STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-2, SUB 1219

In the Matter of:	)	
Application by Duke Energy Progress, LLC,	)	**DIRECT TESTIMONY OF**
for Adjustment of Rates and Charges	)	**RACHEL S. WILSON ON**
Applicable to Electric Utility Service in	)	**BEHALF OF SIERRA CLUB**
North Carolina	)	**(PUBLIC VERSION)**
	)	

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I. INTRODUCTION AND QUALIFICATIONS

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

A My name is Rachel Wilson and I am a Principal Associate with Synapse Energy Economics, Incorporated ("Synapse"). My business address is 485 Massachusetts Avenue, Suite 3, Cambridge, Massachusetts 02139.

Q Please describe Synapse Energy Economics.

A Synapse Energy Economics is a research and consulting firm specializing in electricity industry regulation, planning, and analysis. Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government agencies, developers, and utilities.

Q Please summarize your work experience and educational background.

A At Synapse, I conduct analysis and write testimony and publications that focus on a variety of issues relating to electric utilities, including integrated resource planning, resource adequacy, electric system dispatch, environmental regulations and compliance strategies, and power plant economics.

I also perform modeling analyses of electric power systems. I am proficient in the use of spreadsheet analysis tools, as well as optimization and electricity dispatch models to conduct analyses of utility service territories and regional energy markets. I have direct experience running the Strategist, PROMOD IV, PROSYM/Market Analytics, PLEXOS, EnCompass, and PCI Gentrader models, and I have reviewed input and output data for several other industry models.

Prior to joining Synapse in 2008, I worked for the Analysis Group, Inc., an economic and business consulting firm, where I provided litigation support in the form of research and quantitative analyses on a variety of issues relating to the electric industry.

I hold a Master of Environmental Management from Yale University and a Bachelor of Arts in Environment, Economics, and Politics from Claremont McKenna College in Claremont, California.

A copy of my current resume is attached as Exhibit RW-1.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of Sierra Club.

Q Have you testified previously before the North Carolina Utilities Commission?

A Yes. I testified before this Commission in Docket No. EMP-105, Sub 0 and Docket No. E-7, Sub 1214.

Q What is the purpose of your testimony in this proceeding?

A The purpose of my testimony is to evaluate the economics of the coal-fired units owned by Duke Energy Progress (DEP or the Company) and assess the prudence of continuing to invest in and operate these units, which include Roxboro Units 1-4 and Mayo Unit 1.

Q Please identify the documents and filings on which you base your opinions.

A My findings rely primarily upon the testimony, exhibits, and discovery responses of DEP and its witnesses. I also rely to a limited extent on certain industry publications.

In addition to my resume, exhibits to this testimony include:

Confidential Exhibit RW-2: Unit historical energy value and costs, 2016-2018

Confidential Exhibit RW-3: Unit forward-looking energy value and costs, 2019-2029

II. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q Please summarize your primary conclusions.

A My primary findings indicate that all of DEP's coal units operated uneconomically for the combined three-year period from 2016 through 2018. I estimate that each of the coal units had a total negative net value of between [BEGIN CONFIDENTIAL] [redacted] [END CONFIDENTIAL] between 2016 and 2018. Despite these net losses, DEP continues to determine unit retirement dates for its coal fleet based solely on depreciation studies.

My analysis shows that each of DEP's coal units will continue to operate uneconomically in the future. DEP has not provided any economic assessments of the continued operation of its coal-fired units, even as low gas prices and declining costs for renewables have disadvantaged many coal units across the country. Thus, the Company has not demonstrated that continuing to invest in its coal fired units is a prudent decision and provides value to ratepayers.

Q Please summarize your primary recommendations.

A Based on my findings, I offer the following recommendations:

1. I recommend that the Commission disallow past spending on capital projects incurred between the 2017 rate case and this rate case, given that the data show that all of DEP's coal units had negative net value in 2016, 2017, and 2018. Capital spending during this time period should be disallowed until DEP provides evidence of an analysis demonstrating the value of the investment done at the time the investment decision was made.
2. Similarly, I recommend that the Commission disallow recovery of ongoing operations and maintenance (O&M) expenses at DEP's coal units, given that DEP's coal units are projected to continue to have negative value in the future.
3. I recommend that the Commission place a cap on future capital expenditures intended to prolong the lives of the DEP coal units as generating assets, and

require the utilities to come to the Commission for approval of any expenditure that exceeds that cap before the expenditure can be recovered from ratepayers.

4. I recommend that in future rate cases, DEP be required to demonstrate that its gas units are providing positive net value to ratepayers before being granted recovery of capital and O&M costs. If DEP cannot make such a demonstration, those units should be removed from rate base.

III. DEP'S COAL UNIT PLANS AND PROPOSALS

Q Which DEP generating units are the focus of this testimony?

A This testimony focuses on the economics of DEP's five coal units for which the utility is seeking cost recovery in this case. These include Roxboro Units 1-4 and Mayo Unit 1.

Q What are DEP's plans regarding the future operation of these units?

A Exhibit 1 of the Direct Testimony of John J. Spanos suggests a "probable retirement year" for each of DEP's coal units. According to this document, the probable retirement years are: 2028 for Roxboro Units 1 and 2; 2029 for Roxboro Units 3 and 4; and 2029 for Mayo Unit 1. These retirement dates accelerate the retirements of Roxboro Units 3 and 4 (from 2033) and Mayo Unit 1 (from 2035) from those in DEP's 2019 Integrated Resource Plan (IRP) Update Report.[1] According to Mr. Spanos, in recent years, originally proposed life spans for coal units have been shortened due to unit efficiencies and environmental regulations.[2]

[1] Duke Energy Progress. *2019 Integrated Resource Plan Update Report*. Page 91.

[2] Direct Testimony of John J. Spanos. Page 10, lines 17-18.

Q What is the basis for DEP's assumed coal unit retirement dates?

A DEP bases its retirement dates on the most recent depreciation study approved by the Commission.[3] In the 2019 IRP Update, the retirement dates were based on the depreciation study approved in the 2017 rate case.

In this docket, DEP is seeking approval for the updated retirement dates shown above based on a new depreciation study provided in Spanos Exhibit. The depreciation in that study refers generally to the loss of service value that result from "wear and tear, decay, action of the elements, obsolescence, changes in the art, changes in demand and the requirements of public authorities."[4] The depreciable life span estimates for DEP's coal units specifically considered the following: life spans of similar generating units, unit age, general operating characteristics, major refurbishments, and discussions with management personnel regarding the long-term outlook for the units.[5]

Q Did DEP provide any economic analyses of alternative retirement dates in its 2019 IRP Update or in this rate case?

A No. DEP has not provided any economic analyses of alternative retirement dates for its coal units. DEP was ordered to do such an analysis as part of its 2020 IRP,[6] however, which is expected in September 2020.

Q What is the implication of this lack of analysis?

A The implication of this lack of analysis is that DEP has assumed that it is cost-effective for ratepayers if the utility operates its coal units based solely on their depreciable lives rather than performing an economic assessment. DEP has therefore provided no justification for continuing to invest in its coal units, and thus no basis for asking its customers to pay for capital expenditures associated with continued operation.

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[3] Duke Energy Progress. *2019 Integrated Resource Plan Update Report*. Page 91.

[4] Direct Testimony of John J. Spanos. Page 3, lines 9-14.

[5] Spanos Exhibit 1. Page 40.

[6] North Carolina Utilities Commission. August 27, 2019. *Order Accepting Integrated Resource Plans and REPS Compliance Plans, Scheduling Oral Argument, and Requiring Additional Analyses*.

Q **Have recent electricity market trends affected the economics of coal units in the United States?**

A Recent market trends have had a negative impact on the general economics of coal units across the country and led to a sizable number of retirements. According to the U.S. Energy Information Administration (EIA), more than 65,000 MW of coal capacity retired between 2007 and 2018.[7] Coal retirements in 2018 alone totaled 12,900 MW.[8] A range of factors have contributed to these retirements, including sustained low gas prices and increased competition from renewables, which can be expected to persist in the future. Competition from gas and renewables has led to decreases in capacity factors at the coal units that have continued to operate.[9]

Q **Have other utilities responded to these changes in the electric sector by conducting retirement assessments of their coal units?**

A Yes. Economic assessments of existing coal units have become an increasingly common component of utility resource planning. In its 2018 IRP, Northern Indiana Public Service Company (NIPSCO) examined alternative retirement dates for its five existing coal units, concluding that customers would save more than $4 billion by retiring those units in 2023 rather than operating them until 2030.[10] PacifiCorp's 2019 IRP includes a unit-by-unit retirement analysis of alternative retirement dates, years before the end of the units' depreciable lives, for each of

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[7] U.S. EIA. 2018. *Today in energy: U.S. coal consumption in 2018 expected to be the lowest in 39 years*. Available at: https://www.eia.gov/todayinenergy/detail.php?id=37817.

[8] U.S. EIA. 2019. *Today in energy: More than 60% of electric generating capacity installed in 2018 was fueled by natural gas.* Available at: https://www.eia.gov/todayinenergy/detail.php?id=38632.

[9] U.S. EIA. 2018. *Today in energy: U.S. coal consumption in 2018 expected to be the lowest in 39 years*. Available at: https://www.eia.gov/todayinenergy/detail.php?id=37817.

[10] Northern Indiana Public Service Company LLC. 2018. *Integrated Resource Plan*. Available at: https://www nipsco.com/docs/librariesprovider11/rates-and-tariffs/irp/2018-nipsco-irp.pdf?sfvrsn=15.

its 22 coal units across its six-state service territory.[11] Georgia Power's 2019 IRP also included a retirement analysis for each of its existing coal units.[12]

Q What are the important characteristics of a rigorous coal unit retirement analysis?

A A rigorous analysis would include all costs and benefits associated with near-term and mid-term retirement dates. The continued operation of each coal unit would be compared to an optimized replacement resource portfolio, rather than a single replacement resource, that can provide all of the services that would be needed by the system in the absence of the retired unit. The cost of replacement resources should be informed by recent all-source requests for proposals (RFPs).

IV. COAL-RELATED COSTS FOR WHICH DEP IS SEEKING RECOVERY

Q What types of coal unit expenses is DEP seeking to recover through this case?

A DEP is seeking to recover three types of expenses associated with its coal-fired units in this case: O&M expenses, ongoing capital expenditures, and previously incurred capital expenditures associated with unit maintenance and environmental projects.

A What is the test year upon which DEP's rate case application is based?

The test period is January 1, 2018 through December 31, 2018.

Q What levels of O&M expense did DEP incur at its coal units in 2018?

A The plant-specific O&M expenses incurred by DEP in 2018 are listed in Table 1. DEP's total 2018 O&M expense at its five coal units totals $107.4 million.

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[11] Utility Dive. 2019. *Pacificorp sees 2 GW coal retirement, $599M savings by 2040 in latest planning scenarios.* Available at: https://www.utilitydive.com/news/pacifcorp-sees-2-gw-coal-retirements-599m-savings-by-2040-in-latest-plann/562670/.

[12] Georgia Power. 2019. *Technical Appendix Volume 2: Unit Retirement Study to 2019 Integrated Resource Plan.* Georgia Public Service Commission Docket No. 42310.

Table 1. DEP coal plant O&M expense, 2018

Cost Description		Mayo		Roxboro
500 - Oper, Supv, and Engr Exp	$	1,821,164	$	4,234,078
502 - Steam Exp	$	4,186,831	$	15,765,522
505 - Electric Exp	$	5,774	$	9,388
506 - Misc Steam Power Exp	$	1,960,801	$	7,816,440
509 – Allowances	$	3,196,586	$	11,145,165
Total Operations	**$**	**11,171,156**	**$**	**38,970,593**
510 - Maintenance Supv and Engr	$	930,053	$	3,441,572
511 - Maintenance of Structures	$	5,813,943	$	3,352,177
512 - Maintenance of Boiler	$	6,796,191	$	24,116,813
513 - Maintenance of Electric Plant	$	626,332	$	2,838,042
514 - Maintenance of Misc Steam Plant	$	4,507,416	$	4,785,804
Total Maintenance	**$**	**18,673,935**	**$**	**38,534,408**
Total Operation & Maintenance	**$**	**29,845,091**	**$**	**77,505,001**

Source: 2019 DEP NC SC 2-1 a-b DEP OM FY18-Nov 19 YTD.xls.

Q What levels of capital expense did DEP incur at its coal units in 2018?

A The plant-specific capital expenses incurred by DEP in 2018 are listed in Confidential Confidential Table 2. DEP's total 2018 capital expense at its five coal units totals [BEGIN CONFIDENTIAL] [redacted]. [END CONFIDENTIAL] This includes expenditures classified by the Company as associated with ash and wastewater compliance under the Coal Combustion Residuals (CCR) rule and the Effluent Limitation Guidelines (ELG), designated as "CCP" in Confidential Confidential Table 2, as well as capital expenditures associated with maintenance and investment.[13]

[13] Synapse sorted Duke's capital expenditures into the CCR/ELG and non-environmental categories based on the "ENT Function" designated in attachment "CONFIDENTIAL 2019 DEP NC SC DR 5-1 2018 Capital.xls".

Confidential Table 2. DEP coal plant capital expense, 2018

Plant	CAPEX Type	2018
Mayo	[redacted]	
Mayo		
Roxboro		
Roxboro		
Grand Total		

Source: CONFIDENTIAL 2019 DEP NC SC DR 5-1 2018 Capital.xls.

Q What levels of capital expense is DEP planning to incur at its coal units in future projections?

A The plant-specific capital expenses planned by DEP for the 10-year period between 2019 and 2029 are listed in Confidential Confidential Table 3.

Confidential Table 3. DEP future coal plant capital expense, $ Million, 2019-2029

Capital Costs (2019$)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Environmental											
Mayo	[redacted]										
Roxboro 1											
Roxboro 2											
Roxboro 3											
Roxboro 4											
Non-Enviro											
Mayo											
Roxboro 1											
Roxboro 2											
Roxboro 3											
Roxboro 4											
Total											

Source: 2019 DEP NC Sierra Club DR 4-3_Capital Spend Details_CONFIDENTIAL.xls.

We might expect that, as units approach their retirement dates, capital expenditures would ramp down over time. Nonetheless, Confidential Table 3 shows non-environmental capital expenditures of more than [BEGIN CONFIDENTIAL] [redacted] [END CONFIDENTIAL] for Roxboro 3 in 2024, for Mayo 1 in 2025, and again for Roxboro 3 in 2028.

V. HISTORICAL ECONOMIC STATUS OF DEP COAL UNITS

Q Did you assess the recent performance of DEP's coal units?

A Yes. Using data provided by DEP, I evaluated the net value of each of DEP's coal units between 2016 and 2018.

Q Please summarize your findings regarding the recent economic performance of DEP's coal units.

A Confidential Confidential Table 4 summarizes the results of my analysis. I find that for each of DEP's coal units, the costs to maintain and operate the unit exceeded the value provided by the unit by a total of [BEGIN CONFIDENTIAL] [redacted] [END CONFIDENTIAL] over the three-year period.

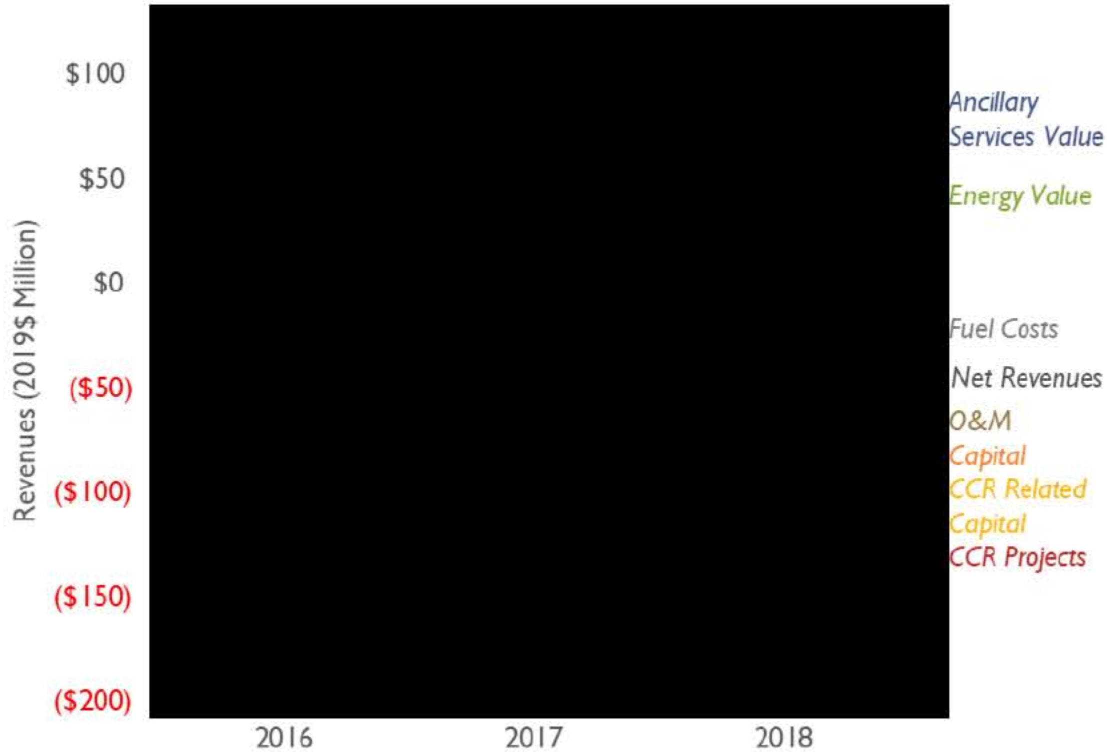
Confidential Table 4. Historical net value by unit and year (2019$, Millions)

Unit	2016	2017	2018	Total
Roxboro 1	[redacted]			
Roxboro 2				
Roxboro 3				
Roxboro 4				
Mayo 1				

Sources: DEP discovery responses; Synapse tabulation.

Confidential Confidential Figure 1 shows the energy value and cost streams for Mayo 1, as well as the unit's net revenues between 2016 and 2018. Individual results for the other four DEP units are shown in Confidential Exhibit RW-2.

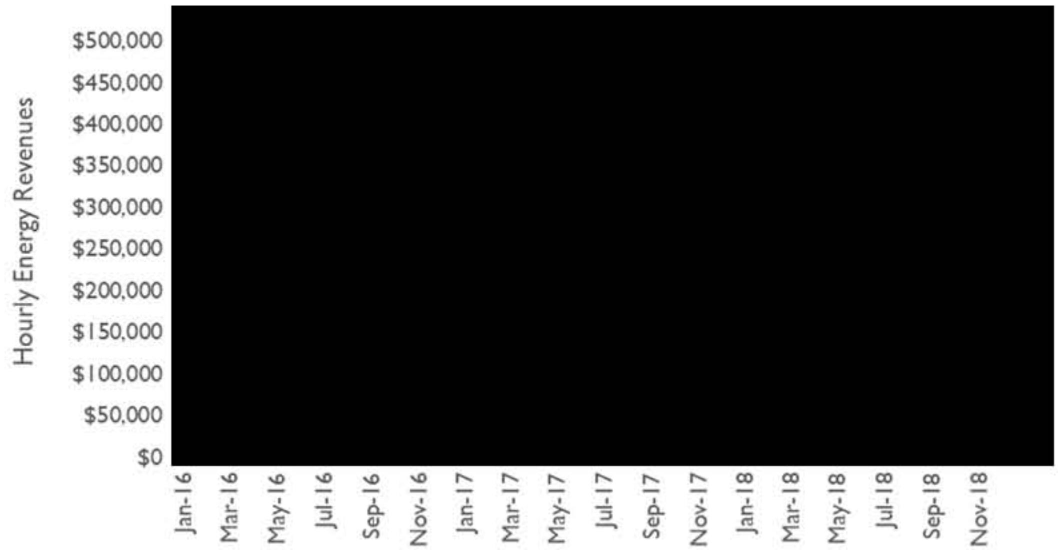
Confidential Figure 1. Mayo 1 historical energy value and costs, 2016-2018



Q Why do the units have higher energy values in 2018 despite producing less energy on average compared to 2016 and 2017?

A This is mainly attributed to the cold snap in early 2018, as shown in Confidential Confidential Figure 2, below. The hourly lambda for the peak times in January 2018 increased to [BEGIN CONFIDENTIAL] [redacted]. [END CONFIDENTIAL] Therefore, the units earned a disproportionate amount of value compared to previous months due to this cold snap. Nonetheless, the overall value of each of the units is overwhelmingly negative despite the increased revenues, due to increased capital expenditures in 2018.

Confidential Figure 2. Hourly energy value for Mayo 1, 2016 to 2018



Q Describe how you arrived at the values in Confidential Confidential Table 4.

A The values presented are based on data related to each unit's energy value, fuel costs, O&M costs, environmental costs, capital costs, and ash management costs.

DEP provided historical hourly generation for each of the units.[14] To calculate each unit's energy value, each unit's converted hourly net generation was

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[14] DEP Response to Sierra Club DR 2-10, attachments "CONFIDENTIAL 2019 DEP NC SC 2-10 Coal HourlyProdCost 2018-2019 xls" and "CONFIDENTIAL 2019 DEP NC SC 2-10e Coal HourlyProdCost 2016-2017 - Supplemental xls".

Although DEP did not specify if these hourly generation values were gross or net, a comparison to the monthly net generation values that were provided in 2-10D indicate that the hourly values were gross. Despite the fact that we had explicitly requested hourly net generation via discovery, DEP provided monthly net generation values to SC 2-10D. In DEP's response to SC 2-10E, the Company provided hourly production costs and hourly generation in MWh. Because the monthly net generation values provided in 2-10D were always smaller than the hourly generation values aggregated to the monthly level provided in 2-10E, it is valid to assume the hourly values are gross. For example, the net generation for Mayo 1 in November 2017 was reported by DEC in 2-10D to be [BEGIN CONFIDENTIAL] [redacted]. [END CONFIDENTIAL] However, when the hourly MWh values for Allen 1 in May 2016 from 2-10E are summed, the result is zero. Because negative hourly generation values never appear in 2-10E, the values must be gross.

To convert the hourly gross generation to hourly net generation, the hourly gross values were multiplied by a net-to-gross ratio. This ratio was calculated by dividing the provided monthly net generation by the aggregated hourly gross generation for each unit, month, and year.

multiplied by the relevant hourly DEP system lambda[15] as provided in discovery.[16]

When asked to provide ancillary services revenues, DEP responded that "The Company does not maintain this information by plant."[17] Due to the lack of information, I estimated ancillary services revenues for the Company using the 2019 historical ratio of the ancillary services price to the load weighted energy price from the PJM State of the Market 2019 report.[18] The resulting number (2.64 percent) was multiplied by the previously calculated energy value and the product was taken as an ancillary services revenue.

DEP provided the total fuel cost burned at the plant-level, and these costs were allocated based on annual generation levels to get unit-level fuel costs.[19]

DEP also provided O&M costs at the plant-level. Although it is standard to show fixed O&M costs separately from non-fuel variable O&M costs, DEP stated in discovery that "the Company does not identify historical costs as either fixed or variable."[20] For this reason, the O&M costs are shown as one category and the plant-level costs are divided into unit-level costs using annual generation levels.

DEP provided plant-level capital costs that were classified by category.[21] Specifically, costs were labeled as "Coal Combustion Products" or "Fossil Hydro Operations". Therefore, we were able to separate costs accordingly. Because all capital costs were provided at the plant-level, they were allocated to individual units based on nameplate capacity.

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[15] The term "system lambda" refers to the marginal cost of electricity in a system and, in an electricity market, is the locational marginal price of energy in a given hour.

[16] DEP Response to Sierra Club DR 2-10, attachment "SCDR_2-10a_DEPSystemLambda_2016-2018-Supplemental xls".

[17] DEP Response to Sierra Club DR 2-9l-o.

[18] Table 1-8, *PJM State of the Market- 2019*, Available at https://www monitoringanalytics.com/reports/PJM_State_of_the_Market/2019.shtml

[19] DEP Response to Sierra Club DR 2-9, attachment "CONFIDENTIAL_DEP Sierra Club DR 2-9i_2016-Oct2019_Supplemental.xls".

[20] DEP Response to Sierra Club DR 2-1.

[21] DEP Response to Sierra Club DR 2-9, attachments "2019 DEP NC SC 2-9 j,k Capex DEP 2016-2017-Supplemental xls" and "CONFIDENTIAL 2019 DEP NC SC DR 5-1 2018 Capital xls"

DEP also provided cost estimates for coal ash remediation projects by plant.[22] These values were allocated to individual units based on nameplate capacity size.

Fuel, O&M, capital costs, and coal ash management costs were subtracted from each unit's energy value to arrive at annual net value.

Q Did you evaluate the economics of the plants without the historical capital expenditures?

A Yes. The results of the economic analysis that exclude historical capital expenditures are shown in Confidential Confidential Table 5. Due to the increase in energy value as a result of the January 2018 cold snap, when capital costs are removed, Roxboro Units 1 and 2 show a slight net positive value in 2018. All other units remain net negative in that year.

Confidential Table 5. Historical net value by unit and year, excluding capital expenditures (2019$, Millions)

Unit	2016	2017	2018	Total
Roxboro 1	[redacted]			
Roxboro 2				
Roxboro 3				
Roxboro 4				
Mayo 1				

Q What are your recommendations to the Commission with regard to any request for recovery of past spending on capital projects at DEP's coal units?

A I recommend that the Commission disallow past spending on capital projects incurred between the 2017 rate case and this rate case, given that the data show that all of DEP's units had negative net value from 2016 to 2018. DEP made capital investments in these coal-fired units either without evaluating the economics of continuing to operate the units, or despite the fact that the units had negative value to DEP ratepayers. Capital spending during this time period should

[22] DEP Response to Sierra Club DR 2-18, attachment "DEP SC 2-18.xlsx".

be disallowed until DEP provides evidence of an analysis demonstrating the value of the investment that was performed at the time the investment decision was made.

VI. FORWARD-LOOKING ECONOMIC STATUS OF DEP COAL UNITS

Q Did you also evaluate the forward-looking economic performance of DEP's coal units?

A Yes. I analyzed the projected energy value of DEP's coal units in each year from 2019 to 2029 using data provided by the Company.

Q Please summarize the results of that forward-looking economic analysis.

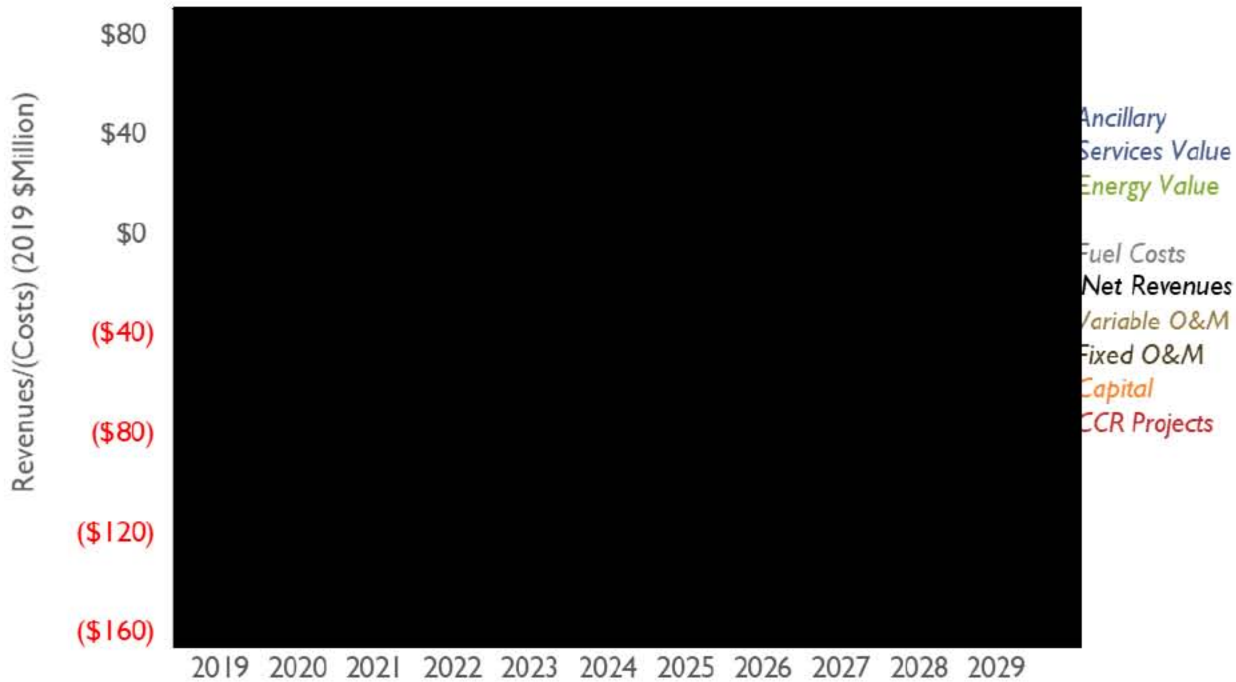
A Based on DEP's projections, I find that the Company's coal units are likely to remain uneconomic through 2029. Confidential Confidential Table 6 indicates that each of DEP's units is projected to have a negative net value in each year from 2019 through 2029.

Confidential Table 6. Forecasted net value by unit and year (2019$, Millions)

Unit	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Roxboro 1	[redacted]										
Roxboro 2											
Roxboro 3											
Roxboro 4											
Mayo 1											

Confidential Confidential Figure 3 shows the projected energy value and cost streams for Mayo 1, as well as the unit's net revenues between 2019 and 2029. Results for the remaining DEP units are shown in Confidential Exhibit RW-3.

Confidential Figure 3. Mayo 1 projected value and costs, 2019 to 2029



Q **Describe how you evaluated the forward-looking economic performance of DEP's coal units.**

A The net values presented are based on DEP data related to each unit's projected energy revenues, fuel costs, O&M costs, and capital costs.

DEP declined to provide specific forecasted avoided energy costs or projected energy market prices requested through discovery. In response to discovery follow ups, DEP provided their avoided cost energy rate schedule and its supporting calculations.[23] I calculated the hourly weighted average rate using the Company's avoided energy cost for Transmission Connected PURPA qualifying facilities (variable rate structure) provided in the attachment.[24] The rate was taken

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[23] DEP Response to Sierra Club DR 3-15, attachment "Avoided Cost_PP rate schedule.pdf".

[24] This was done by multiplying the number of on-peak and off-peak hours for each season by the corresponding energy credit. I divided the product by 8760 to produce the weighted annual average energy credit.

to be in 2018$ and converted to 2019$ for the duration of the analysis period.[25] This avoided cost of energy rate was used to calculate projected energy revenues for each unit.

As mentioned above, I also requested data relating to forecasted ancillary services revenues in discovery, but DEP's response was that "The Company does not calculate…unit specific revenues."[26] Due to the lack of information, I estimated forward-going ancillary services revenues for the Company using the 2019 historical ratio of the ancillary services price to the load weighted energy price from the PJM State of the Market 2019 report.[27] The resulting number (2.64 percent) was multiplied by the avoided cost of energy rate and the product was taken as an ancillary services revenue rate.

DEP directly provided unit-specific capacity, capacity factors, fixed O&M, fuel costs, and capital costs based upon its 2019 IRP studies.[28] DEP also provided unit-specific capital costs and fixed O&M costs for Mayo 1, Roxboro 3, and Roxboro 4 based upon its 2019 depreciation study with accelerated retirement dates.[29] The values from the Company's "No CO_2 Constraint" IRP analysis were used as given for all units except for Mayo 1, Roxboro 3, and Roxboro 4. For those three units, the capital expenditures and fixed O&M data provided in the IRP study were replaced with the updated values from the depreciation study to account for the accelerated retirement dates. Specifically, the generation, variable O&M costs, and fuel costs were adjusted to zero in the years following the units' retirements.

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[25] DEP Second Supplemental Response to Sierra Club DR 2-14.

[26] DEP Response to Sierra Club DR 2-13.

[27] Table 1-8, *PJM State of the Market- 2019*, Available at https://www monitoringanalytics.com/reports/PJM_State_of_the_Market/2019.shtml

[28] DEP Response to Sierra Club DR 2-13, attachment "CONFIDENTIAL 2019 DEP NC SCDR_2-13_a-o_t_DEP_CONFIDENTIAL.xlsx".

[29] DEP Response to Sierra Club DR 2-5, attachment "CONFIDENTIAL 2019 DEP NC_SierraClub_DR2-5_Nov2019DEPRetirementAnalysis.xls".

DEP directly provided forecasted ash management costs through 2040 by plant.[30] These costs were allocated to each unit using nameplate capacity.

Fuel, O&M, capital costs, and forecasted coal ash management costs were subtracted from energy revenues to arrive at net revenues for each plant and each year.

Q What are the implications of these uneconomic results for ratepayers?

A The negative values associated with DEP's coal units means that ratepayers are paying, and will continue to pay, for the uneconomic operation of the Company's coal fleet.

Q Do your findings regarding the recent negative values associated with DEP's coal units indicate that the Company should retire all of its coal units immediately?

A No. Retirement of DEP's entire coal fleet at once would likely lead to reliability issues in DEP's service territory. It is also possible that retirement of a portion of DEP's coal fleet may improve the economics of the remaining coal units. However, the recent net losses of DEP's coal units should, at a minimum, encourage DEP to perform a rigorous economic assessment of alternative retirement dates for each of its units. This assessment would include analysis of the services that the system needs in absence of the retiring units, and the most cost-effective replacement resources that provide these necessary services.

Q Your analysis shows that DEP's coal units have negative value to its customers. Is that a risk for other DEP assets as well?

A Yes. Just as competition from gas resources has challenged the economics of coal units, competition from renewable and storage resources are now challenging new and existing gas units. DEP's 2019 IRP Update calls for new combined cycle units in 2024 and 2026. In addition, DEP is likely to rely on new gas units as

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[30] DEP Response to Sierra Club DR 2-18, attachment "DEP SC 2-18.xlsx".

replacement resources in an analysis of alternative retirement dates for the Company's coal units. However, recent trends show that it can be cheaper today to build new renewable-plus-storage units than to build ***new*** gas units. Forecasts suggest that in the future, it will be cheaper to build new renewable-plus-storage units than to continue operating ***existing*** gas units.[31] This means that new and existing gas units are likely to become stranded assets.

New large combined cycle units are not nimble or modular, need large lead time to construct. If the load the units are planned to meet does not materialize, there is no way for DEP to scale the asset down. Existing coal plants can be retired in a staged manner and replaced incrementally with solar, battery storage, and energy efficiency in quantities that match near-term need and allow for customers to benefit from resource cost declines.

Q What is a stranded asset?

A A stranded asset is one that no longer has value or produces income. It is important to consider stranded asset risk for large gas units because the costs to construct them are usually recovered by utilities from their customers over many decades. This risk is particularly relevant to any new gas units that might be proposed as replacement resources for any of DEP's retiring coal units, and to those new units called for in the 2019 IRP Update.

If conditions in the electric sector cause a new or existing gas unit to no longer be used and useful, either the Company's customers or its shareholders will be burdened with the costs of a non-performing unit for the remainder of its depreciable life. Such conditions might include cost declines associated with renewables and storage, a declining cap on carbon dioxide (CO_2) emissions, or both.

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[31] Exhibit RW-5. Rocky Mountain Institute. 2019. *The Growing Market for Clean Energy Portfolios.*

Q Are there additional reasons that DEP should evaluate alternative retirement dates for its coal units?

A Yes. On October 29, 2018, Governor Roy Cooper signed Executive Order 80, which directed the North Carolina Department of Environmental Quality to develop a Clean Energy Plan. That Plan was released in October 2019, setting a goal to reduce emissions of CO_2 from the electric sector by 70 percent below 2005 levels by 2030.[32] In a separate docket, DEP stated that in order to reduce emissions commensurate with North Carolina goals, as well as its own corporate goals, it would need to accelerate the pace of coal plant retirements and replace those units with low-emitting resources.[33]

Duke Energy, DEP's parent company, also has its own carbon-reduction goals, which are to cut CO_2 emissions by 50 percent or more by 2030 and to attain net-zero emissions by 2050.[34] New combined cycle units built in 2024 and 2026 will be less than 30 years old by 2050. Give that the typical economic life of a combined cycle plant is 30 to 40 years, it is hard to see how Duke can both meet its 2050 CO_2 emissions goal and operate a new plant through its full economic life.

Q Are these emissions goals relevant to the stranded asset risk faced by new gas units that you discuss, above?

A Most definitely.

Q Is there evidence that other state regulators are making decisions about new gas units based on the risk that they will become stranded assets?

A Yes, especially in recent cases, state regulators are regularly citing stranded asset risk as one of the main reasons why they have rejected proposed gas units:

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[32] North Carolina Department of Environmental Quality. 2019. *North Carolina Clean Energy Plan*. Available at: https://files nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf.

[33] Duke Energy Progress. Response to Friesian Holdings Data Request 2-8. Docket No. EMP-105, Sub 0.

[34] Duke Energy. *Global Climate Change*. Available at: https://www.duke-energy.com/our-company/environment/global-climate-change.

- In March 2018 the Arizona Corporation Commission rejected the integrated resource plans of the state's utilities due to their reliance on gas units and the associated risk of stranded assets. The Commission placed a nine-month moratorium on new gas units larger than 150 MW while the utilities modeled scenarios with high penetrations of renewables and storage.[35] That moratorium was then extended for an additional six months.[36]

- In April 2019 the Indiana Utility Regulatory Commission (IURC) rejected an 850 MW gas plant proposed by Vectren, citing concerns that the plant could become a stranded asset as cost of renewables declines and customer demand changes. The IURC directed Vectren to evaluate alternatives to a large, centralized generating station.[37]

- In October 2019 the Minnesota Public Utilities Commission rejected a proposal from Xcel Energy to purchase the 720 MW Mankato combined-cycle gas plant due to stranded asset concerns if the plant were to close early due to the decline in renewable and storage costs.[38]

Q What are your recommendations to the Commission with regard to any request for recovery of future capital investments at DEP's coal units?

A I recommend that the Commission place a cap on future capital expenditures intended to prolong the lives of the DEP units as generating assets, and require the utilities to come to the Commission for approval of any expenditure that exceeds that cap before the expenditure can be recovered from ratepayers. The cap could decline as units approach their respective retirement dates. The cap could also be contingent upon the results of DEP's unit retirement study, to be included with the 2020 IRP.

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[35] Utility Dive. March 15, 2018. *Arizona regulators move to place gas plant moratorium on utilities.* Available at: https://www.utilitydive.com/news/arizona-regulators-move-to-place-gas-plant-moratorium-on-utilities/519176/.

[36] Utility Dive. February 11, 2019. *Arizona extends gas plant moratorium, punts on PURPA reforms.* Available at: https://www.utilitydive.com/news/arizona-extends-gas-plant-moratorium-punts-on-purpa-reforms/548072/.

[37] Utility Dive. April 25, 2019. *Indiana regulators reject Vectren gas plant over stranded asset concerns.* Available at: https://www.utilitydive.com/news/indiana-regulators-reject-vectren-gas-plant-over-stranded-asset-concerns/553456/.

[38] Utility Dive. October 1, 2019. *Minnesota rejects Xcel's 720 MW Mankato gas plant purchase over stranded asset concerns.* Available at: https://www.utilitydive.com/news/minnesota-rejects-xcels-720-mw-mankato-gas-plant-purchase-over-stranded-as/564029/.

Similar action has been taken in other jurisdictions. The Georgia Public Service Commission, for example, recently applied a cap to capital spending at the utility's Bowen plant in the recent 2019 proceeding.[39]

Q Do you offer any recommendations related to your discussion of stranded asset risk for new gas units?

A Yes. I recommend that in future rate cases, DEP be required to demonstrate that its gas units are providing positive net value to ratepayers before being granted recovery of capital and O&M costs. If DEP cannot make such a demonstration, those units should be removed from rate base.

VII. PRUDENCE OF DEP INVESTMENTS IN ITS COAL UNITS

Q Does DEP offer support for the prudence of its investments in its coal units?

A DEP offers limited support for the prudence of its investments through the Direct Testimony of Julie K. Turner, which describes in a single paragraph the Company's "cost management program" and management oversight of project budgeting and cost reporting.[40] Ms. Turner also presents data on the Equivalent Availability Factors (EAFs)[41] and Equivalent Forced Outage Rates (EFORs)[42] for DEP's coal units and compares them to NERC averages.[43]

Q Has DEP demonstrated the prudence of its historical capital investments in its coal units, for which it is seeking cost recovery?

A No. In order to demonstrate prudence in the context of utility planning, DEP would need to show that its decision to commit to a particular power plant

[39] Georgia Public Service Commission. 2019. Docket No. 42310. Order Adopting Stipulation as Amended. Attached as Exhibit RW-4.

[40] Direct Testimony of Julie K. Turner. Page 7, lines 18-23 and page 8, lines 1-3.

[41] Equivalent Availability Factor measures the percent of time that a unit is able to operate at full power if needed.

[42] Equivalent Forced Outage Rate measures the percentage of unit failure in terms of unplanned outage hours and equivalent unplanned derated hours.

[43] Direct Testimony of Julie K. Turner. Page 11.

construction project is justified, based on conditions at the time the decision was made. Planning prudence includes consideration of a reasonable set of alternatives, the use of appropriate models and methodologies, and the collection and application of current forecasts and data. Costs that are found by regulators to have been incurred imprudently should generally be disallowed from rates. Similarly, assets that are not used and useful should be removed from rate base. Customers should not be asked to bear the burden associated with unjustified system planning decisions.

Q What do you mean by "used and useful" in this context?

A The "used" part of the "used and useful" standard is relatively straightforward. Specifically, regulators should determine whether a particular asset is physically used in providing service to customers. Examples of equipment not "used" in providing service can include power plants that have been retired from service, environmental retrofit equipment that is not operated, transmission or distribution equipment that has been removed from the grid, and previously installed meters that are uninstalled as part of a meter replacement program.

The "useful" portion is more complex, as a particular item can be used in providing service but not be economically useful. For example, there may have been a power plant construction project that was planned in a prudent manner but may operate at costs significantly higher than the economic value of the output for reasons beyond the utility's control and ability to reasonably foresee. In such a circumstance a regulatory commission may find that the plant is prudent and used, but not economically useful in providing service to customers.

Q Why are these ratemaking concepts important in this docket?

A DEP is effectively requesting that the Commission determine that its past and future capital expenditures represent prudent investments in its coal fleet. I understand that the Commission applies a presumption of prudence to utility expenditures in some circumstances. There have been no other dockets before the

Commission to determine whether DEP's capital expenditures were prudent prior to the Company spending the money, or whether DEP's coal units are "used and useful." Therefore, it is important that the Commission consider the economics of each of the units when ruling on DEP's application in this docket. While the Commission might consider DEP's coal fleet "used" because it provides energy to ratepayers, given the fact that the coal units are providing energy uneconomically, and increasing costs to DEP ratepayers, they are not currently "useful."

VIII. CONCLUSIONS AND RECOMMENDATIONS

Q Please summarize your conclusions.

A My primary findings indicate that all DEP's coal units operated uneconomically for the three years between 2016 and 2018. I estimate that each of the coal units had negative net value of between [BEGIN CONFIDENTIAL] [redacted] [END CONFIDENTIAL] from 2016 to 2018. Despite these net losses, DEP continues to determine unit retirement dates for its coal fleet based solely on depreciation studies and continues to invest in its uneconomic coal units.

My analysis shows that each of DEP's coal units will continue to operate uneconomically in the future. DEP has not provided any economic assessments of the continued operation of its coal-fired units, even as low gas prices and declining costs for renewables have disadvantaged many coal units across the country. Thus, the Company has not demonstrated that continuing to invest in its coal fired units is a prudent decision and provides value to ratepayers.

Q Please summarize your recommendations.

A Based on my findings, I offer the following recommendations:

1. I recommend that the Commission disallow past spending on capital projects incurred between the 2017 rate case and this rate case, given that the data show that all of DEP's units had negative net value from 2016 to 2018.

Capital spending during this time period should be disallowed until DEP provides evidence of an analysis demonstrating the value of the investment done at the time the investment decision was made.

2. Similarly, I recommend that the Commission disallow recovery of ongoing operations and maintenance (O&M) expenses at DEP's coal units, given that DEP's coal units are projected to continue to have negative value in the future.
3. I recommend that the Commission place a cap on future capital expenditures intended to prolong the lives of the DEP units as generating assets, and require the utilities to come to the Commission for approval of any expenditure that exceeds that cap before the expenditure can be recovered from ratepayers.
4. I recommend that in future rate cases, DEP be required to demonstrate that its gas units are providing positive net value to ratepayers before being granted recovery of capital and O&M costs. If DEP cannot make such a demonstration, those units should be removed from rate base.

Q Does this conclude your direct testimony?

A Yes, it does.

SIERRA CLUB

WILSON EXHIBIT RW-1

RESUME

Docket No. e-2, Sub 1219

Rachel Wilson, Principal Associate

Synapse Energy Economics I 485 Massachusetts Avenue, Suite 2 I Cambridge, MA 02139 I 617-453-7044
rwilson@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, April 2019 – present*, Senior Associate*, 2013 – 2019, *Associate*, 2010 – 2013, *Research Associate*, 2008 – 2010.

Provides consulting services and expert analysis on a wide range of issues relating to the electricity and natural gas sectors including: integrated resource planning; federal and state clean air policies; emissions from electricity generation; electric system dispatch; and environmental compliance technologies, strategies, and costs. Uses optimization and electricity dispatch models, including Strategist, PLEXOS, EnCompass, PROMOD, and PROSYM/Market Analytics to conduct analyses of utility service territories and regional energy markets.

Analysis Group, Inc., Boston, MA.

Associate, 2007 – 2008, *Senior Analyst Intern*, 2006 – 2007.

Provided litigation support and performed data analysis on various topics in the electric sector, including tradeable emissions permitting, coal production and contractual royalties, and utility financing and rate structures. Contributed to policy research, reports, and presentations relating to domestic and international cap-and-trade systems and linkage of international tradeable permit systems. Managed analysts' work processes and evaluated work products.

Yale Center for Environmental Law and Policy, New Haven, CT. *Research Assistant*, 2005 – 2007.

Gathered and managed data for the Environmental Performance Index, presented at the 2006 World Economic Forum. Interpreted statistical output, wrote critical analyses of results, and edited report drafts. Member of the team that produced *Green to Gold*, an award-winning book on corporate environmental management and strategy. Managed data, conducted research, and implemented marketing strategy.

Marsh Risk and Insurance Services, Inc., Los Angeles, CA. *Risk Analyst*, Casualty Department, 2003 – 2005.

Evaluated Fortune 500 clients' risk management programs/requirements and formulated strategic plans and recommendations for customized risk solutions. Supported the placement of $2 million in insurance premiums in the first year and $3 million in the second year. Utilized quantitative models to create loss forecasts, cash flow analyses and benchmarking reports. Completed a year-long Graduate Training Program in risk management; ranked #1 in the western region of the US and shared #1 national ranking in a class of 200 young professionals.

EDUCATION

Yale School of Forestry & Environmental Studies, New Haven, CT
Masters of Environmental Management, concentration in Law, Economics, and Policy with a focus on energy issues and markets, 2007

Claremont McKenna College, Claremont, California
Bachelor of Arts in Environment, Economics, Politics (EEP), 2003. *Cum laude* and EEP departmental honors.

School for International Training, Quito, Ecuador
Semester abroad studying Comparative Ecology. Microfinance Intern – Viviendas del Hogar de Cristo in Guayaquil, Ecuador, Spring 2002.

ADDITIONAL SKILLS AND ACCOMPLISHMENTS

- Microsoft Office Suite, Lexis-Nexis, Platts Energy Database, Strategist, PROMOD, PROSYM/Market Analytics, EnCompass, and PLEXOS, some SAS and STATA.
- Competent in oral and written Spanish.
- Hold the Associate in Risk Management (ARM) professional designation.

PUBLICATIONS

Wilson, R., D. Bhandari. 2019. *The Least-Cost Resource Plan for Santee Cooper: A Path to Meet Santee Cooper's Customer Electricity Needs at the Lowest Cost and Risk.* Synapse Energy Economics for the Sierra Club, Southern Environmental Law Center, and Coastal Conservation League.

Wilson, R., N. Peluso, A. Allison. 2019. *North Carolina's Clean Energy Future: An Alternative to Duke's Integrated Resource Plan.* Synapse Energy Economics for the North Carolina Sustainable Energy Association.

Wilson, R., N. Peluso, A. Allison. 2019. *Modeling Clean Energy for South Carolina: An Alternative to Duke's Integrated Resource Plan.* Synapse Energy Economics for the South Carolina Solar Business Alliance.

Camp, E., B. Fagan, J. Frost, D. Glick, A. Hopkins, A. Napoleon, N. Peluso, K. Takahashi, D. White, R. Wilson, T. Woolf. 2018. *Phase 1 Findings on Muskrat Falls Project Rate Mitigation.* Synapse Energy Economics for Board of Commissioners of Public Utilities, Province of Newfoundland and Labrador.

Allison, A., R. Wilson, D. Glick, J. Frost. 2018. *Comments on South Africa 2018 Integrated Resource Plan.* Synapse Energy Economics for Centre for Environmental Rights.

Hall, J., R. Wilson, J. Kallay. 2018. *Effects of the Draft CAFE Standard Rule on Vehicle Safety*. Synapse Energy Economics on behalf of Consumers Union.

Whited, M., A. Allison, R. Wilson. 2018. *Driving Transportation Electrification Forward in New York: Considerations for Effective Transportation Electrification Rate Design*. Synapse Energy Economics on behalf of the Natural Resources Defense Council.

Wilson, R., S. Fields, P. Knight, E. McGee, W. Ong, N. Santen, T. Vitolo, E. A. Stanton. 2016. *Are the Atlantic Coast Pipeline and the Mountain Valley Pipeline Necessary? An examination of the need for additional pipeline capacity in Virginia and Carolinas.* Synapse Energy Economics for Southern Environmental Law Center and Appalachian Mountain Advocates.

Wilson, R., T. Comings, E. A. Stanton. 2015. *Analysis of the Tongue River Railroad Draft Environmental Impact Statement.* Synapse Energy Economics for Sierra Club and Earthjustice.

Wilson, R., M. Whited, S. Jackson, B. Biewald, E. A. Stanton. 2015. *Best Practices in Planning for Clean Power Plan Compliance.* Synapse Energy Economics for the National Association of State Utility Consumer Advocates.

Luckow, P., E. A. Stanton, S. Fields, B. Biewald, S. Jackson, J. Fisher, R. Wilson. 2015. *2015 Carbon Dioxide Price Forecast.* Synapse Energy Economics.

Stanton, E. A., P. Knight, J. Daniel, B. Fagan, D. Hurley, J. Kallay, E. Karaca, G. Keith, E. Malone, W. Ong, P. Peterson, L. Silvestrini, K. Takahashi, R. Wilson. 2015. *Massachusetts Low Gas Demand Analysis: Final Report.* Synapse Energy Economics for the Massachusetts Department of Energy Resources.

Fagan, B., R. Wilson, D. White, T. Woolf. 2014. *Filing to the Nova Scotia Utility and Review Board on Nova Scotia Power's October 15, 2014 Integrated Resource Plan: Key Planning Observations and Action Plan Elements.* Synapse Energy Economics for the Nova Scotia Utility and Review Board.

Wilson, R., B. Biewald, D. White. 2014. *Review of BC Hydro's Alternatives Assessment Methodology*. Synapse Energy Economics for BC Hydro.

Wilson, R., B. Biewald. 2013. *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans.* Synapse Energy Economics for Regulatory Assistance Project.

Fagan, R., P. Luckow, D. White, R. Wilson. 2013. *The Net Benefits of Increased Wind Power in PJM.* Synapse Energy Economics for Energy Future Coalition.

Hornby, R., R. Wilson. 2013. *Evaluation of Merger Application filed by APCo and WPCo.* Synapse Energy Economics for West Virginia Consumer Advocate Division.

Johnston, L., R. Wilson. 2012. *Strategies for Decarbonizing Electric Power Supply.* Synapse Energy Economics for Regulatory Assistance Project, Global Power Best Practice Series, Paper #6.

Wilson, R., P. Luckow, B. Biewald, F. Ackerman, E. Hausman. 2012. *2012 Carbon Dioxide Price Forecast.* Synapse Energy Economics.

Hornby, R., R. Fagan, D. White, J. Rosenkranz, P. Knight, R. Wilson. 2012. *Potential Impacts of Replacing Retiring Coal Capacity in the Midwest Independent System Operator (MISO) Region with Natural Gas or Wind Capacity.* Synapse Energy Economics for Iowa Utilities Board.

Fagan, R., M. Chang, P. Knight, M. Schultz, T. Comings, E. Hausman, R. Wilson. 2012. *The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region*. Synapse Energy Economics for Energy Future Coalition.

Fisher, J., C. James, N. Hughes, D. White, R. Wilson, and B. Biewald. 2011. *Emissions Reductions from Renewable Energy and Energy Efficiency in California Air Quality Management Districts.* Synapse Energy Economics for California Energy Commission.

Wilson, R. 2011. *Comments Regarding MidAmerican Energy Company Filing on Coal-Fired Generation in Iowa*. Synapse Energy Economics for the Iowa Office of the Consumer Advocate.

Hausman, E., T. Comings, R. Wilson, and D. White. 2011. *Electricity Scenario Analysis for the Vermont Comprehensive Energy Plan 2011*. Synapse Energy Economics for Vermont Department of Public Service.

Hornby, R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M. Wittenstein, R. Wilson, B. Biewald. 2011. *Avoided Energy Supply Costs in New England: 2011 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Wilson, R., P. Peterson. 2011. *A Brief Survey of State Integrated Resource Planning Rules and Requirements*. Synapse Energy Economics for American Clean Skies Foundation.

Johnston, L., E. Hausman., B. Biewald, R. Wilson, D. White. 2011. *2011 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

Fisher, J., R. Wilson, N. Hughes, M. Wittenstein, B. Biewald. 2011. *Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided Through the Retirement of the US Coal Fleet*. Synapse Energy Economics for Civil Society Institute.

Peterson, P., V. Sabodash, R. Wilson, D. Hurley. 2010. *Public Policy Impacts on Transmission Planning*. Synapse Energy Economics for Earthjustice.

Fisher, J., J. Levy, Y. Nishioka, P. Kirshen, R. Wilson, M. Chang, J. Kallay, C. James. 2010. *Co-Benefits of Energy Efficiency and Renewable Energy in Utah: Air Quality, Health and Water Benefits.* Synapse Energy Economics, Harvard School of Public Health, Tufts University for State of Utah Energy Office.

Fisher, J., C. James, L. Johnston, D. Schlissel, R. Wilson. 2009. *Energy Future: A Green Alternative for Michigan*. Synapse Energy Economics for Natural Resources Defense Council (NRDC) and Energy Foundation.

Schlissel, D., R. Wilson, L. Johnston, D. White. 2009. *An Assessment of Santee Cooper's 2008 Resource Planning*. Synapse Energy Economics for Rockefeller Family Fund.

Schlissel, D., A. Smith, R. Wilson. 2008. *Coal-Fired Power Plant Construction Costs*. Synapse Energy Economics.

TESTIMONY

Mississippi Public Service Commission (Docket No. 2019-UA-116): Direct testimony of Rachel Wilson regarding Mississippi Power Company's petition to the Mississippi Public Service Commission for a Certification of Public Convenience and Necessity for ratepayer-funded investments required to meet Coal Combustion Residuals regulations at the Victor J. Daniel Electric Generating Facility. On behalf of the Sierra Club. October 16, 2019.

Georgia Public Service Commission (Docket No. 42310 & 42311): Direct testimony of Rachel Wilson regarding various components of Georgia Power's 2019 Integrated Resource Plan. On behalf of the Sierra Club. April 25, 2019.

Washington Utilities and Transportation Commission (Dockets UE-170485 & UG-170486): Response testimony regarding Avista Corporation's production cost modeling. On behalf of Public Counsel Unit of the Washington Attorney General's Office. October 27, 2017.

Texas Public Utilities Commission (SOAH Docket No. 473-17-1764, PUC Docket No. 46449): Cross-rebuttal testimony evaluating Southwestern Electric Power Company's application for authority to change rates to recover the costs of investments in pollution control equipment. On behalf of Sierra Club and Dr. Lawrence Brough. May 19, 2017.

Texas Public Utilities Commission (SOAH Docket No. 473-17-1764, PUC Docket No. 46449): Direct testimony evaluating Southwestern Electric Power Company's application for authority to change rates to recover the costs of investments in pollution control equipment. On behalf of Sierra Club and Dr. Lawrence Brough. April 25, 2017.

Virginia State Corporation Commission (Case No. PUE-2015-00075): Direct testimony evaluating the petition for a Certificate of Public Convenience and Necessity filed by Virginia Electric and Power Company to construct and operate the Greensville County Power Station and to increase electric rates to recover the cost of the project. On behalf of Environmental Respondents. November 5, 2015.

Missouri Public Service Commission (Case No. ER-2014-0370): Direct and surrebuttal testimony evaluating the prudence of environmental retrofits at Kansas City Power & Light Company's La Cygne Generating Station. On behalf of Sierra Club. April 2, 2015 and June 5, 2015.

Oklahoma Corporation Commission (Cause No. PUD 201400229): Direct testimony evaluating the modeling of Oklahoma Gas & Electric supporting its request for approval and cost recovery of a Clean Air Act compliance plan and Mustang modernization, and presenting results of independent Gentrader modeling analysis. On behalf of Sierra Club. December 16, 2014.

Michigan Public Service Commission (Case No. U-17087): Direct testimony before the Commission discussing Strategist modeling relating to the application of Consumers Energy Company for the authority to increase its rates for the generation and distribution of electricity. On behalf of the Michigan Environmental Council and Natural Resources Defense Council. February 21, 2013.

Indiana Utility Regulatory Commission (Cause No. 44217): Direct testimony before the Commission discussing PROSYM/Market Analytics modeling relating to the application of Duke Energy Indiana for Certificates of Public Convenience and Necessity. On behalf of Citizens Action Coalition, Sierra Club, Save the Valley, and Valley Watch. November 29, 2012.

Kentucky Public Service Commission (Case No. 2012-00063): Direct testimony before the Commission discussing upcoming environmental regulations and electric system modeling relating to the application of Big Rivers Electric Corporation for a Certificate of Public Convenience and Necessity and for approval of its 2012 environmental compliance plan. On behalf of Sierra Club. July 23, 2012.

Kentucky Public Service Commission (Case No. 2011-00401): Direct testimony before the Commission discussing STRATEGIST modeling relating to the application of Kentucky Power Company for a Certificate of Public Convenience and Necessity, and for approval of its 2011 environmental compliance plan and amended environmental cost recovery surcharge. On behalf of Sierra Club. March 12, 2012.

Kentucky Public Service Commission (Case No. 2011-00161 and Case No. 2011-00162): Direct testimony before the Commission discussing STRATEGIST modeling relating to the applications of Kentucky Utilities Company, and Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity, and approval of its 2011 compliance plan for recovery by environmental surcharge. On behalf of Sierra Club and Natural Resources Defense Council (NRDC). September 16, 2011.

Minnesota Public Utilities Commission (OAH Docket No. 8-2500-22094-2 and MPUC Docket No. E-017/M-10-1082): Rebuttal testimony before the Commission describing STRATEGIST modeling performed in the docket considering Otter Tail Power's application for an Advanced Determination of Prudence for BART retrofits at its Big Stone plant***.*** On behalf of Izaak Walton League of America, Fresh Energy, Sierra Club, and Minnesota Center for Environmental Advocacy. September 7, 2011.

PRESENTATIONS

Wilson, R. 2017. "Integrated Resource Planning: Past, Present, and Future." Presentation for the Michigan State University Institute of Public Utilities Grid School. March 29, 2017.

Wilson, R. 2015. "Best Practices in Clean Power Plan Planning." NASEO/ACEEE Webinar. June 29, 2015.

Wilson, R. 2009. "The Energy-Water Nexus: Interactions, Challenges, and Policy Solutions." Presentation for the National Drinking Water Symposium. October 13, 2009.

Resume dated October 2019