STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-100, SUB 190

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of Biennial Consolidated Carbon Plan and Integrated Resource Plans of Duke Energy Carolinas, LLC, and Duke Energy Progress, LLC, Pursuant to N.C.G.S. § 62-110.9 and § 62-110.1(c)	)	**DIRECT TESTIMONY OF MAURA FARVER, JUSTIN LAROCHE, AND LAUREL MEEKS ON BEHALF OF DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC**

I. INTRODUCTION AND OVERVIEW

Q. MS. FARVER, PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION WITH DUKE ENERGY CORPORATION.

A. My name is Maura Farver, and my business address is 411 Fayetteville Street, Raleigh, North Carolina. I am employed by Duke Energy as State Energy and Policy Director.

Q. BEFORE INTRODUCING YOURSELF FURTHER, WOULD YOU PLEASE INTRODUCE THE PANEL?

A. Yes. I am appearing on behalf of Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP" and together with DEC, "Duke Energy" or the "Companies") together with Justin LaRoche and Laurel Meeks on the "Renewables and Energy Storage Panel." Witnesses LaRoche and Meeks will introduce themselves.

Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. I graduated from Duke University in 2005 with a Bachelor of Science degree in Environmental Science. I also obtained a joint Master of Environmental Management degree from Duke University's Nicholas School of the Environment and a Master of Business Administration from the University of North Carolina Kenan-Flagler Business School in 2013.

Q. PLEASE DESCRIBE YOUR BUSINESS BACKGROUND AND EXPERIENCE.

A. Prior to joining Duke Energy, I worked at Southern California Edison as the Manager of Short-Term Planning (managing a team that developed the day ahead bidding strategy for the California Independent System Operator energy market), as a Senior Project Manager on a pilot resource planning project focused on meeting localized generation needs with "preferred" resources, and as a Project Manager for Southern California Edison's energy storage strategy. In 2019, I joined Duke Energy as the Distributed Energy Technology Strategy and Policy Director and moved to my current position in July 2023.

Q. WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. As State Energy and Policy Director, I am responsible for coordinating business strategy work streams and regulatory and policy efforts related to renewable energy as a stand-alone generation resource and when combined with battery storage for DEC and DEP. I recently led the development and execution of the 2022 Solar Procurement and development of the 2023 Request for Proposals ("RFP") for solar and solar paired with storage ("SPS") and continue to lead the execution of the 2023 RFP.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NORTH CAROLINA UTILITIES COMMISSION ("COMMISSION")?

A. Yes. I previously testified before the Commission in Docket No. E-100, Sub 179 in support of the Companies' initial proposed Carbon Plan.

Q. MR. LAROCHE, PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND POSITION WITH DUKE ENERGY CORPORATION.

A. My name is Justin LaRoche, and my business address is 525 South Tryon Street, Charlotte, North Carolina 28202. I am employed by Duke Energy as Director of Renewable Development.

Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. I have a bachelor's degree in Accounting from the University of North Carolina at Charlotte Belk College of Business and a master's degree in business administration from the University of South Carolina Darla Moore School of Business. I also hold a Project Management Professional certification from the Project Management Institute.

Q. PLEASE DESCRIBE YOUR BUSINESS BACKGROUND AND EXPERIENCE.

A. I began my career with Duke Energy in 2008 and have held positions within Corporate Finance, Energy Efficiency, Grid Modernization and Regulated Renewables. Since 2014, I have been supporting and now lead Duke Energy's renewable investments in solar and wind facilities throughout our regulated service territories.

Q. WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. I oversee the development of new renewable facilities, including solar and wind, on behalf of Duke Energy's regulated utilities, including DEC and DEP. In my current role, I am responsible for conducting renewable development activities, including project siting, land acquisition, resource assessment, permitting, obtaining interconnection rights, project layout and design, and arranging contracts for engineering, procurement and construction services, as well as originating, structuring, and executing transactions to acquire rights to existing renewable development projects from third-party developers.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE COMMISSION?

A. Yes. I have previously testified before the Commission in Docket Nos. E-2, Sub 1311, E-2, Sub 1300, and E-7, Sub 1276.

Q. MS. MEEKS, PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION WITH DUKE ENERGY CORPORATION.

A. My name is Laurel M. Meeks. My business address is 400 South Tryon Street, Charlotte, North Carolina 28202. I am employed by Duke Energy as Director of Renewable Business Development.

Q. PLEASE BRIEFLY SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. I graduated from the University of North Carolina at Chapel Hill with a bachelor's degree in 2011 and Master of Business Administration with an Energy Concentration in 2019. My educational experience is coupled with over

seven years of experience in the energy sector and ten years of experience in business administration and development.

Q. PLEASE DESCRIBE YOUR BUSINESS BACKGROUND AND EXPERIENCE.

A. For the past four years, I have worked on the Energy Storage Development team supporting and now leading standalone energy storage development activities on behalf of Duke Energy's regulated utilities. Prior to obtaining a master's degree, I worked in the energy efficiency industry as a business development manager at a building performance contracting company. I also held roles within the consumer products industry in marketing, communications, and finance.

Q. WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. I currently lead a team of project developers responsible for the initiation and deployment of regulated battery energy storage and microgrid systems in the Carolinas.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE COMMISSION?

A. Yes. I previously testified before this Commission in Docket No. E-7, Sub 1276.

Q. IS THE PANEL SPONSORING ANY EXHIBITS?

A. No. The Panel is not.

Q. MS. FARVER, ON BEHALF OF THE PANEL, PLEASE BRIEFLY DESCRIBE THE PURPOSE OF THE PANEL'S TESTIMONY.

A. This Panel's testimony sponsors and highlights several key themes and issues relating to the Companies' planning and execution of solar, onshore wind, and battery energy storage resources, as further addressed in Chapter 4 (Execution Plan) and Appendix I (Renewables and Energy Storage) of the Companies' 2023-2024 Carbon Plan and Integrated Resource Plan ("CPIRP" or the "Plan"). This Panel's testimony provides an overview of the Companies' ongoing efforts to integrate solar, solar paired with energy storage, battery energy storage systems, and onshore wind into the Companies' generation and resource mix pursuant to the Commission's directives in its December 30, 2022 Order Adopting Initial Carbon Plan and Providing Direction for Future Planning issued in Docket No. E-100, Sub 179 ("Carbon Plan Order"). The Panel's testimony supports these ongoing activities as well as the Companies' execution planning to develop incremental solar, solar paired with battery storage, onshore wind, and standalone battery energy storage to be developed in the near-term between now and 2026.

The purpose of my testimony is to provide an overview of the procurement of solar resources selected in the Plan, describe how the Companies prepared a mechanism for the 2023 Solar Procurement that evaluates bids for solar projects that depend on the Red Zone Transmission Expansion Plan ("RZEP") which further includes a cost allocation framework for RZEP projects, and provide an update on the Companies' plans for the 2024 RFP process.

The purpose of Mr. LaRoche's testimony is to discuss the Companies' recent efforts to engage onshore wind industry stakeholders and to assess onshore wind development and siting opportunities in the Carolinas. Mr. LaRoche addresses the Companies' recent efforts to engage the onshore wind industry through an initial engagement survey and follow-on request for information. These engagement efforts revealed that there are currently no onshore wind projects currently under development in the DEC/DEP territories, but that developers are interested in pursuing potential development partnerships with the Companies to site and develop onshore wind projects in the Carolinas. Mr. LaRoche also provides information regarding ongoing execution plan work to identify potential site locations, development timelines, estimated development cost to jumpstart the onshore wind market in the Carolinas, as well as the Companies' plans to bring online the proposed 1,200 megawatts ("MW") of onshore wind capacity additions by 2033.

The purpose of Ms. Meeks' testimony is to discuss the Companies' efforts in planning and executing the Commission-directed 1,000 MW of standalone battery storage in the 2023-2024 timeframe and plans for the incremental 650 MW of energy storage proposed to be procured in 2025-2026 for commercial operation by 2031. Ms. Meeks discusses the Companies' risk-management around battery supply and the Companies' plans regarding siting standalone storage to diversify the technology suite and maximize cost-effectiveness.

Q. PLEASE EXPLAIN HOW THIS PANEL'S TESTIMONY IS ORGANIZED.

A. Section II of the Panel's testimony identifies the portions of the Plan and the Companies' Requests for Relief presented to the Commission for approval in support of the Plan that this Panel sponsors.

Section III of the testimony addresses how the Companies are meeting specific directives from the Commission's Carbon Plan Order relating to solar and paired energy storage, onshore wind and battery energy storage systems and provides support for the Requests for Relief presented in this CPIRP.

II. SPONSORSHIP OF THE PLAN

Q. MS. FARVER, PLEASE IDENTIFY WHICH SECTIONS OF THE PLAN YOU ARE SPONSORING WITH YOUR DIRECT TESTIMONY.

A. I am sponsoring the CPIRP sections addressing the Companies' planning, procurement and execution activities related to solar and solar plus energy storage:

- Chapter 4 (Execution Plan), Detailed Execution Plans: Existing Supply-Side Resources, (Solar and SPS). This section presents the Companies' Near-Term Action Plan ("NTAP") for executing the CPIRP, and I am specifically sponsoring the procurement and development activities for solar and SPS resources as identified in Table 4-7.
- Appendix I (Renewables & Energy Storage). This Appendix describes how solar and solar paired with energy storage helps meet the

Companies' generation needs as it retires its coal fleet and as existing load continues to grow by providing a zero-carbon and fuel-free generation resource. This Appendix also describes the risks associated with solar and solar plus energy storage development and integration into the Companies' system.

Q. MR. LAROCHE, PLEASE IDENTIFY WHICH SECTIONS OF THE PLAN YOU ARE SPONSORING WITH YOUR DIRECT TESTIMONY.

A. I am sponsoring the CPIRP sections addressing the Companies' planning, procurement, and execution activities related to onshore wind:

- Chapter 4, Execution Plan (Onshore Wind). This section presents the Companies' NTAP for executing the CPIRP, and I am specifically sponsoring the procurement and development activities for onshore wind resources as identified in Table 4-10.
- Appendix I (Renewables & Energy Storage). This Appendix describes the current and future planning considerations for onshore wind in the Carolinas, including how onshore wind helps meet the Companies' generation needs and complements the increasing levels of solar on the system. This Appendix also describes the risks and risk management associated with onshore wind.
- Chapter 2 (Methodology and Key Assumptions). I also contributed to the modeling assumptions for onshore wind.

Q. MS. MEEKS, PLEASE IDENTIFY WHICH SECTIONS OF THE PLAN YOU ARE SPONSORING WITH YOUR DIRECT TESTIMONY.

A. I am sponsoring the CPIRP sections addressing the Companies' planning, procurement, and execution activities related to standalone battery energy storage:

- Chapter 4 (Execution Plan). This section presents the Companies' NTAP for executing the CPIRP, and I am specifically sponsoring the procurement and development activities for standalone battery energy storage resources as identified in Table 4-9.
- Appendix I (Renewables & Energy Storage). This Appendix describes how battery energy storage helps integrate variable energy resources and meets the Companies' reliability needs during the energy transition as a non-carbon emitting resource that can store and redeploy clean energy to meet system needs. This Appendix also describes risks associated with deployment of battery energy storage.

Q. PLEASE IDENTIFY THE REQUESTS FOR RELIEF PRESENTED IN THE COMPANIES' CPIRP PETITION AND BOWMAN EXHIBIT 1 THAT THE RENEWABLES AND ENERGY STORAGE PANEL IS SUPPORTING THROUGH ITS TESTIMONY.

A. The Panel supports CPIRP Requests for Relief 2(a)(i)-(iii) as in the public interest and requests Commission approval of the development of these incremental solar, battery energy storage, and onshore wind energy resources

as necessary and reasonable steps to execute the CPIRP during the near-term. The Panel also supports the Companies' Request for Relief 2(c)(ii), requesting authorization to incur project development costs up to $64.5 million for the development of three annual tranches of onshore wind through 2026 for purposes of achieving 1,200 MW in service by 2033.

III. PROGRESS ADDRESSING CARBON PLAN ORDER DIRECTIVES

A. Solar And Paired Energy Storage

Q. THE CARBON PLAN ORDER DIRECTED THE COMPANIES TO TARGET PROCUREMENT OF 2,350 MW OF NEW SOLAR RESOURCE IN 2023-2024, IN ADDITION TO THE RESOURCES ALREADY BEING PROCURED IN THE 2022 SOLAR PROCUREMENT PROGRAM.[1] PLEASE PROVIDE A BRIEF UPDATE ON THE COMPANIES' DEVELOPMENT AND PROCUREMENT OF THE 3,100 MW OF SOLAR RESOURCES SELECTED FOR PROCUREMENT IN THE INITIAL CARBON PLAN.

A. Duke Energy has worked diligently to develop an annual RFP framework to procure the 3,100 MW of new solar targeted for procurement in the initial proposed Carbon Plan for 2022 to 2024. Under the oversight of the Commission and the RFP Independent Evaluator, Charles River Associates, Inc., the 2022

[1] Carbon Plan Order at 133 (Ordering Paragraph Nos. 22, 23).

Solar Procurement was completed in June 2023,[2] and resulted in 965 MW of new controllable solar contracts and utility-owned projects. As further addressed in Appendix I, the recently completed 2022 Solar Procurement included 343 MW of utility-owned solar and 622 MW of purchased power agreements ("PPA").[3] Approximately 549 MW were procured in DEP and 416 MW were procured in DEC.[4]

Building on the success of the 2022 Solar Procurement, the Companies engaged with the Public Staff and solar industry stakeholders to develop the Carolinas' largest and first-ever solar and SPS procurement. The 2023 RFP is seeking 1,435 MW of solar and SPS projects in both North Carolina and South Carolina and recently opened for bids on August 15, 2023. The 2023 RFP bid evaluation process will be completed in spring 2024 and the contracting phase is anticipated to be completed in summer of 2024, with facility in-service dates expected by the end of 2028.

The Companies engaged with the Public Staff, market participants and other interested stakeholders over a series of meetings in winter and spring of 2023 to develop the 2023 RFP, as directed in the Carbon Plan Order. Key issues in developing the 2023 RFP included the ongoing balancing-area wide competitive procurement proceedings before the Public Service Commission of

[2] The Companies filed the Post-Solicitation Report of the 2022 Solar Procurement Independent Evaluator, Charles River Associates, Inc. with the Commission on July 31, 2023. CRA 2022 DEC DEP RFP Post-Solicitation Report, Docket Nos. E-2, Sub 1297, E-7, Sub 1268 (filed July 31, 2023).

[3] CPIRP Appendix I at 4.

[4] *Id.*

South Carolina ("PSCSC"); lessons learned from aligning the ongoing 2022 Solar Procurement Program with the 2022 DISIS; the Companies' recommendation to utilize a Resource Solicitation Cluster ("RSC") for the 2023 RFP; the timeline for an RSC integrated with the annual DISIS cluster; developing a new PPA, terms and conditions, and sizing and operational parameters for SPS resources; as well as an RZEP cost allocation framework and volume adjustment mechanism ("VAM") as directed in the Carbon Plan Order. Based on the Companies' experience implementing the 2022 Solar Procurement Program, the Companies requested, and the Commission authorized, use of an RSC for studying the cost and timing to interconnect 2023 Solar RFP project proposals.[5]

The Companies publicly released the detailed 2023 RFP and Appendices on April 21, 2023, and opened a 30-day period for stakeholders to review and provide feedback to the Independent Evaluator. The Companies then responded to this feedback and reviewed final RFP plans in a June 20, 2023, stakeholder meeting, followed soon after with filings on June 30, 2023 that included the RFP Plan, the Solar-Only Controllable PPA, the SPS Controllable PPA and the Independent Evaluator's Pre-Solicitation Report. The Commission accepted the 2023 Solar RFP for issuance by an order issued July 26, 2023.[6]

[5] Order Authorizing the Use of a Resource Solicitation Cluster Study for the 2023 Solar Procurement and Establishing Procedures, Docket Nos. E-2, Sub 1317, E-7 Sub 1290 (Mar. 2, 2023).

[6] Order Accepting Proposed 2023 Solar Resource Procurement Request for Proposals Documents, Docket Nos. E-2, Sub 1317, E-7 Sub 1290 (July 26, 2023).

The 2024 RFP is anticipated to generally follow the structure (including use of an Independent Evaluator) and timing of the 2023 RFP, subject to incorporating improvements based on lessons learned from the 2023 RFP. The Companies are assessing the implications of the recent Federal Energy Regulatory Commission ("FERC") Order No. 2023 on the interconnection processes and timelines, as discussed in CPIRP Appendix L. The Companies will also assess any impacts on the RFP structure, as well as establishing what filings will be necessary with FERC to maintain the option of a Resource Solicitation Cluster, and whether any state interconnection filings will be needed for alignment and coordination of the interconnection processes.

Q. PLEASE EXPLAIN HOW THE 2023 PROCUREMENT TARGET OF 1,435 MW OF NEW SOLAR ALIGNS WITH THE MW TARGETED FOR PROCUREMENT IN THE INITIAL PROPOSED CARBON PLAN.

A. This 2023 RFP is soliciting an overall target of 1,435 MW, with 735 MW of solar-only resources and 700 MW of solar paired with approximately 260 MW of storage, with target in-service dates by November 2028. These quantities are aligned with the 2,350 MW of solar selected by the Carbon Plan for 2023 and 2024 procurements, and it also targets procurement of an initial 260 MW of the 600 MW of paired storage approved for execution during that same timeframe. The initial proposed Carbon Plan arrived at 2,350 MW by breaking the targets into 1,000 MW and 1,350 MW for 2023 and 2024, respectively, and the 2023 RFP seeks to procure this targeted 1,000 MW plus 200 MW of the terminated

CPRE PPAs and 235 MW of the remaining 2022 Solar Procurement target. Looking beyond the now-open 2023 RFP, the Carbon Plan Order directs the Companies to propose the framework for the 2024 solar and SPS RFP by February 15, 2024, and the Companies will update the Commission on plans for the 2024 RFP at that time.[7]

Q. PLEASE EXPLAIN THE SOLAR PROCUREMENT TARGETS FOR 2024-2026, AS PRESENTED IN THE 2023 CPIRP NTAP AND UPDATED EXECUTION PLAN.

A. As highlighted in Chapter 4, Table 4-2 and Chapter NC, Table NC-1, the Companies are planning to procure 1,435 MW of new solar and SPS in 2024 and between 2,700 MW and 3,150 MW of new solar and SPS in 2025 and 2026. The 2024 RFP target reflects the balance of the initial 3,100 MW approved by the Commission in the first Carbon Plan Order (1,350 MW) and 85 additional MW towards the expanded model-selected solar for end-of-year 2027 from the 2023 CPIRP. The updated CPIRP reflects a greater volume of selected solar for year-end 2027 than the initial proposed Carbon Plan, and that remainder will be spread across RFPs in years 2024-2026. As explained in Appendix L, target procurement volumes for 2025 and 2026 are dependent on North Carolina Transmission Planning Collaborative ("NCTPC") authorization of enabling RZEP 2.0 transmission projects. The Companies plan to procure a minimum of 340 MW of paired storage in the 2024 RFP and plan to maintain flexibility to

[7] CPIRP Chapter 4 at 21 (Table 4-7).

optimize the relative allocation of solar and SPS in the 2025 and 2026 procurements based on evolving experience with the 2023 and 2024 procurements as well as updated information on resource cost and other considerations.

Q. PLEASE DESCRIBE HOW THE COMPANIES ADDRESSED THE CARBON PLAN ORDER DIRECTIVE TO PREPARE A MECHANISM FOR THE 2023 SOLAR PROCUREMENT TO EVALUATE BIDS FOR SOLAR PROJECTS THAT INCLUDES AN APPROPRIATE COST FOR THE RZEP PROJECTS.[8]

A. As noted in Appendix L, 14 RZEP 1.0 projects in the NCTPC's approved 2022–2032 Transmission[9] Plan are necessary in order to timely and efficiently interconnect new resources that enable coal retirement.[10] For the 2023 RFP, solar and SPS projects that are shown to have impact on one or more of the 14 RZEP projects (identified through the RSC Phase 1 study) will have a cost proxy assigned to them for purposes of RFP evaluation;[11] however, the now-approved RZEP transmission projects are now contingent facilities and the costs will not be assigned to the generators in their ultimate interconnection agreements. (For any projects that have dependencies on one or more of the 14 RZEP projects, the RZEP project(s) will be shown as contingent facilities in

[8] Carbon Plan Order at 118-19.

[9] CPIRP Appendix L at 2.

[10] CPIRP Appendix L at 26.

[11] CPIRP Appendix L at 30, 39.

Study results and in the interconnection agreement(s).)

As previously described in the Companies' April 6, 2023, 2023 Solar RFP Proposal filing with the Commission, this RZEP "shadow cost" methodology will use the calculated MW impact on each RZEP upgrade according to the RSC Phase 1 study, the MVA headroom created by the RZEP upgrade, and the cost of the RZEP upgrade. However, the shadow costs will not be included in the VAM weighted average cost calculation that informs whether the target Solar-Only volume will be adjusted.

Q. DO THE COMPANIES PLAN TO CONTINUE USING THIS SHADOW COST APPROACH IN FUTURE SOLAR RFPs?

A. No. The Companies do not intend to carry this shadow cost methodology into subsequent RFPs given that it could have the adverse effect of underutilizing these approved strategic upgrades. As additional strategic transmission upgrades are planned and approved by the NCTPC in the future ("RZEP 2.0" and beyond), the waves of upgrades may interact with each other and make the teasing apart of each individual projects' utilization of each individual upgrade grow increasingly complex and possibly inaccurate.

B. Onshore Wind

Q. MR. LAROCHE, THE CARBON PLAN ORDER DID NOT SELECT ONSHORE WIND FOR PROCUREMENT AND DEVELOPMENT BUT, INSTEAD, DIRECTED THE COMPANIES TO ENGAGE ONSHORE WIND STAKEHOLDERS TO ASSESS DEVELOPMENT

OPPORTUNTIES IN THE CAROLINAS.[12] PLEASE ADDRESS THE COMPANIES' RECENT ONSHORE WIND STAKEHOLDER ENGAGEMENT EFFORTS AND THE KEY INSIGHTS GATHERED FROM THIS WORK.

A. The Companies undertook a multi-step process to engage a variety of stakeholders including, but not limited to, onshore wind developers, wind turbine manufactures, onshore wind consulting firms, and potential permitting agencies in preparation for filing this updated Plan with the Commission. Engagement and discussions with onshore wind developers initially focused on the potential for onshore wind development in the Carolinas and gathering perspectives from the third-party developers, including market conditions and market structures that might attract developer participation. The Companies first developed and distributed a survey (the "Initial Engagement Survey") to onshore wind developers in November 2022. The Initial Engagement Survey was distributed to six (6) onshore wind developers, with five (5) providing responses to the Survey. Key findings from the Initial Engagement Survey included: (i) developers were unlikely to participate in an onshore wind facility open market competitive RFP for project development transfer or development-build in 2023 or 2024 and (ii) developers were interested in pursuing potential development partnerships with the Companies to site and develop onshore wind projects in the Carolinas.

[12] Carbon Plan Order at 133 (Ordering Paragraph No. 23).

Based on the results of the Initial Engagement Survey, the Companies developed and issued a more robust RFI (or the "Market Intelligence RFI") in February 2023. The intent of the Market Intelligence RFI was to engage with onshore wind developers, to gather information and feedback regarding onshore wind resources and development within the Carolinas and to inform the Resource Plan modeling. The RFI was designed into three sections; (i) key CPIRP modeling assumptions/inputs, (ii) onshore wind project development, and (iii) market conditions and development structures that would attract wind developers. The RFI was distributed to nine (9) developers, with six (6) providing responses. Key findings from the RFI include: (i) there are no onshore wind projects currently under development in the DEC/DEP territories, (ii) confirmation of suitable wind turbine technology for regional wind class, optimal hub height, and expected development and construction timelines, (iii) developers are unlikely to have an onshore wind project sited and be interested in participating in a competitive RFP process in 2023 or 2024, (iv) developers are interested in pursuing potential development partnerships to site and develop onshore wind projects in the Carolinas, and (v) siting and development of onshore wind projects within DEC/DEP territories is highly unlikely without the active participation or partnership with the Companies. Throughout this process, the Companies have also had ongoing discussions with onshore wind developers and are actively engaging with interested developers about a potential development partnership.

Additionally, the Companies engaged with onshore wind turbine manufacturers to understand current products, product roadmaps and turbine technology suitability for the Carolinas. The Companies also held an introductory discussion with North Carolina Department of Environmental Quality ("NC DEQ") regarding permitting of onshore wind energy facilities, in accordance with the NC DEQ's onshore wind energy permitting program.[13]

Q. DOES THE CPIRP MODELING INCORPORATE THE ONSHORE WIND MARKET INTELLIGENCE RFI RESULTS IN DETERMINING THAT ONSHORE WIND IS NEEDED AS PART OF THE CPIRP?

A. Yes. The Carbon Plan Order directed the Companies to use the information gleaned from its stakeholder engagement in developing the 2023-2024 biennial CPIRP update and to support the proposal to add onshore wind as a selectable resource in this first biennial CPIRP.[14] The Companies intentionally designed the Market Intelligence RFI to gather feedback that would inform CPIRP modeling inputs and assumptions. Information obtained from onshore wind developers through the Market Intelligence RFI was used to inform the size and availability of onshore wind resources in DEC and DEP, including hub height, turbine technology, timing to achieve commercial operation, as well as projected resource availability.

[13] North Carolina Environmental Quality, Onshore Wind Energy Program, https://www.deq.nc.gov/onshorewindenergy (last visited Sept. 1, 2023).

[14] Carbon Plan Order at 133 (Ordering Paragraph No. 23).

Q. CAN YOU DESCRIBE THE ONSHORE WIND SITING POTENTIAL STUDY THAT IDENTIFIED POTENTIAL SITE LOCATIONS AND KEY RESULTS?

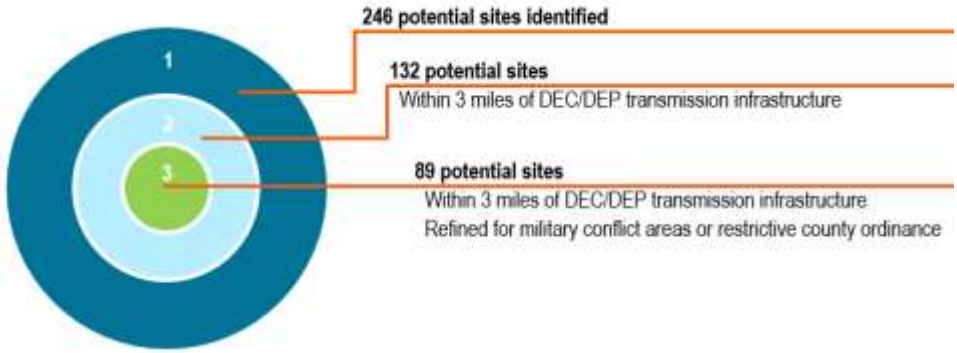
A. In addition to the stakeholder engagement efforts, including the Initial Engagement Survey and the Market Intelligence RFI, the Companies have performed a siting feasibility study to identify potential onshore wind sites within the Carolinas. These efforts were completed to inform modeling assumptions, develop the onshore wind resource timeline and develop the detailed proposal outlining the execution plan for developing onshore wind.

The Companies engaged DNV Energy USA Inc. ("DNV") to perform a multi-criteria geographic information system ("GIS") study to identify potential development sites for utility-scale onshore wind facilities within the Carolinas of at least 50 MW. As described in Appendix I, the siting study considered wind speed data and exclusionary zones where siting would be physically prohibitive, considered high risk, or could lead to prohibitive costs and additional soft constraints which, although not prohibitive, could present challenges. Key attributes of identified potential project sites contained in the DNV study include: location and size, wind resource data points at various hub heights (data collected from two different sources), project capacity potential (MWac), distance to transmission infrastructure, land cover/use/buildability characteristics, distance to environmentally sensitive features, local planning/zoning considerations, hurricane risk and coastal flooding risk index

and military/airspace/radar systems. Each attribute was evaluated and a weighted criteria ranking system developed to rank potential sites.

The siting feasibility study identified over 240 potential onshore wind sites in the Carolinas. After an initial screening and filtering for distance to transmission infrastructure, military use areas and restrictive county ordinances, the siting potential was refined to approximately 90 sites. Figure 1 below illustrates siting potential identified in the study. The Companies used this siting potential analysis to inform the development of production resource profiles for DEC and DEP taking into account actual locations of identified potential sites and the estimated average annual wind speed at those locations. The study results were also used to develop the system-wide cumulative resource availability constraints for DEC and DEP.

Figure 1: Onshore Wind Siting Feasibility Study Results



Building on this analysis, the Companies are engaging in discussions for potential development partnerships and continue to refine and prioritize identified potential sites in support of anticipated site control activities to begin

in 2024 for developing the first tranche of onshore wind projects, as described in the CPIRP Execution Plan.[15]

Q. PLEASE EXPLAIN WHY THE COMPANIES ARE REQUESTING COMMISSION AUTHORIZATION OF ESTIMATED DEVELOPMENT COSTS FOR ONSHORE WIND?

A. To support the timeline to bring 1,200 MW of new onshore wind facilities online by January 2033, with the first resources targeted to come online by January 1, 2031, significant early-stage development activities are required in the near term to jumpstart the onshore wind market and develop new onshore wind resources in the Carolinas. Table I-4 in Appendix I presents the Companies' estimated development costs totaling approximately $65M to achieve 300 MW in-service by 2031, 450 MW in-service by 2032, and 450 MW by 2033. The estimated development costs include the following activities: (i) establish site control and make site control payments, (ii) DISIS interconnection costs, (iii) met tower installation and data collection, (iv) environmental studies, (v) local, state and federal permitting, (vi) development partner service fees, and (vii) labor for internal resources.

To achieve the targeted annual capacities required to be placed in-service by 2031-2033, a multiple of each year's target will need to be sited and initial development executed, as some projects may be terminated due to interconnection costs, permitting issues, Federal Aviation Administration

[15] CPIRP Chapter 4 at 25 (Table 4-10).

("FAA") or military conflicts, or other reasons. The Companies' development plans assume initial development activities will be needed for three to four times the targeted capacity for each year. Therefore, the development budget assumes a four times multiplier, or 1,200 MW (eight (8) 150 MW projects) for tranche 1 and 1,800 MW (twelve (12) projects) for tranche 2 and tranche 3, respectively. The Companies also assume that development would be halted on a site upon meeting a fatal flaw and further development costs would not be avoided or not incurred. As such, the budget for tranche 1 assumes that half of the eight (8) projects would only incur half of the estimated development budget, the budget for tranche 2 assumes that half of the twelve (12) projects would only incur half of the estimated development budget and the budget for tranche 3 assumes that all twelve (12) projects would incur the full development budget considering those projects would be targeting the 2027 DISIS and would primarily have site control expenses in 2026.

Q. CAN YOU SUMMARIZE THE COMPANIES' PLAN TO EXECUTE 1,200 MW OF ONSHORE WIND BY 2033?

A. The Companies have developed a plan to execute 300 MW in-service by 2031, 450 MW in-service by 2032, and 450 MW by 2033. This plan was developed based on the stakeholder engagement efforts, described above, and the Companies' own renewable development experience and understanding of developing onshore wind in the Carolinas. As previously mentioned, the Companies have performed a siting feasibility study to identify potential

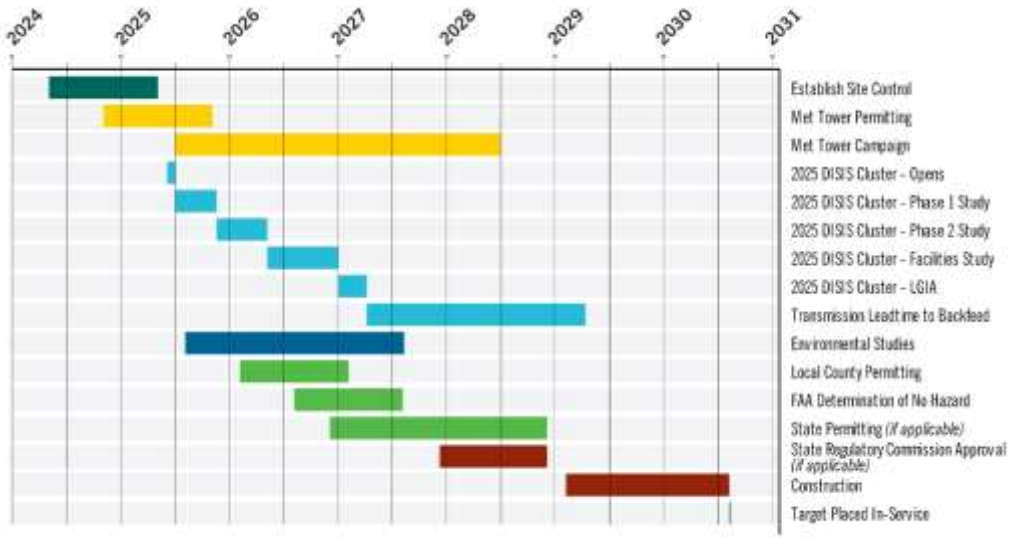
onshore wind sites within the Carolinas, which concluded that a reasonable number of potential sites exist in North and South Carolina. The Companies plan to continue advancing the siting feasibility work to refine targeted development sites throughout 2023 and into 2024. The Companies continue to engage potential onshore wind development partners with the intent of making a selection and being in a position to begin engaging stakeholders and landowners for targeted tranche 1 potential project sites in mid-2024. Tranche 1 projects will then begin the development process as generally illustrated in Figure 3 below, with the target of submitting interconnection applications into the 2025 DISIS cluster and to be placed in-service by January 2031. The Companies will site and advance tranche 2 and tranche 3 projects in a similar fashion, seeking to submit interconnection applications in the 2026 and 2027 DISIS clusters respectively. The Companies will take a portfolio approach to siting, developing, and executing the 1,200 MW, leveraging synergies and opportunities along the way.

Q. HOW DID THE COMPANIES DETERMINE THE DEVELOPMENT AND EXECUTION TIMELINE FOR ONSHORE WIND RESOURCES?

A. The Companies determined the development and execution timeline for onshore wind resources based on input from onshore wind developers provided in the Market Intelligence RFI as well as the Companies' own development experience in the Carolinas. Figure 2 below illustrates the development and

execution timeline to support the first "tranche" of new onshore wind facilities that are targeted to be placed in-service by January 2031.[16]

Figure 2: Illustrative Onshore Wind Development and Execution Timeline



The timeline assumes many development and execution tasks are performed concurrently, but generally assumes enough overlap and flexibility such that a project can be sited, developed and constructed within the six and a half (6.5) years between mid-2024 and end of 2030. For tranche 1 projects, construction would need to start in Q1 2029, shortly after all permits are secured, in order to be placed in-service in Q3 2030. The same timeline sequencing and durations apply to tranche 2 and tranche 3, which are planned to proceed with generator interconnection studies in 2026 and 2027 respectively.

[16] CPIRP Appendix I at 19 (Figure I-4).

C. Battery Energy Storage

Q. MS. MEEKS, THESE NEXT QUESTIONS ARE FOR YOU. THE CARBON PLAN ORDER AUTHORIZED DEVELOPMENT OF 1,000 MW OF STANDALONE BATTERY ENERGY STORAGE RESOURCES AS PART OF THE 2022-2024 NTAP.[17] CAN YOU PLEASE PROVIDE THE COMMISSION AN UPDATE ON DUKE ENERGY'S ONGOING DEVELOPMENT AND PROCUREMENT ACTIVITIES?

A. Yes. As explained in Chapter 4 and Appendix I, the Companies are progressing initial development and procurement activities for 1,000 MW of standalone storage as authorized by the Carbon Plan Order. The Companies' battery energy storage development plan consists of year over year activities to achieve the 1,000 MW target to be placed in-service by the beginning of year 2030.

The Companies are now also planning for incremental development activity commencing in 2024-2026 to bring online the incremental 650 MW of standalone battery energy storage to be installed by 2031 as outlined in the CPIRP NTAP and updated Execution Plan.[18] Table 4-9 in the CPIRP Execution Plan provides details on the Companies' plans to target 1,650 MW of standalone storage to be placed in-service by 2031.

Q. PLEASE EXPLAIN THE COMPANIES' STRATEGY FOR SITING STANDALONE ENERGY STORAGE PROJECTS.

[17] Carbon Plan Order at 133 (Ordering Paragraph No. 22).

[18] *See* Chapter 4 at 5 (Table 4-2) and Chapter NC at 4 (Table NC-1) (each identifying incremental 650 MW of standalone battery storage to be developed in 2024-2026).

A. Duke Energy will strategically site standalone battery energy storage to minimize cost and maximize value. To maximize customer value, the Companies are focused on siting in locations where standalone storage may offer benefits across the Production, Transmission, or Distribution systems and where existing land and infrastructure are re-utilized. Eight out of the sixteen standalone storage projects currently progressing in the 2022 and 2023 DISIS study process are being developed on land owned or controlled by the Companies or at the sites of retiring units. Re-utilizing existing coal plant lands is not only a local community benefit, but also enables the Companies to leverage higher Investment Tax Credit rates for siting the project in an "energy community" as discussed in Chapter 2. Finally, strategic siting enables re-use of existing land and equipment which lowers end cost. Table 1 below presents the incremental standalone storage projects that are currently progressing in the Companies' 2022 and 2023 DISIS Clusters.

Table 1: Incremental Standalone Storage Projects Current Queue Positions

Project Name	Service Territory	Capacity MW(ac)	Interconnection Study Queue
Coleridge	DEP	4.3	2023 DISIS
Aynor	DEP	8.0	2022 DISIS
New Hill	DEP	56.0	2022 DISIS
Spring Hope	DEP	138.0	2022 DISIS
Williamsboro	DEP	3.6	2023 DISIS
Wateree	DEP	2.7	2022 DISIS
HF Lee	DEP	260.0	2023 DISIS
Mayo	DEP	150.0	2023 DISIS
Riverbend	DEC	115.0	2022 DISIS
Wilkes	DEC	120.0	2023 DISIS
Mayo LDES	DEP	18.3	2023 DISIS
Total		**876**	

Q. ARE ALL OF THE COMPANIES' BATTERY PROJECTS THAT ARE NOW IN THE INTERCONNECTION STUDY PROCESS FOUR-HOUR LITHIUM-ION BATTERY ENERGY STORAGE PROJECTS?

A. The majority of projects and energy storage capacity are transmission-connected lithium-ion battery energy storage systems; however, Duke Energy is also pursuing microgrid projects and breakthrough technology long duration energy storage projects beyond the Bad Creek II project discussed by witness Ben Smith of the Long Lead Time Resources and Pumped Storage Hydro Panel. These projects are designed to improve local reliability, expand the potential for the Companies to leverage Infrastructure and Investment Jobs Act of 2021 federal funding or diversify the energy storage technology suite. For example, the Mayo long-duration energy storage project proposes the use of pumped CO_2 storage with a ten-hour duration. The project, which is in early stages of development and was recently submitted into the 2023 DISIS, has an open application for Long-Duration Energy Storage Demonstrations with the Department of Energy.[19]

Q. PLEASE ELABORATE ON THE COMPANIES' ADVANCED PROCUREMENT EFFORTS REFERENCED IN CHAPTER 4.[20]

[19] Department of Energy Office of Clean Energy Demonstrations, *Bipartisan Infrastructure Law: Long-Duration Energy Storage Demonstrations Funding Opportunity Announcement*, *available at* https://oced-exchange.energy.gov/FileContent.aspx?FileID=3a320bf7-68cc-4687-8d76-4d09613f7ef2.

[20] CPIRP Chapter 4 at 22-24.

A. To mitigate challenges in the current battery market, procurement frameworks were established to ensure sufficient supply of battery materials critical to the clean energy transition. Procurement of long lead time infrastructure, battery cells and containers and EPC vendor contracts has begun for the baseline ~300MW energy storage assumed within Carbon Plan modeling as in-service prior to 2026. Procurement of equipment components, engineering, and construction vendors are performed with a competitive bidding process supported by the Duke Energy Supply Chain organization. The Companies plan to continue to leverage established and evolving competitive EPC processes to ensure energy storage project development can be executed efficiently and cost effectively for the benefit of customers.

Q. PLEASE DESCRIBE THE COMPANIES' PROCESS FOR TRACKING EXECUTION OF THE STANDALONE STORAGE RESOURCES APPROVED IN THE INITIAL PROPOSED CARBON PLAN AND NOW THE INCREMENTAL RESOURCES PROPOSED TO BE SELECTED IN THIS UPDATED CPIRP.

A. The Companies' plan for tracking development, procurement, and overall execution of the standalone storage resources approved in the initial proposed Carbon Plan is designed to track development activities year over year and by major project milestones. The Companies use three key major project development milestones in the development process: Interconnection Request, Equipment Procurement Date, and Targeted In-Service Date. Each year, the

Companies specify a MW target amount to achieve each major project milestone assuming project attrition and a timing buffer if project execution faces hurdles outside the Companies' control. This development planning process ensures the Companies are on target to progress new standalone storage projects to achieve commercial operation as well as to provide the Companies' management with ongoing oversight including insight into project progress and potential setbacks to overcome. Table 2 provides an overview of the Companies' planned year-over-year development activities for standalone storage.

Table 2: Standalone Storage Development Targeted per Year

Tranche / Year	2021		2022	2023	2024	2025	2026	2027	2028	2029
2021 Transitional Queues	IR 300			Procure 150	In-Service 65 Procure 120	In-Service 170	In-Service 35			
2022 DISIS			IR 350		Procure 130	In-Service 30 Procure 130	In-Service 170	In-Service 60		
2023 DISIS				IR 500 MW		Procure 375 MW		In-Service 200	In-Service 175	
2024 DISIS					IR 135		Procure 100		In-Service 50	In-Service 50

Q. PLEASE DESCRIBE THE COMPANIES' PROGRESS IN EXECUTING ITS PLANS TO INTEGRATE ADDITIONAL STANDALONE STORAGE.

A. Advanced procurement activities are underway for the ~300 MW of baseline energy storage resources listed in CPIRP Table I-1 and I-2. In addition to the resources identified in CPIRP Tables I-1 and I-2, early-stage development is underway for approximately 700 MW of incremental standalone storage

resources. This activity is also described in Execution Plan Table 4-9. As part of the ongoing energy storage development process, the Companies also plan for project attrition due to interconnection study results, land and permitting challenges, and other development risks which may increase cost resulting in project cancellation. As a result, over 1,100 MW of projects are currently in early-stage development, each of which now holds interconnection queue positions. Planning for some project attrition in the development process will ensure standalone storage targets are met on the timeline identified in the initial proposed Carbon Plan.

IV. CONCLUSION

Q. MS. FARVER, MR. LAROCHE, AND MS. MEEKS, DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.