.

**Response**

Forecasted PJM capacity market prices were not used in the Synapse analysis.

**Request No. 25**

Please provide the following information about any tax credits assumed for each of the following resource types used in Ms. Wilson's analysis:

- a. Percentage credit available each year from 2021-2050.
- b. Confirm that the assumptions are based on current law. If the response is anything other than an unconditional confirmation please identify and describe in detail the basis for the assumptions regarding the tax credits.

**Response**

- a. The Synapse analysis does not include any tax credits when calculating the levelized cost of replacement resources, which were used as an input to the EnCompass model.
- b. These assumptions are not based on current law. The American Rescue Plan Act of 2021 extends the PTC for land-based wind and the ITC for solar and paired battery storage. The bulk of the replacement resources come online later in the analysis period, in which the existing tax credits are not assumed to have a significant effect on the cost of the resources. There are also currently a number of pending proposals before Congress that would increase and/or extend the PTC and ITC beyond what is currently in place.

**Request No. 26**

Please provide the following information regarding the income tax credit (“ITC”) income tax normalization assumptions used by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson’s testimony:

- a. Confirm that normalization treatment was used for the ITC utilized for all solar, storage or paired resources, and all other resources assumed to be eligible for ITC.
- b. Please state whether the normalization treatment was based on either an FI or F2 tax election.
- c. If ITC normalization was used, please provide the annual impacts in terms of both dollars and \$/MWh of the normalization effect on the cost of energy for all resources eligible for ITC.
- d. If ITC normalization was not used by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson’s testimony, please provide a detailed explanation for not using it.
- e. If ITC normalization was not used, please confirm that:
  - i. Ms. Wilson is aware that Kentucky Power Company is subject to ITC normalization rules; and
  - ii. Ms. Wilson is aware that the required ITC normalization rules affect the regulated cost of service of any resource eligible for the ITC.
- f. If ITC normalization was not used by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson’s testimony, please modify the Synapse analysis to incorporate F1 ITC normalization and present the results.

**Response**

- a. See SC response to KPC Request No. 25, above, explaining that the Synapse analysis did not apply the ITC to the replacement resources.
- b. See response to (a), above.
- c. See response to (a), above.
- d. See response to (a), above.
- e. Sierra Club, by and through counsel, insofar as it calls for legal conclusions. Subject to and without waiving that objection, Ms. Wilson responds, to each subpart: See response to (a), above.
- f. Sierra Club, by and through counsel, objects to this request as unduly burdensome, speculative, and otherwise requesting work and information beyond the scope of what applicable rules of discovery and evidence require Sierra Club to perform and provide. Ms. Wilson did not perform the requested analysis in preparing her testimony, and is not required to do so. Sierra Club notes



that, analogously, when Sierra Club asked KPC, in SC RFI 1-27(d)(iii), to perform and provide certain calculations in the event the Company had not already performed them, KPC declined to perform the requested analysis, identifying objections and then stating, for subpart (iii): “The Company has not performed the requested calculation.” Subject to and without waiving the foregoing objections, Ms. Wilson responds: See response to (a), above.

**Request No. 27**

Please provide the following raw EnCompass model outputs for each new resource added in each year of the two cases (BAU and Synapse 2028 Retirement) and both scenarios (“Base No Carbon” and “Base with Carbon”) presented in Ms. Wilson’s direct testimony:

- a. Energy market revenues;
- b. Capacity market revenues;
- c. Ancillary services revenues;
- d. Any other revenues;
- e. Production tax credits earned;
- f. Investment tax credits earned in in-service year;
- g. Investment tax credits included in the cost of energy each year if ITC amortization was normalized;
- h. Fuel expense;
- i. Variable O&M expense;
- j. Fixed O&M expense;
- k. Property tax expense;
- l. Energy output in MWh;
- m. Energy revenue per MWh; and
- n. Capacity factor %.

**Response**

- a. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx. (The ordering of the workpapers as differently numbered attachments after their creation was random, and has no significance other than for convenience in referencing them.)
- b. No capacity market revenues were modeled in the Synapse analysis. It is Synapse’s understanding that under the FRR option, AEP does not earn capacity revenues from, nor make capacity payments, to PJM.
- c. The Synapse analysis did not present scenario results that included ancillary services requirements.
- d. The Synapse analysis did not model any other revenue streams.
- e. See SC response to KPC RFI 1-25.
- f. See SC response to KPC RFI 1-25.
- g. See SC response to KPC RFI 1-25.
- h. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.
- i. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.
- j. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.

- k. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.
- l. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.
- m. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.
- n. See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.

**Request No. 28**

Please refer to Exhibit RW-3 of Ms. Wilson’s testimony. Please separately identify each “financial assumption” in Exhibit RW-3 that Ms. Wilson contends is incorrect, inappropriate, or overstated, and provide all facts supporting Ms. Wilson’s contention that the “financial assumption” is incorrect, inappropriate, or overstated.

**Response**

Ms. Wilson did not contend that any of the financial assumptions made in Exhibit RW-3 are necessarily “incorrect, inappropriate, or overstated,” but that specific values are not adequately cited by KPC, making it impossible to determine how the assumptions were derived or, as a consequence, to assess their accuracy. See, e.g., pp. 18-19 of Ms. Wilson’s Direct Testimony.

**Request No. 29**

Please provide each year's annual total and cumulative all-in capital investment required to build each of the new resources added for each case (BAU and Synapse 2028 Retirement) for each scenario ("Base No Carbon" and "Base with Carbon") presented in Ms. Wilson's direct testimony.

**Response**

See the Wilson workpaper titled Attachment 4\_Scenario\_Comparison – KPCO + CT (20210506).xlsx.

**Request No. 30**

Please provide any analysis prepared by Ms. Wilson in connection with the Synapse Analysis of the impacts (increases or decreases) of the new resource additions on customer rates for any and all years covered by her analysis.

**Response**

Ms. Wilson did not prepare an analysis of customer rates as part of her analysis.

### **Request No. 31**

The Synapse Analysis resource plans contain no natural gas fired-capacity additions other than those contained in all plans to replace Big Sandy 2 when it retires. Kentucky Power is a winter peaking utility, as are other utilities in that region such as Kentucky Power affiliate Appalachian Power Company and Duke Energy North Carolina. Please explain how Ms. Wilson expects Kentucky Power and these other winter peaking utilities to reliably provide energy to its customers between 7 and 9 am on extremely cold winter mornings in 2029 if the Mitchell units retire in 2028, without additional dispatchable gas-fired resources. In preparing this response, assume all generation located in states throughout PJM is needed to serve load in those states, and that the solar resources added in Ms. Wilson’s plan are unable to provide power because it is dark in those hours.

### **Response**

Ms. Wilson prepared an economic analysis that examined the continued operation of the Mitchell units versus scenarios that retired the Mitchell units. This analysis includes KPC’s assumptions on the availability of imports and exports. Per KPC’s response to SC RFI 2-2, the hourly limit on imports in the PLEXOS model is 35,000 MW, “which allows PJM to serve the Company’s load in every hour without limitation.” Per KPC’s response to SC RFI 2-3, the hourly limit on exports in the PLEXOS model is 40,000 MW, “which allows the Company’s generating resources to sell into PJM in every hour without limitation.” Synapse adopted these limits. A scenario in which imports were not available from the rest of PJM was not modeled by either KPC or Synapse for the purposes of this proceeding. PJM is tasked specifically with maintaining reliability within the limits of the RTO, meaning that it ensures that sufficient capacity is available to meet forecasted peak load plus a required reserve margin, meaning that there is sufficient capacity to meet load either in the event that actual load is higher than the forecast, or some amount of generation is unavailable in a given hour. The ELCC values given to specific resources, which were included in this analysis, specifically take into account the reality that specific resources are not available to generate in all hours. Accordingly, Ms. Wilson rejects the premises imposed by this question—namely, that all generation located in states throughout PJM is needed to serve load in those states, and that the solar resources added in Ms. Wilson’s plan are unable to provide power because it is dark in those hours—as speculative, inconsistent with KPC’s own modeling and discovery responses, and thus distorting and misleading.

Further, it bears recalling that, if KPC does not receive approval of its requested capital investments at Mitchell for ELG compliance with the stated intent of continuing coal-fired operation of the plant past 2028 through 2040, the actual selection of the specific lower-cost resources that will replace Mitchell’s coal-fired units must occur in years to come, in the lead-up to 2028, and will depend on a contemporaneous assessment of resources’ availability and relative attractiveness based on updated circumstances and information at such time. KPC has more than seven years before Mitchell’s retiring coal-fired capacity would need to be replaced, giving the Company ample time in the interim to assess, based on updated concrete data, both the

economics and the reliability of specific potential replacements—taking into account contemporaneous laws and regulations, technological advancements (including battery storage, which will be increasingly viable and cost-effective at providing dispatchable power during dark hours when coupled with solar generation, among other things), and other relevant considerations—and thereby to determine the best portfolio of replacement resources closer to such time.



**Request No. 32**

Please identify by added wind and solar resource, and the corresponding cost of, the weatherization equipment assumed by the EnCompass model in connection with the Synapse Analysis presented in Ms. Wilson's testimony. If no weatherization equipment is included in the cost of those resources used by the EnCompass model in connective with the Synapse Analysis presented in Ms. Wilson's testimony please provide an estimate of the cost of such equipment?

**Response**

None was assumed. Ms. Wilson does not have an estimate of the cost of such equipment.

**Case No. 2021-00004**  
**Sierra Club Response to KPC Request No. 33**  
**Respondent: Rachel Wilson**

**Request No. 33**

Please provide any publicly available testimony prepared between 2019 and 2021 by Ms. Wilson analyzing resource plans for other winter peaking utilities located in any state within the United States.

**Response**

See South Carolina Public Service Commission, Docket Nos. 2019-224-E and 2019-225-E, *In the Matters of South Carolina Energy Freedom Act (House Bill 3659) Proceeding Related to S.C. Code Ann. Section 58-37-40 and Integrated Resource Plans for Duke Energy Carolinas, LLC and Duke Energy Progress, LLC*, Surrebuttal Testimony of Rachel S. Wilson on behalf of Carolinas Clean Energy Business Association, Natural Resources Defense Council, Sierra Club, Southern Alliance for Clean Energy, South Carolina Coastal Conservation League, and Upstate Forever (April 15, 2021). This testimony is publicly available on the South Carolina PSC's website: <https://dms.psc.sc.gov/Web/Dockets>.

**Request No. 34**

Please confirm that Ms. Wilson has not provided testimony in any proceeding in which she performed a utility resource plan review similar to the Synapse Analysis in which her modeling results included natural-gas fired resources as a part of the utility's resource plan. If the response is anything other than an unequivocal confirmation please identify the proceeding and either provide a copy of the testimony or a link to it.

**Response**

Confirmed, to the extent that “included natural-gas fired resources as a part of the utility's resource plan,” in modeling presented in testimony by Ms. Wilson, means ‘selected gas as a new/replacement resource for a particular need that was specifically at issue in the case’. (By contrast, to the extent that the phrase and question mean to ask whether Ms. Wilson's modeling in prior testimony has ever incorporated some gas-fired capacity that already existed in a utility's resource plan, and that was not specifically at issue in a case about some other need/issue, as a background/contextual given, Ms. Wilson states that this routinely happens—as in this case).

**Request No. 35**

Please provide an estimate of the acres of land that would be required either for one megawatt, or for one block, of each of the solar, wind, storage, paired solar and storage, and paired wind and storage resources utilized in Ms. Wilson's analysis. Please state if those land estimates include associated transmission interconnection equipment, such as substations or transmission lines.

**Response**

Synapse did not produce such an estimate as part of its analysis.

**Request No. 36**

Please provide an estimate of the total acres of land, exclusive of the existing footprint of the Mitchell Generating Station, that would be required for the resources identified in each scenario (“Base No Carbon” and “Base With Carbon”) for the Synapse 2028 Retirement case and the BAU case.

**Response**

Synapse did not produce such an estimate as part of its analysis.

**Request No. 37**

Refer to the fixed charge rate (labeled Capital Recovery Factor) of 4.279% in every year of Row 247 of the tab names ATB Utility Solar\_SEE found in the file named Renewable LCOE.xlsx provided in Ms. Wilson's workpapers:

- a. Please confirm if Ms. Wilson agrees with the statement that in general the use of a fixed charge rate in an analysis of regulated utility cost of service such as this one produced by Ms. Wilson is intended to produce an estimate of the annual nominal cost ratepayers would incur for a given capital investment by the utility. If she does not agree, please provide an explanation of the fixed charge rate in her analysis.
- b. Please confirm that the 4.25% nominal WACC used by Ms. Wilson to develop the 4.279% fixed charge rate referenced here was ultimately sourced from row 776 of the WACC Calc tab in the 2020 ATB Data file provided to the Company with Ms. Wilson's workpapers.
- c. Please confirm that the useful life which was assumed for the solar resource used in Ms. Wilson's analysis is 30 years.
- d. Please explain why a nominal fixed charge rate on a 30-year investment such as this solar alternative should not be closer to the Company's 10.95% 30 year value found on page 3 of Ms. Wilson's direct testimony Exhibit RW-3.
- e. Please confirm that the 4.279% fixed charge rate which ultimately led to the LCOE's used to forecast the costs of the solar resources in Ms. Wilson's analysis was based on the use of NREL's real WACC of 1.69% rather than NREL's nominal WACC of 4.24%, both of which were sourced from the "2020-ATB-Data" file.
- f. Please confirm that in NREL's ATB source file "2020 ATB Data" the 4.24% nominal WACC is the same value every year from 2018-2050.
- g. Please explain why, given that Ms. Wilson relied on NREL's real dollar capital recovery factor every year from 2018-2050 to prepare real dollar LCOE's on the LCOE Cost Summary worksheet in the Renewable LCOE workpaper file, that she did not also rely on NREL's nominal capital recovery factor every year from 2018 through 2050 when she converted real dollar LCOE's to the nominal dollar LCOE's presented in her testimony and used to forecast the solar resource costs.
- h. Were depreciation expenses, income taxes, land leases, property taxes and general and administrative expenses included in the forecasted costs of the solar resources in Ms. Wilson's analysis? If so, provide workpapers that clearly show their inclusion. If not, please explain why not.
- i. If the solar resources were assumed to be PPA resources in Ms. Wilson's analysis, would Ms. Wilson agree that a rational PPA counterparty offering a 30-year term for an asset with a 30-year useful life would seek to recovery some amount of depreciation, general and administrative expenses, and income taxes in the PPA price? If not, why not?

## Response

Sierra Club, by and through counsel, insofar as it calls for legal conclusions. Subject to and without waiving that objection, Ms. Wilson responds:

- a. According to the Financial Definitions tab of the NREL 2020-ATB-Data workbook, which provides the calculation of solar resource costs used in this analysis, the fixed charge rate is the “Amount of revenue per dollar of investment required that must be collected from customers to pay the carrying charges on that investment.” This is the purpose of the fixed charge rate in the Synapse analysis. Contrary to KPC’s statement that the fixed charge rate is labeled capital recovery factor, these are actually two distinct values. The fixed charge rate is calculated by multiplying the Capital Recovery Factor by the “Project Finance factor,” which is calculated in the NREL 2020-ATB-Data workbook on the “Financial Definitions” tab as follows:

<b>Project Finance factor</b>	$\text{ProFinFactor} = (1 - \text{TR} * \text{PVD}) / (1 - \text{TR})$	
	TR = combined state/federal tax rate	
	PVD = present value of depreciation = summation from $y=1$ to $y=M+1$ of $(\text{FD}_y * f_y)$	
	M = # years in MACRS depreciation schedule	
	$\text{FD}_y$ = fraction of capital depreciated in year $y$	
	$f_y$ = depreciation factor in year $y$	$f_y = 1/d^y$
	d = nominal discount rate (8.9%)	d = WACC * i
	i = inflation rate	

- b. The 4.279% value referenced is the Capital Recovery Factor and not the fixed charge rate, but it is confirmed that the 4.25% nominal WACC was ultimately sourced from row 776 of the WACC Calc tab in the 2020 ATB Data file.
- c. Confirmed.
- d. KPC’s 10.95% nominal fixed charge rate on a 30-year investment is calculated as the sum of Return (7.07%), Depreciation (1.81%), FIT (0.62%), and Property Taxes, General & Admin Expenses (1.45%). The Synapse Analysis assumes that solar resources will be developed via PPA and any of these values could and will likely be different for solar developers, or even other utilities.
- e. It is confirmed that the 4.279% Capital Recovery Factor was based on the use of NREL’s real WACC of 1.69% rather than NREL’s nominal WACC of 4.24%, both of which were sourced from the “2020-ATB-Data” file.
- f. Confirmed.
- g. Ms. Wilson relied on NREL’s real dollar LCOE’s on the LCOE Cost Summary worksheet in the Renewable LCOE workpaper file, and then converted these values to nominal dollars for use in the EnCompass model.
- h. Ms. Wilson’s testimony presents an economic analysis of the forward-going costs associated with the continued operation of Mitchell until 2040 versus the early retirement of the plant in 2028. It is not an analysis of the cost of service for Kentucky Power and should not be considered as such. For that reason, there are components that are included in a cost of service analysis that are not included in Ms. Wilson’s analysis, and that is true for all resources (existing and new) and all scenarios. Depreciation expenses, income taxes, land leases, property taxes, and general and administrative expenses associated with the Mitchell plant, for example, are also not included in Ms. Wilson’s analysis.

- i. Ms. Wilson has never worked for a renewable developer and thus does not know if or how they might seek to recover some amount of depreciation, general and admin expenses, and income taxes in their PPA prices. However, publicly available information from other jurisdictions point to evidence that renewable developers are submitting project bids well below KPC's assumed prices. The Public Service Company of Colorado's 2017 all-resource solicitation resulted in a median bid price for solar PV of \$29.50/MWh. Northern Indiana Public Service Company's 2018 all-resource solicitation resulted in an average bid price for solar PV of \$35.67. See: [https://eta-publications.lbl.gov/sites/default/files/all\\_source\\_competitive\\_solutions\\_20210217\\_gmlc\\_for\\_mat.pdf](https://eta-publications.lbl.gov/sites/default/files/all_source_competitive_solutions_20210217_gmlc_for_mat.pdf).



Dated: June 8, 2021

Respectfully submitted,



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(not licensed in Kentucky):

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### **CERTIFICATE OF SERVICE**

This is to certify that the foregoing copy of the SIERRA CLUB'S RESPONSES TO KENTUCKY POWER COMPANY'S DATA REQUESTS TO SIERRA CLUB in this action is being electronically transmitted to the Commission on June 8, 2021; and that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding. Per the Commission's general standing Order issued in Case No. 2020-00085 on March 16, 2020, this filing will not be mailed in paper medium to the Commission.



JOE F. CHILDERS