J Wind

Although Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP" and, together with DEC, "Duke Energy" or the "Companies") currently have no wind generation installed in the Carolinas, the Companies are expecting to develop significant wind capacity in the Carolinas over the next decade as part of the energy transition and to meet the decarbonization requirements of North Carolina Session Law 2021-165 ("HB 951"). In fact, wind is included in some form in every Carbon Plan portfolio presented in Chapter 3 (Portfolios). Wind is an abundant resource, that offers zero-carbon energy when harnessed with relatively mature turbine technology. Both onshore and offshore wind turbines generally operate in the same way, harnessing the blowing wind with large turbine blades that spin and turn a generator that converts the rotational energy into electrical energy. Multiple wind turbines installed in an array form a wind farm. Wind complements solar due to their different daily generation profiles. When considering the amount of solar that will be likely added to the system in the coming years, wind will be an important generation lever. This Appendix discusses the vision for and constraints of developing onshore and offshore wind separately, as these technologies face different challenges and deployment opportunities.

Offshore Wind

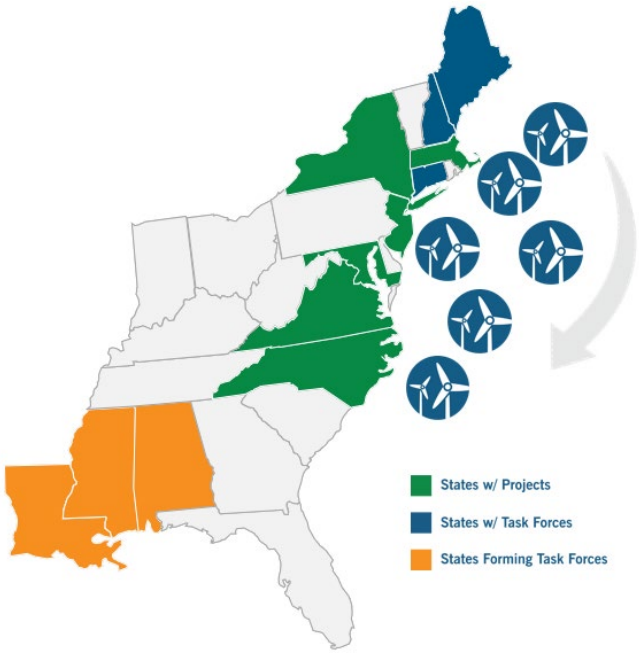
Offshore wind is a mature, scalable and increasingly cost-effective zero-carbon resource. Currently, more than 30 gigawatts ("GW") of offshore wind is in operation globally, with Europe as the largest current market followed by growth in Asia. Globally, significant growth of offshore wind capacity is expected in the next decade, including in the Global Wind Energy Council's Global Offshore Wind Report where more than 200 GW is projected to be installed globally by 2030.[1]

Policy in the United States, at both the federal and state levels, is trending favorably to offshore wind. Competition is also increasing as European entities (such as Ørsted and RWE) and oil and gas majors (such as BP and Shell) are becoming more involved in the U.S. offshore wind market through lease acquisitions and project development. The Northeast United States is seeing a significant trend southward with projects in place in New England and current development focused on the mid-Atlantic, as illustrated in Figure J-1 below.

[1] Global Wind Energy Council, Global Offshore Wind Report 2021 (Sept. 2021), *available at* gwec.net/wp-content/uploads/2021/09/GWEC-offshore-wind-2021-updated-1.pdf.

Technology advancements and supply chain developments are enabling more efficient offshore wind generation projects. This environment is resulting in a decrease in offshore wind energy costs and an increase in demand for acquisition of the U.S. offshore wind parcels.

Figure J-1: Offshore Wind Landscape on the East Coast

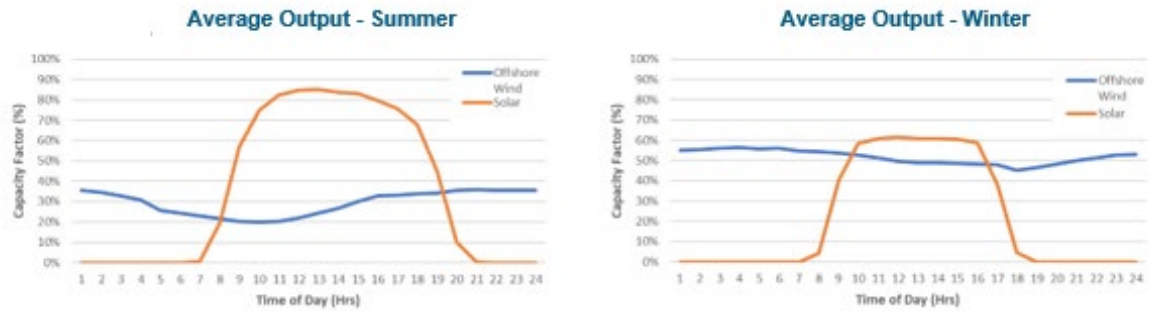


Offshore Wind Complements Solar Energy

Offshore wind can both reduce carbon emissions and increase renewable resource diversity in regions with high penetration of solar energy, which will be particularly important for the Carolinas as the Companies continue to add solar to the systems. During the day, offshore wind allows for a more stable and efficient production of energy when consumer demand peaks. As the sun goes down and peak solar generation decreases, offshore winds increase – extending the usability of renewable generation. The energy profile of offshore wind complements the energy profile of solar for both daily and seasonal generation. Furthermore, when possible, building wind turbines and photovoltaics at the same location can reduce grid and battery costs while leveling out power supply.

The relatively high capacity factors and low intermittency for offshore wind compared to other low carbon resources as presented in Figure J-2 below, as well as the increasing capacity of offshore wind turbines as the technology continues to mature, make wind a cost-effective option for the energy transition and to meet the interim and long-term CO_2 emissions reductions targets of HB 951.

Figure J-2: Average Offshore Wind and Solar Generation Summer and Winter Profiles, Utilized in Carbon Plan Modeling



Siting in North Carolina

In 2021, the Biden Administration announced a plan to deploy 30 GW of offshore wind by 2030 to support U.S. clean energy goals. Offshore energy parcels, which begin at 3 nautical miles from shore, are under the jurisdiction of the Bureau of Ocean Energy Management ("BOEM"). BOEM is responsible for the program that oversees offshore renewable energy residing in federal waters and is actively leading the identification of these suitable wind energy areas ("WEA"). Wind energy development is constrained by the limited availability of areas leased by BOEM.

In addition to the federal plan, individual states have plans to develop offshore wind projects. On June 9, 2021, North Carolina Governor Roy Cooper signed Executive Order 218 "Advancing North Carolina's Economic Clean Energy Future"[2] that aspires for the State to attract jobs and clean energy investments that include 2.8 GW of offshore wind by 2030 and 8 GW by 2040.

Offshore wind in the Carolinas currently consists of two siting possibilities. In North Carolina, the Kitty Hawk parcel (a 200-square-mile WEA, 27 miles from the Outer Banks) was auctioned in 2017 and acquired by Avangrid Renewables. The second area is known as Carolina Long Bay and includes most of the Wilmington East WEA. The energy produced by a project in Carolina Long Bay or Kitty Hawk could power between 500,000-700,000 homes. The location of both Kitty Hawk and Carolina Long Bay are identified in Figure J-3 below.

[2] Advancing North Carolina's Economic and Clean Energy Future with Offshore Wind, Exec. Order No. 218 (June 19, 2021), *available at* https://governor.nc.gov/executive-order-no-218.

Figure J-3: Carolinas Offshore Wind Lease Areas

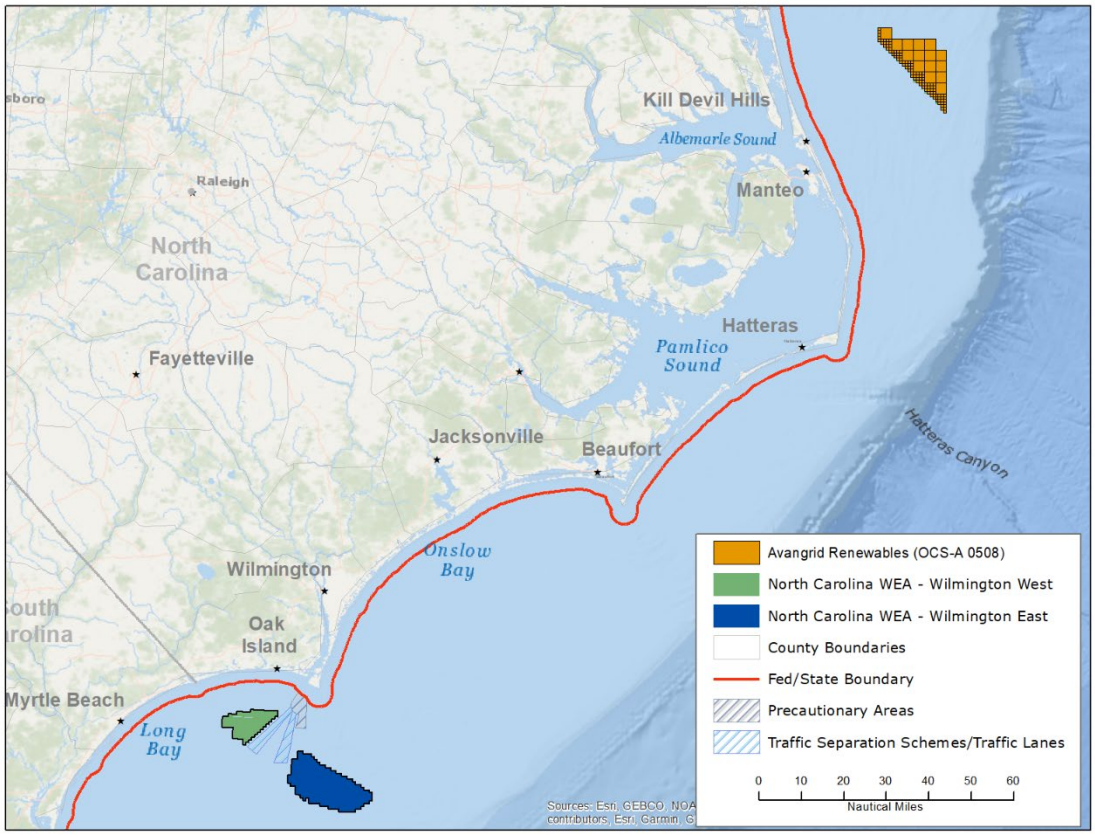


Figure source: BOEM (https://www.boem.gov/sites/default/files/images/jm_ncmap.png).

Carolina Long Bay is a couplet of two offshore parcels located at least 20 miles off the southern shore of North Carolina. At approximately 110,000 acres in size, the two parcels are expected to support offshore wind generation projects of approximately 1,700 megawatts ("MW"), according to BOEM.

On March 25, 2022, BOEM released the Final Sale Notice ("FSN") for the Carolinas Long Bay auction. The FSN contained key changes from the previously identified lease area and the dimensions that were listed in the Proposed Sale Notice issued on October 28, 2021. The identified parcel was split into two nearly identical parcels: OCS-A 545 (54,937 acres) and OCA-A 546 (55,154 acres). The setback, or distance from shore, was increased to 20 miles and the acreage was reduced due to input received during the comment period. Figure J-4 below shows the two parcels and outlines the changes from the previously identified lease area.

To support the federal administration's clean economy goals and with support from Governor Cooper, BOEM has accelerated the timeline to auction the Carolina Long Bay parcels. The auction was held on May 11, 2022, and a lease agreement will be entered into with the winners. The lease must be executed in advance of former President Trump's North Carolina offshore wind leasing moratorium that goes into effect on July 1, 2022.

Figure J-4: BOEM Final Sale Notice Changes to the Carolina Long Bay Lease Area

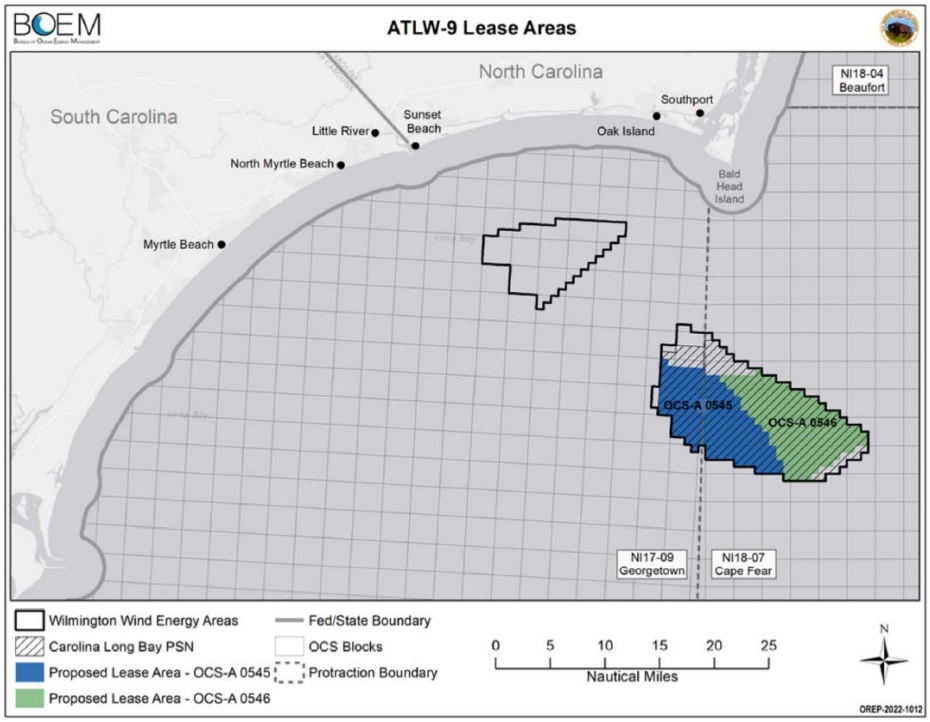


Figure source: BOEM

Developing offshore wind projects in North Carolina will require onshore transmission investments and network upgrades to enable the transport of power to Duke Energy load centers. Regardless of the landfall location, significant investment into the transmission system, including new transmission, will be required. This may include upgrades to existing substations, new acquisitions of land and new transmission build, as well as the usage of existing systems. The projected timeline is approximately 10 years for development and construction, which is a critical consideration for the availability of this technology in the Carbon Plan modeling as discussed in further detail in the next section.

Offshore Wind in the Carbon Plan

Offshore wind will likely be critical to achieving the interim and long-term carbon emissions reductions targets of HB 951. Three of the four portfolios select offshore wind capacity development to achieve the interim target.

Developing offshore wind depends on winning very select lease auctions. The Carolinas Long Bay auction was held by BOEM on May 11, 2022, and Duke Energy Renewables Wind, LLC prequalified as an able bidder for the auction. Based on the results of the auction, Duke Energy Renewables Wind, LLC, an unregulated affiliate of Duke Energy, was the provisional winner of the Carolina Long Bay

OCS-A 0546 lease area.[3] Next steps will include executing a lease agreement with BOEM and beginning development of a Site Assessment Plan.[4] As this lease territory could ultimately bring power into Duke Energy's service territory, DEP will also commence necessary on-land transmission work including, but not limited to, acquiring right-of-way (see Appendix P (Transmission System Planning and Grid Transformation)), which work is necessary in the near-term for the reasons further described in Chapter 4 (Execution Plan). Importantly, this on-land transmission work is necessary for offshore wind from either the Kitty Hawk parcel or the Carolinas Long Bay parcels. Together, these development activities will allow for the Companies to present more refined cost estimates and timelines to the Commission in the 2024 biennial Carbon Plan Update or prior, as the Commission determines whether to select offshore wind as part of the Plan.

Portfolio P1 contains 800 MW of offshore wind to achieve the 70% interim target. The Carbon Plan modeling allowed selection of two 800 MW offshore wind blocks, each block is assumed to be available January 1, 2030, and January 1, 2032, respectively. The size and available dates for these blocks of offshore wind was defined based on realistic development constraints and discussion with stakeholders. Additional offshore wind is assumed available after 2040. Note that achieving the January 1, 2030, in-service date would require partnering on an offshore project that has already advanced beyond the leasing stage.

Economic Development

The addition of offshore wind to Duke Energy's generation portfolio has the potential to bring supplementary economic benefits outside of its decarbonization value. The National Renewable Energy Laboratory ("NREL") performed an analysis of the economic development associated with offshore wind in specific regions of the United States. In the Southeast region, spanning the Atlantic coast from Virginia to Georgia, NREL found that the significant investment associated with this technology drives economic development in the form on on-site work, supply chain growth, and associated business services. It was determined that offshore wind has the potential to support between 14 and 44 full-time equivalent jobs per MW during construction and between 1.6 and 1.7 full-time equivalent jobs per MW during the ongoing operational phase.[5]

BOEM's FSN related to the Carolina Long Bay Area[6] aligns with NREL's findings and outlines specific conditions that would drive economic growth in the region. The FSN calls for 20% of lease funds to go toward either the development of workforce training programs or the domestic supply chain. Examples of these types of activities are highlighted below.

[3] U.S Dep't of the Interior, Bureau of Ocean Energy Management, Carolina Long Bay, https://boem.gov/renewable-energy/state-activities/carolina-long-bay (last visited May 13, 2022).
[4] Federal regulations require the lessee to submit in the preliminary term of 12 months: (i) a Site Assessment Plan ("SAP"); or (ii) a combined SAP and Commercial Operation Plan.
[5] Nat'l Renewable Energy Laboratory, Offshore Wind Jobs and Economic Development Impacts in the United States: Four Regional Scenarios (Feb. 2015), *available at* nrel.gov/docs/fy15osti/61315.pdf.
[6] U.S Dep't of the Interior, Bureau of Ocean Energy Management, Carolina Long Bay, https://boem.gov/renewable-energy/state-activities/carolina-long-bay (last visited May 13, 2022).

Contribution to Workforce Training: Activities that result in a better trained and/or larger domestic offshore wind workforce that would provide more efficient operations via increasing the supply of fully trained personnel. Example contributions to workforce training include:

- Supporting technical training programs or institutions focused on providing skills necessary for the planning, design, construction, operation, maintenance or decommissioning of offshore wind energy projects in the United States

- Enabling the maritime training necessary for the crewing of vessels to be used for the construction, servicing and/or decommissioning of wind energy projects in the United States

Contribution to Domestic Supply Chain Development: Activities that result in a more robust domestic supply chain by reducing the upfront capital or certification cost for manufacturing offshore wind components. Example contributions to the domestic supply chain include:

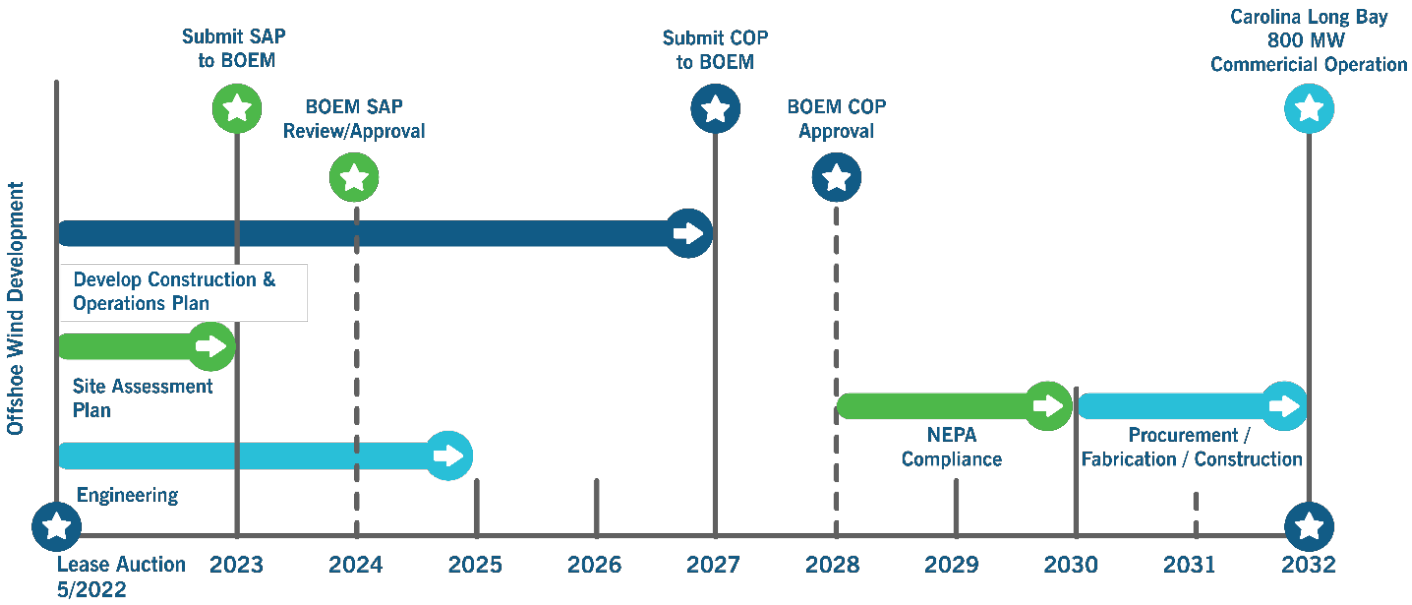
- Supporting the development of a domestic supply chain for the offshore wind industry, including manufacturing of components and sub-assemblies and the expansion of related services

- Funding technical assistance grants to help United States' manufacturers re-tool or certify (e.g., ISO-9001) for offshore wind manufacturing

Execution and Risk Management

Development of offshore wind resources have a long lead time, approximately a decade from leasing a WEA to commercial operation. An example project development timeline for Carolina Long Bay is presented in Figure J-5 below to illustrate this. The detailed near-term actions that will be required to start delivering on the development of offshore wind resources to execute on the pathways are discussed in Chapter 4 (Execution Plan).

Figure J-5: Carolina Long Bay, Sample Development Timeline



Certain actions that BOEM requires are timebound. For example, completion of a Site Assessment Plan ("SAP") is required within 12 months and submittal of a Construction and Operations Plan ("COP") within five years of a lease agreement. Some actions that are required to develop offshore wind resources come with significant execution risks, which are discussed in detail in the remainder of this section, as well as mitigation strategies to address these risks.

Permitting Approvals/Construction Timeline: As illustrated in Figure J-5 above, the development and construction timeline for an offshore wind project can span a decade or more. During this timeline there are multiple permitting studies/approvals required to continue to move the timeline forward. All of these permitting processes offer the potential for delays or extensions to the timeline, that could extend the construction timeline by years. The time frames that have been assumed for the development of onshore wind in the Plan portfolios are aggressive and could be put into jeopardy if early permitting approvals are delayed.

Limited Lease Opportunities for the Next 10 Years: On September 8, 2020, former President Trump signed an executive order which prohibited offshore leasing for energy exploration, development or production off the coast of Florida, Georgia, and South Carolina. On September 25, 2020, North Carolina was officially added to the moratorium. Though not explicitly stated in the executive orders, which were aimed at preventing new oil and gas leases, the BOEM confirmed that wind energy is included in the withdrawal with the following statement. "The withdrawal includes all energy leasing, including conventional and renewable energy, beginning on July 1, 2022."[6]

To support the federal administration's clean economy goals and with support from Governor Cooper, BOEM accelerated the timeline to auction the Carolina Long Bay parcels to May 11, 2022, to ensure a lease agreement could be enacted with the winner(s) prior to the July 1 moratorium. However, the

Carolina Long Bay parcel marks the last offshore wind parcel auctioned/leased off the coasts of the named states until the moratorium is lifted.

Viewshed Concerns and Mitigation: Brunswick County North Carolina officials have expressed concern over the location of the Carolina Long Bay WEA being too close to shore – making the wind turbine generators visible to beachgoers and potentially impacting tourism. BOEM established a 24-nautical-mile, or approximately (27.5 mi), no-leasing buffer for Virginia and the Kitty Hawk WEA. BOEM moved the border of the Carolina Long Bay to 20 miles in the FSN, in part to alleviate concerns and address comments received during the comment period.

Fisheries and Wildlife: There have been concerns around fisheries and wildlife related to the development of offshore wind. The U.S. Fish and Wildlife Service ("USFWS") concurred with BOEM's "no effect" and "may affect, but not likely to adversely affect" determinations for commercial wind lease issuance and site assessment activities. The USFWS met with BOEM to recommend deploying acoustic detectors at Motus Wildlife Tracking System receivers during site assessment to collect data on preconstruction bird and bat presence within the WEA. The BOEM environmental assessment did not identify any environmental justice concerns resulting from site assessment and site characterization activities.[6]

Hurricane Risks: The Carolinas face a higher probability of high category hurricanes than the Northeast, as hurricane risk typically increases as one moves south along the east coast.[7] Duke Energy is in the process of investigating hurricane risks with equipment manufacturers, meteorologists and insurers. While the wind turbines have been designed to withstand major typhoons, further exploration is needed to more fully determine the potential impact, if any, for various Category 4 or 5 hurricanes that could be encountered. The industry believes that a Typhoon-rated offshore wind turbine tower, blades and nacelle can withstand up to a weak Category 4 hurricane. There are no concerns with the foundation, offshore substation or undersea cabling. As part of the development process, the winner of any offshore wind lease will a perform site assessment which will include categorizing construction and operational risks associated with this low probability event. According to the National Oceanic and Atmospheric Association ("NOAA") tracking database, only three Category 4 hurricanes and no Category 5 hurricanes have passed within 70 miles of Carolina Long Bay or Kitty Hawk in 150 years.

Supply Chain Risks: Due to current socio-political, economic and COVID-19-related conditions, challenges exist to obtain the long lead time items and material, such as steel, raw materials and electronics needed to build a new offshore wind facility. Early engagement with major vendors of primary components will be key, along with early procurement and storage of equipment and materials when they are available. Due to the later timeline of when these offshore wind facilities will enter the construction phase, it is believed that some of these supply chain restraints may have dissipated.

Jones Act Requirements – Offshore wind facilities off the U.S. coast require the use of American-made vessel per the Jones Act to transport equipment from port. Typically, large pieces such as the

[7] Nat'l Hurricane Center & Central Pacific Hurricane Center, Tropical Cyclone Climatology, https://nhc/noaa.gov/climo (last visited May 13, 2022).

turbine nacelle or blades are transported and installed using a jack-up vessel. Because there are no Jones Act-compliant jack-up vessels in use in the United States, the use of an alternate Jones Act-compliant vessel is required and adds complexity to construction. However, Dominion Energy is constructing one such vessel for their Coastal Virginia Offshore Wind project. As the Offshore Wind market in the United States matures, Duke Energy expects more such type vessels to become available.

Onshore Wind

Onshore wind is a critically important resource to the energy transition and to meet the HB 951 CO_2 emissions reductions targets. Onshore wind is selected as part of all four of the portfolios, as outlined in Chapter 3 (Portfolios). Similar to offshore wind, onshore wind is complementary to solar energy. In addition, onshore wind is a more mature technology than offshore wind, with approximately 134 GW of onshore wind operating nationwide as of January 2022.[8] However, there are critical challenges to the development of this technology in the Carolinas, including both policy and resource quality challenges. To install the amount of onshore wind that is required to meet the interim 70% CO_2 emissions reductions target, a minimum of 600 MW, will require technological advances, policy and regulatory support and broad stakeholder engagement.

Wind Resource in the Carolinas

As of 2022, the only operating utility-scale wind farm in the Carolinas is the 208 MW Desert Wind Farm (Amazon Wind Farm U.S. East) in Pasquotank and Perquimans counties, North Carolina that provides energy for the PJM Interconnection grid. Additionally, the proposed 189 MW Timbermill Wind Farm located in Chowan County, North Carolina, and also interconnecting into PJM Interconnection, applied for a Certificate of Public Convenience and Necessity in June 2021, and the developer expects commercial operation as early as October 2023.[9] Both of these facilities in northeast North Carolina are located in one of the few regions of the State that has high enough wind speeds at “typical” hub heights to make onshore wind a viable resource today.[10] In the Carolinas, wind speeds are highest along the coastal regions and in the mountain ranges of Western North Carolina, as illustrated in Figure J-6 below. In these regions, wind speeds could lead to capacity factors of 25% to 30% or greater.

[8] U.S. Energy Information Admin, Preliminary Monthly Electric Generator Inventory (based on Form EIA-860M as a supplement to Form EIA-860) (Apr. 26, 2022), *available at* https://eia.gov/electricity/data/eia860m.
[9] *Order Granting Certificates and Accepting Registration*, Docket Nos. EMP-118, Sub 0 & EMP-118, Sub 1 (May 4, 2022).
[10] The Amazon Wind Farm hub height is 92 meters. Average hub height for land-based wind turbines in the US was 90 m in 2020. U.S. Dept. of Energy, Wind Turbines: the Bigger, the Better (Aug. 30, 2021), *available at* https://energy.gov/eere/articles/wind-turbines-bigger-better#~text=Larger%20rotor%20diameters%20diameters%20allow%20wind.areas%20with%20with%20less%20wind.

Figure J-6: Wind Resources Across the Carolinas

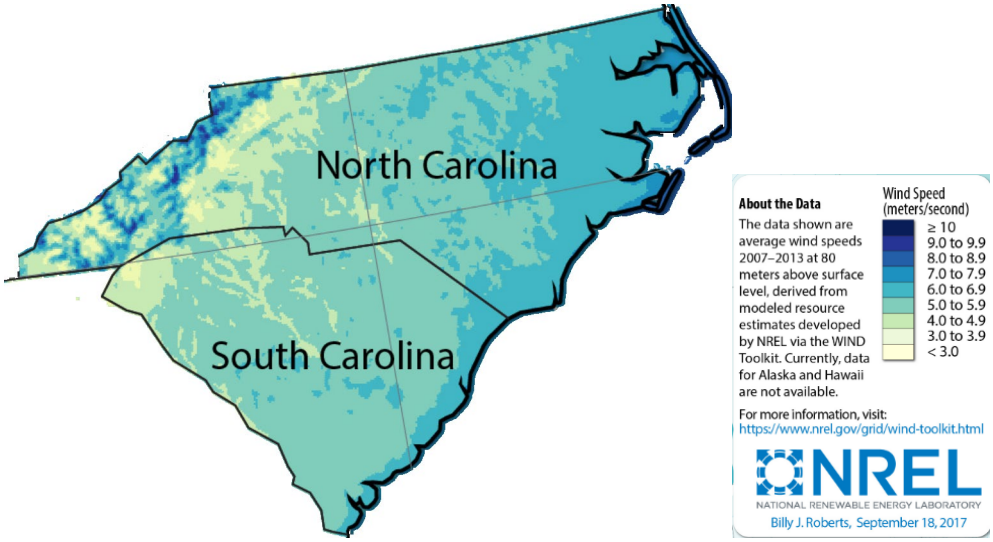


Figure source: NREL

The Mountain Ridge Protection Act ("Ridge Laws") in the Western Carolinas, which are discussed further below, limit the locations where the Companies can build onshore wind. Given these geographic limitations, the Companies developed wind profiles focused on eastern North Carolina to be used in Carbon Plan modeling. The Companies shared these developed wind profiles with stakeholders in the Solar and Wind Technology and Cost Assumptions Technical Subgroup Meeting where stakeholders were generally in agreement that wind profiles should be developed to assume a 30% capacity factor ("CF"). While the Companies believe that achieving 30% CF on a consistent basis with today's technologies and typical hub heights will be challenging, expected improvements in turbine technologies and increasing hub heights make this a reasonable assumption in the Carbon Plan.

Innovation is underway to build onshore wind turbines at higher hub heights without causing excessive cost increases or transportation issues. Typically, onshore wind towers are shipped to the site, and therefore the limiting factor on hub height is the ability to transport towers above a certain height. If towers are constructed on-site, there is potential to increase hub heights beyond the current limit, which would lead to higher CFs due to more consistent wind and increased speeds at higher elevations. There are several companies currently working to address the challenge of building taller towers. If they can successfully address this issue without significantly increasing cost, then onshore wind could be a more favorable option in the Carolinas.

Siting Considerations

There are typical design parameters for laying out an onshore wind farm. For example, standard spacing of wind turbines[11] is:

- **Between rows:** Six to eight rotor diameters (row is perpendicular to direction of prevailing wind)
- **Between turbines in a row:** Three to five rotor diameters

The acreage necessary to develop onshore wind varies greatly; acres per MW varies by topography, wind turbine layout and ownership of the land (leased or owned). The actual land area that wind farms cover can range from 2 to 40 acres or more per MW.[12] While total acreage varies, there is more specific guidance around general expectations for direct permanent land impacts from wind farms. A 2009 NREL study indicates that permanent land use, which refers to land occupied by wind turbine pads, access roads, substations, service buildings and other infrastructure which physically occupy land area, or create impermeable surfaces occupies approximately three-quarters of an acre per MW.[13]

When evaluating areas available for wind farms, exclusion areas must be considered. Wind exclusion areas may include most federal lands; sensitive areas such as wetlands; certain setbacks from roads, railways, and other structures; and line of site of Next Generation Weather Radar installations. Beyond the example exclusions previously listed, military airspace adds an additional siting restriction, particularly in eastern North Carolina. In addition, migratory bird patterns need to be considered in site selection and may be particularly important to consider in the eastern portion of the State where several bird sanctuaries exist.

Other policies in the Carolinas have created additional siting challenges for onshore wind development. Ridge Laws, as defined above, relates to development on mountain ridge tops located above 3,000 feet in elevation that are also 500 feet above the adjacent valley floor. The law also limits construction of buildings by restricting them to be no taller than 40 feet. Ridge Laws apply to 24 counties in the State. These locations would often be ideal locations for the development of onshore wind, but the likely interpretation of these Ridge Laws would make development nearly impossible in the western portion of the State. In addition, the 18-month moratorium that limited the North Carolina Division of Environmental Quality ("NCDEQ") from issuing wind farm permits until the end of 2018 stalled the regional onshore wind development market, requiring dedicated focus on restarting the market to meet the goals for onshore wind as outlined in the Carbon Plan portfolios. Additionally, a

[11] energypedia, Layout of Wind Project, https://energypedia.info/wiki/Layout_of_Wind_Projects (last visited May 13, 2022).
[12] Our World of Energy, How much land does a wind farm require?, https://ourworldofenergy.com/vignettes/php?type=wind-power&id=9 (last visited May 13, 2022).
[13] Nat'l Renewable Energy Laboratory, Land-Use Requirements of Modern Wind Power Plants in the United States (Aug. 2009), *available at* https://nrel.gov/docs/fy09osti/45834.pdf.

2013 law requires that all wind energy facilities must obtain a permit from the NCDEQ, which is in addition to any local jurisdictional permits or zoning that would be required.

In addition to the known siting challenges discussed in this section, onshore wind development in other jurisdictions has seen significant additional development barriers imposed by local communities. Concerns around the implications of wind farms on property value, noise, etc. has led communities to adopt restrictive ordinances, such as setback requirements from roads or other structures, that could make siting wind generation more difficult. Community outreach will be critical for enabling the development of enough onshore wind to contribute to the achievement of the CO_2 emissions reductions targets in HB 951.

Onshore Wind in the Carbon Plan

Despite the challenges discussed above, onshore wind generation remains an important asset to achieving the HB 951 CO_2 emissions reduction targets. Recognizing the timeline required to get onshore wind projects sited, developed and constructed, the Carbon Plan modeling made the following assumptions regarding onshore wind:

- Onshore wind is assumed to have a 30% capacity factor, as determined in coordination with stakeholders during the February 18, 2022 Solar and Wind Technology and Cost Assumptions Technical Subgroup Meeting.

- The annual amount of onshore wind that could be selected between DEC and DEP in the Carbon Plan was 300 MW/year up to a total volume of 1,800 MW through 2050 with the following assumptions:

    - For DEP up to 300 MW/year of additional wind energy could be incorporated into the DEP service territory starting in 2028 and up to a total volume of 1,200 MW through the planning period.

    - For DEC up to 300 MW/year of additional wind energy could be procured in the DEC service territory starting in 2028 and up to a total volume of 600 MW through the planning period. This wind was assumed to be sourced from PJM but could also be sourced from Midcontinent Independent System Operator, Electric Reliability Council of Texas, or other jurisdictions with strong wind profiles. The model includes a wheeling charge, which would be required to provide firm supply into the Carolinas.

Execution and Risk Management

Regardless of the portfolio, delivering on the 70% interim target will require development of a minimum of 600 MW of onshore wind in all four portfolios, as further described in Chapter 3 (Portfolios). Due to

the limited development of onshore wind in the Southeast U.S.[14] near-term actions will be needed to bolster the onshore wind market to ensure that adequate resources are developed to deliver on the HB 951 CO_2 emissions reductions targets. These near-term actions and procurement activities that will be required to deliver new onshore wind resources are discussed in Chapter 4 (Execution Plan). The risks to the development of onshore wind are discussed below.

Identifying Development Locations: As discussed throughout this Appendix, one of the critical risks to the development of onshore wind in the Carolinas is identifying appropriate sites for locating wind farms. If enough generation is going to be sited in the Carolinas to meet the generation goals outlined in the Carbon Plan, current limitations such as the Ridge Laws may need to be reevaluated.

In addition, community zoning/rezoning and community support are not yet fully understood as potential challenges to overcome in the development of wind in the Carolinas, but this could be a significant challenge, as it has been in other states. Any property under consideration for the development of a wind farm will likely require local county/town rezoning or conditional use permitting. The ability of wind developers to secure these permits is critical to achieving the desired onshore wind capacities described previously in this Appendix.

Interconnection: Once an appropriate site is identified for the development of an onshore wind project, the next critical risk is interconnection of that resource to execute on the development. Similar to other generation resources that need to be developed to execute on the plan, interconnection is also a critical path item for the development of onshore wind. In addition to the fact that there are a limited number of interconnection projects that can be executed in a given year, onshore wind resources are often located further from population centers than other generation resources, resulting in more complex and expensive interconnection projects, which further exacerbates this constraint. In addition, onshore wind resources, if located near the Dominion Energy North Carolina area, could create the need for affected system upgrades that would need to be resolved.

Supply Chain Risks: Due to current socio-political, economic and COVID-19-related conditions, challenges exist to obtain the long lead time items and material, such as steel, raw materials, and electronics, needed to build a new onshore wind facility. Early engagement with major vendors of primary components will be key, along with early procurement and storage of equipment and materials when they are available. Due to the later timeline of when these onshore wind facilities will enter the construction phase, it is believed that some of these supply chain restraints may have dissipated.

Conclusion

Wind generation is projected to be a critically important resource in the energy transition and to meet the HB 951 interim and long-term CO_2 emissions targets. Both onshore and offshore wind have

[14] *See* U.S. Dept. of Energy, Office of Energy Efficiency & Renewable Energy, Land-Based Wind Market Report: 2021 Edition (2021), *available at* https://www.energy.gov/sites/default/files/2021-08/Land-Based%20Wind%20Market%20Report%202021%20Edition_Full%20Report_FINAL.pdf.

challenges to overcome but the Companies remain confident that the wind industry will continue to innovate and adapt.

In terms of offshore wind, there are challenges with availability of offshore parcels, the timing of the leases, the 10-year moratorium on new leases off the southeast coast of the U.S., transmission to transport the power into load centers, and a highly competitive market and early action required on a decreasing cost curve. However, given the availability of the technology, commitments from equipment manufacturers (for example Siemens is investing in a blade factory in the U.S.), complementary generation to solar and the maturity of offshore wind turbines, offshore wind represents a potential solution in the energy transition.

The Carbon Plan could be a turning point for Carolinas onshore wind if the Commission approves the Companies to move forward with the proposed procurement. A robust stakeholder engagement process to gather input from local municipalities, counties and their citizens will be critical for the realization of onshore wind development. In addition, engaging onshore wind developers will be important to delivery of the Carbon Plan interim and long-term CO_2 emissions reductions targets, as historically onshore wind developers have faced substantial barriers to project development in the Carolinas.

Meeting the aggressive timelines in the Carbon Plan portfolios will require support from multiple entities. All potential portfolios present aggressive development and construction timelines for wind generation and will require a commitment to bring wind resources to the Carolinas. The Companies have identified and requested approval of a defined set of near-term activities for both onshore and offshore wind that are described in more detail in Chapter 4 (Execution Plan).