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.l(c)	))))))	**DIRECT TESTIMONY OF MICAL NOBEL AND ELIZABETH ANDREWS ON BEHALF OF AVANGRID RENEWABLES, LLC**

I. INTRODUCTION

Q: DR. ANDREWS, PLEASE STATE YOUR NAME, BUSINESS AND POSITION AT AVANGRID RENEWABLES, LLC.

A: My name is Elizabeth Dewing Andrews. My position at Avangrid Renewables, LLC ("Avangrid Renewables") is Project Director for the Kitty Hawk Offshore Wind Projects. My business address is 125 High St. 6th Floor, Boston, MA, 02111.

Q: DR. ANDREWS, PLEASE BRIEFLY STATE YOUR EDUCATIONAL AND BUSINESS BACKGROUND.

A: I received a Science Bachelors Degree in Aquatic Biology from Brown University in 2004. I later received a Master of Science in Maritime Archaeology and a PhD in Geospatial Analysis in Maritime Archaeology from the University of Southampton, UK, in 2007 and 2012, respectively.

Prior to joining Avangrid Renewables, I worked as a maritime archaeologist, geophysicist, and department head for EGSi Ltd., UK, where I was responsible for planning and conducting offshore hydrographic, geophysical, and benthic surveys for a variety of marine infrastructure projects, many specifically for the offshore wind industry in the North Sea and Irish Sea. I worked closely with offshore wind developers, related consultancies, and European regulatory agencies to provide survey datasets to the success of these projects.

Additionally, from 2015 to 2022, I worked as a senior and lead geophysicist for Ørsted in their North Sea and US market projects. I was responsible for refining and standardizing their technical methodologies, process, and documentation. On US projects, I worked extensively with the local supply chain to develop their

understanding of new technical requirements, and further with state and federal regulatory agencies to align expectations for the provision for geophysical and geotechnical datasets, as well as the sound sources that would be used during data acquisition. Beyond technical diligence, I was responsible for leading deep-dive exercises into the cost-efficiency of the development phase of their US portfolio.

I joined Avangrid Renewables in 2022 as Lead Geophysicist and then transitioned to the role of Lead Engineering Manager for development and new business projects. In this capacity, I have been responsible for integration of onshore and offshore design and engineering of project assets, including, but not limited to, foundations, turbines, substations, and cables, as well as transport and installation strategies.

Q: DR. ANDREWS, WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT ROLE?

A: I am the director for the Kitty Hawk Projects, comprising both the Kitty Hawk North and Kitty Hawk South projects. I lead the development of these projects through the federal, state, and local permitting processes, the initial engineering of the offshore and onshore assets, and public engagement. I lead the Kitty Hawk Projects through development-phase goals of creating a confirmed pathway to market for both projects, securing full site control in the form of leases, options, easements, or other manner, securing the required permits for construction of the projects and preparing the projects for execution of construction contracts for, among other things, materials, manufacture, transport and installation.

Q: DR. ANDREWS, ON WHOSE BEHALF ARE YOU TESTIFYING?

A: I am testifying on behalf of Avangrid Renewables, an intervenor in this proceeding.

Q: DR. ANDREWS, HAVE YOU PREVIOUSLY TESTIFIED IN FRONT OF THE NORTH CAROLINA UTILITIES COMMISSION?

A: No.

Q: MS. NOBEL, PLEASE STATE YOUR NAME, BUSINESS, AND POSITION AT AVANGRID RENEWABLES.

A: My name is Mical Nobel. My position at Avangrid Renewables is Senior Manager of the Offshore Wind New Business team. My business address for is 125 High St. 6th Floor, Boston, MA, 02111.

Q: MS. NOBEL, PLEASE BRIEFLY STATE YOUR EDUCATIONAL AND BUSINESS BACKGROUND.

A: I received a Bachelor of Science Degree in Electrical and Computer Engineering from Tufts University in 2013. After working for four years in healthcare technology, I went back to school and received a Master of Business Administration from the University of Chicago Booth School of Business in 2019. I also earned a professional certificate in Financing and Deploying Clean Energy from the Yale University Center for Business and the Environment in May 2024.

After graduating business school in 2019, I worked in a business development and project management role for a public sector consultancy before transitioning to a role in the Avangrid Renewables offshore wind business where I supported internal operations and market assessment activities for 9 months. I joined the Offshore Wind New Business team in 2021.

Q: MS. NOBEL, WHAT ARE YOUR RESPONSIBILITIES IN YOUR

CURRENT ROLE?

A: The Avangrid Renewables Offshore Wind New Business team focuses on the non-engineering scope of all early-stage business development. This covers market-making in all forms, such as working with state policymakers and the Bureau of Ocean Energy Management ("BOEM") in offshore wind policy and lease proceedings, BOEM auction preparation and execution, stakeholder interfaces and RFP responses, contract negotiation, and partnerships.

Q: MS. NOBEL, ON WHOSE BEHALF ARE YOU TESTIFYING?

A: I am testifying on behalf of Avangrid Renewables, an intervenor in this proceeding.

Q: MS. NOBEL, HAVE YOU PREVIOUSLY TESTIFIED IN FRONT OF THE NORTH CAROLINA UTILITIES COMMISSION?

A: No.

Q: DR. ANDREWS, PLEASE PROVIDE SOME BACKGROUND ON AVANGRID RENEWABLES' PARENT COMPANIES.

A: Avangrid Renewables is a subsidiary of Avangrid, Inc., which has approximately $40 billion in assets across two primary lines of business — Avangrid Networks and Avangrid Renewables. Avangrid Renewables, among the three largest wind energy generators in the United States, owns and operates more than 8,400 megawatts ("MW") of owned and controlled wind and solar generation in more than 20 states across the country. This includes ownership of the only major operating wind project in North Carolina.[1]

[1] The Commission approved this project's Petition for Certificate to Construct Merchant Plant & Registration as New Renewable Energy Facility in 2011 and the project has been generating electricity since 2017. For further details about the project's ap e royal by the Commission, see NCUC Docket No. EMP-49, Sub 0.

Avangrid Renewables is an experienced offshore wind developer with a plethora of lessons learned in developing and executing offshore wind projects through the US's first commercial-scale offshore wind project, Vineyard Wind 1, which began to deliver power to Massachusetts last fall. Furthermore, we benefit from a wealth of experience from colleagues in the US and across the globe who have directly worked on the development, construction, and operation of an extensive global portfolio managed by our majority shareholder, Iberdrola, and being a part of the Iberdrola Group. We are well-positioned to handle the short-term market challenges and deliver a successful project like Kitty Hawk for North Carolina.

Avangrid, Inc.'s primary shareholder, Iberdrola S.A., is a global energy leader and top producer of wind power in the world. This relationship allows Avangrid Renewables to benefit from the experience of affiliates, such as ScottishPower Renewable Energy Ltd and Iberdrola Renovables SAS. These affiliates have substantial expertise in offshore and onshore wind development, finance, construction, and operations.

Avangrid Renewables, through its Vineyard Wind joint venture, developed and is currently constructing the 800 MW Vineyard Wind 1 project in federal waters off the coast of Massachusetts. The project delivered first power in January 2024 as the first commercial-scale offshore wind project in the United States. In addition, Avangrid Renewables is the sole owner of two other offshore wind projects off the coast of Massachusetts, New England Wind 1 and New England Wind 2, which total approximately 2 gigawatts ("GW") of capacity. The company is also developing the Kitty Hawk Wind North and South lease areas off the coast of North

Carolina/Virginia, which have a combined capacity of up to 3.5 GW.

Q: DR. ANDREWS AND MS. NOBEL, WHAT IS THE OBJECTIVE OF YOUR PANEL'S TESTIMONY?

A: The objective of our testimony is to provide information and analysis regarding the offshore wind industry, North Carolina's offshore wind potential and status, and the necessity to move forward with development of the projects. Our Kitty Hawk Projects collectively represent the largest and most advanced of the North Carolina offshore wind energy areas and Avangrid Renewables is ready to continue development of these project, but only if a clear path to market or an alternative path to return on investment is established. Without that, we will have to consider alternative options for this lease area.

Q: DR. ANDREWS AND MS. NOBEL, PLEASE SUMMARIZE THE PANEL'S RESPONSE TO DUKE'S POSITION ON OFFSHORE WIND DEVELOPMENT AS STATED IN FILINGS MADE IN THIS DOCKET.

A: Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (DEC and DEP, collectively "Duke") have recognized the need for offshore wind resources to meet expected near- and mid-term increases in demand as well as statutory carbon emissions reductions mandates. We support the inclusion of 2.4 GW of offshore wind energy in the January 2024 Duke Carbon Plan Integrated Resource Plan Update Preferred Portfolio ("Preferred Portfolio"). However, Duke's proposed Acquisition Request for Information ("ARFI") needs to be amended to allow for developer feedback on process and timeline certainty for developers to advance the offshore wind projects.

Q: DR. ANDREWS AND MS. NOBEL, WHAT INITIAL RECOMMENDATIONS DO YOU HAVE FOR THE COMMISSION TO CONSIDER?

A: Overall, we recommend the Commission issue an order requiring that Duke, with the developers, expedite the processes leading to the continued development of offshore wind. More specifically, we recommend the Commission:

- Accept Duke's proposed portfolio of offshore wind with an interest in potential expansion beyond 2.4 GW;
- Order for immediate action which results in the initial procurement of offshore wind no later than October 1, 2025, supporting project timelines which meet North Carolina's carbon reduction requirements according to schedule, at the most advantageous costs;
- That immediate action should include, but is not limited to, opening a new docket no later than September 2024 for the purpose of facilitating a solicitation for offshore wind and the appointment of a third-party administrator to oversee the process and to provide regular reports to the Commission, to facilitate an efficient process to procure offshore wind.

To that end, Avangrid Renewables intends to move the Commission to open the parallel docket after the conclusion of the evidentiary hearing but prior to the final Order in this proceeding. As mentioned further herein, the need and timing concerns for offshore wind development are clear and further delay may result in North Carolina losing its offshore wind opportunities.

Q: DR. ANDREWS AND MS. NOBEL, CAN YOU SUMMARIZE WHY THE

COMMISSION SHOULD EXPEDITE THE PROCESSES LEADING TO THE DEVELOPMENT OF THE OFFSHORE WIND ENERGY AREAS?

A: Offshore wind projects are capital-intensive and require long lead times for development. The North Carolina offshore wind market must develop immediately, likely via regulatory order and implementation, for the North Carolina Utilities Commission and Duke to meet the interim emissions reduction requirement.

II. OVERVIEW OF THE OFFSHORE WIND MARKET

Q: MS. NOBEL, WHAT IS THE CURRENT STATE OF THE MARKET OF THE OFFSHORE WIND INDUSTRY IN THE UNITED STATES?

Over the last few years, the global offshore wind industry has progressed markedly, with over 67 GW of offshore wind energy in operation and an additional 16 GW under construction as of the end of 2023.[2] Numerous countries around the globe have recognized that offshore wind is an indispensable component of a transition to clean energy and is a significant generator of jobs and economic development. In the United States, one major project is now operating, three major projects are under construction, and approximately 10 GW of capacity has been approved by the Biden administration.[3]

Q: MS. NOBEL, CAN YOU DESCRIBE ANY HEADWINDS THE OFFSHORE WIND INDUSTRY IS CURRENTLY FACING AND WHAT IS NEEDED TO OVERCOME THOSE?

A: Like many industries, the offshore wind industry has experienced cost increases

[2] https://wfo-global.org/wp-content/uploads/2024/04/WFO-Report-2024Q1.pdf (Last checked May 24, 2024).

[3] https://www.doi.gov/pressreleases/biden-harris-administration-approves-eighth-offshore-wind-project (Last checked May 24, 2024).

and supply chain challenges. Like other energy industries, offshore wind developers have been impacted by cost increases from inflation, financing, and supply chain disruptions. Costs of offshore wind development have generally risen since 2022, as demonstrated through recent published bid prices in Northeast states such as New York.[4]

However, there are positive indicators that the offshore wind industry is recovering. Oceantic Network, an organization focused on growing the offshore wind supply chain, recently published a market report highlighting contributing factors helping the industry to recover. These include falling interest rates, stabilizing commodity prices, Inflation Reduction Act ("IRA") tax credit guidance, and multiple large state solicitation windows.[5] Agencies overseeing competitive offshore wind solicitations across the Northeast have addressed inflation concerns by allowing indexed prices and inflation adjustment mechanisms for their respective offshore wind solicitations.[6]

Commitment to offshore wind development is necessary, though.to achieve the economies of scale and supply chain development to lower costs over time. Currently, there is a chicken and egg problem facing the offshore wind supply chain, where established European supply chain companies and financiers are cautious about investing in new U.S. manufacturing facilities or vessels due to U.S. project delays or cancellations, and those same U.S. manufacturing facilities are in

[4] https://www.reuters.com/business/energy/new-york-auction-highlights-jump-us-offshore-wind-prices-2024-03-14 (Last checked May 24, 2024).

[5] https://online.flippingbook.com/view/968060436/ (Last checked May 24, 2024).

[6] https://www.fticonsulting.com/insights/articles/turbulent-waters-current-developments-us-offshore-wind-industry (Last checked May 24, 2024).

turn facing cost increases due to a global vessel shortage and need for supply chain diversification. This can be resolved with state offtake or procurement awards to the most advanced projects at competitive prices that can solidify the projects' financial viability and delivery, which in turn can be used to attract the supply chain to the U.S.

Q: MS. NOBEL, CAN YOU DESCRIBE AN EXAMPLE OF WHERE STATE COMMITMENT TO OFFSHORE WIND DEVELOPMENT RESULTED IN BENEFICIAL RESULTS TO RATEPAYERS AND ALSO THE OFFSHORE WIND BUSINESS COMMUNITY?

A: Virginia is an excellent example of the supply chain advancements that can be achieved with large-scale offshore wind projects. The 2.6 GW Coastal Virginia Offshore Wind Project ("CVOW") has enabled Dominion Energy to finance and construct the first U.S. Jones Act wind turbine installation vessel, which will play a key role in building out the nation's future offshore wind projects. North Carolina is uniquely poised to play a critical role in this state and national endeavor, with its business-friendly environment attractive to manufacturers and the projected future load needs of Duke Energy.

III. N.C. REGULATORY CONCERNS AND OFFSHORE WIND

Q: MS. NOBEL, CAN YOU DESCRIBE YOUR BACKGROUND IN RELATION TO NORTH CAROLINA ENERGY REGULATORY ISSUES AND HOW OFFSHORE WIND FITS INTO THAT?

A: I have worked on issues related to the Kitty Hawk offshore wind energy area since prior to the initial North Carolina Carbon Plan proceeding in 2022 with our internal

experts and external counsel to understand the nuance of North Carolina energy regulatory matters, especially those which impact the development of offshore wind projects off the coast of North Carolina. I am also generally aware of North Carolina's robust utility scale solar fleet, which, as detailed below, has a complimentary generation profile to offshore wind.

Q: MS. NOBEL, PLEASE DESCRIBE THE IMPORTANCE OF THE OFFSHORE WIND ASSET CLASS WITH REGARD TO MEETING THE STATE'S UTILITY GENERATION CARBON EMISSION REDUCTION REQUIREMENTS.

A: Offshore wind is both feasible and necessary to meet North Carolina's carbon emissions reduction requirements. Offshore wind adds to the diverse and complementary portfolio of energy sources needed for energy resilience in the state. As we have previously testified[7], offshore wind is a mature, scaled, and clean generation technology with gigawatts of projects in service and in development domestically and internationally.

As mentioned in Avangrid Renewables' previous testimony in the initial Carbon Plan proceeding[8], offshore wind also has a significant generation shape diversity benefit. The yearly resource additions in Duke's Preferred Portfolio reflect a system which is increasingly short on capacity as thermal plants retire and load increases. However, Duke's Preferred Portfolio generation stack could create real world operational challenges when forecast uncertainty and extreme weather materialize

[7] See, NCUC Docket No. E-100, Sub 179, *In the Matter of: Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC, 2022 Biennial Integrated Resource Plans and Carbon Plan*, Tr Vol. 23, pp. 164-169.

[8] NCUC Docket No. E-100, Sub 179, *In the Matter of: Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC, 2022 Biennial Integrated Resource Plans and Carbon Plan*, Tr Vol. 23, p. 166.

at intra-hour timescales not well captured within the modeling tools. In contrast, offshore wind produces consistently throughout the day, providing a baseload-style curve that produces roughly equally at all hours in winter when solar is at its seasonal low, and at a gentle inverse of the solar daily load curve in summer.

Q: MS. NOBEL, OFFSHORE WIND AND SOLAR ARE COMPLIMENTARY, BUT DOES OFFSHORE WIND STAND ON ITS OWN?

A: Offshore wind is a robust and unique energy opportunity for North Carolina. Traditional utility production cost modeling can be an effective tool but has limitations including, in particular and relevant to our testimony, recognizing the advantages of offshore wind generation resources in a diverse North Carolina generation stack. Offshore wind is complimentary to solar and also, at times, exceeds the ability of solar. Offshore wind produces at its nameplate capacity more hours per year, with likely capacity factors possibly exceeding the 40 percent range, versus solar's high 20s and low 30s.

Q: MS. NOBEL, DOES AVANGRID RENEWABLES CONSIDER DUKE'S PREFERRED PORTFOLIO SATISFACTORY, PARTICULARLY IN ITS MODELLING OUTCOMES, AS IT PERTAINS TO OFFSHORE WIND?

A: The Carolina Long Bay projects have the potential to reach more than 2 GW, and the Kitty Hawk Projects have the potential to reach nearly 3.5 GW. Therefore, there is additional offshore wind resource beyond the Preferred Portfolio request available to North Carolina.

Furthermore, given the likely reliance of each project on high voltage direct current ("HVDC") technology, the approach of a first tranche of 800 MW is technically

and economically inefficient as compared with larger capacity projects. The Preferred Portfolio does not appear to fully account for the geographic, technical, and lease-specific characteristics of each of the three regional offshore wind energy areas. This lack of account for the offshore wind potential is exhibited, in part, by the Duke's modeling assumptions incorporating 800 MW project blocks. Using larger project blocks that are better aligned with lease area sizes and that optimize HVDC cable technology capacity would be more appropriate for modeling offshore wind compared to the currently proposed 800 MW blocks. Larger project tranches would also enable benefits from economies of scale and support a larger offshore wind market in North Carolina.

Q: MS. NOBEL, HOW WOULD AVANGRID RENEWABLES SUGGEST DUKE MORE APPROPRIATELY APPROACH BUILDING OUT OFFSHORE WIND SOLAR PROJECTS?

Avangrid Renewables would encourage the year-over-year introduction of new projects, as available, to provide North Carolina with a continuous or "rolling" pathway to clean, complimentary offshore wind generation. Through interconnection of several projects and further offshore wind procurement in the future, we see that North Carolina would be in a strong position to build a long-term sustained industry.

IV. ENGINEERING AND CABLING RECOMMENDATIONS

Q: DR. ANDREWS, IS HVDC CABLE TECHNOLOGY VIABLE FOR OFFSHORE WIND FOR NORTH CAROLINA AND, IF SO, WHY?

A: High Voltage Alternating Current ("HVAC") subsea cabling has been the dominant

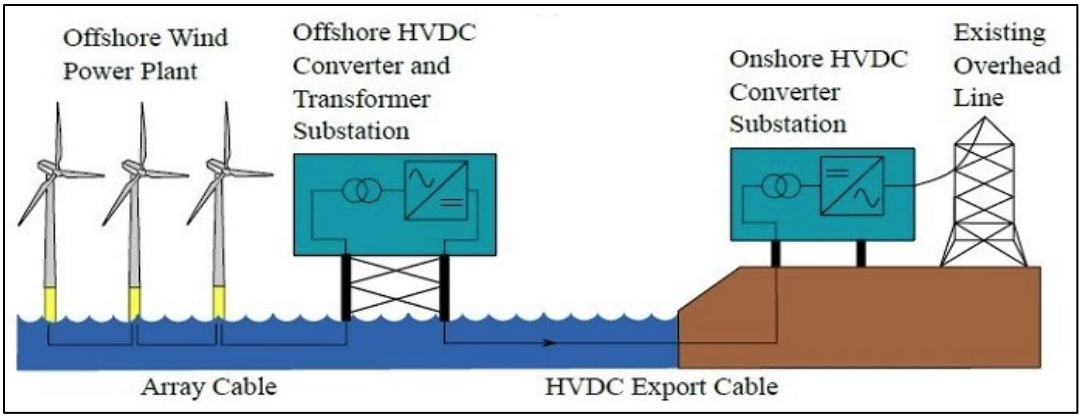
form of transmission technology to bring energy generated by offshore wind projects to shore. However, HVDC technology is increasingly required to support projects at larger distances from shore. HVAC cables transmit alternating current power at voltages nominally between 33 kilovolt ("kV") and 230 kV; HVDC cables transmit direct current power at voltages of nominally between 100 kV and 800 kV. Each of the projects currently available for interconnection into North Carolina, the two Carolina Long Bay projects, with expected transmission lengths of approximately 111 miles, and the two Kitty Hawk projects, with expected transmission lengths between nominally 145 miles and 200 miles, will require HVDC subsea cable technology.

Especially with reference to these projects, HVDC is strong transmission technology offering technical advantages over HVAC cables, including but not limited to:

- Reduced Transmission Loss: due to reduced skin friction and corona loss, transmission losses are lower for HVDC than HVAC, which is critical over longer cable routes. Longer transmission routes required for interconnection to North Carolina are viable without reactive compensation for losses through the installation of offshore booster stations (similar infrastructure to offshore substations or electrical services platforms ("ESPs")) along the transmission route; this lowers costs and the environmental footprint of the projects.
- Improved performance in in weak grid conditions: where the expected point of interconnection is outside of an urban load center (i.e. a city center), the

onshore transmission grid is typically lower in voltage levels (115 kV or 230 kV as opposed to 345 kV) and commonly has lower short circuit strength due to the lower demands on grids in these locations. This can be problematic for interconnection of HVAC offshore cables which rely on higher voltages; HVDC cables do not pose a problem for the grid in these conditions.

- Simpler cable routing: the number of conductors needed to transmit power is lower compared to HVAC; HVDC thereby narrows the cable corridor required to route the subsea and onshore portions of the cables occupying less space and reducing potential impacts from the projects.
- Greater resilience to main grid disturbances: the HVDC transmission system is decoupled from the onshore HVAC network which prevents grid disturbances from propagating throughout the windfarm as may be seen with HVAC transmission technology.
- Potential improvements to the onshore HVAC network stability: the onshore HVAC network is only connected to one large HVDC converter, as opposed to the many small Wind Turbine Generators ("WTG") converters as in an HVAC system; from a frequency and voltage perspective, this is beneficial to the stability of the grid.



There are different HVDC configurations such as symmetrical monopole or bipole metallic return for instance, which could be available for the interconnection of these North Carolina offshore projects, whilst staying within the expected single contingency limits, which creates optionality to find the optimal solution at the final point of interconnection. Manufacturers have installed HVDC converter stations and employed a range of these configurations, successfully interconnecting many offshore wind projects in Europe using HVDC technology.

Q: DR. ANDREWS, CAN YOU PROVIDE SOME REAL-WORLD EXAMPLES WHICH SHOW HOW TO SUCCESSFULLY UTILIZE THESE TYPES OF LINES THROUGH THE WATER AND ONSHORE?

A: Avangrid Renewables' affiliate ScottishPower's East Anglia 3 project is currently being built using 320kV DC converter stations to deliver 1320 MW to the transmission grid from the wind project at a distance of approximately 114 miles; this demonstrates not only the technical viability, but Avangrid Renewables' internal experience with this technology through the Iberdrola Group.

Within the US offshore wind market, Ørsted's 924 MW Sunrise Wind project, planned for construction beginning in late 2024, will be the first offshore wind

project in the US to employ HVDC technology; this project will reportedly deliver power from a lease area more than 50 miles way from its onshore landfall. As of May 2024, four transformers for the Sunrise Wind project have already arrived in New York, demonstrating the on-the-ground reality of this technology for US projects.

Q: DR. ANDREWS, WHAT COST DRIVERS SHOULD BE CONSIDERED FOR THIS TYPE OF SYSTEM AND ENGINEERING?

In a consideration of cost, once the HVDC converter and transformer substation has been constructed, the difference in cable length between projects is not seen to be a significant driver for overall cost of energy from the wind project. HVDC cable utilizes fewer conductors than HVAC for the same amount of energy delivered. For example, a 1.2 GW HVAC project requires three export cable circuits compared to only one to two circuits for an HVDC project, depending on the HVDC configuration. This substantially lowers the export cable cost per mile for an HVDC project compared to HVAC.

As each project will utilize HVDC cables, the projects will have highly similar costs for the manufacturing and installation of the HVDC offshore and onshore converter stations and onshore routes. Naturally, the longer route length of the Kitty Hawk projects (between 145 – 200 miles compared to Carolina Long Bay's 111 miles) will mean higher export cable costs for the Kitty Hawk projects. However, because HVDC cable costs per mile are relatively inexpensive compared to the overall HVDC converter station cost or even the overall offshore wind project cost, the additional route length from the Kitty Hawk lease areas is not a meaningful cost

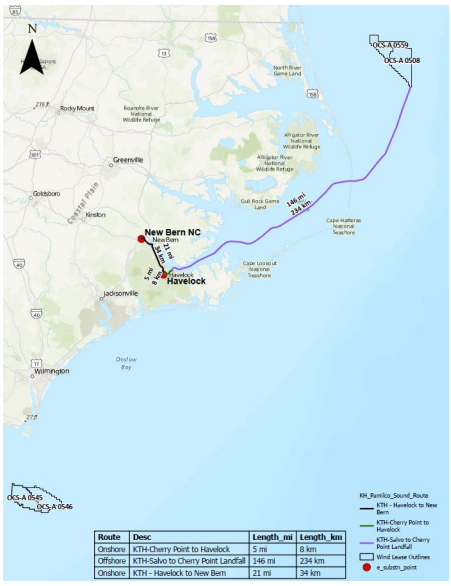
driver when comparing the cost efficiency of the projects.

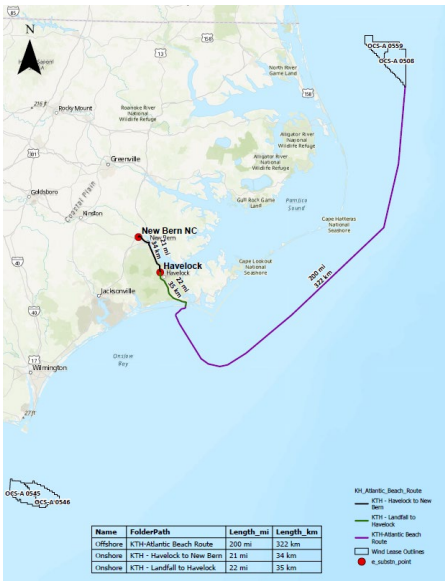
Q: **DR. ANDREWS AND MS. NOBEL, CAN YOU DESCRIBE THE EFFECTS OF THE CABLING RECOMMENDATIONS ABOVE ON THE RELATIVE COST FOR THE OFFSHORE WIND PROJECTS?**

The CapEx premium required for the Kitty Hawk Projects' longer estimated route length (as compared to the route length required by the Carolina Long Bay projects) will not materially change the substantial cost efficiency advantage Kitty Hawk has over the Carolina Long Bay projects, with such advantage driven by the superior wind conditions and, therefore, energy production of the Kitty Hawk projects.

Q: DR. ANDREWS, DOES AVANGRID RENEWABLES HAVE A CORRIDOR PLAN FOR THESE PROJECTS TO COME ONSHORE?

A: Two potential offshore transmission corridors to North Carolina have currently been matured through initial diligence: a route making initial landfall in the Outer Banks with an additional inshore subsea cable through Pamlico Sound, and a longer, fully offshore route making landfall south of the Outer Banks in Atlantic Beach.





Q: DR. ANDREWS, PLEASE PROVIDE SOME BACKGROUND ABOUT SPLITTING THE KITTY HAWK WIND ENERGY AREA AND ASSUMPTIONS ABOUT THE BUILDOUT FOR THE TWO WIND ENERGY AREAS?

A: The original Kitty Hawk Wind lease area OCS-A 0508, awarded to Avangrid Renewables in 2017, was segregated into two lease areas in November 2023; the newly designated OCS-A 0559 represents the north-western third of the original area, Kitty Hawk North, and is held by Kitty Hawk North, LLC, whilst the south-eastern two-thirds, Kitty Hawk South, is still designated OCS-A 0508 and is held by Kitty Hawk Wind, LLC. This lease split was conducted to facilitate creation of a path to market for these lease areas in 2024. Avangrid Renewables has held these areas for seven years and is eager to accelerate progress on these valuable projects. Currently, Kitty Hawk North is expected to construct 56 WTGs and 1 ESP, otherwise known as an Offshore Substation. Kitty Hawk South is expected to construct 121 WTGs and 2 ESPs. As both projects are considering a WTG size

range between 15 MW and 20 MW, this results an overall capacity expectation between 800 MW and 1.1 GW for Kitty Hawk North and a range of 1.6 GW to 2.4 GW for Kitty Hawk South; a cumulative maximum of 3.5 GW from the two projects.

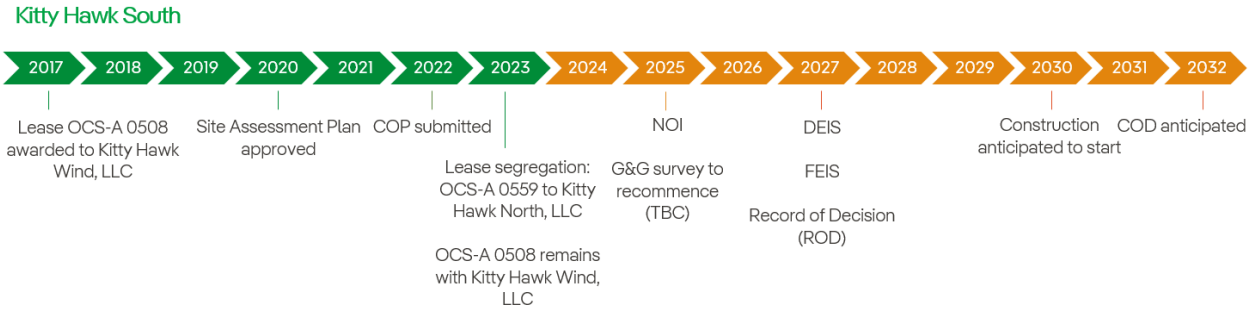
V. CONSTRUCTION SCHEDULE

Q: DR. ANDREWS, CAN YOU COMMENT ON DRIVERS FOR THE CONSTRUCTION SCHEDULE FOR THE KITTY HAWK PROJECTS AND WHERE EACH PROJECT SITS IN THE PERMITTING PROCESSES?

A: In addition to securing major supply chain contracts, the overall project construction schedule for offshore wind projects in the United States is driven by the successful completion of federal permitting. Federal permitting for an offshore wind project will typically take a minimum of 5 to 8 years from lease award, as shown in the timeline below, and to cost tens to over a hundred million dollars. Due to the duration and cost, expectations for start of offshore construction and Commercial Operation Date ("COD") is anchored in this process.

Kitty Hawk North and Kitty Hawk South have each submitted their own Construction and Operations Plan ("COP") as a component of the Federal Permitting process, driving independent Environmental Impact Study ("EIS") processes. The Federal Infrastructure Projects Permitting Dashboards for each projects detail the permitting milestones and dates currently agreed between each project and all related federal permitting agencies.

According to the current permitting dashboard for Kitty Hawk North, Record of Decision is planned for May 2026; this would facilitate the project to start foundation installation nominally Q2 2029, targeting COD by end of 2030. For Kitty Hawk South, the current permitting dashboard provides a planned Record of Decision milestone in December 2027; the project could then expect to start foundation installation nominally Q2 2031, targeting COD by end of 2032.



In summary, assuming the stimulus of required actions to preserve the working timelines of the Kitty Hawk Wind projects, individually and together, the projects are well-positioned to contribute to North Carolina's ambition for a 70% carbon reduction by 2032, making the target of 2.4 GW of offshore wind energy an achievable reality. In addition, Kitty Hawk North and South are further along in the permitting process than the other two projects in North Carolina, having already submitted Construction and Operations Plans for both.

Q: DR. ANDREWS, WHAT ACTIONS ARE REQUIRED TO PRESERVE THE CURRENTLY ACHIEVABLE PROJECT TIMELINES? WHAT WOULD CONSTITUTE SUFFICIENT PROJECT CERTAINTY TO TAKE THESE ACTIONS?

A: To maintain the schedules for Kitty Hawk North and South as presented above, a path to market needs to be established, and done so promptly. With a confirmed

pathway to market, Avangrid Renewables will be enabled to continue to invest in the federal permitting process and the procurement of critical-path construction contracts.

Avangrid Renewables have been informed by suppliers of HVAC and HVDC subsea cables that additional supply chain delays of approximately 6 years or greater may be incurred due to demand for cables and installation vessels. Certainty on the pathway to market is required for the wind developer to timely undertake the risk of agreements with manufacturers and transport and installation suppliers.

Where geophysical and geotechnical data acquisition, as a fundamental component of the federal permitting and procurement processes, can represent 50% or greater of the development spend for a project, on the scale of tens to greater than a hundred million dollars in survey data acquisition, action must be driven by certainty in project schedule. The presented COD dates each assume data acquisition continuing in 2025.

Should the projects suspend further substantive development action to 2027 or 2028 whilst certainty on pathway to market is pending, a corresponding delay to COD of three to four years should be expected as a minimum; this delay could be anticipated to be longer. Alternatively, Avangrid will have to consider other uses of the lease site than a project delivering energy to North Carolina.

Q: DUKE'S REQUEST FOR AN OFFSHORE WIND INVESTIGATION IS PROJECTED TO CONCLUDE BY THE NEXT CARBON PLAN/IRP FILING IN SEPTEMBER 2025. MS. NOBEL, CAN YOU COMMENT ON DUKE'S PROPOSAL?

A: The ARFI process proposed by Duke in its filing is short on detail. On the one hand, Avangrid Renewables welcomes the opportunity to sketch out the details of any such process alongside Duke Energy and the other wind developers. On the other hand, the lack of clarity as to the process does not garner confidence in the potential for a transaction taking place in the near-term, which is needed for further project development financing. A more transparently structured and expeditious process will produce better results for ratepayers and the developers.

Q: MS. NOBEL, DOES AVANGRID RENEWABLES SEE THE ARFI PROCESS, AS DUKE HAS LOOSELY OUTLINED, TO BE PRODUCTIVE?

A: Avangrid Renewables supports the adoption of a well-defined Commission-supported process for structured solicitation for offshore wind resource required to meet North Carolina objectives. However, the timeline of actions identified by Duke in its Near-Term Action Plan (and as detailed in the April 17, 2024 *Public Staff's Motion Requesting Issuance of Commission Order*, describing the ARFI) may not support North Carolina in satisfying the statutory carbon emissions reduction requirements. All of the North Carolina offshore wind developers, including Avangrid Renewables, have reached a point at which no reasonable spend on survey work or other work necessary to progress development can go forward, due to the lack of certainty on a path to market. This stagnation of development will negatively impact North Carolina's ability to meet its emissions reduction requirements.

Q: MS. NOBEL, CAN YOU FURTHER DETAIL YOUR CONCERNS ABOUT

DELAYING OFFSHORE WIND DEVELOPMENT AS PROSCRIBED IN DUKE'S ARFI PROPOSAL?

A: Assuming that this lack of certainty will persist for another two-plus years, it is reasonable to project that all projects (certainly the Kitty Hawk projects) would experience a two-year minimum delay to the projected start of offshore construction and, therefore, COD. This will put meeting the interim reductions requirement at risk, if not make it unviable. Even if the Commission were to accept Duke's Preferred Portfolio that reaches the target in 2035, the additions of offshore wind beginning in 2033 would also be at risk.

Schedule concerns aside, we are concerned that the proposed ARFI process does not describe sufficiently tangible actions upon completion. Mandating a third-party administered process with results being reported to the Commission would provide assurance that this is an efficient and competitive process. It's also critical to define implement a defined timeline that allows developers to provide accurate responses and maintain a clear understanding of the likelihood and timing of a transaction taking place.

Q: MS. NOBEL AND DR. ANDREWS, WHAT COULD REPLACE THE PROPOSED ARFI PROCESS TO BETTER MEET REQUIREMENTS?

A. The panel recommends an expedited third-party administrator-led solicitation with Commission final approval to support transparency and specificity on proposals submitted by developers akin to the structure the Commission utilizes in its solar procurements with necessary deviations to reflect the unique nature of offshore wind procurement and the agreed-upon deal structure.

VI. DEAL STRUCTURE

Q: THE COMMISSION HAS NOT DETERMINED WHAT TYPE OF DEAL STRUCTURE NEEDS TO BE UTILIZED TO ENABLE AN OFFSHORE WIND FACILITY TO BE CONSTRUCTED AND START GENERATING ELECTRICITY FOR DUKE CUSTOMERS. MS. NOBEL, DOES AVANGRID RENEWABLES HAVE CONCERNS OR OPINIONS ABOUT HOW THE DEAL FOR THE KITTY HAWK OFFSHORE WIND SITE SHOULD BE STRUCTURED?

A: Generally speaking, a PPA-model where the developer retains ownership of the facility is typically considered the least cost and least risk to captive ratepayers. However, the Commission has previously determined that Duke must own the offshore wind facility but declined to further define ownership.[9] Avangrid Renewables is comfortable with engaging in a split equity partnership structure. Avangrid Renewables is aware of at least one proposed natural gas facility where Duke proposes in its certificate application that it share ownership with another entity, so the path is already well-worn by Duke. However, as further detailed below, the details of a Kitty Hawk deal structure are subject to Commission constraints and, beyond that, Avangrid Renewables is committed and open to negotiating deal structure and terms, as necessary.

Q: MS. NOBEL, IS A BUILD-OPERATE-TRANSFER DEAL STRUCTURE

[9] NCUC Docket No. E-100, Sub 179, *Order Adopting Initial Carbon Plan and Providing Direction for Future Planning*, p. 33, fn, 9. ["For the avoidance of doubt, the Commission does not intend that its decision on this matter exhaustively define utility ownership nor extend to resources the utility selects for purposes other than compliance with the carbon dioxide emissions reduction directives of N.C.G.S. § 62-110.9."]

OPTIMAL FOR THE ACQUISITION OF OFFSHORE WIND FOR NORTH CAROLINA?

A: Build-Operate-Transfer models or "turnkey" models are not commonly reflected in the offshore wind industry, globally. Within the US offshore wind industry, equity partnerships have been the most common path forward and have been seen in nearly all current offshore wind development projects. For example, Stonepeak's recent 50% equity investment in Dominion Energy's CVOW project and Global Infrastructure Partner's recent investment in Orsted's South Fork Wind and Revolution Wind projects. This structure may benefit Duke and ratepayers, allowing more experienced neighboring offshore wind developers such as Avangrid and Total to leverage global and domestic experience and expertise in offshore wind through all phases of the project: development, construction, and operation.

Q: MS. NOBEL, DOES AVANGRID RENEWABLES HAVE EXPERIENCE IN JOINT VENTURES LIKE THE ONE YOU DESCRIBED ABOVE?

A: Avangrid's joint venture with Copenhagen Infrastructure Partners, the Vineyard Wind 1 project, is a prime example of such a joint venture partnership. Vineyard Wind 1, which began delivering power last year and is the first large-scale offshore wind project to be built in the US, is jointly owned, and was jointly developed and constructed. Once fully built, later this year, Avangrid will be responsible for operations.

Q: MS. NOBEL, WILL AVANGRID RENEWABLES CONSIDER A DIFFERENT MODEL THAN THE JOINT VENTURE DETAILED

ABOVE?

A: Yes, Avangrid Renewables is open to considering multiple options. In fact, other models can also be found in the global industry, including structures in which there is a complete separation of ownership of the transmission asset and the generation infrastructure. This structure is most common in the United Kingdom, where different functions of the electricity system are separated. Offshore wind projects are owned and operated by well-known developers such as Ørsted, RWE, Vattenfall, and ScottishPower Renewables and there are separate entities acting as offshore transmission operators ("OFTOs"). We are beginning to see movement in this direction for shared offshore transmission models being developed in the northeast in New York and New Jersey and being discussed in Maryland and New England.

There are additional models that may work as well. Avangrid believes that the process should include consideration of feasible structures with global industry precedents.

Q: MS. NOBEL, WHAT ARE YOUR RECOMMENDATIONS TO THE COMMISSION?

A: We recommend that the Commission:

a. Accept Duke's proposed portfolio of offshore wind with an interest in potential expansion beyond 2.4 GW;

b. Order for immediate action which results in procurement of offshore wind no later than October 1, 2025, depending on the complexity of the deal structure, supporting project timelines which meet North Carolina's carbon

reduction targets according to schedule, at the most advantageous costs;

c. That immediate action should include, but is not limited to, opening a new docket no later than September 2024 for the purpose of facilitating a solicitation for offshore wind and the appointment of a third-party administrator to oversee the process and to provide regular reports to the Commission, in order to facilitate an efficient process to procure offshore wind.

Avangrid Renewables intends to move the Commission to open the parallel docket after the conclusion of the evidentiary hearing but prior to the final Order in this proceeding. As mentioned above, the need and timing concerns for offshore wind development are clear and further delay may result in North Carolina losing its offshore wind opportunities.

Q: DOES THAT CONCLUDE YOUR PANEL TESTIMONY?

A: Yes.