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# VINEYARD WIND

## Draft Construction and Operations Plan

### Volume I

## Vineyard Wind Project

October 22, 2018

**Submitted by**

**Vineyard Wind LLC  
700 Pleasant Street, Suite 510  
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**Submitted to**

**Bureau of Ocean Energy Management  
45600 Woodland Road  
Sterling, Virginia 20166**

**Prepared by**

**Epsilon Associates, Inc.  
3 Mill & Main Place, Suite 250  
Maynard, Massachusetts 01754**

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45600 Woodland Rd  
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Biodiversity Research Institute  
C2Wind  
Capitol Air Space Group  
Clarendon Hill Consulting  
Ecology and Environment  
Foley Hoag  
Geo SubSea LLC  
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JASCO Applied Sciences  
Morgan, Lewis & Bockius LLP  
Public Archaeology Laboratory, Inc.  
RPS  
Saratoga Associates  
Swanson Environmental Associates  
Wood Thilsted Partners Ltd  
WSP

October 22, 2018

## Section 1.0

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### Project Overview

## 1.0 PROJECT OVERVIEW

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### 1.1 Introduction

Vineyard Wind, LLC (“Vineyard Wind”) is proposing an ~800 megawatt (“MW”) wind energy project within Bureau of Ocean Energy Management (“BOEM”) Lease Area OCS-A 0501, consisting of offshore Wind Turbine Generators (“WTGs”) (each placed on a foundation support structure), Electrical Service Platforms (“ESPs”), an onshore substation, offshore and onshore cabling, and onshore operations & maintenance facilities (these facilities will hereafter be referred to as the “Project”). The location of the Lease Area is depicted on Figure 1.1-1. As is described later in this document, the ~800 MW Project will be located in the northern portion of the over 675 square kilometers (“km<sup>2</sup>”) (166,886 acre) Lease Area (referred to as the “Wind Development Area” or “WDA”).

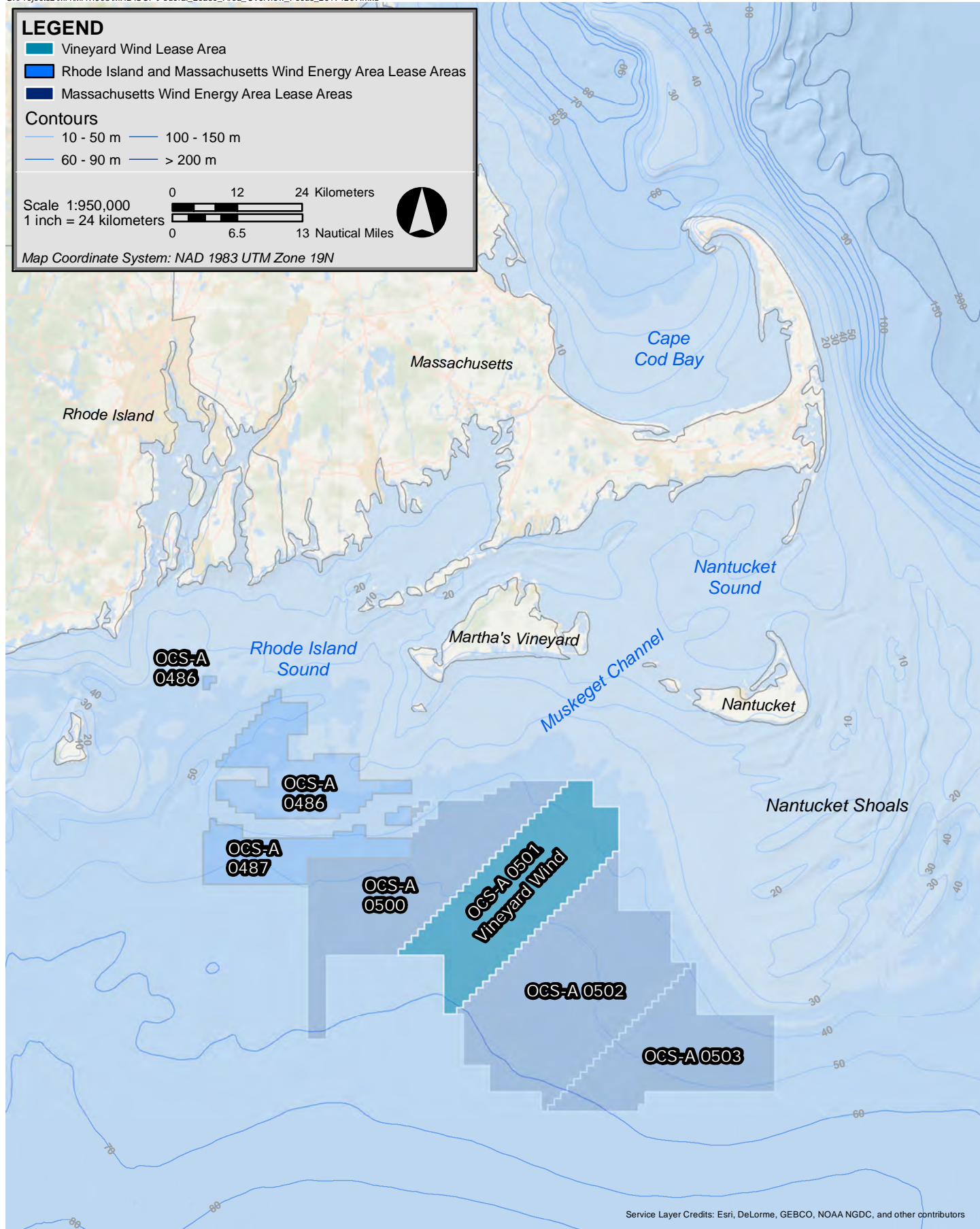
### 1.2 Massachusetts Offshore Wind Leasing Program

BOEM has evaluated areas along the Atlantic coast with respect to their potential suitability for offshore wind development via a public stakeholder and desktop screening<sup>1</sup> process, which began in 2009. The location of the Massachusetts offshore wind lease areas, including the Vineyard Wind Lease Area, was determined through a process that involved significant public input over a period of approximately six years. The process began with the formation of a Massachusetts-BOEM task force, composed of representatives from many federal, state, tribal, and local government agencies, as well as public stakeholder meetings. As a result of this initial planning and consultation, BOEM published a Request for Interest (“RFI”) on December 29, 2010 for a preliminary Massachusetts (“MA”) Wind Energy Area (“WEA”) of approximately 7,628 km<sup>2</sup> (1,884,920 acres), referred to as the “RFI area.” This RFI requested expressions of commercial interest from potential wind energy developers, as well as any information from the public relevant to determining the suitability of the RFI area for offshore wind development. After the initial round of responses to the RFI, BOEM announced a second public comment period, which closed on April 18, 2011. A total of 10 companies, including Vineyard Wind/Vineyard Power, responded to the RFI and 260 public comments were received.

After careful consideration of the public comments, as well as input from the Massachusetts-BOEM task force, BOEM extensively modified the RFI area to address stakeholder concerns. For example, BOEM decided to exclude certain areas identified as important habitats that could be adversely affected if ultimately used for offshore wind energy development. BOEM also excluded an area of high sea duck concentration, as well as an area of high fisheries value so as to reduce potential conflict with commercial and recreational fishing activities. The

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<sup>1</sup> Conducted by the Department of Energy's National Renewable Energy Laboratory.



## Vineyard Wind Project



**Figure 1.1-1**  
RI and MA Lease Areas Overview

distance from the WEA to the nearest shore was also extended, in order to further reduce any possible viewshed impacts. These extensive revisions resulted in the revised MA WEA being reduced in size, as compared to the preliminary RFI area, by approximately 40%.

On February 6, 2012, BOEM published a “Call for Information and Nominations” (“Call”) for areas within the revised MA WEA (the “Call Area”). The Call for Information and Nominations requested the submission of a nomination for a lease by those interested in potentially obtaining a commercial lease for the “Call Area” and also allowed interested and affected parties to provide comments about site conditions, resources, or uses within the “Call Area.” That same month, BOEM also published a Notice of Intent to prepare an Environmental Assessment (“EA”) for the “Call Area.” The EA was made available for public review on November 12, 2012. Among other issues, the EA considered potential impacts to the endangered North Atlantic Right Whales (*Eubalaena glacialis*) and potential effects on viewsheds. Comments on the EA were considered and the revised EA for the WEA was issued on June 4, 2014. As a result of the analysis presented in the revised EA, BOEM issued a “Finding of No Significant Impact” (also known as a “FONSI”), which concluded that reasonably foreseeable environmental effects associated with the commercial wind lease issuance and related activities would not significantly impact the environment.

On June 17, 2014, BOEM and Massachusetts announced that 3,002 km<sup>2</sup> (742,000 acres) comprising the MA WEA would be made available for commercial wind energy leasing. On January 29, 2015, BOEM held a competitive lease sale, conducted as an auction, for the lease areas within BOEM’s MA WEA. While the lease areas were to be awarded to the highest cash bid, prior to the auction, BOEM awarded Vineyard Wind<sup>2</sup> a discount to the bid amounts it would have to pay, in recognition of the Community Benefits Agreement (“CBA”) Vineyard Wind had entered into with the local, community-based non-profit cooperative, Vineyard Power. Vineyard Wind won Lease Area OCS-A 0501 (see Figure 1.1-1) in the auction.

Lease Area OCS-A 0501 is as good as any offshore wind site in the world. The Lease Area has high wind speeds, excellent seafloor conditions, moderate water depths, and reasonable proximity to multiple grid connection locations in an area of high electrical load and a need for new generation capacity. Since winning the lease, Vineyard Wind has worked to optimize the project design and efficiency, while accounting for stakeholder input. These efforts also support the preparation of the major federal (i.e., BOEM) and Massachusetts (e.g. Energy Facility Siting Board and Massachusetts Environmental Protection Act) application submittals, as well as the Project’s response to Massachusetts’ recent Request for Proposals for long-term Power Purchase Agreements.

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<sup>2</sup> At the time of the auction, Vineyard Wind, LLC was called Offshore MW, LLC.

### 1.3 Company Overview

Vineyard Wind is a New Bedford, MA based project company owned by Copenhagen Infrastructure Partners (“CIP”) and Avangrid Renewables (“AR”). Together, these owners bring a considerable depth of offshore wind energy knowledge and experience as well as strong financial backing. CIP makes long-term clean energy infrastructure investments on behalf of 21 institutional investors, including several large Scandinavian pension funds, and currently has over five billion euros (\$5.9 billion) under management.

Copenhagen Offshore Partners is a specialized team formed to develop and deliver offshore wind projects for institutional investors such as CIP<sup>3</sup>. The Copenhagen Offshore Partners team includes individuals who have had key roles on more than 15 offshore wind projects in Europe, dating back to 1995. Major projects undertaken to-date include Veja Mate, a 402 MW wind project in the German North Sea, and Beatrice, a 588 MW project under development in the Moray Firth portion of the North Sea. The 67 turbine Veja Mate project achieved its financial closing in 2015; commissioning was completed in May 2017, well ahead of schedule. The Beatrice project is currently under construction off the northeast coast of Scotland; commercial operation is scheduled for the second quarter of 2019.

Avangrid Renewables is a leader in the renewable energy industry in the United States (“US”) and is amongst the nation’s largest renewable energy operators. AR’s mission is to lead the transformation to a competitive, clean energy future. The company is headquartered in Portland Oregon, and has regional offices in Philadelphia, Chicago, and Austin. AR controls over 6,000 MW of operating generation, including thermal, wind, solar, and biomass projects. AR is a subsidiary of Avangrid,<sup>4</sup> which is 81.5% owned by Iberdrola, SA. Iberdrola has an asset base which includes 14,000 MW of renewable energy projects in 12 countries.

Within the Avangrid/Iberdrola family, Scottish Power is where the considerable offshore wind energy expertise is positioned. Scottish Power has completed several major offshore projects, including the 389 MW West of Duddon Sands project in the UK. Scottish Power teams are currently completing construction of three new offshore wind projects: the 350 MW Wikinger project, located in the German Baltic Sea; the 714 MW East Anglia One project, located in the UK North Sea; and the 496 MW St Brieuc project, located in the Atlantic Ocean off the French coast of Brittany.

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<sup>3</sup> Copenhagen Offshore Partners has a long-term exclusivity arrangement to CIP in North America. However, there is no ownership or governance relationship between the two companies.

<sup>4</sup> Avangrid Renewables is a subsidiary of Avangrid, a New York Stock exchange listed company (AGR). Other subsidiaries of Avangrid include Central Maine Power, United Illuminating in Connecticut, New York State Electric & Gas, and Rochester Gas and Electric.

Vineyard Wind's New Bedford-based team includes scientists, engineers and managers with decades of local offshore wind energy expertise and a strong knowledge of the power grid, infrastructure, New England coastline, and ocean waters off Cape Cod and the Islands.

The Vineyard Wind team also includes Vineyard Power, a non-profit renewable energy cooperative based on Martha's Vineyard, with which Vineyard Wind has entered into a CBA. This partnership has enabled significant input into the Project design process from members of the local community, such that the Project's design addresses local concerns and enhances opportunities for local benefits. Vineyard Power staff and its board of directors have been working closely with the broader Vineyard Wind project team, and have lead responsibility for outreach to community stakeholders, including local towns, environmental interests, and commercial and recreational fisheries.

### ***1.3.1 Contact Information***

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### ***1.3.2 Designation of Operator***

The operator of the Project will be Vineyard Wind.

## **1.4 Standard Terminology**

The following table defines standard terms that are used to describe elements of the Vineyard Wind Project throughout this Construction and Operations Plan.

**Table 1.4-1 Standard Terminology Used to Describe Project Elements**

<b>Standard Term</b>	<b>Definition</b>
Construction staging areas	Areas to be used for unloading and loading equipment, final equipment assembly, etc.
Duct bank	The underground structure that houses the onshore export cable, which consists of PVC pipes encased in concrete.
Electrical Service Platform ("ESP")	The offshore substations located in the WDA, which contain transformers and other electrical gear
Export cable	The entire physical transmission cable that transmits power generated by the WTGs to the onshore substation.
Export Cable Corridor ("ECC")	The area identified for routing the entire length of onshore and offshore export cable.



**Table 1.4-1 Standard Terminology Used to Describe Project Elements (Continued)**

<b>Standard Term</b>	<b>Definition</b>
Fisheries Communication Plan	A comprehensive communications plan with the various port authorities, federal, state and local authorities, and other key stakeholders.
Foundations	Steel structures that support both ESPs and Wind Turbine Generators ("WTGs") and are driven into the seabed.
Inter-array cables	Submarine transmission cables that connect groups of WTGs to the ESPs.
Inter-link cables	A submarine transmission cable that connects ESPs together.
Landfall Site	The shoreline landing site where the export cable transitions from offshore to onshore.
Lease Area	The entire area that Vineyard Wind purchased from BOEM, which includes more area than just the WDA.
MA or RI-MA Wind Energy Area	The areas designated in Massachusetts and Rhode Island ("RI") by BOEM for wind energy development.
New Bedford Marine Commerce Terminal ("New Bedford Terminal")	A 26-acre port facility in the Port of New Bedford, which Vineyard Wind intends to use as a construction staging area.
Offshore cable system	All offshore transmission cables (inter-array cable, inter-link cable, and offshore export cable).
Offshore export cable	The portion of the export cable that is located offshore below the seafloor.
Offshore Export Cable Corridor ("OECC")	The area identified for routing the offshore export cable.
Offshore facilities	All offshore infrastructure (WTGs, ESPs, etc.).
Offshore Project Area	The offshore area where Project components are physically located.
Onshore export cable	The portion of the export cable that is located onshore underground.
Onshore Export Cable Route	The area along onshore portion of the export cable.
Onshore facilities	All onshore infrastructure (onshore substation, onshore export cables, etc.).
Onshore Project Area	The onshore area where Project components are physically located.
Onshore substation	The landside substation located in Barnstable County that contains transformers and other electrical gear.
Operations and Maintenance Facilities ("O&M Facilities")	All buildings and infrastructure used to support operations and maintenance activities.
Project	All elements of the Vineyard Wind Project (both offshore and onshore).
Project Area	The combined onshore and offshore area where Project components are physically located.

**Table 1.4-1 Standard Terminology Used to Describe Project Elements (Continued)**

Standard Term	Definition
Project Region	The cities and towns surrounding the area where Project activities will occur.
Scour protection	Rock or other protection placed around the base of a foundation to prevent sediment erosion.
Splice vaults	Underground concrete "boxes" where segments of the onshore export cable are joined together.
Transition vault	A type of splice vault where the offshore cable is transitioned to the onshore cable.
Utility right-of-way ("utility ROW")	Previously disturbed corridors that contain existing electric transmission lines or other utilities.
Wind Development Area ("WDA")	The northeast portion of the Lease Area that will be developed initially for an ~800 MW project.
Wind Turbine Generators ("WTGs")	Offshore wind turbines that will each generate approximately eight to 10 MW of electricity each.

## 1.5 Construction and Operation Concept

### 1.5.1 Objective

Vineyard Wind plans to design, permit, construct and operate an ~800 MW offshore wind energy project in the northern half of BOEM Lease Area OCS-A 0501. The WTGs for this Project will be among the most efficient renewable energy generators currently demonstrated for offshore use. Based on detailed analysis of regional wind data, it is expected that the WTGs will be capable of operating with an annual capacity factor in excess of 45%; capacity factor refers to the ratio of the Project's annual power production to the nameplate production potential.

The Project will be new, privately financed, generation infrastructure that is ideally located to provide clean, renewable electric power to one of the densely populated areas along the Atlantic coast. Electricity generated by the WTGs is emission-free and will displace electricity generated by fossil fuel-powered plants, thereby significantly reducing emissions from the ISO New England ("NE") power grid over the lifespan of the Project. Based on air emissions data for New England power generation facilities, obtained from the Environmental Protection Agency's Emissions & Generation Resource Integrated Database (eGRID), the Project will reduce carbon dioxide ("CO<sub>2</sub>") emissions from the ISO NE power grid by approximately 1,630,000 tons per year ("tpy"). In addition, the Project is expected to reduce nitrogen oxide ("NO<sub>x</sub>") and sulfur dioxides ("SO<sub>2</sub>") emissions by approximately 1,050 tpy and 860 tpy, respectively (see Section 5.1 of Volume III).

Beyond these very important environmental advantages, the Project will bring significant employment and other economic benefits to the south coast of Massachusetts and the region (see Section 7.0 of Volume III) as well as energy diversity, and on-peak power production (i.e., hot summer afternoons). Lastly, the Vineyard Wind Project could be the second offshore wind project in the US and would be an important foundational step in creating a thriving, utility-scale, domestic offshore wind industry.

Finally, the Project is being developed and permitted using an “Envelope” concept. The Envelope concept allows Vineyard Wind to properly define and bracket Project characteristics for purposes of environmental review and permitting while maintaining a reasonable degree of flexibility with respect to the selection and purchase of key Project components, such as the WTGs, foundations, submarine cables, offshore substations, etc.<sup>5</sup> As the Project is bidding into competitive power procurement processes, this flexible approach is particularly important to ensure projects can take advantage of rapidly advancing technology and produce the most cost-effective results for Massachusetts ratepayers.

The Project design may be further refined during the permitting process in an effort minimize potential impacts within the envelope. The Project Envelope which is being used to develop this Construction and Operations Plan (“COP”) is provided as Table 1.5-1, below.

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<sup>5</sup> The evolution of offshore wind technology toward less expensive, safer, and more efficient concepts often outpaces the speed of permitting processes. As BOEM recognized in its National Offshore Wind Strategy, the envelope concept allows for optimized projects once permitting is complete while ensuring a comprehensive review of the project by regulators and stakeholders.

**Table 1.5-1 Vineyard Wind Project Envelope Parameters**

Layout and Project Size	Foundation	WTGs
<ul style="list-style-type: none"> <li>• ~800MW project</li> <li>• Up to 106 WTG positions</li> <li>• Up to 100 WTGs installed</li> <li>• Construction begins late 2019</li> <li>• Continuous construction of ~800 MW project</li> </ul>	<ul style="list-style-type: none"> <li>• 100% monopiles for WTG foundations or up to 10 jacket foundations for WTGs, with the remainder monopiles</li> <li>• Pile driving hammer</li> <li>• Scour protection on all positions</li> <li>• Installation with a jack-up vessel or vessel on dynamic positioning (DP) with feeder barges</li> </ul>	<ul style="list-style-type: none"> <li>• 8 – 10MW WTG</li> <li>• Rotor size of 164-180 m (538-591 ft)</li> <li>• Hub height of 109-121 m (358-397 ft)</li> <li>• Installation with a jack-up vessel or vessel on dynamic positioning (DP) with feeder barges</li> </ul>
Inter-array Cables	Offshore Export Cables	Electrical Service Platform (ESP)
<ul style="list-style-type: none"> <li>• 66kV cables beneath the seafloor</li> <li>• Example layout identified, not finalized</li> <li>• Maximum total cable lengths indicated</li> <li>• Installation techniques include jet plow, mechanical plow &amp; mechanical trenching</li> <li>• Installation with a vessel on dynamic positioning (DP)</li> <li>• Pre-lay grapnel run</li> </ul>	<ul style="list-style-type: none"> <li>• Two 220kV export cables beneath the seafloor</li> <li>• One corridor identified with variants</li> <li>• Max total cable lengths indicated</li> <li>• Installation techniques include jet plow, mechanical plow &amp; mechanical trenching, with dredging in some locations to achieve burial depth</li> <li>• Installation with a vessel on dynamic positioning (DP) and some use of an anchored vessel</li> <li>• Use of rock protection, concrete mattresses, or half-shell, or similar on areas of minimal cable burial</li> <li>• Pre-lay grapnel run</li> </ul>	<ul style="list-style-type: none"> <li>• One 800 MW conventional ESP or two 400 MW conventional ESPs</li> <li>• Each ESP installed on one monopile or a single jacket foundation</li> <li>• Scour protection on all positions</li> <li>• Installation using foundation and turbine installation vessels or specialized crane vessel</li> </ul>

### **1.5.2 Proposed Activities**

The key elements of the Project, as bounded by the Envelope (see Table 1.5-1), are as follows. A complete description of each component, including figures, is provided in Section 3.0:

- ◆ Wind Turbine Generators: The WTGs will range in size from eight to 10 MW. Up to 106 turbine locations are being permitted to allow for spare positions (in the event of environmental or engineering challenges) and added power generation to account for electrical losses along the transmission line. If a larger turbine is selected, fewer positions will be occupied.
- ◆ Monopile and Jacket Foundations: Foundations will be monopiles or jackets. A monopile is a long, steel tube that is driven into the seabed to support a WTG. The monopiles will typically be topped by a transition piece although in some cases an extended monopile may be used with no transition piece, subject to detailed design.

Up to 12 jacket foundations may be used for the Project (up to ten jackets for WTG foundations and up to two jackets for ESP foundations). Jacket foundations, if used, would typically be located in the deeper water portions of the Lease Area. The jacket foundation is a large lattice-type steel structure that includes either three or four piles (i.e., legs) connected with welded steel tubular cross bracing. The jacket structures also include a transition piece to connect the WTG to the foundation.

- ◆ Scour Protection: All WTG and ESP foundations will have scour protection. The scour protection is expected to be a layer of stone or rock laid around the foundation.
- ◆ Inter-array Cables: 66 kilovolt (“kV”) inter-array cables will connect radial “strings” of six to 10 WTGs to a shared offshore substation or ESP.
- ◆ Offshore Substations/Electrical Service Platforms: The ESPs will include step-up transformers (66 kV to 220 kV) and other electrical gear. The ESPs are expected to be located along the northwest edge of the WDA. Two options for ESPs are being considered and analyzed in this COP: one 800 MW conventional ESP or two 400 MW conventional ESPs.
- ◆ Offshore Cables: 220 kV offshore export cables will connect the offshore ESPs to the shore. Two cables will be needed for an ~800 MW Project. If two 400 MW conventional ESPs are used, an inter-link cable will be used to connect them. The inter-link is a 220 kV cable, which connects the ESPs and provides additional reliability in the event of an export cable issue. A range of Offshore Export Cable Corridor variations and installation techniques are under consideration and are further described in Section 3.1.5. While the offshore export cables will follow a common corridor, a reasonable distance will be maintained between each cable to facilitate installation as well as any future repairs that may be needed (see Section 3.1.5.2).

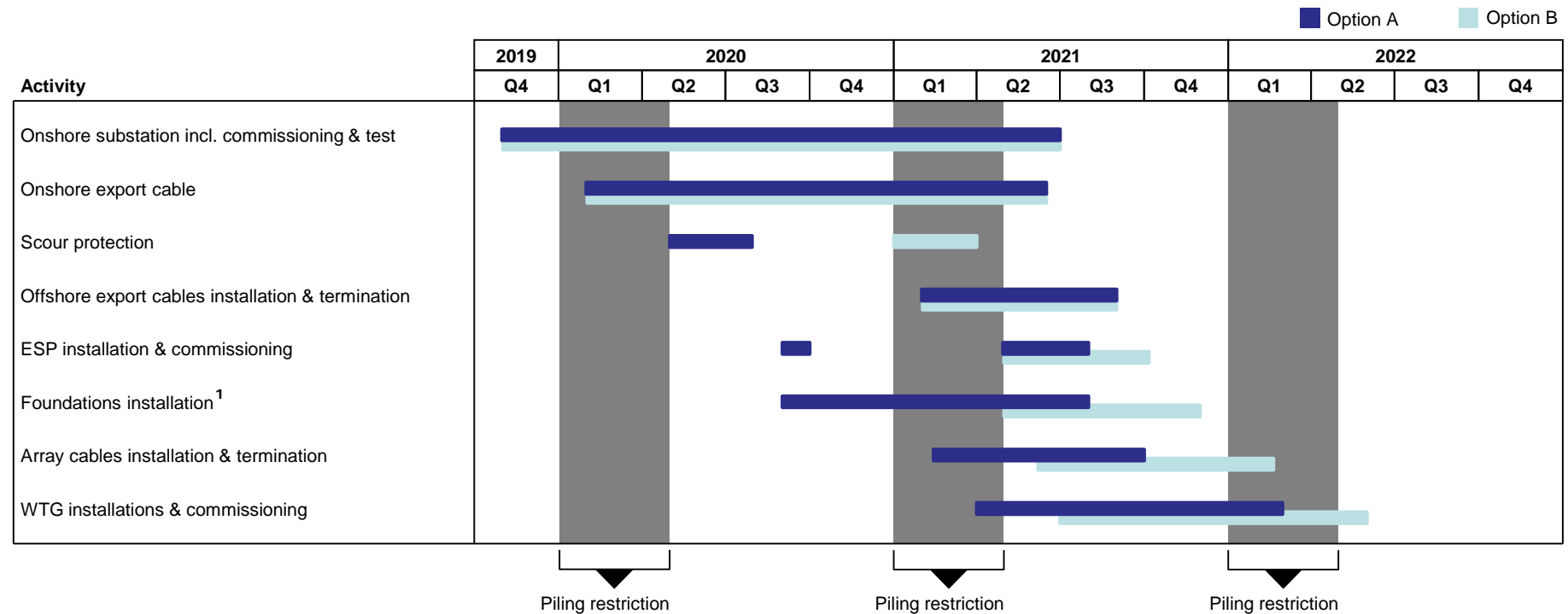
- ◆ Onshore Cables: 220 kV underground onshore export cables will be used to connect the Landfall Site to a 220 kV to 115 kV step down onshore substation and the subsequent interconnection to the bulk power grid. As with the offshore export cables, a range of underground onshore export cable routes are under consideration. Section 3.2 describes the Onshore Export Cable Routes and onshore substation.
- ◆ Installation: The Project Envelope also describes potential foundation and equipment installation approaches. As a general matter, WTG installation will be performed using jack-up vessels or dynamically positioned (“DP”) vessels, as well as necessary support vessels and barges. As described in Sections 4.2.3.3 and 4.2.3.6, cable laying will be accomplished primarily by jet plowing, mechanical plowing, or mechanical trenching. Vessel types under consideration for cable installation include DP, anchored, self-propelled, or barge. In accordance with standard industry practice, a pre-lay grapnel run will be made in all instances to locate and clear obstructions, such as abandoned fishing gear and other marine debris.

### **1.5.3      *Tentative Schedule***

Federal and Massachusetts environmental reviews, and subsequent federal, state, regional and local permitting are expected to be a principal focus of Project activities during 2018 and a portion of 2019. Assuming the necessary permits are issued and the planned financial close is completed in late 2019, construction will begin in late 2019 and will be continuous. A representation of the Project’s construction schedule is provided as Figure 1.5-1.

The Proponent anticipates that onshore construction will commence in late 2019 with work at the Landfall Site, onshore substation, and onshore duct bank. On Cape Cod, there are general summer limitations on construction activities, which the Proponent has built into the Project schedule for construction at the Landfall Site and along the onshore transmission route where the route follows public roadway layouts. Activities at the Landfall Site where transmission will transition from offshore to onshore will not be performed during the months of June through September unless authorized by the host town. Likewise, Vineyard Wind will not conduct activities along the onshore transmission route within public roadway layouts from Memorial Day through Labor Day unless authorized by the host town; such work could extend through June 15 subject to consent from the local Department of Public Works (DPW). The Company will consult with the towns regarding the construction schedule. Typical construction hours will extend from 7:00 AM to 6:00 PM. Nighttime work will be performed only on an as-needed basis, such as when crossing a busy road. When

# High-level Construction Plan



**Note 1:** Foundations installation activity includes monopile and transition piece installation.

## Vineyard Wind Project



**Figure 1.5-1**

*Construction Schedule (Continuous 800 MW)*

needed, nighttime work/extended construction hours, including possible work on weekends, will be coordinated through each Town. These summer limitations on certain onshore construction activities are shown on the detailed construction schedule included as Figure 4.1-1.

Once an increment of the Project is completed and commissioned, it will have an operational life of up to 30 years. Throughout that time, the entire Project will be carefully monitored and maintained. Skilled technicians and engineers will be responsible for a rigorous preventative maintenance program and will be responsible for addressing any malfunctions that may occur, making repairs, and replacing components. A more detailed discussion of the Project's operations and maintenance is provided in Section 4.3. Decommissioning at the end of the Project's useful life is described in Section 4.4. Assuming a 30-year operational life, decommissioning of the Project would be slated to begin no earlier than 2052.

#### **1.5.4 Plans for Phased Development**

Vineyard Wind is not proposing to develop the WDA in phases at this time.

### **1.6 Guide to Location of Required Information for COP**

The following table lists the BOEM regulations and where the corresponding information can be found in this COP.

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b)**

<b>Requirement</b>	<b>Location in COP</b>
<b>30 CFR §585.105(a)</b>	
1) Design your projects and conduct all activities in a manner that ensures safety and will not cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components to the extent practicable; and take measures to prevent unauthorized discharge of pollutants including marine trash and debris into the offshore environment.	Section 3.1.1 of Volume I Section 4.2.2 of Volume I Section 4.3 of Volume I Appendix I-A Appendix I-B Appendix I-E Section 4 of Volume III Section 5 of Volume III Section 6 of Volume III Appendix III-A Appendix III-B Appendix III-C Appendix III-D Appendix III-F



**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.621(a-g)</b>	
a) The project will conform to all applicable laws, implementing regulations, lease provisions, and stipulations or conditions of the lease.	Section 1.6 (Table 1.6-1) of Volume I Section 1.7 (Table 1.7-1) of Volume I Section 1.10 of Volume I Section 3 of Volume I Section 4 of Volume I Section 5 (Table 5-1) of Volume I Appendix I-E
b) The project will be safe.	Section 3.1.1 of Volume I Section 4.2.2 of Volume I Section 4.3 of Volume I Appendix I-B
c) The project will not unreasonably interfere with other uses of the OCS, including those involved with National security or defense.	Section 7.5 of Volume III Section 7.6 of Volume III Section 7.9 of Volume III Appendix III-E Appendix III-I
d) The project will not cause undue harm or damage to natural resources; life (including human and wildlife); property; the marine, coastal, or human environment; or sites, structures, or objects of historical or archeological significance.	Section 4 of Volume III Section 5 of Volume III Section 6 of Volume III Section 7 of Volume III Appendix III-A Appendix III-B Appendix III-C Appendix III-D Appendix III-F Appendix III-G Appendix III-H.a Appendix III-H.b
<b>30 CFR §585.621(a-g)</b>	
e) The project will use the best available and safest technology.	Section 1.5.1 of Volume I Section 4.2.2 of Volume I Appendix I-B Appendix I-D Appendix I-E
f) The project will use best management practices.	Section 4 (Table 4.1-2) of Volume III
g) The project will use properly trained personnel.	Section 4.2.2 of Volume I Section 4.3.1 of Volume I Section 4.3.2 of Volume I
<b>30 CFR §585.626(a)</b>	
<i>(1) Shallow Hazards</i>	
(i) Shallow Faults;	Section 3.2 (Table 3.2-1) of Volume II-A
(ii) Gas Seeps or shallow gas;	Section 3.2 (Table 3.2-1) of Volume II-A
(iii) Slump blocks or slump sediments;	Section 3.2 (Table 3.2-1) of Volume II-A

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.626(a)</b>	
(iv) Hydrates; or	Section 3.2 (Table 3.2-1) of Volume II-A
(v) Ice Scour of seabed sediments	Section 3.2 (Table 3.2-1) of Volume II-A
<i>(2) Geological survey relevant to the design and siting of facility</i>	
(i) Seismic activity at your proposed site;	Section 4.1 (Table 4.1-1) of Volume II-A
(ii) Fault zones;	Section 4.1 (Table 4.1-1) of Volume II-A
(iii) The possibility and effects of seabed subsidence; and	Section 4.1 (Table 4.1-1) of Volume II-A
(iv) The extent and geometry of faulting attenuation effects of geological conditions near your site.	Section 4.1 (Table 4.1-1) of Volume II-A
<i>(3) Biological</i>	
(i) A description of the results of biological surveys used to determine the presence of live bottoms, hard bottoms, and topographic features, and surveys of other marine resources such as fish populations (including migratory populations), marine mammals, sea turtles, and sea birds.	Section 5 of Volume II-A Section 6 of Volume III
<i>(4) Geotechnical Survey</i>	
(i) The results of a testing program used to investigate the stratigraphic and engineering properties of the sediment that may affect the foundations or anchoring systems for your facility.	Section 2.1.2.2 of Volume II-A (summary) Appendix F of Volume II-A Appendix N of Volume II-B
(ii) The results of adequate in situ testing, boring, and sampling at each foundation location, to examine all important sediment and rock strata to determine its strength classification, deformation properties, and dynamic characteristics.	Section 2.1.2.2 of Volume II-A (summary) Appendix F of Volume II-A Appendix N of Volume II-B
<b>30 CFR §585.626(a)</b>	
(iii) The results of a minimum of one deep boring (with soil sampling and testing) at each edge of the project area and within the project area as needed to determine the vertical and lateral variation in seabed conditions and to provide the relevant geotechnical data required for design.	Section 2.1.2.2 of Volume II-A (summary) Appendix F of Volume II-A Appendix N of Volume II-B
<i>(5) Archeological Resources</i>	
(i) A description of the historic and prehistoric archaeological resources, as required by the NHPA (16 U.S.C. 470 et. seq.), as amended.	Volume II-C (submarine) Section 7.3 of Volume III (terrestrial) Appendix III-G
<i>(6) Overall Site Investigation</i>	
(i) Scouring of the seabed;	Section 3.2 (Table 3.2-1 and Section 3.2.2) of Volume II-A Section 4.1 (Table 4.1-1) of Volume II-A
(ii) Hydraulic instability;	Section 4.1 (Table 4.1-1) of Volume II-A

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

<b>Requirement</b>	<b>Location in COP</b>
<b>(6) Overall Site Investigation</b>	
(iii) The occurrence of sand waves;	Section 3.2 (Section 3.2-1) of Volume II-A Section 4.1 (Table 4.1-1) of Volume II-A
(iv) Instability of slopes at the facility location;	Section 3.2 (Table 3.2-1) of Volume II-A Section 4.1 (Table 4.1-1) of Volume II-A
(v) Liquefaction, or possible reduction of sediment strength due to increased pore pressures;	Section 4.1 (Table 4.1-1) of Volume II-A
(vi) Degradation of subsea permafrost layers;	Section 4.1 (Table 4.1-1) of Volume II-A
(vii) Cyclic loading;	Section 4.1 (Table 4.1-1 and Section 4.2.1) of Volume II-A
(viii) Lateral loading;	Section 4.1 (Table 4.1-1 and Section 4.1.2) of Volume II-A
(ix) Dynamic loading;	Section 4.1 (Table 4.1-1) of Volume II-A
(x) Settlements and displacements;	Section 4.1 (Table 4.1-1) of Volume II-A
(xi) Plastic deformation and formation collapse mechanisms; and	Section 4.1 (Table 4.1-1) of Volume II-A
(xii) Sediment reactions on the facility foundations or anchoring systems.	Section 4.1 (Table 4.1-1) of Volume II-A
<b>30 CFR §585.626(b)</b>	
(1) Contact information	Section 1.3.1 of Volume I
(2) Designation of operator, if applicable	Section 1.3.2 of Volume I
(3) The construction and operation concept	Section 1.5 of Volume I
(4) Commercial lease stipulations and compliance	Section 1.7 of Volume I
(5) A location plat	Section 2.1 (Figure 2.1-1) of Volume I Section 2.2 (Figure 2.2-1) of Volume I
(6) General structural and project design, fabrication, and installation	Section 1.9 of Volume I Section 3 of Volume I Appendix I-C Appendix I-D Section 2 of Volume III
<b>30 CFR §585.626(b)</b>	
(7) All cables and pipelines, including cables on project easements	Section 2.1 (Figure 2.1-1) of Volume I Section 2.2 (Figure 2.2-1) of Volume I Section 3.1.5 of Volume I Section 3.1.6 of Volume I Section 3.2.1 of Volume I Section 3.2.2 of Volume I Section 3.2.3 of Volume I Section 3.3 of Volume I Section 4.2.3.3 of Volume I Section 4.2.3.5 of Volume I Section 4.2.3.6 of Volume I

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.626(b)</b>	
	Section 4.2.3.8 of Volume I Section 4.2.3.9 of Volume I Section 4.3.2.1 of Volume I Section 4.4 of Volume I
(8) A description of the deployment activities	Section 4.2 of Volume I
(9) A list of solid and liquid wastes generated	Section 4.2.5 of Volume I
(10) A listing of chemical products used (if stored volume exceeds Environmental Protection Agency (EPA) Reportable Quantities)	Section 4.2.6 of Volume I
(11) A description of any vessels, vehicles, and aircraft you will use to support your activities	Section 3.2.6 of Volume I Section 4.2.3 of Volume I Section 4.2.4 of Volume I Section 4.4 of Volume I Section 5.1 of Volume III Section 7.9 of Volume III Appendix III-I Appendix III-J
(12i) A general description of the operating procedures and systems under normal conditions	Section 4.3.1 of Volume I Section 4.3.2 of Volume I Appendix I-B
(12ii) A general description of the operating procedures and systems in the case of accidents or emergencies, including those that are natural or manmade.	Section 4.3.3 of Volume I Appendix I-A Appendix I-B Section 8 of Volume III
(13) Decommissioning and site clearance procedures	Section 4.4 of Volume I
(14i) A listing of all Federal, State, and local authorizations, approvals, or permits that are required to conduct the proposed activities, including commercial operations	Section 5 (Table 5-1) of Volume I
<b>30 CFR §585.626(b)</b>	
The U.S. Coast Guard, U.S. Army Corps of Engineers, and any other applicable authorizations, approvals, or permits, including any Federal, State or local authorizations pertaining to energy gathering, transmission or distribution (e.g., interconnection authorizations).	

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.626(b)</b>	
(14ii) A listing of all Federal, State, and local authorizations, approvals, or permits that are required to conduct the proposed activities, including commercial operations  A statement indicating whether you have applied for or obtained such authorization, approval, or permit.	Section 5 (Table 5-1) of Volume I
(15) Your proposed measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts	Section 4 (Table 4-1) of Volume III Section 5 of Volume III Section 6 of Volume III Section 7 of Volume III Appendix III-A Appendix III-C Appendix III-D Appendix III-F
(16) Information you incorporate by reference	Section 7 of Volume I
(17) A list of agencies and persons with whom you have communicated, or with whom you will communicate, regarding potential impacts associated with your proposed activities	Section 6 (Table 6-1 and Table 6-2) of Volume I
(18) Reference	Section 7 of Volume I Section 9 of Volume III
(19) Financial assurance	Section 1.8 of Volume I
(20) CVA nominations for reports required in subpart G of this part	Section 1.9 of Volume I Appendix I-C Appendix I-D
(21) Construction schedule	Section 1.5.3 (Figure 1.5-1) of Volume I Section 4.1 (Figures 4.1-1) of Volume I
(22) Air quality information	Section 5.1 of Volume III Appendix III-B
(23) Other information	Section 1.1 of Volume 1 Section 1.2 of Volume 1 Section 1.4 of Volume 1 Section 1.6 of Volume 1 Section 3 of Volume III Appendix III-G
<b>30 CFR §585.627(a)</b>	
(1) Hazard information	Section 3 of Volume II-A Section 4 of Volume II-A Appendix III-A

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.627(a)</b>	
(2) Water quality	Section 5.2 of Volume III Appendix III-A
(3)(i) Benthic Communities	Section 5 of Volume II-A Section 6.5 of Volume III Appendix III-D
(3)(ii) Marine Mammals	Section 6.7 of Volume III
(3)(iii) Sea turtles	Section 6.8 of Volume III
(3)(iv) Coastal and marine birds	Section 6.2 of Volume III Section 6.4 of Volume III Appendix III-C
(3)(v) Fish and shellfish	Section 6.5 of Volume III Section 6.6 of Volume III Appendix III-D Appendix III-F
(3)(vi) Plankton	Appendix III-F
(3)(vii) Seagrasses	Section 5.2.2 of Volume II-A Section 6.4 of Volume III Appendix III-F
(3)(viii) Plant life	Section 6.1 of Volume III Section 6.4 of Volume III
(4) Threatened or endangered species	Section 6 of Volume III
(5) Sensitive biological resources or habitats	Section 5.2 of Volume II-A (marine-benthic) Section 6 of Volume III Appendix III-D Appendix III-F
(6) Archaeological resources	Volume II-C (submarine) Section 7.3 of Volume III (terrestrial) Appendix III-G
(7) Social and economic resources	Section 7 of Volume III, Appendix III-E Appendix III-H.a Appendix III-H.b
(8) Coastal and marine uses	Section 7.6 of Volume III Section 7.8 of Volume III Section 7.9 of Volume III Appendix III-E Appendix III-I
(9) Consistency Certification	Appendix III-P

**Table 1.6-1 Construction and Operations Plan Requirements for Commercial Leases Pursuant to 30 CFR §585.105(a), 621 (a-g), 626(a) and (b), 627(a) and (b) (Continued)**

Requirement	Location in COP
<b>30 CFR §585.627(a)</b>	
(10) Other resources, conditions, and activities	Section 5.1 of Volume III Section 5.3 of Volume III Section 6.3 of Volume III Section 7.9 of Volume III Appendix III-B Appendix III-J
<b>30 CFR §585.627(b)</b>	
Consistency certification	Appendix III-P
<b>30 CFR §585.627(c)</b>	
Oil spill response plan	Appendix I-A
<b>30 CFR §585.627(d)</b>	
Safety management system	Appendix I-B

## 1.7 Commercial Lease Stipulations and Compliance

Table 1.7-1 demonstrates compliance with the stipulations in the Project's lease.

**Table 1.7-1 Commercial Lease Stipulations and Compliance**

Stipulation	Compliance
<b>Section 4(a):</b> The lessee must make all rent payments to the Lessor in accordance with applicable regulations in 30 CFR Part 585, unless otherwise specified in Addendum "B".	The Proponent has made and will continue to make all rent payments in accordance with applicable regulations, unless otherwise specified in Addendum "B".
<b>Section 4(b):</b> The Lessee must make all operating fee payments to the Lessor in accordance with applicable regulations in 30 CFR Part 585, as specified in Addendum "B".	The Proponent will make all operating fee payments in accordance with applicable regulations.
<b>Section 5:</b> The Lessee may conduct those activities described in Addendum "A" only in accordance with a SAP or COP approved by the Lessor. The Lessee may not deviate from an approved SAP or COP except as provided in applicable regulations in 30 CFR Part 585.	The Proponent will conduct activities as described in the COP.
<b>Section 7:</b> The Lessee must conduct, and agrees to conduct, all activities in the leased area in accordance with an approved SAP or COP, and with all applicable laws and regulations.	The Proponent will conduct all activities in the leased area in accordance with the COP and all applicable laws and regulations.
<b>Section 10:</b> The Lessee must provide and maintain at all times a surety bond(s) or other form(s) of financial assurance approved by the Lessor in the amount specified in Addendum "B".	The Project will provide the necessary financial assurances as described in Section 1.8 of Volume I.

**Table 1.7-1 Commercial Lease Stipulations and Compliance (Continued)**

Stipulation	Compliance
<p><b>Section 13:</b> Unless otherwise authorized by the Lessor, pursuant to the applicable regulations in 30 CFR Part 585, the Lessee must 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 within two years following lease termination, whether by expiration, cancellation, contraction, or relinquishment, in accordance with any approved SAP, COP, or approved Decommissioning Application, and applicable regulations in 30 CFR Part 585.</p>	<p>Preliminary decommissioning plans are described in Section 4.4 of Volume I. The decommissioning will be in accordance with the applicable regulations.</p>
<p><b>Section 14:</b> The Lessee must</p> <ul style="list-style-type: none"> <li>(a) Maintain all places of employment for activities authorized under this lease in compliance with occupational safety and health standards and, in addition, free from recognized hazards to employees of the Lessee or of any contractor or subcontractor operating under this lease;</li> <li>(b) Maintain all operations within the leased areas in compliance with regulations in 30 CFR Part 585 and orders from the Lessor and other Federal agencies with jurisdiction, intended to protect persons, property and the environment on the OCS; and</li> <li>(c) Provide any requested documents and records, which are pertinent to occupational or public health, safety, or environmental protection, and allow prompt access, at the site of any operation or activity conducted under this lease, to any inspector authorized by the Lessor or other Federal agency with jurisdiction.</li> </ul>	<ul style="list-style-type: none"> <li>(a) The Proponent will maintain all places of employment in compliance with applicable standards.</li> <li>(b) The Proponent will maintain all operations in the leased area in compliance with applicable regulations.</li> <li>(c) The Proponent will provide any requested documents and records.</li> </ul>
<p><b>Section 15:</b> The Lessee must comply with the Department of the Interior's non-procurement debarment and suspension regulations set forth in 2 CFR Parts 180 and 1400 and must communicate the requirement to comply with these regulations to persons with whom it does business related to this lease by including this requirement in all relevant contracts and transactions.</p>	<p>The Project will comply with the applicable Department and suspension regulations.</p>



**Table 1.7-1 Commercial Lease Stipulations and Compliance (Continued)**

Stipulation	Compliance
<b>Section 16:</b> During the performance of this lease, the Lessee must fully comply with paragraphs (1) through (7) of section 202 of Executive Order 11246, as amended (reprinted in 41 CFR 60-1.4(a)), and the implementing regulations, which are for the purpose of preventing employment discrimination against persons on the basis of race, color, religion, sex, or national origin.	The Project will fully comply with paragraphs (1) through (7) of section 202 of Executive Order 11246, as amended.
<b>Addendum “B”, Section III (Payments):</b> Unless otherwise authorized by the Lessor in accordance with the applicable regulations in 30 CFR Part 585, the Lessee must make payments as described below.	The Proponent will make payments as stipulated in Addendum “B”, Section III.

As described in Section 4.3.2 and Table 4.3-1, offshore and nearshore geophysical surveys will be conducted post-construction during the operations and maintenance phase of the Project to conduct activities such as, inspect cable depth of burial and conduct as-built cable surveys. In addition, it is anticipated that short ad-hoc geophysical or geotechnical surveys may be required during construction to verify site conditions. Geotechnical work would only be conducted in areas already cleared for archaeological/historical resources. Any unanticipated discoveries of cultural resources will be reported and avoided during further onsite work, with review and recommendations by the qualified marine archaeologist.

All surveys will use Best Management Practices and industry standard equipment that has been approved for use previously for offshore renewable energy work on the OCS. Most of the surveys will entail use of geophysical systems 200 kHz or higher in frequency that do not require any special mitigation (multi-beam echosounder, side scan sonar, and magnetometer). Standard operating conditions (i.e., vessel strike avoidance, separation distances from protected species, necessary notifications, marine trash and debris prevention, etc.) for work on the OCS will be observed.

For surveys using sonar equipment less than 200 kHz in frequency (sub-bottom profilers) and any bottom disturbing investigations that have been previously cleared, in addition to the standard operating procedures identified above, the following mitigation measures will be employed to maintain a level of consistency with pre-COP offshore project activities.

- ◆ Notifications when appropriate: national security and military organizations, USCG communication, tribal correspondence.
- ◆ Vessel strike avoidance measures, including speed restrictions in Dynamic Management Areas and from November 1 through July 31.

- ◆ Protected Species Observer (“PSO”) monitoring: PSOs will accompany survey vessels and follow standard monitoring protocols, actively observing an established exclusion zone around each vessel.
- ◆ Shut down and soft start procedures.

## 1.8 Financial Assurance

The activities and facilities proposed in the COP will be covered by financial assurance in amounts and within time frames approved by BOEM.

## 1.9 Certified Verification Agent Nomination

BOEM regulations at 30 C.F.R. § 585.705 et seq. define the requirements for use of a Certified Verification Agent (“CVA”) for offshore wind projects subject to BOEM jurisdiction. The CVA role is a key component in maintaining safety and reducing environmental risk in offshore wind projects.

### *Nomination Statement*

Vineyard Wind nominates DNV GL as CVA for the Facility Design Report (“FDR”) and Fabrication and Installation Report (“FIR”) as required by 30 C.F.R. § 585.706(a). DNV GL is world-recognized as a leading certification and classification society and has significant experience in the US offshore wind sector.

### *Qualification Statement*

The Statement of Qualifications for CVA Services is provided in Appendix I-C. The Statement addresses:

- ◆ Previous experience of the nominated CVA in third-party verification and BOEM procedures
- ◆ Technical capabilities of the CVA and staff members
- ◆ Size and type of organization
- ◆ Availability of technology
- ◆ Ability to perform
- ◆ Conflict of interest
- ◆ Professional Engineer supervision

### *Scope of Work and Verification Plan*

The CVA Scope of Work and Verification Plan is provided in Appendix I-D. This document defines the alignment of 30 C.F.R. § 585 with the International Electrotechnical Commission (“IEC”) Standard 61400-22, including issuance of IEC-compliant conformity statements and evaluation reports. IEC 61400-22 will be supplemented by DNVGL-SE-0073, Service Specification for Project Certification of Wind Farms. The scope specifies the level of work to be performed by the CVA at all phases of the verification, and identifies the high-level list of documents and subject matter that the CVA will review.

#### **1.10 Design Standards**

BOEM’s COP Guidelines recognize that “[t]he BOEM’s renewable energy regulations are not prescriptive regarding the design standards that must be used for an offshore wind energy installation” (COP Guidelines Appendix C, Section I). Further, the Guidelines state that “[f]or offshore wind turbines, BOEM will accept a ‘design-basis’ approach whereby the applicant proposes which criteria and standards to apply, and then justifies why each particular criterion and standard is appropriate” (COP Guidelines Appendix C, Section I). Towards that end, Vineyard Wind has created a Hierarchy of Standards, provided in Appendix I-E, to inform the Project design and development process.

