LIBERTY WIND

PROPOSALS FOR PURCHASE OF OFFSHORE WIND RENEWABLE ENERGY CERTIFICATES ORECRFP20-1

Prepared for

The New York State Energy Research and Development Authority

Submitted by

VINEYARD WIND

October 20, 2020

PUBLIC

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Vineyard Wind LLC
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New Bedford, MA 02740

Certain information in this Submission is non-public, proprietary, commercial, and/or financial information and has been redacted from the version of this Submission marked "PUBLIC." Vineyard Wind LLC has submitted a confidential version of this Submission, marked "CONFIDENTIAL", which includes redacted information, and which should be treated as a non-public record that is exempt from disclosure under New York State law and as set forth in the ORECRFP20-1 Request for Proposals issued July 21, 2020.

VINEYARD WIND

4.0
Proposal Narrative

Response to New York State Energy Research and Development Authority Request for Proposals ORECRFP20-1

LIBERTY WIND

PUBLIC

CONFIDENTIALITY STATEMENT

As contemplated under Sections 6.2.2 and 8.1 of the Request for Proposals ORECRFP20-1 issued July 21,2020 and as further described in the Attachment 1—Statement and Request for Confidential Treatment included with Vineyard Wind's cover letter dated October 20, 2019 (the "Cover Letter"), certain information in this document or electronic file and the appendices listed below, each of which forms a part of this proposal, is non-public, confidential and proprietary information including commercial and financial information and trade secrets (as further defined in the Cover Letter, "Confidential Information"). Vineyard Wind intends for all such Confidential Information to remain confidential and be treated as such by NYSERDA and the Scoring Committee. Under the New York Public Officers Law, Article 6, the New York State Freedom of Information Law and NYSERDA's implementing regulations under 21 NYCRR Part 501, the Confidential Information contained in this proposal is not a public record and is exempt from public records requests. Confidential Information has been redacted from this Submission and/or is clearly marked "CONFIDENTIAL."

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SECTION 1
EXECUTIVE SUMMARY

LIBERTY WIND OVERVIEW

Vineyard Wind (the "Proposer") is proud to present the Liberty Wind (the "Project") Submission in response to the Request for Proposals ORECRFP20-1 issued July 21, 2020 (as updated September 16, 2020) (ORECRFP20-1) by the New York State Energy Research and Development Authority (NYSERDA). Liberty Wind offers New York an opportunity to realize Governor Cuomo's mantra to "Build Back Better" and chart a new course for a more sustainable, resilient, and equitable economic future for New Yorkers. The Project will do so by creating thousands of good paying jobs, making substantial investments in port infrastructure to catalyze long-term manufacturing and supply chain opportunities, and delivering significant investments to Disadvantaged Communities, all while providing clean, reliable, and affordable offshore wind energy to New York ratepayers.

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[redacted] In this way, the Project presents a clear and compelling opportunity for New York to diversify its offshore wind sector and provides a significant opportunity for New York to make substantial progress toward achieving its goals of deploying 9,000 megawatts (MW) of offshore wind by 2035.

[redacted]

Liberty Wind is a well-sited and designed offshore wind project backed by the most experienced US offshore wind developer. [redacted]

[redacted]

Vineyard Wind is proud of its Liberty Wind Submission and the opportunity it provides to New York to advance and diversify the development of the State's offshore wind industry, generate enormous economic development and thousands of good paying jobs, support collaborative environmental and fisheries research, work with local communities and stakeholders, and provide ratepayers with clean, reliable, and affordable renewable energy, all while contributing to the goals of the CLCPA and Environmental Justice (EJ) for all New Yorkers.

LIBERTY WIND PROPOSALS

[redacted]

[redacted]

Port Infrastructure and Investment Plans

[redacted]

[redacted]

PROJECT OVERVIEW

Liberty Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522, which is located approximately 84 miles east of Montauk Point on Long Island. [redacted]

[redacted]

[redacted]

[redacted]

The Liberty Wind Submission offers a number of critical advantages and benefits compared to other offshore wind projects, which are summarized below.

Well-Sited Offshore Wind Project in an Advantageous Lease Area

[redacted]

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COMMUNITY ENGAGEMENT AND ENVIRONMENTAL STEWARDSHIP

Collaborative Community Engagement Using a Tried, Tested, and Proven Approach

Vineyard Wind has developed a Community Engagement Plan (the "Plan") for Liberty Wind, which outlines a thoughtful approach to build Project support, respectfully respond to opposition and community concerns, and develop community benefits on a collaborative basis. The Plan also puts Disadvantaged Communities at the forefront of efforts to maximize the economic development, job creation, and environmental benefits of Liberty Wind for New York in full support of CLCPA goals. In doing so, the Plan expands upon the Proposer's ongoing efforts with the Vineyard Wind 1 and Park City Wind projects to ensure that low-income and minority communities where project activities are planned have an opportunity to access the economic development and job creation benefits of offshore wind.

[redacted]

- [redacted]
- [redacted]
- [redacted]

Continued Commitment to Responsible Offshore Wind Development

Vineyard Wind is committed to developing, permitting, and deploying well-sited offshore wind projects with minimal environmental impact. To do so, the Proposer: (1) employs project design and siting measures aimed at avoiding potential impacts from the outset; (2) extensively surveys and monitors offshore areas in support of baseline characterization; (3) works collaboratively with regulators and interested stakeholders to identify appropriate and practicable solutions to further avoid, minimize, restore, and/or offset likely potential impacts; and (4) incorporates data, research, and stakeholder feedback into the final design of its projects. Among other things, Vineyard Wind is putting this approach into practice for Liberty Wind through:

[redacted]

[redacted]

- **Building Bridges with Fishermen:** Vineyard Wind remains convinced that the offshore wind and fishing industries can successfully co-exist in the offshore environment and has spearheaded industry efforts to respond to fishermen's concerns, including the proposal to adopt a 1 x 1 NM project layout across lease areas. Vineyard Wind will continue to build bridges between the two sectors with Liberty Wind by funding research, sharing data, relying on stakeholder feedback to inform and guide decisions about the Project, constant communication, and expanding efforts to directly hire fishermen to support offshore wind development and research efforts.

[redacted]

[redacted]

[redacted]

[redacted]

THE VINEYARD WIND ADVANTAGE

Vineyard Wind is the most advanced offshore wind developer in the US with firsthand experience in developing, permitting, contracting, and financing a commercial-scale offshore wind project in federal waters. The significant experience and knowledge gained in developing Vineyard Wind 1 and Park City Wind has been brought to bear in developing the Liberty Wind Proposals, further ensuring successful delivery of the Project.

Vineyard Wind's team of industry experts has a long track record of developing offshore and onshore wind projects across the US and the globe. This extensive experience is complemented by la local team of US offshore wind leaders with deep expertise in US offshore wind, permitting, and local infrastructure. The Proposer remains the most experienced US offshore wind developer and has acquired unparalleled experience while advancing the nation's first commercial-scale offshore wind project, Vineyard Wind 1, through the development, permitting, procurement, and financing processes. Key accomplishments, which demonstrate Vineyard Wind's ability to deliver Liberty Wind for New York, include:

- **Community Engagement:** Vineyard Wind's community engagement approach has proven successful in building enduring support for its offshore wind projects. Since well before the initial Vineyard Wind 1 COP filing in 2017, Vineyard Wind has been involved in an extensive community engagement effort, which has resulted in a growing network of regional and local supporters. Vineyard Wind 1 remains the only offshore wind project in Massachusetts to be endorsed by every town on Martha's Vineyard and Nantucket, the two closest communities to that project.

- **Host Community Agreement:** Vineyard Wind overcame opposition to offshore wind on Cape Cod and signed a Host Community Agreement with the Town of Barnstable in October 2018, which was unanimously approved, in support of the Vineyard Wind 1 and Park City Wind projects.
- **Marine Mammal Protection:** Vineyard Wind recently launched the Offshore Wind Challenge in partnership with Greentown Labs and the Massachusetts Clean Energy Center to advance real time marine mammal monitoring technologies and committed $3 million to support the protection of marine mammals through research and technological innovations. This is in addition to the Proposer's landmark agreement with the National Resources Defense Council, National Wildlife Federation and Conservation Law Foundation to implement additional protections for the critically endangered North Atlantic right whale.
- **Permitting:** Vineyard Wind is on track to complete the federal permitting process for Vineyard Wind 1 in the coming months. All local, regional, and state approvals were obtained for that project in 2019. After several years of working closely with BOEM and other federal agencies, Vineyard Wind has a firm grasp on how to successfully and efficiently navigate the numerous and complicated regulatory processes.
- [redacted]
- **Research:** Vineyard Wind has developed the nation's largest offshore wind-supported fisheries science program with over $2 million per year in funding. Key elements of the program were developed with fishermen input, the work is conducted from fishing vessels, and the surveys are led by a leading fisheries science academic institution.

[redacted]

[redacted]

[redacted]

FINANCIALLY STRONG BACKERS READY TO INVEST IN LIBERTY WIND

Vineyard Wind is a 50-50 joint venture of CIP and Avangrid Renewables, a subsidiary of Avangrid Inc (Avangrid). The Shareholder Companies bring significant financial strength and experience to Liberty Wind, including successfully organizing project financing for several offshore wind and HVDC transmission projects of similar scope and scale as Liberty Wind. Vineyard Wind's corporate structure also allows it to draw heavily on Shareholder Company and affiliate resources, which have combined experience across 37 offshore wind projects totaling almost 20,000 MW of capacity in the US, Europe, Australia, and Southeast Asia.

Copenhagen Infrastructure Partners

CIP is a fund management company established in 2012 that specializes in investments in energy infrastructure, including offshore wind, onshore wind, solar PV, biomass and energy-from-waste, transmission and distribution, and other energy assets like reserve capacity and storage. CIP has six funds under management with total commitments of $12 billion in equity and is currently raising its fourth flagship fund, which is the world's largest dedicated renewable energy infrastructure investment fund. CIP has a "buy-and-hold" fund strategy, as its more than 40 Danish and international investors have investment horizons spanning more than 20 years. CIP's senior management have shaped the offshore wind industry through their involvement in a significant number of the world's largest offshore wind projects and transactions. Today, CIP is the only offshore wind developer in the world to have projects in development on four continents: North America, Europe, Asia, and Australia.

Avangrid Renewables

Avangrid Renewables is the third largest developer of onshore wind projects in the US and has more than 7,300 MW of owned and controlled wind and solar generation in more than 20 states. Avangrid Renewables is supported by its shareholder company Avangrid, a public company with an equity market capitalization of approximately $15 billion. Avangrid has a Long-Term Issuer rating of BBB+/Stable and a Senior Unsecured rating of BBB by Standard and Poor's, a Long-Term Issuer rating of Baa1/Negative and a Senior Unsecured rating of Baa1 by Moody's, and a Long-Term Issuer rating of BBB+/Stable by Fitch. Avangrid can raise equity capital from its majority owner, Iberdrola S.A. (Iberdrola), which has a market capitalization of $78 billion. At the end of 2019, Iberdrola had 52,082 MW of installed generation capacity. More than half of Iberdrola's 32,041 MW of installed renewable energy capacity is wind.

LIBERTY WIND MEETS OR EXCEEDS ALL ORECRFP20-1 REQUIREMENTS

Liberty Wind is a technically, financially, and commercially viable offshore wind project that meets or exceeds all requirements of ORECRFP20-1. The Project offers competitive pricing, substantial job and economic development benefits, meaningful environmental commitments, and supports New York's nation-leading climate change and offshore wind goals.

Liberty Wind includes the following key distinguishing features, advantages, and benefits:

[redacted]

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SECTION 2
IMPACTS OF COVID-19 ON PROPOSER AND PROJECT DEVELOPMENT

OVERVIEW

Vineyard Wind (the "Proposer") has adapted its operations to successfully maintain business continuity, including sustaining and cultivating relationships with federal and states regulators, supply chain partners, and community stakeholders, in response to the COVID-19 pandemic. Throughout 2020, Vineyard Wind has continued to advance project development and permitting activities for Liberty Wind (the "Project"), as well as Vineyard Wind 1 and Park City Wind, while maintaining a high standard of health and safety for everyone working on the Proposer's projects and respecting the health and safety of the communities in which Vineyard Wind works.

[redacted]

[redacted]

COVID-19 BUSINESS IMPACTS

The emergence of the COVID-19 pandemic has dramatically changed the landscape in which businesses operate—the offshore wind industry is no exception. Since the emergence of the virus in the US, Vineyard Wind has complied with COVID-19 guidelines set forth by the Commonwealth of Massachusetts, where the Proposer is headquartered, which deem offshore wind and supporting work an "essential business." Starting in March, Vineyard Wind closed its New Bedford and Boston offices and restricted employee travel. [redacted] Since then, however, Vineyard Wind has successfully adapted its business operations and relaunched all project development activities taking into account the COVID-19 pandemic. [redacted][1] Personnel attendance in

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[1] "Reopening: Mandatory Safety Standards for Workplaces" 24 Jul. 2020, Commonwealth of Massachusetts, https://www.mass.gov/info-details/reopening-mandatory-safety-standards-for-workplaces

the office is voluntary and is likely to remain so for the remainder of 2020. For personnel that choose to work in the office, safety and social distancing standards set forth by the Commonwealth of Massachusetts are strictly enforced.

COVID-19 Safety Practices to Support Business Continuity

Protecting the health and safety of staff and contracted personnel is a top priority, which has allowed Vineyard Wind to operate effectively, perform essential functions, and provide essential services throughout the COVID-19 pandemic. [redacted]

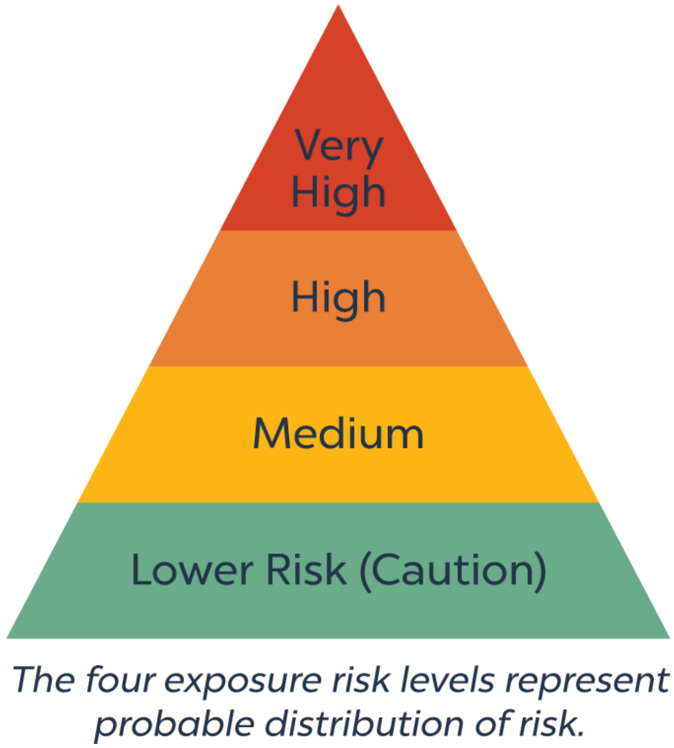
[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

As seen in Figure 2-1, OSHA has divided the exposure risk for COVID-19 into four levels: very high, high, medium, and lower risk. Vineyard Wind project activities primarily fall within the medium exposure risk category, while office-based personnel working from home are considered lower risk.

Figure 2-1 OSHA COVID-19 Risk Pyramid



For project activities, Vineyard Wind and its contractors have implemented additional health and safety measures to address COVID-19 exposure risk at onshore-based project and construction locations as well as chartered vessels. Vineyard Wind requires all contractors to submit a COVID-19 mitigation plan for review during proposal evaluation, further mitigating delay/budgetary risks from all suppliers, vessels, operators, and ports. Most contractors have exceeded the minimum requirements. Examples of how such guidelines and procedures have been implemented for the Vineyard Wind 1 and Park City Wind projects are summarized in Table 2-1.

Demonstrated Success of Business Continuity

[redacted] Table 2-1 highlights a subset of COVID-19-related business impacts, mitigation measures, and Vineyard Wind's many achievements since the onset of the pandemic in the US as they relate to permitting; research, surveys, and vessel operations; procurement; community engagement; and financing.

Table 2-1 Vineyard Wind Business Continuity During the COVID-19 Pandemic

Development Activity	Impacts, Mitigation Measures, and Achievements
Permitting	▪ Permit filing and review activities for Vineyard Wind 1 and Park City Wind have moved to an all-digital format as a result of the COVID-19 pandemic. During this time, Vineyard Wind has filed and received extensions to state permits for Vineyard Wind 1, filed federal and state permit applications for Park City Wind, and participated in remote public hearings as part of Vineyard Wind 1's federal permitting process. ▪ Vineyard Wind has developed a Zoom webinar format to continue hosting public meetings, presentations, and consultations to support virtually-based permitting activities. ▪ Vineyard Wind has transitioned to a virtual site visit strategy to support state permitting efforts. In July, Vineyard Wind hosted a virtual site visit with Massachusetts regulators, which included a virtual Geographic Information System flyover video. Vineyard Wind has also accommodated in-person site visits by arranging driving tours, requiring use of separate vehicles, and using PPE and social distancing for all face-to-face interactions. ▪ [redacted]
Research, Surveys, and Vessel Operations	▪ Vineyard Wind developed guidelines to safely continue research and survey activities, i.e., ventless trap and larval lobster/fish surveys, drop camera research, trawl survey research, geophysical and geotechnical surveys, avian studies, and other offshore research activities. ▪ Vineyard Wind's pre-departure vessel guidelines include requirements that personnel must have received a negative COVID-19 test result prior to boarding a vessel, two-week quarantine prior to boarding a vessel, completing a safety/emergency form and risk assessment questionnaire, conducting a PPE inventory assessment, and conducting a first aid supply assessment. Crew members are also encouraged to take separate vehicles to the port of departure. ▪ Guidelines during research trips include mandatory PPE usage while in close confinement and when the vessel is boarded by anyone not listed on the sail plan, social distancing when possible (including sleeping and dining quarters), proper sanitation of common and high touch surfaces, and isolation protocols for crew members suspected of having COVID-19. ▪ Post-trip guidelines include disembarkment procedures, sanitation guidelines, and encouragement to quarantine, particularly if reboarding the ship in 24 hours. ▪ [redacted]
Procurement	[redacted]

Table 2-1 Vineyard Wind Business Continuity During the COVID-19 Pandemic (Continued)

Development Activity	Impacts, Mitigation Measures, and Achievements
Community Engagement	▪ COVID-19 has affected macroeconomic conditions related to offshore wind energy procurement prices, such as Euro-US dollar exchange rates and increased global demand for offshore wind equipment and services. Vineyard Wind is effectively monitoring and managing these conditions. ▪ Vineyard Wind has successfully transitioned its community engagement efforts to a virtual model, relying almost exclusively on Zoom calls, webinars, phone calls and other remote communication methods to remain engaged with stakeholders, share project updates, and support project permitting. ▪ Since the onset of the COVID-19 pandemic in March, Vineyard Wind has hosted no less than eight webinars geared towards Cape Cod and Island community stakeholders, which were attended by more than 110 people. Other webinars have been hosted for other stakeholder groups, including fisheries and environmental stakeholders. ▪ On June 12, 2020, the Bureau of Ocean Energy Management (BOEM) published a Notice of Availability for the Supplement to its Draft Environmental Impact Statement for Vineyard Wind 1. This opened a 45-day public comment period during which BOEM hosted five virtual public meetings. Vineyard Wind conducted a campaign to support the project and worked with environmental organizations, unions, suppliers, and community stakeholders to share information about the public comment period and public meetings with an even wider audience. The campaign was a resounding success. Of the 13,260 written comments received by BOEM, approximately 80% were in favor of Vineyard Wind 1. Additionally, a total of 135 stakeholders spoke at the virtual public hearings and approximately 86% of speakers expressed support for Vineyard Wind 1 (see Section 15). ▪ Vineyard Wind initiated a consortium among all New England Wind Energy Area leaseholders to contribute funds to a Southcoast Health pilot program offering free COVID-19 testing directly at the Port of New Bedford. Testing was made available for fishermen, who are both essential workers and at-risk of infection. The funds extended the availability of free COVID-19 tests by seven weeks and more than 100 tests were administered. [redacted]
Financing	[redacted] ▪ The COVD-19 pandemic has introduced uncertainty into the financial markets. Uncertainty introduces risk, resulting in a marginal increase in the cost of capital. Project finance and tax equity investors want to be compensated for said increased risk. As a result, financing costs for the entire US offshore wind industry has increased by approximately 50 basis points. However, some of this margin is mitigated by significantly lower Libor rates. [redacted]

ORECRFP20-1 SUBMISSION DEVELOPMENT

As demonstrated above, the COVID-19 pandemic has not materially impacted the process of developing the Project or Vineyard Wind's ability to respond to the ORECRFP20-1 solicitation. [redacted]

Vineyard Wind also adheres to the Massachusetts COVID-19 Travel Order.[2] During the proposal development period, travel to and from New York and Massachusetts has been permitted, enabling Massachusetts-based personnel to travel to New York for essential meetings with ports, manufacturers, suppliers, and other stakeholders. [redacted]

[2] See: https://www.mass.gov/info-details/covid-19-travel-order

SECTION 3
PROPOSER EXPERIENCE

OVERVIEW

Vineyard Wind (the "Proposer") is the most experienced US offshore wind developer with an unparalleled understanding of what is required to develop, permit, and finance offshore wind projects in the US. [redacted]

The Project also benefits from the global offshore wind expertise and management capabilities of Vineyard Wind's shareholder companies–Copenhagen Infrastructure Partners P/S (CIP) and Avangrid Renewables LLC (Avangrid Renewables) (together the "Shareholder Companies"). Combined, Vineyard Wind, the Shareholder Companies, and affiliates have experience across 37 offshore wind projects totaling almost 20,000 megawatts (MW) of capacity in the US, Europe, Australia, and Southeast Asia.

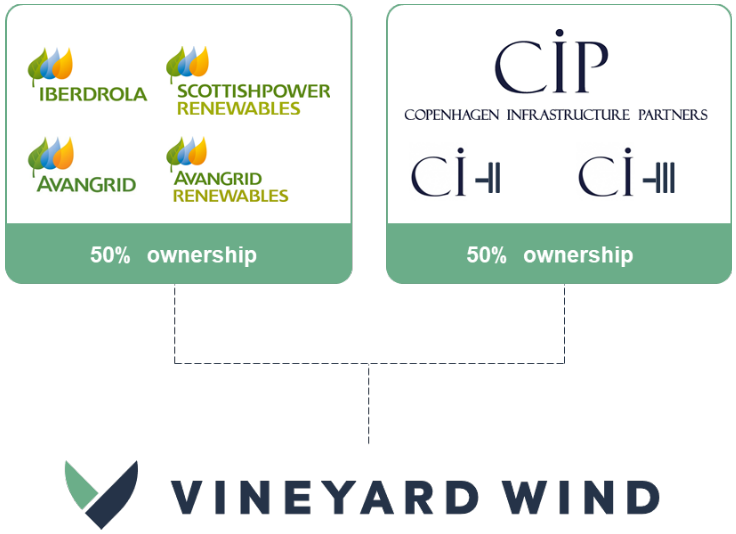
[redacted]

[redacted]

ORGANIZATIONAL CHART

Vineyard Wind LLC, a Delaware limited liability company registered in Massachusetts, was established in 2009 (at the time called Offshore MW), and is a 50–50 joint venture of CIP (through two investment funds: CI II and CI III) and Avangrid Renewables, a subsidiary of Avangrid Inc. (Avangrid) (see Figure 3-1). Avangrid is 81.5% owned by Iberdrola S.A. (Iberdrola), a corporation organized under the laws of the Kingdom of Spain. The remaining outstanding shares of Avangrid are publicly traded on the New York Stock Exchange (NYSE).

Figure 3-1 Vineyard Wind Business Entity Ownership Structure



[redacted]

[redacted]

[redacted]

Key consultants supporting the Project are depicted in Figure 3-2 and further described in Table 3-1. Additional partners and expert consultants involved in Liberty Wind's economic development, workforce training, supply chain, and research initiatives are further described in Section 17.

[redacted]

PROPOSER AND PROJECT PARTICIPANT EXPERIENCE

Vineyard Wind

Vineyard Wind's team of industry experts has a long track record of developing offshore and onshore wind projects across the globe. This extensive experience is complemented by local staff with expertise in US offshore wind, permitting, and local infrastructure. The Vineyard Wind team is comprised of personnel provided by the Shareholder Companies, local staff with expertise in offshore wind development, and expert consultants selected to ensure a well-rounded team with the skillset required to develop and operate offshore wind projects.

Vineyard Wind's corporate structure allows the company to draw heavily on the Shareholder Company and affiliate resources with experience developing, permitting, financing, constructing, and/or operating almost 20,000 MW of offshore wind capacity across 37 projects in the US, Europe, Australia, and Southeast Asia. The Shareholder Companies and/or affiliates also have recent experience with several offshore wind projects of a similar type, size, and technology as the Project.

Table 3-1 below provides an overview of the combined Vineyard Wind, Shareholder Company, and affiliate experience in offshore wind. In addition, members of the Vineyard Wind team have previously developed major high-voltage direct current (HVDC) transmission systems in US and abroad as shown in Table 3-2 and Table 3-3.

Table 3-1 Combined Vineyard Wind Team Experience in Offshore Wind

Project	Capacity (megawatts [MW])	Development	Financing	Construction	Operation
Anholt	400	✓	✓	✓	✓
Baltic Eagle	476	✓			
Barrow	90				✓
Beatrice	588			✓	✓
Borkum Riffgrund 1	200	✓		✓	✓
Borkum Riffgrund 2	450	✓	✓		✓
Burbo Bank	90	✓		✓	✓
Burbo Bank Extension	258	✓			
Celtic Array	1,000	✓			
CFXD	589	✓	✓	✓	
ChangFeng	552	✓	✓		
Chong Neng	300	✓	✓		
East Anglia ONE	714	✓	✓	✓	✓
East Anglia Hub	3,100	✓			
Gode Wind 1	330	✓	✓		
Gode Wind 2	252	✓			✓
Gunfleet Sands 1 - 2	170		✓	✓	✓
Horns Rev I	160			✓	✓
Horns Rev II	209	✓		✓	✓
Hornsea 1	1,218	✓			
Lincs	270		✓		✓
London Array	630			✓	✓
Nysted	165				✓
Race Bank	573	✓			
Park City Wind	804	✓			
Saint Briuec	496	✓	✓		
Scroby Sands	60	✓			
Star of the South	2,200	✓			
VejaMate	402	✓	✓	✓	✓
Vineyard Wind 1	800	✓	✓		
Walney 1	183.6	✓	✓	✓	✓
Walney 2	183.6	✓	✓	✓	✓
Walney 3 - 4	660	✓			
West of Duddon Sands	389	✓		✓	✓
Westermost Rough	210	✓		✓	
Wikinger	350	✓	✓	✓	✓
Xidao	48	✓	✓		
	37 projects	**30 projects**	**16 projects**	**16 Projects**	**19 projects**
	19,570 MW	**17,497 MW**	**4,449 MW**	**4,879 MW**	**5,896 MW**

Copenhagen Infrastructure Partners

CIP has gained market-leading competencies and experience developing a number of offshore wind projects in Europe. CIP's senior partners have been involved in a significant proportion of offshore wind projects and transactions globally, which represent some of the largest and most complex projects within the energy infrastructure investment universe. Today, CIP is the only offshore wind developer in the world to have projects in development on four continents: North America, Europe, Asia, and Australia. Table 3-4 provides an overview of CIP's portfolio of onshore and offshore wind and transmission projects.

Table 3-2 CIP Onshore and Offshore Wind and Transmission Projects

Project Name	Location	Project Size	Technology Type	Commercial Operation Date	Actual Capacity Factor (est.)	Availability (est.)
Onshore Wind						
Blue Cloud	Texas, US	148 MW	[redacted]	Q2 2019	[redacted]	[redacted]
Terna DEN	Texas, US	504 MW	[redacted]	Bearkat I Q4 2017, Fluvanna I Q4 2017, and Fluvanna II Q3 2019	Not applicable (N/A)	N/A
Bearkat II	Texas, US	162 MW	[redacted]	Planned Q3 2020	N/A	N/A
Monegros	Spain	487 MW	[redacted]	Planned Q2 2021	N/A	N/A
Offshore Wind						
Beatrice	UK	588 MW	[redacted]	Q2 2019	[redacted]	[redacted]
Veja Mate	Germany	402 MW	[redacted]	Q2 2017	[redacted]	[redacted]
CFXD	Taiwan	589 MW	[redacted]	Planned Q1 2024	N/A	N/A
Star of the South	Australia	Up to 2,200 MW	[redacted]	Pre-construction	N/A	N/A
HVDC Transmission						
DolWin 3	German part of North Sea	900MW	N/A	Q4 2020	N/A	N/A
BorWin 1, BorWin 2, Dolwin 2, Helwin 2	German part of North Sea	2,800 MW	N/A	BW 1: 2010, BW 2: 2015, HW 2: 2015, DW 2: 2016	N/A	N/A

CIP provides management oversight, bringing rigor to the evaluation of the assumptions used to design and develop the Project, in addition to providing access to funds for financing the Project's construction and operation. CIP has extensive experience in project financing, having financed over a dozen offshore and onshore wind, solar, and biomass projects as well as other clean energy investments.

One recent and notable offshore wind achievement includes the delivery of the Veja Mate project in record time. The project was completed four months ahead of schedule despite the installation of 67 foundations and 6 megawatt (MW) wind turbine generators (WTGs) under challenging conditions almost 60 miles from shore and in water depths up to 135 feet. In the process, the team set several world records, including the first use of the world's largest installation vessel (*Seajacks Scylla*), and installing a 1,300-ton monopile—the largest monopile foundation ever installed. In 2019, CIP, through the fund CI-II, divested its equity stake in the Veja Mate but remains a lender to the project.

In early 2020, CIP reached financial close and start of construction of the Changfang and Xidao offshore wind project in Taiwan. This 589 MW project has contracted with experienced international and local contractors under eight key construction agreements and will localize the jacket foundation, pin piles, onshore substation, transport, and installation contracts for a portion of the project. The WTGs will be supplied by MHI Vestas who will deliver sixty-two 9.5 MW WTGs. The project will be financed through a combination of equity and senior loans from a consortium of 25 international and Taiwanese banks and financial institutions, including CI-II, Taiwan Life Insurance, and TransGlobe Life Insurance, as well as six export credit agencies. CIP is leading the project through its construction phase with the start of commercial operations expected in 2024.

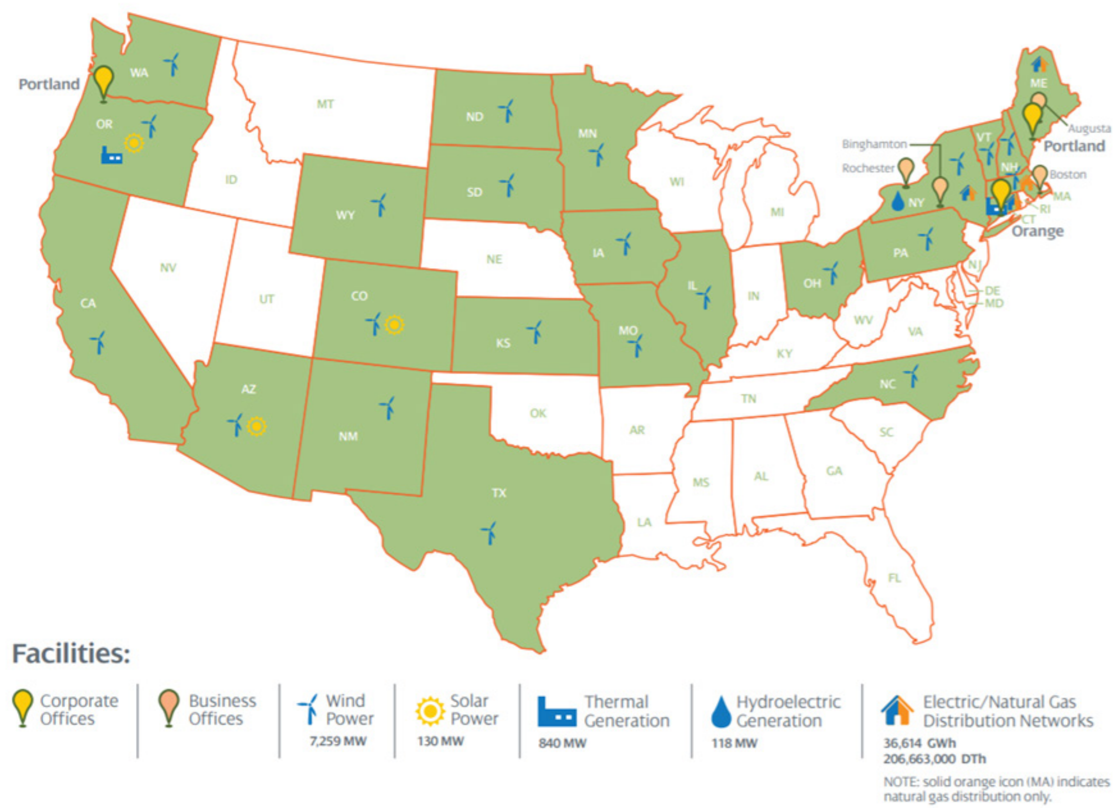
Another notable experience includes financing the construction of the 900 MW DolWin3 Offshore Wind Farm Connection in Germany, which is located approximately 31 miles offshore in the German North Sea. This offshore HVDC transmission platform was successfully completed in September 2018 and is one of nine HVDC systems in the German North Sea. Constructed and operated by TenneT, these nine systems deliver power from more than 6,000 MW of offshore wind capacity to shore. CIP also has an ownership interest in four fully operational offshore HVDC converter stations: BorWin1, BorWin2, HelWin2, and DolWin2, which have a combined capacity of about 2,800 MW. The converter stations are also located in the German North Sea in proximity to DolWin 3.

Avangrid Renewables

Avangrid Renewables is the third largest developer of onshore wind projects in the US and strives to lead the transformation to a sustainable, competitive, and clean energy future. Avangrid Renewables has more than 7,300 MW of owned and controlled wind and solar generation in more than 20 states. In New York, Avangrid Renewables has successfully completed three onshore wind projects and has extensive experience operating wind projects in the New York Control Area (NYCA) as a market participant.

The map provided as Figure 3-3 depicts Avangrid Renewables' wind, solar, thermal generation, hydroelectric generation, and electric/natural gas distribution networks across the US. The geographic diversity of Avangrid Renewables' project portfolio allows the company to optimize lessons-learned across different regions, markets, and operating conditions, and maximize each project's generation capabilities.

Figure 3-3 Map of Avangrid Renewables Assets in the US (April 2020)



Avangrid Renewables has also secured an offshore lease (Lease Area OCS-A 0508) for the 122,000-acre Kitty Hawk Offshore Wind project, which represents 2,500 MW of potential wind capacity. The company has commenced preliminary offshore wind development activities in this lease area and is on schedule to achieve anticipated key state and federal permitting milestones.

Avangrid Renewables is a wholly owned subsidiary of Avangrid, whose majority shareholder is Iberdrola. This allows Avangrid Renewables to benefit from the experience of affiliates, such as Avangrid Networks, ScottishPower Renewable Energy Ltd. (ScottishPower Renewables), and Iberdrola Renovables SAS (Iberdrola Renovables). These affiliates have substantial expertise in offshore and onshore wind development, transmission project development, finance, construction, and operations.

Table 3-3 provides an overview of Avangrid Renewables and affiliate onshore and offshore wind and transmission projects. Avangrid Renewables' capabilities are further detailed below.

Table 3-3 Avangrid Renewables and Affiliate Wind and Transmission Projects

Project	Location	Project Size	Technology Type	Commercial Operation Date	Actual Capacity Factor (est.)	Availability (est.)
Avangrid Renewables (Onshore Wind)						
Maple Ridge I & Ia[1]	New York	231 MW	[redacted]	2005	[redacted]	[redacted]
Maple Ridge II[2]	New York	90.8 MW	[redacted]	2006	[redacted]	[redacted]
Hardscrabble	New York	74 MW	[redacted]	2011	[redacted]	[redacted]
Roaring Brook Wind	New York	77.7 MW	[redacted]	Under Construction	Not applicable (N/A)	[redacted]
Lempster	New Hampshire	24 MW	[redacted]	November 2008	[redacted]	[redacted]
Hoosac	Massachusetts	28.5 MW	[redacted]	December 2012	[redacted]	[redacted]
Groton	New Hampshire	48 MW	[redacted]	2012	[redacted]	[redacted]
Deerfield	Vermont	30 MW	[redacted]	December 2017	[redacted]	[redacted]
Iberdrola (Offshore Wind)						
West of Duddon Sands[3]	12.4 miles off North West English coast	389 MW	[redacted]	October 2014	[redacted]	[redacted]
Wikinger	German Zone, Baltic Sea	350 MW	[redacted]-135	October 2018	[redacted]	[redacted]
East Anglia ONE[4]	East Anglia Zone, England, North Sea	714 MW	[redacted]	July 2020	[redacted]	[redacted]
Saint Brieuc[5]	Bay of St. Brieuc off Brittany coast, France	496 MW	[redacted]	Pre-construction	N/A	N/A
Baltic Eagle	Germany	476 MW	[redacted]	Pre-construction	N/A	N/A
East Anglia Hub	East Anglia Zone, England, North Sea	3,100 MW	[redacted]	Pre-construction	N/A	N/A

Table 3-3 Avangrid Renewables and Affiliate Wind and Transmission Projects (Continued)

Project	Location	Project Size	Technology Type	Commercial Operation Date	Actual Capacity Factor (est.)	Availability (est.)
Avangrid Networks (Transmission)						
MPRP	Maine, US	5 new substations & 440 miles	HVAC	2015	N/A	N/A
NECEC	Maine, US	1,200 MW	HVDC	Pre-construction	N/A	N/A

Notes:
1. This is a 50/50 joint venture between Avangrid Renewables and EDP Renewables North America.
2. This is a 50/50 joint venture between Avangrid Renewables and EDP Renewables North America.
3. This is a 50/50 joint venture between ScottishPower Renewables and Ørsted.
4. This is a 60/40 ownership structure between ScottishPower Renewables and Green Investment Group.
5. This was a partnership with RES to FID. RES has exercised right to sale. This is now 100% owned by Iberdrola Energia International.

Development and Construction

Avangrid Renewables is a leading renewable energy developer in the US, pursuing greenfield projects, repowering projects, and acquisitions. The company currently has more than 16,000 MW of both wind and solar projects under active development. Avangrid has several hundred megawatts of New York projects in the advanced development stage, including both wind and solar.

Origination

Avangrid Renewables has a wide and varied customer base that includes commercial and industrial end-use customers, public utility districts, investor-owned utilities, electric cooperatives, and federal power marketing administrations. In NYCA, Avangrid Renewables has entered into five long-term renewable energy credit (REC) sales agreements with the New York State Energy Research and Development Authority (NYSERDA).

Operations and Maintenance

Avangrid Renewables' operations and maintenance (O&M) group currently operates 24/7 to oversee the operation of the company's 7,300 MW of installed renewable capacity in the US. The company has also developed in-house expertise for the maintenance of its project fleet; staff is present at each facility, providing balance-of-plant O&M, substation oversight, and maintaining an inventory of spare parts and equipment.

In early 2010, Avangrid Renewables launched its 24/7 National Control Center (NCC) in Portland, Oregon. Avangrid Renewables uses cutting-edge and sophisticated technology to lead the industry in asset-monitoring and system control and has the ability to control every WTG under its management across North America. The company's expert technicians can troubleshoot 24/7, adjust WTG activity to comply with local grid demands, shut down individual WTG for safety or reliability concerns, and manage WTG output to maximize efficiency. The company is also in full compliance with North American Electric Reliability Corporation and New York Independent System Operator (NYISO) requirements for maintaining the security and reliability of its operations in the NCC.

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[redacted]

[redacted]

Project Partners

Vineyard Wind is working with project partners, including expert consultants, to support the offshore wind and transmission project development efforts for Liberty Wind. Key consultants and partners involved with the Project are summarized in Table 3-4.

[redacted]

[redacted]

[redacted]

VINEYARD WIND KEY PERSONNEL

[redacted] The Proposer's leadership team is based in the US and the full resources of the Shareholder Companies are available to support the team in successfully executing the Project. Biographical details of Board of Manager members, Executive Committee members, officers, and other key personnel are provided below.

[redacted]

[redacted]

Board of Managers

Vineyard Wind's Board of Managers is comprised of four independent representatives appointed by Vineyard Wind's Shareholder Companies. Together, the Board of Managers has over 60 years of combined experience in the renewable investment, energy infrastructure, and onshore and offshore wind sectors.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

The Shareholder Companies have established an Executive Committee within Vineyard Wind to bring together management expertise from both organizations in order to make key decisions regarding strategy and direct the execution of tactical decisions by Vineyard Wind.

[redacted]

[redacted]

[redacted]

Officers of Vineyard Wind

Lars Thaaning Pedersen is CEO of Vineyard Wind and co-founded Copenhagen Offshore Partners a leading offshore wind development and construction management company working exclusively with CIP, in 2015. Copenhagen Offshore Partners is currently involved in the development of more than 6,000 MW of offshore wind projects in the US, Canada, Taiwan, and Australia. In summer 2017, Copenhagen Offshore Partners completed the construction of the 402 MW Veja Mate project in the German North Sea four months ahead of schedule and under budget. Lars has been working in the energy sector since 2004 and with offshore wind since 2008. Prior to joining Vineyard Wind in 2016, he held executive positions at Ørsted and has been involved in more than 10 offshore wind projects in Europe, including managing six offshore wind joint ventures. Lars has significant experience in the development, construction, and operation of offshore wind projects and has been instrumental in bringing new wind turbine generator (WTG) technology to the market, such as the Siemens 3.6 MW-120 in 2009 and the 6 MW Siemens Direct Drive WTG in 2012. He also headed the development of the in-house operations and maintenance (O&M) and Asset Management business units while at Ørsted. Lars holds a master's degree in Mechanical Engineering from the Technical University of Denmark. His resume is included in Attachment 3-4.

Sy Oytan is the Deputy CEO of Vineyard Wind. He has 24 years of experience in the development and construction of international onshore and offshore wind projects in a wide range of geography including the US, Asia, and Europe. During his career, he led the development, delivery, and construction of 6,500 MW of onshore and offshore wind energy projects. Moreover, he led a range of offshore wind port and supply chain development initiatives for the state of New Jersey with a $400 million strategic investment plan. Sy has an international background with living and working experience in the US, Norway, Germany, Denmark, Turkey, and Singapore. He has held a variety of leadership positions at Arup, New Jersey Economic Development Authority, Siemens Gamesa, and Schlumberger. Sy is a mechanical engineer with a master's degree in Industrial Management from Clemson University. His resume is included in Attachment 3-4.

Rachel Pachter is the Chief Development Officer (CDO) of Vineyard Wind. She was previously Vineyard Wind's Vice President of Permitting (2016-2019), dedicated solely to Vineyard Wind's projects. Rachel has more than 18 years of experience in offshore wind development, particularly in permitting and regulatory compliance, environmental and site investigation, and federal, state, and local regulations. In addition to overseeing permitting efforts for Vineyard Wind 1, she has developed geophysical, geotechnical, and avian surveys and conducted community outreach and public relations. Additionally, she is the only person so far to have successfully managed and completed permitting of a commercial-scale offshore wind project located in federal waters in the US (Cape Wind). Rachel advised and planned all environmental and permitting aspects of development for Vineyard Wind 1 as well as managed the first phase of offshore geophysical and geotechnical site investigations for that project. Other roles held by Rachel include Permitting and Environmental Manager at Energy Management Inc./Cape Wind Associates, where she worked for nearly 14 years. Rachel has a Bachelor of Science in

Geology, Cum Laude, from the University of Alaska at Fairbanks (US) and received the Geology & Geophysics Award for outstanding scholastic achievement. Her resume is included in Attachment 3-4.

Klaus Møller is Project Director of Vineyard Wind 1. Klaus has more than 12 years of experience in offshore wind. He has a successful track record of leading the development and construction of 2,900 MW of large-scale offshore wind projects, including serving as Program Director for the Zhong Neng (Taiwan), Race Bank (UK), Burbo Bank Extension (UK), and Gunfleet Sands 3 (UK) offshore wind projects. His resume is included in Attachment 3-4.

Jennifer Simon Lento is General Counsel and Corporate Secretary of Vineyard Wind 1 and has been practicing law in the renewable energy and environmental sectors for more than 14 years. After 10 years with the energy and environmental practice groups of several large and mid-sized law firms in Boston, southern New Jersey, and Philadelphia, Jennifer most recently served as counsel for a private equity fund focused on the acquisition, development, and financing of distributed solar energy facilities. Her resume is included in Attachment 3-4.

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Development Team

Geri Edens is Acting Director of Permitting and counsel for Vineyard Wind. She has more than 27 years of experience permitting large-scale energy projects, working closely with multiple federal agencies on National Environmental Policy Act (NEPA) reviews and related permitting under numerous federal statutes. She has litigated numerous NEPA cases, representing project proponents as intervenors defending the adequacy of the environmental reviews in federal court. For over a decade, Geri represented Cape Wind Associates, where she assisted the company through the federal review process for its offshore wind project and successfully defended multiple challenges to project permits and approvals. Prior to launching her solo practice in 2020 and working directly with Vineyard Wind, she was a partner at a major international law firm.

Matthew Robertson is the Director of Environmental Affairs at Vineyard Wind. He is presently managing all environmental surveys, activities, and initiatives as part of the overall development process for Vineyard Wind's lease areas, including cross-industry and regional collaboration. He is a trained biologist with substantial experience permitting energy projects along the US East Coast, including in New York, Massachusetts, Rhode Island, New Jersey, Virginia, Maryland, and South Carolina, and has led permitting activities for Vineyard Wind 1. Notably, Matthew conducted the third-party oversight, on behalf of the federal and state regulating agencies, for the construction of the Block Island Wind Farm and associated sea2shore transmission line. He has also prepared numerous environmental impact statements and environmental studies for the Bureau of Ocean Energy Management. Matthew has a Bachelor of Science in Biological Sciences with a minor in Evolution and Ecology and a focus in ornithology from the University of Connecticut in Storrs (US).

Chris Rodstrom is the Grid Connection Technical Design and Permitting Manager at Vineyard Wind and has over 20 years of permitting and project management experience. He previously worked at Eversource Energy where he oversaw the siting, permitting, and construction of electric utility transmission and substation projects and natural gas transmission projects. He has also worked at Clean Energy Collective, where he managed the siting, permitting, and construction of large-scale ground-mounted solar projects. Over his career, Chris has worked on a range of energy projects including: the Walpole to Holbrook Reliability Project, the K Street Substation-Boston expansion, the Chelsea BPS Substation Upgrade, Needham to Baker Reliability Project, and Woburn to Mystic Transmission Line. Early in his career, he worked in commercial high-voltage alternating current construction on Long Island and in New York City with the AD Winston Corporation. Chris holds a bachelor's degree in Environmental Studies from Clark University (US) and master's degree in Environmental Management from Yale University (US).

Nathaniel Mayo is Vineyard Wind's Director of Public Affairs. He oversees stakeholder engagement and local policy efforts for the Vineyard Wind project, heading outreach and coordination efforts with various community groups at the neighborhood, municipal, regional and state level. He also serves as part of the permitting, government affairs, and communications teams. Nathaniel is a 12th-generation Cape Cod native with over a decade in public policy and community engagement on Cape Cod, having worked on environmental, energy and fisheries issues. He previously worked for US Congressman William Delahunt and served as legislative director to former Cape and Islands State Senator Robert O'Leary, working at various levels on issues including environmental protection, fisheries, zoning and regional planning. He currently serves as vice-chair of the Conservation Commission in Provincetown, Massachusetts. Nathaniel earned a bachelor's degree in Sociology from Brandeis University (US) and holds a master's degree in Environmental Policy and Planning from Tufts University (US).

Jennifer Cullen is the Manager of Workforce and Supply Chain Development at Vineyard Wind, and is responsible for implementing offshore wind workforce development programs to ensure a locally trained and qualified workforce and domestic supply chain for offshore wind. Previously, she spent over 10 years in the non-profit sector, advocating for policies to promote clean energy and clean water in communities throughout the US. Jen is originally from Cape Cod and has extensive experience working to build support for offshore wind in the community. She holds a master's degree in Communications from Boston University (US) and a dual bachelor's degree in Political Science and French from the University of Vermont (US).

Crista Bank is Vineyard Wind's lead Fisheries Liaison and a fisheries biologist. She has spent the last 12 years working collaboratively with commercial fishermen on various fisheries research projects focusing primarily on tagging studies, discard mortality, and age and growth studies. Through her research, she's spent time on board scallop vessels, draggers, and gillnet vessels along the east coast from Maine to Virginia. Crista holds a 100-ton US Coast Guard Captain's license. She earned a bachelor's degree in Marine Biology from the University of Massachusetts, Dartmouth (US) and a master's degree in Fisheries Oceanography from the University of Massachusetts School for Marine and Science Technology (US).

Caela Howard is a Fisheries Liaison for Vineyard Wind and joined in 2019. She focuses on communicating with members of the commercial fishing industry and other fisheries stakeholders in southern New England. Caela previously worked alongside the Fleet Manager at the Town Dock in Narragansett, Rhode Island where she helped lead work on fishing fleets certificates, licenses, and state and government reporting. Prior to that, she worked as a contracted portside biological sampler for the National Marine Fisheries Service and the National Oceanic and Atmospheric Administration in the ports of New Bedford, Massachusetts and Point Judith, Rhode Island. Her career working with the fishing industry began with the Connecticut Department of Energy and Environmental Protection's Marine Division in 2009, where she logged extensive boat hours seining, trawling, gill netting, and drift netting. She also worked on various research projects, including work to analyze juvenile shad and river herring, and endangered Shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) in the Connecticut and Thames Rivers and Long Island Sound. Caela holds a bachelor's degree in Environmental Science and a master's degree in Environmental Management.

Elizabeth Hansel is the Manager of Environmental Affairs at Vineyard Wind and has a decade of experience in environmental permitting, project management, and environmental compliance. Elizabeth is currently supporting the development of Vineyard Wind 1 through environmental permitting and compliance management. Prior to joining Vineyard Wind, she served as project manager at an environmental consulting firm where she supported environmental permitting and compliance for multiple Fortune 500 energy sector clients. Elizabeth is a graduate of the University of Rhode Island with a bachelor's degree in Marine Biology and Marine Affairs with a focus on invertebrate biology and marine ecology.

Jeannot Smith is Vineyard Wind's Marine Liaison Officer and a retired US Coast Guard senior officer. He has spent 8 years in the Cape and Island region working with maritime partners in industry, fisheries, and law enforcement. During his career with the US Coast Guard, he worked throughout the US focusing on interagency cooperation in Maritime Search and Rescue, Oil Spill Response, and Disaster relief efforts. In his last assignment, he served as the Deputy Sector Commander for Sector Southeastern New England based out of Woods Hole, Massachusetts. Jeannot has a master's degree in Marine Affairs and Coastal Zone Management from Dalhousie University (Canada) and a Bachelor's degree Macalester College (US).

Michael Mulé is the regulatory compliance manager on Vineyard Wind 1 and a Senior Permitting Manager within Avangrid Renewables' offshore wind business. He has 15 years of experience in the field of environmental compliance and management. Michael began his career in local government with the development of an offshore aquaculture program in Suffolk County, New York and went on to private consulting and industry where he assisted some of the world's largest companies with their environment, health, and safety compliance programs. Michael has both a Bachelor of Science and master's degree in Environmental Science and Management from the University of Rhode Island.

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[redacted]

PORTFOLIO REFERENCES

Vineyard Wind is providing the following client references from the Shareholder Companies' wind energy projects that have been developed, executed, and are currently in operation. Additional references are available upon request.

Avangrid Renewables

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Vineyard Wind and the Shareholder Companies have extensive contacts and access to the firms required to satisfy the financing, environmental assessment, operation, engineering, transmission, and legal counsel requirements of the Project.

1. **Construction Period Lender:** [redacted]
2. **Operating Period Lender and/or Tax Equity Provider:** [redacted]

3. **Financial Advisor:** [redacted]
4. **Environmental Consultant:** [redacted]
5. **Facility Operator and Manager:** [redacted]
6. **Owners' Engineer**: [redacted]
7. **EPC Contractor:** [redacted]
8. **Transmission Consultant**: [redacted]
9. **Legal Counsel**: [redacted]

NYISO MARKET EXPERIENCE

Avangrid Renewables is also responsible for selling energy and energy-related products from more than 7,300 MW of renewable generation assets in the US. With more than 850 employees, and 24/7 operations in the NCC, Avangrid Renewables performs transaction execution, risk management, settlement, information technology, regulatory, legal, and human resource functions. Through the daily trading activities across markets in the Northeast as well as nationwide, Avangrid Renewables has extensive experience in marketing power across electricity markets and balancing authorities in the US. Avangrid Renewables has substantial experience in the NYISO market and will assume the duties of Lead Market Participant for the Project.

In NYISO markets, Avangrid Renewables controls investments in wind farms totaling 395.8 MW. The Maple Ridge Wind Farm (I, Ia, and II), which has been operating since 2006, is a joint venture between EDP Renewables NA LLC (EDPR) and Avangrid Renewables. EDPR conducts O&M at the facility while Avangrid Renewables performs the NYISO market operations for the sales of energy and RECs from the facility. Hardscrabble Wind Farm is a 74 MW generation facility owned and operated by Avangrid Renewables, which began operating in 2011. Both projects were awarded REC sales agreements by NYSERDA. Avangrid Renewables also has two large-scale renewable energy projects in New York that are in the advanced stages of development—Roaring Brook Wind and Mohawk Solar. The Roaring Brook Wind project is currently under construction in Northern New York.

In merchant operations, the energy and asset management teams at Avangrid Renewables have extensive experience moving power and RECs across New York both under contracts with purchasers and as an independent power marketer.

SECTION 4

PROJECT DESCRIPTION AND SITE CONTROL

OVERVIEW

Liberty Wind (the "Project") is a well-sited and designed offshore wind project with a robust and flexible plan to secure the necessary rights and permissions to construct and operate the Project in line with the schedule outlined in Section 11. As further described in this section, and summarized below, this plan was informed by a comprehensive assessment process and contains all the necessary elements to ensure a successful Project.

[redacted]

[redacted]

[redacted]

[redacted]

As this section demonstrates, Liberty Wind has a plan and team in place to secure site control, obtain all necessary permits and approvals, and construct and interconnect the Project and reliably deliver Liberty Wind's offshore wind power to the New York electric grid.

SITE PLAN

Liberty Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522, which is located approximately 84 miles east of Montauk, Long Island. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

The Site Plan generally describes the preferred OECC, Delivery Point, landfall site, and onshore export cable route. Details of each segment and the required rights for each are described below. [redacted]

[redacted]

OFFSHORE WIND GENERATION FACILITY SITE

Liberty Wind's Offshore Wind Generation Facility will be installed in Lease Area OCS-A 0522, a 132,370-acre area in the open Atlantic Ocean, located south/southeast of Martha's Vineyard and Nantucket. Lease Area OCS-A 0522 is one of five lease areas in the MA WEA. Vineyard Wind is also a leaseholder for a second lease area in the MA WEA—Lease Area OCS-A 0501, where the Vineyard Wind 1 and Park City Wind projects will be located.

The MA WEA has been studied for offshore wind development since 2011, including studies of the seabed geography, wind resource, oceanographic conditions, fishing activity, and marine life (in particular, the North Atlantic right whale [*Eubalaena glacialis*] and other protected species). Vineyard Wind has supplemented the existing baseline data for the Lease

Area through significant survey work. Completed and ongoing survey campaigns include successful geophysical and geotechnical surveys of the seabed and avian and fisheries surveys, which together with existing baseline data inform a comprehensive characterization of the geology, environmental, and wildlife resources in the Lease Area. Additional offshore surveys planned for the Lease Area will further augment the information gained through prior activities (see Section 14).

The Lease Area also offers several advantages compared to other lease areas, including:

- **Best Wind Resource:** Compared to other available East Coast offshore wind lease areas, Lease Area OCS-A 0522 has the best wind resource due to its location furthest from shore. [redacted]
- **Relatively Shallow Waters:** Compared to other lease areas, the Lease Area's relatively shallow waters combined with suitable seabed conditions supports efficient foundation deployment and lowers overall installation risks.

[redacted]

- **Minimal Visual Impact:** The Lease Area is the furthest from shore, which substantially minimizes potential visual impacts from the Project (see Section 16). [redacted]
- **Ample Generation Capacity:** The Lease Area has significant unused capacity and is minimally impacted by current transit lane proposals relative to other lease areas (see Attachment 4-4).

[redacted]

[redacted]

Offshore Wind Generation Facility Layout

[redacted]

[redacted]

[redacted] This is consistent with the WTG spacing that Vineyard Wind has adopted across both of its lease areas as well as US Coast Guard recommendations (see Section 13). The preliminary Project layout arranges the WTGs in a grid pattern, with the WTG rows aligned in an east-west and north-south direction. Vineyard Wind notes that the proposed preliminary WTG layout described in this Submission is subject to federal permitting requirements and further stakeholder consultation. While decreasing the available capacity across lease areas, the 1 x 1 NM east-west, north-south WTG layout, which has been adopted by all lease holders in the MA WEA and RI/MA WEA, accommodates fishing activity and promotes safe navigation across the lease areas.

[redacted]

Offshore Wind Generation Facility Site Rights

Vineyard Wind has executed a lease agreement for Lease Area OCS-A 0522 with the Bureau of Ocean Energy Management (BOEM) for the purpose of offshore wind energy generation on the Outer Continental Shelf (the "Lease Agreement"). A copy of the executed Lease Agreement is included as Attachment 4-5. The Lease Agreement provides Vineyard Wind with site control and rights to secure all necessary permits and easements needed to build and operate offshore wind projects within the area identified and install the necessary related grid connection system within federal waters. The Lease Agreement allows for commercial operation of the Project for a period of at least 33 years, which can be extended by BOEM. [redacted]

To exercise its rights under the Lease Agreement, Vineyard Wind must obtain approval for the Project through the federal permitting process. This requires the submission of a Construction and Operations Plan (COP) to BOEM, followed by the submission of a Facilities Design Report (FDR) and Fabrication and Installation Report (FIR). [redacted]

OFFSHORE EXPORT CABLE CORRIDOR

The offshore export cables will be installed within an OECC, which connects the ESP to the onshore export cables at the landfall site. [redacted]

[redacted]

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[redacted]

Offshore Export Cable Corridor Rights

Federal Waters

Per U.S.C. § 585.200(b), Vineyard Wind is entitled to one or more easements in which to locate the Project's offshore export cables in federal waters to enable grid connection for offshore wind projects located in the Lease Area. This easement will be issued upon approval of the Project's COP and will be recorded as an addendum to the Lease Agreement.

New York State Waters

[redacted]

LANDFALL SITE AND ONSHORE EXPORT CABLE ROUTE

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Landfall Site

[redacted] To minimize impacts to sensitive environmental and cultural resources, the cables will be installed using horizontal directional drilling (HDD), which is a trenchless method of installing a conduit in an arc deep under the beach by using a surface-launched drilling rig.

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[redacted]

Landfall Site Rights

[redacted]

Onshore Export Cable Route

[redacted]

[redacted]

[redacted]

- [redacted]

Onshore Export Cable Route Rights

[redacted]

ONSHORE SUBSTATION SITE

[redacted]

[redacted]

Onshore Substation Site Rights

[redacted]

[redacted]

DELIVERY POINT

[redacted]

Delivery Points Rights

[redacted]

PROJECT SITING ALTERNATIVES

[redacted]

ACQUISITION OF ADDITIONAL RIGHTS

[redacted]

[redacted]

SECTION 5

ENERGY RESOURCE ASSESSMENT AND PLAN

OVERVIEW

Liberty Wind (the "Project") is an offshore wind project that Vineyard Wind (the "Proposer") is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles east of Montauk Point, Long Island. [redacted]

This section outlines the energy resource assessment and plan for the Project. Vineyard Wind has access to an extensive body of wind data collected from onshore and offshore measurement sites near the Lease Area, as well as proprietary data from the Proposer's Floating LiDAR System (FLS) in Lease Area OCS-A 0501. [redacted]

The Lease Area provides for the best wind resource of any available East Coast offshore wind lease area due to its location furthest from shore. This assessment has been validated by various mesoscale modelling as well as the available site data that the Proposer has collected over the last two years. Vineyard Wind has analyzed this wind data using industry best practice and state-of-the-art methods to reduce energy production projection uncertainty. The wind data indicate a favorable wind resource; this assessment has been confirmed by Avangrid Renewables' wind assessment team as well as through independent wind resource assessments, produced at the Proposer's request. Vineyard Wind therefore has every confidence in the annual energy production estimates included in this section as well as the Project's ability to secure financing on this basis.

OFFSHORE WIND GENERATION FACILITY SITE

Lease Area OCS-A 0522 is a 132,370-acre area in the open Atlantic Ocean, located south/southeast of Martha's Vineyard and Nantucket, and is one of five lease areas in the Massachusetts Wind Energy Area (MA WEA). Vineyard Wind is also a leaseholder for a second MA WEA lease area, Lease Area OCS-A 0501, where the Proposer's Vineyard Wind 1 and Park City Wind projects will be installed.

[redacted]

[redacted]

[redacted] For both project sizes, Vineyard Wind has proposed a preliminary Project layout with 1 x 1-nautical mile (NM) spacing between WTGs. The preliminary Project layout arranges the WTGs in a grid pattern, with the WTG rows aligned in an east-west and north-south direction and 1 NM spacing between all WTGs as well as the ESP (see Section 4). Vineyard Wind notes that the proposed preliminary WTG layout described in this Submission is subject to federal permitting requirements and further stakeholder consultation.

WIND DATA

The Project's wind resource assessments are based on onshore and nearshore wind data, as well as site-specific offshore wind data. [redacted]

Additionally, in line with industry best practice, Vineyard Wind has deployed an FLS in Lease Area OCS-A 0501, which began collecting wind data in May 2018. As of May 2020, Vineyard Wind has gathered two full years of onsite wind measurement data that, in combination with other existing and ongoing measurements, will provide an even stronger basis for energy production estimates. [redacted]

Figure 5-2 illustrates the measurement locations of the wind datasets the Proposer used in its analyses as well as the study locations of the extensive wind assessment studies and production estimates carried out by Vineyard Wind. The datasets are summarized in Table 5-1. [redacted]

[redacted]

The primary data sources and methods used in the wind resource and energy production estimates are the following:

- cup anemometers on the Nantucket Radio Tower (also referred to here as a met mast), by the University of Massachusetts, Wind Energy Center;

- a vertical profiling LiDAR at the Woods Hole Oceanographic Institution (WHOI) tower south of Martha's Vineyard, with data by WHOI and AWS Truepower;
- NOAA Buzzards Bay (BUZM3) weather platform, with data by the National Oceanic and Atmospheric Administration (NOAA)–National Data Buoy Center;
- the closest Climate Forecast System Reanalysis (CFSR), Modern Era Retrospective analysis for Research and Applications (MERRA), and MERRA2 37 years reanalysis time series;
- two short-term (six months) Vortex mesoscale time series (SERIES), computed at the Nantucket met mast location and the Buzzards Bay platform;
- several long-term (20 years) Vortex mesoscale time series (SERIES), computed at the Lease Area (VOWF), using CFSR, MERRA2, and European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalysis Interim datasets as inputs (ERAI); and
- two years of FLS collected wind data from Lease Area OCS-A 0501 with predefined measurement heights of 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 240 meters (m) using the onboard LiDAR, as well as near the ocean surface with a sonic anemometer.

Figure 5-3 illustrates the time spans covered by each time series of measurement points from the locations shown in Figure 5-1.

[redacted]

DATA COLLECTION SUMMARY

Information on the data collection points referenced above, including their proximity to the Offshore Wind Generation Facility site, is provided in Table 5-1.

[redacted]

[redacted]

[redacted]

WIND RESOURCE ASSESSMENT

Vineyard Wind tasked C2Wind, an unaffiliated third-party wind resource assessment firm, with developing a wind resource assessment report and one year of representative hourly wind resource for Lease Area OCS-A 0522. C2Wind is one of the most experienced wind energy forecasting companies in the world. C2Wind's experts have been working in offshore wind since 2003 and have more than 50 years' combined experience in offshore wind resource assessment and energy production estimation. C2Wind's team has worked with the top five offshore wind turbine suppliers and has first-hand experience with, and insight into, turbine behavior and key support structure design drivers. Additionally, C2Wind's experts are working with the leading offshore wind companies globally and have been involved in more than 20 offshore wind projects across the world.

The wind resource assessment report is provided as Attachment 5-1.

Methodology

The wind resource assessment report includes a detailed description of the methodology used to produce the assessments. [redacted]

[redacted] The wind resource assessment report uses the data sources included in Table 5-1. The report is therefore based on several datasets and include both direct measurements (met mast, FLS, and weather platform) and models (reanalysis, mesoscale models).

After processing the initial measurements and models, C2Wind performed the following steps to produce the final report:

- analysis of the observed wind climates;
- long-term correction;
- spatial extrapolation; and
- derivation of the final wind climate.

The C2Wind assessment has been further validated by internal wind assessments done by the experienced Avangrid Renewables' wind assessment team.

Summary of Results

[redacted]

[redacted]

- [redacted]
- [redacted]

[redacted]

[redacted]

NET ENERGY PRODUCTION

Gross and net-after-wake WTG production have been calculated using the wind climate derived for the Lease Area, accounting for the Project's layout. [redacted]

[redacted]

Wake losses from any relevant adjacent offshore wind projects, as well as electrical losses, have been considered in developing the estimated net production. Consequently, buildout of neighboring lease areas will have limited effect on the Project's estimated net production. As a result, the Project's energy delivery plan is robust.

The energy production numbers shown below account for net-after-wake values and all losses. Projections of net annual energy production, including projections of average net hourly energy production, based on the wind resource data (a 12 x 24 energy projection) at p50 levels are shown in Table 5-3 and Table 5-4 for the 1,204 MW and 1,302 MW project size variations, respectively. The sum of all values is equal to the net energy production (at the metering point) as shown in Table 5-2.

[redacted]

[redacted]

A 20-year long-term time series from Vortex Factoria De Calculs, S.L. (Vortex), computed at the center of the Project, has been used to provide a reliable description of the monthly and hourly variations of the net-after-wakes power production. The Vortex time series has been scaled so that it is described by the two-parameter Weibull distribution that is specified and described in further detail in Attachment 5-1.

A net-after-wake power time series has been derived from this 20-year long hourly mesoscale model time series (hourly averages provided every hour). The time series has been used in combination with a 12-wind directional bins park power curve derived using the ensemble wake model approach described above. This net-after-wake power time series has been used in providing the energy production statistics in Tables 5-2, 5-3, and 5-4. The described method utilizes best-in-class and industry practice energy production methods and tools, including the commercial tool WindPro.

[redacted]

[redacted]

POWER CURVE

[redacted] The final power curve for the Project may differ, depending on the final WTG supplier and platform selected.

[redacted]

[redacted]

[redacted]

[redacted]

SECTION 6
OPERATIONAL PARAMETERS

OVERVIEW

Liberty Wind (the "Project") is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles east of Montauk, Long Island. [redacted]

Liberty Wind has been designed to reliably generate and deliver clean energy to New York while withstanding the rough operating conditions experienced offshore. The key elements to meet this goal include:

- employing well-known, highly reliable and commercially available technologies that will reduce the risk of equipment failures of key components;
- an operations and maintenance (O&M) concept based on regular and comprehensive scheduled maintenance combined with a preventative maintenance strategy and use of remote monitoring systems to ensure the longevity and reliability of equipment components over the course of the Project's operating life and minimizing outages; and
- an O&M logistics concept based on a Service Operating Vessel (SOV) that will maximize the time available for wind technicians to conduct maintenance and repairs at the Offshore Wind Generation Facility site, operate safely in severe weather conditions, and ultimately ensure high reliability and a quick response to unscheduled outages.

Further, Vineyard Wind will apply any lessons learned from operating the Vineyard Wind 1 and Park City Wind projects to Liberty Wind along with any relevant experience acquired from the Shareholder Companies' and affiliates operating offshore wind projects (see Section 3).

This section further describes the operational parameters for Liberty Wind, including partial and planned outage requirements, as well as expected operating constraints and operational restrictions for the Project.

OUTAGE REQUIREMENTS

[redacted]

[redacted]

[redacted]

The preventative maintenance measures described in this section will reduce the need for corrective intervention and support enhanced operation of the Project.

[redacted]

Major Project Components

Wind Turbine Generators

[redacted]

[redacted] The WTGs not undergoing maintenance will remain online and operational, enabling the Project to continue to contribute to meeting peak summer demand while maintenance activities are completed.

Inter-array Cables and Export Cables

The Project's cables are inactive assets; as such, they do not need maintenance. Scheduled inspections can be carried out periodically to check that termination points are secure without the need for an outage.

Electrical Service Platform and Onshore Substation

[redacted]

[redacted]

Preventative Maintenance

Preventative maintenance will be performed to reduce the need for corrective intervention. The Shareholder Companies and affiliates have employed preventative maintenance approaches that have proven successful in other offshore wind projects globally. For example, Iberdrola is leading a consortium of 12 companies on the Romeo project; this initiative, backed by the European Commission through the Horizon 2020 Program, intends to reduce operating costs and maintain offshore wind farms to achieve maximum efficiency and drive renewable energy production. Vineyard Wind will employ any lessons learned from these approaches as well as experience gained operating the Vineyard Wind 1 and Park City Wind projects to support preventative maintenance efforts for the Project.

Remote monitoring is a key element for preventative maintenance as it allows continuous assessment of the technical state of a project without having to send technicians offshore for inspection. The Project will be monitored around-the-clock from an onshore control room, and real-time data from condition monitoring sensors will be continuously analyzed to enable

Vineyard Wind to predict potential failures and respond quickly to minimize any impact on production. Data gathered by remote monitoring will also allow technicians to improve maintenance plans and identify potential future problems when conducting maintenance on WTGs. If an alarm is raised in the remote monitoring system, the technical team will be notified immediately; based on the type of notice, either a remote or an onsite intervention can be planned.

The two main systems available for remote monitoring of offshore wind projects are:

- **WTG Condition Monitoring (TCM):** TCM systems measure vibration and acceleration in specific WTG components, typically including the main hub bearing, main shaft, gearbox, generator, and tower. The vibrations and accelerations are measured and sent to a centralized computer system, and when defined levels are exceeded, an alarm is issued. If necessary, the WTG will automatically initiate a forced shutdown until the root cause has been identified and mitigating actions have been completed.
- **Supervisory Control and Data Acquisition (SCADA):** SCADA is a computer system that gathers and analyzes real-time data. The system connects individual WTGs, substations, and meteorological stations to a central computer and gathers information such as temperature, pressure, and positions. Gathered data is continuously analyzed by trained technicians to establish monitoring routines and evaluate project components for early indications of wear, tear, or upcoming breakdown. In the event a breakdown occurs, SCADA data can be analyzed to identify the root cause of the breakdown.

Both above remote monitoring systems are managed by local experts from an operations and maintenance facility or in shared monitoring centers located in the US.

OPERATING CONSTRAINTS AND RESTRICTIONS

The Project's operating constraints are largely determined by the technical parameters of the Offshore Wind Generation Facility and transmission system components. Importantly, offshore WTGs and related structures are designed to withstand the harsh offshore climate and ensure a long operational life. [redacted]

Weather-Related Conditions

Operational constraints for the WTGs are dictated by temperature, wind speed, and sea states. These operational constraints have been accounted for in the WTG availability calculation.

Temperature

[redacted]

Wind Speed

[redacted]

Sea States

[redacted]

SECTION 7
BUSINESS ENTITY AND FINANCING PLAN

OVERVIEW

This section summarizes the business entity and financing plan for Liberty Wind (the “Project”). The Project will be developed by Vineyard Wind LLC (Vineyard Wind or the “Proposer”), which is owned by two funds managed by Copenhagen Infrastructure Partners P/S (CIP) and Avangrid Renewables LLC (Avangrid Renewables) (together the “Shareholder Companies”). The Shareholder Companies are contributing their financial strength to Liberty Wind along with their successful track record of developing, financing, constructing, and operating renewable energy and offshore wind projects across the globe.

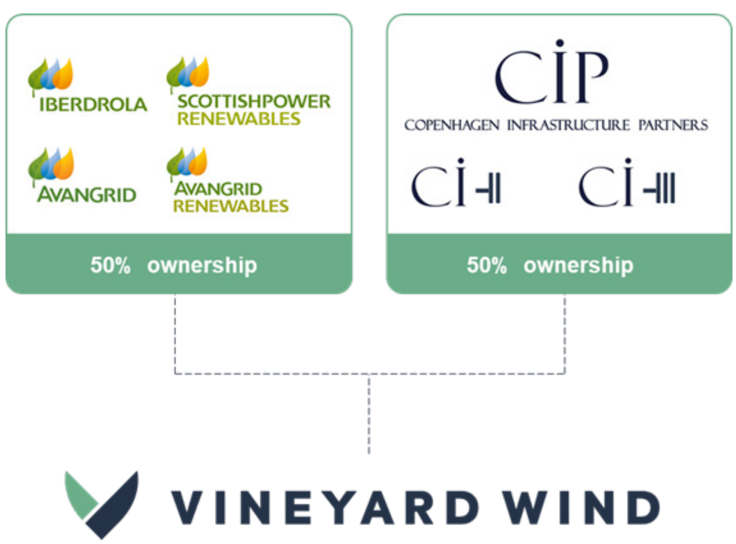
[redacted]

Additional information regarding the Shareholder Companies’ financial strength and the Project’s financing plan is provided below and in 4.2 Financing Plan.

BUSINESS ENTITY STRUCTURE

Vineyard Wind LLC, a Delaware limited liability company registered in Massachusetts, was established in 2009 (at the time called Offshore MW), and is a 50–50 joint venture of CIP (through two investment funds: CI II and CI III) and Avangrid Renewables, a subsidiary of Avangrid Inc. (Avangrid) (see Figure 7-1). Avangrid is 81.5% owned by Iberdrola S.A. (Iberdrola), a corporation organized under the laws of the Kingdom of Spain. The remaining outstanding shares of Avangrid are publicly traded on the New York Stock Exchange.

Figure 7-1 Vineyard Wind Business Entity Ownership Structure



[redacted]

[redacted]

Vineyard Wind

Vineyard Wind's team of industry experts has a long track record of developing offshore and onshore wind projects globally. The extensive global experience is complemented by local staff with expertise in US offshore wind, permitting, and local infrastructure. The Vineyard Wind team is comprised of personnel provided by the Shareholder Companies, local staff with expertise in offshore wind development, and expert consultants selected to ensure a well-rounded team with the skillset required to develop and operate offshore wind projects and transmission infrastructure in New York.

Vineyard Wind's corporate structure allows the Proposer to draw heavily on resources with experience developing, permitting, financing, constructing, and/or operating almost 20,000 megawatts (MW) of offshore wind capacity across 37 projects in the US, Europe, and Southeast Asia. CIP and Avangrid Renewables, for example, each have recent experience in the construction of several offshore wind projects of a similar type, size, and technology as the Project. Moreover, Vineyard Wind has unique local knowledge gained while developing, permitting, and financing Vineyard Wind 1, the country's first commercial-scale offshore wind project, and Park City Wind.

The Proposer's organizational structure as well as biographical details of Board of Manager members, Executive Committee members, officers, and other key personnel are provided in Section 3 and 4.2 Financing Plan.

FINANCING EXPERIENCES AND RESOURCES

Vineyard Wind

Vineyard Wind has gained critical experience from the ongoing financing process for Vineyard Wind 1. [redacted]

[redacted]

[redacted]

Copenhagen Infrastructure Partners

[redacted]

CIP has a unique combination of hands-on experience and execution skills covering all aspects of energy infrastructure investments, from sourcing, structuring, financing, and negotiations to project development, construction, and operations management, as well as general management. Table 7-1 provides a list of selected projects, financed by way of CIP-managed funds, that are either operating or under construction.

Table 7-1 Select CIP Onshore and Offshore Wind and Transmission Projects

Project and Location	Project Type and Size	Date of Construction and Permanent Financing	Form of Debt and Equity Financing
DolWin 3 (Germany)	900 MW high-voltage direct current (HVDC) offshore transmission in partnership with TenneT	[redacted]	[redacted]
BorWin 1 BorWin 2 Dolwin 2 Helwin 2 (Germany)	2,800 MW HVDC offshore transmission	[redacted]	[redacted]

Table 7-1 Select CIP Onshore and Offshore Wind and Transmission Projects (Continued)

Project and Location	Project Type and Size	Date of Construction and Permanent Financing	Form of Debt and Equity Financing
Beatrice (UK)	World's largest offshore wind project (588 MW) based on jacket foundations	[redacted]	[redacted]
Veja Mate (Germany)	402 MW offshore wind project in the German North Sea	[redacted]	[redacted]
Blue Cloud (US)	148 MW onshore wind project in Texas	[redacted]	[redacted]
Terna DEN (US)	Three separate onshore wind projects (Bearkat I, Fluvanna I & II) with total capacity of 504 MW in partnership with Terna	[redacted]	[redacted]
Bearkat II (US)	162 MW onshore wind project in Texas in partnership with TriGlobal Energy	[redacted]	[redacted]
CFXD (Taiwan)	589 MW offshore wind project	[redacted]	[redacted]
Monegros (Spain)	487 MW onshore wind project	[redacted]	[redacted]

Avangrid Renewables

Avangrid Renewables is supported by its shareholder company Avangrid, a public company with an equity market capitalization of approximately $15 billion. Avangrid has a Long-Term Issuer rating of BBB+/Stable and a Senior Unsecured rating of BBB by Standard and Poor's, a Long-Term Issuer rating of Baa1/Negative and a Senior Unsecured rating of Baa1 by Moody's, and a Long-Term Issuer rating of BBB+/Stable by Fitch. Avangrid can raise equity capital from its majority owner, Iberdrola, or from US public equity markets. Avangrid also has access to the investment grade debt capital markets and, in April 2020, raised $750 million through the issuance of a ten-year green bond. In addition, Avangrid's utilities access the debt capital markets directly and have approximately $7.7 billion of long-term debt outstanding. The company also has a committed $3 billion revolving credit facility and an active $2 billion commercial paper program.

Iberdrola is listed on the stock exchanges in Madrid (Ibex-35), Barcelona, Bilbao, and Valencia. In New York, the company is listed in the form of an American Depositary Receipt. At the beginning of September 2020, Iberdrola had a market capitalization of $78 billion. At the end of 2019, Iberdrola had 52,082 MW of installed generation capacity. Of this capacity, 32,041 MW is renewable resources. More than half (i.e., 17,854 MW) of Iberdrola's renewable energy capacity portfolio is wind; the remainder is hydropower and other renewable technologies.

Substantially all of Avangrid Renewables' wind and solar projects are unencumbered by external debt, having been funded by a combination of equity contributions and intercompany debt from Avangrid. A selection of onshore wind projects successfully financed by Avangrid Renewables in New York is provided in Table 7-2. A full description of Avangrid Renewables' current onshore wind, offshore wind, and onshore transmission projects of similar scope, size, and technology are included in Section 3.

Table 7-2 Avangrid Renewables' Onshore Wind Projects in New York

Project and Location	Project Type and Size	Date of Construction and Permanent Financing	Form of Debt and Equity Financing
Maple Ridge I & Ia[1]	231 MW onshore wind project	Operational since 2005	[redacted]
Maple Ridge II[2]	90.8 MW onshore wind project	Operational since 2006	
Hardscrabble	74 MW onshore wind project	Operational since 2011	[redacted]
Roaring Brook Wind Farm	77.7 MW onshore wind project	Under Construction	[redacted]

Notes:

1. This is a 50/50 joint venture between Avangrid Renewables and EDP Renewables North America.
2. This is a 50/50 joint venture between Avangrid Renewables and EDP Renewables North America.

FINANCING PLAN

Financing the development and construction of Liberty Wind is expected to follow the plan provided herein and in 4.2 Financing Plan. It is important to note, however, that the Project's expected financing path is subject to change, in part, because financial markets undergo structural change and are subject to cyclical variation. Given the Project's size and development time horizon, Vineyard Wind and the Shareholder Companies are prepared to respond to changes, seek creative alternatives, and commit their capital resources appropriately to ensure the Project's success and as a matter of good prudence. The Shareholder Companies' financial strength and access to alternative financial sources is a key strength in ensuring the successful delivery of the Project.

Project Financing

[redacted]

Financial Structure

[redacted]

Debt and Equity Financing

Vineyard Wind and the Shareholder Companies will work together to apply their substantial financing experience and knowledge to organize a financing package that provides a low cost of capital. [redacted]

Fixed and Index OREC Form of Pricing

[redacted]

Estimated Construction Costs

[redacted]

Projected Capital Structure

[redacted]

In project finance, capital structure is typically expressed in terms of a coverage ratio called debt-service coverage ratio (DSCR) rather than in terms of leverage ratio (i.e., debt-to-capital). DSCR is defined as cash flow available for debt service divided by interest plus principal payments. The amortizing loans are sculpted based on a forecast of project cash flows to provide a stable DSCR over the life of the loans. A project typically targets a DSCR that corresponds to a particular credit rating. The Shareholder Companies intend to target a DSCR that corresponds to an investment grade (BBB- or better) rating.

Agreements

[redacted]

Tax Credits

[redacted]

SECTION 8
INTERCONNECTION AND DELIVERABILITY PLAN

OVERVIEW

Liberty Wind (the "Project") is an offshore wind project that Vineyard Wind (the "Proposer") is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles east of Montauk Point on Long Island. [redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]

[redacted]

INTERCONNECTION REQUESTS

[redacted] Vineyard Wind has applied for Energy Resource Interconnection Service (ERIS) and Capacity Resource Interconnection Service (CRIS) for both interconnection requests. Documentation of the interconnection requests is provided in 4.3 Interconnection and Deliverability Plan.

Table 8-1 Liberty Wind LFIRs

LFIR	Capacity	Delivery Point
Q-1010–Vineyard Wind I	1,403 MW	East Garden City 345-kV substation
Q-1011–Vineyard Wind II	1,403 MW	Pilgrim 138-kV substation

Q-1010 is currently in the System Reliability Impact Study (SRIS) process with NYISO, and the Project's SRIS scope was approved by the NYSIO Operating Committee (OC) on September 17, 2020. [redacted]

[redacted]

[redacted]

DELIVERY POINT SELECTION PROCESS

[redacted]

- [redacted]
- [redacted]
- [redacted]

[redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

INTERCONNECTION AND TRANSMISSION COST ESTIMATES

A summary of System Upgrade Facilities, System Deliverability Upgrades, and Attachment Facilities cost estimates for Q-1010 and Q-1011 is provided below in Table 8-2 and Table 8-3.

[redacted]

Additional interconnection requests in Zone K and the timing of the Project's Class Year Study will ultimately determine whether the interconnection upgrade costs will be fully borne by the Project or shared amongst other projects. If other Class Year participants or previous Class Year participants are in electrical proximity to the Project, Liberty Wind's interconnection upgrade costs could be reduced through cost sharing or increased if the combined effect of multiple projects triggers the need for additional interconnection upgrades.

[redacted]

[redacted]

SECTION 9
ENVIRONMENTAL ASSESSMENT AND PERMIT ACQUISITION PLAN

OVERVIEW

[redacted]

- **Offshore Wind Permitting Experience:** Vineyard Wind remains the most experienced company in US offshore wind project permitting and is on track to complete federal permitting for Vineyard Wind 1, the nation's first commercial-scale offshore wind project, in 2020. All local, regional, and state approvals were obtained in 2019. Vineyard Wind is also well underway with federal and state permitting for its second project, Park City Wind. After working closely with the Bureau of Ocean Energy Management (BOEM) staff and other federal agencies over several years, Vineyard Wind has a firm grasp on the information and analyses needed to support a complete and sufficient federal applications and streamline the review processes.

[redacted]

- **Community Engagement Success:** Instrumental to the above approach is a robust community engagement effort that establishes open lines of communication and builds strong and trusting relationships. [redacted] As further described in Section 15, the community engagement activities that are already underway, and will continue for the life of the Project, will lay the groundwork for the formal permitting process.

- **Baseline and Site Assessment Underway:** The Project will be located in Lease Area OCS-A 0522 (the "Lease Area"), which is well understood from completed reconnaissance geophysical and geotechnical surveys and ongoing avian and fisheries surveys that support baseline characterization for environmental and wildlife resources. Vineyard Wind's survey program augments substantial existing baseline data and available data on potential environmental and wildlife impacts (e.g., marine mammals, birds, etc.).

[redacted]

PERMITTING PLAN

Liberty Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522, which is located approximately 84 miles east of Montauk, Long Island. [redacted] The location of Liberty Wind's major components determines the scope of state, regional/local, and federal permitting reviews as summarized in Table 9-1.

Table 9-1 Scope of New York State, Regional/Local, and Federal Review

Jurisdictional Entity	Scope of Permitting Review
New York State	[redacted] This includes portions of the 320-kV HVDC offshore export cables installed within an OECC, the landfall site, the 320-kV HVDC underground onshore export cables, a new onshore substation, and the Delivery Point at an existing utility substation.
Regional/Local Governmental Entities	The 345-kV underground onshore export cables, a new onshore substation, and portions of the 320-kV HVDC offshore export cables are subject to regional/local reviews by regulatory bodies largely through the state process.
Federal Government	Federal review encompasses the entire Project. Project components located offshore beyond state territorial waters (i.e., beyond three NM seaward of the low water mark of the shore) are under exclusive federal jurisdiction. This includes the wind turbine generators (WTGs), the 66-kV inter-array cables, the electrical service platform (ESP), and portions of the 320-kV HVDC offshore export cables installed within an OECC.

[redacted]

New York State Permits and Approvals

[redacted]

Additional state permits that are required but not included in the Article VII process include those needed for locating the offshore export cables in state waters and onshore export cables within state highway layouts. A summary of the anticipated New York State permits and approvals required for the Project is provided in Table 9-2 below.

[redacted]

New York Article VII Review

The NYSPSC approves applications filed under Article VII, with the New York Department of Public Service (NYSDPS) staff functioning as technical staff for the NYSPSC. Article VII requires the submission of detailed reviews of public health and safety related to the siting, design, construction, and operation of all aspects of a proposed transmission facility and appurtenant facilities located within state, county, and local jurisdictions. The process also requires the issuance of a Certificate of Environmental Compatibility and Public Need (an "Article VII Certificate") before construction of a proposed transmission facility is allowed to commence. Through the Article VII process, the applicant(s) provides all affected stakeholders, including state agencies and the municipalities in which project components will be located, with notice of the various aspects of the project as well as the right to become a party to the Article VII proceeding.

The Article VII process is comprised of the following key aspects:

- identifying the agencies, programs, and stakeholders that will be affected by a proposal to address relevant issues;
- collaborating with state agencies, including the New York State Department of Environmental Conservation (NYSDEC), New York State Department of State (NYSDOS) Coastal Management Program (in relation to the federal consistency review), and the New York State Office of Parks, Recreation and Historic Preservation;
- incorporating agency involvement with the proceedings, conditions, or required mitigation that would have otherwise been placed on individual permits;
- obviating the need for separate permit applications to most other state or local agencies. For example, the NYSDEC is a statutory party to the Article VII process, and separate permits (e.g., Freshwater Wetlands Permits and Protection of Waters Permit) are not required;
- preparing a comprehensive Environmental Management & Construction Plan (EM&CP) to comply with permit conditions;
- delegating authority to the NYSPSC to issue a 401 Water Quality Certification in conjunction with the Article VII Certificate; and
- issuing a Public Involvement Plan (PIP), which the NYSPSC considers to be integral to the process, although it is not required by statute.

Other New York State Permits

State permits that are addressed through the Article VII Certificate include:

- State Environmental Quality Review Act;
- Tidal Wetlands Permit;
- Freshwater Wetlands Permit;
- Coastal Erosion Management Permit;
- Protection of Waters Permit-Excavation or Placement of Fill in Navigable Water and Their Adjacent and Contiguous Wetlands Permit;
- State Lands Permit;
- State Coastal Zone Consistency Review;

- National and New York State Historic Preservation Act review (note that BOEM administers the federal Section 106 process); and
- New York State Department of Motor Vehicles Vessel Registrations.

Numerous state reviews that may be required in select locations/jurisdictions are also incorporated into the Article VII process, including, but not limited to, local harbor management plan and flood policy review, state-listed protected species regulatory review, and New York State air quality regulatory program compliance.

Other Easements and Rights

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Regional/Local Permits and Approvals

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Federal Permits and Approvals

Vineyard Wind will lead the Project's federal permitting process and be the sole applicant for all permits and approvals. As described in more detail below, the principal federal permits and authorizations required to construct and operate the Project include:

- BOEM's Office of Renewable Energy Programs' approval of the SAP for Lease Area OCS-A 0522 and Liberty Wind COP, along with submission of a Facilities Design Report and Fabrication and Installation Report;
- a permit to construct structures in navigable waters under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA), issued by the ACOE;
- a Clean Air Act (CAA) Outer Continental Shelf (OCS) permit for emissions from certain vessels and equipment used during construction and operation of the Project, issued by the Environmental Protection Agency (EPA);
- an Incidental Harassment Authorization (IHA) or Letter of Authorization (LOA) under the Marine Mammal Protection Act (MMPA) for construction-related noise associated with pile installation, issued by the National Marine Fisheries Service (NMFS);
- US Coast Guard (USCG) Private Aid to Navigation (PATON) authorization; and
- Federal Aviation Administration (FAA) "Determinations of No Hazard" for any structures within FAA jurisdiction (including temporary construction equipment).

The above list does not include reviews that will be conducted by other agencies that BOEM, as the lead permitting agency, will consult with during the federal permitting process, as described below. Table 9-4 lists the expected federal permits required for the Project.

Table 9-4 Anticipated Federal Permits, Approvals, and Consultations

Agency/Regulatory Authority	Permit/Approval	Status
BOEM	SAP approval COP approval/Record of Decision National Environmental Policy Act review Section 7 –Endangered Species Act consultation with US Fish and Wildlife Service (USFWS) and NMFS Essential Fish Habitat consultation with NMFS Migratory Bird Treaty Act applied through an interagency agreement with USFWS whereby BOEM takes measures to reduce migratory bird impacts	[redacted]
EPA	National Pollutant Discharge Elimination System (NPDES) Permit(s) OCS Air Permit	To be filed
ACOE	Individual Clean Water Act Section 404 (Required for side-casting of dredged material and placement of foundations, scour protection, and cable protection) Rivers and Harbors Act of 1899 Section 10 permit (Required for all offshore structures and dredging activities)	To be filed
NMFS	IHA or LOA	To be filed
USCG	PATON authorizations	To be filed
FAA	Determinations of No Hazard (for activities at construction staging areas and vessel transits, if required) Interagency consultation No Hazard Determination Notice of Proposed Construction or Alteration	To be initiated
US Department of Defense Siting Clearinghouse	Informal review regarding military air traffic over the Lease Area	To be initiated

Federal Permitting Process

Bureau of Ocean Energy Management

BOEM has jurisdiction under the Outer Continental Shelf Lands Act to issue leases, easements, and rights-of-way for the development of renewable energy on the OCS and to ensure that activities conducted on the OCS are carried out in a manner that adequately addresses environmental protection, safety, protection of US national security, and protection of the rights of others to use the OCS and its resources. BOEM authorizes development on the OCS through its review and approval of a project's SAP and COP and will be the lead federal agency for the Project.

Vineyard Wind will explore use of Fixing America's Surface Transportation Act (FAST-41) or "One Federal Decision" (OFD) to expedite the Project's federal permitting process. Vineyard Wind 1 is being permitted under the OFD process, and while there are some advantages to this process, it was also observed that OFD created some challenges to efficient permitting. It is anticipated that some changes to OFD may be made as a result of the inefficiencies encountered, and so a final decision on whether to use OFD for the Project will be made by Vineyard Wind at a later date. Vineyard Wind had previously decided not to pursue Vineyard Wind 1 under FAST-41, and while this was the right decision for Vineyard Wind 1, an updated analysis will be made before deciding whether to utilize FAST-41 or OFD for Liberty Wind.

A SAP describes the initial activities to characterize a site (e.g., installation of meteorological towers and meteorological buoys). As noted above, Vineyard Wind has submitted a SAP to BOEM to install a meteorological-oceanographic buoy in Lease Area OCS-A 0522, which will provide data that informs the design of the Project.

The next major step in the Project's federal permitting process will be preparation and submission of a COP. In reviewing a COP, BOEM must comply with its obligations under the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Migratory Bird Treaty Act (MBTA), the CAA, Marine Mammal Protection Act (MMPA), and the Endangered Species Act (ESA). Thus, BOEM coordinates and consults with numerous other federal agencies, including NMFS, US Fish and Wildlife Service, EPA, and the USCG during the review process. When appropriate, BOEM also coordinates with states under the Coastal Zone Management Act (CZMA) to ensure that a project is consistent with state-level coastal zone management plans.

Army Corps of Engineers

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any Navigable Water. A Section 10 permit from the ACOE is needed for the installation of the wind turbine generators (WTGs), electrical service platform (ESP), and their associated foundations, the placement of scour protection around WTG and ESP foundations, the installation of cable protection for the inter-array cables (if/where needed), and the installation of offshore export cables and any associated cable protection within the three-nautical mile limit for state territorial waters. Section 404 of the CWA requires a permit before dredged or fill material can be discharged into waters of the US (within the three-NM limit for state territorial waters). A Section 404 permit from the ACOE is needed because installation of the offshore export cables may involve the discharge of dredged materials from localized sand wave dredging and potentially change the seafloor's bottom elevation due to temporary changes to the seafloor during cable installation or installation of cable protection (if needed). Like BOEM, the ACOE must comply with its obligations under NEPA, NHPA, MSFCMA, MBTA, and ESA. However, to avoid duplication of effort, the ACOE is expected to be a cooperating agency with BOEM through the NEPA process.

Environmental Protection Agency

An OCS Air Permit is required for emissions from vessels and equipment used during construction and operation of the Project on the OCS. OCS sources subject to the permit include any equipment or activity that has the potential to emit any air pollutants that are located on or in the waters above the OCS. A vessel itself is not considered an OCS source unless it attaches to the seabed or another existing OCS source, but vessel emissions associated with an OCS source are included in the permit. The EPA is expected to coordinate with BOEM to satisfy its obligations under the ESA and other relevant statutes.

National Marine Fisheries Service

An IHA or LOA under the MMPA is necessary for construction, principally because of the potential noise impacts to marine mammals associated with pile driving. Under the MMPA, the noise levels associated with construction have the potential to "harass" marine mammals and, therefore, an authorization is required. In addition, Vineyard Wind will consult with NMFS under the MMPA regarding any geophysical surveys or other relevant activities.

Federal Aviation Administration

The FAA requires a public notice of the proposed construction of a structure that is more than 200 feet above ground level or within certain distances of airports. Even though the Project's WTGs are outside of the FAA's jurisdiction, Vineyard Wind will consult with the FAA on the Project's construction and the temporary use or movement of any structures that exceed 200 feet, including within ports and at construction staging areas. Vineyard Wind will also consult with the US Department of Defense Siting Clearing House with respect to military air traffic.

Coastal Zone Management

The CZMA gives states the authority to review federal actions that impact their coastal uses and/or resources to ensure that such actions are consistent with a state's federally approved coastal zone management program and policies. The NYSDOS Coastal Management Program is responsible for implementing the federal consistency review process for New York and will have consistency review authority over applicable portions of the offshore export cables. The NYSDOS is a statutory party to the Article VII proceeding.

Additional Review/Authorizations

Additional review and authorizations, such as PATON authorizations from the USCG or review by the US Navy, may be required to determine that there are no issues with the location, installation, and operation of the offshore export cables.

PERMITTING TIMELINE

Liberty Wind has been planned and designed with a robust and prudent schedule that ensures on time Project delivery in line with the schedule provided in Section 11. Vineyard Wind believes this timeline is the most realistic and achievable timeline for new offshore wind projects given current market and regulatory conditions. [redacted]

[redacted]

The Project's permitting schedule is described in further detail below. A brief overview of the timeline is provided in Table 9-5, and major permit requirements have been included in the Project schedule detailed in Section 11. [redacted]

[redacted]

State and Local Permitting Timelines

New York Public Service Commission Article VII Certificate

[redacted]

[1] Vineyard Wind notes that the anticipated start date for the Project's federal and state permitting process assumes a December 2020 ORECRFP20-1 award. In the event the ORECRFP20-1 award occurs later than December 2020, adjustments to the Project's permitting timeline, including anticipated filing dates, may be required.

State and County/Local Permits

[redacted]

[redacted]

[redacted]

Federal Permitting Timeline

Bureau of Ocean Energy Management

[redacted] Vineyard Wind has taken this into account when drafting the overall Project schedule in Section 11.

Army Corps of Engineers

The ACOE is expected to coordinate its reviews of Liberty Wind's Section 10 Rivers and Harbors Act and Section 404 Clean Water Act permits with BOEM's NEPA process. The ACOE will actively participate in BOEM's process to allow ACOE to adopt the Final EIS and the findings of associated reviews. [redacted]

Environmental Protection Agency

[redacted] Upon receipt of the NOI, the EPA would designate the Corresponding Onshore Area and publish a consistency update to the OCS Air Regulations (40 Code of Federal Regulations Part 55). [redacted] The EPA reviews the application for completeness within approximately 30 days and then prepares a draft permit and Statement of Basis. The draft permit is then available for public comment for 30 days. Following the close of the comment period, the EPA addresses comments and issues a final permit. The permit typically becomes effective approximately 30 days after it is finalized.

In issuing a permit, the EPA has an obligation to comply with the ESA. However, to avoid duplication of effort, the EPA typically relies upon BOEM's ESA assessments and consultations. The permit process usually takes approximately eight to 12 months. However, if the permitting is undertaken through One Federal Decision, the final permit will likely be issued after the BOEM decision. [redacted]

National Marine Fisheries Service

Under the MMPA, an IHA is to be issued 120 days after an application is considered complete. [redacted] The proposed approach for the analysis of data and impact assessment will be determined in consultation with NMFS prior to submittal. This will facilitate a timely issuance of the IHA.

Federal Aviation Administration and US Coast Guard

Both the FAA and USCG will be involved in Project development and ongoing permitting activities with Vineyard Wind and through coordination with BOEM.

Project Support

Vineyard Wind's community engagement approach has proven successful in building enduring support for its offshore wind projects. Since well before the first COP filing in 2017, Vineyard Wind has been involved in an extensive community engagement effort, which has resulted in a growing network of regional and local supporters. This was most recently demonstrated in the Supplemental EIS process for Vineyard Wind 1, where the majority (80%) of the 13,260 written comments submitted to BOEM, which included letters from New York, expressed support for the Vineyard Wind 1 project.

[redacted]

Vineyard Wind is not aware of any opposition to the Project that would materially impact permitting approval or timelines and is already proactively working to limit the potential for Project opposition. As further described in Section 15, Vineyard Wind has developed a Community Engagement Plan (the "Plan") for Liberty Wind, which outlines a thoughtful approach to build Project support, respectfully respond to opposition, and develop community benefits on a collaborative basis. [redacted]

[redacted]

[redacted] A robust PIP has proven to be an effective tool in gaining important stakeholder support for major utility projects and in reducing and minimizing active Project opposition. [redacted]

SECTION 10

ENGINEERING AND TECHNOLOGY

OVERVIEW

Liberty Wind (the "Project") utilizes high-performance equipment components with established track records in the offshore wind sector. The Project's engineering and technology is similar to that used in other leading offshore wind projects developed by Vineyard Wind (the "Proposer"), Copenhagen Infrastructure Partners and Avangrid Renewables (the "Shareholder Companies"), and affiliates globally. [redacted] Vineyard Wind is therefore confident that Liberty Wind's preliminary design and engineering plan will deliver a robust and reliable offshore wind project in support of the goals outlined in New York State's nation-leading Climate Leadership and Community Protection Act (CLCPA).

Liberty Wind's preliminary design and engineering plans were developed by one of the most experienced Engineering, Procurement, and Construction (EPC) teams in offshore wind using the latest commercial intelligence. The Project also benefits from Vineyard Wind's unparalleled experience in the US offshore wind sector. The Proposer remains the first and only developer to navigate the procurement process from initial feasibility study to final contracting for a commercial-scale offshore wind project in the US. Consequently, Vineyard Wind possesses unique insights into the costs of and commercial terms for constructing viable offshore wind projects. In particular, the Project will benefit from the Proposer's:

- [redacted]
- [redacted]
- [redacted]

[redacted]

[redacted] Finally, equipment dimensions indicated in this section are typical and projections based on initial engineering feasibility assessment; final equipment dimensions are dependent on the site conditions, model of wind turbine generator (WTG) selected, and final design.

PRELIMINARY DESIGN AND ENGINEERING PLAN

Liberty Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles east of Montauk, Long Island. [redacted]

The Project utilizes high performance equipment components with established track records in the offshore wind sector. [redacted] Vineyard Wind 1 has undergone rigorous independent certification and review. This includes progressing the Certification Verification Agent (CVA) process for design, as required by the Bureau of Ocean Energy Management (BOEM), and scrutiny of Vineyard Wind 1's entire engineering plan by the technical advisor for the Proposer's primary financing partners. With the incorporation of lessons learned and understanding of this process, Vineyard Wind is confident that Liberty Wind's preliminary design and engineering plan will deliver a robust and reliable offshore wind project in support of the goals outlined in New York State's nation-leading CLCPA.

A summary of Liberty Wind's foundation types, offer capacity, and transmission technology is provided in Table 10-1. This table details the WTG technology, foundation types, transmission structures and platforms, electrical equipment, and cable characteristics envisioned for the Project. An overview of the major components associated with Project deployment is shown in Figure 10-1.

[redacted]

Major Equipment Components

Liberty Wind will generate and deliver zero-emission, renewable electricity through its Offshore Wind Generation Facility and electrical transmission system. The five major technology and equipment groups that comprise the Project are WTGs, foundations, transmission structures and platforms, electrical equipment, and cables, which are illustrated in Figure 10-1 and described below.

[redacted]

Wind Turbine Generators

[redacted] On top of the WTG tower is a nacelle (housing) and rotor hub. The nacelle contains a driveshaft and gearbox or direct-drive system (depending on WTG type), as well as the electrical generator, electric motors to yaw and pitch the WTG, and workspace. The nacelle also contains a full array of instrumentation, controls, fire protection systems and other safety equipment, ventilation and cooling, and ancillary equipment. Wind sensors mounted on the top of the nacelle are used to control the yaw and pitch system, which turns the nacelle into the wind to maximize power production and out of the wind to maintain the WTG's safety in high winds. [redacted] The Project will include a nighttime WTG aviation obstruction lighting system controlled by an Aircraft Detection Lighting System (ADLS), subject to BOEM approval, that complies with Federal Aviation Administration (FAA) and/or BOEM requirements.

A schematic presentation of a typical WTG of the type planned for the Project is provided as Figure 10-2.

[redacted]

Foundations

The Project will use either monopiles or jackets as the support structures for the WTGs. Jackets may be connected to the seabed either through piled pin piles or suction bucket technology. The final technology selections will be made after more detailed assessments of the seabed and other load conditions have been completed during the detailed engineering design phase.

Monopile Foundation Concept

A monopile is a single, hollow cylinder fabricated from steel that is driven into the seabed. A transition piece (TP) is mounted on top of the monopile to connect the top of the monopile to the bottom of the WTG tower. The Project's monopile foundation concept is illustrated in Figure 10-3.

[redacted]

[redacted]

The foundation includes the following: inter-array cable hang-off supports, corrosion protection systems (both internally and externally), a boat landing for accessing each WTG, a Davit crane(s) to lift tools and parts from the service vessel, marine navigation aids (e.g., identification marking and lights), external and internal platforms (scaffolding), and various electrical components. Scour protection may be installed around each WTG foundation to protect the foundations from scour development.

Jacket Foundation Concept

The jacket design concept consists of three or four-legged support structure with an integrated TP. [redacted]

The jacket will also contain secondary structures, such as boat landings, cable tubes, a tower flange for mounting the WTG, internal and external platforms, and various types of electrical equipment needed during installation and operation. The jacket will also be equipped with a corrosion protection system designed in accordance with relevant standards. The jacket concepts are illustrated in Figure 10-4.

[redacted]

Transmission Structures and Platforms

Electrical Service Platform

The electrical service platform (ESP) is comprised of two primary structures: the topside, which contains the electrical components and is located above water, and the foundation substructure, which is mainly below water. The ESP topside will be mounted on a jacket foundation, as depicted in Figure 10-5.

[redacted]

Onshore Substation

The components at the onshore substation will be:

[redacted]

[redacted]

[redacted]

Electrical Equipment

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

The ESP will contain several additional components, such as a supervisory control and data acquisition (SCADA) system, heating, ventilation, and air conditioning, a fire safety system, hydraulic platform crane(s), electrical hoist crane(s), a closed-circuit television system, a communication system (including antenna), safety kits, aviation and navigational marking and lighting, a pollution prevention system, export and inter-array cable hang-off supports, corrosion protection systems, and more.

[redacted]

[redacted]

[redacted]

[redacted]

Cables

Inter-array Cables

The 66-kV inter-array cables are expected to contain three copper or aluminum cores and one or more of fiber optic cables. The inter-array cables will connect the WTGs to the ESP. The total length of the cables will be optimized according to the Project's layout and WTG model chosen. The cross sections will be decided at a later stage in the design process and will depend on the final number of WTGs per string and cable length. In general, cables with smaller cross sections will connect the farthest WTGs in each string to one another, with the cable cross section increasing as the string routes through more WTGs before connection to the ESP. [redacted]

Offshore Export Cables

[redacted] Figure 10-8 illustrates the design of the offshore export cable.

[redacted]

[redacted] Water-blocking sheathing is used to prevent water infiltration of the cable, and this sheathing is accompanied by multiple armor layers to protect the cable against external forces. [redacted]

Final dimensions of the overall cable and cable cores will vary along the offshore export cable corridor based on seabed geotechnical conditions and burial depth requirements along the route.

Onshore Export Cables

The Project's offshore export cables will be brought to shore and into a buried splice vault located at the landfall site. Within the splice vault, the offshore export cables will be connected to the onshore export cables. [redacted]

The conductor material will most likely be aluminum, but copper may also be used, depending on the specific optimization of the cable and the logistics around installation. Portions of the onshore export cables are expected to be installed in concrete duct banks, which will provide the necessary mechanical protection and thermal conditions for operation of the cables.

[redacted]

EQUIPMENT MANUFACTURERS

Vineyard Wind has leveraged its experience in developing and completing the procurement process for Vineyard Wind 1 to identify cost-effective opportunities to use and support the offshore wind supply chain that is emerging on the US East Coast and in New York State in particular.

[redacted]

Table 10-2 summarizes some of the potential locations for the manufacturers of key Project components. This is not a final or exhaustive list; other locations may come into play as engineering and procurement work proceeds and the East Coast's offshore wind supply chain matures.

[redacted]

[redacted]

EQUIPMENT ACQUISITION

[redacted]

[redacted]

[redacted] A list of potential component suppliers that Vineyard Wind has engaged with is provided in Figure 10-9.

[redacted]

EQUIPMENT CONTRACTING

[redacted]

[redacted]

[redacted]

Vineyard Wind has developed a comprehensive procurement plan using the multi-contracting strategy described above. The procurement plan builds on the procurement process implemented for Vineyard Wind 1, as illustrated in Figure 10-11, creating and leveraging synergies between the projects.

The procurement timeline accounts for:

[redacted]

[redacted]

EQUIPMENT VENDORS

Based on Vineyard Wind's engagement and dialogue with prospective supply chain partners, the following major equipment vendors listed in Table 10-3 are being considered for the Project.

[redacted]

[redacted]

EQUIPMENT TRACK RECORD

The operational track record for equipment under consideration for the Project is described below.

Wind Turbine Generators

The WTGs under consideration for the Project are based on well-known, proven technology and will be delivered from leading original equipment manufacturers in the industry. The latest offerings and roadmap for major WTG manufacturers is detailed below:

[redacted]

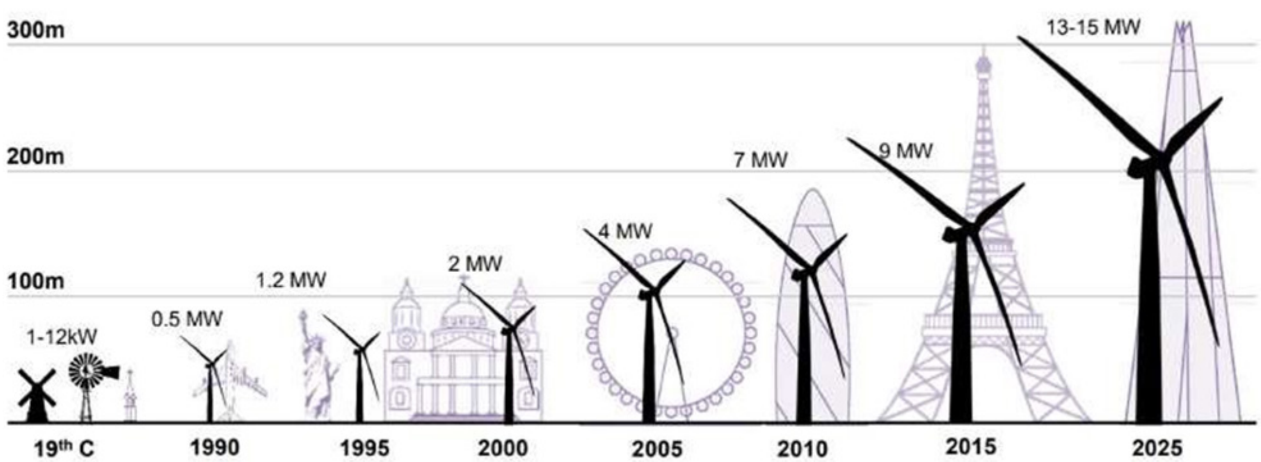
[redacted]

[redacted]

[redacted]

[redacted] Bloomberg New Energy Finance has estimated, for example, that offshore wind WTGs will reach ratings of 13 MW to 15 MW by 2025 (see Figure 10-12).

Figure 10-12 WTG Capacity Development



Source: Bloomberg New Energy Finance

Foundations

Monopiles and TPs are well-known and proven technologies used across numerous offshore wind projects worldwide. The first monopile projects were installed at the Lely offshore wind project in the Netherlands in 1994. The Blyth Offshore Windfarm (England), which began operation in 2000, and the Horns Rev 1 project (Denmark), which began operation in 2002, represented some of the first large-scale commercial deployments of the technology. Since then, more than 2,500 monopiles have been deployed in the offshore wind industry. The

Shareholder Companies also have extensive experience with monopiles, including monopiles with dimensions comparable to those required for the Project. This experience includes managing the largest monopiles ever installed outside of China at the time with the Veja Mate (Germany) project in 2016.

Inter-array Cables

Inter-array cables are a well-known technology that has been used for many years in the wind industry. The 66-kV cables proposed for the Project were developed from the proven 33-kV technology and were first tested at the Blyth demonstrator project in 2017; shortly thereafter, 66-kV cables were installed at Nissum Bredning Vind (Denmark) and Aberdeen Bay (UK). Several suppliers now have 66-kV cable designs that are fully certified and ready for commercial applications. [redacted]

Electrical Service Platforms

[redacted]

Export Cables

[redacted]

Onshore Substation

[redacted]

The electrical design will be derived from the final design of the Project's entire electrical system and based on well-known and proven concepts. There are many experienced contractors in New York and the rest of the US with the expertise to build this type of onshore substation. [redacted] For an overview of Shareholder Company affiliate Avangrid Networks' substantial onshore interconnection experience and long track record of US renewable energy project construction, refer to Attachment 3-3.

DESIGN CONSIDERATIONS

With a designed lifespan of greater than 30 years in the offshore environment, the WTG, foundation, and ESP concepts under consideration for the Project are designed to survive extreme weather events and the effects of rising sea levels.

Climate Adaptation and Resiliency

[redacted] As is evident by the flooding, wind damage, and sustained loss of power encountered following Tropical Storm Isaias in August of 2020, all current and future infrastructure projects must account for severe weather events of this magnitude multiple times a year. The Project's design will be certified, according to the standards above, by an independent and accredited third party as was done for Vineyard Wind 1. Experiences from certifying the design of that project, as well as Park City Wind, will be incorporated into the design and certification process for the Project.

While the Project's design standards and methods are the same as for other modern offshore wind projects, the environmental conditions for the specific site (e.g., sea level rise, severity and frequencies of hurricanes and nor'easters, etc.) need to be assessed using information relevant to the site. In this respect, site-specific studies of environmental conditions will be performed and supplemented by a careful review of reliable public information relevant to the site. For example, the local water level change (which is the sum of vertical land movement and sea level rise) is found using reports for the area by the National Oceanic and Atmospheric Administration, local global positioning system (GPS) measurements of vertical movement, the most recent reports by the Intergovernmental Panel on Climate Change, as well as other sources.

[redacted]

Regarding offshore technology selection, the WTGs, the ESP, and their foundations are designed to withstand the harsh conditions encountered on the Outer Continental Shelf. [redacted]

The selection of a foundation concept is one of the most crucial decisions made in project design with regards to offshore structure resiliency. Both the monopile and jacket concepts have proven track records of stability in the challenging conditions of the North Sea and, more recently, climate and soil conditions in Asia. As such, implementation of these concepts, along with the inclusion of sufficient foundation design margin to allow for wind and wave forces in excess of the current record-setting storms, is currently seen as the lowest risk solution to designing and operating a reliable offshore wind project given the increasing frequency of severe weather events.

Responsible Disposal and Recycling

As is typical of a utility-grade generation and transmission infrastructure project, the Project's offshore facilities are expected to have a physical life expectancy of at least 30 years. Following the completion of the Liberty Wind's operations phase, the Project will be decommissioned. Unless otherwise authorized by BOEM, pursuant to the applicable regulations in 30 Code of Federal Regulations (CFR) Part 585, Vineyard Wind is required to remove or decommission all facilities, projects, cables, pipelines, and obstructions and clear the seafloor of all obstructions created by activities on the leased area, including any project easements(s), within two years following lease termination in accordance with any approved Site Assessment Plan, Construction and Operations Plan, or approved Decommissioning Application.

While the currently-envisioned decommissioning process is essentially the reverse of Project installation, the decommissioning process will ultimately utilize the latest technological and logistical developments in the offshore wind industry, as the overall industry approach is expected to evolve over the coming decades. The Project's general decommissioning concept, including how Vineyard Wind expects to maintain an inventory of decommissioned components and ensure safe disposal, is elaborated in Section 13. Offshore wind projects have been successfully decommissioned in Europe, the first of which was the Yttre Stengrund project in Swedish waters in 2015. The discussion below focuses on anticipated recycling potential associated with decommissioning the Project's major offshore components.

Decommissioning of offshore facilities, including towers, monopiles, jackets, and other steel components, will require the involvement of an onshore recycling facility with the ability to handle large quantities of steel. Multiple facilities of this type operate in New York and New England. [redacted]

[redacted] Foundations, WTG components, and other large steel components will be transported from site and offloaded from vessels at the final decommissioning scrap site for recycling.

WTGs are currently understood to be between 85 to 90% recyclable[1], when considering both traditional scrap recycling (steel) and component reuse in a circular market. The largest impediment to full recycling of WTG components is the blades themselves, which are generally constructed from fiberglass, thermosetting plastics, or a similar combination of composite materials. Various methods are currently being explored in attempts to recycle blade material.

For onshore components, the extent of decommissioning is subject to discussions with the host town(s) on the decommissioning approach that best meets the host town's needs and has the fewest environmental impacts. The onshore cables, the concrete encased duct bank itself, the splice vaults, and elements of the onshore substations and grid connections could be retired in place or retained for future use. If onshore cable removal is determined to be the preferred approach, the process will consist of pulling the cables out of the duct bank, loading them onto truck-mounted reels, and transporting them offsite for recycling or possible reuse. The splice vaults, conduits, and duct banks will likely be left in place, available for reuse. Similarly, the onshore substation will have a useful life beyond that of the Project and could be available for reuse.

LIGHTING CONTROLS

The Offshore Wind Generation Facility, including any lighting, will not be visible from any location in New York and will have extremely limited visibility from other locations (see Section 16). The marine navigation and aviation lighting controls proposed for the Project, described below, further reduce lighting-related visual impacts and minimize risk to avian species to the greatest extent possible. The Project's current aviation and marine navigation lighting scheme is largely based on the scheme developed for Vineyard Wind 1 as well as FAA Advisory Circular 70/7460-1L, the recommendations contained in US Coast Guard (USCG) District 1 Local Notice to Mariner (LNM) 33-20, and International Association of Lighthouse Authorities (IALA) Guidance for the Marking of Manmade Offshore Structures (IALA Recommendation O-139, edition 2, 2013). However, FAA, USCG, and BOEM guidance may change by the time the Project proceeds to construction. The final, approved lighting scheme for the Offshore Wind Generation Facility will be determined through the Project's permitting process, in consultation with BOEM, FAA, and the USCG, and will follow applicable guidance in effect at the time of construction.

[1] "ZEBRA Project Launched to Develop First 100% Recyclable Wind Turbine Blades." Lmwindpower.com, www.lmwindpower.com/en/stories-and-press/stories/news-from-lm-places/zebra-project-launched

Construction Phase Lighting Controls

During the Project's construction phase, lighting controls will be in place for the WTGs, ESPs, and onshore staging areas. All lighting controls will be installed in accordance with federal standards. Lighting may be required on installation vessels over a certain height. All Project-related vessels, equipment, and appurtenances will display the required navigation lighting.

For the Offshore Wind Generation Facility, per FAA Advisory Circular 70/7460-1L, temporary aviation lighting is required on the WTGs once they reach a height of 200 ft or greater until the permanent lighting configuration is activated. If power to the WTGs is available, temporary lighting will consist of an L-810 steady red light until the permanent flashing FAA L-864 lights are installed. If power is not available, the temporary lights would be self-contained, solar-powered, LED, steady-burning red lights that meet the photometric requirements of an FAA L-810 lighting system. ESPs are also required to have temporary aviation lights once they reach a height of 200 ft or greater until the permanent lighting configuration is activated.

Each WTG and ESP will become a private aid to navigation (PATONs) once they are installed. Temporary marine navigation lighting will be installed on the foundation structures as they are being constructed, depending on the timing and sequence of foundation installation. Per USCG District 1 LNM 33-20, all temporary base, tower, and construction components preceding the final structure completion will be marked with Quick Yellow (QY) obstruction lights visible 360 degrees around the structure at a distance of 5 nautical miles (NM).

Operations Phase Lighting Controls

During the Project's operations phase, the Offshore Wind Generation Facility will be equipped with aviation and marine navigation lighting controls.

Aviation Lighting and Aircraft Detection Lighting System

All WTGs will include a nighttime aviation obstruction lighting system consisting of two synchronized FAA L-864 red flashing aviation obstruction lights placed on the nacelle of each WTG. The obstruction lights will be placed as high as possible on the WTG nacelle and arranged horizontally, on opposite sides of the nacelle so that they are visible from any direction. If the WTGs' total tip height is 699 ft or higher, there will be at least three additional low intensity L-810 flashing red lights on the tower at a point approximately midway between the top of the nacelle and sea level. The ESP will also include aviation obstruction lighting in compliance with FAA and/or BOEM requirements.

Vineyard Wind will utilize an ADLS, subject to BOEM approval, which will dramatically reduce the total amount of light produced by the Project's aviation lights during the operations phase. The area for ADLS activation is considered by the FAA to be 1,000 ft above the tallest structure of a project. If an aircraft crosses this threshold, it will be detected by radar located on select WTG's TPs and aviation obstruction lighting affixed to WTGs would illuminate. All aviation obstruction lights located on a WTG would be turned on by the ADLS in sufficient time to allow the lights to illuminate and flash simultaneously prior to an aircraft reaching 3 NM from and 1,000 ft above any WTG or other structure. Once an aircraft has departed the area, the lights are deactivated by the system. [redacted]

[redacted]

[redacted]

Marine Navigation Lighting

Each WTG and ESP will be permitted as a PATON and marine navigation lights are expected to be installed in accordance with USCG District 1 LNM 33-20. The final navigation lighting equipment, configuration, and intensity will be determined through consultations with BOEM and the USCG.

Each WTG foundation and ESP will be equipped with marine navigation lights consisting of two or more yellow flashing lights. [redacted] Based on USCG District 1 LNM 33/20, yellow marine lights placed on the foundation of a peripheral WTG or ESP will be visible at a distance of 3–5 NM and those placed on the foundation of an internal WTG or ESP will be visible at 2 NM.

SECTION 11
PROJECT SCHEDULE

OVERVIEW

[redacted] Vineyard Wind has complete confidence in this schedule, which is based on the extensive experience the Proposer and its Shareholder Companies—Copenhagen Infrastructure Partners and Avangrid Renewables—have acquired managing the execution of similar projects in the US and abroad. In particular, the experience gained developing Vineyard Wind's first project, Vineyard Wind 1, lends invaluable insight into permitting, procurement, and installation timelines for the Project. A high-level schedule for the Project is provided as Figure 11-1.

[redacted]

[redacted] This is the most realistic schedule given current market and regulatory conditions. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] Additional details and timelines are provided in the Port Infrastructure and Investment Plans (PIIPs) included in this Submission.

PROJECT SCHEDULE AND CRITICAL PATH

Liberty Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles east of Montauk, Long Island. [redacted]

In developing Liberty Wind's schedule and critical path, Vineyard Wind first identified the critical steps and work streams for Project execution, then mapped out the primary activities to deliver the Project in accordance with the key milestones. The following subsections describe high-level Project schedules together with a list of the critical path activities for the Project. Each schedule shows the main activities and their alignment. These schedules are based on a rolling wave planning principle in which the schedule gradually expands as the Project progresses. The Project's critical path activities are identified in Figure 11-2 below and additional detail is provided in Table 11-1.

[redacted]

[redacted]

[redacted]

[redacted]

PERMISSABLE CONSTRUCTION WINDOWS

Vineyard Wind has identified several potential offshore and onshore construction restrictions for the Project, which have been accounted for in the Project's schedule. These include:

- seasonal pile driving restrictions during marine mammal (particularly North Atlantic right whale [NARW; *Eubalaena glaciali]*) migratory periods;
- seasonal and time-of-day restrictions for landfall site installation, onshore export cable installation, and onshore substation civil works; and
- restrictions during periods of high fishing activity or critical life stages (e.g., spawning and egg laying) for key species along the OECC.

[redacted] For Vineyard Wind 1, the Project schedule adheres to January–April restrictions on pile driving for NARW, general summertime restrictions for onshore construction activities, and an April-June restriction on offshore export cable installation in Nantucket Sound during a period of high commercial fishing activity. Vineyard Wind will incorporate schedule constraints in the final construction schedule for Liberty Wind, as appropriate, to address environmental and stakeholder issues.

[redacted]

[redacted]

[redacted]

CRITICAL PATH ANALYSIS

The schedule presented above in Figure 11-1 and 11-2 is robust, in part, because it incorporates significant float to accommodate the long lead times of key components as well as adverse weather conditions that could impact installation activities. Vineyard Wind has previously validated this scheduling approach with key suppliers in connection with Vineyard Wind 1; continued analysis of the logistical approach for Vineyard Wind 1, in consultation with suppliers, has yielded key insights into the ability to scale the same approach to larger projects like Liberty Wind. Given this, Vineyard Wind is confident that the Project's schedule is achievable based on these discussions as well as continued critical supplier discussions, and that the Project will be delivered as planned.

[redacted]

Federal and State Permitting

[redacted]

[redacted]

[redacted]

WTG Installation and Commissioning

[redacted]
Vineyard Wind has invested considerable resources into understanding the potential manufacturing and logistical solutions to ensure the timely procurement the WTGs, foundations, other long lead time components. The information gathered, combined with cross-project benchmark data from the Shareholder Companies' projects, formed the basis of an extensive modeling exercise involving multiple scenarios and potential concepts. [redacted]

ESP Procurement, Design, Manufacturing, Installation, and Commissioning

The ESP is a vital Project component required for the energization of the WTGs and the start of power generation. [redacted]

SECTION 12
CONSTRUCTION AND LOGISTICS

OVERVIEW

Vineyard Wind (the "Proposer") has developed a cost-effective and robust construction and logistics concept for Liberty Wind (the "Project"). This section provides a detailed construction plan addressing all necessary arrangements and processes for outfitting, assembly, storage, and deployment of major Project components. [redacted]

[redacted] Since 2016, Vineyard Wind has conducted extensive supply chain investigations with numerous US and international manufacturers and supply chain partners and has completed agreements for procurement of key components for Vineyard Wind 1. As such, the engineering, construction, and logistics concept for the Project has already been tested in the market and validated by potential New York, US, and international supply partners.

Vineyard Wind completed a comprehensive logistical analysis to inform the Project's construction plan. The analysis assesses multiple installation concepts, including port facilities in New York and different Jones Act compliant vessel spreads, to identify the most robust logistical solution for outfitting, assembly, storage, and deployment of the Project. [redacted]

[redacted]

Vineyard Wind has also carefully investigated opportunities for assembly, storage, staging, and deployment of wind turbine generators (WTGs) using New York ports. [redacted]

Additional detail on port activities, including required investments to upgrade and prepare facilities, is provided in Section 17 and the Port Infrastructure and Investment Plans that accompany this Submission.

MAJOR DEVELOPMENT PACKAGES AND EQUIPMENT

Liberty Wind consists of the following six main work packages:

- Foundations
- Electrical service platform
- Offshore export cables
- Inter-array cables
- WTGs
- Onshore works

A schematic construction plan that depicts the projected sequence of major tasks for each of the six work packages is provided in Figure 12-1. A detailed Project schedule is provided in Section 11.

[redacted]

Vineyard Wind has also conducted a detailed logistical analysis for multiple installation scenarios. Among other things, this analysis examines various vessel spreads and potential use of different harbors, including their operational and load-out capabilities. A downtime analysis was also performed across the installation scenarios to estimate the duration of the offshore campaign based on the net duration of the activities occurring during the campaign, their weather window requirements, and task and vessel interdependencies. [redacted] These results provide Vineyard Wind with unique insights and support the development of an ambitious and robust logistical concept and construction plan. See Attachment 12-1 for the full logistical analysis.

The transport and installation vessel spread terminologies used throughout this section are defined in Table 12-1.

Table 12-1 Installation Vessels and Technologies

Description	Terminology
Feeder Vessels	
Transportation from US load-out harbors to the Offshore Wind Generation Facility site using Jones Act compliant vessels; oceangoing tugs are required for long distances	▪ Self-propelled jack-up feeder vessels (from ports without air draft restrictions) ▪ Tugs ▪ Articulated tug barges (ATBs) ▪ Barges
Transport Barges	
Transportation from manufacturer's fabrication facilities to the Offshore Wind Generation Facility site or a port for staging using non US-flagged vessels (i.e., not Jones Act compliant); oceangoing tugs are required for long distances	▪ Tugs ▪ Barges ▪ ATBs
Heavy Lift Installation Vessel (HLV)	
Installation vessel for foundations (both monopiles and TPs) and ESP	▪ Dynamic positioning (DP) floating heavy lift crane installation vessel(s)
WTG Installation Vessel	
Installation vessel for WTGs	▪ Jack-up crane installation vessel(s)
Heavy Transport Vessel (HTV)	
General transport vessel for foundations, ESP, WTGs, cables, and other Project equipment; for transportation from manufacturer site to the Offshore Wind Generation Facility site or staging port	▪ Semi-submersible HTVs ▪ Heavy transportation vessels with cranes (lower capacity than HLVs) ▪ Transportation vessels (without craneage capability)
Cable Installation Vessels	
Cable laying vessels and cable transport barges are large vessels that contain specialized cable spools for transport and payout of cable during installation	▪ Cable laying vessel ▪ Cable transport barges
Specialized Support Vessels	
Various vessels specifically designed to support offshore wind construction and operation, crew lodging and transportation, and/or general port and offshore logistics	▪ Fall pipe vessel ▪ DP support vessel/offshore support vessel ▪ Noise mitigation support vessels ▪ General support vessels ▪ Crew transfer vessel (CTV) ▪ Anchor handling tug supply (AHTS) vessel ▪ Walk-to-work vessels ▪ Hotel vessel ▪ Safety vessels

An overview of the major tasks associated with Project deployment, including the specialized equipment required to complete each of the work packages, is provided in Table 12-2.

Table 12-2 Major Tasks and Specialized Equipment for Deployment

Major Task	Specialized Equipment
Work Package: Foundations	
Scour protection Foundation transport Harbor operation Foundation installation	▪ Scour protection and fall pipe vessel ▪ Feeder vessels ▪ Transport barges ▪ HTVs ▪ HLV(s) ▪ Hydraulic hammer, pile gripper/piling frame, monopile upending and lifting tool(s) ▪ Drilling equipment (if required) ▪ Noise mitigation support vessels ▪ Noise mitigation system(s) ▪ Protected Species Observer (PSO) team including vessel(s) ▪ Passive acoustic monitoring (PAM) system and vessel ▪ CTVs and helicopter ▪ Safety vessel
Work Package: Electrical Service Platform	
Transport of ESP ESP installation ESP offshore commissioning	▪ Transport barges or HTVs ▪ HLV(s) ▪ Hydraulic hammer, pile gripper/piling frame, monopile upending and lifting tool(s) ▪ Drilling equipment (if required) ▪ Noise mitigation support vessels ▪ Noise mitigation system(s) ▪ PSO team including vessel(s) ▪ PAM system and vessel ▪ Accommodation vessel (either floating or jack-up vessel) ▪ CTVs and helicopter

Table 12-2 Major Tasks and Specialized Equipment for Deployment (Continued)

Major Task	Specialized Equipment
Work Package: Offshore Export Cables	
Transportation Pre-installation surveys and pre-lay grapnel run Landfall site installation Cable installation (laying, burial, and jointing) Pulling into the ESP Termination and commissioning works	▪ Feeder vessels (if required) ▪ Cable transport barge(s)/vessel(s) (if required) ▪ Vessel and grapnel train ▪ Barge and AHTS vessels (if required) ▪ Installation buoys ▪ Cable laying vessel ▪ Cable support vessel incl. remotely operated vehicles (ROVs) ▪ Burial tool (water jetting, plow, mechanical trenchers, etc.) ▪ Dredging vessel (if required) ▪ Cable entry protection system ▪ CTVs ▪ Cable protection placement vessels (if required) ▪ Cable protection (if required) ▪ Temporary and permanent hang-offs ▪ Messenger wires and cable pulling heads ▪ Safety vessels
Work Package: Inter-array Cables	
Transportation Pre-installation surveys and pre-lay grapnel run Cable installation (laying and burial) Pulling into the WTG foundations and ESP Termination and commissioning works	▪ Feeder vessels (if required) ▪ Cable transport barge(s)/vessel(s) (if required) ▪ Vessel and grapnel train ▪ Barge and AHTS (if required) ▪ Installation buoys ▪ Cable laying vessel ▪ Cable support vessel (incl. ROVs) ▪ Burial tool (water jetting, plow, mechanical trenchers, etc.) ▪ Dredging vessel (if required) ▪ Cable entry protection system ▪ CTVs or walk-to-work vessels ▪ Cable protection placement vessels (if required) ▪ Cable protection (if required) ▪ Temporary and permanent hang-offs ▪ Messenger wires and cable pulling heads ▪ Safety vessels

Table 12-2 Major Tasks and Specialized Equipment for Deployment (Continued)

Major Task	Specialized Equipment
Work Package: Wind Turbine Generators	
WTG transport to pre-assembly harbor Harbor logistics and pre-assembly works WTG installation WTG commissioning	▪ Transport barges or HTVs ▪ Mobile harbor quayside cranes ▪ WTG installation vessel(s) (e.g., jack-up crane installation vessel) ▪ Feeder vessels (if WTGs are staged locally) ▪ Lifting equipment, frames, and racks ▪ CTV in combination with helicopter
Work Package: Onshore Works	
Onshore substation Cable works Landfall works (horizontal directional drilling [HDD] duct & installation) Civil duct bank works	▪ Heavy lift equipment, excavating equipment, cranes, electrical cable/bus installation equipment ▪ Splicing equipment, cable pulling equipment, large cable reel trucks ▪ HDD equipment, drilling equipment, containment, generators ▪ Excavating equipment, concrete pouring equipment, milling and paving machines

MARINE TERMINALS

Constructing an offshore wind project in a timely and cost-effective manner requires the availability of specialized facilities and vessels to stage, assemble, and deploy various project components. To determine the best available options for the Project, Vineyard Wind conducted a logistical analysis of different installation solutions, including harbor facilities and vessels. This analysis is provided in Attachment 12-1. Vineyard Wind has validated the results of this analysis with information and experience acquired through the competitive procurement processes that Vineyard Wind continues to conduct with suppliers for the Vineyard Wind 1 and Park City Wind projects.

[redacted]

Table 12-3 provides a summary of the facilities that Vineyard Wind has already secured for the staging, assembly, and deployment of key Project components. [redacted]

[redacted]

[redacted] Additional information is provided below and in Section 17.

[redacted]

[redacted]

[redacted]

[redacted]

STAGING AND DEPLOYMENT

Vineyard Wind, as noted above, has invested considerable resources into investigating harbor facilities and logistical solutions for the staging and deployment of the Project's major components. The results of the analyses performed are provided in Attachment 12-1. The following discussion provides an overview of the approach for staging and deployment of major Project components for each of the Project's six main work packages:

- Foundations
- Electrical service platform
- Offshore export cables
- Inter-array Cables
- WTGs
- Onshore works

Foundations

The primary foundation concept for the Project's WTGs consists of a monopile and TP. This is the concept that will be deployed for Vineyard Wind 1 and is expected to be deployed for Park City Wind. Vineyard Wind has completed multiple rounds of comprehensive competitive tendering for the Vineyard Wind 1 project's foundations and has received binding offers for the fabrication, transportation, and offshore installation logistics, which inform the Project's technical and cost basis.

[redacted]

Foundation deployment consists of the following major tasks:

- Scour protection transport and installation
- Monopile transport to and installation at the Offshore Wind Generation Facility site
- TP transportation to the staging and assembly port and load-out to the Offshore Wind Generation Facility site for installation

Scour Protection Installation

The benefit of scour protection is that foundation penetration can be minimized, as the design does not have to account for significant scour development. If scour protection is used, it is expected to consist of one or two layers of rock material placed around the base of the foundation. Installation of the initial layer of scour protection will be carried out prior to the start of foundation installation. The second layer, if used, may be installed before or after the foundation is installed.

The steps shown in Table 12-4 describe the installation of rock material, which is the most widely used scour protection in the offshore wind industry.

Table 12-4 Scour Protection Transportation and Installation

Transportation and Installation Steps	
Scour protection transportation and installation	1. The scour protection is loaded from a quarry by conveyor belt or crane grab onto a fall pipe vessel or barge and transported to the Offshore Wind Generation Facility site. 2. A pre-construction survey of the bottom bathymetry is conducted. 3. The scour protection is placed prior to the installation of foundations. 4. A post-lay seabed survey of bottom bathymetry is conducted (if additional material is required, local refilling is carried out to ensure the installation is within tolerances). 5. If needed in limited locations, for example to protect the inter-array cables, additional scour material may be placed. If a two-layer scour protection system is used, Steps 3 through 5 are repeated to install a second layer of scour protection around the foundation before or after the foundation is installed.

Several techniques exist for placing scour at the base of WTG foundations, such as side dumping, placement with a crane/bucket, or fall pipes. The fall pipe method, in which a pipe extends from a vessel towards the foundation, has the greatest precision and is sometimes supported by a remotely operated vehicle (ROV) at the fall pipe's lower end. This approach will be used whenever possible. Vessels utilized for this approach will operate in dynamic positioning (DP) mode and will move along a pre-determined route to minimize usage of the scour protection material and ensure even distribution of the rock material. Scour protection material placement will be adjusted during the operation based on bathymetry survey results, if required.

Foundation Transportation

[redacted] Each foundation position will have a custom designed monopile based on site-specific seabed conditions. [redacted]

HTVs are generally very maneuverable, and some are equipped with DP systems, allowing them to maintain their position next to the heavy lift vessel (HLV) and foundation position during monopile and TP installation. A DP system is a computer-controlled system that automatically maintains a vessel's position and heading by using its own propellers and thrusters (i.e., without the use of anchors). [redacted]

[redacted]

[redacted]

Foundation Installation

[redacted] Table 12-6 describes the installation of foundations.

[redacted]

The gripper frame or piling template is used to stabilize the vertical alignment before and during pile driving. Once stabilized, the crane hook is released and the hammer is picked up and placed on top of the monopile. Pile driving will commence, beginning with soft-start to ensure vertical alignment, reduce the risk of pile runs, and allow any motile marine life to leave the area before pile driving intensity is increased. Noise mitigation systems can be applied during piling. After pile driving is complete, the hammer is removed, and a survey of the vertical alignment and flange is carried out to ensure acceptable quality.

Once the monopile is installed, the TP will be picked up and placed on the monopile, using a grouted and/or bolted connection. If an anode cage is required, it will be installed prior to mounting the TP. The electrical connection will be installed by a ROV. [redacted]

Other vessels required during this operation include tugs, a safety vessel, and crew transfer vessels (CTVs) and/or a helicopter.

Electrical Service Platform

[redacted] Vineyard Wind has received binding offers from experienced companies and, where applicable, local contractors, for the fabrication, transportation, and offshore installation logistics. [redacted]

The Project's chosen ESP concept has two primary components: (1) the topside, which houses the electrical components; and (2) the foundation jacket substructure with piles. This is a conventional offshore substation design. The deployment of the ESP will consist of the following main tasks:

- ESP transport and installation
- ESP offshore hook-up and commissioning

ESP Transport and Installation

[redacted]

[redacted]

In general, the foundation substructure installation will be similar to the process described above for WTG foundation installation. [redacted] The topside and the jacket foundation will be connected using a combination of bolts and welding.

Seabed preparation, such as the removal of large obstructions, may be required prior to installation to prevent excessive seabed gradients. If scour protection is needed, it will be installed during the same campaign as the scour protection for the WTG foundations and in the same manner. ESP installation activities are enumerated in Table 12-8.

[redacted]

[redacted] These cables will be routed through J-tubes located on the substructure.

ESP Commissioning

After the ESP is installed, offshore commissioning will commence, which requires the steps indicated below in Table 12-9. A similar "onshore" commissioning of the ESP occurs as part of the final manufacturing process for the topside and is conducted at the factory prior to ESP transport.

[redacted]

Offshore Export Cables

Vineyard Wind has been through a comprehensive competitive tendering process for the supply of offshore export cables for Vineyard Wind 1 and has received binding offers for the fabrication, transportation, and offshore installation logistics. The most robust and price competitive solution for offshore export cable logistics for Vineyard Wind 1 is assumed to be the same for the Project and is described below.

The method and extent to which offshore export cables are buried is dependent on the results obtained from seabed surveys. [redacted] The burial equipment will be deployed and operated from an anchored barge or DP vessel. Additional methods of cable protection, such as rock or mattress placement, may be required in the event of adverse ground conditions. The offshore export cables can be installed both from shore towards the Offshore Wind Generation Facility site or in the opposite direction. [redacted]

Offshore export cable deployment consists of the following main steps:

- Transportation, pre-installation surveys, route clearance, and pre-lay grapnel run
- Landfall site installation
- Cable laying, jointing, and burial
- Cable pull into the ESP
- Cable termination and commissioning works

Transportation, Pre-installation Surveys, and Pre-lay Grapnel Run

The offshore export cables will be transported directly from the fabrication facilities to the offshore export cable corridor (OECC) in a cable transport barge or cable laying vessel. A pre-installation survey will be carried out to assess the water depth, identify shallow geology, and locate objects that might impede cable installation (e.g., lost fishing gear or shipping debris). The planned cable alignment will be prepared with a pre-lay grapnel run. The pre-lay grapnel run involves a vessel towing a grapnel train over the cable route to find and recover debris crossing the cable route. This will be performed in advance of the cable deployment in order to minimize the risk of any debris on the seabed hindering cable installation.

Landfall Site Installation

[redacted] HDD is a trenchless method of installing a conduit in an arc along a prescribed bore path by using a surface-launched drilling rig. Once the conduit is installed, the cable is pulled through it in a process known as "pull in."

Once at the landfall site, the cable laying vessel will position close to the HDD exit and deploy the burial tool. The onshore pulling winch wire will be pulled through the conduit to the cable laying vessel, the wire will be connected to the offshore export cable's end, and the export cable will be pulled through the conduit towards shore. Buoys will be installed on the cable prior to the offshore export cable section leaving the chute of the vessel, enabling the cable to be floated towards the burial tool position. Once at the burial tool position, the buoys will be removed and the offshore export cable end will be guided through the burial tool. The cable pull-in continues until the export cable end arrives at the transition jointing bay at the landfall site.

When the shore pull-in is complete, the cable laying vessel will pull back the burial tool and commence moving towards deeper water. The HDD cable conduit end will then be closed and buried. [redacted] The additional HDD conduit would be completed in quick succession utilizing the same HDD equipment as the first conduit.

Cable Laying and Burial

Once the cable landing is complete, the cable laying vessel will move along the cable alignment while likely simultaneously laying and burying the cable, except in limited areas where laying and subsequent burial is required from a logistical perspective. The burial tool will grade-out near the jointing locations or ESP. The cable ends will be attached with easy recovery rigging markers and buoys.

[redacted] The location and quantity of the joints will be adjusted, as required, to fit the marine installation approach (for specific vessels and installation tools) and the seabed topography. The jointing operations will start with the retrieval of the ends of the already installed cable. The cable ends are brought to the surface by the cable laying vessel or another dedicated vessel. The joint is made inside a dedicated jointing room on board the vessel. Once the joint is performed, it will be lowered to the seabed and subsequently buried.

Cable Pull into the ESP

At the ESP, a pull-in winch will be located at the first deck level. The J-tubes will have a pre-installed messenger wire and cover plate at the end of the bell mouth. As the cable laying vessel approaches the ESP, it will stop at a calculated distance and the cable will be cut and sealed. To commence the pulling into the ESP, an ROV will be lowered to the seabed to recover the messenger wire in the J-tube and connect it to the pull-in head of the cable. As pull-in progresses, the cable laying vessel will move towards the ESP and the cable will be lowered to the seabed. Once the cable is on the seabed, the pull-in continues from the ESP-mounted winch until the cable reaches the hang-off point where a dedicated team will install the temporary hang-off.

Cable Termination and Commissioning

After the offshore export cable is secured on the temporary hang-off, the termination team will start with stripping the cables to expose the power cores and the optical fibers. The permanent hang-off will then be installed. The power core will be routed inside the ESP and terminated in the high voltage gas-insulated switchgear bay. The optical fibers will be connected or terminated into the optical fiber patch box. Ground wires will be connected to the dedicated ground points. Once termination is completed, the export cables will be fully tested and commissioned to confirm they can be energized safely.

Inter-array Cables

[redacted]

[redacted] The cables will be transported directly from the fabrication facility on a cable laying vessel and directly installed at Offshore Wind Generation Facility site upon arrival. [redacted] The method and extent to which inter-array cables are buried is dependent on the results from seabed surveys.

Cable protection measures will be required for the cable transition from the seabed to the WTG foundation, which may be accomplished through a second application of scour protection or other cable entry protection system. Cable pull-in and cable termination will be conducted at each foundation location. Inter-array cable termination is the process by which inter-array cables are connected to the WTG foundation's junction box ahead of WTG installation. This process involves removing the external layers of the cable and splicing the three cores to the termination point.

Inter-array cable deployment consists of the following main steps:

- Transportation, pre-installation surveys, and pre-lay grapnel run
- Cable laying and burial
- Cable pull into the foundations and ESPs
- Cable termination and commissioning

Transportation, Pre-installation Surveys, and Pre-lay Grapnel Run

Inter-array cables will be transported directly from their fabrication facility to the Offshore Wind Generation Facility site on a cable laying vessel or transport barge. A pre-installation survey will be carried out to assess the water depth, identify shallow geology changes since the detailed design survey, and locate objects that might impede the cable installation works. The planned cable alignments within the Offshore Wind Generation Facility site will be prepared with a pre-lay grapnel run. The pre-lay grapnel run involves a vessel towing a grapnel train over the cable routes to find and recover debris crossing the cable route.

Cable Laying and Burial

With the required cable length pulled-in, the cable laying vessel will move in the direction of the next foundation, surface laying the cable along the planned route. The departure angle of the cable will be constantly monitored along with the laid cable length as it leaves the vessel. These measures ensure the cable is not laid with too much tension (which would prevent it from sinking during burial) and help ensure that the cable maximum bending radius is not compromised. As the installation vessel approaches the next foundation, the remaining length required to carry out the second-end pull-in will be calculated and the cable will be cut.

Cable burial operations will be performed by a cable laying vessel or a dedicated separate vessel using a burial tool.

Cable Pull into the Foundations and ESP

Messenger wires can be pre-installed onshore or installed offshore depending on the final strategy or specific foundations selected. In the case of monopiles, messenger wires would be installed directly offshore. Before the inter-array cables are pulled in, the preparation teams will move to the ESP and the foundations to install the pull-in rigging equipment and winch.

A messenger wire will be recovered by the cable laying vessel using an ROV. Once the pull-in rope is on the vessel, it will be connected to the cable pull-in head. After connection of the pull-in rope to the cable rigging, the preparation team will increase tension on the pull-in rope using the tower winch and the cable laying vessel will simultaneously pay out cable. The pull-in will continue until the cable is in the right position in the foundation where it will be secured at the cable hang-off point.

The cable will be installed with a cable entry protection system to ensure cable integrity. A ROV will carry out a final visual inspection of the cable entry protection system and cable and ensure that there are no issues with the scour protection surrounding the monopile.

Cable Termination and Commissioning

After the inter-array cable is secured on the temporary hang-off, the termination team will strip the cables to expose the power cores and the optical fibers. The permanent hang-off will then be installed. The power cores will be routed inside the foundation or ESP and terminated at a dedicated junction box/T-connector. The optical fibers will be connected or terminated into the optical fiber patch box. Ground wires will be connected to the dedicated ground points. Once termination is completed, the inter-array cables will be fully tested and commissioned to confirm they can be energized safely.

Wind Turbine Generators

[redacted]

[redacted]

The WTG staging and deployment consists of the following major tasks:

- WTG transport to pre-assembly harbor
- Harbor operation and pre-assembly
- WTG installation
- WTG commissioning

The WTG consists of three major types of components: the tower sections (two or three sections), the nacelle, and three blades. Each component will be prepared at a fabrication facility and shipped to a pre-assembly harbor. When ready for final assembly offshore, each component will be loaded on to a feeder vessel, HTV (if air draft is not an issue), or transport barge at the pre-assembly harbor and brought to the Offshore Wind Generation Facility site.

WTG Transport to Pre-Assembly Harbor

At the pre-assembly harbor, a sufficient stock of components will be accumulated prior to WTG installation in order to maintain a steady pace of installation activities. WTG components may be transported from their manufacturing sites to the pre-assembly harbor on multi-purpose HTVs or transport barges. These vessels are readily available in the market and various suppliers are already engaged with Vineyard Wind on its other projects.

[redacted]

WTG transport will proceed according to the steps outlined in Table 12-10.

[redacted]

Harbor Operation and Pre-assembly

The main activities at the pre-assembly harbor will be moving WTG components from transport vessels to storage and back onto feeder vessels for transport to the Offshore Wind Generation Facility site for installation. When the nacelles, blades, and tower sections arrive at port, the handling steps listed in Table 12-11 will occur. Mobile harbor cranes will be used for inbound logistics if no crane capability is available on the HTVs and for outbound logistics to lift the WTG components onto the feeder vessels.

[redacted]

[redacted]

WTG Installation

WTG installation will occur continuously until all WTGs are in place. [redacted]

[redacted]

The WTG installation vessel is expected to be a jack-up crane installation vessel. [redacted]

The WTG installation process is further described in Table 12-12.

[redacted]

WTG Commissioning

WTG installation will be followed by commissioning, where the WTGs are prepared for operation and energized. Commissioning involves conducting tests of the electrical infrastructure and the WTG before responsibility is passed on to the operations and maintenance teams for the duration of the WTG service life. The WTG commissioning and testing phase will happen in parallel with the WTG installation phase.

Onshore Works

Onshore works consist of the following major tasks:

- HVDC onshore substation construction
- Landfall site and duct bank civil works
- Cable supply and installation works

HVDC Onshore Station Construction

Vineyard Wind will construct an onshore substation to house terminal equipment for the HVDC export cables. The facility will convert direct current (DC) generated at the Offshore Wind Generation Facility site to alternating current (AC) to interconnect with the electric grid. Construction of the onshore substation is planned to occur in parallel with the onshore duct bank and cable installation. [redacted]

[redacted] As a preliminary concept, a conventional steel frame building will be constructed to enclose a large portion of the HVDC voltage source converter components. The AC interface yard and power transformers, cooling fans, and the phase reactor cooling enclosure will be immediately outside the building. A security fence and gates will be installed to enclose the onshore substation.

Construction of the onshore substation will be completed in four primary phases: (1) site preparation; (2) assembly of foundations and primary structures; (3) equipment installation; and (4) site restoration. Site preparation involves placement of erosion controls and excavation work. The assembly phase involves constructing the foundations and structural facilities. Phase three involves the installation and erection of electrical equipment. Site restoration includes cleanup, landscaping, and site stabilization.

Landfall Site Activities

[redacted] Use of HDD also minimizes or avoids direct impacts to nearshore marine habitat and shorelines. The interconnection of the offshore and onshore export will require a joint installed in a transition vault in the vicinity of the landfall site. The construction of the transition vault and HDD pit for pull-in constitute the majority of the landfall site onshore works.

Horizontal Directional Drilling

[redacted] The HDD operation at each location will include a land-based HDD drill rig system, drilling fluid recirculation systems, residuals management systems, and associated support equipment. The HDD drill rig will be set up behind the HDD entry pit where the drill pipe will be set in place to begin HDD. A bentonite and freshwater slurry will be injected into the borehole to hold the bore open for insertion of the plastic conduit casing as the bore proceeds. When the drill bit advances to the exit point, the bit will be replaced with a series of reamers to widen the borehole. Once the desired borehole diameter is achieved, a pulling head will be placed on the end of the drill pipe and the pipe will be used to pull a section of high-density polyethylene (HDPE) conduit into the bored hole from the exit end. [redacted]

Civil Duct Bank Works

The onshore export cable construction and installation methods include: (1) conventional cut-and-cover of concrete-encased conduit (i.e., installed within duct bank); (2) trenchless crossings (including HDD); and (3) conventional cut-and cover of the HVDC onshore export cable (i.e., direct buried). The onshore export cable route is described in Section 4.

The choice of method will depend on location, mechanical loading considerations, safety factors, environmental impacts, and other applicable requirements. For example, HDD will be used, where practicable, to avoid direct impacts and potential disruption in wetland areas, recreation areas, and roadway/railway crossings. [redacted] Excavation will be performed with standard earthmoving machinery, including excavators and backhoes, and will be performed in accordance with applicable standards, such as New York State Department of Transportation (NYSDOT) highway work permit conditions. Any excess soil or soil unsuitable for use as backfill will be transported off-site in accordance with applicable regulations.

Duct banks will be used to limit the length and time that trenches will be open for public safety reasons. This is especially important along public roadways, walkways, bike paths, etc. Duct banks will be utilized when the cable is installed under roads, in parking lots, or in the roadway shoulders per the requirements of the NYSDOT. The use of duct banks provides mechanical protection for the cable from vehicle loading. Furthermore, the use of duct banks allows for easier access and less environmental disturbance in the event that a cable repair is necessary post installation.

In roadway sections, saw cutting and removal of the existing pavement is required before excavation. [redacted] Native materials will be transported off-site and a fluidized thermal material will be used to backfill the remainder of the trench based on NYSDOT specifications and requirements. In areas outside the roadway, native fill may be used to backfill over the concrete encased conduit in place of the fluidized thermal backfill material.

In limited, select areas along the onshore export cable route, where open trenches and splice pits can be safely managed and future mechanical loading is not of concern, the onshore export cable may be direct buried. The trench excavation shall be approximately 8 ft wide at grade, with a 1:1 slope (the slope and width of excavation may vary due to geotechnical conditions and the terrain along the route). Speed shoring may be used in areas with unstable soil conditions. [redacted]

Cable Supply and Installation Works

The cables will be cross-linked polyethylene (XLPE) insulated cables. It is anticipated that the onshore cables will be transported to site by truck in order to reduce the need for a large staging area for cable laydown. The cable will be installed between manholes at splice vault locations; one reel containing the cable length will be positioned at one manhole and the pulling vehicle with a winch will be at the manhole on the other end of the corresponding duct bank length. Once cables are installed between the vaults, the cables will be spliced together. The supplier will test and commission the cables following cable installation and termination.

Vessel Types and Respective Roles

An overview of vessels, including the number, type, size, and anticipated roles on the Project for each offshore package is provided in Table 12-13. The list is indicative and non-exhaustive.

[redacted]

[redacted]

[redacted]

The Coastwise Laws

This section provides specific information on how the Project's deployment strategy will conform to the requirements of the Merchant Marine Act of 1920 (Jones Act) and the Passenger Vessel Services Act (PVSA; 46 U.S.C. § 55103). As recently as September 2020, the US House of Representatives passed the Expanding Access to Sustainable Energy Act of 2019, which further affirms the currently understood position that foreign flagged-vessels cannot transport merchandise for offshore wind projects between ports, and highlights that US Customs and Border Patrol will enforce these regulations during offshore wind project construction.

[redacted]

The following details the relevant parts of the PVSA and court rulings:

- [redacted]
- [redacted]
- [redacted]

[redacted]

[redacted]

Table 12-14 summarizes Vineyard Wind's approach to compliance with the Jones Act.

[redacted]

Responsible Party and Roles for Each Deployment Activity

Table 12-15 provides a list of the potential parties involved in Project deployment along with their scope of responsibility for each of the work packages. This list represents the suppliers with whom Vineyard Wind has been in direct dialogue. Tier 2 suppliers have been approached (such as harbor owners, crane companies, supply vessel, and transport vessel owners) but are not included in the table below. The list is not to be considered complete as other suppliers are likely to be considered relevant to the Project.

Table 12-15 Parties Potentially Involved in Project Deployment

Work Package/ Deployment Activity	Scope of Responsibility (Major Tasks)	Potential Suppliers
Foundation/ Foundation Installation	▪ Transport of foundations from manufacture's sites to the Offshore Wind Generation Facility site ▪ Port and harbor logistics ▪ Scour protection installation ▪ Foundation installation	[redacted]
Electrical Service Platform/ ESP installation and commissioning	▪ Transport of ESP ▪ ESP installation ▪ ESP offshore completion and commissioning	[redacted]
Offshore Export Cables/ Offshore export cable installation and commissioning	▪ Transportation ▪ Pre-installation surveys and pre-lay grapnel run ▪ Landfall site installation ▪ Laying and burial ▪ Pulling into the ESP ▪ Termination and commissioning works	[redacted]
Inter-array Cables/ Inter-array cable installation and commissioning	▪ Inter-array cable transportation ▪ Pre-installation surveys and pre-lay grapnel run ▪ Cable installation (laying and burial) ▪ Pulling into the WTG foundations and ESPs ▪ Termination and commissioning works	[redacted]

Table 12-15 Parties Potentially Involved in Project Deployment (Continued)

Work Package/ Deployment Activity	Scope of Responsibility (Major Tasks)	Potential Suppliers
Wind Turbine Generators/ Supply of installation vessel spread	▪ WTG transport to pre-assembly harbor ▪ Harbor logistics with storage and pre-assembly activities ▪ WTG installation ▪ WTG commissioning	[redacted] [redacted]
Onshore Works/ Onshore civil works and substation construction	▪ Onshore substation construction ▪ Landfall site works ▪ Civil duct bank works ▪ Cable supply and installation works	[redacted] [redacted]

SECTION 13
FISHERIES MITIGATION PLAN

FISHERIES MITIGATION PLAN SUMMARY

Vineyard Wind (the "Proposer") is committed to developing, permitting, and deploying well-sited offshore wind projects with minimal environmental impact. To do so, the Proposer employs project design and siting measures aimed at avoiding potential impacts from the outset; extensively surveys and monitors offshore areas in support of baseline characterization; works collaboratively with regulators and interested stakeholders to identify appropriate and practicable solutions to further avoid, minimize, restore, and/or offset likely potential impacts; and incorporates data, research, and stakeholder feedback into the final design of its projects. Vineyard Wind has applied this approach in developing the nation's first commercial-scale offshore wind project—Vineyard Wind 1—and is using the same approach for the Liberty Wind (the "Project") and Park City Wind projects.

Vineyard Wind's track record of stakeholder engagement demonstrates that it is a proactive partner on a number of fisheries-related matters. Over the course of the last decade, Vineyard Wind has successfully forged constructive working relationships with fisheries stakeholders despite very challenging circumstances. Aside from building relationships, one key objective fisheries engagement is to find ways to support the region's fishing industry. These conversations recently led to the Vineyard Wind leading a consortium among all New England Wind Energy Area leaseholders to contribute funds to a Southcoast Health pilot program offering free COVID-19 testing directly at the Port of New Bedford in Massachusetts for fishermen.

[redacted]

The Proposer remains convinced that the offshore wind and fishing industries can successfully co-exist in the offshore environment and will continue to build bridges between the two sectors. As this section demonstrates, Vineyard Wind intends to do this by funding research, sharing data, relying on stakeholder feedback to inform and guide decisions about the Project, participating in regional science initiatives, maintaining constant communication through numerous channels, and expanding efforts to directly hire fishermen to support offshore wind development and research efforts.

COMMUNICATIONS AND COLLABORATION

Stakeholder Identification

Vineyard Wind has more than a decade of experience working with fishermen, fishery businesses and organizations, and advocates. The Proposer's track record in the region demonstrates its ability to develop productive working relationships, even in challenging circumstances, with fisheries stakeholders as well as its commitment to develop, permit, and deploy well-sited offshore wind projects with minimal environmental impact.

Since 2010, Vineyard Wind has met with hundreds of fisheries stakeholders, including fishermen from various gear types, sectors, fishing advocacy organizations, and local fisheries groups who are most likely to be affected by offshore wind development on the Outer Continental Shelf (OCS). Notably, Vineyard Wind was the first US offshore wind developer to engage a fisheries representative, and today has formal relations with six fisheries representatives/organizations who represent a variety of gear types and home ports.[1] These fisheries representatives include:

- New Bedford Seafood Consulting,
- New Bedford Port Authority,
- Massachusetts Lobstermen's Association,
- Martha's Vineyard Fishermen's Preservation Trust,
- Coastal Assets Management LLC, and
- Commercial Fisheries Center of Rhode Island.

Vineyard Wind also employs two full-time Fisheries Liaisons (FLs), who have deep knowledge of fishing practices and issues, and an extensive network of personal relationships with a wide variety of fishermen and fishery organizations in the region.[2] In addition to engaging and communicating with the region's fishermen and fisheries stakeholders, among many other things, the FLs actively participate in identifying fisheries studies that are needed to better understand the ecosystem and recruit academic institutions that have collaborative relationships with the fishing industry to execute the research. The FLs are also supported by fishing liaison consultants—referred to as Offshore Fisheries Liaisons (OFLs)—whose role is further described below. Vineyard Wind's FLs also work with Vineyard Wind's Marine Liaison Officer to coordinate marine affairs and surveys.

Vineyard Wind staff are in near daily communication with fisheries stakeholders across the region, including individual commercial (fixed and mobile gear) and recreational fishermen (see Attachment 13-1). Vineyard Wind is also in regular contact with the relevant federal (e.g., Bureau of Ocean Energy Management [BOEM], US Coast Guard [USCG], and National Marine

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[1] Additional information on the fisheries representative role is included in the Fisheries Communication Plan (FCP), which is provided as Attachment 13-2.

[2] Additional information on the Fisheries Liaison role play is provided in the FCP. Biographical information for Vineyard Wind's Fisheries Liaisons—Crista Bank and Caela Howard—is provided in Section 3 and on Vineyard Wind's website at: https://www.vineyardwind.com/fisheries

Fisheries Service [NMFS]) and state agencies on environmental and fishery-related matters. The Proposer is also a member of and/or active participant in the following technical working groups, advisory boards, councils, and commissions:

- Atlantic States Marine Fisheries Commission
- Connecticut Commission on Environmental Standards
- International Council on Exploration of the Seas (member of Working Group on Offshore Wind Development and Fisheries)
- Massachusetts Fisheries Working Group on Offshore Wind Energy
- Massachusetts Habitat Working Group on Offshore Wind Energy
- Mid-Atlantic Fishery Management Council
- New England Fishery Management Council
- NYSERDA's Environmental Technical Working Group
- NYSERDA's F-TWG
- Project Advisory Committee for Automated Radio Telemetry at Offshore Wind Farms
- Regional Wildlife Science Entity
- Responsible Offshore Development Alliance (RODA) Joint Industry Task Force
- Rhode Island Fisheries Advisory Board meetings
- ROSA (Board member and Council member)

In New York, Vineyard Wind has been actively engaged and communicating with commercial and recreational fishermen as well as the Long Island Commercial Fishing Association over the last two years, including dock visits and meeting with fishermen in Montauk and Shinnecock. The Proposer has also engaged several New York fishermen as OFLs. This includes Captain Paul Forsberg, a former commercial fisherman and family member of the recreational Viking Fishing Fleet owners from Montauk. Vineyard Wind now contracts OFLs through Captain Fosberg and his support services company Offshore Wind Farm Support.

Vineyard Wind hosted a fisheries webinar in August 2020 with a focus specific to fishermen and fisheries interests. The webinar provided attendees with information related to Vineyard Wind's current projects, cable installation and monitoring, fisheries science, and fisheries outreach. Vineyard Wind sent invitations for this webinar to fishermen and regulators across the region, including New York, using contact information obtained from Vineyard Wind's fishery email list and Massachusetts State Permit Lists. The webinar was attended by the F-TWG co-lead Morgan Brunbauer.

Vineyard Wind anticipates expanding its outreach to commercial and recreational fishermen in New York throughout the remainder of 2020. This includes plans to hold open port hours in New York to provide fishermen the opportunity to engage with Vineyard Wind's FLs one-on-

one. Vineyard Wind is actively working to expand its use of fishermen and/or fishing vessels to support site assessment and data gathering activities for the Proposer's projects. For Liberty Wind, Vineyard Wind will coordinate these efforts with the F-TWG to ensure opportunities for New York fishermen are communicated in advance and work to identify additional opportunities to develop or invest in collaborative research with the fishing industry.

Vineyard Wind has also sent an e-mail introduction to approximately 40 recreational fishing contacts, primarily fishing clubs and charter businesses, on Long Island with offers to facilitate information exchange and learn more about recreational fishing activities in Lease Area OCS-A 0522 (the "Lease Area") and along the offshore export cable corridor (OECC). Finally, Vineyard Wind is actively searching for a New York fisheries representative in order to strengthen the two-way flow of information between Liberty Wind and New York's fishing communities.

In light of the above, Vineyard Wind is confident in its ability to identify and collaborate with stakeholders relevant to the Project.

Stakeholder Communication

Early, often, and inclusive communication with a range of stakeholders is a hallmark of Vineyard Wind's collaborative development approach. The Proposer's communication efforts prioritize information sharing, soliciting feedback on the design and execution of the Project.

Vineyard Wind's fisheries communication efforts are guided by a Fisheries Communication Plan (FCP), which is based on best practice guidance and input from fisheries stakeholders. Vineyard Wind's, included as Attachment 13-2, is updated regularly in response to stakeholder input, to ensure the communication protocols and tools remain relevant and effective. Vineyard Wind also maintains a dedicated page on its website for fishermen (https://www.vineyardwind.com/fisheries) where FL contact details are readily available along with the latest version of the FCP, fisheries science initiatives and data, and additional relevant information.

To notify fishermen about activities offshore, Vineyard Wind publishes timely Offshore Wind Mariner Updates that include detailed information such as the vessel information, a description of the activities, anticipated dates, charts showing the location of planned operations, vessel contact information, and images of the vessel and/or equipment to be deployed. These notices are published on the Vineyard Wind website, social media channels, and sent via email and SMS text alert to known fisheries contacts and other mariners who have opted-in to receive notifications from Vineyard Wind. At the request of several fishermen, Vineyard Wind recently implemented a weekly email update to recirculate active Offshore Wind Mariner Updates.

Aside from building relationships with the region's fishermen and fisheries stakeholders, one key objective of Vineyard Wind's communication efforts is to find ways to support the fishing industry, particularly around health and safety. These conversations recently led to the Proposer initiating a consortium among all New England Wind Energy Area leaseholders to contribute funds to a Southcoast Health pilot program offering free COVID-19 testing directly at the Port of New Bedford. Testing was made available for fishermen, who are both essential workers and at risk of infection. The funds extended the availability of free COVID-19 tests for fishermen by seven weeks and more than 100 tests were administered. Vineyard Wind is also currently contemplating ways in which it can support locally sourced seafood as another measure to assist fishermen impacted by the ongoing pandemic.

Throughout every phase of the Project, Vineyard Wind will continue to actively engage and communicate with fisheries stakeholders, build and maintain trusted relationships, and follow through on identified issues. Vineyard Wind will communicate regularly with New York State agencies, maintain active participation in the F-TWG, and work with New York's commercial and recreational fishing communities to understand and address concerns. As a member of the F-TWG, Vineyard Wind already communicates with the F-TWG on a regular basis, including recently established recurring monthly meetings with Mr. Brunbauer. Vineyard Wind also sends all of its Notices to Mariners to Mr. Brunbauer so they can be distributed through relevant channels to reach fishermen in New York.

As described in Section 9, and in accordance with ORECRFP20-1, Vineyard intends to engage with New York State agencies on the Project's Site Assessment Plan and Construction and Operations Plan (COP), including meeting with Consulting State Agencies that request a meeting, at reasonable times and intervals in order to attempt to resolve any identified issues. Vineyard Wind will also provide regular Project updates to members of the F-TWG.

Vessel Communication

The FCP includes a set of communication tools and protocols to facilitate communication with vessels actively fishing in or preparing to fish in areas in or adjacent to the Offshore Wind Generation Facility site and along the OECC during site assessment and construction activities. Vineyard Wind is increasingly relying on OFLs to facilitate communication during survey and vessel operations. These individuals are employed to assist vessel captains with communication and to document fishing gear in the area to help avoid interactions. The OFL's role is to continue the role of the FL offshore, so that there is effective communication onsite and in in real time. The OFL reports to the FLs, and serves as the FL's "eyes, ears, and voice" during offshore operations.

Among other things, the OFL records observed fisheries activities, ensures survey vessel operations are compliant with the FCP and other fisheries-related policies and, in particular, seeks to avoid negative fisheries interactions by looking out for fixed gear and establishing communications (usually by very high frequency radio) with fishing vessels when appropriate. If there is a negative fisheries interaction, the OFL works with the FLs and relevant fisheries representatives to resolve the matter safely, fairly, and efficiently. Typically, the OFL is contracted for the duration of a vessel's operations for Vineyard Wind and is an individual familiar with marine operations and fishing practices in the region. Additional information on the OFL role during is provided in the FCP.

MONITORING AND RESEARCH PRE-, DURING- AND POST-CONSTRUCTION

Baseline Data

To establish baseline data on the presence of wildlife in and around the Offshore Wind Generation Facility site, OECC, and surrounding waters, Vineyard Wind will leverage its extensive experience preparing desktop site assessments and collecting survey data within the Massachusetts Wind Energy Area (MA WEA) for two COPs. To supplement existing baseline data, Vineyard Wind is already collecting pre-construction data on fish and invertebrate species within Lease Area OCS-A 0522, as discussed below. Vineyard Wind is also collecting benthic habitat data via surficial and subsurface sonar systems, underwater video, and benthic grab samples as part of its geophysical and geotechnical surveys in Lease Area OCS-A 0522.

Vineyard Wind will also conduct a desktop review of existing literature, which is a necessary part of the Project's COP development process. Many recently completed studies, as well as data from long-term monitoring programs, are available that provide information about fish (including larval and juvenile species), invertebrates, and benthic habitats (especially rare and unique habitats such as hard bottom seafloor) within the MA WEA, surrounding southern New England waters, and New York State waters (see Section 14 and Attachment 14-1).

In support of permitting for Liberty Wind, further desktop review, surveys, and consultations with fisheries stakeholders will be conducted to confirm fish and invertebrate assemblage as well as temporal and spatial variations in fish, invertebrates, and their habitats in and around the Lease Area and along the OECC.

Monitoring for Impacts

Pre-Construction Monitoring

Vineyard Wind has and is continuing to conduct surveys for fish, invertebrates, and benthic habitats. In collaboration with the Massachusetts School for Marine Science and Technology (SMAST), Vineyard Wind has developed and is currently implementing fisheries studies within both Lease Area OCS-A 0522 and Lease Area OCS-A 0501. The pre-construction surveys are being done in collaboration with the fishing community, as they are conducted by SMAST scientists onboard commercial fishing vessels and fishermen were included in the development of the survey methods and plan.

The ongoing fisheries surveys in Lease Area OCS-A 0522 include demersal bottom trawl surveys and drop camera surveys, which are described below. The purpose of the studies is to obtain pre-construction data on seasonal fish abundance, distribution, population structure, habitats, and community composition for future impact assessments and post-construction monitoring. All data from the SMAST surveys are publicly available with completed reports posted on Vineyard Wind's website at: www.vineyardwind.com/fisheries-science.

Demersal Bottom Trawl Surveys

Trawl surveys occur each season (spring, summer, winter, fall) within Lease Area OCS-A 0522. A demersal otter trawl is a net that is towed behind a vessel along the seafloor expanded horizontally by a pair of otter boards or trawl doors. Trawls tend to be relatively indiscriminate in the fish and invertebrates they collect; hence trawls are a general tool for assessing the biological communities along the seafloor and are widely used by institutions worldwide for ecological monitoring. The methodology for the trawl survey was adapted from the Atlantic States Marine Fisheries Commission's Northeast Area Monitoring and Assessment Program (NEAMAP) nearshore trawl survey, which enables Vineyard Wind's trawl data to be integrated with NEAMAP's annual spring and fall trawl surveys that have occurred regionally since 2006. Tow locations within the Lease Area are selected using a systematic random sampling design. The Lease Area (207 square miles) is sub-divided into 10 sub-areas (each ~20.7 square miles), and one trawl tow is made in each of the 10 sub-areas to ensure adequate spatial coverage throughout the Lease Area. As of August 2020, a total of five trawl surveys have been conducted (spring 2019, summer 2019, fall 2019, winter 2020, summer 2020).

Drop Camera Surveys

Drop camera surveys occur twice per year in Lease Area OCS-A 0522 until the start of construction. The minimally invasive, image-based drop camera surveys allow for practical data collection of the epibenthic community and substrate characteristics without causing a disturbance to the seafloor. Samples are taken at 22 stations placed 3.5 miles apart following a grid design. As of August 2020, three drop camera surveys in the Lease Area have been completed (in July 2019, October 2019, and July 2020).

Construction and Post-Construction Monitoring

In recognition of the regional nature of fisheries science, Vineyard Wind plans to develop a framework for during- and post-construction fisheries studies that will involve coordination with other offshore wind energy developers in the MA WEA and Rhode Island/Massachusetts Wind Energy Area (RI/MA WEA) as well as BOEM, federal and state agencies, fisheries stakeholders, academic institutions, and other stakeholders. These studies will be informed and refined based on those that have been put in place for Vineyard Wind 1 and Park City Wind as well as stakeholder input.

Building on its experience from Vineyard Wind 1, Vineyard Wind may use a beyond Before-After-Control-Impact (BACI) framework (recommended by BOEM[3]) and/or a Before-After-Gradient (BAG) framework (suggested by NMFS). The Vineyard Wind 1 project is using a beyond BACI framework to assess trawl and drop camera data and a combination BACI-BAG approach to assess benthic habitat data, where sample stations are placed at regular distances from the impact source (either foundation/scour protection or export cable alignment) along impact monitoring transects.

[3] As recommended in BOEM's (2013) *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585*.

[redacted]

Commercial and Recreational Fishing Impacts

Vineyard Wind is well-positioned to evaluate the potential and expected impacts to fisheries from offshore wind development. Throughout the review process for Vineyard Wind 1, the Proposer has gained expertise on how to utilize the best available data to assess commercial and recreational fisheries activities and to make adjustments to account for different state and federal reporting requirements for the various fisheries and gear types. As described below, Vineyard Wind has also supported research to address data gaps in the recreational fishing sector. Throughout the Project's multi-year permitting phase, Vineyard Wind will also continue working extensively with state and federal partners and resource agencies, including Consulting State Agencies, BOEM, NMFS, the F-TWG, commercial and recreational fisheries stakeholders, academia, and industry economists to quantify commercial and recreational fishing activities, assess the potential economic exposure of the commercial fishing industry to offshore wind development, and evaluate how best to assess changes in commercial and recreational fishing patterns post-construction.

Commercial Fisheries Assessment

For commercial fishermen, Vineyard Wind will conduct a commercial fisheries assessment during COP preparation that that uses best available historical landings data to determine ex-vessel values to ascertain how the Offshore Wind Generation Facility site and OECC is used by commercial fisheries in the region. The assessment will also evaluate the potential for both downstream and upstream economic impacts resulting from the Project. Vineyard Wind anticipates that the commercial fisheries assessment will primarily encompass fishing ports in Massachusetts with the remainder in New York, New Jersey, Connecticut, and Rhode Island.

Using the best available data, Vineyard Wind's primary goal in assessing and quantifying potential fisheries exposure is to create a systematic and comprehensive spatially explicit analysis that, to the greatest extent possible, accurately documents all commercial fishing activities in the Offshore Wind Generation Facility site and along the OECC. The economic value of commercial fishing in any particular area can vary significantly from year to year due to changes in the abundance and distribution of fish and changes in ocean, weather, market conditions, and fishery regulations. However, it is well-established that analyzing data related to the historical economic value of commercial landings from a geographic area is the most reliable basis for assessing the economic exposure of commercial fishing in that area to potential impacts from the construction, operation, maintenance, and decommissioning of the proposed Project.

There is no single source of data, publicly available or otherwise, that fully captures the geographic extent or value of any particular fishery. However, Vineyard Wind has gathered a large volume of qualitative and quantitative fisheries data needed to prepare the COPs and state-level permits for Vineyard Wind 1 and Park City Wind, and Vineyard Wind will continue to make use of the best available fisheries data from federal, state, and third-party sources to maintain the already-developed comprehensive timeseries of each fishery active in the region. These data are augmented through stakeholder outreach to provide context for specific fisheries, fill gaps that may exists for certain fisheries, and incorporate additional qualitative attributes not necessarily available from other data sources.

Importantly, potential impacts of the OECC on fishing activity are expected to be relatively minor, short-term, and localized and largely limited to the construction phase. This is attributed to the following factors:

- Cable installation activities will be temporally limited and will likely occur over a period of several months.
- At any given time during cable installation, fishing may be impaired or precluded only in the portion of the OECC containing ongoing construction activity.
- Vineyard Wind will consider commercial fishing and fish spawning activity when developing the cable installation schedule in consultation with federal and state agencies and marine users.
- Vineyard Wind will prioritize cable burial to sufficient depths and limit the use of cable protection on the seafloor thereby limiting the risk of interactions with bottom fishing gear during the operations phase.

Commercially important fish and invertebrate species may occur within Lease Area OCS-A 0522 and along the OECC. The predominant gear types within the Lease Area are: scallop dredge, gill net, and bottom trawl, which likely harvest scallop, hakes, and monkfish (*Lophius americanus*). Other potential commercially important species that may occur within the Lease Area include: bluefish (*Pomatomus saltatrix*), dogfish, eel, Atlantic cod (*Gadus morhua*), Atlantic pollock (*Pollachius pollachius)*, haddock (*Melanogrammus aeglefinus*), redfish (*Sebastes fasciatus*), skates, squid, mackerel, butterfish (*Peprilus triacanthus*), flounders, scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), Jonah crab (*Cancer borealis*) and American lobster (*Homarus americanus*) (see Attachment 14-1).

[redacted]

[redacted]

[redacted]

Recreational Fisheries Assessment

For recreational fisheries, Vineyard Wind recently partnered with the New England Aquarium Anderson Cabot Center for Ocean Life to study highly migratory species presence across the MA WEA and RI/MA WEA, based on a desktop review and input from the pelagic recreational fleet. The study determined that recreational effort for highly migratory species is widespread, with the highest levels of recreational fishing activity occurring to the west of Lease Area OCS-A 0522. Results from that study are available on Vineyard Wind's website: https://www.vineyardwind.com/fisheries-science.

This study resulted in a further funding proposal from INSPIRE Environmental in partnership with the New England Aquarium to the Massachusetts Clean Energy Center (MassCEC) to support a two-year acoustic tagging and tracking study of highly migratory species at recreational fishing hotspots in the MA WEA and RI/MA WEA identified in the initial study to provide additional baseline data. In May 2020, INSPIRE Environmental and the New England Aquarium were awarded $443,450 in funding administered by MassCEC to set up an acoustic array consisting of 10 acoustic receivers in these hotspots and support additional tagging.[4] Vineyard Wind plans to further support this study effort by deploying an eleventh acoustic receiver on the LiDAR buoy that will be deployed in Lease Area OCS-A 0522.

Data generated by this study, along with stakeholder consultation, will further assist Vineyard Wind's assessment of potential recreational fishing impacts. Vineyard Wind is currently examining ways to expand its outreach to recreational fishermen, including more active engagement with Anglers for Offshore Wind, additional attendance at recreational fishing shows, and engaging a fisheries representative for the recreational fishing sector. Vineyard Wind anticipates continuing conversations with recreational fishermen throughout every phase of the Project to determine potential changes to recreational fishing patterns and will consider opportunities to further support ongoing research efforts. Such efforts may also be funding through the regional investment discussed above.

Collaborative Research

Vineyard Wind is committed to collaborative fisheries research and studies to deepen understanding of fisheries and offshore wind industry interactions, and to identify opportunities to further avoid and minimize impacts. As noted above, the Proposer is already collaborating with several Regional Regulatory and Science Organizations or Entities for long-

[4] See: https://www.masscec.com/about-masscec/news/massachusetts-rhode-island-boem-award-11-million-regional-fisheries-studies-guide

term monitoring and research. Vineyard Wind is also a founding board member of the non-profit ROSA whose mission is to provide for and advance regional research and monitoring of fisheries and offshore wind interactions.

[redacted] Vineyard Wind will also continue working with the region's fisheries interests to identify research priorities that will inform the design and effort of studies to evaluate Project-related impacts. As with the SMAST initiative, these research efforts are intended to be a collaborative process that relies on the input of fisheries interests as well as scientists and regulators.

Fisheries Data Transparency

Vineyard Wind's offshore survey and monitoring efforts are already and will continue to collect a range of environmental and fisheries data as part of the project development process, all of which is and will be available in the public domain in a manner consistent with other academic research. Much of the data will be publicly available through the federal and state permitting process, as well as reports or academic publications that may come out of the survey or monitoring work. Vineyard Wind also plans to make all fisheries monitoring data generated by the Project publicly available on its website, as discussed in Section 13. In fact, several seasons of fisheries data collected in Lease Area OCS-A 0522 are already available on Vineyard Wind's website at: https://www.vineyardwind.com/fisheries-science. ROSA or other organizations or agencies may also develop data sharing programs in which Vineyard Wind would participate.

For all other environmental and fisheries data, including data collected in the construction and post-construction period, Vineyard Wind will explore appropriate ways to store and make data publicly available and easy to access. Through ROSA and/or Regional Regulatory and Science Organizations or Entities, Vineyard Wind will also work with stakeholders and other offshore wind developers to find ways to streamline and standardize available data across all lease areas to further support independent research and collaborative science. In accordance with Section 2.2.6 of ORECRFP20-1, Vineyard Wind will provide a Data Availability Plan to NYSERDA within 120 days of ORECRFP20-1 contract award and execution detailing how Site and Environmental Data will be made available on an ongoing basis as soon after collection as is practicable.

SUPPORTING OTHER RESEARCH

Vineyard Wind is committed to information sharing and supporting independent scientific research, recognizing the importance of engaging in and collaborating on science to further understand the potential impacts of offshore wind. As already noted in this section, Vineyard wind currently supports, or has made funding commitments to support, a number of fisheries-related collaborations with third-party researchers in support of monitoring activities, assessing impacts, and addressing data gaps.

Data Requests and Site Access

Vineyard Wind will review any requests for coordination with third-party supported scientists on a case-by-case basis to the extent that such requests do not concern environmental and fisheries data that Vineyard Wind already intends to make public as described above. Vineyard Wind may impose restrictions on data provision or site access to protect proprietary and/or competitively sensitive information, maintain site security, and ensure safety. However, all requests will be considered and discussed with the requestor and not unreasonably denied.

Funding Independent Research

Vineyard Wind's fisheries science program is currently the largest offshore wind-supported program in the country. The Proposer provides more than $2 million in annual funding for the SMAST surveys along with financial and technical support for the other efforts described in this section. Additional commitments include financial support for the University of Connecticut's Department of Marine Sciences to advance fisheries research and education as part of the Connecticut Initiative on Environmental Research of Offshore Wind, which aims to improve the understanding of environmental impacts from offshore wind. Vineyard Wind is also actively working and financially support RODA-led efforts, through the joint industry task force, to support educational efforts. To date, the task force has organized educational events to improve the level of understanding and encourage dialogue on various topics in the fishing and offshore wind industries, include the Jones Act and geological and geotechnical surveys.

[redacted]

[redacted]

[redacted]

[redacted]

SITE DESIGN CONSIDERATIONS

In developing the MA WEA, BOEM undertook considerable effort to minimize and avoid the risk of environmental and fisheries impacts. During the Area Identification process for the MA WEA, for example, BOEM excluded some of the OCS lease area blocks that overlapped with areas of high commercial fishing value and high value sea duck habitat. Siting choices associated with this process were the first step to minimize and avoid impacts to fisheries as well as other resources and habitats. Vineyard Wind has also taken steps to site and design a Project that avoids impacts to fish, invertebrates, and fisheries during Project construction and operation to the greatest extent practicable. The Proposer is also committed to working with the F-TWG and fisheries stakeholders to refine layouts and design measures, where technically feasible, as the Project moves through the permitting process.

Proposed Site Design

The Project's preliminary layout includes design elements that Vineyard Wind has specifically selected to avoid and minimize potential adverse fisheries impacts. Specifically, Vineyard Wind has proposed a preliminary Project layout with 1 x 1 nautical mile (NM) spacing between Wind Turbine Generators (WTGs), and design elements aimed at minimizing the potential loss of fishing gear due to snags on foundation structures, associated cables and cable protection, or related structures.

The Project's 1 x 1 NM layout arranges the WTGs in a grid pattern, with the WTG rows aligned in an east-west (E-W) and north-south (N-S) direction and 1 NM spacing between all WTGs as well as the Electrical Service Platform (ESP). This uniform layout also inherently creates 0.7 NM-wide diagonal corridors in the northwest-southeast (NW-SE) and southwest-northeast (SW-NE) directions. The Project layout does not include an edge-weighted design (i.e., does not have a higher density of WTGs at the perimeter of the WTG array). This uniform WTG layout will allow vessels to transit through the WTGs on a constant heading track along N-S, E-W, NW-SE and SW-NE corridors at all locations within the Offshore Wind Generation Facility site.

Vineyard Wind notes that the Project's preliminary layout is consistent with the recommendations of the USCG. The USCG recently undertook a port access route study (referred to as "MARIPARS") to evaluate the need for vessel routing measures, including regional transit lanes, within the MA WEA and RI/MA WEA[5] (USCG-2019-0131). On May 27, 2020, the USCG published the final MARIPARS, which found that:

> "Based on fishing vessel tracks, specifically squid, mackerel, and butterfish vessels, there is significant east to west fishing activity in the WEA, particularly in August and September, following the north to south migration of the fish. Based on comments received on this report, there is a 'gentlemen's agreement' between the fixed gear fishermen and mobile hear fishermen to prevent gear entanglement. The fixed gear fishermen set their gear along traditional LORAN-C lines that are generally in an east to west direction. The mobile gear fishermen fish in functional lanes between the set fixed gear, in a general east to west direction."

The MARIPARS recommends "That the MA/RI WEA's turbine layout be developed along a standard and uniform grid pattern with at least three lines of orientation and standard spacing to accommodate vessel transits, traditional fishing operations, and search and rescue operations, through the MA/RI WEA." The USCG concludes that "The adoption of a standard and uniform grid pattern through BOEM's approval process will likely eliminate the need for the USCG to pursue formal or informal routing measures within the MA/RI WEA at this time." Based on these findings and recommendations from the USCG, the Project's preliminary layout is expected to accommodate traditional fishing patterns Lease Area OCS-A 0522.

As with Vineyard Wind 1, Vineyard Wind will continue to account for potential adverse impacts of project design elements and installation techniques and endeavor to select the least impactful technically feasible approach whenever practicable. Vineyard Wind will also prioritize cable burial for Liberty Wind's inter-array and offshore export cables to a depth that allows continued fishing over the cable and limit the use of cable protection such as concrete mattresses.

Site Design Flexibility

Vineyard Wind has reasonable flexibility in the site layout to accommodate specific limited changes that may be identified as the Project moves through the permitting process. [redacted]

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[5] The "MA/RI WEA" as used in the USCG's (2020) MARIPARS includes all seven adjacent lease areas on the OCS south of Martha's Vineyard, Massachusetts, and east of Rhode Island, which are referred to in this Submission as the "MA WEA and RI/MA WEA."

[redacted]

[redacted]

Throughout the Project's multi-year permitting phase, Vineyard Wind will continue to consult with state and federal agencies and fisheries stakeholders, including the F-TWG, regarding design and siting measures for the Project. This includes the required consultations with New York State Agencies in accordance with Section 2.2.3 of ORECRFP20-1. Vineyard Wind will also seek to incorporate any lessons learned from Vineyard Wind 1 and Park City Wind into the final design of Liberty Wind. Finally, any advances in offshore wind energy technology that reduce the potential for adverse impacts will also be considered provided they align with the Project's schedule commitments and permitting requirements.

CONSTRUCTIONAND OPERATION

As noted above, the location of the Project in Lease Area OCS-A 0522 in the MA WEA already avoids and minimizes potential impacts to fish, invertebrates, and fisheries during the Project's construction and operations phases. Vineyard Wind aims to further minimize potential impacts via careful siting of the WTGs, making adjustments to the Project's layout and design elements based on stakeholder input, refining the OECC, micro-siting informed by survey data and fishermen input, and conducting further screening of the proposed landfall site. Vineyard Wind therefore anticipates that the Project's potential impacts to fish, invertebrates, and fisheries will be limited. Measures to avoid, minimize, and mitigate impacts to fish, invertebrates, and their habitats as well as fisheries are further discussed in Section 14.

Vineyard Wind will also implement measures to limit potential impacts to fishing activity occurring in the Lease Area or along the OECC during the construction phase. [redacted]

Additional measures during the construction phase are expected to include USCG-imposed temporary safety zones in the immediate vicinity of the construction and installation vessels in the Lease Area and along the OECC. Temporary safety zones are expected to improve safety in the vicinity of active work areas and would not affect the entire Lease Area or OECC at any given time. No vessel restrictions are anticipated during the operations phase of the Project. Vineyard Wind will also implement any relevant lessons learned from the construction and operation of Vineyard Wind 1 and Park City Wind to the construction and operations phase of the Project.

[redacted]

From a best practice perspective, mitigation funding, including compensatory mitigation for potential fisheries loss and ecological impacts, is the last step and only employed to the extent that proposed avoidance and mitigation measures are exhausted. Further, by the time Liberty Wind begins construction, several offshore wind projects will be operational. Vineyard Wind expects that this will advance the understanding of potential fisheries-related impacts from offshore wind and inform the development of mitigation measures and best practice approaches; therefore, while committed to addressing Liberty Wind's potential impacts, Vineyard Wind believes it is too early to determine which tools and alternative measures are best suited to do so. As such, Vineyard Wind will remain focused on refining environmental assessments, further evaluating potential design changes to avoid or minimize impacts, and consulting with stakeholders to identify mitigation and monitoring measures for the Project.

Minimizing Fishing Gear Interactions

For commercial fisheries, specifically, Vineyard Wind has proposed a Project layout with east-west WTG orientation, 1 x 1 NM spacing between WTG rows, and design elements aimed at minimizing the potential loss of fishing gear due to snags on foundation structures, associated cables and cable protection, or related structures. This includes burying the Project's inter-array and export cables to a sufficient depth whenever practicable to minimize the use of cable protection measures.

In the event fishing gear is lost or damaged, fishermen will be able to file a claim for compensation. Vineyard Wind is currently finalizing procedures for Vineyard Wind 1 to provide fair compensation to fishermen for gear loss. These procedures can be extended to the Project or a separate gear loss compensation mechanism can be created. The final procedures, along with guidance in determining appropriate levels of compensation, will be determined through detailed discussions with the fishing community and relevant agencies and based on lessons learned from Vineyard Wind 1 and Park City Wind.

PROJECT DECOMMISSIONING

Unless otherwise authorized by BOEM, pursuant to the applicable regulations in 30 Code of Federal Regulations (CFR) Part 585, Vineyard Wind is required to remove or decommission all facilities, projects, cables, pipelines, and obstructions and clear the seafloor of all obstructions created by activities on the leased area, including any project easements(s), within two years following lease termination in accordance with any approved SAP, COP, or approved Decommissioning Application. All foundations would need to be removed 15 feet below the mudline (30 CFR § 585.910(a)). Although the Project has a minimum designed life span of 30 years, some installations and components may remain fit for continued service after this time. Vineyard Wind would have to apply for an extension if it wanted to operate the proposed Project for longer than the operating term.

Prior to decommissioning and removing Project components, Vineyard Wind will consult with the relevant New York State agencies, BOEM, and fishing interests to submit a decommissioning plan for review and approval. This process will include an opportunity for public comment and consultation with municipal, state, and federal management agencies and all affected stakeholders.

Upon receipt of the necessary BOEM approval and any other required permits, Vineyard Wind would implement the decommissioning plan to remove and recycle equipment and associated materials. As currently envisioned, the decommissioning process is essentially the reverse of the installation process and involves the following steps: (1) Removal of offshore cable system and any associated cable protection; (2) Dismantling and removal of WTGs; (3) Cutting and removal of foundations and removal of scour protection; (4) Removal of the ESP; and (5) Possible removal of onshore export cables.

General Decommissioning Concept

The WTGs, the ESP, the supporting cabling, and the onshore substation infrastructure will be robustly designed and carefully maintained. As is typical of utility-grade generation and transmission infrastructure, the Project's equipment is expected to have a physical life expectancy of up to 30 years. The following discussion outlines decommissioning procedures and methods that would be most appropriate given today's technology. However, it is reasonable to expect that by the end of the operating term, decommissioning experience in the world-wide offshore wind industry and, more generally, technological advances in methods and equipment servicing the offshore industry, may result in some increased level of efficiencies as well as a reduced level of environmental impacts. The offshore cables could be retired in place or removed, subject to discussions with stakeholders and the appropriate regulatory agencies on the preferred approach to minimize environmental impacts. For Vineyard Wind 1, the commercial fishing sector has request complete removal of inter-array and offshore export cables as they have prior experience with gear interactions from abandoned cables and other sources on the seafloor.

If removal is required, the first step of the decommissioning process would involve disconnecting the inter-array cables from the WTGs. Next, the inter-array cables would be pulled out of the J-tubes (or similar connection) and extracted from their embedded position in the seabed. In some places, in order to remove the cables, it may be necessary to jet plow the cable trench to fluidize the sandy sediments covering the cables. Then, the cables will be reeled up onto vessels. Lastly, the cable reels will be transported to the port area for further handling and recycling. The same general process will likely be followed for the offshore export cables. If protective concrete mattresses or rocks were used to cover portions of the offshore cables, they will be removed prior to recovering the cable.

Prior to dismantling the WTGs, they would be properly drained of all lubricating fluids, according to the established operations and maintenance procedures and the Oil Spill Response Plan (OSRP). Removed fluids would be brought to the port area for proper disposal and/or recycling. Next, the WTGs would be deconstructed (down to the foundation) in a manner closely resembling the installation process. The blades, rotor, nacelle, and tower would be sequentially disassembled and removed to port for recycling using vessels and cranes similar to those used during construction. It is anticipated that almost all of the WTG will be recyclable, except possibly for any fiberglass components.

After removing the WTGs, the steel foundation components would be decommissioned. Sediments inside monopiles and jacket piles (if used) could be suctioned out and temporarily stored on a barge to allow access for cutting. In accordance with the BOEM's removal standards (30 CFR § 250.913), the steel foundations would likely be cut below the mudline using one or a combination of: underwater acetylene cutting torches, mechanical cutting, or a high-pressure water jet. The portion of the foundation below the cut will likely remain in place. Depending upon the available crane's capacity, the foundation/transition piece assembly above the cut may be further cut into several more manageable sections to facilitate handling. Then, the cut piece(s) would be lifted out of the water and placed on a barge for transport to an appropriate port area for recycling. The sediments previously removed from the inner space of the pile would be returned to the depression left once the pile is removed. To minimize sediment disturbance and turbidity, a vacuum pump and diver or ROV-assisted hoses would likely be used.

The WTGs and ESP foundation may be surrounded by stone and/or rock scour protection, which Vineyard Wind expects to propose to remove. The stone and/or rock would likely be excavated with a dredging vessel, set on a barge, and transported to shore for reuse or disposal at an onshore location.

The ESP will be disassembled in a similar manner to the WTGs. Prior to dismantling, the ESP would be properly drained of all oils, lubricating fluids, and transformer oil according to the established operations and maintenance procedures and OSRP. Removed fluids would be brought to the port area for proper disposal and/or recycling. Similarly, any sulfur hexafluoride in gas insulated switchgear would be carefully removed for reuse. Before removing the ESP, the offshore export cables would be disconnected from the ESP and removed, as discussed for inter-array cables above. The ESP topside would then be removed from its supporting jacket foundation and placed on a vessel for transport to port. Depending on the crane capacity available and design of the topside, some of the major electrical gear may be removed before removing the topside. The ESP foundation will likely be removed according to the same procedures used in the removal of the WTG foundations described above.

The extent of the decommissioning of onshore components, such as the onshore export cables, is subject to discussions with the host communities(s) on the decommissioning approach that best meets the host communities needs and has the fewest environmental impacts. The onshore cables, the concrete encased duct bank itself, the transition vaults, and elements of the onshore substations and grid connections could be retired in place or retained for future use. If onshore cable removal is determined to be the preferred approach, the process will consist of pulling the cables out of the duct bank, loading them onto truck-mounted reels, and transporting them offsite for recycling or possible reuse. The splice vaults, conduits, and duct banks will likely be left in place, available for reuse. This approach will avoid disruption to the streets.

During decommissioning activities, a careful inventory of all Project components to be removed would be made. This inventory would include the WTGs, ESP, foundations, offshore export cables, inter-array cables, inter-link cables, cable protection, scour protection, and so forth. As they are removed from the site, Project components would be counted and noted as removed in the inventory. This careful reporting system will ensure that all Project components are removed. Vineyard Wind also anticipates conducting a survey of the seabed to confirm all Project components have been removed.

It is anticipated that the equipment and vessels used during decommissioning will be similar to those used during construction and installation. For offshore work, vessels would likely include cable laying vessels, crane barges, jack-up vessels, larger support vessels, tugboats, crew transfer vessels, and possibly vessels specifically built for erecting WTG structures. For onshore work, construction equipment would likely include truck-mounted winches, cable reels, and cable reel transport trucks.

(OPTIONAL) FISHERIES COMPENSATION PLAN

Vineyard Wind has finalized a compensatory mitigation program for Vineyard Wind 1 to provide reasonable and fair compensation to Massachusetts fishing businesses that experience direct economic losses from that project. The compensatory mitigation funding Vineyard Wind has committed to this program will be held in escrow and managed by a third-party administrator that will be selected by Vineyard Wind in consultation with the Massachusetts Office of Coastal Zone Management. A similar approach could be used for the Project with adjustments for lessons learned along the way.

Vineyard Wind notes that by the time Liberty Wind begins construction, significant experience and understanding regarding potential fisheries-related impacts and mitigation measures will have been acquired. One important discussion currently underway is the relationship of regional versus localized mitigation. Vineyard Wind thinks this is an important discussion and continues to support an approach that works with affected fisheries stakeholders as well as federal and state permitting processes to determine the need for, and form of, compensatory mitigation for the Project.

ADDITIONAL CONSIDERATIONS

Vineyard Wind is committed to working with fisheries stakeholders to better understand and minimize potential impacts from offshore wind on fisheries and the fishing community. To make this possible, as noted in this section, the Proposer has hired two Fisheries Liaisons along with an expanding network of Fisheries Representatives to facilitate communication and foster collaboration with fisheries stakeholders; is engaged at all levels on fisheries issues and a proactive partner on a number of fisheries-related matters; funds the largest offshore wind-supported fisheries research program; employs fishermen to support data gathering, research, and offshore survey efforts; and reacts quickly to address gear interactions when they occur as well as issues raised by fishermen in relation to non-Vineyard Wind lease areas.

Vineyard Wind will grow and adapt its approach over time to best meet the needs of the fishing industry. The Proposer is always thinking creatively to address concerns raised by the region's fishermen, leads by example, and works collaboratively with other offshore wind developers to implement measures that support the fishing community. By the time Liberty Wind achieves commercial operation, Vineyard Wind expects there will be a much greater understanding of the extent to which the offshore wind and fishing sectors can co-exist on the OCS as several commercial-scale offshore wind projects, including Proposer's Vineyard Wind 1 and Park City Wind project, will be operational. Experiences, lessons learned, and data gathered from the construction and operation of these projects will further inform Vineyard Wind's efforts to minimize Liberty Wind's potential impacts on fisheries and the fishing community.

In the meantime, the Proposer will continue working with federal and state regulators, the F-TWG, ROSA, and other fisheries stakeholders to better understand potential social and economic impacts from offshore wind on fishing communities; fund independent research and participate in regional science initiatives; develop plans to avoid, minimize, or mitigate any risks identified; listen to and work with fishermen; and ensure that Project information is available to all who want to learn more.

SECTION 14

ENVIRONMENTAL MITIGATION PLAN

ENVIRONMENTAL MITIGATION PLAN SUMMARY

Vineyard Wind ("the Proposer") is committed to developing, permitting, and deploying well-sited offshore wind projects with minimal environmental impact. To do so, the Proposer: (1) employs project design and siting measures aimed at avoiding potential impacts from the outset; (2) extensively surveys and monitors offshore areas in support of baseline characterization; (3) works collaboratively with regulators and interested stakeholders to identify appropriate and practicable solutions to further avoid, minimize, restore, and/or offset likely potential impacts; and (4) incorporates data, research, and stakeholder feedback into the final design of its projects. Vineyard Wind has applied this approach in developing the nation's first commercial-scale offshore wind project, Vineyard Wind 1, and is using the same approach for the Liberty Wind (the "Project") and Park City Wind projects.

Vineyard Wind's track record readily demonstrates that the Proposer is a willing and cooperative partner capable of developing productive working relationships with environmental stakeholders and engaging them in support of project permitting. A recent federal public comment period for Vineyard Wind 1 resulted in the submission of 13,260 written comments to the Bureau of Ocean Energy Management (BOEM), the overwhelming majority of which were supportive. The success of this effort is due in large part to Vineyard Wind's close coordination with key environmental stakeholders, including the National Wildlife Federation and Union of Concerned Scientists, to generate letters of support for that project.

Vineyard Wind also currently supports a number of collaborative and third-party party research initiatives, as summarized in this section. [redacted]

[redacted]

As further described in this section, Vineyard Wind will also continue to rely on research, data, and stakeholder feedback to inform and guide decisions made throughout the life of the Project. Finally, this section draws upon a considerable body of existing literature to inform the discussion of existing environmental resources relevant to the Project. Accordingly, a separate References subsection is provided in Attachment 14-1.

COMMUNICATIONS AND COLLABORATION

Stakeholder Identification

Vineyard Wind has spent much of the past decade working with environmental stakeholders to develop and permit commercial-scale offshore wind projects on the Outer Continental Shelf (OCS). Along the way, the Proposer has identified and developed relationships with many of the stakeholders relevant to environmental issues, including those for Liberty Wind.

In New York, Vineyard Wind has been actively engaged in the New York State Energy Research and Development Authority's (NYSERDA) Environmental and Fisheries Technical Working Groups (E-TWG and F-TWG, respectively) since their formation and has strong working relationships with NYSERDA staff and members of both working groups. Vineyard Wind staff regularly attend, speak at, and provide input to workshops, specialist committees, and other E-TWG-led discussions and initiatives. Vineyard Wind also participated in the development of the NYSERDA-funded scientific research framework to guide the long-term study of potential impacts to birds and bats from offshore wind energy development in the eastern US, including the multi-day workshop and follow-up document review.

The Proposer has also ramped up its environmental, Disadvantaged Community, and local community engagement efforts, particularly in downstate New York in 2020, as further detailed in Section 15. In doing so, Vineyard Wind has worked to identify additional stakeholders relevant to environmental issues and develop relationships with individuals and organizations relevant to the Project. Engagement with many of these stakeholders will be guided, at least in part, by the Community Engagement Plan provided as Attachment 15-1. [redacted]

Vineyard Wind is also a member of and/or active participant in a number of technical working groups, advisory boards, councils, and commissions that focus on environmental and/or fisheries-related issues (see Section 13). The Proposer is also financially supporting research projects, is actively engaged in environmental collaborations, and/or has committed to develop research initiatives with multiple organizations and institutions in connection with Vineyard Wind 1 and Park City Wind. These include the New England Aquarium, Mystic Aquarium, Woods Hole Oceanographic Institution, climate tech incubator Greentown Labs, and the University of Connecticut's Department of Marine Sciences. Vineyard Wind is planning additional research collaborations with New York environmental and fisheries stakeholders as detailed below and in Section 13.

Given the Proposer's longstanding stakeholder engagement efforts, existing relationships, project partnerships, Community Engagement Plan, and Fisheries Communication Plan (see Section 13), Vineyard Wind is confident in its ability to identify and develop constructive relationships with environmental stakeholders relevant to the Project.

Communication

Early, often, and inclusive communication with a range of stakeholders is a hallmark of Vineyard Wind's collaborative development approach. The Proposer's communication efforts prioritize information sharing, soliciting feedback on the design and execution of the Project, and supporting an efficient and timely permitting process.

Throughout every phase of the Project, Vineyard Wind will continue to actively engage and communicate with environmental stakeholders, foster, build, and maintain trusted relationships, and work to address concerns. Vineyard Wind will communicate regularly with New York State agencies, maintain active participation in the E-TWG, and work with New York's environmental stakeholders to better understand and address concerns. As a member of the E-TWG, Vineyard Wind already communicates and interacts with the E-TWG, E-TWG members, and NYSERDA staff on a regular basis and will continue to do so as the Project moves forward. This includes providing Project updates to the E-TWG at appropriate intervals. [redacted]

[redacted]

MONITORING AND RESEARCH PRE-, DURING- AND POST-CONSTRUCTION

Baseline Data

To establish baseline data on the presence of wildlife in and around the Offshore Wind Generation Facility site, offshore export cable corridor (OECC), and surrounding waters, Vineyard Wind will leverage its extensive experience preparing desktop site assessments and collecting survey data within the Massachusetts Wind Energy Area (MA WEA) for two COPs. To supplement existing baseline data, Vineyard Wind has and will continue to conduct field surveys. The Proposer is already conducting a multi-year high-resolution digital aerial survey of the Lease Area to collect spatial and temporal data on wildlife; these surveys focus on detecting birds, marine mammals, and sea turtles and will include observations of non-biota, such as fishing vessels (see Attachment 14-2). Vineyard Wind is also conducting pre-construction fisheries surveys (trawl and drop camera surveys) and benthic habitat surveys, as described below and in Section 13. These surveys will also gather extensive baseline data on seafloor habitat in the Offshore Wind Generation Facility site.

Vineyard Wind will also conduct a desktop review of existing literature, which is a necessary part of the Project's COP development process. Fortunately, the MA WEA, where the Offshore Wind Generation Facility will be located, is well-studied and baseline data and studies already exist for many species. Key data sources used to characterize the distribution, abundance, and composition of wildlife potentially affected by Project activities are discussed below as well as in Attachment 14-1. Finally, Vineyard Wind will also draw from the vast wealth of survey data collected for Vineyard Wind 1 and Park City Wind including, but not limited to, boat-based offshore avian surveys, fisheries surveys, and benthic habitat surveys.

Monitoring Impacts

Pre-construction Monitoring

As noted above, Vineyard Wind has and will continue to conduct pre-construction monitoring for wildlife in Lease Area OCS-A 0522. For example, the Proposer has already completed 20 high-resolution digital aerial surveys focusing on the Lease Area to collect over one year of spatial data on wildlife including marine mammals and sea turtles; [redacted] Vineyard Wind has conducted similar surveys in Lease Area OCS-A 0501, in connection with Vineyard Wind 1 and Park City Wind. Data from these surveys will also be used to establish an ecological baseline for the Project and assess potential future changes. Additional pre-construction monitoring and data collection efforts for Liberty Wind are described later in this section.

Construction and Post-Construction

Vineyard Wind will implement appropriate monitoring measures during the construction and post-construction phases to assess potential changes to the ecological baseline established for the Project. The measures will be determined through the Project's permitting processes, in consultation with stakeholders, and will be informed by those that have been or will be put in place for Vineyard Wind 1 and Park City Wind as well as NYSERDA's Mitigation and Monitoring Practices Tool. Vineyard Wind is also participating in the development of a Regional Wildlife Science Entity to support efforts to improve regional information on species use.

Vineyard Wind is already gaining valuable experience assessing changes attributable to project activities through the monitoring plans that are being developed and implemented for the Vineyard Wind 1 and Park City Wind projects. For example, scientifically sound, statistically rigorous methods employed for Vineyard Wind 1 include a beyond Before-After-Control-Impact (BACI) framework to assess potential impacts to fish and a combination BACI-Before-After Gradient (BAG) sampling design to assess potential impacts to benthic resources.

The Proposer is also currently developing a framework for a pre- and post-construction monitoring program for birds, bats, and marine mammals for Vineyard Wind 1 that could be applied to the Project. This is being developed in collaboration with federal and state agencies, leading ornithologists, and a host of eNGOs. Additionally, Vineyard Wind has already engaged in extensive consultations with BOEM, the National Marine Fisheries Service (NMFS), the US

Fish and Wildlife Service (USFWS), and other agencies regarding monitoring plans and has an intimate understanding of what agencies expect to see in those plans. For example, Vineyard Wind knows the extent of monitoring for NARW during pile driving that is expected by NMFS.

Vineyard Wind will continue to collaborate with federal and state agencies and relevant stakeholders to identify appropriate approaches to assess and quantify changes attributable to Project activities for different species. At the same time, whenever practicable, the Proposer will design surveys that align with established survey methods so that data generated can be compared to previous data and ongoing regional studies to support longer-term monitoring of the regional impacts of offshore wind development. [redacted]

Environmental Data Transparency

Vineyard Wind's offshore survey and monitoring efforts will collect a range of environmental and fisheries data as part of the Project development process, all of which will be available in the public domain in a manner consistent with other academic research. Much of the data will be publicly available through the federal and state permitting processes, as well as reports or academic publications that may come out of the survey or monitoring work. Vineyard Wind also plans to make all fisheries monitoring data generated by the Project publicly available on its website (see Section 13). ROSA or other organizations or agencies may also develop data sharing programs in which Vineyard Wind would participate.

For other environmental and fisheries data, including data collected in the construction and post-construction period, Vineyard Wind will explore appropriate ways to store and make data publicly available and easy to access. Through ROSA and/or Regional Regulatory and Science Organizations or Entities, Vineyard Wind will also work with stakeholders and other offshore wind developers to find ways to streamline and standardize available data across all lease areas to further support independent research and collaborative science. In accordance with ORECRFP20-1, Vineyard Wind will provide a Data Availability Plan to NYSERDA within 120 days of contract execution detailing how Site and Environmental Data will be made available on an ongoing basis as soon after collection as is practicable.

SUPPORTING OTHER ENVIRONMENTAL RESEARCH

Vineyard Wind is committed to information sharing and supporting independent scientific research, recognizing the importance of engaging in and collaborating on science to further understand the offshore environment and the potential impacts of offshore wind. The Proposer currently supports, or has made funding commitments to support, a number of environmental and fisheries-related collaborations with third-party researchers. Vineyard Wind intends to continue pursuing these efforts, as well as new partnerships and research collaborations with New York State partners as described below and in Section 13.

Data Requests and Site Access

Vineyard Wind will review any requests for coordination with third-party supported scientists on a case-by-case basis to the extent that such requests do not concern environmental and fisheries data that Vineyard Wind already intends to make public as described above. Vineyard Wind may impose restrictions on data provision or site access to protect proprietary and/or competitively sensitive information, maintain site security, and ensure safety. However, all requests will be considered and discussed with the requestor and not unreasonably denied.

Vineyard Wind has already responded to environmental data requests from NYSERDA and numerous others and will continue to do so. Vineyard Wind has also previously responded to questions from NYSERDA regarding how best to conduct geophysical surveys for offshore wind needs, including how to identify and integrate Offshore Fisheries into offshore surveys. The Proposer also plans to share protected species observer (PSO) data with the National Oceanic and Atmospheric Administration (NOAA) and will be providing environmental survey data to both BOEM and NOAA. Vineyard Wind has also previously provided SAP data gathered by a buoy in Lease Area OCS-A 0501 to BOEM.

Funding Independent Research

[redacted]

MARINE MAMMALS AND SEA TURTLES

Vineyard Wind has a solid understanding of existing marine mammal and sea turtle species that may be present at the Offshore Wind Generation Facility site. Through its Vineyard Wind 1 and Park City Wind projects, Vineyard Wind will continue to gain unparalleled experience in developing appropriate measures to minimize potential Project impacts to marine mammals and sea turtles. For example, Vineyard Wind has spent nearly three years consulting with NMFS on mitigation measures in relation to Vineyard Wind 1. As the Proposer's track record readily demonstrates, Vineyard Wind is firmly committed to working with environmental stakeholders to identify and implement appropriate mitigation measures to offset potential impacts to marine mammals and sea turtles, particularly the NARW.

Presence of Marine Mammals and Sea Turtles

Numerous data sources characterize the distribution and abundance of marine mammals and sea turtles potentially affected by Project activities. Examples of primary data sources consulted for this initial assessment include Marine Mammal Stock Assessment Reports; the Northeast Large Pelagic Surveys (Kraus et al. 2016); the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys; the Duke University Habitat-based Cetacean Density Models (Roberts et al. 2016a; 2016b; 2017; 2018; 2020); and the New York Bight Whale Monitoring Program aerial and acoustic surveys. Additional studies and reports are described in Attachment 14-1. Vineyard Wind is also conducting a multi-year high-resolution digital aerial survey of the Lease Area to collect spatial data on wildlife including marine mammals and sea turtles. These studies, reports, and surveys, which were developed using a variety of methodologies (aerial, boat, acoustic), provide comprehensive data sets for marine mammals and sea turtles that define their spatial and temporal distribution

Based on these sources, a basic description of mammal and sea turtle assemblage, temporal use, and spatial use in the vicinity of the Project is provided below and described in more detail in Attachment 14-1. The information presented here, which is primarily based on comprehensive assessments conducted for Vineyard Wind 1 and Park City Wind, is preliminary and will be confirmed through subsequent desktop review and detailed analysis of the surveys conducted in Lease Area OCS-A 0522 and the surrounding region as part of a future COP.

Marine Mammals

Thirty-eight marine mammal species (whales, dolphins, porpoise, seals, and manatees) have been documented as present in the Northwest Atlantic OCS region (CeTAP 1982; Hayes et al. 2018; 2019; Roberts et al. 2016; USFWS 2014). All 38 marine mammal species are protected by the Marine Mammal Protection Act (16 U.S.C. § 1361 et seq.) and some are also listed under the Endangered Species Act (ESA; 16 U.S.C. § 1531 et seq). The five ESA-listed marine mammal species known to be present in southern New England waters are the sperm whale (*Physeter macrocephalus*), NARW, fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), and sei whale (*Balaenoptera borealis*). The humpback whale (*Megaptera novaeangliae*), which may occur year-round, has been delisted as an endangered species federally. However, all six whale species are listed as endangered at the State level, with the humpback whale status under review (New York State Department of Environmental Conservation [NYSDEC] [date unknown]).

Of the 38 marine mammal species documented in the Northwest Atlantic OCS region, four ESA-listed species are likely to be the species of greatest concern given their biology, habitat use, low abundance, ESA status, existing threats, and potential to occur at least seasonally in and around Lease Area OCS-A 0522 and the OECC: NARW, fin whale, sei whale, and sperm whale. These species are migratory. NARW can occur in the MA WEA during all months; the highest seasonal density of NARW occurs in early spring (late February- April) although there is increasing evidence of seasonal distribution shifts. Fin whales primarily occur in the region in the spring and summer, sei whales from spring to fall, and sperm whales in all seasons. Although blue whales are also listed under the ESA, due to habitat preferences and distribution information, this species is not expected to occur in Lease Area OCS-A 0522. This assessment will be confirmed through additional analysis of existing and collected data.

Sea Turtles

Of the six species of sea turtles that can be found in US waters, all of which are protected under the ESA, five may occur within the vicinity of the Project: loggerhead sea turtles (*Caretta caretta*), Kemp's Ridley sea turtles (*Lepidochelys kempii*), leatherback sea turtles (*Dermochelys coriacea)*, green sea turtles (*Chelonia mydas*), and hawksbill sea turtles[1] (*Eretmochelys imbricata).* All five species that may be present are also on New York State's list of endangered, threatened, and special concern species (NYSDEC 2015). However, only three species are likely to occur in and around Lease Area OCS-A 0522 and the OECC. These species are the loggerhead sea turtle, the Kemp's Ridley sea turtle, and the leatherback sea turtle. Sea turtle presence in the MA WEA is primarily limited to summer and fall months as sea turtles use warmer water habitats in the winter months. In addition, no nesting sites are expected near the Project's landfall site. Nevertheless, in light of sea turtles' status under the ESA and their occurrence in and around the MA WEA, all three species of sea turtle are considered species of concern.

Surveys to Establish an Ecological Baseline and Assess Impacts

As noted above and described further in Attachment 14-1, extensive survey work has been conducted to characterize the distribution and abundance of marine mammals and sea turtles in the MA WEA and Rhode Island/Massachusetts Wind Energy Area (RI/MA WEA). Currently available data allows Vineyard Wind to, among other things, generate marine mammal and sea turtle density and exposure estimates to determine potential impacts from the Project in relation to existing population levels.

To supplement the above studies, Vineyard Wind has completed 20 high-resolution digital aerial surveys focusing on Lease Area OCS-A 0522 to collect over one year of spatial data on wildlife including marine mammals and sea turtles. Vineyard Wind plans to commission an additional 12 surveys through July 2021. The surveys are described further in Attachment 14-1 and the survey plan is included as Attachment 14-2. Vineyard Wind is also collecting additional information on the presence and abundance of marine mammals and sea turtles via opportunistic observations by PSOs that occur during any geotechnical and geophysical (G&G) surveys within Lease Areas OCS-A 0522 and OCS-A 0501. In addition, Vineyard Wind has partnered with Orsted, Equinor, Mayflower, the Massachusetts Clean Energy Center (MassCEC), and the New England Aquarium to continue the Northeast Large Pelagic Survey

1 Note that the official range of hawksbill sea turtles extends over the Project but there are no recent recorded sightings of this species in the area.

Collaborative aerial surveys for large whales and sea turtles. To further support efforts to improve regional information on species use, as described above, Vineyard Wind is participating in the development of a Regional Wildlife Science Entity.

Vineyard Wind will use this data to establish an ecological baseline and assess changes to that baseline within the Lease Area. Vineyard Wind will comply with BOEM's site characterization requirements in 30 CFR § 585.626(a)(3) as part of a future COP and expects to follow BOEM's *Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 Subpart F*.

Vineyard Wind will work with federal and New York State agencies to develop appropriate and practicable post-construction survey/monitoring techniques to document any observed impact to marine mammals and sea turtles. Monitoring techniques for these species typically include use of digital aerial surveys, boat surveys, and/or passive acoustic monitoring (PAM; specific to marine mammals); however, as new techniques and technologies become proven, additional tools may also be utilized. The monitoring measures will be informed by those that have been or will be put in place for Vineyard Wind 1 and Park City Wind and will be developed with stakeholder input.

Measures to Minimize Potential Impacts to Marine Mammals and Sea Turtles

Working collaboratively with BOEM, NOAA, Consulting State Agencies, the E-TWG, and other stakeholders, Vineyard Wind will identify appropriate mitigation measures that are expected to effectively avoid and minimize the risk of impacts to marine mammals and sea turtles from underwater sound during the Project's construction phase. Appropriate mitigation and best management practices (BMPs) must consider both practicability for a large-scale project (e.g., safety, logistical ability, Project integrity) and effectiveness at avoiding and minimizing impacts.

This iterative and adaptive process will also incorporate lessons learned from Vineyard Wind 1, Park City Wind, and other offshore wind farm development in the MA WEA and RI/MA WEA. For example, Vineyard Wind will conduct sound source verification during pile driving for Vineyard Wind 1, which will provide information on the effectiveness of the noise attenuation systems used and can be used to inform the noise attenuation technologies employed for Liberty Wind. Vineyard Wind would also integrate any relevant learnings and/or new technologies, as appropriate, that result from the following research and technology development initiatives that Vineyard Wind is currently supporting in connection with Vineyard Wind 1 and Park City Wind:

- **Whales and Wind Fund:** Upon financial close of Vineyard Wind 1, Vineyard Wind will establish a $3 million fund to develop and demonstrate innovative methods and technologies to enhance protections for marine mammals during offshore wind development.
- **Offshore Wind Protected Marine Species Mitigation Fund:** [redacted]

- **Offshore Wind Challenge:** Vineyard Wind has an ongoing partnership with Greentown Labs, North America's largest climate tech incubator, to deliver an accelerator program that supports innovations in responsible development of offshore wind energy. The Offshore Wind Challenge is focused on advances in marine mammal monitoring, specifically for data collection and real-time transmission or data analysis, although technologies will be expandable to monitoring other resources. Three companies have been selected to participate in this challenge and apply their technologies to near, real-time marine mammal detection: SICdrone, Night Vision Technology Solutions, and Open Ocean Robotics. Additional information is available at: https://www.vineyardwind.com/offshorewindchallenge.

Vineyard Wind has also engaged Dr. Christopher Clark as a Senior Scientist to inform the Proposer's efforts to identify appropriate mitigation measures. Dr. Clark was the founding Director and Imogene P. Johnson senior scientist of the Cornell Lab of Ornithology's Bioacoustics Research Program (BRP) from 1987 to 2017 as well as a graduate research professor in the Department of Neurobiology and Behavior at Cornell University. Under his leadership, BRP initiated a suite of acoustic monitoring projects for the critically endangered NARW and other marine mammals along the US Atlantic Coast. These monitoring projects have evolved into the premier method for documenting when and where whales occur along the east coast, and they provide critical data for evaluating and measuring biological impacts of human activities on whales and marine life. As a biologist and engineer, Dr. Clark is an expert in both marine mammal science and biological acoustics and has published more than 300 peer reviewed papers. Throughout his career, Dr. Clark has engaged in numerous collaborative research projects promoting the application of scientific knowledge for responsible conservation of marine mammals and endangered species.

Preliminary Mitigation Measures

While it is premature to finalize mitigation measures at this stage of the Project's development, a number of preliminary measures have been identified. For sea turtles, best available science indicates that sea turtle hearing is less than that of marine mammals; therefore, the proposed mitigation measures described below that focus on protections for marine mammals provide significant protection for sea turtles.

BMPs for Survey Work. All surveys will use BMPs and industry standard equipment. Many of the surveys will entail use of geophysical systems with frequencies at 200 kilohertz or higher that do not require any special mitigation. Where necessary, exclusion, clearance, and monitoring zones will be maintained for an appropriate period of time around noise-generating activities to help measure and mitigate potential noise-related effects on marine mammals during geophysical surveys. The size of these zones will be based on best available science and applicable thresholds (as defined by NOAA) and will be determined in consultation with BOEM and NOAA. Other mitigation measures include PSOs onboard survey vessels actively observing established clearance zones, vessel strike avoidance measures, seasonal restrictions, and shut down and ramp-up procedures.

Temporal Constraints on Pile Driving. [redacted] For Vineyard Wind 1, Vineyard Wind has voluntarily implemented a moratorium on pile driving activities between January 1 and April 30 to minimize the amount of pile driving that occurs when migratory NARW are likely to be in Lease Area OCS-A 0501 and thus limit sound exposure for this endangered species. [redacted]

Pile Driving Noise Attenuation Systems. Sound attenuation technology currently under consideration for the Project includes piling equipment that is optimized for sound reduction (e.g., Integrated Pile Installer), underwater noise abatement systems (e.g., AdBm encapsulated bubble sleeve), and/or bubble curtains. Although attenuation levels vary by equipment type, frequency band, and location, various studies have demonstrated that these mitigation measures are capable of attenuating sounds by approximately 10 to 23 decibels (Bellmann 2014; Christopherson and Lundberg 2013; Reinhall et al. 2015).

Use of Protective Zones, PSOs, and Underwater Vocalization Detection Systems During Pile Driving. Monitoring, clearance, and/or exclusion zones will be established to minimize potential impacts of underwater sound on marine mammals during pile driving. Clearance zones are typically zones in which observations for marine mammals are made prior to starting an activity (e.g., pile driving). An exclusion zone is a shutdown or power-down area surrounding construction activities that may be defined relative to Level A Harassment zones (as defined in NOAA 2018) or based on other criteria as appropriate. In addition, a monitoring zone may be established during impact pile driving to monitor and record marine mammal occurrence and behavior. These monitoring zones are useful for observing potential approach by marine mammals to exclusion zones and can inform understanding of and adaptive management for potential behavioral disturbance. The size of feasible monitoring, clearance, and/or exclusion zones are anticipated to be determined using acoustic modeling in consultation with BOEM and NOAA. NMFS-approved PSOs will monitor protective zones before and during piling activities, utilizing visual aids when necessary. Vineyard Wind anticipates utilizing an underwater vocalization detection system (e.g., PAM) to further detect the presence of marine mammals in Lease Area OCS-A 0522 prior to the commencement of and during any pile driving activities. The system will be identified prior to construction and in consultation with BOEM and NMFS. Data sharing requirements will be determined in collaboration with BOEM, NMFS, and New York State agencies.

Pile Driving Ramp-Up/Soft-Start Procedures. As practicable, a ramp-up (i.e., soft-start) will be used at the commencement of a pile driving activity. A soft-start utilizes an initial set of very low energy strikes from the impact hammer, followed by a waiting period. Additional strike sets gradually increase energy to what is needed to install the pile, which is usually less than hammer capability. A soft-start allows marine mammals and sea turtles to become aware of noise at low levels and avert from the area prior to the commencement of full energy pile driving activities.

[redacted]

In addition to the above mitigation measures, Vineyard Wind will continue reporting protected species sightings to BOEM and NOAA and collaborate with BOEM and NOAA to integrate practicable technology choices in equipment, mitigation, and monitoring (e.g., thermal cameras, sound dampening devices, etc.) to meet the necessary standards for permitting and successful consultations.

Measures to Minimize Risk of Ship Strikes

Vineyard Wind is committed to maintaining the required 1,640-ft (500-meter) setback distance between all transiting construction-related vessels and NARWs. Project vessels will also comply with the NMFS Regional Viewing Guidelines while in transit, which offers additional protections to all marine mammals and sea turtles. Additionally, as safe and practicable, NOAA's vessel strike guidance will be implemented. To avoid collisions with sighted animals, observers who have undergone marine mammal and sea turtle training will communicate in real-time with vessel operators. Vessel operators will be briefed on the Project monitoring and mitigation measures and buffer distances before the Project starts and any time new personnel are brought on-board. Additional vessel operations measures will be addressed through consultation with federal and state agencies, scientists, and eNGOs during the pre-permitting and permitting processes.

BIRDS AND BATS

Through desktop assessments and site-specific surveys performed for Vineyard Wind 1 and Park City Wind, Vineyard Wind has developed a strong understanding of bird and bat assemblages in the vicinity of the Project. Vineyard Wind is already supplementing its immense knowledge by conducting digital aerial surveys over the Lease Area to collect data on birds and other wildlife; these surveys have greater spatial and temporal coverage than BOEM recommended in its 2020 *Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf pursuant to 30 CFR Part 585*. Vineyard Wind has previously performed exposure assessments for bird and bat species as part of two COPs, and as a result, is very knowledgeable about potential impacts and methods to minimize the Project's risk to birds and bats. Like Vineyard Wind 1 and Park City Wind, Vineyard Wind expects to use an Aircraft Detection Lighting System (ADLS), subject to BOEM approval, to reduce impacts from lighting and will apply lessons learned from its previous projects to develop other measures to minimize risk to birds and bats.

Presence of Birds and Bats

This discussion of birds and bats is based primarily on the extensive desktop research and survey work conducted in relation to Vineyard Wind 1 and Park City Wind. Bird and bat presence in Lease Area OCS-A 0522 is expected to be similar to that of Lease Area OCS-A 0501 given the proximity of the two lease areas. However, Lease Area OCS-A 0522 may have different species abundances given the Lease Area's proximity to Nantucket Shoals, as already indicated by the preliminary results of surveys in the Lease Area. The information presented herein is preliminary and will be confirmed and refined through subsequent desktop review of previous surveys, results of ongoing surveys, and consultations with state and federal agencies, researchers, and stakeholders. Additional detailed information on birds can be found in Attachment 14-1.

Birds

Birds in the Offshore Environment

The MA WEA was designed taking bird activity south of Nantucket Island into account; BOEM excluded OCS lease area blocks that overlapped with high value sea duck habitat from the MA WEA (BOEM 2014). In addition, the occurrence of birds in the MA WEA and surrounding area is well-documented. Vineyard Wind has collected the most environmental survey information in the MA WEA of any developer, which demonstrates the Proposer's commitment to understanding and analyzing potential risks to bird species within Vineyard Wind's lease areas. Key studies and reports that contribute to the available information related to birds occurring near the Project include, but are not limited to, the MassCEC seabird surveys (Veit et al. 2016), the Marine-life Data and Analysis Team (MDAT) marine bird abundance and occurrence models (Winship et al. 2018; Curtice et al. 2019), and the Stenhouse et al. (2020) satellite tracking study of diving bird species. Additional data sources are provided in Attachment 14-1.

To complement existing studies and reports for birds, Vineyard Wind is conducting digital aerial surveys across Lease Area OCS-A 0522. Vineyard Wind's goal for these surveys is to collect spatial and temporal distribution and abundance data on birds and other wildlife (including species listed under the ESA) in the Lease Area to support exposure and risk assessments in the COP and to provide a baseline for post-construction monitoring. The specific objectives of the aerial surveys are to: (1) determine the distributions and abundances of wildlife species present in the area, (2) determine seasonal variability in these distributions and abundances, (3) document use of the Lease Area by species of conservation concern, such as the roseate tern (*Sterna dougallii*), and (4) further improve the identification of protected species during aerial digital surveys by surveying a known nearshore avian "hotspot" where focal species are more likely to occur (Veit et al. 2016). These aerial surveys cover the entire Lease Area, plus a 1 nautical mile (NM) buffer. The surveys are conducted monthly, with two surveys per month during the spring (April and May) and fall (August and September) migration periods. [redacted] Vineyard Wind also conducted four boat-based avian surveys in the northern portion of Lease Area OCS-A 0501 in spring 2018 and one year of monthly boat surveys (October 2018 to September 2019) in the southern portion of Lease Area OCS-A 0501, which can be used to corroborate baseline data for the Project given the proximity of the two lease areas.

Based on a review of the data sources listed above for Vineyard Wind 1 and Park City Wind, the most likely marine bird species to occur within Lease Area OCS-A 0522 and surrounding waters include gulls and terns, sea ducks, auks, loons, shearwaters and storm-petrels, and gannets and cormorants. Other migratory non-marine bird species may pass through the Lease Area. This assessment will be advanced through additional analysis of available studies and data collected from the ongoing aerial surveys across Lease Area OCS-A 0522.

Bird Species in the Nearshore and Onshore Environments

[redacted]

[redacted]

Bird Species of Greatest Concern

The bird species of concern are the three species of birds federally listed as threatened or endangered under the ESA that may occur within the vicinity the Project: roseate tern, piping plover, and red knot (*Calidris canutus rufa*). Vineyard Wind's initial assessment is that these three species of birds will have limited exposure to the Project. While bald eagles (*Haliaeetus leucocephalus)* are listed as threatened and golden eagles (*Aquila chrysaetos*), they are no longer federally listed under the ESA and are not expected to be exposed to the Offshore Wind Generation Facility site. The black-capped petrel (*Pterodroma hasitata*), which is proposed for listing as threatened, is not expected to occur in the vicinity of the Project. Thus, these species are not considered species of greatest concern.

Bats

Regional studies generally indicate low use of the offshore environment by cave-hibernating bats (BOEM 2018). In addition, these species are not expected to regularly feed on insects over the ocean. While tree bats are detected more often in the offshore environment, exposure is likely to be limited to the migration period. The northern long-eared bat (*Myotis septentrionalis*) is currently listed as threatened under federal and New York state law. Although the range of the northern long-eared bat extends throughout the Northeast, based on BOEM's (2019) Biological Assessment for Vineyard Wind 1, given the rarity of the bat in the region, its ecology, and habitat requirements, it is extremely unlikely this species would traverse portions of Lease Area OCS-A 0522. Similarly, it is unlikely that eastern small-footed bat (*Mytotis leibii;* a New York State species of special concern), little brown bat (*Myotis lucifugus; a* New York State high priority species of greatest conservation need), or tri-colored bat (*Perimyotis subflavus;* a New York State high priority species of greatest conservation need) would encounter offshore facilities during migration. The Indiana bat (*Myotis sodalis*) is listed as endangered under federal and New York state law, but its range does not extend to the Lease Area or Long Island.

The northern long-eared bat is expected to be a bat species of greatest concern because the onshore portions of the Project may potentially include northern long-eared bat habitat and their federal status is currently being reviewed. The New York Natural Heritage Program (NYNHP) lists the towns of Huntington and Oyster Bay as having summer occurrence records of northern long-eared bat. Liberty Wind will contact NYNHP to determine the onshore facilities' proximity to known northern long-eared bat roost trees or hibernacula. If necessary, during onshore work, Vineyard Wind will adhere to the northern long-eared bat ESA 4(d) Rule and New York State's Endangered Species Regulations. A comprehensive review of bat species, likely impacts, and proposed mitigation measures will be provided in the future COP for Liberty Wind.

Methods to Evaluate Risks to Birds and Bats

During construction, operation, and decommissioning, coastal birds may be exposed to the Offshore Wind Generation Facility during migration and marine birds may be exposed during all seasons. As part of a future COP for Liberty Wind, Vineyard Wind will conduct an avian assessment (as was used for Vineyard Wind 1 and Park City Wind) to determine the likelihood of exposure (i.e., likelihood of occurrence) and vulnerability to collision and displacement across seasons. The exposure of birds to the Project will be evaluated within a local and regional context for each species or species group and categorized as insignificant, unlikely, potential, or likely based upon available literature and a quantitative assessment. Exposure of birds to the Lease Area will be assessed using site-specific data collected during Vineyard Wind's digital aerial surveys, MDAT models, MassCEC surveys, and relevant individual tracking studies. Seasonal or monthly densities will be provided for each marine bird species in the Offshore Wind Generation Facility site to support evaluating individual risk.

Then, vulnerability of species to collision and displacement will be assessed as well as the population sensitivity. For ESA-listed species of greatest conservation concern, a more detailed analysis will be conducted that draws upon all available survey, tracking data, and relevant literature. Details of the exposure and vulnerability assessment and how it will be used can be found in the Avian Appendix of the Vineyard Wind 1 COP.[2] Vineyard Wind will coordinate with BOEM regarding the approach to evaluate risks to birds in the COP.

[redacted]

Measures to Minimize Risk to Birds and Bats

[redacted] To avoid attracting birds and bats during construction (and thus reduce the risk of collision and mortality), Vineyard Wind will reduce lighting as much as is practicable, use red (not white) aviation lights in accordance with Federal Aviation Administration recommendations, and use down-shield lighting and/or down-lighting, as practicable.

During operation, Vineyard Wind will take similar steps to reduce lighting as much as possible. When practicable, the Proposer will reduce the number of lights, use low intensity lights, avoid white lights, and use flashing lights rather than steady burning lights. In addition, when practicable, the Proposer will use hooded lighting and/or down-lighting to limit bird attraction and disorientation, limit outside light to necessary/required lighting, and close blinds on all windows in boat living quarters. Vineyard Wind will also use an ADLS, subject to BOEM approval, which dramatically reduces the total amount to of light produced by the Project's aviation obstruction lights. [redacted]

Approaches to Assess Impacts to Birds and Bats

Data collected during Vineyard Wind's digital aerial surveys across Lease Area OCS-A 0522 will provide a baseline for post-construction monitoring. Vineyard Wind is already developing a framework for a pre- and post-construction bird monitoring program in relation to Vineyard Wind 1 that could be adapted to Liberty Wind. Under the framework, Vineyard Wind is

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2 See https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Vineyard-Wind/Vineyard-Wind-COP-Volume-III-Appendix-III-C.pdf

considering multiple monitoring methods, including established and emerging technologies (e.g., automated radio telemetry, boat-based avian surveys, etc.), to reduce uncertainty about collision and displacement. This framework is being developed through consultation with federal, state, and local agencies, and with input from other stakeholders. Vineyard Wind will also consult E-TWG's Bird and Bat Scientific Research Framework, which is expected to be completed later this year. By the time Liberty Wind nears construction, implementation of the framework will be well underway. During construction, O&M, and decommissioning of the Project, Vineyard Wind will also document any dead or injured birds found on vessels and structures using a standardized protocol.

FISH, INVERTEBRATES AND THEIR HABITATS

Vineyard Wind firmly believes that offshore wind developers must support comprehensive fisheries studies and science as the offshore wind industry grows up alongside the region's oldest offshore industry—fishing. As noted in Section 13, Vineyard Wind is conducting extensive research using accepted methods to document existing fish and invertebrate populations and their habitats and assess and monitor the effects of offshore wind on fisheries. Vineyard Wind is an active member and/or participant in technical fisheries-related working groups and advisory boards in New York, Massachusetts, Connecticut, and Rhode Island as well as a board member and active participant in ROSA. Through its work advancing Vineyard Wind 1 and Park City Wind through the permitting process, Vineyard Wind has gained unique insight into critical issues and mitigation measures for fish, invertebrates, and their habitats.

Presence of Finfish, Invertebrates, and Their Habitats

The MA WEA, which includes the Offshore Wind Generation Facility site, is well-studied. Numerous studies already exist to characterize fish and invertebrate assemblage and their habitats in Lease Area OCS-A 0522, the OECC, and the surrounding region. See Attachment 14-1 for a description of existing data sources.

To supplement existing baseline data, Vineyard Wind is already collecting pre-construction data on fish and invertebrate species within Lease Area OCS-A 0522 and Lease Area OCS-A 0501 in collaboration with the Massachusetts School for Marine Science and Technology (SMAST) (see Section 13). The purpose of the studies is to obtain pre-construction data on seasonal fish abundance, distribution, population structure, habitats, and community composition for future impact assessments and post-construction monitoring. These surveys are designed to be compatible with previous data and ongoing regional surveys. Vineyard Wind also recently partnered with the New England Aquarium Anderson Cabot Center for Ocean Life to study highly migratory species presence across the MA WEA and RI/MA WEA, based on a desktop review and input from the pelagic recreational fleet. This study is now being expanded in coordination with other developers. Vineyard Wind is also collecting benthic habitat data as part of its G&G surveys in Lease Area OCS-A 0522. Based on desktop research and site-specific results of the ongoing fisheries surveys in Lease Areas OCS-A 0522 and OCS-A 0501, Vineyard Wind has a strong understanding of fish and invertebrate assemblage as well as temporal and spatial variations in fish, invertebrates, and their habitats in the vicinity of the Project. A basic description of fish, invertebrates, and their habitats in and around the Offshore Wind Generation Facility site and OECC is provided below and discussed in greater detail in Attachment 14-1. Commercially-important species are discussed in Section 13. The information presented herein is preliminary and will be confirmed and refined through subsequent desktop review, analysis of G&G survey data collected in and near the Project, results of ongoing fisheries surveys in the Lease Area, and consultations with state and federal agencies, researchers, and fisheries stakeholders.

Three federally-listed threatened or endangered fish species may occur off the northeast Atlantic coast: shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and Atlantic salmon (*Salmo salar*). Species that have been proposed for endangered status and not deemed candidates (or are currently candidates for listing and the status determination has not yet been made) are described in Attachment 14-1. Essential Fish Habitat (EFH) is designated for 42 species within Lease Area OCS-A 0522 and 46 species within the OECC. [redacted]

While Vineyard Wind will undertake further desktop research and consult with fisheries stakeholder and experts to determine which fish species, invertebrate species, and habitats are most likely to be impacted by the Project and are of greatest concern, Vineyard Wind's initial review suggests that this assessment could include hard bottom habitat areas as well as federally-listed species and the predominant commercial fishing species (scallop, hakes, and monkfish).

Methods to Evaluate Risks to Fish, Invertebrates, and Their Habitats

To evaluate risks to fish and invertebrates generally, and those of greatest concern specifically, Vineyard Wind expects to assess which species are vulnerable to the Project's potential impact producing factors (IPFs). IPFs for finfish and invertebrate species, across all life stages, are expected to include: habitat alteration (from introduction of foundations, placement of scour or cable protection, and temporary construction activities), cable installation/maintenance, underwater noise (including pile driving noise), sediment suspension and deposition, and electromagnetic fields (EMF). As part of a future COP, Vineyard Wind will evaluate the extent to which IPFs are likely to result in population level impacts to fish, invertebrates, and habitat.

During permitting, Vineyard Wind expects to conduct Project-specific modeling of the cables' magnetic fields and sediment dispersion modeling to assess the potential impacts of cable installation activities. Experience from Vineyard Wind 1 and Park City Wind, as well as BOEM's Real-time Opportunity for Development Environmental Observations (RODEO) study of Block Island Wind Farm, suggest that impacts from sediment dispersion are localized and temporary (only a few hours). BOEM's DEIS (2018) for Vineyard Wind 1 determined that short-term impacts from vessel sounds and pile driving during construction as well as long-term impacts from operational noise and EMF on fish and invertebrates will be minor. The BOEM DEIS (2018) also found that long-term conversion of habitat would have moderate impacts but would not affect fishes and invertebrates at a population level and that the foundations and scour protection would provide a moderate beneficial effect through the creation of artificial reef.

Vineyard Wind will continue to collaborate with federal and state agencies, F-TWG, fisheries stakeholders, academic institutions, and other stakeholders to develop and implement appropriate monitoring measures to assess potential impacts to the ecological baseline established for the Project (see Section 13).

Measures to Minimize Risk to Fish, Invertebrates, and Their Habitats

At present, Vineyard Wind is considering several measures to reduce impacts to fisheries resources and other sensitive species. Generally, mitigation measures to protect marine mammals and sea turtles, which are discussed above, will also protect fish species. For example, pile driving noise will be mitigated through a soft-start, which allows fish time to move away from the area. Further, the WTGs and ESPs will be widely spaced, leaving a vast majority of the Offshore Wind Generation Facility site undisturbed by WTG and ESP installation. Scour protection may be installed around foundations, where necessary, to minimize scouring and sediment suspension around foundations. The addition of foundations, scour protection, and cable protection (if required) may act as an artificial reef and provide habitat previously absent from the area.

Offshore cables will be sited to avoid areas containing sensitive habitats (e.g., eelgrass, oyster reefs, and hard bottom) to the greatest extent feasible. Most impacts from cable installation will be temporary. Cable burial techniques will be selected to maximize the likelihood of achieving sufficient cable burial, minimize the need for cable protection, and minimize suspended sediments during installation. Cable burial in the substrate or cable protection (in limited instances where sufficient burial depth cannot be achieved) will mitigate and/or eliminate potential impacts from EMF. [redacted]

Vessel anchors and legs will be required to avoid known eelgrass beds and other sensitive seafloor habitats (hard/complex bottom) as long as such avoidance does not compromise the vessel's safety or the cable's installation. Contractors will be provided with a map of sensitive habitats to allow them to plan their mooring positions accordingly. Use of mid-line anchor buoys will be considered, where feasible and safe, as a potential measure to reduce impacts from anchor line sweep. [redacted] Additional methods to reduce impacts to fish and invertebrates will be determined based on knowledge gained in the field from all projects and consultations with agencies and stakeholders during Project permitting.

[3] The analysis does not include electric field modeling, since underground lines (including buried offshore cables) produce no above-ground electric fields.

Fisheries Research and Other Mitigation Measures

Vineyard Wind will continue to work diligently with regulatory agencies, academic and fisheries research institutions, and fisheries stakeholders to actively explore other research and measures, which may include ecosystem or habitat enhancements, that could be implemented to reduce risk or impacts to fish, invertebrates, or their habitats. For example, Vineyard Wind is aware that agencies and stakeholders may have preferences for certain types of cable protection to best replicate existing habitats and will work to evaluate these options. Vineyard Wind will evolve and refine its pre-, during-, and post-construction fisheries monitoring program to incorporate results from the Vineyard Wind 1 and Park City Wind surveys, advance alongside regional science efforts, and incorporate advancements in other science and technology. Vineyard Wind also expects to develop a benthic habitat monitoring plan for the Project that is built upon the framework developed for Vineyard Wind 1 and/or Park City Wind but will seek to advance understanding and not revisit questions that may have already been answered. See Section 13 for additional discussion of fisheries research and mitigation measures.

SECTION 15
COMMUNITY ENGAGEMENT PLAN

OVERVIEW

[redacted] The Plan outlines a thoughtful approach to build Project support, respectfully respond to opposition and community concerns, and develop community benefits on a collaborative basis. It also puts Disadvantaged Communities at the forefront of efforts to maximize the economic development, job creation, and environmental benefits of Liberty Wind for New York in full support of Climate Leadership and Community Protection Act (CLCPA) goals. This will be achieved through the following:

- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted] As further described in this section, the Plan, Project benefits, and other initiatives were developed with stakeholder input and informed by lessons learned during Vineyard's first project, Vineyard Wind 1, and Vineyard Wind's second project, Park City Wind and a general companywide engagement in the offshore wind, marine, and environmental community. [redacted]

PROJECT BENEFITS

Liberty Wind offers a range of benefits related to reduced energy burden, avoided health costs, added climate resiliency, avoided environmental costs/added environmental benefits, low-income and EJ population participation, and avoided social costs, as summarized below:

- **Climate Benefits:** [redacted]
- **Reduced Energy Burden:** [redacted]

Avoided Health Costs: [redacted]

[1] NYSERDA Clean Energy Standard White Paper referencing: Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. 2016. Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866.

- **Added Climate Resiliency:** [redacted]
- **Avoided Social Costs:** [redacted]
- **Avoided Environmental Costs/Added Environmental Benefits:** [redacted]
- **Low-income and Environmental Justice Participation:** [redacted]

To fully realize the above Project benefits, and to continuously incorporate stakeholder feedback into Project design and community initiatives, Vineyard Wind has developed a comprehensive and collaborative Community Engagement Plan, which is described below. Liberty Wind's economic development and job creation benefits are further discussed in Section 17.

COMMUNITY ENGAGEMENT PLAN

Vineyard Wind's efforts to develop, permit, and operate Liberty Wind are supported by a community engagement approach that is tried, tested, and proven as described in Liberty Wind's Community Engagement Plan (see Attachment 15-1). The Plan leverages the community engagement expertise Vineyard Wind has acquired over much of the last decade, including the hyper-local experience gained while advancing onshore permitting activities for the Vineyard Wind 1 and Park City Wind projects.

[redacted]

The Plan outlines a thoughtful approach to cultivate Project support, respectfully respond to and work with opposition, and develop community benefits on a collaborative basis. The Plan's key objectives are to:

- identify and provide accurate, factual, timely, and relevant information to stakeholders;
- build and maintain trust and constructive stakeholder relationships;
- provide a range of opportunities for meaningful public engagement and stakeholder consultation;
- ensure the features and benefits of Liberty Wind are well-understood by communities, stakeholders, opinion leaders, and public officials;
- incorporate stakeholder input into Project design, construction, and operations plans wherever feasible; and
- deliver tangible and direct economic benefits from Liberty Wind to local communities and Disadvantaged Communities.

Vineyard Wind will consult with the New York State Energy Research and Development Authority (NYSERDA) in the months following ORECRFP20-1 contract award and execution about the content of this Plan and will take into account any feedback provided during implementation. Vineyard Wind will also provide NYSERDA with quarterly progress reports as required by Section 3.2.8 of the ORECRFP20-1.

Prioritizing Disadvantaged Communities

Vineyard Wind is acutely aware of the many burdens that Disadvantaged Communities in New York face; 2020 has brought this into stark relief with the Black Lives Matter movement, the COVID-19 pandemic, and the aftermath of Tropical Storm Isaias. The Proposer also firmly believes that offshore wind development has the potential to address decades of economic and environmental burdens in the energy sector that are disproportionately concentrated in low-income communities and communities of color. Vineyard Wind has therefore taken steps to ensure Liberty Wind's benefits are available and accessible to and/or realized in Disadvantaged Communities. The measures described below were designed with stakeholder input and incorporate lessons learned from Vineyard Wind 1 and Park City Wind and a general companywide engagement in the offshore wind, marine, and environmental communities.

Vineyard Wind's Disadvantaged Community engagement in New York began in earnest in July 2020 and was informed by a preliminary EJ assessment to identify potentially impacted communities and stakeholders. The EJ assessment is included in Appendix 1 of the Community Engagement Plan (see Attachment 15-1). Among other things, Vineyard Wind staff have attended Climate Justice Working Group public meetings, engaged with organizations that focus on EJ and just transition issues, and reviewed reports and other materials produced by the PEAK Coalition, UPROSE, New York City Environmental Justice Alliance, Climate Works for All, and others.

Vineyard Wind will continue to prioritize and expand engagement with Disadvantaged Communities potentially impacted by the Project, with a specific focus on making economic benefits of offshore wind development available to these constituencies; the Proposer recognizes that direct representation of communities is central to the issues on racial and economic justice. [redacted]

[redacted]

Additionally, Liberty Wind includes a set of workforce training measures aimed at recruiting, supporting, and creating jobs for Disadvantaged Community residents (see Section 17). [redacted]

Altogether, Vineyard Wind believes that Disadvantaged Communities will be at the forefront of the Proposer's efforts to maximize the economic development, job creation, and environmental benefits of Liberty Wind for New York in full support of CLCPA goals. Vineyard Wind looks forward to continuing its Disadvantaged Community engagement and working with this stakeholder group to realize the vision of a just and equitable energy future for all New Yorkers.

STAKEHOLDER ENGAGEMENT

New York Stakeholders

As a hub of the US offshore wind industry, Vineyard Wind's engagement efforts in New York State have been ongoing for several years. This includes Vineyard Wind's participation in the Fisheries Technical Working Group and Environmental Technical Working Group and related stakeholders, as discussed in Sections 13 and 14, respectively. [redacted]

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- [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Vineyard Wind staff have also participated in the Climate Jobs and Just Transition Summit hosted by Climate Jobs NY at Climate Week NYC to engage in discussions about climate change, racial equality, and building a diverse and equitable offshore wind industry; attended Climate Action Council public meetings; attended Climate Justice Working Group public meetings; and presented to the Wind Works Long Island coalition. [redacted]

Acknowledging Vineyard Wind's community engagement work in New York, the Proposer has gathered letters of support, which are included with this Submission as 4.6 Letters of Support. Excerpts from selected letters, included below, demonstrate Vineyard Wind's community engagement in action. They also show Vineyard Wind's ability to effectively establish and cultivate relationships with stakeholders on a virtual basis.

[redacted]

[redacted]

[2] See: https://nylcv.org/wp-content/uploads/nylcv2020gala_program_journal.pdf

[redacted]

[redacted]

[redacted]

[redacted]

Stakeholders Outside of New York

Vineyard Wind's engagement activities have intensified significantly in the past four years as Vineyard Wind moved Vineyard Wind 1 through the permitting process and commenced the permitting process for Park City Wind. The Proposer is in daily contact with a wide array of federal, state, community, fisheries, and environmental stakeholders. In addition to regular phone and e-mail communication, Attachments 15-3 and 15-4 list the federal, non-New York State, local municipality, and local tribe meetings that Vineyard Wind has hosted or attended since 2015.

As Vineyard Wind maintains constructive working relationships with a number of key Lease Area stakeholders, much of the need for identifying stakeholders and introducing the Proposer to local communities has already been conducted. Vineyard Wind's community engagement efforts with these stakeholders is supported by Vineyard Wind's community benefits partner, [redacted]

[redacted]

[redacted]

Vineyard Wind in the Community

Vineyard Wind spends a great deal of time on community organizing, attending, speaking at, and sponsoring events (see Attachment 15-5). Vineyard Wind believes this kind of engagement is not only important to build support for its projects but is a necessary part of being a good corporate citizen. Vineyard Wind's quarterly newsletters showcase the range of events that staff at all levels of Vineyard Wind participate in on a regular basis.[3] These include career fairs for high school students, speaking at community roundtables on climate change, sponsoring fisheries-related trade shows, and organizing events aimed at increasing consumer awareness around renewable energy and electric vehicle transport solutions.

For example, just in 2019, Vineyard Wind hosted 23 community forums, office hours, information sessions, and presentations in the stakeholder communities of Barnstable, Nantucket, Martha's Vineyard, and New Bedford. This is in addition to over 150 other events that Vineyard Wind either attended or participated in. Vineyard Wind uses a variety of tools to inform residents about these events (see Attachment 15-1).

Since the onset of the COVID-19 pandemic in March 2020, the Proposer has successfully transitioned its community engagement efforts to a virtual model (see Section 2). The Proposer has hosted no less than 11 webinars geared towards Cape Cod and Island community stakeholders, which were attended by more than 150 people. Webinars have been hosted for other stakeholder groups, including fisheries and environmental stakeholders. Vineyard Wind has also been invited to present at virtual community meetings held by neighborhood associations, civic associations, and other local stakeholder groups. Despite the challenges presented by COVID-19, the pandemic has highlighted that virtual meetings can be a viable and useful outreach tool, which can be used to supplement and enhance in-person community engagement efforts.

Vineyard Wind's efforts to build the nation's first commercial-scale offshore wind project have also attracted significant media coverage. A selection of news stories about Vineyard Wind is included as Attachment 15-6. Further evidence of interest in and community support for Vineyard Wind and its offshore wind projects is contained in supportive opinion editorials and letters to the editor, which are provided as Attachment 15-7.

[3] See: https://www.vineyardwind.com/news

COMMUNITY ENGAGEMENT EXPERIENCE

Vineyard Wind

Vineyard Wind's track record demonstrates the Proposer's ability to constructively engage with a range of stakeholders on important and complex issues and build local community support for offshore wind projects. Behind Vineyard Wind's successful community engagement efforts are local teams that include community organizing and campaign veterans who have spent years working for environmental non-profits, community organizations, elected officials, and political campaigns in and around the region. Another key factor driving support for Vineyard Wind's projects is the Proposer's commitment to delivering tangible benefits to state and local economies. Recognizing the success of this approach, Vineyard Wind plans to build a similarly local, experienced, and engaged team in New York to support the development of Liberty Wind.

Putting Vineyard Wind's proven approach to community engagement into practice for Vineyard Wind 1 and Park City Wind, the Proposer has already achieved the following:

- Vineyard Wind signed a CBA with a local partner, Vineyard Power (see Attachment 15-8). The CBA gives Vineyard Power a significant and defined role in community outreach and aims to bring economic benefits from Vineyard Wind 1 to Martha's Vineyard.
- Vineyard Wind led a successful outreach effort to encourage participation in the public comment period for Vineyard Wind 1's Draft Environmental Impact Statement (DEIS) with over 400 people attending five meetings in February 2019 (see Attachment 15-9).
- Vineyard Wind overcame opposition to offshore wind on Cape Cod and signed a Host Community Agreement (HCA) with the Town of Barnstable in October 2018, which was unanimously approved, in support of the Vineyard Wind 1 and Park City Wind projects (see Attachment 15-10).

[redacted]

[redacted]

- Vineyard Wind developed the nation's largest offshore wind-supported fisheries science program with over $2 million per year in funding (see Section 13). Key elements of the program were developed with fishermen input, the work is conducted from fishing vessels, and is led by a leading fisheries science academic institution.
- Vineyard Wind entered into a landmark agreement with national and regional environmental organizations to secure additional protections for the critically endangered North Atlantic right whale (*Eubalaena glacialis*).
- Vineyard Wind launched the Offshore Wind Challenge in partnership with Greentown Labs and the Massachusetts Clean Energy Center (MassCEC) to advance real time marine mammal monitoring technologies and committed $3 million to support protection of marine mammals through research and technological innovations (see Section 14).
- Vineyard Wind received overwhelming public support for Vineyard Wind 1 in response to the public comment period for that project's Supplemental Environmental Impact Statement (SEIS). Of the 13,260 written comments received by BOEM, approximately 80% were in favor of Vineyard Wind 1. BOEM also received petitions estimated to contain over 19,500 signatures of which approximately 84% supported Vineyard Wind 1. Additionally, a total of 135 stakeholders spoke at the virtual public hearings and approximately 86% of speakers shared positive comments, spanning economic development, labor, business, community, EJ, climate, and advocacy groups. The SEIS case study, included as Attachment 15-12, provides 100 of the many letters and comments submitted in support of Vineyard Wind 1.

Figure 15-1 Selected Stakeholders Supporting Vineyard 1 SEIS

[redacted]

[redacted]

[redacted]

[redacted]

COMMITMENTS TO ENVIRONMENTAL JUSTICE

Vineyard Wind

From the outset, Vineyard Wind has worked to ensure that EJ, low-income, and other communities at risk from climate change have access to job opportunities and economic benefits from offshore wind in Massachusetts and Connecticut. For Vineyard Wind 1, Vineyard Wind has committed $15 million to establish the Resiliency and Affordability Fund, which will support low-income ratepayers in Massachusetts, promote clean energy projects, and fund the effective use of distributed battery energy storage to enhance the resiliency of local coastal communities.[4] Vineyard Wind has also centered project development and construction activities in Bristol County, an area in southeastern Massachusetts with low-income and EJ populations, with the opening of Vineyard Wind's headquarters in New Bedford and plans to stage the bulk of the Vineyard Wind 1 project's construction activities from the New Bedford Marine Commerce Terminal. Vineyard Wind has collaborated with MassCEC and a variety of educational institutions and workforce stakeholders to support the development and implementation of workforce training programs focused on providing opportunities in the

[4] See https://www.boem.gov/sites/default/files/documents/renewable-energy/Vineyard-Wind-COP-Volume-III-Appendix-III-Q_0.pdf.

offshore wind industry to residents of Southeastern Massachusetts, with a particular focus on the access to opportunities that local community colleges and adult education organizations provide.

Vineyard Wind plans to base operations and maintenance (O&M) of Vineyard Wind 1 at Vineyard Haven on Martha's Vineyard. As UMass Dartmouth's economic analysis of Vineyard Wind 1 project notes, the "steady and well-paying jobs" created by the project during the O&M period will "have a significant positive impact on Martha's Vineyard economy, which experiences severe seasonal fluctuations in employment due to its largely tourism dependent economy" and will result in a "positive and stabilizing impact on one of the Commonwealth's most highly seasonal regional economies."[5,6] As part of its workforce initiative, Vineyard Wind is collaborating with MassCEC, Bristol Community College, and Adult Continuing Education of Martha's Vineyard to provide a 29-credit Offshore Wind Technician Training Certificate remotely to residents of the island, which began in January 2020. The majority of the 14 students in the first cohort are adult "re-trainers" who currently hold seasonal jobs on Martha's Vineyard and are pursuing the certification to gain year-round employment in this new industry that will allow them to remain at home on the island.

Vineyard Wind has also specifically committed $2 million to recruit, mentor, and train residents of Massachusetts, particularly residents in southeastern Massachusetts, for careers in the offshore wind industry. An additional $10 million has been allocated to accelerate the development of the offshore wind supply chain, businesses, and infrastructure in Massachusetts, with a requirement for one-to-one matching funds resulting in a total of $20 million in local investments. These funds will be used, in part, with the aim of creating jobs in critical coastal communities where EJ communities are located, including Barnstable, Martha's Vineyard, and New Bedford.

Park City Wind continues and expands these efforts through ongoing outreach in Bridgeport and Connecticut at-large. Vineyard Wind began engaging local partners in Connecticut more than two years prior to Park City Wind's selection in December 2019. Park City Wind will drive economic development and job creation that directly targets and integrates the local community, particularly minorities, women, second chance citizens, and veterans, into the industry, ensuring that the benefits of offshore wind uplift distressed communities and that those benefits extend beyond Park City Wind's development and construction. Park City Wind established the Connecticut Windward Workforce Fund, which ensures that Connecticut's current and future workforce has access to various educational, training, and workforce

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[5] Borges D, Goodman M, Korejwa E, McCarthy M. 2017. Proposed Vineyard Wind offshore wind energy project estimated contribution to employment and economic development. Public Policy Center, UMass Dartmouth.

[6] Despite the common perception of Martha's Vineyard as an affluent place, Dukes County is actually comprised of year-round communities with a median income significantly lower than the Massachusetts average and limited local economic prospects due in part to geographical constraints and a highly seasonal economy.

pathways into the offshore wind industry. The fund will provide support for local programs and organizations, ensuring trade workers have access to offshore wind training and future offshore wind trade workers can participate in pre-apprenticeship programs to enter the trades.

[redacted]

[redacted]

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[redacted]

ALIGNMENT WITH THE CLCPA

The CLCPA enhances New York's nation-leading clean energy initiatives and embodies the fundamental objective to "build back better" with clean, reliable, and affordable renewable energy. The Project directly advances the CLCPA outcomes, including several of New York's nation-leading climate targets: 85% reduction in GHG emissions by 2050; 100% carbon-free electricity by 2040; 70% renewable energy by 2040; and 9,000 megawatts of offshore wind by 2035.

Vineyard Wind supports New York for the inclusion of essential EJ provisions in the CLCPA. This sets a target for Disadvantaged Communities to receive no less than 35% of the benefits from clean energy programs. In addition to the Climate Action Council, the CLPCA also created the Climate Justice Working Group to establish the final criteria for identifying Disadvantaged Communities based on indicators related to public health, environmental hazards, and socioeconomic factors. As recognized in the ORECRFP20-1, the focus of the Community Engagement Plan for Disadvantaged Communities associated with the Project will rely on NYSDEC Potential Environmental Justice Areas and the Empire State Development New York Opportunity Zones as a starting pathway to incorporate indicators into actions. The Proposer is cognizant that these systematic issues extend beyond geographic regions and the Community Resiliency Fund can encompass any evolution of the criteria and indicators in the implementation of the community-led energy projects.

[redacted]

As this section demonstrates, prioritization of Disadvantaged Communities is highlighted throughout the Project in stakeholder input, direct economic benefits, workforce development and supply chain programs, and community engagement. The Community Engagement Plan seeks to develop a sustainable process whereby all of the communities potentially impacted by the Project are actively engaged, see tangible benefits from offshore wind development and a partnership with Vineyard Wind, and have an opportunity to take part in a just transition to a clean energy future. Vineyard Wind is committed to advance the targets of the CLCPA with Liberty Wind and environmental justice for all New Yorkers.

SECTION 16

VISIBILITY AND VIEWSHED IMPACTS

OVERVIEW

Liberty Wind (the "Project") is an offshore wind project that Vineyard Wind (the "Proposer") is proposing to build in federally designated Lease Area OCS-A 0522 (the "Lease Area"), which is located approximately 84 miles (over the horizon) east of Montauk, Long Island. [redacted]

Liberty Wind's Offshore Wind Generation Facility will be located more than 20 statute miles from the nearest shore. [redacted] Liberty Wind will not be visible from any mainland locations, including New York State.

Due to the Project's sheer distance from any shoreline, visibility and viewshed impacts are largely avoided. [redacted] As a result, the Offshore Wind Generation Facility would result in minimal change to landscape conditions for viewers along the Nantucket coastline. To the extent the Offshore Wind Generation Facility can be seen from the nearest coastal vantage points, when viewed within the context of the ocean that includes the vast expanse of water, extended beach views and dunes, as well as the sights and sounds of breaking surf and wind, any visible portion of the WTGs will be very difficult to perceive and visually subordinate to the wider landscape.

PROJECT LOCATION

Lease Area OCS-A 0522 is a 132,370-acre area in the open Atlantic Ocean, located south/southeast of Martha's Vineyard and Nantucket and is one of five lease areas in the Massachusetts Wind Energy Area (MA WEA). For the purposes of this Submission, Liberty Wind's Offshore Wind Generation Facility site is defined as Lease Area OCS-A 0522.

[redacted]

[redacted]

OFFSHORE WIND GENERATION FACILITY LAYOUT

[redacted] Vineyard Wind notes that the proposed preliminary WTG layout described in this Submission is subject to federal permitting requirements and further stakeholder consultation.

VISIBILITY ASSESSMENT

In accordance with the requirements of ORECRFP20-1, Vineyard Wind commissioned Saratoga Associates, a New York-based landscape architectural, architectural, planning, and engineering services firm, to perform a visibility study for the Project (see 4.6 Letter of Support). [redacted] The study, including the required photo simulations, included in Attachment 16-1, confirm the very limited visual and viewshed impacts of the Offshore Wind Generation Facility.

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

Theoretical Visibility

[redacted]

1 See: https://www.boem.gov/vineyard-wind-cumulative-visual-assessment

[redacted]

Given the distance from the nearest coastal vantage points, the elements of the WTG that are potentially visible would be minimally discernible by the naked eye even in the best visibility conditions (i.e., a clear, low humidity day). In the case of long-distance views, theoretical visibility typically exceeds actual visibility. In seascapes, atmospheric haze reduces the practical viewing limit, sometimes significantly. The presence of waves also obscure objects very low on the horizon. The limits of human visual acuity reduce the ability of an observer to discern objects at great distances, suggesting that even when mathematically visible above the horizon, WTG elements may not be discernible to the human eye.

Project Visibility

Nantucket

[redacted] Viewing distances increase as viewers move up or down the coast on Nantucket.

[redacted]

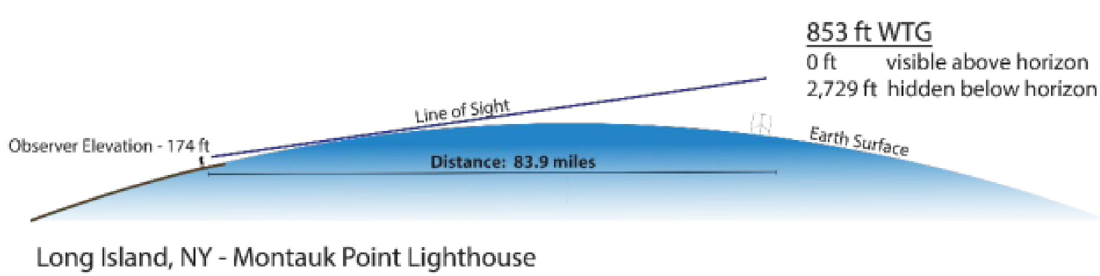
[redacted]

[redacted]

New York

The closest location to the Offshore Wind Generation Facility site in New York State is Montauk Point, Long Island which is approximately 84 miles away. Even from the top of the Montauk lighthouse (174 ft above sea level) the Project will not be visible above the horizon. Figure 16-4 is a line-of-sight diagram illustrating the visual screening from Montauk Point.

Figure 16-4 View of Nearest Liberty Wind WTG from Montauk Point



Potential Visual Impacts of the Project

Onshore Visibility

[redacted]

Offshore Visibility

For offshore viewers, potential visual impacts could be greater than for onshore viewers because boats could closely approach or potentially move through an offshore wind generation facility. In a close approach, the large form and strong geometric lines of both the individual WTGs and the array of WTGs could dominate views, and the large sweep of the moving rotors would draw visual attention. Structural details, such as surface textures, could become apparent, and the ESPs could be visible as well, as could strong specular reflections from the towers and moving rotor blades.

Meteorological Visibility

Visibility of the Offshore Wind Generation Facility will be reduced by fog, precipitation, particulate matter, smog, or any combination of thereof. Meteorological analysis indicates that haze, fog, and other atmospheric conditions limit visibility to less than 10 miles approximately 32% of the time on an annual basis (see Attachment 16-1). In general, views greater than 10 miles are obscured more frequently during the summer—nearly 39% of the time on Nantucket. It is important to note that visibilities greater than 10 miles are still reported as 10 miles. Therefore, given the nearest shoreline vantage point is more than 30 miles, it is reasonable to conclude that the Offshore Wind Generation Facility, to the extent it is visible, will be obscured from coastal vantage points more frequently. In addition, the presence of waves, sea spray, and salts further affect visibility beyond what is reported in meteorological data.

Visibility of Night Lighting

[redacted] Subject to BOEM approval, Vineyard Wind will use an ADLS that automatically activates all aviation obstruction lights when aircraft approach the Offshore Wind Generation Facility Site. [redacted]

MITIGATION MEASURES

The sheer distance of the Offshore Wind Generation Facility from the nearest shoreline significantly limits visibility and viewshed impacts; the small portion of the Offshore Wind Generation Facility that will be visible from the nearest vantage point on Nantucket is effectively indiscernible under most viewing conditions. As such, the need for mitigation options for the

Project to reduce visibility and potential viewshed impacts is limited. Nevertheless, certain Project design elements and commitments will further mitigate any potential visibility and viewshed impacts. These include:

- **Design and Appearance:** The WTGs are uniform in shape, color, size of rotor blades, nacelles, and towers to minimize visual contrast. Tubular tower designs are similarly used throughout the Offshore Wind Generation Facility and components are in proportion to one another. The design and appearance of the Project are consistent with best practices to minimize visual impact.
- **Color Selection:** In accordance with Federal Aviation Administration (FAA) Advisory Circular 70/7460-1L, Vineyard Wind will paint the WTGs no lighter than RAL 9010 Pure White and no darker than RAL 7035 Light Grey; however, it is anticipated that the WTGs will be painted off-white/light gray to blend into the horizon. The off-white/light gray color will reduce contrast with the sea and sky under most conditions, thus minimizing daytime visibility of the WTGs. The yellow color of the WTG foundation falls below the visible horizon and will not be visible from onshore viewpoints. No commercial/advertising messages will be placed on the WTGs.
- **Reduction in Nighttime Lighting:** Marine navigation warning lights (required by the USCG) will not be visible from any land-based vantage point and is thus not an impact to be mitigated. Aviation obstruction lights on the WTGs will contribute to their visual impact. However, such lighting is implemented as a safety measure and cannot be eliminated. Lighting-related impacts can be reduced by limiting WTG lighting to the minimum duration allowed by BOEM. Vineyard Wind will use an ADLS, subject to BOEM approval, that is automatically activates the lights when aircraft approach, which would substantially reduce the amount of time such lights would be visible.

[redacted]

[redacted]

[redacted]

[redacted] Together with its local partners, Liberty Wind will:

- [redacted]
- [redacted]

[redacted]

[redacted]

[redacted]

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[redacted]

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Liberty Wind Proposals

[redacted]

[redacted]

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[redacted]

[redacted]

Liberty Wind Benefits

[redacted]

[redacted]

[redacted]

PUBLIC

[redacted]

Liberty Wind's Economic Impacts

[redacted]

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SECTION 18

CARBON EMISSIONS AND EMBODIED CARBON

OVERVIEW

[redacted] Importantly, Liberty Wind will further decrease the region's reliance on fossil fuels and enhance the reliability and diversity of the regional energy supply.

[redacted] As such, Liberty Wind will support New York State's nation-leading clean energy mandates. [redacted]

This section demonstrates how, with respect to the Project's carbon emissions and embodied carbon, the Proposer commits to:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

CLIMATE BENEFITS

Liberty Wind will produce clean, renewable offshore wind energy that is expected to displace electricity produced by fossil fuel power plants. [redacted] In doing so, Liberty Wind will directly advance CLCPA outcomes, including several of New York's nation-leading climate targets: 85% reduction in greenhouse gas (GHG) emissions by 2050; 100% carbon-free electricity by 2040; 70% renewable energy by 2040; and 9,000 MW of offshore wind by 2035. The benefits of wind energy would also be complemented by energy storage; [redacted]

Offshore wind is an essential renewable energy resource in the fight against climate change. Compared to other renewable energy resources, wind energy has low lifecycle GHG emissions (average: ~26 tons/GWh; range: 6–124 tons/GWh) compared to other renewables, such as biomass (average: ~45 tons/GWh; range: 10–101 tons/GWh) and solar photovoltaics (average: 85 tons/GWh; range 13–731 tons/GWh).[3] Further, without a robust offshore wind industry, many of New York's ambitious GHG emission and renewable energy targets would be difficult, if not impossible, to achieve. [redacted]

While the construction of any new infrastructure will generate emissions, the Project's construction impacts will be quickly offset by its benefits. For the Vineyard Wind 1 project, Vineyard Wind has demonstrated that, without any additional mitigation, direct CO_2e emissions from construction, operation, and decommissioning of the project would be offset after less than five months of operation by displacing electricity produced by fossil fuel power plants; Vineyard Wind expects Liberty Wind to offset its direct CO_2e emissions within a similar or shorter timeframe. [redacted]

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[1] Based on New York Independent System Operator (NYISO) Zone K energy demand in 2018 from *Table I-2: Baseline Annual Energy, Historical and Forecast* of ISO's (2019) *2019 Load & Capacity Data Gold Book* found here: https://www.nyiso.com/documents/20142/2226333/2019-Gold-Book-Final-Public.pdf/

[2] Based on the average annual residential energy consumption in New York in 2018 from US Energy Information Administration (EIA) (2020) *Table 5a Residential average monthly bill by Census Division, and State* found here: https://www.eia.gov/electricity/sales_revenue_price/

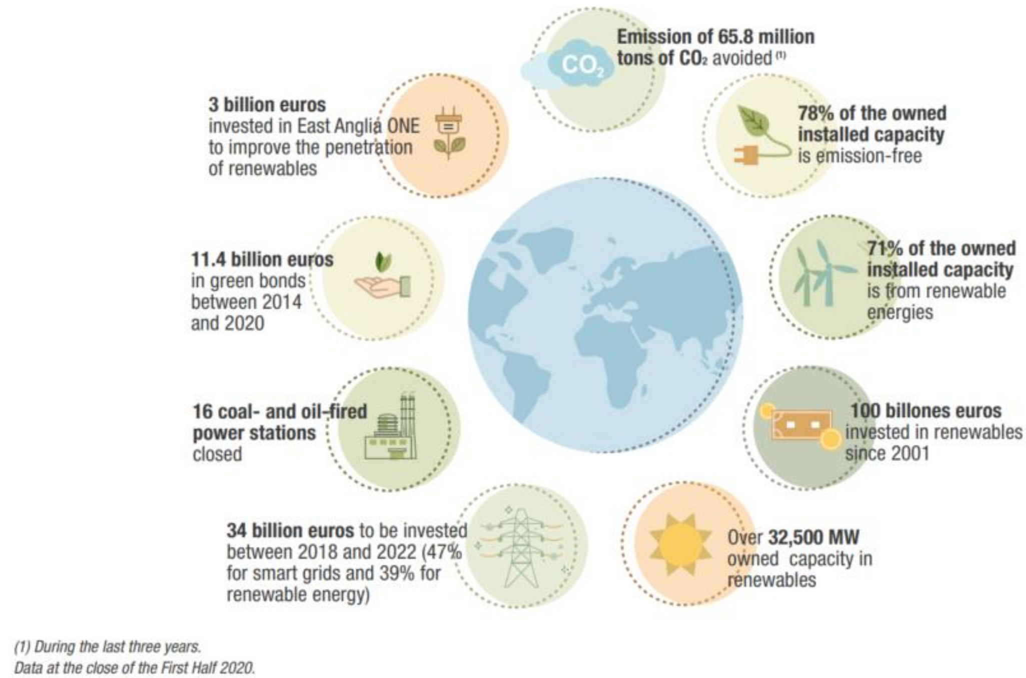
[3] Chipindula J, Botlaguduru V, Du H, Kommalapati R, Huque Z. 2018. Life cycle environmental impact of onshore and offshore wind farms in Texas. Sustainability. 10. 2022. https://www.mdpi.com/2071-1050/10/6/2022

In addition to reducing GHG emissions, by displacing electricity produced by fossil fuel power plants, Liberty Wind will provide other societal benefits, including the reduction of harmful emissions such as nitrogen oxides (NOx), sulfur dioxide (SO_2), and fine particulate ($PM_{2.5}$), which lead to early death, heart attacks, respiratory disorders, stroke, exacerbation of asthma, and absenteeism at school and work. [redacted] In doing so, the Project will help the Greater New York City region meet its air quality goals by delivering net emissions reductions to help decrease premature deaths and hospitalizations.

Similar climate benefits will be realized across Vineyard Wind's entire project portfolio, including future projects, as the Proposer is exclusively focused on developing offshore wind. Copenhagen Infrastructure Partners (CIP) and Avangrid Renewables, Vineyard Wind's shareholder companies, are themselves leading global and national renewable energy companies, as further described in Section 3. CIP is currently in the process of raising the largest renewable energy infrastructure fund in the world while Avangrid Renewables is continuing to expand its renewable energy generation fleet across the US.

Avangrid Renewables is a wholly owned subsidiary of Avangrid Inc., whose majority shareholder is Iberdrola S.A. (Iberdrola). Avangrid Inc. is committed to achieving carbon neutrality by 2035. Iberdrola is similarly committed to ambitious and urgent climate action and participated in this year's Climate Week NYC. Among other things, Iberdrola created a virtual discussion space that was available to attendees during events organized by the UN Global Compact, within the Uniting Business Live initiative. The topics discussed in the virtual platform consisted of conclusions from a report by the Swedish consulting company AFRY on how the electrification of transport and residential heat and obtaining electricity through renewables will be the keys to decarbonizing the European economy by 2050. Iberdrola also presented material about the company's commitment to the Green Recovery, its commitment to renewable energy and sustainable mobility, and its promotion of the UN Sustainable Development Goals. Figure 18-1 summarizes the Iberdrola Group's efforts, including those of Avangrid Renewables and Avangrid Inc., to address climate change across the globe.

Figure 18-1 Overview of Iberdrola Group's Response to Climate Change



CARBON EMISSIONS AND EMBODIED CARBON

Vineyard Wind fully supports and applauds New York's efforts to better understand and consider embodied carbon. Such efforts, however, must account for the reality that, in almost every respect, the US offshore wind supply chain remains in the nascent stages of development. The lack of a well-established US or New York offshore wind supply chain, combined with other considerations including cost, market readiness, and timing, currently limits opportunities to significantly reduce embodied carbon absent heavy reliance on carbon offsets. Nevertheless, as this section demonstrates, Vineyard Wind has endeavored to understand and is committed to minimizing Liberty Wind's carbon emissions and embodied carbon. Vineyard Wind's efforts focus on carbon reductions that are real, meaningful, and achievable.

As described below, "carbon emissions" refers to *direct* carbon emissions from the construction, operation, and decommissioning of the Project. While more expansive definitions exist, and the difference between *direct* and *indirect* emissions is not always clear-cut, for the purposes of this Submission, "embodied carbon" refers to *indirect* carbon emissions generated during the manufacturing and supply of Project components. Vineyard Wind is committed to a holistic approach for minimizing the Project's carbon impacts.

Direct Emissions

The Project's direct emissions include emissions associated with construction, operations and maintenance (O&M), and decommissioning activities. Thus, direct emissions from the Project include emissions from transporting Project components to site, installing, maintaining, and removing the facilities, transporting personnel to site, and any operational emissions from sources located on the wind turbine generators (WTGs) and electrical service platform (ESP). For example, direct emissions related to a monopile would include vessel emissions from transporting and installing the monopile at the Offshore Wind Generation Facility site, conducting inspections of the monopile throughout its life, and removing the monopile for delivery to a recycling center upon decommissioning. Offshore, direct emissions will primarily come from internal combustion engines, including marine diesel engines on vessels, diesel engines on construction equipment, and diesel generators. Onshore, direct emissions will primarily come from vehicle and construction equipment emissions.

Indirect Emissions

Embodied carbon refers to indirect carbon emissions. The Project's indirect emissions are those released throughout the supply chain and include emissions from raw material extraction/processing, fabrication of parts, and manufacturing/assembly of Project components. For example, indirect emissions related to a monopile would include emissions from extracting iron and other metals from the ground, smelting, forging, and forming the steel, rolling the steel into shape and welding, and coating/painting the monopile. Embodied carbon depends on location, availability of raw materials, and supply chain structure.

Several life cycle assessments for onshore and offshore wind farms indicate that indirect carbon emissions account for a majority of an offshore wind project's overall carbon footprint.[4] According to Chipindula et al. (2018) *Life Cycle Environmental Impact of Onshore and Offshore Wind Farms in Texas*, indirect emissions from material extraction and manufacturing accounted for approximately 50% to 65% of an offshore wind project's global warming impact whereas direct emissions from installation and O&M contributed to approximately 5% to 25% of a project's global warming impact.[5]

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[4] Chipindula et al. 2018. J, Botlaguduru V, Du H, Kommalapati R, Huque Z. 2018. Life cycle environmental impact of onshore and offshore wind farms in Texas. Sustainability. 10. 2022. https://www.mdpi.com/2071-1050/10/6/2022
Smoucha EA, Fitzpatrick K, Buckingham S, Knox OGG. 2016. Life cycle analysis of the embodied carbon emissions from 14 wind turbines with rated powers between 50 Kw and 3.4 Mw. J Fundam Renewable Energy Appl 6: 211. doi: https://10.4172/20904541.1000211

[5] Based on Figure 2 of Chipindula et al. (2018). The study defines shallow-water offshore wind projects as those typically occurring in water depths less than 30 m using monopile, gravity-based, or jacket foundations whereas deep-water installations were assumed to use floating WTGs in water depths greater than 50 m.

The processing of steel for Project components (e.g., WTG towers, monopiles, transition pieces, jackets, ESP topside) is expected to be the primary source of indirect emissions from the Project and will be a major focus of Vineyard Wind's efforts to "buy clean." Significant opportunities exist to reduce emissions from conventional steel production. The European steel industry, for example, has implemented a number of measures and managed to cut the per tonne emissions from steel production in half.[6] In addition, recent developments hold promise for developing zero carbon approaches to steel production in the medium-term. For example, in 2019, Thyssenkrupp (a German manufacturing company) successfully completed a test demonstration of running a steel furnace completely on hydrogen.[7] In Sweden, where steel production is the largest CO_2 emitter, the government and private sector are working to advance zero emission steel projects. Hybrit, a joint venture involving SSAB (a Swedish steelmaker), Vattenfall (a power utility), and LKAB (Europe's largest iron ore producer), aims to pilot a fossil-free value chain concept for steel through the construction of a facility that will use hydrogen, in place of coking coal, and renewable electricity to produce steel.[8] The only emissions from the facility would be water vapor.

Carbon capture and storage and/or utilization (CCS/U) applications have also been proposed as a way to reduce emissions from steel production as well as cement and power production. However, CCS/U has not yet advanced beyond the demonstration phase and remains cost prohibitive. Further, CCS/U would not eliminate GHG emissions from industrial processes or power production given that capture rates, particularly from a lifecycle assessment perspective, are well below 100%.[9]

MEASURES TO AVOID, MINIMIZE, AND MITIGATE CARBON EMISSIONS

As described above and quantified in more detail below, the Project itself is an air quality impact avoidance measure; the electricity generated by the WTGs will displace electricity produced by fossil fuel power plants and avoid emissions resulting from those fossil fuel power plants. While the Project will provide a net air quality benefit, there will be direct and indirect emissions from the Project. Steps taken by Vineyard Wind to minimize the Project's carbon emissions and embodied carbon, as well as emissions of other air pollutants, are described below.

[6] Strategic Energy Technologies Information System (SETIS). 2016. Carbon capture utilisation and storage: The zero-emission steel plant of the future. [accessed 2020 September 23]. https://setis.ec.europa.eu/publications/setis-magazine/carbon-capture-utilisation-and-storage/zero-emission-steel-plant-of

[7] Mazengard M. 2019. Another nail in coal's coffin? German steel furnace runs on renewable hydrogen in world first. Renew Economy. [accessed 2020 September 23]. https://reneweconomy.com.au/another-nail-in-coals-coffin-german-steel-furnace-runs-on-renewable-hydrogen-in-world-first-55906/

[8] Simon F. 2018. Swedish steel boss: 'Our pilot plant will only emit water vapour'. Euractiv. [accessed 2020 September 23] https://www.euractiv.com/section/energy/interview/hybrit-ceo-our-pilot-steel-plant-will-only-emit-water-vapour/

[9] Jacobson M. 2019. The health and climate impacts of carbon capture and direct air capture. Energy & Environmental Science, 12, 2019, pp.3567-3574. https://doi.org/10.1039/C9EE02709B

Direct Emissions

Liberty Wind will minimize direct emissions associated with construction, operation, and decommissioning in five key ways:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

PUBLIC

[redacted]

[redacted]

Vessels will be the primary source of direct emissions from the Project. In addition to the above measures, the Project's vessel operators will minimize GHG emissions by using good combustion practices and operating engines in the most efficient configuration. Where applicable, this will include establishing an Energy Efficiency Design Index (EEDI) for new ships and a Ship Energy Efficiency Management Plan (SEEMP) for all ships, consistent with the International Maritime Organization (IMO) energy-efficiency regulations (Annex 19, Resolution MEPC.203(62)). The EEDI requires a minimum energy efficiency level per capacity mile for new ships based on their type and size. The SEEMP is an operational measure that establishes mechanisms to improve the energy efficiency of a ship and incorporates best practices for fuel-efficient ship operation. Use of these two programs will ensure efficient engine operation and minimize carbon emissions from vessels used during the Project.

Liberty Wind will follow in the footsteps of Vineyard Wind 1, which is the only active offshore wind project to receive a draft Environmental Protection Agency (EPA) Outer Continental Shelf (OCS) Air Permit per 40 CFR Part 55 for its offshore renewable wind energy facilities. Vineyard Wind will use that experience to develop a Project design meeting Best Available Control Technology (BACT) standards. [redacted] The use of BACT will minimize direct carbon emissions and provide important co-benefits through the minimization of fuel combustion-related emissions during construction and operation.

Indirect Emissions

Vineyard Wind is currently working with Original Equipment Manufacturers (OEMs) to identify and address indirect carbon emissions and will continue that collaborative effort through the Liberty Wind project. OEMs are already taking significant steps towards reducing the embodied carbon of offshore wind farm components. For example, WTG supplier MHI Vestas completed its first GHG Inventory in 2020 following the international standard of the Greenhouse Gas Protocol and has identified several avenues for reducing carbon emissions onshore and offshore. MHI Vestas is mapping and assessing new solutions to zero emission vessels (e.g., hydrogen, ammonia, and batteries) and is having novel hydrogen fuel technology installed on one of its contracted service operation vessels.[11] GE Renewables has pledged to make its renewable energy operations (wind, hydro, energy storage, and grid) carbon neutral

[11] See: https://mhivestasoffshore.com/magazine/sustainability-report-2019-20/mhivestasoffshore-csr.pdf.

by the end of 2020.[12] Another WTG supplier, Siemens Gamesa Renewable Energy has committed to having all production facilities and buildings worldwide achieve a net zero-carbon footprint by 2030.[13] Transportation and installation contractors are taking similar steps. For example, Boskalis aims to be climate neutral across its global operations by 2050 and owns the first dredging vessel in the world to operate on 100% bio-fuel oil.[14]

[redacted]

[redacted]

[redacted]

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[12] See: https://www.ge.com/news/press-releases/ge-renewable-energy-announces-its-plan-become-carbon-neutral-2020.

[13] See: https://new.siemens.com/global/en/company/sustainability/decarbonization/carbonneutral.html.

[14] See: https://boskalis.com/press/press-releases-and-company-news/detail/world-first-for-boskalis-by-operating-a-dredging-vessel-on-100-bio-fuel-oil.html.

[15] Smoucha EA, Fitzpatrick K, Buckingham S, Knox OGG. 2016. life cycle analysis of the embodied carbon emissions from 14 wind turbines with rated powers between 50 Kw and 3.4 Mw. J Fundam Renewable Energy Appl 6: 211. doi: https://10.4172/20904541.1000211

[redacted]

[redacted]

EMISSION METHODOLOGIES

Vineyard Wind is committed to analyzing and understanding the Project's carbon footprint on an ongoing basis as the Project evolves. Vineyard Wind's efforts to better understand and quantify carbon intensity in design, sourcing, and construction, including tools or methodologies that could be used to estimate and validate Project emissions, are discussed below.

Direct Emissions from Construction, Operation, and Decommissioning

Vineyard Wind is well-practiced with estimating direct emissions from the construction and operation of offshore wind projects. Since 2017, the Proposer has worked to understand and estimate direct emissions from its projects as part of the Bureau of Ocean Energy Management (BOEM) Construction and Operations Plan (COP) and EPA OCS Air Permitting processes.

Vineyard Wind was the first offshore wind company to develop a comprehensive methodology for estimating direct emissions from the construction and operation of an offshore wind project in connection with obtaining the only draft OCS Air Permit from EPA for an active utility-scale offshore wind project. This emissions estimating methodology was subsequently reviewed and accepted by both BOEM and EPA. This methodology set the industry standard and has been subsequently used for other Vineyard Wind projects (e.g., Park City Wind) and adopted by other developers' projects (e.g., South Fork Wind Farm). While some variation exists in the implementation of this methodology, a similar approach to estimating emissions allows for better apples-to-apples comparison between projects.

[16] ISO 14001 (Environmental Management Systems) specifies the requirements for an environmental management system that can be used to enhance an organization's environmental performance in a systematic manner. ISO 50001 (Energy Management) provides organizations with a systematic approach to improve energy use through the development of an energy management system.

Estimating Direct Emissions During Project Design and Permitting

Vineyard Wind will employ the same methodology used for Vineyard Wind 1 and Park City Wind to estimate all direct construction and operational emissions within the US as part of the Project's COP. Before performing the emissions analysis for Liberty Wind, Vineyard Wind will review the existing methodology and refine it (if necessary) to reflect best available literature, tools, and emissions data.

Emissions from commercial marine vessels (the primary source of emissions during construction and operation) are calculated according to the methodology described in BOEM's Offshore Wind Energy Facilities Emission Estimating Tool Technical Documentation, which was developed by BOEM to provide a consistent approach for estimating emissions associated with proposed offshore wind projects and to ensure consistency in BOEM's environmental review process.[17] The BOEM Emission Estimating Tool contains default vessel characteristics and emission factors for a variety of vessel types commonly used in offshore wind projects. These emission factors were developed using Information Handling Service vessel population data combined with tier level emission factors from EPA's 2014 National Emissions Inventory, Version 1 Technical Support Document (2016) to create weighted emission factors for each vessel type. When necessary, BOEM's emission calculation methodology was supplemented with information from EPA publications.[18]

Use of average, fleet-wide emission factors is necessary for estimating direct emissions during project planning and permitting because projects will not know exactly which third-party vessels will be used until much closer to the start of construction and operation (vessels may also be changed out after construction begins). Representative vessels, preliminary project schedules, and approximated vessel routes must also be used to estimate potential direct emissions during project planning stages. Emissions are generally estimated for each engine using the following equation:

$$E = kW * Hours * LF * EF * 1.10231 \times 10^{-6}$$

Where:

- E = total emissions (US tons)
- kW = total engine size (kilowatt [kW])
- Hours = duration of each activity (hours)
- LF = engine load factor (unitless)

[17] Chang R, Do B, Billings R. 2017. Technical documentation for the offshore wind energy facilities emission estimating tool. US Dept. of the Interior, Bureau of Ocean Energy Management, Sterling, VA. OCS Study BOEM 2017-079. 51 pp. [accessed 2020 April 27]. https://www.boem.gov/sites/default/files/renewable-energy-program/BOEM-Wind-Power-Technical-Documentation_2017_079-%281%29.pdf

[18] The methodology is supplemented by the following EPA publications: 1) EPA's (2015) Commercial Marine Vessels – 2014 NEI Commercial Marine Vessels Final; 2) EPA's (2018) *2014 National Emissions Inventory, Version 2 Technical Support Document*; 3) Eastern Research Group's (2019) Category 1 and 2 Commercial Marine Vessel 2017 Emissions Inventory; 4) Eastern Research Group's (2019) Category 3 Commercial Marine Vessel 2017 Emissions Inventory; and 5) EPA's (2009) Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories.

- EF = emission factor (g/kW-hr)
- 1.10231 x 10^{-6} = grams to ton conversion factor

Currently, there is limited operational data for marine engines because vessels' engines are typically only regulated via emission standards for engine manufactures (e.g., EPA's tiered marine emission standards) rather than through tracking actual emissions. Through tracking emissions for Vineyard Wind 1 per the requirements of its OCS Air Permit, Vineyard Wind will gain important operational data on vessel engine usage, particularly engine load factors, which have a significant influence on emissions estimates. Vineyard Wind expects to use this operational data to more accurately estimate emissions.

Validating Emissions During Construction, Operation, and Decommissioning

During the OCS Air Permitting process for Vineyard Wind 1, Vineyard Wind worked with EPA to develop a rigorous method to track and validate actual emissions. This method employs the same equation identified above but uses specific engine parameters and operational data rather than fleet-wide averages to derive a more precise quantification of actual emissions. While the methodology to calculate actual emissions may be further refined prior to the issuance of the final Vineyard Wind 1 OCS Air Permit, it entails the following steps:

1. Record the make, model, maximum rated power output, cylinder size, engine speed rating, and manufacturing date of each engine.

2. For each engine, record daily the total hours of operation and fuel usage (if possible).

3. Calculate the engines' load factor based on the ratio of actual fuel used to the fuel consumption rate at maximum engine power (or alternatively use EPA's default load factors).

4. Estimate actual emissions using each engine's size, hours of operation, load factor, and the emission factor associated with the engine's emission certification (or alternatively the default emission factors provided by EPA).

Vineyard Wind will implement a similar methodology to validate direct emissions during and following commissioning of the Project, subject to EPA approval.

Indirect Emissions from the Supply Chain and Manufacturing

Vineyard Wind has evaluated numerous state-of-the-art embodied carbon databases and tools for their suitability to estimate indirect emissions from the manufacturing, fabrication, and supply of offshore wind farm components. Table 18-1 provides a summary of many, but not all, databases and tools that are currently available.

Table 18-1 Summary of Existing Embodied Carbon Calculators

Tool/ Database	Description[1,2]	Suitability for Offshore Wind Projects
Databases		
	▪ Provides an Excel spreadsheet of embodied carbon emission factors in terms of kilogram (kg) of CO_2e per kg of material for over 200 building materials. ▪ Downloaded by over 30,000 professionals world-wide. ▪ Last updated in November 2019 and continues to be updated. See: https://circularecology.com/embodied-carbon-footprint-database.html	▪ Provides embodied carbon emission factors for most key offshore wind farm building materials (e.g., steel, concrete, aluminium, fiberglass), but not all (e.g., certain plastics). ▪ The weight of Project components depends on site-specific conditions, making it challenging to use this tool before performing detailed engineering.
	▪ A standardized whole-building life cycle assessment (LCA) database of emission factors that is integrated into other software or embodied carbon tools (e.g., One Click LCA). ▪ Last updated in March 2018. See: https://www.bregroup.com/impact/features/	▪ This database appears to be tailored for onshore buildings and would not be suitable for estimating the embodied carbon of an offshore wind project.
	▪ A popular life cycle inventory (LCI) database that provides process data for thousands of products and contains global supply chains. ▪ Latest version released in September 2019. See: https://www.ecoinvent.org/	▪ Has been used for LCAs of several onshore and offshore wind projects.
	▪ An LCA database with over 15,000 plans and processes for numerous industries, including energy and utilities. ▪ Updated annually. See: http://www.gabi-software.com/america/databases/gabi-databases/	▪ Has been used to perform LCAs for onshore wind projects and may be suitable for offshore wind projects.

Table 18-1 Summary of Existing Embodied Carbon Calculators (Continued)

Tool/ Database	Description[1,2]	Suitability for Offshore Wind Projects
Tools		
	▪ Provides embodied carbon emission factors in terms of kg of CO_2e per unit or per unit weight for over 17,000 individual products for the US and Canada. ▪ Uses building material quantities from construction estimates and/or Building & Information Modeling and a robust database of digital, third-party verified EPDs. ▪ Launched as a public beta in November 2019. The scope for the A4 (transport to site) and A5 (installation) modules are not complete. See: https://www.buildingtransparency.org/en/	▪ Provides embodied carbon emission factors for some key offshore wind farm building materials (e.g., steel, concrete, aluminium), but not all (e.g., plastics, fiberglass). ▪ The design and weights of Project components depend on site-specific conditions, making it challenging to use this tool before performing detailed engineering.
	▪ Allows for comparisons of a baseline building to a design building (created by making changes to the baseline). Embodied carbon emissions are largely based on the building type, gross floor area, and number of floors. ▪ First released in 2017. See: https://www.oneclicklca.com/carbon-designer/	▪ Carbon designer is specifically tailored to optimizing carbon performance in the early design stages for onshore buildings. This tool would not be suitable for estimating the embodied carbon of an offshore wind project.
	▪ A widely-respected software tool designed to evaluate whole buildings and assemblies based on internationally-recognized LCA methodology. ▪ Only recommended for building projects in the US or Canada. ▪ Updated annually. See: https://calculatelca.com/software/impact-estimator/	▪ When selecting a climate zone, there is no option for an offshore environment. ▪ This software is designed for estimating embodied carbon from onshore buildings and is not suitable for offshore wind projects.
	▪ Software used to perform LCAs for buildings and infrastructure (roads and motorways, transmission systems, pipelines and power grids, marine works, reservoirs, etc.). ▪ Based on EPD data, which may be too specific and unreliable. ▪ Used primarily in Europe and initially released in 2010. See: https://www.oneclicklca.com/	▪ Pending further investigation, this tool may be suitable for offshore wind projects, but no specific examples of using One Click LCA for onshore or offshore wind projects were found.
	▪ Provides a whole-building LCA and allows for comparative analysis of design options. ▪ Database draws from and contains 68 product-specific and 74 industry-wide EPDs ranging from cladding systems to flooring. The dataset is based on North American averages. ▪ See: https://choosetally.com/	▪ This tool is specifically tailored to LCAs for onshore buildings and would not be suitable for estimating the embodied carbon of an offshore wind project. ▪ A Revit plug-in that is not practical for use before a Revit model is created.

Table 18-1 Summary of Existing Embodied Carbon Calculators (Continued)

Tool/ Database	Description[1,2]	Suitability for Offshore Wind Projects
Tools		
	▪ A web-based whole-building LCA software. ▪ First conceived in 2009. See: https://etoolglobal.com/about-etoollcd/	▪ Although no specific examples of using eTool for offshore wind projects were found, the website suggests the tool can assess electricity generators.
	▪ A popular LCA software used in over 80 countries that incorporates the latest version of econinvent. ▪ Last updated in June 2020. See: https://simapro.com	▪ Has been used for LCAs of several onshore and offshore wind projects.
	▪ LCA software that can incorporate numerous datasets including ecoinvent and GaBi. ▪ Last updated in 2019. See: http://www.openlca.org/openlca/	▪ No specific examples of using OpenLCA for offshore wind projects were found, but it incorporates datasets from offshore wind farms.

Notes:

1. Embodied carbon calculators that were evaluated, but determined to be outdated or were very industry-specific include: the Quartz Database, the Construction Carbon Calculator, and EcoCalculator, the Highways England Carbon Emissions Calculation Tool, the AggRegain Carbon Dioxide (CO_2) Emissions Estimator Tool – For Aggregates, and Asphalt Pavement Embodied Carbon Tool – asPECT.
2. Additional sources: Melton P. (2019). Embodied Carbon Tools: Assessing the Options. Retrieved from https://www.buildinggreen.com/news-analysis/embodied-carbon-tools-assessing-options. Circular Ecology. (2020). Embodied Carbon Footprint Calculators for Construction. Retrieved from: https://circularecology.com/carbon-footprint-calculators-for-construction.html.

Based on this review, numerous embodied carbon databases and tools are available, but many are tailored toward estimating an onshore building's carbon footprint rather than renewable energy projects and associated supply chains. While some tools and databases (e.g., ecoinvent and SimaPro) may be suitable for quantifying indirect GHG emissions from the offshore wind supply chain, a clear, consistent methodology does not yet exist. [redacted]

[redacted]

Estimating Avoided Emissions, Carbon Payback Periods, and Avoided Social Costs

Avoided Emissions

To quantify the CO_2e, NOx, and SO_2 emissions associated with conventional power generation that would be avoided due to the Project, the following equation was used:

$$EA_i = EF_i * NP * 1.10231 \times 10^{-6}$$

Where:

- EA_i = Annual Emissions Avoided for Pollutant i (tpy)
- EF_i = eGRID Avoided Emission Factor for Pollutant i (g/MWh)
- NP = Net Annual Power Production (MWh/year)
- 1.10231×10^{-6} = grams to ton conversion factor

The avoided emissions analysis uses the Northeast Power Coordinating Council (NPCC) Long Island annual non-baseload output emission rates from EPA's Emissions & Generation Resource Integrated Database (eGRID2018(v2)) released in March 2020.[19] [redacted] The net annual power production accounts for the WTG's rated power, capacity factor, and transmission losses, which have a significant influence on avoided emissions. [redacted]

[redacted]

19 From: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid.

Carbon Payback Period

The carbon payback period of an offshore wind project indicates how long the Project would need to operate before the emission-free electricity it generates offsets the carbon emissions associated with the construction and operation of the new infrastructure. Once the Project's total embodied carbon and carbon emissions are quantified, the Project's carbon payback period can be estimated by dividing the Project's total carbon footprint by the carbon emissions avoided annually by the Project. When estimating a project's carbon payback period, it is important to consider the following:

- The boundaries of the embodied carbon analysis have significant impacts on the final estimate, so to compare carbon footprint between projects, the boundaries of the analysis must be clearly defined.
- Emission estimates developed for permitting processes are likely very conservative due to uncertainty in the project's design and schedule at the early planning stages. At this time, lack of operational data for marine engines also requires the use of more conservative assumptions. However, direct experience with the Vineyard Wind 1 project will allow Vineyard Wind to provide a more accurate accounting of carbon impacts from Liberty Wind's construction activities and more clearly show the Project's benefits.
- Engines available for use at the time of decommissioning will likely be cleaner than those available today due to refinements in engines and emission control technologies over time.
- The avoided emissions analysis is not an apples-to-apples comparison between different types of electric generators. Unlike the emissions estimates that will be generated for Liberty Wind and other offshore wind projects, estimates of operational emissions from onshore power generation facilities used to develop the annual non-baseload output emission rates do not account for emissions from mobile sources (e.g., delivery of fuel, worker transits) or construction of the facilities.
- Similarly, the avoided emissions analysis does not account for the construction of additional power generation facilities that would likely be required to meet the region's electricity demand if the Project were not constructed.

Vineyard Wind has demonstrated that the Vineyard Wind 1 project would (without any additional mitigation) offset its direct CO_2e emissions from construction, operation, and decommissioning after less than five months of operation by displacing higher-polluting electricity. [redacted]

Avoided Social Costs

The social cost of carbon ($SC\text{-}CO_2$) is a measure, in dollars, of the long-term damage caused by a ton of carbon dioxide (CO_2) emissions in a given year. In other words, $SC\text{-}CO_2$ is an estimate of climate change damages from CO_2, which accounts for property damages from floods and changes in agricultural productivity, human health, and energy system costs (e.g., air conditioning costs).[20] SC-CO_2 also represents the value of damages that are avoided by a reduction in CO_2 emissions. According to the Interagency Working Group on the Social Cost of Greenhouse Gases (2016),[21] the annual social cost of carbon (in 2007$)[22] will increase from $48 to $69 per metric ton of CO_2 between 2027 (i.e., the anticipated start of operations) and 2050 based on a 3% discount rate. As EPA recognizes,[23] the models used to estimate SC-CO_2 currently do not include all of the important physical, ecological, and economic impacts of climate change, and can thus be considered conservative estimates. Many experts agree that the true social costs of carbon are much higher,[24] with estimates exceeding $150 by 2027 and $300 by 2050[25].

Similar to SC-CO_2, the social costs of other GHGs, such as methane (SC-CH_4) and nitrous oxide (SC-N_2O), can also be estimated. Table 18-3 provides low, medium, and high estimates of the Project's avoided social costs for all three GHGs. The annual estimates are based on 2027 values of SC-CO_2, SC-CH_4, and SC-N_2O from the Interagency Working Group's (2016) *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866*[26] and its Addendum.[27]

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[20] EPA. 2017. The social cost of carbon: Estimating the benefits of reducing greenhouse gas emissions. [accessed 2020 September 25]. https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html

[21] Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. 2016. Technical support document: Technical update of the social cost of carbon for regulatory impact analysis - Under Executive Order 12866. https://19january2017snapshot.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf

[22] In 2020 dollars, this is roughly equivalent to an increase from $60 to $86 per metric ton of CO_2 between 2027 and 2050.

[23] See EPA (2017).

[24] Environmental Defense Fund. [date unknown]. The true cost of carbon pollution: How the social cost of carbon improves policies to address climate change. [accessed 2020 September 25]. https://www.edf.org/sites/default/files/expertconsensusreport.pdf

[25] Values in 2015$ approximated from Howard and Sylvan (2015).

Howard P, Sylvan D. 2015. Expert consensus on the economics of climate change. Institute for Policy Integrity, New York University School of Law. https://www.edf.org/sites/default/files/expertconsensusreport.pdf

[26] See Interagency Working Group (2016).

[27] Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. 2016. Addendum to technical support document on social cost of carbon for regulatory impact analysis under Executive Order 12866: Application of the methodology to estimate the social cost of methane and the social cost of nitrous oxide. https://19january2017snapshot.epa.gov/sites/production/files/2016-12/documents/addendum_to_sc-ghg_tsd_august_2016.pdf

[redacted]

Note:

1. Based on avoided emission estimates for CO_2, CH_4, and N_2O, which were developed using the method to estimate CO_2e, NOx, and SO_2 described above. The values presented are the sum of SC-CO_2, SC-CH_4, SC-N_2O estimates for the year 2027 based the Interagency Working Group on the Social Cost of Greenhouse Gases (2016) *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866* and its Addendum. The final values were adjusted from 2007$ to 2020$ using an approximate factor of 1.25 from https://data.bls.gov/cgi-bin/cpicalc.pl.

It is important to note that these estimates understate Liberty Wind's avoided social costs on a cumulative basis as the Project's annual avoided social costs are likely to increase over time given that the value of SC-CO_2, SC-CH_4, and SC-N_2O increases with time. This is primarily due to the fact that: (1) future emissions are expected to cause greater damages as physical and economic systems become increasingly stressed by climate change, and (2) many climate change damages are considered proportional to gross domestic product, which increases over time. Nevertheless, these estimates show the significant social costs that can be avoided through the Project and underscore the critical importance of rapidly decarbonizing the electricity sector to avoid the worst impacts of climate change.