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**VIA ELECTRONIC FILING**

Ms. A. Shonta Dunston, Chief Clerk  
North Carolina Utilities Commission  
4325 Mail Service Center  
Raleigh, North Carolina 27699-4300

**RE: Duke Energy Carolinas, LLC's Finding of Fact Number 4  
Docket No. E-7, Sub 1282 – Test Period Outages in Dispute**

Dear Ms. Dunston:

As the Commission is aware, the Public Staff and the Company worked diligently to resolve the differences in their respective opinions as to the Company's management in connection with certain test period outages that occurred. Nevertheless, the parties were unable to reach agreement.

Accordingly, please find enclosed for filing in the above-referenced docket proposed Finding of Fact Number 4, separately addressing the Company's management of its nuclear and fossil fleet during the test period.

Please contact me if you have any questions.

Sincerely,

Ladawn S. Toon

Enclosure

cc: Parties of Record

**DEC Fuel (E-7 Sub 1282)****FINDINGS OF FACT**

4. The Company's baseload plants were managed prudently and efficiently during the test period so as to minimize fuel and fuel-related costs.

**EVIDENCE AND CONCLUSIONS FOR FINDING OF FACT NO. 4**

The evidence for this finding of fact is contained in the direct testimony of Company witnesses Capps and Flanagan, the rebuttal testimony of Witness Flanagan, and the direct testimony of Public Staff witness Lawrence.

Commission Rule R8-55(d)(1) provides that capacity factors for nuclear production facilities will be normalized based generally on the national average for nuclear production facilities as reflected in the most recent North American Electric Reliability Corporation (NERC) Generating Availability Report, adjusted to reflect the unique, inherent characteristics of the utility facilities and unusual events.

Witness Capps testified that the Company operated its nuclear stations in a reasonable and prudent manner during the test period, providing approximately 61% of the total power generated by DEC. In fact, he explained, the Company's seven nuclear units operated at a system average capacity factor of 94.66% during the test period. This capacity factor, as well as the Company's two-year average capacity factor of 95.39%, exceeded the five-year industry weighted average capacity factor of 91.87% for the period 2017 - 2021 for average comparable units on a capacity-

rated basis, as reported by NERC in its latest Generating Availability Report. (Tr. vol. 2, p 235.)

Witness Capps testified that for the 23<sup>rd</sup> consecutive year, DEC's seven nuclear units achieved a system average capacity factor exceeding 90%, which included four refueling outages. In addition, Witness Capps testified that on a larger industry basis, using early release data for 2022 from the Electric Utility Cost Group, Catawba, McGuire, and Oconee nuclear plants rank in the top quartile in total operating cost among the 55 U.S. operating nuclear plants. (Tr. vol. 2, pp 235-236.)

#### Fossil Management

Witness Flanagan testified concerning the performance of DEC's Traditional/Renewable (formerly described as Fossil/Hydro/Solar) generation department, testifying that the primary objective is to provide safe, reliable, and cost-effective electricity to DEC's customers. Witness Flanagan further stated that DEC achieves compliance with all applicable environmental regulations and maintains station equipment and systems in a cost-effective manner to ensure reliability. Additionally, 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 for its customers. (Tr. vol. 2, pp 67-68.)

Witness Flanagan testified that the Company's generating units operated efficiently and reliably during the test period. He explained that several key measures are used to evaluate 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 (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) equivalent forced outage rate (EFOR), which represents the percentage of unit failure (unplanned outage hours and equivalent unplanned derated hours); a low EFOR represents fewer unplanned outages and derated hours, which equates to a higher reliability measure; (4) starting reliability (SR), which represents the percentage of successful starts; and (5) equivalent forced outage factor (EFOF) which quantifies the number of period hours in a year during which the unit is unavailable because of forced deratings. (Tr. vol. 2, p 70.)

Regarding significant planned outages during the test period, Witness Flanagan testified that in general, planned maintenance outages for all fossil and larger hydroelectric units are scheduled for the spring and fall to maximize unit availability during periods of peak demand. During the test period, most of these units had at least one planned outage to inspect and maintain plant equipment. (Tr. vol. 2, p 71.)

According to witness Flanagan, in the spring of 2022, Marshall 4 completed a planned outage to rebuild major turbine valves, repair condenser valves and steam piping, and replace step up transformer oil coolers and pumps. Cliffside 6 completed an outage to inspect and test the generator, rebuild turbine valves, and replace the "A" Induced Fan rotor and six boiler coal burners. Belews Creek 2 performed work boiler inspections and repairs along with turbine inspections and valve rebuilds. Buck CC

performed an outage to conduct a turbine inspection and balance of plant maintenance, hotwell cleaning and condenser inspection. Dan River CC completed an outage to inspect the steam turbine, generator, and high energy piping and replace the cooling tower fill and natural gas valve. Lincoln CT 3 and 4 performed an outage to replace Generator Step Up relays. W.S. Lee CC completed an outage to perform pressure wave cleaning and do general inspection and maintenance activities. (Tr. vol. 2, p 71.)

Witness Flanagan also testified that in the fall of 2022, planned outages included an outage at Mill Creek CT-1 and Mill Creek CT-2 to inspect CT Combustion hardware and stacks, and outages at Mill Creek CT-3 and Mill Creek CT-4 to inspect CT combustion hardware and replace compressor blades. Rockingham CT-3 performed an outage to complete a CT Hot Gas Path Inspection and parts replacement. Marshall 1 completed an outage to replace lower slope boiler tubes, inspect and test CT & Aux transformers, replace the main stop valve and booster fan rotor, and perform BOP maintenance. W.S. Lee CC1-10 completed an outage to inspect the generator and replace the turbine valve. W.S. Lee CC1-11 completed an outage to perform a GT11 medium generator inspection. W.S. Lee CC1-12 completed an outage to perform CT Hot Gas Path Inspection and parts replacement, DCS Evergreen, SCR Catalyst replacement, HEP Inspection, and GT12 medium inspection. (Tr. vol. 2, pp 71-72.)

In sum, as Witness Flanagan testified, the company's management of its fossil fleet during the test-period was reasonable and prudent, as demonstrated by its longstanding history of executing outages in a prudent manner, following prescribed processes and operating experience to maintain its fleet reliably for DEC's customers. (Tr. vol. 2, p 76.)

Public Staff witness Lawrence testified that the Company met the standard of nuclear performance in Commission Rule R8-55(k) with an actual system-wide nuclear capacity factor during the test year that exceeded the NERC weighted average nuclear capacity factor. Additionally, he agreed that the Company's two-year simple average of its system-wide nuclear capacity factor exceeded the NERC average nuclear capacity factor. Public Staff witness Lawrence agrees that the DEC's nuclear units operated prudently. (Tr. vol. 2, p 264.) Nevertheless, with respect to DEC's fossil units, Witness Lawrence testified that certain fossil outages that occurred at the Company's Belews Creek Steam Station Unit 2 and W.S. Lee Combined Cycle Plant during the test period were "preventable." (Tr. vol. 2, p 263.)

Witness Flanagan explained on rebuttal that the question in fuel cases is not whether an outage was or was not "preventable" but instead whether the Company's decisions in connection with such outage were prudent. (Tr. vol. 2, p 77.)

**Standard for Determining Prudency**

N.C. Gen. Stat. § 62-133.2(d) allows for the recovery of fuel and fuel- related costs that are "prudently incurred under efficient management and economic operations." the Commission has stated the general prudency standard as follows:

...the standard for determining the prudence of the Company's actions should be whether management decisions were made in a reasonable manner and at an appropriate time on the basis of what was reasonably known or reasonably should have been known at that time. The Commission agrees that this is the appropriate standard to be used in judging the various claims of imprudence that have been put forth in this proceeding...and adopts it as the standard to be applied

herein. The Commission notes that this standard is one of reasonableness that must be based on a contemporaneous view of the action or decision under question. Perfection is not required. Hindsight analysis -- the judging of events based on subsequent developments -- is not permitted.<sup>1</sup>

**Belews Creek Unit 2 April 22, 2022 Outage Extension**

Witness Lawrence testified that the Belews Creek Unit 2 outage extension that began on April 22, 2022, was preventable and likely caused because someone working on the turbine did not follow proper procedures. (Tr. vol. 2, p 271.)

For additional context, Witness Flanagan explained the March 17th planned outage was scheduled to perform boiler maintenance, technology updates, and turbine valve work. Part of the planned scope also included a routine borescope inspection of the intermediate pressure (IP) turbine to inspect general condition and look for any issues that may need to be addressed in future planned maintenance. Unexpected foreign material was found in the IP turbine blade path during the routine borescope inspection performed on April 1, 2022, during the planned outage. (Tr. vol. 2, p 78.)

The Company considered the risk of potentially catastrophic damage to the turbine blade path and a possible future forced outage and made a prudent and reasonable decision to remove the foreign material from the IP turbine. The scope of work to disassemble and reassemble the IP turbine extended the outage end date from April 22, 2022, to May 8, 2022 (16 days). (Tr. vol. 2, p 78.)

The Company believes that the foreign material removed was the metal valve from an inflatable bladder used for foreign material exclusion (FME) prevention during turbine

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<sup>1</sup> North Carolina Utilities Commission *Order Approving Fuel Charge Adjustment* at 24, Docket No. E-7, Sub 1163 (August 20, 2018)

maintenance work, as Witness Flanagan testified. The metal bladder valve was the only component that survived the high temperature steam during turbine operation. The rubber bladder had disintegrated from the high temperature steam exposure. (Tr. vol. 2, p 79.)

He testified that the Company further believes that the inflatable bladder was left in the double flow IP turbine inlet piping during the Unit 2 Intermediate Pressure Turbine inspection during the 2018 turbine outage by error while performing final inspection prior to reassembly. (Tr. vol. 2, p 79.)

Witness Flanagan also testified that there were no operational problems or other indicators of the foreign material in the IP turbine prior to discovery from the borescope inspection in the 2022 planned outage. Furthermore, that Witness Lawrence has presented no evidence to identify specific imprudent actions or inactions by the company but has simply made the conclusory allegation that the outage was “preventable” (which is not the Commission’s prudence standard) and was “likely caused by someone ... not following proper procedures...” (Tr. vol. 2, p 79.)

#### **Belews Creek Unit 2 August 31, 2022 Outage**

Additionally, Witness Lawrence’s testified that the Belews Creek Unit 2 outage that began on August 31, 2022, was preventable, stating that the Company has the responsibility to ensure that the crossover pipe is adequately designed and properly assembled and installed by its employees or vendors. (Tr. vol. 2, p 274.)

On direct, Witness Flanagan testified that a review of the events that led up to this outage show the Company responded and took prudent actions. He also testified that in 2018 Fall Unit 2 outage the low pressure (LP) turbine crossovers were sent offsite to a



specialty vendor for expansion joint replacement. The crossovers are shipped to the vendor fully assembled and return fully assembled. The turbine was reassembled, and no problems were noted until September 4, 2019, when a tie rod nut was observed loosened by an operator during normal operator rounds. Witness Flanagan also explained on direct that the Company consulted the specialty vendor and was provided guidance on how to retighten the loose nut with Loctite Threadlocker 272. Additionally, the Company took the prudent step to conduct an inspection of all tie rods during the 2019 Fall Unit 2 outage on October 10, 2019. (Tr. vol. 2, p 93-95.)

The inspection revealed one tie rod with a cracked circumferential weld and loose spherical fasteners on another tie rod. The station performed a weld repair on the cracked weld and followed vendor guidance to tighten the loosened fastener securing the nuts with Loctite. The crossover presented no other abnormal indications until returning to service after a brief outage on August 31, 2022, when an operator noticed another loose tie rod nut and created a work order to have it retorqued during the next unit outage. The crossover failed hours later with the end cap liberating. Throughout the events that occurred prior to the ultimate failure the Company consulted with subject matter experts and took the recommended steps. With no original design criteria available from the OEM, only during the post event investigation using destructive testing and finite element analysis was the design and associated margin fully understood. The analysis showed the design margin was inadequate to handle the loading condition that results from a loose fastener. Witness Flanagan testified that the failure of the vendor to use Loctite Threadlocker, lack of original design margins, and understanding of subject matter

experts lead to the failure. This was not apparent or “preventable” at the time decisions were made on the actions to take. (Tr. vol. 2, pp 94-95.)

**W.S. Lee December 11, 2022 Outage**

Finally, witness Flanagan testified that he disagrees with witness Lawrence’s conclusion that the W.S. Lee outage that began on December 11, 2022, was preventable. (Tr. vol. 2, p 81.)

Witness Flanagan testified that the fire that occurred at W.S. Lee CC Unit ST 10 was caused by a failed hydraulic turning gear unit. There were no indications of a problem with the turning gear unit prior to the outage and no work was performed on the turning gear unit as part of the outage. The failure occurred due to a malfunction causing the turning gear not to disengage properly during turbine startup. There is nothing the Company did to cause this and no indications that could have been acted on to prevent it. (Tr. vol. 2, p 81.)

Witness Flanagan’s testified that he disagreed with the Witness Lawrence’s assertion that any of the above- discussed outages were “preventable”. He testified that Hindsight information, i.e., post-outage documentation, does not give an accurate view of whether an outage was preventable. According to Witness Flanagan, there is no evidence of pre-outage indicators that there were problems that would have caused forced outages and required immediate attention. He stated that sufficient evidence has not been presented to establish that management decisions concerning pre-outage activities were unreasonable given what was known at the time. (Tr. vol. 2, pp 91-92.)

### Commission's Conclusion

Of note, despite concluding that the outages were “preventable,” Witness Lawrence did not recommend any disallowance of replacement power costs resulting from outages in question and Public Staff does not dispute the Company’s test period fuel and fuel related costs. Therefore, the Commission’s review is limited to the Public Staff’s claims of imprudence.

Contrary to witness Lawrence’s testimony, the standard for determining the prudence of the Company’s management of its fleet is not whether an outage was or was not “preventable” but instead whether the Company’s decisions in connection with such outage were prudent.

As noted above, when evaluating whether the Company’s actions or inactions were prudent, the Commission examines whether the action or inaction was made in a reasonable manner at an appropriate time on the basis of what was known or reasonably should have been known at the time. The Commission is persuaded by Witness Flanagan’s testimony that there were no pre-outage indicators that would have caused the outages in question. Witness Lawrence takes the position that the outages were caused by the Company’s imprudent management (though he used the term “preventable”) but does not identify a single instance of imprudence or fact the Company knew or should have known that would have warranted a different action. Other than an unsubstantiated claim that someone did not follow proper procedures, there is no evidence demonstrating that the outages in question were caused by the Company’s imprudent management.

The Commission has further determined hindsight analysis is not permitted when assessing prudence and that perfection is not required. Witness Flanagan explained on rebuttal that the Public Staff relies heavily on outage documentation (e.g., Root Cause Analysis, Outage Report etc.) as support for its imprudence claims. He also testified that outage documentation, by design, is hindsight-based and self-critical in nature and are intended to identify every direct and contributing cause of an incident, along with all potential avenues for improvement. He further testified that reports are not designed to assess whether the actions of management were reasonable and prudent given what was known at the time, which, is exactly what Public Staff is doing. We tend to agree. Thus, the Commission is further persuaded by Witness Flanagan's testimony that there is no basis for the Public Staff's imprudent management claims. Outside of hindsight analysis, no evidence – much less material evidence-has been presented, which supports Witness Lawrence's testimony that these outages were preventable-i.e., the Company's actions or inactions were imprudent. To conclude otherwise, would allow for impermissible hindsight analysis and create a new standard of perfection. Therefore, in accordance with existing precedent, we find that the Public Staff's assertions of imprudent management are unfounded. Furthermore, there is no evidence that indicates that any action or inaction rises to the level of imprudence, required by the Commission's' well-established standard for prudence.

Based on a preponderance of the evidence in the record, the Commission concludes that the Company managed its baseload plants during the test period prudently and efficiently so as to minimize fuel and fuel-related costs.

## CERTIFICATE OF SERVICE

I certify that a copy of Duke Energy Carolinas, LLC's Finding of Fact Number 4, in Docket No. E-7, Sub 1282, has been served by electronic mail, hand delivery or by depositing a copy in the United States mail, postage prepaid to parties of record.

This the 24<sup>th</sup> day of July, 2023.



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