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BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1300

In the Matter of: Application of Duke Energy Progress, LLC For Adjustment of Rates and Charges Applicable to Electric Service in North Carolina and Performance-Based Regulation	)))))))	**DIRECT TESTIMONY OF LAUREL M. MEEKS AND EVAN W. SHEARER FOR DUKE ENERGY PROGRESS, LLC**

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I. INTRODUCTION

Q. MRS. MEEKS, PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Laurel M. Meeks. My business address is 400 S. Tryon Street, Charlotte, North Carolina 28202.

Q. BEFORE INTRODUCING YOURSELF FURTHER, PLEASE INTRODUCE THE PANEL.

A. I am appearing on behalf of Duke Energy Progress, LLC ("DEP" or "the Company") together with Evan W. Shearer on the "Battery Energy Storage Panel."

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

A. I am employed by DEP as Director of Renewable Business Development at Duke Energy Corporation. DEP is a subsidiary of Duke Energy Corporation ("Duke Energy").

Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

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. For the past three years, I have worked on the Energy Storage Development team on behalf of the regulated arm of Duke Energy.

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Q. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AS DIRECTOR OF RENEWABLE BUSINESS DEVELOPMENT.

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

Q. HAVE YOU TESTIFIED BEFORE THE NORTH CAROLINA UTILITIES COMMISSION ("COMMISSION") IN ANY PRIOR PROCEEDINGS?

A. No. I have not.

Q. MR. SHEARER, PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Evan W. Shearer. My business address is 526 South Church Street, Charlotte, North Carolina 28202.

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

A. I am employed by Duke Energy Carolinas, LLC ("DEC") as Principal Integrated Planning Coordinator, providing planning guidance for both DEP and DEC (collectively, the "Companies"), which are subsidiaries of Duke Energy.

Q. PLEASE SUMMARIZE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I graduated from Boston College in 2007 with a bachelor's degree in history and English and from the University of South Carolina in 2017 with a master's degree in Business Administration. I joined Duke Energy in 2013 and spent eight years in various regulatory strategy roles for Duke Energy's Customer

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Delivery and Grid Modernization organizations. I joined the Integrated Systems and Operations Planning ("ISOP") team in 2021 as a Principal Integrated Planning Coordinator. Prior to working at Duke Energy, I was a Telecom Infrastructure Specialist with the Vermont Public Service Department, which included responsibilities overseeing smart grid activities by utilities in the state.

Q. PLEASE BRIEFLY DESCRIBE YOUR DUTIES AS PRINCIPAL INTEGRATED PLANNING COORDINATOR.

A. My responsibilities on the ISOP team have included preparing the ISOP Appendix to the 2022 Carolinas Carbon Plan ("Carbon Plan") and representing ISOP on the Carolinas Transmission and Distribution Climate Risk and Resilience Study.

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

A. No. I have not.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY [R1-17B(d)(2)j.]?

A. Our testimony supports the battery energy storage portfolio of discrete and identifiable investments that DEP has included in the proposed Multi-Year Rate Plan ("MYRP") in this proceeding. Meeks/Shearer Exhibit 1 provides details regarding projected cost, schedule, and scope for each MYRP project, as well as the reasoning for each project as required by Commission Rule R1-17B(d)(2)j.(i-iii). In our testimony we highlight key factors driving these investments—these projects advance renewable development and encourage

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carbon reductions and are a necessary part of the resource portfolio as we transition to a cleaner energy future.

Q. PLEASE DESCRIBE THE EXHIBITS TO YOUR TESTIMONY.

A. Our testimony includes two exhibits. Meeks/Shearer Exhibit 1 lists the battery energy storage projects included in the proposed MYRP and details the projected cost, schedule, and scope for each MYRP project, as well as the reasoning for each project as required by Commission Rule R1-17B(d)(2)j. Meeks/Shearer Exhibit 2 contains detailed descriptions of each battery energy storage project included in DEP's proposed MYRP and summarizes key components of each project.

Q. WERE THESE EXHIBITS PREPARED BY YOU OR UNDER YOUR DIRECTION AND SUPERVISION?

A. Yes. These exhibits were prepared under our supervision and direction.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Our testimony describes the battery energy storage portfolio that DEP has included in DEP's proposed MYRP. We highlight the critical importance of battery energy storage as DEP, and the entire industry, continue the transition to a cleaner energy future: all paths forward include battery energy storage solutions as a tool to facilitate the transition. The Company's proposed battery energy storage portfolio consists of near-term, prudent investments that will play an integral role in the next phases of the energy transition, given battery storage's unique ability to serve multiple grid functions across generation, transmission, and distribution systems. Furthermore, through these efforts,

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DEP can also begin executing the volume of battery energy storage identified in the Companies' near-term action plan of the Carbon Plan.[1] In addition, our testimony requests cost recovery for the Hot Springs Microgrid Solar and Battery Storage Facility: these costs and corresponding work are reasonable and prudent, and customers will benefit from this important foundational work.

As our testimony highlights, battery storage provides unique benefits to the bulk power system for the benefit of customers, and DEP's MYRP energy storage portfolio is part of the 1,000 MW of standalone storage in the Carbon Plan near-term action plan. These early pipeline projects are needed to provide the integration and operational experience necessary to support the further storage projects expected to be required under the Carbon Plan.

II. MYRP BATTERY ENERGY STORAGE PROJECTS

Q. PLEASE IDENTIFY THE BATTERY ENERGY STORAGE PROJECTS INCLUDED IN DEP'S PROPOSED MYRP [R1-17B(d)(2)j.].

A. The MYRP includes the following battery storage projects: Riverside, Warsaw, Lake Julian, Elm City, Knightdale, and Craggy. Meeks/Shearer Exhibit 1 includes details regarding projected cost, schedule, and scope for each battery energy storage project included in the proposed MYRP, as well as the reasoning for each proposed project. In addition to projected costs for the proposed battery energy storage projects, Meeks/Shearer Exhibit 2 also identifies (1) the reason for each project; (2) the project scope; and (3) the anticipated timeline,

[1] In addition, these projects have been included in the Companies' Integrated Resource Plans ("IRPs") since 2018 and were more recently included in the 2020 IRPs, which were approved by the Commission in Docket No. E-100, Sub 165. *See Order Accepting Integrated Resource Plans, REPS, and CPRE Program Plans with Conditions and Providing Further Direction for Future Planning* (Nov. 19, 2021).

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including projected in-service month and year for each battery energy storage project as required by Commission Rules R1-17B(d)(2)j. This information is supplemented, where appropriate, by the Direct Testimony of Company Witness Kathryn Taylor.

Q. DO ANY OF THE PROJECTS OFFER PROJECTED OPERATING BENEFITS?

A. No quantified operating benefits were identified for the proposed projects. The specific benefits of each project are detailed further in Meeks/Shearer Exhibit 1 and briefly described below.

Q. WHAT BENEFITS ARE EXPECTED FROM THE SPECIFIC BATTERY STORAGE PROJECTS IN THE DEP MYRP PORTFOLIO?

A. As required by Commission Rule R1-17B(d)(2)j., Meeks/Shearer Exhibit 2 describes the reason for each project and summarizes key project components.

The Craggy, Lake Julian, and Riverside projects each comport with Western Carolinas Modernization Plan ("WCMP")[2] goals and support the Mountain Energy Act, which authorized the use of alternative energy solutions to defer a transmission line running through North Carolina, where new transmission lines would run through scenic Blue Ridge escarpment, and in South Carolina, where most of the new transmission infrastructure and a new substation were proposed. These projects were included as part of the battery

[2] *Order Granting Application in Part, With Conditions, and Denying Application in Part*, Docket No. E-2, Sub 1089 (March 28, 2016) ("WCMP Order"). Battery energy storage represented a key component of the WCMP and provided the basis for battery energy storage investments in the DEP-West region. The WCMP specifically included a commitment to deploy at least 5 MWs of battery energy storage for the western Carolinas region.

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storage resources in the 2019 IRP Update.[3] Craggy is a 30.5 MW, 2-hour transmission-connected battery expected to provide bulk system services, but it is also capable of supporting a grid contingency for two years if construction of a new planned transmission line were delayed. Lake Julian is a 17 MW, 4-hour battery at the retired Asheville coal plant, which will give the Company experience with transitioning coal sites, reusing existing brownfield land, and re-training personnel on clean energy technologies. Riverside is the smallest battery in the DEP MYRP Energy Storage portfolio – a 4.6 MW, 1-hour battery – and will serve as a standalone distribution-tied battery that provides bulk services.

The battery projects at Elm City and Warsaw are both leveraging and providing experience with surplus solar interconnection capacity. Elm City – an 18 MW, 4-hour battery – and Warsaw – a 30 MW, 2-hour battery – will provide capacity and ancillary services. Both projects utilize existing interconnection infrastructure and rights to reduce development cost and timeline.

Finally, the 100 MW, 2-hour bulk services battery project at Knightdale will be the largest battery DEP has installed. This project is beneficial to the system and is increasingly important to execute to achieve a cleaner energy future. This project provides experience with a larger grid scale battery system providing energy transfer (arbitrage) to peak periods and ancillary services, which support system balancing at a scale shown valuable by utilities and grid

[3] *Duke Energy Progress, LLC Integrated Resource Plan 2019 Update Report*, Docket No. E-100, Sub 157 (Oct. 29, 2019) ("2019 IRP Update").

operators across the nation.

Q. PLEASE DESCRIBE HOW BATTERY ENERGY STORAGE CAPABILITIES ENABLE THE CLEAN ENERGY TRANSITION.

A. When dispatched by the grid operator, a single energy storage project can perform many different grid functions across generation, transmission, and distribution systems. The grid operator is uniquely situated to optimally site and dispatch storage to maximize value for customers by providing services across these systems with one single asset. Regarding generation, the Company can leverage energy storage to capture excess low-carbon energy production and discharge it when customer demand is highest to maximize the use of carbon-free energy and most efficiently use the system. From a transmission perspective, operator-controlled storage could provide minute by minute balancing between load and generation via ancillary services to maintain adequate system reliability. Furthermore, battery energy storage technologies can be a cost-effective alternative to a transmission or distribution investment to increase capacity, reliability, or resiliency for customers. Through the battery energy storage projects discussed in this testimony, the Company will be better prepared to integrate and operate the clean energy technologies necessary to effectuate the clean energy transition while maintaining safety and reliability of the grid and minimizing impacts to customer rates.

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Q. DID THE COMPANY CONSIDER COST WHEN IDENTIFYING BATTERY ENERGY STORAGE PROJECTS FOR THE PROPOSED MYRP?

A. Yes. However, it is important to highlight that each project included in the MYRP portfolio is critical: prudent utility planning supports the Company undertaking these investments to navigate the energy transition while continuing to provide customers with affordable and reliable service.

Regarding project cost, DEP established required criteria that governed the project selection process. First, DEP prioritized projects that could be placed in-service prior to 2027 to support timing described in the 2018[4], 2019[5], and 2020[6] IRPs. The Companies have learned over the past decade of development that grid-connected batteries frequently require a multi-year lead-time. DEP's proposed battery energy storage projects employ a variety of strategies to achieve faster deployment, such as utilization of an existing interconnection agreement or early development efforts from WCMP.

Second, DEP strategically selected project locations where existing infrastructure and land can be leveraged—this approach reduces local community impact. Third, DEP selected projects that ensure a variety of business development, construction, and operational environments. This "All of the Above" development approach ensures that DEP has an appropriate mix

[4] *See Duke Energy Progress, LLC 2018 Integrated Resource Plan and 2018 REPS Compliance Plan*, Docket No. E-100, Sub 157, (June 5, 2018) ("2018 IRP") at 78 (Table 14-A).
[5] *See* 2019 IRP Update at 82 (Table 11-A).
[6] *See Duke Energy Progress, LLC 2020 Integrated Resource Plan Corrections*, Docket No. E-100, Sub 165 (Nov. 6, 2020) at 120 (Table 14-B).

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of configurations, sites, and use cases. Moreover, this project selection approach will facilitate DEP's ability to expand energy storage generation, transmission, and distribution systems in the years beyond the MYRP.

Finally, DEP focused on selecting projects that maximize customer and grid values over the asset life through demonstration of "stacked values." Meeks/Shearer Exhibit 2 includes detailed summaries of each project and further details the proposed portfolio and individual project benefits to DEP customers.

Q. DO THE PROPOSED MYRP BATTERY ENERGY STORAGE PROJECTS SATISFY THE SELECTION CRITERIA DESCRIBED ABOVE?

A. Yes. As described in Meeks/Shearer Exhibit 2, each MYRP battery energy storage project satisfies selection criteria described above.

Q. PLEASE EXPLAIN HOW THE COMPANY DEVELOPED COST ESTIMATES FOR THE MYRP BATTERY ENERGY STORAGE PROJECTS.

A. DEP used internal cost projections in developing cost estimates for the proposed battery energy storage projects. Specifically, DEP estimated costs based on averages/ranges of: (1) construction labor and engineering costs from previous projects; (2) averages/ranges of equipment costs from real-time 2022 market supplier data; and (3) Q2 2022 interconnection study cost estimates. In addition, DEP plans to competitively bid the major components and construction of the projects for the benefit of customers.

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III. HOT SPRINGS MICROGRID

Q. PLEASE PROVIDE AN OVERVIEW OF THE HOT SPRINGS MICROGRID PROJECT.

A. The Hot Springs Microgrid Solar and Battery Storage Facility ("Hot Springs Microgrid") is an approximately 3 MW direct current/2 MW alternating current solar photovoltaic electric generator and an approximately 4 MW lithium-based battery energy storage system in Madison County, North Carolina, which was placed in-service in December 2021. DEP pursued a Certificate of Public Convenience and Necessity ("CPCN") for the Hot Springs Microgrid consistent with the WCMP Order, which was granted by the Commission on May 10, 2019, (the "CPCN Order").[7]

Q. DID THE NCUC INCLUDE CONDITIONS TO ITS APPROVAL IN THE CPCN ORDER?

A. Yes. Given the rapidly evolving technologies and difficulties quantifying and analyzing costs and benefits, the Commission approved the CPCN subject to: (1) reporting requirements; (2) a frequency regulation study; and (3) a cap on above-the-line project capital costs.

Q. PLEASE ELABORATE ON THE COST CAP THAT THE CPCN ORDER INCLUDED.

A. The Commission concluded that DEP's initial project cost estimates were reasonable. However, in balancing the uncertainties surrounding a first-of-a-kind project with customer interests, the Commission determined that a cost cap

[7] *Order Granting the Certificate of Public Convenience and Necessity with Conditions*, Docket No. E-2, Sub 1185 (May 10, 2019) ("CPCN Order").

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was appropriate. The cost cap implemented a rebuttable presumption that any Hot Springs Microgrid construction costs exceeding the cap are unreasonably or imprudently incurred and shall not be recoverable from customers.[8]

Q. DID THE COMMISSION IDENTIFY AN EXCEPTION TO THE REBUTTABLE PRESUMPTION REFERENCED ABOVE?

A. Yes. Per the CPCN Order, DEP can overcome this presumption by demonstrating that it reasonably and prudently incurred the costs exceeding the cap as a result of an event, or events, directly impacting the timing or cost of construction of the Hot Springs Microgrid that was, or were (1) not reasonably foreseeable at the time the CPCN was approved; (2) unavoidable through the exercise of commercially reasonable efforts and diligence consistent with prudent industry practice, and (3) outside of the reasonable control of DEP ("Force Majeure Events").[9]

Q. DID THE HOT SPRINGS MICROGRID CONSTRUCTION COSTS EXCEED THE CAP AMOUNT ADDRESSED IN THE CPCN ORDER?

A. Yes. The actual construction costs have exceeded the cap amount identified in the CPCN Order; however, these costs were due to Force Majeure Events outside the Company's control, and are therefore reasonable and prudent, as explained further below. Several factors have driven these cost variances, including higher than expected interconnection study and interconnection

[8] CPCN Order at 15.

[9] The Commission defined "Force Majeure Events" as "(1) extreme weather events (including named storms, tornadoes, earthquakes, floods, and forest fires), war, acts of terrorism, epidemics, natural disasters, and other Acts of God, (2) discovery of latent and unknown site conditions, and (3) changes in State or federal law through judicial, legislative, or executive/administrative action or interpretation implemented, enacted, adopted or otherwise ordered after the date this CPCN is approved." CPCN Order at 16.

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equipment costs, higher than expected costs driven by emergent lithium-ion fire safety requirements, and higher than expected construction oversight and advanced funds used during construction ("AFUDC") costs due to total project cost increases and schedule delays due to the COVID-19 pandemic.

Q. PLEASE ELABORATE ON THE FACTORS IMPACTING THE HOT SPRINGS MICROGRID COSTS.

A. First, it is important to highlight, as the Commission did in the CPCN Order, that the Hot Springs Microgrid is a first-of-a-kind microgrid both in size and scope. The Commission acknowledged that one benefit of the project was that DEP and stakeholders would "gain valuable experience and lessons from the deployment of utility-scale battery storage and microgrids in North Carolina, as this technology continues to develop."[10]

To that end, the Hot Springs Microgrid consists of distinct operational modes that impact grid safety in vastly different ways: Grid Parallel Mode and Island Mode. Each of these operational modes requires technical due diligence related to integration to the distribution system, generator system site design, and safety considerations. These operational modes are further complicated when considering that only inverter-based generation sources (solar and an AC coupled battery) are included in the interconnection request.

Second, during the interconnection process for islanding mode, DEP unearthed challenges in this first-of-a-kind operational profile study. This caused delay in project deployment and the need for newly identified equipment

[10] CPCN Order at 16.

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to maintain grid safety.

Third, the project was simultaneously affected by emergent industry learnings stemming from the Arizona Public Service ("APS") battery fire in 2019. Battery energy storage is a nascent technology with evolving fire safety standards, and DEP uses industry-leading fire safety equipment and protocol to keep personnel and equipment safe. New and previously unknown fire protocol and learnings were derived from the APS battery fire incident that required design and equipment change in the Hot Springs Microgrid.

Both effects from the first-of-a-kind interconnection study and external fire safety incidents caused project delays funneling into the COVID-19 pandemic. Subsequent delays due to newly identified and necessary equipment caused increased timing for construction oversight as well as AFUDC.

Q. DID THE COMPANY KEEP THE COMMISSION INFORMED ON THE STATUS OF THE PROJECT AS REQUIRED BY THE CPCN ORDER?

A. Yes. Consistent with the CPCN Order, the Company filed reports and updates with the Commission regarding the Hot Springs Microgrid in Docket No. E-2, Sub 1185. DEP's February 2020 Revised Semi-Annual Hot Springs Report and its October 2020 Interim Progress Report included updates to the Commission on the expected project cost and timeline for commercial operation and reasons for the ultimate delay in the commercial operation date. The Company also had several witnesses participate in a live informational briefing for the Commission on March 5, 2020. The Company anticipates filing its final report on or before October 31, 2022.

Q. REGARDING THE REBUTTABLE PRESUMPTION: DO THE HOT SPRINGS MICROGRID COSTS EXCEEDING THE COST CAP QUALIFY FOR THE EXCEPTION REFERENCED IN THE HOT SPRINGS ORDER?

A. Yes. The excess costs resulted from Force Majeure events, as defined in the CPCN Order, such as the COVID-19 pandemic, and from unforeseeable first-of-a-kind events that were outside of the control of the Company and were unavoidable through the exercise of commercially reasonable efforts consistent with prudent industry practice, including among other things, updates and modifications made for the safety and reliability of the Hot Springs Microgrid as a result of the previously discussed updated fire safety protocol. For these reasons, along with the benefits that customers will receive from this project, the Company's costs that exceed the cap were reasonable and prudent.

Q. DOES THIS CONCLUDE YOUR TESTIMONY.

A. Yes.

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DUKE ENERGY PROGRESS
MYRP PROJECTS
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Line No.	MYRP Project Name	FERC Function	Project Forecasted In-Service Date	MYRP Project Description & Scope	Reason for the MYRP Project	Total Project Amount (System) Projected In-Service Costs	Projected Annual Net O&M	Projected Installation O&M
1	Craggy	Other Production Plant in Service	Mar-26	This is a 30.5MW, 2 hour battery in DEP-W, supporting the Western Carolinas Modernization Plan	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 48,000,000	$ 915,000	$ -
2	Elm City	Other Production Plant in Service	Jun-25	This is a 18MW, 4 hour battery at an existing solar project owned/operated by DEP.	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 52,000,000	$ 549,000	$ -
3	Knightdale	Other Production Plant in Service	Mar-25	This is a 100MW, 2 hour battery at Wake county.	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 107,000,000	$ 3,000,000	$ -
4	Lake Julian	Other Production Plant in Service	Dec-24	This is a 17MW, 4 hour battery at the retired Asheville Coal plant, supporting the Western Carolinas Modernization Project.	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 50,000,000	$ 517,500	$ -
5	Riverside	Other Production Plant in Service	Feb-24	This is a 4.6MW, 1 hour battery in DEP-W, supporting the Western Carolinas Modernization Project.	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 11,000,000	$ 138,000	$ -
6	Warsaw	Other Production Plant in Service	Jul-24	This is a 30MW, 2 hour battery at an existing solar project owned/operated by DEP.	Constituent project of the Foundational Portfolio of Energy Storage resources which are required to enable the cleaner energy transition.	$ 44,000,000	$ 900,000	$ -
	TOTALS					**$ 312,000,000**	**$ 6,019,500**	**$ -**

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Meeks/Shearer Exhibit 2: MYRP Project Summaries

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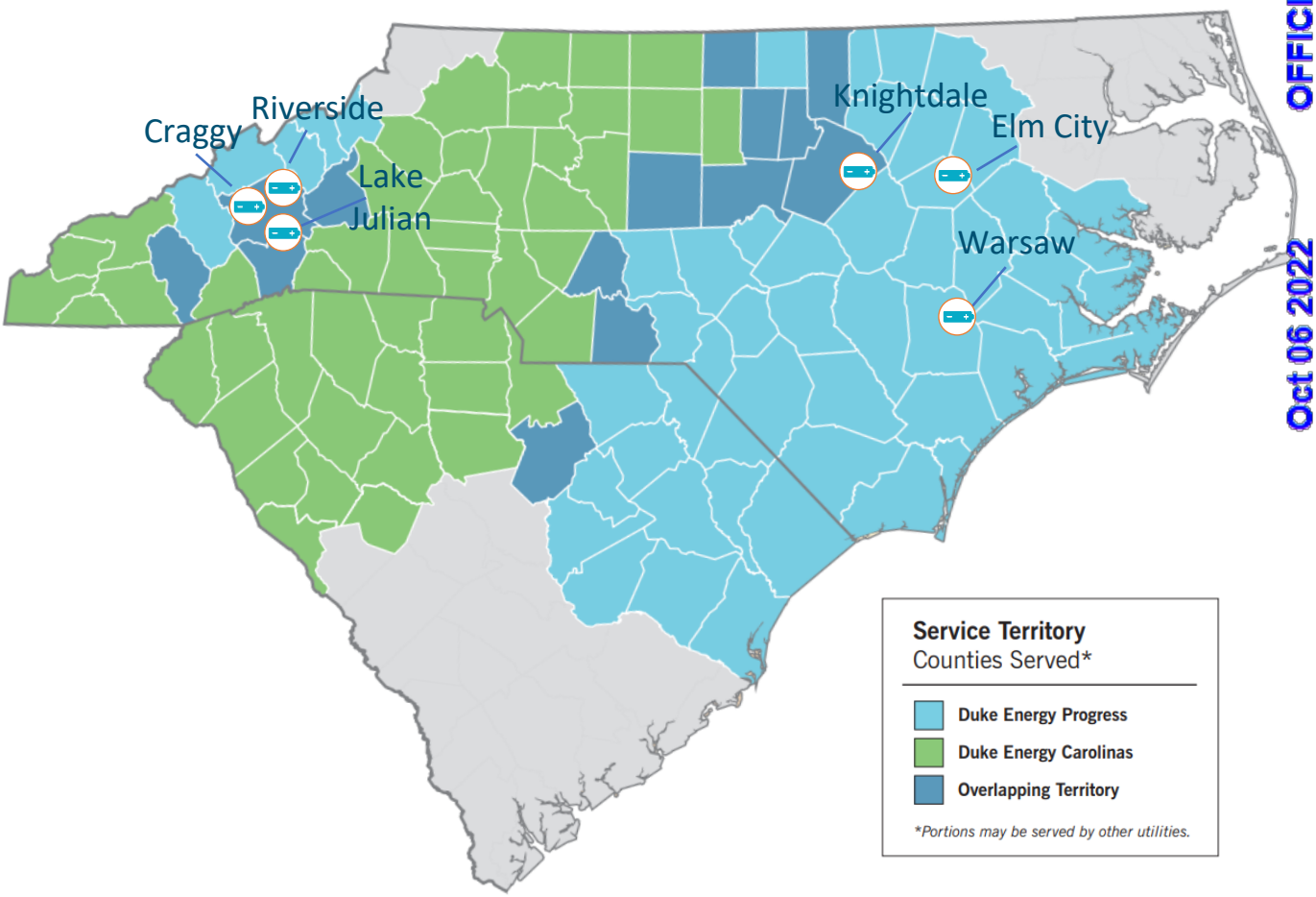
Map of Projects



Project	County	MW	MWh	CAPEX ($MM)	Target COD	Point-of-Interconnection
Riverside	Buncombe	4.6	4.6	$11	Feb ‘24	Distribution
Warsaw	Duplin	30	60	$44.0	Jul ’24	Transmission
Lake Julian	Buncombe	17.3	69	$50.0	Dec ‘24	Transmission
Knightdale	Wake	100	200	$107.0	Mar ‘25	Transmission
Elm City	Wilson	18.3	73.2	$52.0	Jun ‘25	Transmission
Craggy	Buncombe	30.5	61	$48.0	Mar ‘26	Transmission

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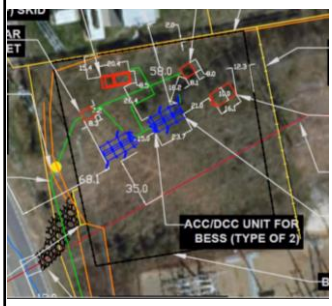
Project: Riverside

County	Buncombe		Functions
Power	4.6 MW		Energy Arbitrage
Energy	4.6 MWh		Capacity
CAPEX ($MM)	$11.0		Ancillary Services
Estimated ISD	Feb'24		
Point of Interconnection	Distribution		
PMCOE Gate/Date	Initiate - Nov'21		
Associated Substation	Elk Mtn. 115kV		



Strategic Rationale:

- Supports Western North Carolinas Modernization: this community desires investment in clean energy technologies to defer investment in traditional technologies and accelerate the clean energy transition.
- Part of a local fleet of batteries testing and perfecting the ability to provide bulk system benefits with distribution interconnection points. This asset is unique to the other local systems in that it is not held in reserve for a local reliability function.
- Uses existing land and infrastructure to lower development and operations cost.

Location: Adjacent to Duke Energy Progress Elk Mountain 115 kV substation in Buncombe County NC on land owned by Duke Energy.

Design Power/Energy: Designed to provide bulk system services via the medium voltage bus of a retail substation, the project is to maintain a 4.6 MW, 4.6 MWh (1-hour) sizing through its life.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 4 estimate predicts the overnight capital investment for this project will be $11 MM.

Estimated ISD: Based upon expected timelines for interconnection study and subsequent required work to construct network upgrades and point-of-interconnection, this project is expected to enter service in February 2024.

Point of Interconnection: This project is to connect to the DEP distribution system at the Elk Mountain 115kV substation.

Selection History: The project was successfully screened in February 2022 Initiate Gate Review.

Interconnection Study: An interconnection agreement has been executed for this project.

Functionality: It is expected that this project will test and validate the ability for distribution-connected resources not held in reserve for reliability functions to provide bulk system capacity, energy arbitrage and ancillary services.

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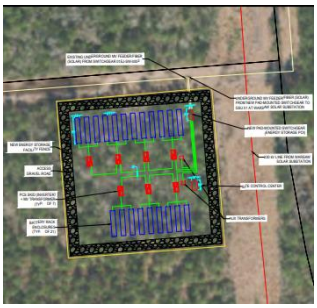
Project: Warsaw

County	Duplin
Power	30 MW
Energy	60 MWh
CAPEX ($MM)	$44.0
Estimated ISD	Jul'24
Point of Interconnection	Transmission
PMCOE Milestone/Date	Select – Apr '22
Associated Substation	Warsaw Solar 230kV

Functions
Energy Arbitrage
Capacity
Ancillary Services



Strategic Rationale:

- Maximizes use of existing interconnection rights with surplus interconnection, lowering interconnection cost and accelerating deployment timeline compared to storage projects using net new interconnection.
- Uses existing land to lower development and operations cost.
- May provide access to investment tax credit as well as production tax credit due to co-location with solar

Location: Adjacent to Duke Energy Progress Warsaw Solar Generating Facility in Duplin County NC on land owned by Duke Energy.

Design Power/Energy: Designed to utilize the existing infrastructure and interconnection agreement of the Warsaw Solar Facility, the project is to maintain a 30 MW, 60 MWh (2-hour) sizing through its life. The battery system is co-located with the existing solar facility.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 5 estimate predicts the overnight capital investment for this project will be $44.0 MM.

Estimated ISD: Based upon expected timelines for interconnection study and subsequent required work to construct point-of-interconnection facilities, this project is expected to enter service in July 2024.

Point of Interconnection: This project is to connect to the DEP transmission system at the Warsaw Solar 230kV Switching Station.

Selection History: The project was successfully screened in an April 2022 Select Gate Review.

Interconnection Study: A surplus interconnection request has been submitted for the project and the study process is ongoing.

Functionality: It is expected that this project will provide bulk system capacity, energy arbitrage and ancillary services.

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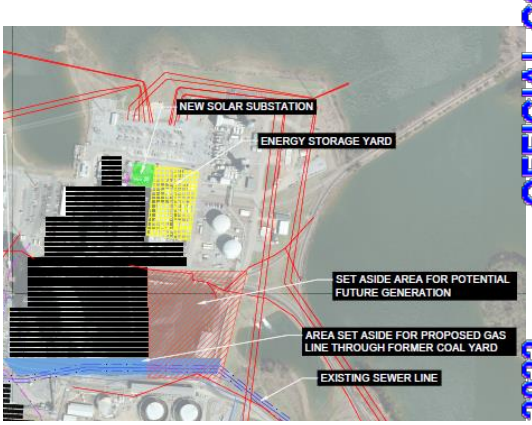
Project: Lake Julian

County	Buncombe
Power	17.3 MW
Energy	69 MWh
CAPEX ($MM)	$50.0
Estimated ISD	Dec ’24
Point of Interconnection	Transmission
PMCOE Milestone/Date	Select – Oct’19
Associated Substation	Asheville Plant Solar 115kV

Functions
Energy Arbitrage
Capacity
Ancillary Services



Strategic Rationale:

- Supports Western North Carolinas Modernization: this community desires investment in clean energy technologies to defer investment in traditional technologies and accelerate the clean energy transition.
- Part of a fleet of clean technologies replacing a retiring coal unit, providing direct learnings for how to reutilize brownfield sites, repurpose existing equipment, and retrain personnel for working on clean energy technologies of the future.
- Brownfield location may maximize investment tax credit available.
- Uses existing land and infrastructure to lower development and operations cost.

Location: Adjacent to Duke Energy Progress’ Asheville Combined Cycle Plant and planned Asheville Solar facility in Buncombe County NC on land owned by Duke Energy.

Design Power/Energy: Designed to re-utilize equipment associated with the recently demolished Asheville Steam Station, the project is to maintain a 17.3 MW, 69 MWh (4-hour) sizing through its life. The battery system is co-located with the planned solar facility.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 5 estimate predicts the overnight capital investment for this project will be $50.0 MM.

Estimated ISD: Based upon expected timelines for interconnection study and subsequent required work to construct network upgrades and point-of-interconnection facilities, this project is expected to enter service in December 2024.

Point of Interconnection: This project is to connect to the DEP transmission system at the planned Asheville Plant Solar 115kV substation.

Selection History: The project was successfully screened in an October 2019 Select Gate Review.

Interconnection Study: An interconnection agreement has been executed for this project.

Functionality: It is expected that this project will provide bulk system capacity, energy arbitrage and ancillary services.

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Project: Elm City

County	Wilson
Power	18.3 MW
Energy	73.2 MWh
CAPEX ($MM)	$52.0
Estimated ISD	June '25
Point of Interconnection	Transmission
PMCOE Milestone/Date	Select - Jun '22
Associated Substation	Elm City Solar 115kV

Functions
Energy Arbitrage
Capacity
Ancillary Services

Strategic Rationale:

- Maximizes use of existing interconnection rights with surplus interconnection, lowering interconnection cost and accelerating deployment timeline compared to storage projects using net new interconnection.
- Uses existing land to lower development and operations cost.
- May provide access to investment tax credit as well as production tax credit due to co-location with solar.

Location: Adjacent to the Duke Energy Progress' Elm City Solar Generating Facility in Wilson County NC on land leased by Duke Energy.

Design Power/Energy: Designed to utilize the existing infrastructure and interconnection agreement of the Elm City Solar Facility, the project is to maintain an 18.3 MW, 73.2 MWh (4-hour) sizing through its life. The battery system is co-located with the existing solar facility.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 5 estimate predicts the overnight capital investment for this project will be $52.0 MM.

Estimated ISD: Based upon expected timelines for interconnection study and subsequent required work to construct point-of-interconnection facilities, this project is expected to enter service in June 2025.

Point of Interconnection: This project is to connect to the DEP transmission system at the Elm City Solar Facility 115kV Switching Station.

Selection History: The project was successfully screened in a June 2022 Select Gate Review.

Interconnection Study: This project will submit a surplus interconnection study request in Q4 2022.

Functionality: It is expected that this project will provide bulk system capacity, energy arbitrage and ancillary services.

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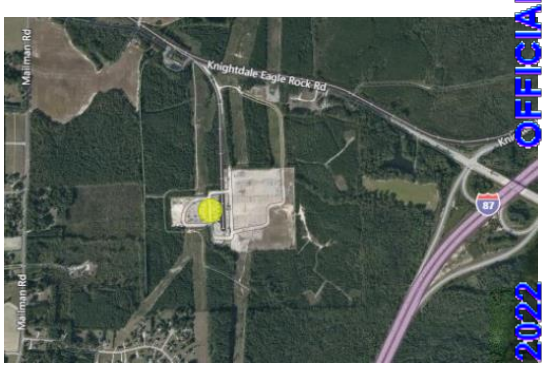
Project: Knightdale

County	Wake
Power	100 MW
Energy	200 MWh
CAPEX ($MM)	$107.0
Estimated ISD	Mar '25
Point of Interconnection	Transmission
PMCOE Milestone/Date	Select - Oct '21
Associated Substation	Wake 500kV

Functions
Energy Arbitrage
Capacity
Ancillary Services



Strategic Rationale:

- This size project provides the next phase of operating experience. It will test most if not all grid functions.
- 15+ 100MW facilities are under construction or operational in US.
- DEP must incorporate new processes and procedures for design/implementation of large-scale battery systems using augmentation to address degradation.
- Partnership with the developer community. Knightdale represents Duke Energy's first 3rd party acquisition for regulated utility-scale energy project in the Carolinas. Duke Energy purchased real estate and an interconnection queue position from an independent developer in October 2021.
- Uses existing land and infrastructure to lower development and operations cost.

Location: Adjacent to the DEP Wake 500kV substation in Wake County NC on land owned by Duke Energy.

Design Power/Energy: Designed to make use of significant existing transmission infrastructure, the project is to be a 100 MW, 200 MWh (2-hour) system at end of life.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 5 estimate predicts the overnight capital investment for this project will be $107.0 MM for the first project phase.

Estimated ISD: Based upon expected timelines for interconnection study and required work to construct network upgrades and point-of-interconnection, this project is expected to enter service in March 2025.

Point of Interconnection: This project is to connect to the DEP transmission system at the Wake 500kV substation.

Selection History: The project was successfully screened for acquisition in October 2021.

Interconnection Study: An interconnection request was submitted in 2019.

Functionality: It is expected that this project will provide bulk system capacity, energy arbitrage and ancillary services.

Additional Notes: In order to maximize equipment project economics, Knightdale project will be constructed in phases. Additional power and energy will be installed at the site over the course of several years to account for the degradation of battery cells, with the site reaching a rating of 100MW and 200MWh.

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Project: Craggy

County	Buncombe
Power	30.5 MW
Energy	61 MWh
CAPEX ($MM)	$48.0
Estimated ISD	Mar '26
Point of Interconnection	Transmission
PMCOE Milestone/Date	Select - Oct '20
Associated Substation	Craggy 230kV

Functions
Energy Arbitrage
Capacity
Ancillary Services

Strategic Rationale:

- Supports Western North Carolinas Modernization: this community desires investment in clean energy technologies to defer investment in traditional technologies and accelerate the clean energy transition.
- This project was identified as a part of a first of a kind non-wires alternative study. It is sited and sized for a potential for transmission deferral: the battery will support a transmission contingency for two years if the planned in-service date for a new 230kV line is delayed. Meanwhile it will provide bulk system services on behalf of all DEP customers throughout asset life.
- Uses existing land and infrastructure to lower development and operations cost.

Location: Adjacent to Duke Energy Progress' Craggy 230kV substation in Buncombe County NC on land owned by Duke Energy.

Design Power/Energy: Originally designed to alleviate a future DEP-West balancing area transmission constraint, the project is to maintain a 30.5MW, 61MWh (two-hour) system sizing through its life.

Expected Technology: Containerized, lithium-chemistry electrochemical battery storage; industry-proven, packaged DC-AC inverters; flexible battery control software/hardware; and best-in-class safety features.

Cost: A 2022 Class 5 estimate predicts the overnight capital investment for this project will be $48.0 MM.

Estimated ISD: Based upon expected timelines for interconnection study and subsequent required work to construct network upgrades and point-of-interconnection, this project is expected to enter service in March 2026.

Point of Interconnection: This project is to connect to the DEP transmission system at the Craggy 230kV substation.

Selection History: The project was successfully screened in an October 2020 Select Gate Review.

Interconnection Study: An interconnection request has been submitted for this project, and the study process is on-going.

Functionality: A potential dual-use transmission and generation asset. It is expected that this project will provide bulk system capacity, energy arbitrage and ancillary services. A possible secondary use case could be transmission contingency support if the planned construction of a new transmission system improvement is delayed.