# NORTH CAROLINA UTILITIES COMMISSION
# DOCKET NO. E-7, SUB 1297

## APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

# MARSHALL ENERGY COMPLEX
## SIMPLE-CYCLE GAS COMBUSTION TURBINE ADDITIONS PROJECT

Exhibit 1B: Statement of Need

## 1.1 PROJECT DESCRIPTION

Duke Energy Carolinas, LLC ("DEC") proposes to construct two new hydrogen-capable, advanced-class, simple-cycle, natural gas-fueled, electric generating combustion turbines ("CT") with ultra-low sulfur diesel ("ULSD") back-up and associated transmission and natural gas pipeline interconnection facilities (the "Proposed Facility"). Each CT will have an estimated nominal winter capacity of 425 megawatts ("MW"). The Proposed Facility will be located in Catawba County, on DEC-owned land at the Marshall Steam Station ("Marshall"). The site consists of four (4) coal-fired electric generating units. Marshall Units 1 and 2 are subcritical steam generator coal technology each rated at 380 MW that were put into commercial operation in 1965 and 1966, respectively. Marshall Units 3 and 4 are supercritical steam generator coal technology rated at 658 MW and 660 MW, respectively, that were first placed into commercial operation in 1969 and 1970, respectively. Marshall Units 3 and 4 are each currently capable of operating at up to 50% on natural gas at full load operations. The Proposed Facility has completed a Generator Replacement Request interconnection study process for use of approximately 780 MW of transmission interconnection rights associated with the retiring coal capacity from Marshall Units 1 and 2. DEC is pursuing an interconnection agreement in the 2023 Definitive Interconnection System Impact Study ("DISIS") for the remaining capacity beyond the interconnection rights of the retiring coal units. The Proposed Facility, along with the remaining Marshall Units 3 and 4, will be referred to as the Marshall Energy Complex.

## 1.2 STATEMENT OF NEED

The Proposed Facility will provide dispatchable capacity and energy to meet the needs of the system. The North Carolina Utilities Commission's ("Commission") *Order Adopting Initial Carbon Plan and Providing Direction for Future Planning* issued in Docket No. E-100, Sub 179 on December 30, 2022 (the "Carbon Plan Order"), along with DEC's and Duke Energy Progress, LLC's ("DEP," and together with DEC, the "Companies") 2023-2024 Carbon Plan and Integrated Resource Plan ("CPIRP" or the "Plan"), including the initial Plan filed with the Commission on August 17, 2023, in Docket No. E-100, Sub 190, and the Supplemental Planning Analysis ("SPA") filed with the Commission in the same docket on January 31, 2024, support the addition of these resources as part of the Companies' current Execution Plan and proposed Near-Term Action Plan. The Proposed Facility conforms to the CPIRP and is supported by robust modeling and analysis. The resources are consistently selected across all model pathways and scenarios, and, consistent with the requirements of N.C.G.S. § 62-110.1(e), the Proposed Facility is part of the least-cost path to achieve compliance with the authorized carbon dioxide ("$CO_2$") reduction goals in N.C.G.S. § 62-110.9, will maintain or improve upon the adequacy and reliability of the existing grid, and construction and operation of the Proposed Facility is in the public interest. The Proposed Facility

is part of the Companies' most reasonable, least cost, and least risk resource plan and will be a used and useful resource serving DEC's system over its planned 35-year operational life. The Proposed Facility is needed to provide firm, dispatchable, and equally reliable capacity to the retiring coal units, contribute to maintaining reliable system operations and meeting the Company's capacity planning reserve margin target, and to serve load during extreme weather conditions, as well as to serve as a reliability back stand for variable energy and energy limited resources.

## 1.3 BIENNIAL AND ANNUAL REPORTS

Exhibit 1A contains a copy of the (1) the Carbon Plan Order; and (2) the Companies' 2023-2024 CPIRP, including the initial Plan filed with the Commission on August 17, 2023, in Docket No. E-100, Sub 190, and the SPA filed with the Commission on January 31, 2024, in the same docket. The CPIRP is on file with the Commission and DEC is incorporating these documents by reference—rather than reproducing them—given the size of the documents and their public availability through the Commission's Document Management System.

## 1.4 CONFORMANCE WITH 2022 CARBON PLAN ORDER AND 2023 CPIRP

The Proposed Facility conforms to the Commission's Carbon Plan Order and the Companies' CPIRP.

### 1.4.1 Conformance with the 2022 Carbon Plan Order

The Commission's Carbon Plan Order concluded that "…planning for approximately 800 MW of CTs … is a reasonable step for Duke to take at this time."[1] The Proposed Facility's estimated nominal winter capacity is 850 MW with a potential of up to 900 MW depending on the final engineering estimates for the units. The Companies' 2022 Carbon Plan filing recommended these CT resources be online in the 2027-2028 timeframe to facilitate planned coal unit retirements by supplying replacement resources that can provide firm, dispatchable, and equally reliable capacity like peaking CTs.

### 1.4.2 Conformance with the CPIRP

The CPIRP identifies the need for 2,125 MW of CT capacity in the 2028-2031 timeframe.[2] The CT resources continue to be needed to meet load growth and replace retiring coal units. New CTs are selected in each of the CPIRP's modeled Energy Transition Pathways and across the 40

[1] Carbon Plan Order at 79.

[2] SPA at 48-49 (Table SPA-1); Chapter NC Supplement at 5 (Table SPA NC-2).

portfolios developed in the CPIRP ranging from base planning assumptions, alternate assumptions with regards to resources availability and fuel supply, and sensitivity assumptions with respect to load, technology prices, fuel price, and demand-side resources. The first CTs selected consistently correspond to the retirement of Marshall coal Units 1 and 2 and are part of the least cost path to achieve compliance with the authorized $CO_2$ reduction goals in N.C.G.S. § 62-110.9 and will maintain or improve upon the adequacy and reliability of the existing grid.

#### 1.4.2.1 Resource Type

The CPIRP models generic resources as representative for a class of resources. For peaking generation needs, the Companies model advanced-class frame CT resources. The Proposed Facility is comprised of advanced-class frame CT resources consistent with the peaking generation resources as modeled in the CPIRP and is capable of meeting the identified peaking generation resources needed starting in 2029 in the Plan. The advanced-class frame CT resources are highly efficient among peaking resources with heat rates ranging from 9,000-9,600 btu/kWh. These firm, dispatchable, and flexible resources are able to respond to the needs of the system, while providing reliable capacity when the system needs it the most. These hydrogen-capable CTs are being configured for future conversion for operation on 100% carbon-free hydrogen.

#### 1.4.2.2 Resource Operational Life

The CPIRP modeled 35-year operational life for natural gas resources, which continues to be reasonable for planning purposes. In the Carbon Plan Order, the Commission similarly found the Companies' use of 35-year operational life for new gas assets reasonable for planning purposes and also directed the Companies to provide additional information on the appropriateness of this assumption in their future filings.[3] With the recent supportive policies intended to incentivize the deployment of carbon-free technologies, including the production of hydrogen and use of the fuel to generate electricity, as well as the capture and sequestration of $CO_2$, the Companies maintain that there are reasonably viable long-term options for fuel conversion to hydrogen, utilization of future carbon emission offset market(s), as identified in N.C.G.S. § 62-110.9, $CO_2$ capture and sequestration, or to support continued operation of the CT unit if determined necessary to maintain or improve the reliability of the system. Specifically, the continued development of hydrogen production, transportation, storage, and utilization as well as the long-term potential for $CO_2$ offsets or $CO_2$ capture, utilization, or sequestration justify the use of 35-year lives for natural gas assets. Since the Commission issued the Carbon Plan Order, the momentum for the development of hydrogen as an energy source for power generation and the economy, as a whole, has continued

[3] Carbon Plan Order at 78.

to increase. The Proposed Facility will be initially configured to allow operation on a blend of hydrogen and natural gas and for future conversion to operate exclusively on hydrogen, which will continue to be monitored by the Company for the least cost path to achieve Carbon Neutrality in 2050.

#### 1.4.2.3 Fuel Supply and Dual-Fuel Capability

The CPIRP assumes generic CT resources have adequate fuel supply to ensure reliable operation of the units. The Company assumes these resources have firm intrastate transportation service of natural gas with supply provided by Transco Zone 5 delivered gas. Furthermore, the Companies assume, based on the utilization of the resources and to limit exposure to delivered gas supply and commodity, dual-fuel capabilities on ULSD. Conforming to the CPIRP, the Proposed Facility will have firm intrastate natural gas transportation service and will primarily utilize Transco Zone 5 delivered gas. Furthermore, the Proposed Facility will also have dual-fuel capability and have six (6) days of ULSD stored on-site.

#### 1.4.2.4 Least Cost Path to Achieve Compliance with Authorized $CO_2$ Reduction Goals

The development of the CPIRP centered around Energy Transition Pathways to achieve the $CO_2$ emissions reduction goals authorized by N.C.G.S. § 62-110.9. The development of portfolios under each of these Pathways utilized sophisticated capacity expansion and production cost modeling that sought to minimize cost of the system in making resource decisions considering its reliability and operational needs, the cost of available resource options to meet those needs and the overall production cost of the system. In each of the portfolios in each of the Energy Transition Pathways, the model selected CT resources in the 2028-2031 timeframe to meet the energy and capacity needs of the system while optimizing resources for achieving the emissions reduction targets. While the Carbon Plan Order did not definitively "select" new dispatchable natural gas-fueled resources as part of the Commission's initial Carbon Plan, the Commission gave "substantial weight" to testimony that the CT resources identified by the Companies are "essential to achieving the [70% $CO_2$ emission reduction] Interim Target, while maintaining or improving reliability, and doing so along a least cost path[]" and found "persuasive" the Companies' testimony that "failing to develop new natural gas resources jeopardizes Duke's ability to achieve the mandated carbon dioxide emissions reduction[.]"[4] Finally, the Commission found persuasive the Companies' testimony "that a failure to consider new natural gas resources may increase the cost of operating the system and curtail future longer-term development of the hydrogen economy or appropriately structure a North Carolina carbon offset market that may provide a pathway for continued

[4] Carbon Plan Order at 79.

operation of new CC and CT resources beyond 2050 in a manner consistent with N.C.G.S. § 62-110.9."[5] The Proposed Facility is consistent with these resources uniformly selected across all portfolios in the CPIRP as well as supported in the Carbon Plan Order.

The need for the Proposed Facility is also justified by CPIRP Appendix F (Coal Retirement Analysis), which identifies the need for retirement of Marshall Units 1 and 2 (760 MW capacity) as part of the orderly retirement of the coal fleet by 2035. CPIRP Appendix F supports the planned coal unit retirement schedule as part of the ongoing orderly transition of the fleet.

#### 1.4.2.5 Maintain or Improve Upon the Adequacy of the Existing Grid

The Proposed Facility will serve to meet the needs of DEC's customers by maintaining or improving upon the adequacy and reliability of the existing grid. The planned retirement of 760 MW of aging coal generating capacity and corresponding addition of approximately 850 MW of new dispatchable gas CT capacity allows the excess capacity to go toward meeting rapid load growth in the Carolinas as identified in the CPIRP. The Proposed Facility's firm, dispatchable, and flexible CT resources help with the integration of renewables and promote customer usage with the ability to quickly start and shutdown and rapidly ramp to meet the energy needs of the system. Dispatchable and flexible generation is increasingly critical to maintain reliability and energy adequacy as the Companies' fleet transitions towards more variable energy and energy-limited renewable resources, as discussed in CPIRP Appendix M (Reliability and Operational Resilience).

The CPIRP also identifies that significant network upgrades to the DEC transmission system would be required to maintain the reliability of the grid in 2028 when Marshall's coal-fired Units 1 and 2 are retired, absent replacement generation at the site. As explained in CPIRP Appendix L (Transmission Planning and Grid Transformation),[6] incremental and accelerated transmission to upgrade the McGuire to Marshall 230 kV lines would be required to reliably operate the system without the replacement generation at the Marshall site. The Proposed Facility will also utilize existing infrastructure and provide the required capacity from the site in a more efficient and flexible manner relative to the retiring coal units in maintaining the reliability of the system.

## 1.5 CAPACITY REQUIREMENTS OF THE SYSTEM AND OPERATIONAL PROJECTIONS FOR THE PROPOSED FACILITY

As presented in this section, the Proposed Facility provides the firm planning capacity

[5] *Id.*

[6] CPRIP Appendix L at 28-29.

required by the system and provides increasingly critical, while less frequent, energy to meet the needs of DEC's customers. The Proposed Facility contributes to resource and fuel diversity and, thereby, contributes to maintaining a robust and resilient system.

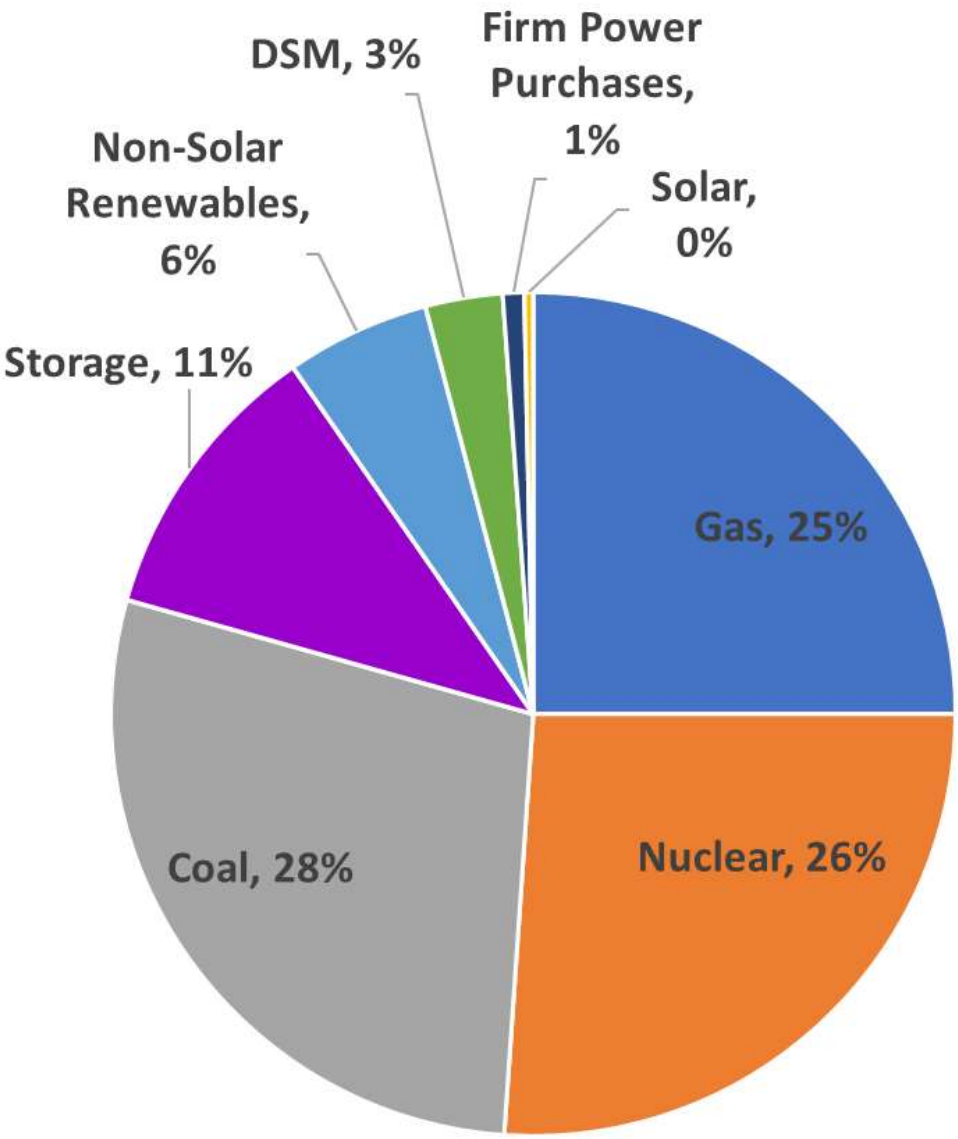
### 1.5.1 Resource and Fuel Diversity

The Proposed Facility will operate primarily on natural gas which will be delivered to the plant through firm intrastate transportation service. The gas supply will often be available via Transco Zone 5 delivered gas. The CTs will also have the ability to operate on ULSD as an emergency backup should there be a physical interruption in natural gas delivery to the Proposed Facility or a temporary spike in price that makes natural gas more expensive than ULSD. There will be sufficient fuel oil on site to enable the Proposed Facility to operate for six (6) days.

The Proposed Facility's turbines are also designed to be able to run on a blend of hydrogen when installed and the advanced-class CTs are suitable for operation exclusively on hydrogen in the future.

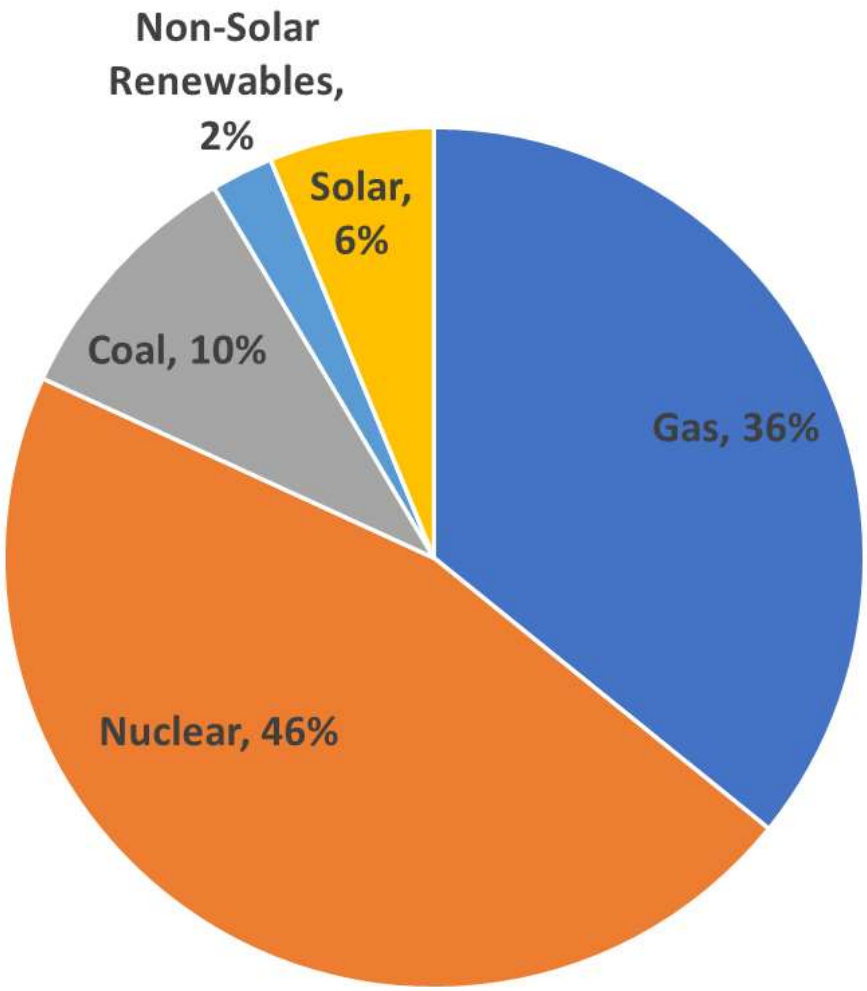
DEC's firm winter capacity mix consists of approximately 25% gas-fired generating capacity, 26% nuclear generating capacity, 28% coal-fired generating capacity, and the remainder in storage, non-solar renewables, demand-side management, and other firm power purchases, and solar. The 2024 DEC Firm Winter Capacity Mix is shown in Figure 1 below.

**Figure 1: CPIRP P3 Fall Base – 2024 DEC Firm Winter Capacity Mix**




While ensuring long-term capacity planning reserve margins are met for DEC and DEP separately, the systems in the Carolinas are jointly dispatched under the Joint Dispatch Agreement ("JDA") which allow DEC and DEP to jointly dispatch the systems through non-firm, energy-only transfers between DEC and DEP. Figure 2 below represents the projected 2024 DEC and DEP jointly dispatched energy mix. Gas-fired generation is projected as approximately 36% for 2024, with nuclear generation is at 46%, and coal-fired generation is at just 10%.

**Figure 2: CPIRP P3 Fall Base – 2024 DEC + DEP Energy Mix**




Overall, the Proposed Facility allows for the orderly, planned retirement of coal capacity, while increasing flexibility of the system. Peaking CTs represent approximately 15% of DEC's firm winter capacity. When the Proposed Facility is added to the system and Marshall coal-fired Units 1 and 2 are retired, CTs will make up approximately 19% of DEC's firm winter capacity while coal capacity will decrease from 28% to approximately 21%. While the CT resources increase, the retirement of coal helps to avoid future more carbon-intensive generation from coal, while providing the system with a more flexible and efficient resource. In general, CTs have relatively small impacts in overall generation mix over time, as these resources are utilized generally only when customer demand is peaking and in response to rapid movements in load and generation. The more efficient resources provide a lower carbon emissions intensive generation resource, compared to the retiring coal that they are replacing. Finally, as the system continues to

add carbon-free generation over time, the utilization of these resource will continue to decline, being reserved for the highest load days, often correlated with extreme weather. The diversity of the Proposed Facility relative to the variable energy and energy limited resources that are also being added to the system allows for a reliable back stand with a secure fuel supply to operate continuously for several day at a time if needed to meet the needs of customers.

### 1.5.2 Energy Forecasts and Energy Requirements of the System

The Proposed Facility will serve to meet the energy needs of the system. Through the joint dispatch of the system, peaking CTs in the CPIRP modeling, overall, are projected to account for less than 10% of the annual energy mix for each year over the planning horizon. While the utilization of less efficient CTs will decrease more rapidly, the advanced-class CTs on the system are expected to operate the most as they are the most efficient peaking generation resources on the system, providing lower cost and lower $CO_2$ intensive energy overall.

The average annual capacity factor for the Proposed Facility is expected to be approximately 20% over the first five years of operations. The Proposed Facility is expected to have a higher utilization in the early years, with capacity factors quickly declining as additional combined cycle generation, renewables, and battery energy storage come online over time as the Proposed Facility's utilization transitions to increasing focus in peak load hours. However, it is important to note that the CPIRP projected capacity factors are based on normal weather load as well as perfect model foresight of system load and operating conditions. While the Proposed Facility is projected to operate as a peaking resource with generally low utilization factors over the long term, the CTs will continue to contribute to maintaining sufficient capacity to meet the Company's planning reserve margin target and will be needed to serve load during extreme weather conditions as well as serve as a reliability back stand for variable energy and energy limited resources.

Table 1 shows the projected energy mix of the system by fuel type over the 2023 CPIRP's base planning horizon, through 2038 with generation from natural gas, including the generation from the Proposed Facility.

**Table 1: CPIRP P3 Fall Base – Annual DEC + DEP Energy Mix by Fuel Type**

| Fuel Type | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nuclear | 46% | 46% | 44% | 43% | 41% | 40% | 39% | 39% | 38% | 37% | 36% | 38% | 39% | 41% | 42% |
| Renewables | 9% | 9% | 9% | 10% | 12% | 13% | 14% | 16% | 19% | 22% | 26% | 30% | 31% | 32% | 33% |
| Gas | 36% | 29% | 30% | 31% | 34% | 37% | 40% | 39% | 39% | 38% | 36% | 31% | 30% | 27% | 25% |
| Coal | 10% | 16% | 17% | 16% | 13% | 9% | 7% | 6% | 5% | 3% | 2% | 1% | 0% | 0% | 0% |

### 1.5.3 Capacity Forecasts and Requirements of the System

The Proposed Facility will provide an estimated 850 MW of firm nominal winter capacity beginning in the winter of 2028-2029. The Proposed Facility is consistent with the capacity need identified to replace retiring coal generation from the Carbon Plan Order. The additional capacity over the retiring coal units contributes to the firm planning capacity of the system to meet the tremendous load growth the Companies are projecting in the CPIRP. These resources are identified in the CPIRP Near Term Action Plan and provide additional capacity to maintain reliable system operations. As noted above, the CTs also will be needed to serve load during extreme weather conditions as well as serve as a reliability back stand for variable energy and energy limited resources.