STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-2, SUB 1321

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of Application of Duke Energy Progress, LLC Pursuant to G.S. 62-133.2 and NCUC Rule R8-55 Relating to Fuel and Fuel-Related Charge Adjustments for Electric Utilities	)	**DIRECT TESTIMONY OF JEFFREY FLANAGAN FOR DUKE ENERGY PROGRESS, LLC**

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jeffrey Flanagan and my business address is 8320 East Highway 150, Terrell, North Carolina.

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

A. I am employed by Duke Energy as General Manager III of the Carolinas Dispatchable Generation - West Zone including the Marshall, Allen, Asheville and WS Lee stations.

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I graduated from NC State University with a Bachelor's Degree in Paper Science & Engineering and a Bachelor's Degree in Chemistry. I also graduated from The University of South Carolina with a Master's Degree in Business Administration. I am a registered Professional Engineer in the state of South Carolina. My career began with Duke Energy as an FGD Scrubber Engineer at Progress Energy. Since that time, I have held various roles of increasing responsibility in generation projects, engineering and operations areas, including Operations and Maintenance Superintendent at Marshall Station and Station Manager at Smith Energy Complex. I was named General Manager of Marshall and Allen Stations in July of 2021. I assumed my current role in February of 2023.

Q. WHAT ARE YOUR DUTIES AS GENERAL MANAGER III OF THE CAROLINAS DISPATCHABLE GENERATION?

A. I am responsible for the overall direction and management for over 4,000 megawatts of Carolinas Dispatchable Generation coal, combined cycle and peaking generation,

providing strategic direction and leadership to station general managers including day to day operations, business analysis, process development, O&M and capital budget allocation and implementation and outage performance. I am also responsible for operational excellence at all levels of the organization including continuous improvement and competitive benchmarking. I interact with the public and private sector to manage the overall business to maintain profitable and publicly positive stations.

Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION IN ANY PRIOR PROCEEDINGS?

A. Yes. I testified before the North Carolina Utilities Commission on behalf of the Company in its Duke Energy Carolinas, LLC 2023 annual fuel rider proceeding in Docket No. E-7, Sub 1282.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to (1) describe DEP's Traditional and Renewable (formerly called the Fossil/Hydro/Solar fleet) generation portfolio and changes made since the 2022 fuel cost recovery proceeding, as well as those expected in the near term; (2) discuss the performance of DEP's Traditional and Renewable facilities during the period of April 1, 2022 through March 31, 2023 (the "review period"); (3) provide information on significant Traditional/Renewable outages that occurred during the review period; and (4) provide information concerning environmental compliance efforts.

Q. PLEASE DESCRIBE DEP'S TRADITIONAL/RENEWABLE GENERATION PORTFOLIO FOR THE REVIEW PERIOD.

A. The Company's Traditional/Renewables generation portfolio consists of 8,945 MWs of generating capacity, made up as follows:

Coal-fired -	3,143 MWs
Combustion Turbines -	2,404 MWs
Combined Cycle Turbines -	3,079 MWs
Hydro -	228 MWs
Solar -	87 MWs[1]
Battery Storage-	4 MWs

The 3,143 MWs of coal-fired generation represent two generating stations and a total of five units. These units are equipped with emission control equipment, including selective catalytic reduction ("SCR") equipment for removing nitrogen oxides ("NO_x"), flue gas desulfurization ("scrubber") equipment for removing sulfur dioxide ("SO_2"), and low NO_x burners. This inventory of coal-fired assets with emission control equipment enhances DEP's ability to maintain current environmental compliance and concurrently utilize coal with increased sulfur content – providing flexibility for DEP to procure the most cost-effective options for fuel supply. The Company has a total of 24 simple cycle combustion turbine ("CT") units, the larger 14 of which provide 2,144 MWs, or 89% of CT capacity. These 14 units are located at the Asheville, Darlington, Richmond County (Smith Energy Complex), and Wayne County (H.F. Lee) facilities, and are equipped with water injection and/or low NO_x burners for NO_x control. The 3,079 MWs shown as "Combined Cycle Turbines" ("CC") represent six power blocks. The two

[1] This value represents the dependable capacity contribution to meeting summer peak demand, based on the Company's integrated resource planning metrics. The nameplate capacity of the Company's solar facilities is 141 MWs.

Asheville Combined Cycle power blocks have a configuration of one CT and one steam turbine. The H.F. Lee Energy Complex CC power block has a configuration of three CTs and one steam turbine. The two Richmond County power blocks located at the Smith Energy Complex consist of two CTs and one steam turbine each. The Sutton Combined Cycle at Sutton Energy Complex consists of two CTs and one steam turbine. The six CC power blocks are equipped with SCR equipment, and all eleven CTs have low NOx burners. The steam turbines do not combust fuel and, therefore, do not require NO_x controls. The Company's hydro fleet consists of 15 units providing 228 MWs of capacity. The Company's solar fleet consists of four sites providing 87 MWs of dependable capacity. 4 MWs of battery storage includes the Asheville-Rock Hill battery and the Hot Springs Microgrid battery.

Q. DID ANY NOTABLE CHANGES OCCUR WITHIN THE TRADITIONAL/RENEWABLES PORTFOLIO SINCE DEP'S 2022 ANNUAL FUEL PROCEEDING?

A. The solar Contribution to Peak percentages increased to 62% for DEP, resulting in a 52 MW increase in capacity. The increase was based on the updated ELCC (Effective Load Carrying Capability) results. Two battery storage projects were added to the fleet, adding 4 MWs to the generation total.

Q. WHAT ARE DEP'S OBJECTIVES IN THE OPERATION OF ITS TRADITIONAL/RENEWABLES FACILITIES?

A. The primary objective of DEP's Traditional/Renewables generation department is to provide safe, reliable, and cost-effective electricity to DEP's customers.

Operations personnel and other station employees are well-trained and execute their responsibilities to the highest standards in accordance with procedures, guidelines, and a standard operating model. Like safety, environmental compliance is a "first principle," and DEP works very hard to achieve high level results.

The Company achieves compliance with all applicable environmental regulations and maintains station equipment and systems in a cost-effective manner to ensure reliability. The Company also takes action in a timely manner to implement work plans and projects that enhance the safety and performance of systems, equipment, and personnel, consistent with providing low-cost power options for DEP's customers. Equipment inspection and maintenance outages are generally scheduled during the spring and fall months when customer demand is reduced due to milder temperatures. These outages are well-planned and executed with the primary purpose of preparing the unit for reliable operation until the next planned outage.

Q. HOW MUCH GENERATION DID EACH TYPE OF GENERATING FACILITY PROVIDE FOR THE REVIEW PERIOD?

A. For the review period, DEP's total system generation was 58,900,432 megawatt-hours ("MWHs"), of which 29,905,327 MWHs, or approximately 51%, was provided by the Traditional/Renewables fleet. The breakdown includes a 40% contribution from gas facilities, 9% contribution from coal-fired stations, 1% contribution from hydro sources, and 0.4% from solar facilities.

Q. HOW DID DEP COST EFFECTIVELY DISPATCH THE DIVERSE MIX OF GENERATING UNITS DURING THE REVIEW PERIOD?

A. The Company's portfolio includes a diverse mix of units that, along with its nuclear capacity, allows DEP to meet the dynamics of customer load requirements in a logical and cost-effective manner. The addition of new CC units within the Carolinas' portfolio in recent years has provided DEP with additional natural gas resources that feature state-of-the-art technology for increased efficiency and significantly reduced emissions. DEP also uses the Joint Dispatch Agreement with DEC, which allows generating resources for DEP and DEC to be dispatched as a single system to enhance dispatching the lowest cost resources available. The cost and operational characteristics of each unit generally determine the type of customer load situation (e.g., base and peak load requirements) that a unit would be called upon or dispatched to support.

Q. PLEASE EXPLAIN HEAT RATE AND WHAT WAS THE HEAT RATE FOR DEP'S COMBINED CYCLE AND COAL-FIRED UNITS DURING THE REVIEW PERIOD?

A. Heat rate is a measure of the amount of thermal energy needed to generate a given amount of electric energy and is expressed as British thermal units ("Btu") per kilowatt-hour ("kWh"). A low heat rate indicates an efficient fleet that uses less heat energy from fuel to generate electrical energy. Over the review period, the Company's six combined cycle power blocks produced 69% of the Traditional/Renewables generation, with an average heat rate of 7,205 Btu/kWh. The five coal units produced 18% of the Traditional/Renewables generation, with the average heat rate of 11,157 Btu/kWh.

Q. PLEASE DISCUSS THE OPERATIONAL RESULTS FOR DEP'S TRADITIONAL/RENEWABLES FLEET DURING THE REVIEW PERIOD.

A. The Company's generating units operated efficiently and reliably during the review period. Several key measures are used to evaluate the operational performance depending on the generator type: (1) equivalent availability factor ("EAF"), which refers to the percent of a given time period a facility was available to operate at full power, if needed (EAF is not affected by the manner in which the unit is dispatched or by the system demands; it is impacted, however, by planned and unplanned maintenance (i.e., forced) outage time); (2) net capacity factor ("NCF"), which measures the generation that a facility actually produces against the amount of generation that theoretically could be produced in a given time period, based upon its maximum dependable capacity (NCF is affected by the dispatch of the unit to serve customer needs); (3) starting reliability ("SR"), which represents the percentage of successful starts; and (4) equivalent forced outage factor ("EFOF") – which quantifies the number of period hours in a year during which the unit is unavailable because of forced outages and forced deratings.

DEP Comparison to NERC Five Year Average				
Generator Type	Measure	Review Period*	2017-2021	Number of Units
		DEP Operational Results	NERC Average	
Coal Fired Test Period	EAF	63.23%	78.77%	182
	NCF	19.79%	52.30%	
	EFOF	9.22%	n/a	
*Coal Fired Summer Peak***	EAF	82.71%	n/a	n/a
Total CC Average	EAF	73.89%	84.41%	342
	NCF	65.70%	54.21%	
	EFOF	0.69%	n/a	
Total CT Average	EAF	76.22%	86.06%	680
	SR	99.15%	98.64%	
Hydro	EAF	68.95%	78.89%	909
Solar	NCF	20.31%	n/a	n/a

* Trailing 12 months ending 3/31/2023

** June, July, August

Q. PLEASE DISCUSS SIGNIFICANT OUTAGES OCCURRING AT DEP'S TRADITIONAL/RENEWABLES FACILITIES DURING THE REVIEW PERIOD.

A. In general, planned maintenance outages for all fossil and hydro units are scheduled for the spring and fall to maximize unit availability during periods of peak demand. Most units had at least one short, planned outage during this review period to inspect and maintain plant equipment.

In the spring of 2022, Lee CC performed an outage to do a steam turbine inspection, steam turbine generation inspection, and generator rotor winding repair. Roxboro 1 had an outage to do the annual boiler certificate inspection and Flue Gas Desulfurization (FGD) inlet expansion joint repairs. Lee CC performed an outage to do a borescope inspection, compressor blade replacement, and compressor blade

ring alignment. Asheville CC performed a GE warranty outage and made turbine rotor and packing repairs. Mayo 1 had an outage to tie in the aqueous ammonia system, precipitator inspection and repair, and miscellaneous boiler valve and piping repairs. Roxboro 3 had an outage to replace the top layer of SCR catalyst in two SCR's, inspected the precipitator, did FGD inspections and miscellaneous boiler valve and piping repairs.

Fall outages included an outage at Roxboro 3 to perform water pump repairs, dry fly ash piping and valve repairs, ammonia skid vaporizer replacement, coal surge bin inspections and cola reclaim chute repairs. The Company also performed an outage a Mayo 1, to replace the air preheater baskets and seals, perform turbine valve replacements and rebuilds, do High Energy Piping Non-Destructive Examination evaluations, and perform miscellaneous Balance of Plant activities. The Heat Recovery Steam Generator blowdown tanks and silencer end of life were replaced as part of an outage at Richmond County CC units. An outage at Wayne County CT13 was performed to replace the exhaust stack. Finally, an outage at Wayne County CT14 to conduct a Hot Gas Path Inspection and turning gear upgrade.

Forced outages with the highest equivalent hour impact during the test period included an outage at Weatherspoon CT1, where the unit expander exhaust case floor was broken at the center pin area and running toward the turning gear. A forced outage occurred at Weatherspoon CT4 with damage on a first stage rotating blade. Fuel nozzles caused a forced outage at Blewett CT2. Lastly, Roxboro 3 had a broken turning gear housing on the 3B Boiler Feed Pump Turbine that required a forced outage to repair.

Q. HOW DOES DEP ENSURE EMISSIONS REDUCTIONS FOR ENVIRONMENTAL COMPLIANCE?

A. The Company has installed pollution control equipment on coal-fired units, as well as new generation resources, to meet various current federal, state, and local reduction requirements for NOx and SO2 emissions. The SCR technology that DEP currently operates on the coal-fired units uses ammonia or urea for NOx removal and the scrubber technology employed uses crushed limestone or lime for SO2 removal. SCR equipment is also utilized on power blocks 4 and 5 Smith Energy Complex with aqueous ammonia (19% solution of NH_3) for NOx removal.

Overall, the type and quantity of chemicals used to reduce emissions at the plants varies depending on the generation output of the unit, the chemical constituents in the fuel burned, and/or the level of emissions reduction required. The Company is managing the impacts, favorable or unfavorable, because of changes to the fuel mix and/or changes in coal burn and utilization of non-traditional coals. Overall, the goal is to effectively comply with emissions regulations and provide the optimal total-cost solution for operation of the unit. The Company will continue to leverage new technologies and chemicals to meet both present and future state and federal emissions requirements including the MATS rule. MATS chemicals that DEP may use in the future to reduce emissions include, but may not be limited to, activated carbon, mercury oxidation chemicals, and mercury re-emission prevention chemicals. Company witness Harrington provides the cost information for DEP's chemical use and forecast.

Q. DOES THAT CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.