Kitty Hawk
OFFSHORE

Construction and Operations Plan

July 26, 2021

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AVANGRID
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COP – Executive Summary

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Executive Summary

Kitty Hawk Wind, LLC (the Company), a wholly owned subsidiary of Avangrid Renewables, LLC, proposes to construct, own, and operate the Kitty Hawk Offshore Wind Project (hereafter referred to as the Project). The Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf of Lease Area OCS-A 0508 (the Lease) was awarded to Avangrid Renewables, LLC through the Bureau of Ocean Energy Management (BOEM) competitive renewable energy lease auction of the Wind Energy Area offshore of North Carolina. The Lease was effective on 01 Nov 2017. The Project will be located in the designated Renewable Energy Lease Area OCS-A 0508 (Lease Area). The Lease Area covers 49,536 hectares (ha) and is located approximately 44 kilometers (km) offshore of Corolla, North Carolina.

At this time, the Company proposes to develop approximately 40 percent of the Lease Area, an area located in the northwest corner closest to shore (19,441 ha, referred to as the Wind Development Area). Infrastructure in the Wind Development Area will include wind turbine generators (WTGs), inter-array cables, and an electrical service platform (ESP). The Project will connect from the ESP through offshore export cables (within a designated corridor) and onshore export cables to the new onshore substation in Virginia Beach, Virginia, where the renewable electricity generated will be transmitted to the electric grid.

The goals of the Kitty Hawk Offshore Wind Project are to:

- Deliver sustainable, safe, and healthy domestic energy generation for all Americans through the responsible production of electricity using wind turbine generators.
- Efficiently and responsibly construct and operate an offshore wind energy facility that enhances the quality and long-term productivity of renewable wind resources located on the Outer Continental Shelf.
- Deploy technically and economically feasible technologies that maximize the sustainable electrical generation within Lease Area OCS-A 0508, as described in the Lease and located in a federally designated Wind Energy Area.
- Contribute to the federal goal of delivering 30 gigawatts of offshore wind in the U.S. by 2030[1].
- Contribute to the Commonwealth of Virginia enacted Virginia Clean Economy Act mandated to procure 5.2 gigawatts of offshore wind by 2034.

The Project will meet these goals by delivering domestic renewable energy from up to 69 WTGs to Virginia, where it will be injected into the PJM Interconnection's energy grid and make a substantial contribution to the region's electrical reliability and energy security, in alignment with the clean energy mandates included in the Virginia Clean Economy Act.

In support of these goals, the Company is submitting this Construction and Operations Plan (COP) to BOEM. The purpose and need of the federal agency action in response to the Kitty Hawk Offshore Wind Project COP submittal is to determine whether to approve, approve with modifications, or disapprove the COP to construct, operate, and decommission the Project within Lease Area OCS-A 0508.

[1] https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/

In accordance with BOEM guidance, the Company has instituted a Project Design Envelope (PDE) approach to present a range of potential design parameters for the Project. The PDE is used to assess the potential impacts on key environmental and human use resources, focusing on the design parameter (within the defined range) that represents the realistic maximum design scenario for each unique resource. For the purpose of characterizing the assessments of the Project activities presented within the COP, the PDE includes the parameters illustrated in Table ES-1 below.

The components that make up the PDE, as well as the siting of onshore components and the offshore export cable corridor, have been selected based on existing site information, site characterization studies completed to date, environmental and engineering analysis, and assumptions regarding advancement of technology, as well as extensive engagement with regulators and stakeholders. Detailed information on the final Project design selected will be included in the Facility Design Report and Fabrication and Installation Report, to be reviewed by the Certified Verification Agent and submitted to BOEM prior to construction.

The Project is expected to operate up to 35 years after construction is complete. Per 30 Code of Federal Regulations (CFR) § 585.235(3) and Addendum B of the Lease, the operations term of the Project is 25 years commencing on the date of COP approval. Two years before the end of operations term, the Company may request renewal of its Lease in accordance with 30 CFR §§ 585.425 through 429.

Table ES-1 Summary of PDE Parameters

Project Parameter Details
General (Layout and Project Size)
• Up to 70 locations • Anticipated to begin construction no earlier than 2024
Foundations
• Installation of one or more foundation types: monopile, piled jacket, and up to three suction caisson jacket • Installation using hammered pile driving (for monopiles and/or piled jacket foundations) • Scour protection may be installed around all foundation types
Wind Turbine Generators
• Up to 69 WTGs • Rotor diameter up to 285 meters (m) • Hub height up to 175 m above mean sea level • Tip height up to 317.5 m above mean sea level • Lowest blade tip height 27 m above mean sea level
Inter-Array Cables
• 66-kilovolt, 3-core cables buried up to 1.5 to 2.5 m beneath the seabed • Maximum total cable length 240 km • Jet trencher, mechanical trencher, and free-lay and post-lay burial installation • Proposed protection if target cable burial depth is not achieved includes rock armor, gabion rock bags, concrete mattresses, and protective half-shells
Offshore Export Cables
• Up to two 275-kilovolt export cables buried up to 1.5 to 2.5 m beneath the seabed • Minimum separation distance between circuits is 50 m a/ • Maximum total corridor length is 80 km • Jet trenching, jet plow, mechanical plow, and free-lay and post-lay burial installation, with dredging in some locations to achieve burial depth • Proposed protection if target cable burial depth is not achieved includes rock armor, gabion rock bags, concrete mattresses, and protective half-shells

Project Parameter Details
Electrical Service Platform
• One ESP • ESP installed atop monopile, piled jacket, or suction caisson jacket foundation
Onshore Facilities
• Landfall of export cables will be completed via horizontal directional drilling • Construction work area for the onshore substation at Corporate Landing to disturb up to 13.1 ha • Onshore transmission and interconnection cables with total maximum cable length of 9.2 km • Up to six 275-kilovolt onshore export cables and two fiber optic cables • Up to 32.6 ha of disturbed area for the onshore export cable corridors
Construction and Operations & Maintenance Facilities Options
• Portsmouth, Virginia • Newport News, Virginia • Cape Charles, Virginia • Chesapeake, Virginia
Note: a/ Separation distance between cables is based on site-specific conditions (e.g., water depth and seabed constraints). Circuits will be separated by a minimum of 50 m or four times the water depth, whichever is greater.

The Company will decommission the Project in accordance with a detailed Project decommissioning plan that will be developed in compliance with Section 13 of the Lease and applicable laws, regulations, and best management practices at that time.

Chapter 1 of this COP provides an Introduction; Chapter 2 details the Project Siting and Design Development; and Chapter 3 provides a Description of Project Activity. Chapters 4 through 7 describe the Physical, Biological, Cultural, and Socioeconomic Resources that exist in the area of the Project, as well as the potential impacts to these resources and proposed measures to avoid, minimize, and, as necessary, mitigate impacts. References are provided by chapter and detailed reports are presented in appendices.

Project Benefits

Construction and operations of the Project are expected to displace significant quantities of carbon dioxide, sulfur dioxide, and nitrogen oxides emissions from existing fossil-fuel generating units each year during its useful lifetime, which will contribute significantly to reducing overall greenhouse emissions in the region. The burning of fossil fuels produces air emissions that degrade air and water quality and contribute to climate change. A representative 800-megawatt project has the potential to displace significant qualities of carbon dioxide, sulfur dioxide, and nitrogen oxide. During each year of operations, our analysis projects that the following pollutants will be displaced as a representative project that generates clean, renewable energy:

- 1,330,032 tons of carbon dioxide,
- 860 tons of sulfur dioxide, and
- 703 tons of nitrogen oxide.

The Project will therefore benefit a wide range of human and natural ecosystems. In addition, the Project would decrease the regional reliance on fossil fuels and enhance the reliability and diversity of the energy sources in Virginia.[2]

To combat climate change, the Commonwealth of Virginia enacted the Virginia Clean Economy Act in April 2020 to transition Virginia's biggest utility companies from the current electric portfolio to 100 percent carbon-free resources by 2050. The Act sets a target for Dominion Energy Virginia to produce their electricity from 100 percent renewable sources by 2045, with 5.2 gigawatts of offshore wind by 2034. The Project Lease Area is one of two existing BOEM lease areas eligible to meet the offshore wind target. Dominion Energy Virginia included 5.2 gigawatts of offshore wind in its proposed path to meet carbon and legislatively mandated renewable energy goals in its most recent Integrated Resource Plan.[3] Energy from the Project will be essential to enabling the Commonwealth of Virginia, which has established the third-largest offshore wind commitment in the United States, and Dominion Energy Virginia to meet the clean energy objective from offshore wind.

The Project will create employment opportunities within Virginia and the region, as well as increase tax revenues for both state and local governments. In conjunction with future projects within the entire Lease Area, these include[4]:

- Nearly $2 billion dollars in total economic impact is projected to be generated over the next decade in Virginia and northeast North Carolina.
- Construction activities will increase sales by Virginia businesses by $1.5 billion, of which $994 million of that total will be in the Hampton Roads region.
- During construction, Lease Area projects will increase total net household earnings by nearly $390 million in Virginia, of which $273 million will be in Hampton Roads.
- Between 2021 and 2030, Lease Area projects will generate an additional $100 million in income and sales tax revenues for the Commonwealth of Virginia and the City of Virginia Beach.
- Construction-related activities will result in an average estimated increase in employment of 799 jobs annually in Virginia. Once construction is complete, Lease Area projects will support over 900 full-time equivalent new jobs in Virginia, of which 830 full-time equivalent jobs will be in the Hampton Roads region.
- It is expected that the Project will attract new offshore wind parts manufacturers and suppliers to Virginia or Hampton Roads, making the economic and fiscal impacts of the Project larger than those currently estimated.

The installation of WTG and ESP foundations in the Wind Development Area may also have environmental benefits, due to the structures creating new surface area in offshore waters. For example, scour protection for foundations would introduce valuable hardbottom habitat. Foundations may be installed in areas of previously low habitat productivity and/or soft sediments with little hard structure; these foundations attract fish and can enhance food availability for local predator species. Established offshore wind facilities have shown an increase in overall ecosystem activity and positive effects on distributions of fish and macroinvertebrates, which are attracted to the hardbottom scour protection around wind turbine

[2] Appendix N Air Emissions Calculations and Methodology (to be submitted as a supplement to this COP), and PJM 2020, as cited within Section 4.3 Air Quality.
[3] VEPC 2020, as cited within Chapter 1 Introduction.
[4] The Economic Impact of Kitty Hawk Offshore Wind (Appendix EE) was developed for the entire Lease Area. In response to BOEM's request, a subset of this analysis will be provided for the Project.

foundations.[5] Specifically, these benefits extend to the federally endangered Atlantic sturgeon, a species with a historical range in North Carolina waters; any individual Atlantic sturgeon passing through an operational wind farm area would likely benefit from increased prey associated with the hard armoring around the turbine foundations and offshore export cables.[6]

In addition to benefitting a variety of marine species by creating new habitat within the Wind Development Area, foundations may increase the frequency and method of fishing activities (e.g. spearfishing) by acting as fish aggregators. A study conducted by the University of Rhode Island on the Block Island Wind Farm determined that anglers believe offshore wind developments have improved fishing in the areas very close to the foundations by increasing species richness.[7]

Evidence has shown that the presence of new fixed structures within a wind development area has become a tourist attraction, enticing new marine users to visit such an area. Notably, tourism activities have been observed at the Block Island Wind Farm resulting in increased tourism to the island overall, increase in boat charters and rentals, and the emergence of new businesses to support new tourist demand. The increase in recreation and tourism has brought economic benefits to Block Island. Similarly, a 2008 study of projected offshore wind facilities offshore New Jersey predicted that a wind facility located 32 km offshore would increase tourism sales by up to $65 million statewide.[8]

Prior to the commercial lease auction, the Lease Area was carefully sited by members of the North Carolina Intergovernmental Renewable Energy Task Force, a joint state and federal task force, in order to avoid and minimize potential user conflicts as well as reduce impacts to biological resources. For example, to minimize impacts to viewshed resources and navigational concerns, the North Carolina Intergovernmental Renewable Energy Task Force reduced the size of the Lease Area from the original "Call Area." The Lease Area location, which avoids sensitive habitat, areas of intensive fishing, and other common marine use areas, is reflective of input from commercial and recreational fisheries.

Building upon the North Carolina Intergovernmental Renewable Energy Task Force's siting practices, within the Wind Development Area, the Project's array layout incorporates historic tow directionality of commercial fisheries and includes a gridded pattern to minimize impacts to fishing and navigation. The offshore export cables and onshore Project components are similarly sited by the Company to avoid impacts to users of the area and sensitive resources.

Impact-Producing Factors

The potential impact-producing factors resulting from the construction, operations, and decommissioning of the Project and the resources potentially affected are presented in Table ES-2. Avoidance, minimization, and mitigation measures for addressing the impacts to the potentially affected resources are included in the relevant impact analysis sections.

[5] Bergstrom et al. 2013, 2014; Krone et al. 2017; Raoux et al. 2017; Rein et al. 2013; Reubens et al. 2011, 2014; Stenberg et al. 2015; and Wilhelmsson et al. 2006, as cited within Section 5.4 Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat.
[6] NOAA Fisheries 2015, as cited within Section 5.4 Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat.
[7] Prevost and Bidwell 2019 and ten Brink and Dalton 2018, as cited within Section 7.2 Commercial and Recreational Fishing.
[8] Brookins 2017; Global Insight 2008; and Lilley et al. 2010, as cited within Section 7.1 Recreation and Tourism.

Table ES-2 Summary of Evaluation of Impact-Producing Factors associated with Project Components and Affected Resources

Impact-Producing Factor	Physical Resources					Biological Resources						Cultural Resources				Socioeconomic Resources											
	Physical and Oceanographic Conditions	Water Quality	Air Quality	In-Air Acoustic Environment	Underwater Acoustic Environment	Wetlands and Waterbodies	Terrestrial Vegetation and Wildlife	Bat and Avian	Benthic Resources and Finfish, Invertebrates, and Essential Fish Habitat	Marine Mammals	Sea Turtles	Marine Archaeological and Cultural Resources	Terrestrial Archaeological and Cultural Resources	Aboveground Historic Properties	Visual Resources	Recreation and Tourism	Commercial and Recreational Fishing	Marine Transportation and Navigation	Department of Defense and Outer Continental Shelf National Security Maritime Uses	Offshore Renewable Energy, Mineral Exploration, and Infrastructure	Aviation and Radar	Other Coastal and Marine Uses	Population, Economy, Employment, and Housing	Environmental Justice	Land Use and Zoning	Land Transportation and Traffic	Health and Safety and Low Probability Events
Impact Analysis Section Number	*4.1.2*	*4.2.2*	*4.3.2*	*4.4.2*	*4.5.2*	*5.1.2*	*5.2.2*	*5.3.2*	*5.4.2*	*5.5.2*	*5.6.2*	*6.1.2*	*6.2.2*	*6.3.2*	*6.4.2*	*7.1.2*	*7.2.2*	*7.3.2*	*7.4.2*	*7.5.2*	*7.6.2*	*7.7.2*	*7.8.2*	*7.9.2*	*7.10.2*	*7.11.2*	*7.12.2*
Seabed or land disturbance	•	•				•	•	•	•	•	•	•	•				•			•					•		
Habitat alteration						•	•	•	•	•	•						•					•					
Sediment suspension, erosion, and/or deposition	•	•					•		•	•	•	•					•					•					
Noise (in-air or underwater)				•	•		•	•	•	•	•						•										
Electric and magnetic fields									•	•	•						•										•
Accidental discharges and releases, including marine debris		•				•	•	•	•	•	•						•										•
Traffic (terrestrial, vessels, and helicopters)			•					•		•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Air emissions			•																								
Presence of abovewater structures on the Outer Continental Shelf								•						•	•	•	•	•	•	•	•	•		•			•
Lighting							•	•	•	•	•			•	•	•		•	•		•						•
Jobs, taxes, and Project purchases																•							•				

Key Project Terms

Project Term	Description
cable protection	Measures to protect cables in instances where sufficient burial is not feasible and/or at existing submarine asset crossings.
electrical service platform (ESP)	Offshore structure that connects the inter-array cables to the offshore export cables.
export cable	Export cable route from the ESP in the Lease Area to the onshore substation. This term refers to the linear path (zero width).
export cable corridor	Corridor centered on the export cable from the Lease Area to the landfall (offshore export cable corridor) and from landfall to the Point of Interconnection (onshore export cable corridors). This term refers to the permanent easement/right-of-way.
foundation (offshore)	Structure required to secure the WTG and ESP, vertically. Foundations may be monopile, piled jackets, or suction caisson jackets.
installation corridor	Corridor centered on the export cable from the Lease Area to the landfall (offshore export cable corridor) and from landfall to the onshore substation (onshore export cable corridors). This term refers to the temporary area affected by construction and installation activities.
inter-array cable	Submarine cable interconnecting the WTGs and ESP.
landfall	The location where the export cable transitions from offshore to onshore.
Lease	Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS-A 0508).
Lease Area	BOEM-designated Renewable Energy Lease Area OCS-A 0508.
offshore export cables	Cables connecting the ESP to the transition bay at the landfall.
onshore export cables	Cables connecting the transition bay at the landfall to the onshore substation.
onshore substation	The landside substation constructed for the Project that contains transformers and other electrical gear.
Project Area	The combined onshore and offshore area where the Project facilities are physically located.
Project	The Kitty Hawk Offshore Wind Project.
scour protection	Material, typically stone or rocks, placed around/on top of a structure to prevent seabed sediment from being flushed away as a result of water flow.
seabed preparation	The preparation of the seabed prior to offshore installation activities.
the Company	Kitty Hawk Wind, LLC.
Wind Development Area	Approximately 40 percent of the Lease Area in the northwest corner closest to shore (19,441 ha), where the WTGs, ESP, and inter-array cables with be located.
wind turbine generator (WTG)	Wind turbine that will generate electricity.

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