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## SECTION 83C

# REQUEST FOR PROPOSAL APPLICATION FORM

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### APPLICANT INFORMATION

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Section 1 OF APPENDIX B TO THE RFP  
CERTIFICATION, PROJECT AND PRICING DATA

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*The Certification, Project and Pricing Data ("CPPD") document is a Microsoft Excel workbook that is provided on the website at [www.MACleanEnergy.com](http://www.MACleanEnergy.com).*

**Section 2 OF APPENDIX B TO THE RFP  
EXECUTIVE SUMMARY OF THE PROPOSAL (INCLUDING THE BASE PROPOSAL  
AND ANY ALTERNATIVE PROPOSALS)**

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*The bidder is required to provide an executive summary of the project proposal that includes a complete description of the proposed generation and/or transmission bid, the proposed contract term and pricing schedule, the overall project schedule and other factors the bidder deems to be important. Expandable Transmission proposals must provide the information requested below for each phase of the expansion and identify all incremental equipment and incremental costs associated with the expandable nature of the plan.*

**The Vineyard Wind value proposition: Cost effective, Early Project, Big Benefits for Massachusetts**

We are proud to present a proposal that will make the Commonwealth of Massachusetts home to the first large-scale commercial offshore wind project in the United States as early as 2021, fast-tracking Massachusetts to become the leading hub for offshore wind in the US.

The Vineyard Wind proposal targets the construction and operation of a 400MW offshore wind project that can be structured as either a standalone Generator Lead-Line proposal integrating generation and transmission assets, or as a combination of a 400MW generation facility and an expandable transmission facility that could absorb up to 1600MW of generation.

Our lowest cost bid is an “all-in”, fixed price 400MW Generator Lead Line proposal

While the “all-in” price is our lowest cost-bid, we believe our best value bid is to build 400MW generation in combination with 800MW of transmission capacity, all with a 2021 delivery date

Vineyard Wind has taken advantage of its unique geographical location in developing this best-value bid. Adding 400MW of spare transmission capacity, available to all developers, in the Vineyard Wind lease area – the central part of the 5 wind energy areas, with 2 areas to the east and 2 areas to the west – allows Massachusetts to capture a significant portion of the benefits of a project larger than 400MW. By removing both significant costs and risks the EDCs will be able in upcoming solicitations to make available to developers a transmission infrastructure that will result in more competitive offers for Massachusetts ratepayers.

The proposals highlighted above, to be detailed in the following pages, are the result of a thorough analysis performed by an experienced, senior team based in Massachusetts and a substantial interaction with US and global supply chain companies to validate the feasibility and price certainty of an early delivery project.

The Vineyard Wind parent companies consist of funds managed by Copenhagen Infrastructure Partners (CIP), whose senior partners are pioneers in the offshore wind industry, and Avangrid Renewables (AR),



the third largest onshore wind developer in the US with operations in 27 states including Massachusetts, and an affiliate of the Iberdrola Group, the world's largest wind developer with more than 15,000MW of wind installed.

Vineyard Wind's partners have since August 2016 invested significant resources in developing the project to a point where it is now the most mature and most advanced large scale offshore wind projects anywhere in the US. We are proud to announce that we – as the first of the currently active Massachusetts offshore wind developments - have filed the 2 key permit applications, the federal-level Construction and Operations Plan (COP), and the state-level Energy and Facilities Siting Board (EFSB) in December 2017.

We believe our progressed and mature project plan will enable us to deliver the earliest possible project in Massachusetts. Vineyard Wind will base our construction activities from the existing facilities around the New Bedford Marine Commerce Terminal and we will, as estimated by UMass Dartmouth's Public Policy Center (UMass PPC), contribute to create 2500 jobs, 1000 of which jobs UMass PPC expects to be created before the end of 2021.


Following the construction phase, our project will create 1500 jobs over its 25-year operational phase, helping to invigorate and sustain the economies of Martha's Vineyard, where the O&M facility will be located, and New Bedford, where strategic support services will be based.

To further increase the impact of its early delivery schedule, beyond the figures estimated by UMass PPC, Vineyard Wind is announcing a \$15m initiative called the "Massachusetts Offshore Wind Accelerator Program". The program is proposed to be managed by MassCEC, with a focus on further accelerating the way supply chain companies can and, as part of the procurement for the early Vineyard Wind project, set up operation in Massachusetts.

The early timeline of the Vineyard Wind project will therefore not only kick-start the development of supply chain establishment and job creation in the Commonwealth, it will also build a strong foundation for future projects. Projects with a later timeline can benefit and build on the foundation laid by Vineyard Wind to drive even stronger job creation at a later point in time.

To deliver the first large-scale commercial offshore wind farm in the US, Vineyard Wind has gathered strong local support for our project through early engagement, starting in 2009, with communities of the Cape and the Islands, and fishermen of the region. We are the first and only US offshore wind developer to have entered into a Community Benefit Agreement, which we signed with our local partner Vineyard Power Cooperative in 2015. Vineyard Wind is also proud to have received letters of support from all six towns on Martha's Vineyard and the Town of Nantucket - the communities closest to the project.

We firmly believe Vineyard Wind's early project will become an integral part of kick-starting a new green technology industry with Massachusetts as its hub, at a time when other states are announcing ambitious plans for offshore wind. In summary, the early Vineyard Wind project will:

- 
- ✓ **Make Massachusetts home of the first large-scale offshore wind project in the US**, with site construction starting in 2019, and fully commissioned project in 2021.
  - ✓ **Maximize supply chain opportunities in Massachusetts** through the early project delivery and by funding the \$15m "Massachusetts Offshore Wind Accelerator Program".
  - ✓ **Generate 2500 jobs**, with 1000 of those jobs starting in just a couple of years with the start of on-site construction.
  - ✓ **Enable savings of \$230 million for Massachusetts ratepayers** by providing an innovative, low cost, fixed cost phased transmission solution for 400MW of additional capacity available already in 2021 for upcoming solicitations.

- ✓ **Provide significant carbon dioxide reductions starting as soon as 2021** and making a major contribution to meeting the Global Warming Solutions Act by displacing 627,000 metric tons of carbon dioxide annually.

### Vineyard Wind 1 project description

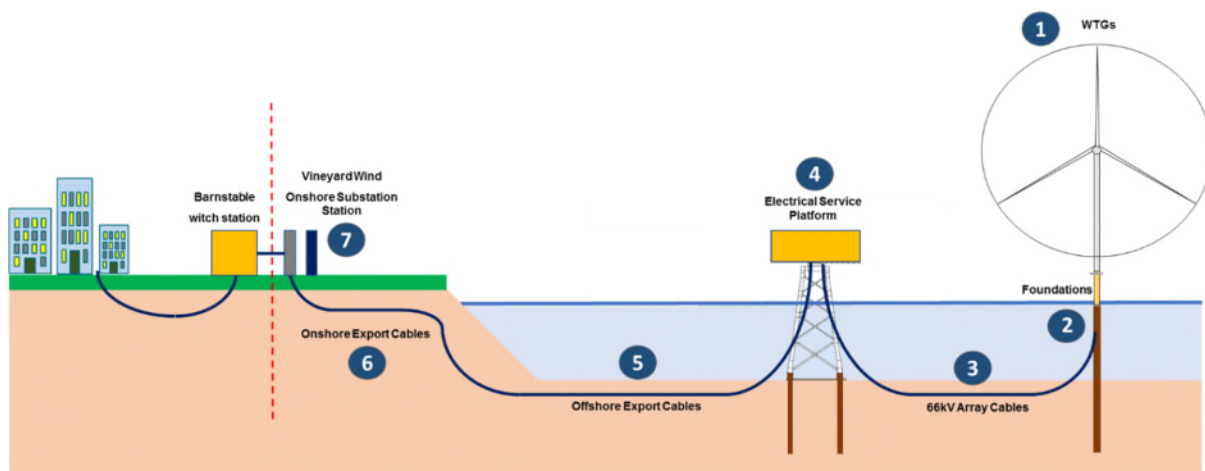
Vineyard Wind proposes to build the 400 MW Vineyard Wind 1 offshore wind farm based on commercially available and highly reliable technology, and the project plan is designed to achieve full operation by the end of 2021 (see **Figure 2.1.-1** for details on the timeline).

The project schedule is based on the most recent experience from projects in Europe completed in similar timeframes, and has been validated by significant interaction with the supply chain companies relevant for an early project delivery, as is evidenced by the letters of support and interest that are included in this RFP response.



**Figure 2.1.-1: Vineyard Wind 1 high-level milestones.**

The 400 MW Vineyard Wind 1 project will consist of the latest generation offshore Wind Turbine Generators currently available on the market, each to be placed offshore on a Monopile (MP) foundation, with a Transition Piece (TP) making the connection between the foundation and the turbine tower. Inter-array cables will connect the WTGs to an offshore substation, or Electrical Service Platform (ESP). At the ESP the power is transformed from 66kV to 220kV and transmitted to the Massachusetts grid through cables buried up to 6 feet under the sea floor. The cables will also be buried as they come, and follow a route under streets and through existing rights-of-way to the substation and grid connection point in Barnstable. Vineyard Wind's onshore substation will deliver up to 800MW of clean power without need for upgrades to the existing transmission system.



**Figure 2.1.-2: Schematic outline of the Project.**

The New Bedford Marine Commerce Terminal (NBMCT) will be used as the main construction port for the project, and Vineyard Wind will construct a new facility for crew transfer vessels, warehouses, and other facilities in the port of Vineyard Haven, from which O&M will be staged.

The project will interconnect to Barnstable and West Barnstable through two offshore cables (for each 800MW of transmission), that travel north from the project site, through Muskeget Channel and will

make landfall in Yarmouth and potentially Barnstable depending on final route selection. **Figure 2.1.-3** below shows the key locations for the Vineyard Wind proposals.

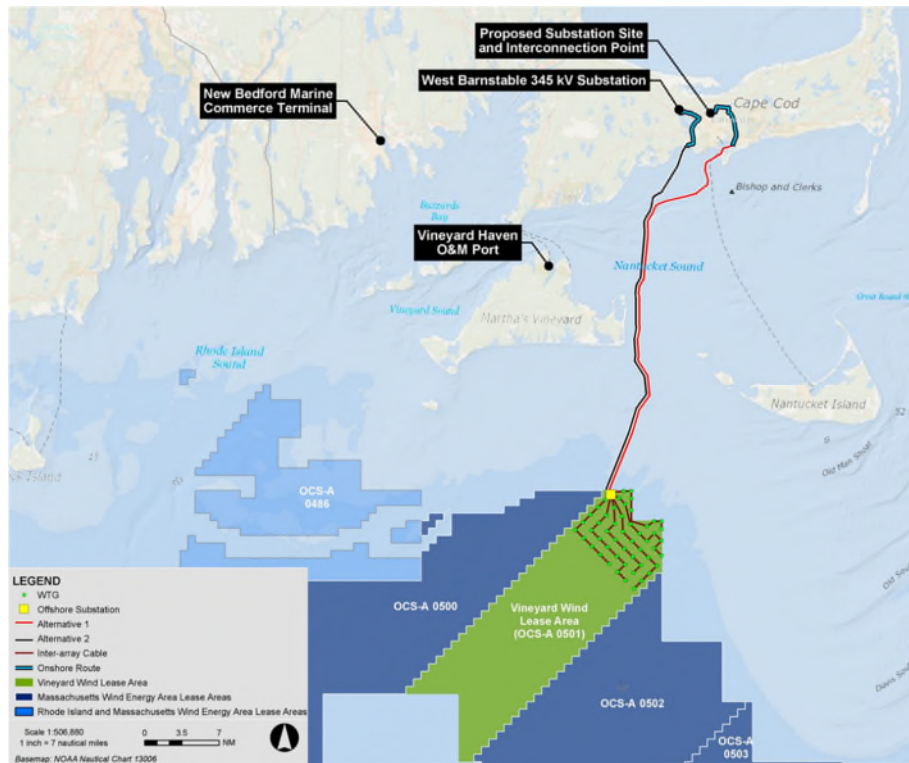


Figure 2.1.-3: Vineyard Wind 1 project overview.

### The Vineyard Wind Connector: a phased, cost-efficient transmission concept

The Vineyard Wind Connector consists of 2 phases of expandable transmission of 800MW each (Vineyard Wind Connector 1 and 2) that is based on its partner's experience from offshore wind projects in other markets. Vineyard Wind has developed a proposal to immediately capture transmission synergies at low, fixed costs while building the first 400 MW generation project.

The Vineyard Wind Connector will enable long-term cost benefits by saving \$230 million in capital costs compared to two separate 400MW proposals by maximizing transmission capacities in subsea and onshore cables and other electrical equipment. Such a design also reduces the impact on the local communities and the marine environment by increasing transmission capacity by 100% without increasing the number of cables being laid on the seabed and buried underground in the affected communities.

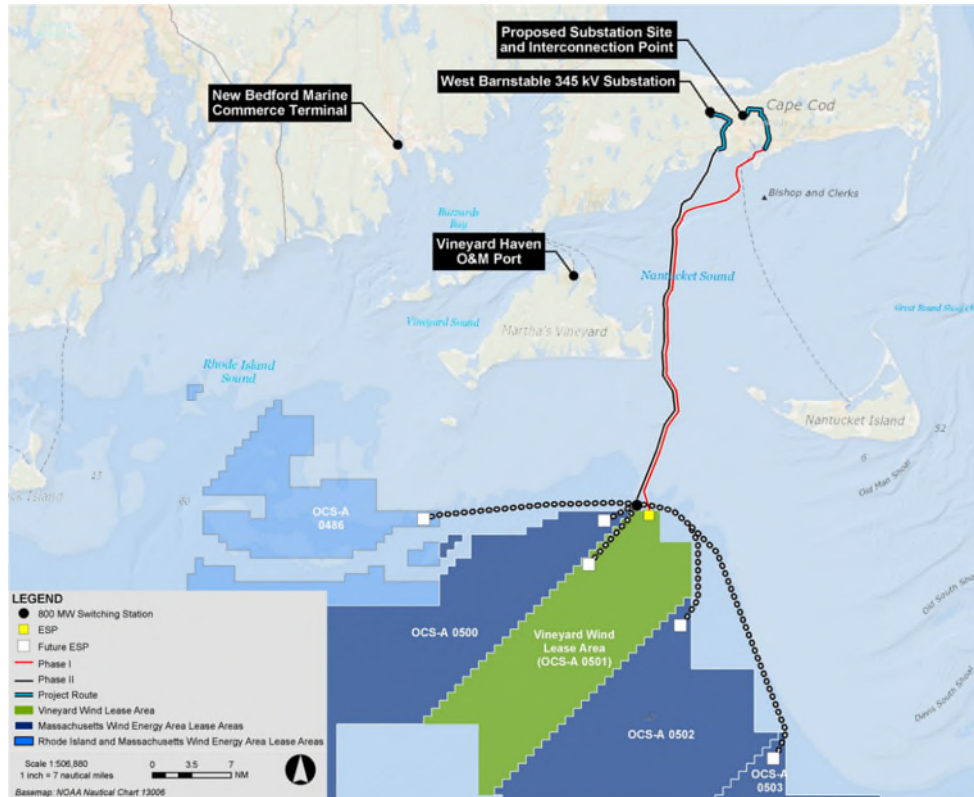


Figure 2.1-4: Vineyard Wind Connector 1 and 2 and potential interconnects.

The first phase buildout of the 800 MW Vineyard Wind Connector 1 offers unique advantages for a number of reasons:

- **The shortest, most direct route to the mainland grid from the center of the development area:** The Vineyard Wind Connector's Energy Service Platform (ESP) location at the center of the RI-MA and Massachusetts Wind Energy Areas, with two lease areas to the east, and two lease areas to the west, is optimal for providing grid connection to the full development area.
- **Readily available, cost-effective solution for future developers serving Massachusetts:** The two yet-to-be-leased offshore lease areas in the Massachusetts Wind Energy Area (WEA) will require the longest transmission routes of the five existing lease areas, and will have the least time to develop transmission solutions before the next Section 83C solicitations are held.
- **Lower costs for future offshore wind generation projects:** By allowing open, non-discriminatory access to 400MW capacity on the Vineyard Wind Connector 1 transmission system, a significant commercial risk will be removed, enabling better prices in future solicitations.

Vineyard Wind is also proposing to develop the 800MW Vineyard Wind Connector 2, re-using the same design principles as used for Vineyard Wind Connector 1, but due to a lack of certainty on future solicitation schedules and other requirements, means that we are offering this as a standard OATT tariff on a cost-of-service basis.

### Vineyard Wind proposal pricing overview

Vineyard Wind has submitted two separate CPPD forms detailing two separate proposals as part of this Section 83C RFP, one for 400MW generation and one for 800MW generation, each with expandable transmission options for up to 1600MW.

This proposal is for 400MW of offshore wind generation (**Vineyard Wind 1**) which can connect through its own Generator Lead Line, or through the first phase of a two-phased Expandable Transmission solution, each phase having 800MW of transmission capacity (**Vineyard Wind Connector 1** and **Vineyard Wind Connector 2**).

The below overview provides the structure and key pricing elements of the Vineyard Wind 400MW proposal as included and detailed in this document. Our lowest cost proposal is detailed as proposal “C” below, whereas our best value proposal is described as proposal “A”.

**Table 2.1.-1: Vineyard Wind 1 (400MW generation) proposal outline and pricing.**

	400 MW Offshore Wind Energy Generation with an Expandable Transmission Proposal			Project Specific Generator Lead Line Proposal
	Generation	Vineyard Wind Connector 1	Vineyard Wind Connector 2	
Project proposal	A: Bundled proposal		B: Optional	C: Stand-alone
Type	Generation only	Expandable Transmission (phase 1)	Expandable Transmission (phase 2)	Bundled Generation and Transmission
Capacity	400MW	800MW	800MW	400MW
COD	Dec. 2021	Dec. 2021	Suggested 2023	Dec. 2021
Contract type	PPA	TSA	TSA	PPA
Contract term	██████	██████	██████	██████
Unit pricing	Fixed	Fixed	Cost of service	Fixed
First year price	██████████	██████████████	██████████████████	██████████████
First year contract cost <sup>2</sup>	██████████			██████████

Vineyard Wind has carefully developed fixed-cost, no risk options for Massachusetts ratepayers, allowing the EDCs to choose between either (i) a very attractive proposal offering a combination of 400MW generation and 800MW transmission (Proposal A above), or (ii) the lowest cost possible for 400MW offshore wind generation with an “all-in” proposal (Proposal C above).

#### **Best value proposal (“A”): 400MW generation and 800MW transmission**

Vineyard Wind firmly believes that Proposal A, as shown in **Table 2.1-1** above, a bundling of 400MW offshore wind generation and 800MW transmission is an extraordinary value proposal for Massachusetts ratepayers. The 400MW offshore wind generation will be delivered at a very attractive price by achieving \$230 million in capital costs savings compared to building two, separate 400MW projects.

The 800MW Vineyard Wind Connector 1 will allow for 400MW transmission capacity constructed and commissioned offshore, to be made available for all developers by 2021, at a low and fixed cost.

Massachusetts ratepayers would realize substantial savings from a strategy to select this offering now, so that future 83C solicitations will have the benefit of savings from future price reductions as offshore wind



technology continues to evolve, while removing a significant risk related to grid connection for developers bidding in upcoming tenders.

**Expandable transmission up to 1600MW (“B”): the 800 MW Vineyard Wind Connector 2**

Vineyard Wind is also offering to develop, permit, construct, and operate an additional 800MW of transmission for a total of 1600MW of expandable transmission in combination with the Vineyard Wind Connector 1, shown as Proposal B in **Table 2.1-1** above.

The 800MW Vineyard Wind Connector 2 will build on the same engineering design for the off- and onshore cable routes as well as onshore substation design. It will include an 800MW offshore switching station that will be available for all current and future offshore developers to use as an interconnect point for up to 800MW of transmission capacity.

By phasing 1600MW expandable transmission buildout into two, separate 800MW phases, Massachusetts ratepayers will be protected against the risk of stranded assets compared to building a single 1600MW offshore facility for the first 400MW project. Due to the unknown timing for subsequent offshore wind generation projects, the Vineyard Wind Connector 2 project is offered on a cost-of-service basis. However, once firm timing and location requirements are developed, Vineyard Wind would be willing to discuss a proposal for a fixed price offer for this transmission option, if requested to do so.

**Lowest cost 400MW proposal (“C”): 400MW with generator lead line**

While Vineyard Wind believes a proposal where 400MW offshore wind generation and 800MW transmission is jointly developed and provide the highest, long-term value for consumers, we are equally proud to present a proposal, shown as Proposal C in **Table 2.1-1** above.

The “all-in” proposal will provide Massachusetts ratepayers with a very attractive fixed price for 400MW of offshore wind generation with a Generator Lead Line with no risk for cost overruns. The suggested 400MW an “all-in” proposal also allows for a very simple contract structure between Vineyard Wind and the EDCs, and minimizes interface and timing risks on future buildout plans and solicitations.

**Early delivery timeline with a low price**

As detailed in this proposal, Vineyard Wind has an early delivery timeline which requires early equipment procurement and other early works, as an integral part of the attractive pricing. All proposals are designed so as to maximize the benefits of the tax credits for Massachusetts and it is Vineyard Wind’s expectation that the selection of projects, negotiation and execution of contracts and submittal of contracts for approval by the Massachusetts Department of Public Utilities (“MA DPU”) will proceed according to the timeline established by the MA DPU in its Order issued June 21, 2017 in its docket D.P.U. 17-103 and that executed contracts will have been approved by the MA DPU not later than December 31, 2018.

**Delivery to states other than Massachusetts**

Vineyard Wind recognizes that a procurement involving EDCs of more than one state could bring important and relevant synergies, thus provide significant savings. Vineyard Wind is therefore willing to adapt its current proposals to any procurement of more than 400MW of offshore wind capacity. Vineyard Wind would very much want to engage in a commercial discussion with prospective buyers on procurement of additional capacity such that ratepayers in Massachusetts, as well as other states, can fairly benefit from cost reductions resulting from such synergies.

The synergies are dependent on the level of additional procurement, alignment of such procurement schedule with the schedules of the proposals presented, and the terms and conditions of the PPA and/or TSAs of any prospective buyer.

## **Key highlights of the Vineyard Wind bids**

Vineyard Wind has developed a proposal that integrates a number of key features that, in combination, will not only deliver an early offshore wind project in Massachusetts but also deliver other significant benefits to Massachusetts ratepayers, as detailed in the following sections.

### **1. Massachusetts Offshore Wind Accelerator Program**

Not only is Vineyard Wind offering a very attractive price for Massachusetts ratepayers, it will also – through its early project delivery – enable Massachusetts to reap the many benefits of being a first mover in a new, early stage industry, much as the Commonwealth has been able to take leading positions in other industries such as IT and medicine.

The 2021 delivery timeline will put Massachusetts at the center of a new green industry in the US at a time when other states on the East Coast are announcing significant offshore wind ambitions and are seeking to attract the same supply chain companies.

Over the last 15 months Vineyard Wind has had intense discussions with companies in the US, as well as the existing global offshore wind supply chain, and we believe, as evidenced by the letters of support and interest attached to this RFP response, that there is an immense opportunity for the Commonwealth to attract the supply chain to the Commonwealth with an early project and other follow-on projects.

To leverage the effect of the early delivery of its project, Vineyard Wind will therefore contribute \$15m to set up the Massachusetts Offshore Wind Accelerator Program. The program is designed to maximize offshore wind industry development in Massachusetts alongside the early project and is proposed to be managed by MassCEC, an organisation that has already been instrumental in laying the groundwork for the offshore wind industry in Massachusetts.

The program is built on four pillars: (i) improving or acquiring port facilities or other real estate relevant for establishing supply chain activities, (ii) support setup costs for supply chain companies moving to Massachusetts, (iii) training of a local workforce and a commitment to “look local first”, and finally (iv) research and technology development to protect marine mammals as the offshore wind industry is growing.

### **2. Vineyard Wind – a very experienced and strong team**

To credibly deliver a large-scale commercial project in a new market, a strong partnership such as Vineyard Wind is needed. The unique experience of Vineyard Wind’s parent companies is a key enabler for project delivery with an attractive price as early as 2021. The parent companies’ world-leading offshore wind expertise is combined with leading US onshore wind and transmission development expertise, as well as local knowledge of Massachusetts and its coasts.

#### **Financially strong, world-leading experience and capabilities**

- Copenhagen Infrastructure Partners P/S (CIP) is a fund management company, specializing in investing in the energy infrastructure sector. Since its establishment in October 2012, CIP has raised four infrastructure funds to support renewable technologies with total commitments of more than EUR6 billion from over 25 institutional investors. The CIP senior partners have been involved in a significant number of the largest offshore wind projects and transactions globally.
- Avangrid Renewables is a leader in the renewable energy industry in the US and has more than \$10 billion worth of operating assets and with 6,000MW of owned and controlled wind and solar facilities in 27 states across the United States, including in Massachusetts. Avangrid Inc. is 81.5% owned by Iberdrola SA, the world’s largest wind developer, with more than 15,000MW of installed wind capacity and total assets of \$134 billion (September 2017).
- Vineyard Wind will also be supported by personnel from two of Iberdrola’s subsidiary companies, ScottishPower Renewables Ltd (SPR) and Central Maine Power (CMP). SPR has

considerable experience in the development, construction, and operation of offshore windfarms as the company responsible for Iberdrola's offshore wind projects in Europe.

**Global offshore wind development and construction experience**

- CIP and SPR are currently developing more than 10,000MW in total of offshore wind projects in seven countries around the world (US, UK, Germany, France, Canada, Taiwan and Australia).
- CIP and SPR are also involved in the ongoing construction of 2,000MW of projects in Europe.

**Strong US offshore wind development and permitting experience**

- Coupled with the European offshore wind experience, the Vineyard Wind project team includes key US individuals who have a 10-year track record in the early stages of US offshore wind development and project permitting.

**Transmission development experience, on- and offshore**

- Vineyard Wind transmission development activities will draw on the resources and personnel of Central Maine Power (an affiliate of Avangrid Renewables) which has recently completed the \$1.4 billion Maine Power Reliability Program on-time and on-budget. CMP is one of the most experienced transmission network operators in New England.
- CIP is, in a joint venture with the European leading transmission operator TenneT, currently constructing the 900MW Dolwin 3 HVDC offshore wind converter platform in the German North Sea. Dolwin 3 is currently in the final stages of construction, going through final commissioning and is expected to enter operation in 2018.

**3. Vineyard Wind provides direct economic benefits of \$1.87 billion to Massachusetts**

Besides providing transmission benefits for future projects, Vineyard Wind will also create a range of other benefits to Massachusetts. Vineyard Wind has engaged Daymark Energy Advisors, a leading provider of integrated planning, policy, strategic analysis, and advisory services to the North American electric and natural gas industries, to identify and quantify other economic benefits of the Vineyard Wind project.

The direct benefits of the Vineyard Wind project are measured by Daymark as the market value of the generation and RPS Class I eligible RECs at the contract delivery point with the project in-service. The Vineyard Wind 1 400 MW project was found to offer direct contract benefits of up to \$1.87 billion net present value (NPV).

Vineyard Wind also engaged the University of Massachusetts, Dartmouth's Public Policy Center (UMass PPC) to undertake a forecast of job creation and other economic benefits resulting from the early Vineyard Wind Project. It is projected by UMass PPC that such an early project will create up approximately 2500 full-time equivalent jobs in the Commonwealth over the life of the project, and of these approximately 2500 Massachusetts jobs, more than 90% will be in southeastern Massachusetts.

The jobs created will span a diverse range of professions, from construction to engineering and science to managerial. As the first offshore wind project in Massachusetts the jobs will be springboards for entire careers for many.

**4. Resiliency and Affordability Fund – low income benefits and battery storage**

Besides the early delivery of the Vineyard Wind 1 project and associated direct benefits through job creation, Vineyard Wind has also decided to establish a Resiliency and Affordability Fund in partnership with Citizens Energy and its community benefit partner Vineyard Power Cooperative to provide low-income and community benefits.

Vineyard Wind will contribute \$1 million each year for 15 years, providing low-income and community benefits, while demonstrating how distributed battery energy storage will enhance reliability as



Massachusetts continues to expand its use of renewable energy like offshore wind. Specific objectives of the Vineyard Wind Resiliency and Affordability Fund are:

- **Effective use of distributed battery energy storage:** Enhance system reliability and resiliency by wide deployment of distributed battery energy storage
- **Low-income benefit:** Provide credits directly to low-income ratepayers electric utility bill.
- **Community Benefit:** Implement energy storage and solar projects that provide back-up power and energy cost savings to public buildings

Vineyard Wind's Resiliency and Affordability Fund will support the construction of solar and energy storage projects in the communities hosting the Vineyard Wind project, which includes Bristol County and New Bedford, Martha's Vineyard and Nantucket, Barnstable and Yarmouth. These projects will then deliver significant and on-going benefits to these communities in the form of bill-credits for low-income residents, back-up power and cost savings for public buildings

#### 5. Vineyard Wind excels in meeting the requirements of this 83C procurement

With a fully cost-contained and cost-effective transmission option, all the inherent benefits on an early project, its commitment to the Massachusetts Offshore Wind Accelerator Program, and the Resiliency and Affordability Fund, Vineyard Wind also fulfils all other relevant criteria in Section 83C with this proposal.

The 400 MW Vineyard Wind early project will:

- ✓ **Enhance electricity reliability in Massachusetts;** by providing a large, reliable energy source at the heart of the SEMA load center.
- ✓ **Contribute to reducing Winter Electricity Price Spikes** by providing a very high and stable winter capacity factor generation unaffected by risk of fossil fuel shortages.
- ✓ **Avoid Line Loss and mitigate Transmission Cost Overruns;** by providing a fixed cost, highly efficient transmission design with the shortest possible route to shore, highest possible voltage level, and by having built-in redundancy, all at a fixed price.
- ✓ **Contribute to Employment and Economic Development;** by fostering direct and indirect job creation in Massachusetts, further enhanced by the \$15m Massachusetts Offshore Wind Industry Accelerator Program.
- ✓ **Adequately demonstrate Project Viability in a Commercially Reasonable Timeframe;** by having already submitted two major permit applications as the first Massachusetts based offshore wind project to do so.
- ✓ **Provide support for the development of distributed battery energy storage projects;** by establishment of the Resiliency and Affordability Fund that invests in local community storage projects.
- ✓ **Demonstrate benefit to low-income ratepayers in the Commonwealth without adding cost to the Project:** Through a substantial job creation and training opportunity as well as a self-sustaining Resiliency and Affordability Fund.

#### Summary

The parent companies of Vineyard Wind are world-leading renewable energy companies in global offshore wind as well as strong US onshore and transmission experience. Since passage of the Section 83C legislation, Vineyard Wind has invested significant resources in the development of the Vineyard Wind projects.

Vineyard Wind's Massachusetts based-team has developed the Vineyard Wind projects to a point where they are the most mature and furthest advanced large scale offshore wind projects currently under development in the US.

CIP and Avangrid believe the time has now come for Massachusetts to seize the opportunity to be a first mover for large-scale offshore wind in the US, reap the benefits of previous investments in offshore wind facilities such as the New Bedford Marine Commerce Terminal, and capitalize on the head start that the Section 83C legislation has created for the Commonwealth to establish itself as the center of a new green-tech industry.

The time has come for offshore wind to work for Massachusetts, and Vineyard Wind is ready to get to work.

### Section 3 OF APPENDIX B TO THE RFP OPERATIONAL PARAMETERS

**3.1. Maintenance Outage Requirements – Specify partial and complete planned outage requirements in weeks or days for all generation facilities and transmission facilities. Also, list the number of months required for the cycle to repeat (e.g., list time interval of minor and major overhauls, and the duration of overhauls).**

Vineyard Wind will positively contribute to meeting energy requirements, especially during periods of high demand, despite the occasional need for maintenance outages. Planned outages will contribute to [REDACTED] of the average annual time the Vineyard Wind Offshore Wind Farm, Vineyard Wind 1, will be unavailable for production.

Maintenance outages for the various wind farm components will generally be scheduled as shown in **Table 3.1-1**.

**Table 3.1-1: Partial and complete planned outage requirements in weeks or days for all generation facilities and transmission facilities.**

Wind farm component	Approximate yearly outage period due to scheduled maintenance		% of wind farm capacity out of service during maintenance
	May-Sep.	Outside ISO-NE restricted period <sup>1</sup>	
WTG	[REDACTED] WTG	-	[REDACTED]
ESP	-	[REDACTED] substation*	[REDACTED]
Onshore substation	-	[REDACTED] substation**	[REDACTED]
Inter-Array cable	-	[REDACTED]	N/A
Export cable	-	[REDACTED]	N/A

\*: Every 5 years it may be necessary to increase outage to [REDACTED]

\*\*: Every 5 years it may be necessary to increase outage to [REDACTED]

The summer months are the safest time of year for technicians to perform scheduled maintenance, and safety is the number one priority for Vineyard Wind. However, in order to limit the impact of performing maintenance during the summer months, the maintenance will be carried out in a rolling sequence of [REDACTED] wind turbines (equal to [REDACTED] of the wind farm capacity) being taken off-line at any given time.

Scheduled maintenance of the ESP and onshore substation is assumed to be conducted simultaneously, meaning that a [REDACTED] reduction in production capacity only occurs once per year.

In addition, Vineyard Wind will work closely with the WTG manufacturers to maximize efficiency in carrying out scheduled maintenance. Efficiency enhancements may include the proactive replacement of parts and consumables on an accelerated schedule so operational reliability will not be compromised, ensuring commonly required parts and consumables are on hand at the time maintenance is being performed, and potentially adopting an alternating schedule where, rather than performing every task every year, tasks that can be safely deferred will be performed every other year. Finally, Vineyard Wind will monitor summer temperature and may be able to suspend maintenance during particularly hot weather when demand is highest.

#### 3.1.1. Maintenance Campaign Period

Scheduled maintenance will be planned and scheduled to occur during periods of historically low production, thereby minimizing the impacts of any necessary outages. ISO New England (ISO-NE) will

<sup>1</sup> i.e. Oct, Nov, Mar and Apr

<sup>2</sup> WTG can export through remaining circuit as long as overall capacity factor does not exceed 50%.

be advised about the planned maintenance campaigns well in advance in order to minimize the system impacts of the outage.

**Wind Turbine Generators (WTG):** WTGs will undergo scheduled maintenance requiring an outage lasting [REDACTED] for each WTG once every 12 months. WTGs will not necessarily be taken out of service for a consecutive time period but, based on personnel scheduling, the outage may split over several days. WTG maintenance will be carried out on a rolling program of approximately [REDACTED] turbines taken off-line at a time, resulting in the remaining WTGs staying online (producing electricity) and able to contribute towards meeting the peak summer demand.

**Electrical Service Platform (ESP):** Scheduled maintenance of the ESP components will take place at predefined intervals in accordance with the manufacturer's recommendations and in coordination with ISO NE.

An ESP maintenance outage will be scheduled once per year outside ISO-NE peak load period (e.g., during October), as per **Table 3.1-1**. [REDACTED]

[REDACTED] and will be planned and resourced to minimize overall downtime.

[REDACTED] it is possible that a longer outage [REDACTED] days will be needed in order to perform additional, in-depth scheduled maintenance such as high voltage protection functional testing, switchgear tests, and detailed transformer inspections. These in-depth inspections are required in order to ensure the safe and reliable operation of these systems, which in turn support improved system stability and reliability. This in-depth maintenance may result in a full outage; although measures will be taken to optimize this work to the greatest extent possible, e.g., aligning it with other outages such as any on-shore substation outage, in order to reduce the overall production loss. Any full outage will be planned in advance and coordinated with ISO-NE.

**Inter-Array Cables (IAC):** During normal operations, scheduled inspections can be carried out on the IACs without the need for an outage. It is not expected that there will be any planned outages on the IAC.

**Export Cables:** As with the IAC, during normal operations scheduled maintenance can be carried out on Export Cables without the need for an outage. It is not expected that there will be any planned outages on the export cable.

**Onshore Substation:** Scheduled maintenance of the onshore substation components will take place at predefined intervals, in accordance with the manufacturers recommendations and in coordination with ISO-NE.

[REDACTED] This outage will be planned and resourced to minimize overall downtime. The outage will normally be scheduled outside the peak load periods of December through February and June through September. This maintenance will be conducted simultaneously with the ESP maintenance, thus further reducing the impact of the outage. This work will be planned in collaboration with the ISO-NE in order to minimize any potential disruption of the wider grid.

[REDACTED] it is possible that a longer outage [REDACTED] will be needed in order to perform additional in-depth scheduled maintenance such as high voltage protection functional testing,

<sup>3</sup> WTG can export through remaining circuit as long as overall capacity factor does not exceed 50%.

<sup>4</sup> WTG can export through remaining circuit as long as overall capacity factor does not exceed 50%.

switchgear tests, and detailed transformer inspections. These in-depth inspections are required in order to ensure the safe and reliable operation of these systems, which in turn support improved stability and reliability. This in-depth maintenance may result in a full outage; although measures will be taken to optimize this work, i.e. aligning it with other outages (such as the ESP outage) to reduce the overall production loss. Any full outage will be planned in advance and coordinated with ISO-NE.

**3.2. Operating Constraints – Specify all the expected operating constraints and operational restrictions for the project (i.e., limits on the number of hours a unit may be operated per year or unit of time).**

Vineyard Wind 1 is estimated to operate with [REDACTED]

The expected operational constraints and restrictions causing the availability loss can be divided into:

- Scheduled maintenance; and
- Unscheduled maintenance

### 3.2.1. Scheduled maintenance

Each WTG is planned to run for a minimum of one year between scheduled maintenance activities. As described above in section 3.1, scheduled maintenance of the WTGs will be conducted during summer periods to minimize the effect of weather downtime and the resulting loss of productivity (time where boat access is prohibited by rough seas). The WTGs will be serviced according to the manufacturer's recommendations and any regulatory requirements. Scheduled maintenance accounts for approximately [REDACTED] total availability loss.

### 3.2.2. Unscheduled maintenance

Unscheduled maintenance, which includes unscheduled repairs or replacement of damaged components, as well as cable untwisting, automatic system tests, and remote resets, can be planned only to a limited degree, and may, therefore, take place throughout the year. Vineyard Wind 1 will be monitored 24/7 from an onshore control room, and real-time data from condition monitoring sensors will be analyzed continuously to enable us to predict potential failures and respond quickly to minimize their impact on production. To avoid unscheduled maintenance, and ensure high production reliability, selected components will be designed with redundancy (e.g., the substation will be designed with two transformers and two export cables will be installed). Unscheduled maintenance accounts for [REDACTED]

The portion of availability losses associated with both scheduled and unscheduled maintenance is shown in **Figure 3.2-1** (i.e., the breakdown of the [REDACTED] described above).

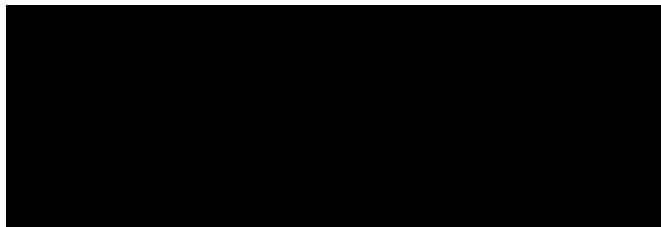


Figure 3.2-1 [REDACTED]

[REDACTED]

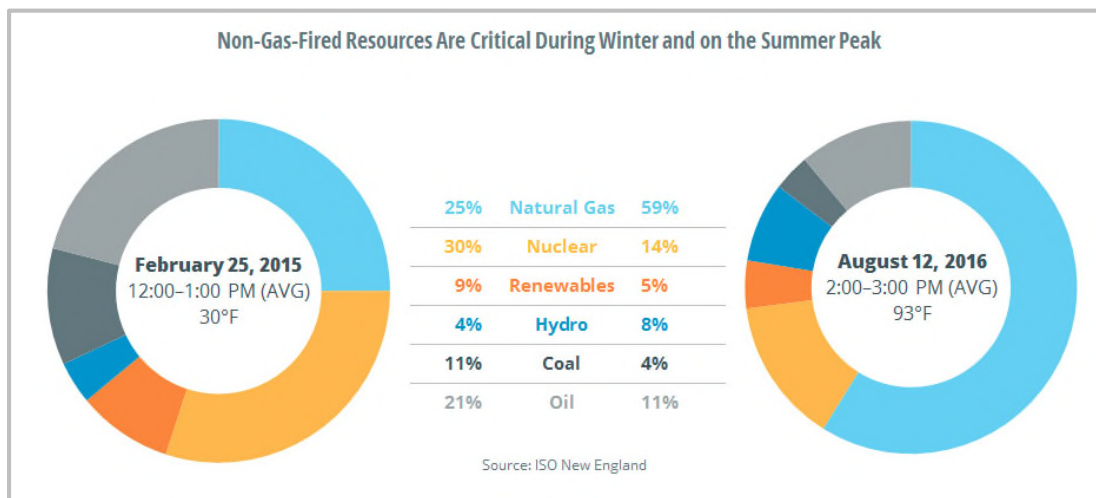
**3.3. Reliability – Describe how the proposal would provide enhanced electricity reliability to Massachusetts, including its impact on transmission constraints.**

Vineyard Wind 1's generation injection of 400 MW into the lower Southeastern Massachusetts (SEMA) load zone will enhance the reliability of the SEMA load zone by providing critical additional capacity and fuel diversification in the region and injecting significant power and reactive power in a region facing significant generation retirement. The SEMA load zone has recently experienced several large generation retirements and more are expected. Most recently, Brayton Point in Somerset retired, removing almost 1,600 MW of coal fired generation, and the Pilgrim nuclear plant has announced it will retire prior to the 2019 summer peak. In addition, ISO-NE has also identified other large generation units in the SEMA load zone, such as the Canal units 1 and 2, that are considered at risk of announcing their retirement over the next five to ten years.

Moreover, the generation fuel sources that are retiring or anticipated to retire are coal, oil, and nuclear, so any replacement of this generation from the most likely thermal generation source, a natural gas fueled generator, will put more pressure on a constrained natural gas transmission system into New England and the SEMA region in particular. Increasing the fuel diversification in the SEMA generation resources by adding high capacity factor offshore wind generation will reduce reliance on an already-strained natural gas infrastructure and will also help to alleviate potential price volatility in that area. Delivering qualified capacity to the SEMA/RI zone in future Forward Capacity Auctions (FCA) will lessen the likelihood of the zone becoming constrained and separating from the other zones due to a lack of local generation, resulting in higher auction clearing prices and additional costs to rate payers.

For perspective on the tenuous state of capacity in the region, ISO-NE recently filed the FCA-12 numbers with the FERC (November 2017). The data shows that 11,705 MW were qualified in the Southeast New England (SENE) capacity zone to support a Local Source Requirement (LSR) of 10,018 MW, providing a margin of 1,687 MW. This includes over 1,100 MW of capacity from the Canal units 1 and 2 and 575 MW from Mystic 7—a total of 1,675 MW, all of which have been identified as at risk of retirement by ISO-NE.

From ISO-NE's website (see **Figure 3.3-1**), it can be seen that nuclear, oil, and coal-fired resources provide significant generation to serve seasonal demand peaks. If these were to retire, the demand would have to be made up with other resource types. Vineyard Wind 1 can help meet this demand as an alternative to reliance on generation from natural gas fired resources that could be scarce or expensive.



**Figure 3.3-1: Illustration of the electricity production mix in ISO-NE on February 25 (2015) and August 12 (2016).**  
Source: ISO New England.

For the larger ISO-NE operating area, there is also significant benefit from diversifying the distribution of wind resources in the region. Vineyard Wind 1 is geographically distant from the region's primary wind resources in northern New England, thus providing potential for more consistent wind generation as weather conditions vary across the region. This diversity enhances reliability by adding to the resources available for management of the bulk power system in locations where other assets strain to meet the need. It will also be providing a reactive power source at the edge of the system, as the WTGs will be equipped with full-scale power converters that can deliver reactive power even during periods of no wind, mitigating the loss of reactive power that will be caused by the retirement of generation at Brayton, Pilgrim, and Canal.

Vineyard Wind 1 was studied per the ISO-NE Network Capability Interconnection Standards (NCIS) and Capacity Capability Interconnection Standards (CCIS). This study utilized the latest cases that were made available in support of the SEMA/RI Needs Analysis that is underway at ISO-NE. Consistent with ISO-NE study practices, the study investigated the performance of the system both with and without the Project online under a variety of case scenarios. Scenarios investigated included load levels (Peak, Light-Load, and Minimum load conditions were tested) and area generation dispatch. Results of the analysis showed that under the conditions simulated, no system upgrades other than substation upgrades associated with the direct interconnection of Vineyard Wind 1 were required. Based on the analysis performed, there is no adverse impact to the reliability of the ISO-NE transmission system.

The ISO-NE transmission at 345 kilovolts (KV) in the southeastern edge has been supported in the past by the Canal plant units 1 and 2, which are only 14 miles (23 kilometer [km]) from the Barnstable interconnection point for Vineyard Wind 1, and the Pilgrim plant 30 miles (48 km) west and north of Barnstable. As described above, Pilgrim will retire in 2019 and Canal Units 1 and 2 have been described by ISO-NE as being at risk of retirement due to age.

The Vineyard Wind Project will enhance the reliability of the transmission system by injecting power at the very southeastern edge of New England's high voltage system and reducing future demand for energy to flow into the region across areas of constraint to the north and west. The addition of Vineyard Wind 1 will have a positive impact on the high-voltage transmission system serving Massachusetts.

In summary, because of its interconnect location and generation type, adding Vineyard Wind 1 to the current power generation portfolio in Massachusetts will enhance the overall reliability of power generation and transmission in the region generally and, in particular, the SEMA area which has seen, and will continue to see, substantial changes in generation capacity. The Vineyard Wind Project will enhance system reliability and mitigate future costs for ensuring reliable service for Massachusetts ratepayers.

**3.4. Moderation of System Peak Load – Describe how the proposal would contribute to moderating system peak load requirements and provide the following information:**

- i) Estimated average output for each summer period (June- September) from 1:00 - 6:00 pm
- ii) Estimated average output for each winter period (October-May) from 5:00 – 7:00 pm

The production characteristics of Vineyard Wind 1 would closely match the SEMA region's peak demand for energy on an hourly and seasonal basis, relieving demand for natural gas generation at times when supply constraints can drive up energy prices. These projections are based on the detailed analyses of the wind resource and wind farm technical characteristics, described in detail in Section 4.

Vineyard Wind 1's generation profile will moderate system peak load requirements by delivering a substantial amount of energy production during the ISO-NE defined seasonal reliability hours, as recognized by the ISO-NE Forward Capacity Market (FCM), thereby directly contributing to the seasonal supply of peak capacity. This is clearly demonstrated in **Figures 3.4-1** and **3.4-2** which illustrate how



Vineyard Wind's average daily production output aligns with the reliability hours through summer and winter periods. The figures are based on data from **Table 4-2-2**.

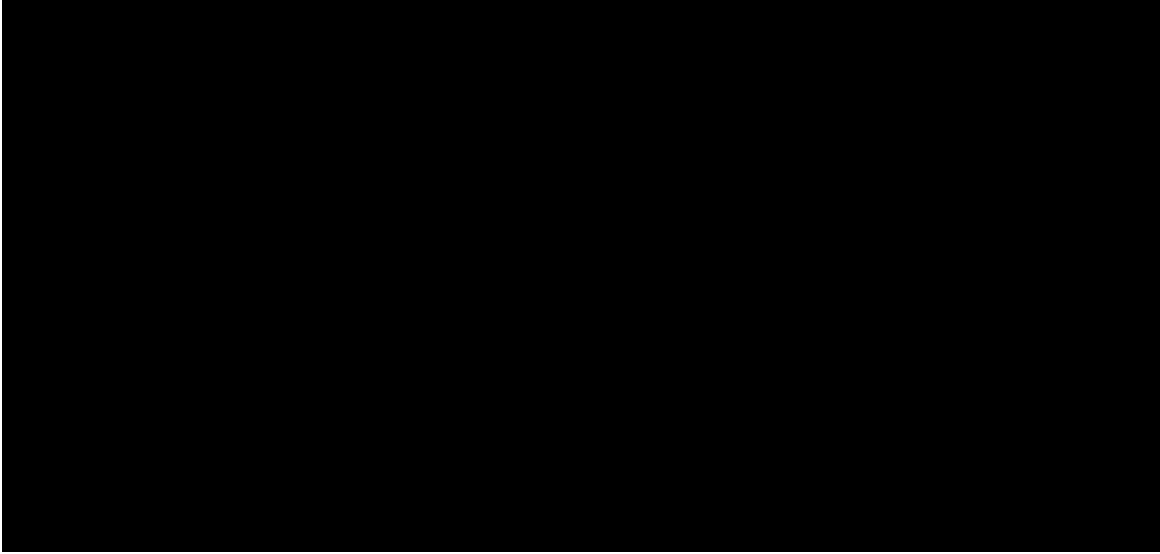


Figure 3.4-1:

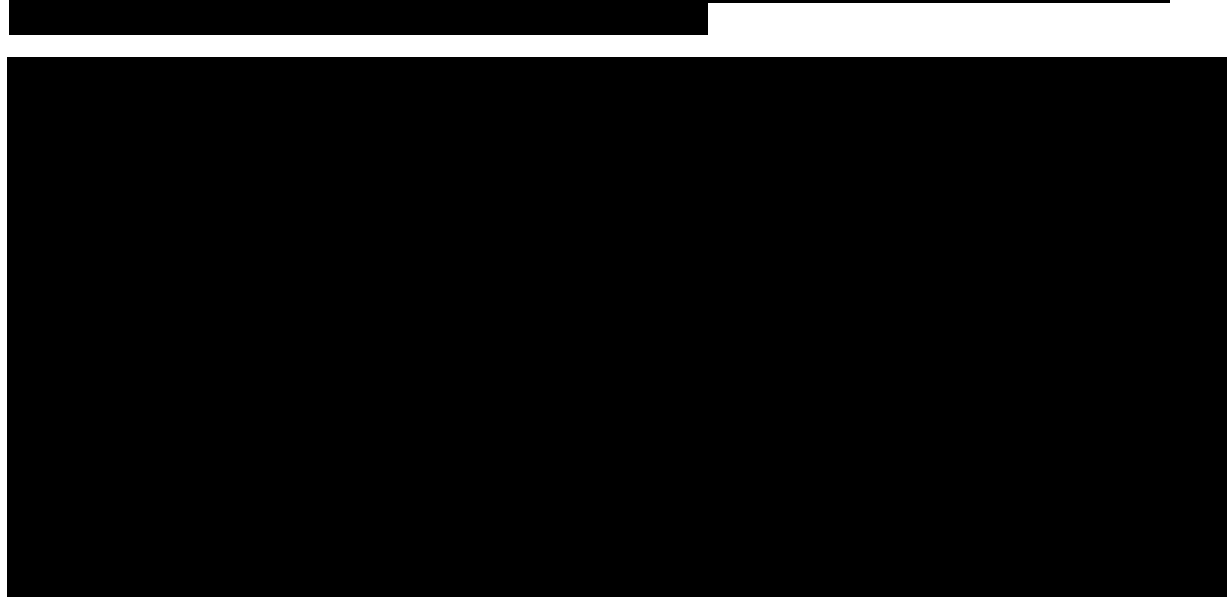


Figure 3.4-2:

Vineyard Wind 1 will also contribute higher overall monthly production during the seasonal winter peak period of October to May, coinciding with peak demand for natural gas pipeline capacity. Most importantly, it will deliver local generation during the winter in an area of the state where the natural gas system is highly stressed, thereby reducing the risk of price volatility caused by pipeline capacity constraints on the natural gas transmission system when a large demand for natural gas from both power generators and for heating purposes is at its peak. Vineyard Wind 1's seasonal peak production corresponding to the winter peak months is shown in **Figure 3.4-3**. The figures are based on data from **Table 4-2-2**.



**Figure 3.4-3:**

Furthermore, Vineyard Wind 1's production and delivery of a renewable resource with a significant amount of energy is unique in its location at the southeastern, radial edge of the ISO-NE grid. Its deliveries at the Barnstable Switch Station (or alternatively, West Barnstable) interconnection point, at or just beyond the very edge of the region's 345 kV system, during high demand periods will reduce energy loss due to line losses during peak hours when those losses are at the highest. These losses at peak times are a contributor to peak load requirements, so Vineyard Wind 1 will be moderating peak load requirements due to its physical interconnection point as well. This is an area of the system that has been impacted by recent large generating unit retirements, with others identified as at risk. Injecting a local resource at this point of interconnection will enhance the reliability of the lower SEMA zone within the area and increase generating resource type diversity.

The amount of energy delivered by Vineyard Wind 1 during peak load hours is indicated in **Table 3.4-1**. These projections are based on the detailed analyses of the wind resource and wind farm technical characteristics, described in detail in Section 4.

**Table 3.4-1:**

**Section 4 OF APPENDIX B TO THE RFP  
ENERGY RESOURCE AND DELIVERY PLAN**

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*4.1. For Eligible Facilities, the bidder is required to provide an energy resource or fuel supply plan for its proposed project, including supporting documentation. The fuel supply/energy resource profile information should be consistent with the type of technology/resource option proposed and the term proposed. Bidders should respond to all information requests which are relevant to the bid in a timely manner.*

**All Projects**

*Provide a summary of all collected wind data for the proposed site. Identify when and how (e.g. meteorological mast or LiDAR – for “Light Detection and Ranging”) the data was collected and by whom.*

Vineyard Wind’s wind resource experts have substantial experience evaluating the wind resource of offshore wind areas around the world. These experts have conducted an extensive analysis of the wind resource at the Vineyard Wind Offshore Project Area.

Vineyard Wind has access to wind data collected from 1999 to 2017, from both on and offshore measurement sites around the Vineyard Wind Offshore Project Area, including LiDAR data from a nearby offshore platform. An overview of the extensive wind data utilized and the analyses applied can be found in **Figure 4.1-2**, and a summary of the extensive wind assessment studies and production estimates carried out by Vineyard Wind follows; full and complete details can be found in Attachment 4.1-1 Wind Resource Assessment. This assessment makes use of the most reliable wind data presently available.

Primary data sources and methods used in the wind resource and energy production estimates are:

- Cup anemometers on the Nantucket Radio Tower (also referred to as met mast), by the University of Massachusetts, Wind Energy Center.
- A vertical profiling LiDAR at the WHOI tower south of Martha’s Vineyard, with data by Woods Hole Oceanographic Institution and AWS Truepower.
- NOAA Buzzards Bay (BUZM3) weather platform, with data by NOAA – National Data Buoy Center.
- The closest CFSR, MERRA, and MERRA2 37 years reanalysis time series.
- Two short-term (6 months) and several long-term (20 years) Vortex mesoscale time series (SERIES), computed respectively at the met mast location and the Buzzard Bay platform (6 months), and at the center of the Vineyard Wind Offshore Project Area (20 years).

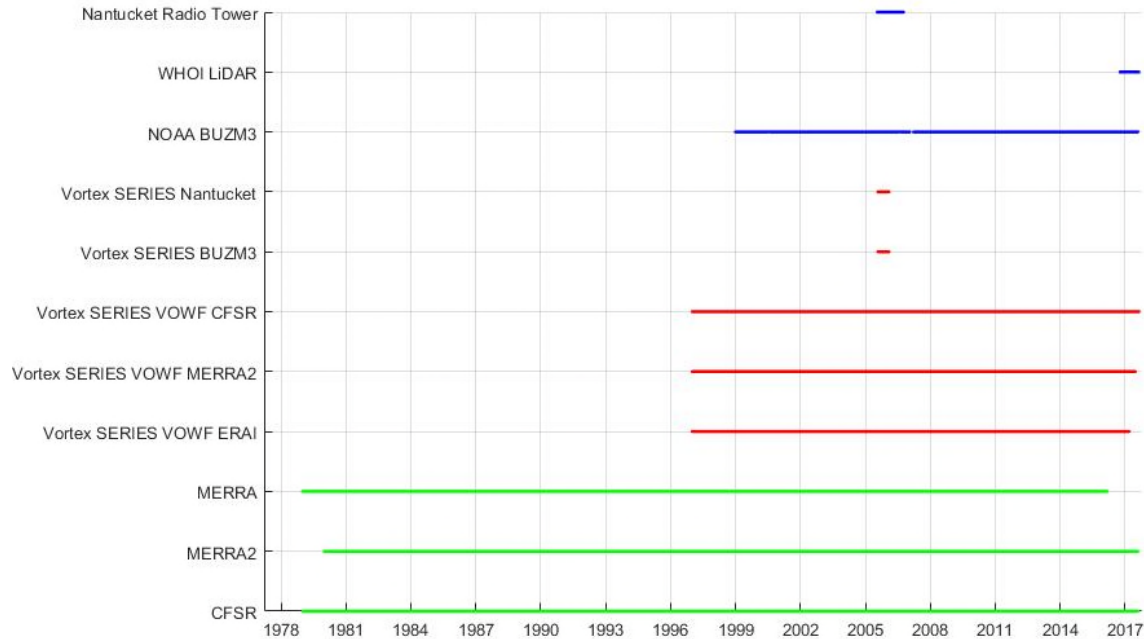
Vineyard Wind and its investors have determined that the available wind resource data, as summarized here, is sufficient to provide confidence in its bid and ensure future financing of Vineyard Wind 1.

The wind resource analysis is based on onshore and near-shore measured wind speed and wind direction in the region of the Offshore Project Area, together with reanalysis and mesoscale wind model data. The energy production yield estimates account for wake losses, as well as turbine and balance of plant efficiencies, and also consider potential future neighboring wind farms. This analysis provides the best possible resource plan basis for Vineyard Wind’s bid, and provides a central estimate (p50) of the net Annual Energy Production (AEP) of the different wind farm configurations, as well as its associated uncertainty (including the ninety percent quantile estimate, or p90) for several time horizons.

The datasets, along with a description of the individual measurement stations and mesoscale data, can be found in Attachment 4.1-1 Wind Resource Assessment. The available wind resource data has all been

analysed using best industry practices and state-of-the-art methods to both lower the uncertainty of the energy production projections and also to provide the best possible energy production for the lowest cost. The duration and quality of the available wind data is sufficient for providing an energy production plan with minimal uncertainties.

See **Table 4.1-1** for an overview of the datasets, **Figure 4.1-2** for the location of the time series, and **Figure 4.1-1** for the time spans covered by each time series.



**Figure 4.1-1: Overview of the time spans of time series presented in Table 4.1-1.**

*Indicate where the data was collected and its proximity to the proposed site. Include an identification of the location and height for the anemometers and/or “range gate” heights for sensing by LiDAR that were used to arrive at an assessment of the site generation capability.*

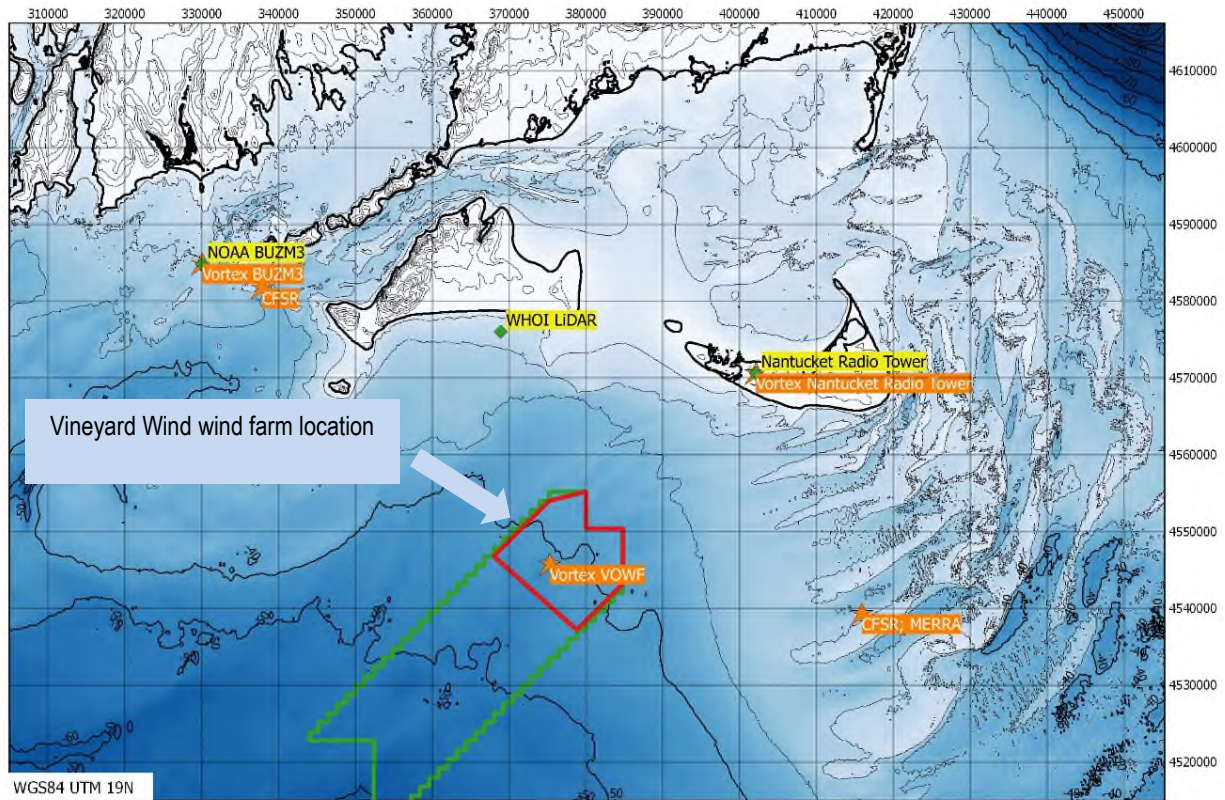
The data collection and locations of other sources are identified in **Table 4.1-1**.

**Table 4.1-1: Primary sources used for the assessment of wind conditions. The field measurements are marked in blue, the reanalysis datasets in green, and the mesoscale data in yellow.**

Name	Location [Long; Lat]	Time span	Description and comments
<b>Nantucket Radio Tower</b>	[-70.169; 41.281] Distance to site center 19 miles (31 km)	2005-07-22 to 2006-10-03	10-minute measurements at 99, 68 and 58 mAGL. (Meters Above Ground Level).
<b>WHOI LiDAR</b>	[-70.567; 41.325] Distance to site center 18 miles (29 km)	2016-10-08 to 2017-08-28	10-minute measurements between 57 and 200 mMSL (meters above Mean Sea Level),
<b>NOAA BUZM3</b>	[-71.033; 41.397] Distance to site center 40 miles (64 km)	1998-12-31 to 2017-07-31 1985-08-09 to 2017-07-31	10-minute measurements at 24.6 mMSL at the NOAA weather station BUZM3 (Buzzards Bay, MA). 8-minutes reported hourly measurements at 24.6 mMSL at the NOAA weather station BUZM3 (Buzzards Bay, MA).

Name	Location [Long; Lat]	Time span	Description and comments
<b>Vortex SERIES Nantucket</b>	[-70.169; 41.281] Distance to site center 34 miles (55 km)	2005-07-31 to 2006-02-01	Three 1-hour mesoscale time series computed at the Radio Tower location, using respectively CFSR, MERRA2 and ERAI as input.
<b>Vortex SERIES BUZM3</b>	[-71.033; 41.397] Distance to site center 40 miles (64 km)	2005-07-31 to 2006-02-01	Three 1-hour mesoscale time series computed at the BUZM3 weather station location, using respectively CFSR, MERRA2 and ERAI as input.
<b>Vortex SERIES Project Area CFSR</b>	[-70.484; 41.053] Distance to site center 0 miles (0 km)	1997-01-01 to 2017-08-19	1-hour mesoscale time series computed at the Project Area, using CFSR as input.
<b>Vortex SERIES Project Area MERRA2</b>		1997-01-01 to 2017-06-19	1-hour mesoscale time series computed at the Project Area, using MERRA2 as input.
<b>Vortex SERIES Project Area ERAI</b>		1997-01-01 to 2017-06-03	1-hour mesoscale time series computed at the Project Area, using ERA-Interim as input.
<b>MERRA</b>	[-70.000; 41.000] Distance to site center 30 miles (48 km)	1978-12-31 to 2016-02-29	1-hour reanalysis time series at 50 mMSL.
<b>MERRA2</b>	[-70.000; 41.000] Distance to site center 30 miles (48 km)	1978-12-31 to 2017-07-31	1-hour reanalysis time series at 50 mMSL.
<b>CFSR</b>	[-70.000; 41.000] Distance to site center 30 miles (48 km)	1979-12-31 to 2017-07-30	1-hour reanalysis time series at 10 mMSL (concatenation of CFSR and CFSR v2).

**Figure 4.1-2** Map depicting the locations of the primary data sources.



**Figure 4.1-2:** Location of the primary data sources. Yellow marks show measurement locations, orange marks show model outputs locations.



*Describe any additional wind data collection efforts that are planned or ongoing.*

Vineyard Wind and its investors have determined that the available wind resource data, as described in the first question, and the extensive analysis of that data, described in response to the subsequent question, is sufficient to provide confidence in its bid and ability to obtain future financing. Nonetheless, Vineyard Wind will, in order to further develop Vineyard Wind 1 and facilitate financing, conduct on site wind measurements.

A maximum of two floating Lidar devices are anticipated to be installed within the Vineyard Wind Offshore Project Area during the second quarter of 2018. These devices will be installed in representative areas within the Offshore Project Area with the objective of providing additional onsite wind measurement data. Prior to installing these devices, BOEM must approve a Site Assessment Plan (SAP). Vineyard Wind has submitted its SAP to BOEM, and BOEM has deemed our submittal sufficient and complete.

In addition to planned on site measurements, the WHOI ASIT LiDAR data collection will continue to be monitored and assessed on a bi-weekly basis. The WHOI ASIT LiDAR (Leosphere pulsed LiDAR Windcube v2) has been installed since October 7, 2016 at the Woods Hole Oceanographic Institution (WHOI), Martha's Vineyard Coastal Observatory (<http://www.whoi.edu/mvco/home>) Air/Sea Interaction Tower (ASIT), located about 3 km (1.9 mi.) at the south end of the island of Martha's Vineyard. See **Figure 4.1-3**.



**Figure 4.1-3: Location of the WHOI ASIT (white mark left). LiDAR installed on the work bench (mid) and (right).**

The planned additional measurement campaigns will be continuously monitored and will, in addition to the already available and continuously monitored wind data, provide accuracy and insight into wind resource and energy production. Thus, Vineyard Wind will have a minimum of one year of full onsite data that, in combination with the other existing and ongoing measurements, is consistent with best in class industry practice for other offshore wind farms and will provide a strong basis for energy production estimates.

*Provide (a) at least one year of hourly wind resource data. Real Data collected from the site is preferred, though projected data is permissible. Methodology must also be included. And (b) a wind resource assessment report from a qualified unaffiliated third-party wind resource assessment firm. Include an analysis of the available wind data which addresses the relationship between wind conditions and electrical output. Provide a projection 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 both P50 and P90 levels.*

A wind resource assessment report, using the data described in answer to question 4.1, was carried out by C2Wind, one of the most experienced wind energy forecasting companies in the world. C2Wind's experts have over 50 years total experience in offshore wind resource assessment and energy production

estimates, working with the leading offshore wind companies in the world. The C2Wind team has been working in offshore wind since 2003, and has been involved in more than 15 constructed offshore wind farms and numerous others on conceptual levels at locations around the world. C2Wind has also worked with the top five wind turbine suppliers in the market and has key knowledge and insight of turbine behavior and support structure design drivers.

A detailed description of the methodology for this forecast can be found in Attachment 4.1-1 Wind Resource Assessment. The analysis is based on several datasets. Those include both measurements (met mast, LiDAR, and weather platform) and models (reanalysis, mesoscale models). After these were processed, the following steps have been undertaken:

- Analysis of the observed wind climates.
- Long-term correction.
- Spatial extrapolation.
- Derivation of the final wind climate.

A detailed assessment and analysis of the turbulence intensity and vertical wind speed shear conditions has been prepared and is presented in Attachment 4.1-1 Wind Resource Assessment.

The wind resource derived at 100 m Mean Sea Level (MSL) at the center of the Offshore Project Area is summarized below:

- [REDACTED]
- [REDACTED]

C2Wind's findings are consistent with other available reports, including a meso-scale modeling analysis carried out by AWS Truewind for Vineyard Wind in 2010 (See Attachment 4.1-2) and public wind energy resource maps such as the following provided by NREL:

<https://www.eia.gov/todayinenergy/detail.php?id=4770>  
<https://maps.nrel.gov/wind-pro prospector/>

Early in December 2017 another independent wind assessment by Environmental Hydraulics Institute “IH Cantabri” was finalized and can be found in Attachment 4.1-3 IH Cantabri Report. This study confirms the wind speed pickup from both the Nantucket radio tower met mast and the WHOI Lidar to the site center and substantiates the wind energy resource identified by C2Wind.

In Attachment 4.1-4 Wind data.xlsx, one year of measured wind data from the Nantucket Met mast is made available. The wind data in Attachment 4.1-4 Wind data.xlsx has been adjusted to represent the wind conditions at the site.

Based on the wind data and analysis summarized above, Vineyard Wind developed the Offshore Project Area layout shown In **Figure 4.1-4**. This layout accounts for technical constraints addressing the following items:

- [REDACTED]

- Alignment of WTGs in straight lines in one axis to facilitate navigation through the turbine field. Also, six corridors, each 1 nautical mile wide, were incorporated into the design. In general terms, the corridors should form a semi-regular grid. The location of these corridors has been analyzed in order to optimize the WTG layout, while also taking into consideration comments from fishermen regarding their typical route transiting the area. In order to minimize the total area affected by these corridors, the corridors are designed to run parallel to the area boundaries and over wrecks where possible.

[REDACTED]

Given these constraints, the Offshore Project Area layout was designed to maximize WTG performance by minimizing inter wind turbine wake losses. The final WTG locations will be based on later analysis and site investigations addressing geotechnical factors, other engineering limitations, permit limitations, and stakeholder input.

The wind farm layout has a total of 53 WTG positions, which includes spare positions [REDACTED] on the final wind turbine choice and its actual power rating, as smaller capacity turbines will require more locations to achieve the same total capacity. [REDACTED]

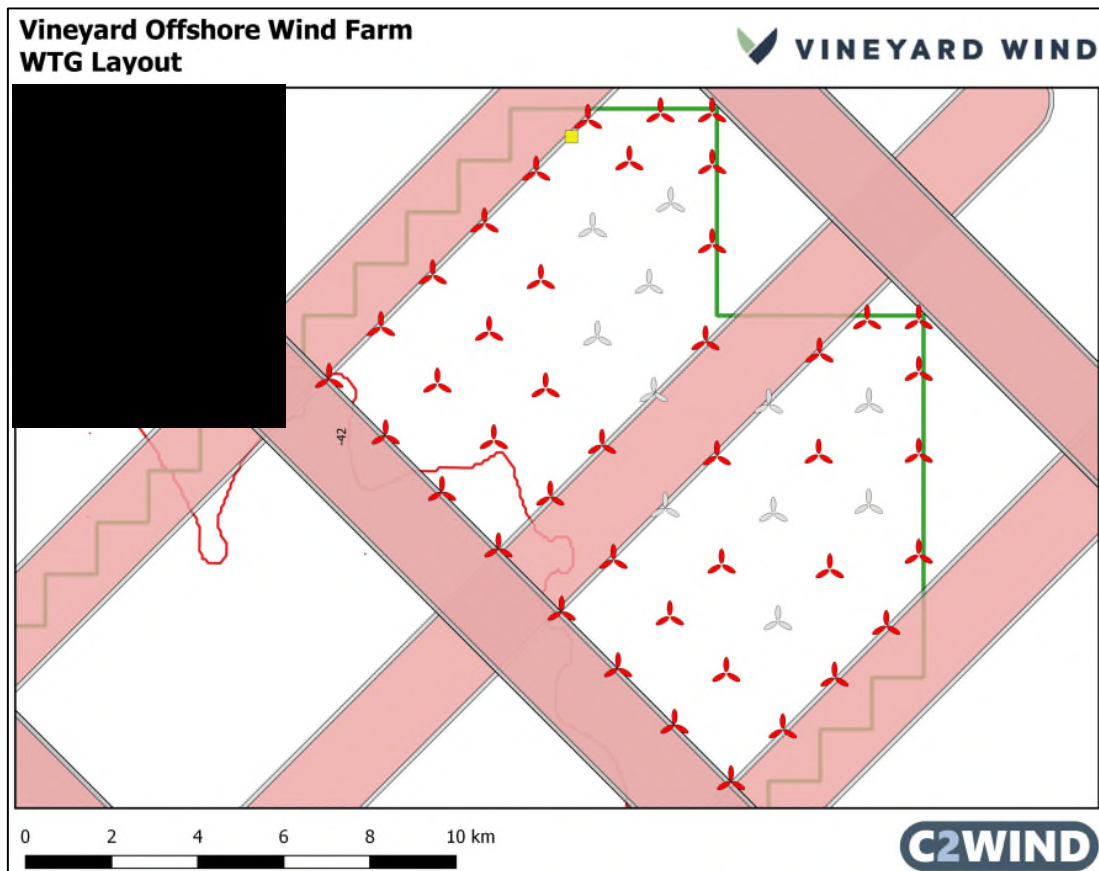


Figure 4.1-4: Northern part of the Offshore Project Area.

In **Figure 4.1-4**, applicable lease area borders are shown in green, with one nautical mile transit corridors shown in pink (buffers in grey), while the corridors designed to comply with a thorough investigation of existing sailing routes are shown as dashed red areas, which extend in a straight line beyond the limits of the Vineyard Wind Offshore Project Area and have an additional 105 m buffer in dashed grey areas to ensure no blade flyover.

The Gross and Net-after-wake wind turbine production has been calculated using the wind climate derived for the lease area, combined with the turbine and Offshore Project Area layout. The wake calculation is carried out in WindPRO using the N.O. Jensen PARK model with a wake decay parameter

Table 4.1-2:

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 both p50 and p90 levels are shown in Table 4.2-2 and 4.2-3.

*Provide a site-adjusted power curve. Each curve should list the elevation, temperature and air density used.*

A site-adjusted power curve listing the elevation, temperature, and air density used is provided in Attachment 4.1-6 Power Curve. **Figure 4.1-5** shows the power curve for the

Figure 4.1-5

*Identify the assumptions for losses in the calculation of projected annual energy production, including each element in the calculation of losses.*

An overview of the losses used in the calculations of projected annual energy production is provided in **Table 4.1-3**. The losses are described in detail, along with the rationale for ascribed values, in Attachment 4.1.7 Base Wind Yield Assessment and Attachment 4.1-1 Wind Resource Assessment. The



losses provided below are calculated for the standalone Project and assume no future wind farms will be built in adjacent areas. However, in developing the commercial offer contained in this proposal, wake losses from likely build-out scenarios of neighboring wind farms were included, in order to confirm that future wind farms in adjacent areas would not have any significant impact on Vineyard Wind 1's economics or design. These potential future losses were found acceptable and the Vineyard Wind energy delivery plan has shown to be robust; any build-out of neighboring areas will have limited effects, given Vineyard Wind's layout and design.

**Table 4.1-3: Overview of all efficiency ratios applied in production estimates.**

Losses	V164-9.5MW	Comments
<b>Availability</b>		
Turbine availability		
Balance of Plant availability		
Grid availability		
<b>Turbine Performance</b>		
High wind speed hysteresis		
Site specific power curve adjustment		
Turbine and blade degradation		
<b>Environmental</b>		
Performance degradation – icing		
Icing shutdown		
Temperature shutdown		
Temperature de-rating		
Temperature out of power boost range		
Site access		
<b>Total Additional Losses</b>		
<b>Total Electrical Losses</b>		
<b>Total Wake losses</b>		

#### 4.2. Offshore Wind Energy Generation Delivery Plan

*Please provide an energy delivery plan and profile for the proposed project, including supporting documentation. The energy delivery profile must provide the expected Offshore Wind Energy Generation to be delivered into the ISO-NE market settlement system and permit the Evaluation Team to determine the reasonableness of the projections for purposes of Sections 2.2.1.3 Eligible Bid Categories and 2.2.1.7 Minimum Contract Size of the RFP. Such information should be consistent with the energy resource plan provided above and also considering any and all constraints to physical delivery into ISO-NE.*

The current design features an array [REDACTED] turbines and, throughout this section, this turbine model has been assumed. However, the final layout and turbine type will be selected after a competitive procurement process, which will take place after the PPA has been awarded, so as to ensure best pricing for the project. Other turbines are also under consideration and the current Energy Resource Plan may be altered due to final selection of a different turbine type. [REDACTED]

All energy production numbers shown below are net-after-wakes values. The non-wake losses from Section 4.1 should be applied accordingly to obtain representative values at the energy production

metering point. The values are provided as long-term (park lifetime) central or p50 estimates. See also Attachment 4.1-1 Wind Resource Assessment and Attachment 4.1-7 Base Wind Yield Assessment for a detailed overview of the associated uncertainties. The expected long-term wind resource at the site is described in detail in Attachment 4.1-1 Wind Resource Assessment and the description of the turbine type and performance characteristics can be found in Attachment 4.1-6 Power Curve.

In **Table 4.2-1**, the p50 energy production during on-peak and off-peak diurnal periods are provided. The sum of all values is equal to the net energy production (at the metering point) as stated in **Table 4.1-2**.

The p50 and p90 monthly and diurnal energy production is provided, respectively, in **Table 4.2-2** and **Table 4.2-3**.

These values have been derived using the following method:

- 1) For each (Month, Hour), the hourly energy production has been sampled from the 20 year energy production time series.
- 2) For each of the events (Month, Hour) the p90 and p50 energy production have been derived from the empirical energy distribution. The p90 estimate reflects the uncertainty on the p50 energy production estimates and have been found by addressing the uncertainty on the diurnal p50 estimates.
- 3) Each of p50 estimates (Month, Hour) are hereafter scaled so that the sum arrives at the same overall p50 energy production values provided in **Table 4.1-2**. This has been done to ensure correct capture of all relevant energy losses.

**Table 4.2-1: p50 Seasonal and diurnal variation of wind farm energy production at metering point in GWh.**

Month	On peak hours [7:00 :23:00] [GWh]	Off peak hours [23:00;7:00] [GWh]	Summarized [GWh]
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Sum			

**Table 4.2-2: p50 Seasonal and diurnal variation of wind farm net energy production at metering point in GWh.**

[illegible]

[illegible]

**Table 4.2-3: p90 Seasonal and diurnal variation of wind farm net after wakes energy production in GWh.**

[illegible]

Through the design of the turbine layout, Vineyard Wind has optimized energy delivery to ISO-NE and Massachusetts. Vineyard Wind predicts a net-after-wakes energy production delivery [REDACTED] during the summer period (April-September) [REDACTED] during the winter period (October-March). Vineyard Wind has conducted detailed wind measurement assessments and data analysis to ensure both the best possible accuracy and lowest uncertainties in the energy delivery plan [REDACTED]

A 20 year long-term time series from Vortex Factoria De Calculs, S.L. (hereafter “Vortex”), computed at the center of the Vineyard Wind Offshore Wind Farm, and has been used in order to provide a reliable description of the monthly and hourly variations of the net-after-wakes power production. See a detailed description of the time series in Attachment 4.1-1 Wind Resources Assessment. For the purpose of this analysis, the Vortex time series has been scaled so that it is described by the two-parameters Weibull

distribution specified in Attachment 4.1-1 Wind Resource Assessment. A net-after-wakes 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 N.O. Jensen wake model, using a wake decay parameter of 0.04. This net-after-wakes power time series has been used in providing the energy production statistics in **Table 4.2-1**, **Table 4.2-2**, and **Table 4.2-3**. This method applied utilizes best in class, best-industry practice energy production methods and tools. The commercial tool WindPro has been used for these analyses.

**4.3.     *REC/Environmental Attribute Delivery Plan***

*Please provide documentation demonstrating that the project will Deliver GIS Certificates representing those RECs or Environmental Attributes.*

Vineyard Wind certifies that Vineyard Wind 1 will deliver GIS Certificates representing those RECs, and associated Environmental Attributes, which are required to be delivered to purchasers, by means of the New England Power Pool Generation Information System (NEPOOL GIS). Such delivery will be compliant with the requirement stated in the Bidder Response Form section 7.7, that "...RECs associated with the Offshore Wind Generation must be delivered into the Distribution Companies' NEPOOL GIS accounts."

Section 5 OF APPENDIX B OF THE RFP  
FINANCIAL/LEGAL

*Bidders are required to demonstrate the financial viability of their proposed project. Bidders should provide the following information:*

*5.1. Each bidder is required to submit information and documentation that demonstrates that a long term contract resulting from this RFP Process would either permit the bidder to finance its proposal that would otherwise not be financeable, or assist the bidder in obtaining financing of its proposal.*

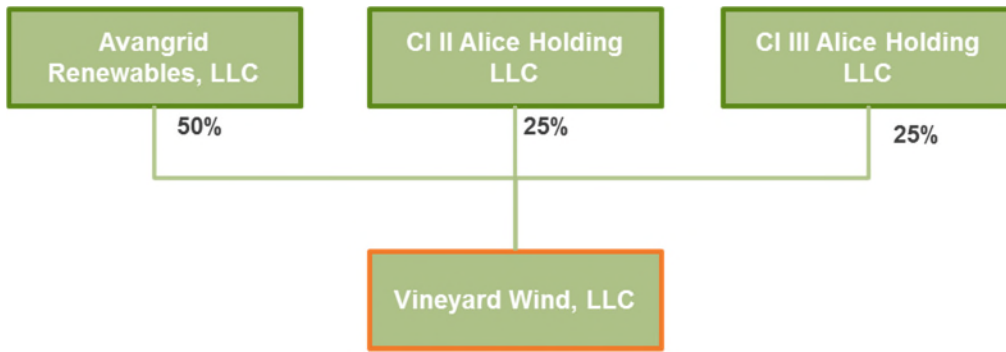
Vineyard Wind's construction will be financed by capital from its owners, Avangrid Renewables (AR) and two investment funds, Copenhagen Infrastructure II (CI-II) and Copenhagen Infrastructure III (CI-III), managed by Copenhagen Infrastructure Partners (CIP). The owners also may raise debt capital and tax equity capital to finance the construction activities.

All of these investors have significant financial resources and world-leading experience investing in offshore wind and other renewable energy projects. The commitment of these investors to support the Vineyard Wind project is evidenced in the letters of support and authorization provided in Attachment 5.1-1 (CI-II and CI-III) and Attachment 5.1-2 (AR).

However, as these same letters make clear, this commitment to provide investment in Vineyard Wind 1 is predicated on Vineyard Wind first obtaining long-term contracts for the output of the project. Indeed, all previous offshore wind projects financed by Vineyard Wind's parent companies, or their affiliates, have been done on the basis of the provision of a long-term contract mechanism, such as the Power Purchase Agreement (PPA) to be awarded through this Request for Proposal.

*5.2. Please provide a description of the business entity structure of the bidder's organization from a financial and legal perspective, including all general and limited partners, officers, directors, managers, members and shareholders, involvement of any subsidiaries supporting the project, and the providers of equity and debt during project development. Provide an organization chart showing the relationship between the equity and debt participants and an explanation of the relationships. For jointly owned facilities, identify all owners and their respective interests, and document the Bidder's right to submit a binding proposal.*

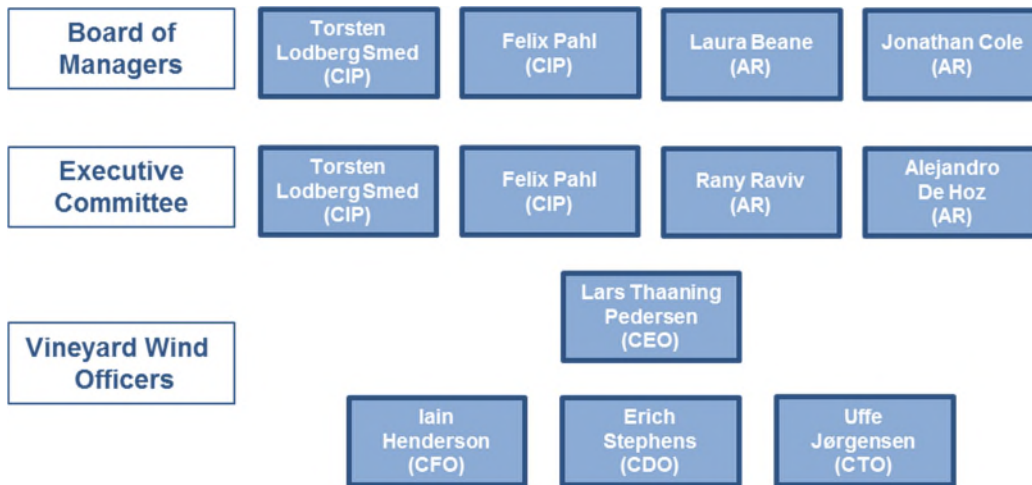
This bid is being submitted by Vineyard Wind LLC, a Delaware limited liability company, registered in Massachusetts. Vineyard Wind LLC is indirectly owned 50% by two investment funds, each of which own 25% of the project company, with the funds managed by Copenhagen Infrastructure Partners P/S. The remaining 50% is owned by Avangrid Renewables LLC, as shown in **Figure 5.2.1**. The three investors are collectively referred to here as the parent companies. An additional legal entity, Vineyard Transmission LLC, may be formed by the shareholders and owned in the same proportion as Vineyard Wind LLC, for the transmission assets of Vineyard Wind 1, as further described in responses to Section 15.



**Figure 5.2-1: Vineyard Wind Equity Ownership Structure (structure above CI II / CI III Holding companies please see Figure 5.2-4).**

Pre-construction development has been, and will continue to be, funded by equity investment from the parent companies; construction financing will be structured as described in response to question 5.3. No debt funding has been used or will be used prior to start of construction.

Vineyard Wind LLC’s governance organization is formed from experienced teams that have been involved in the successful construction and operation of many offshore wind projects. The ultimate governance body is the Board of Managers, with operational matters directed by an Executive Committee and day to day matters controlled by the officers of the company. An organization chart showing all officers and members of the Executive Committee and the Board of Managers is provided in **Figure 5.2-2**.



**Figure 5.2-2: Vineyard Wind LLC Governance Structure.**

Biography highlights of managers, executives and officers are provided below, with detailed biographies provided in Attachment 12.3-1.

**Torsten Lodberg Smed** – Senior Partner of Copenhagen Infrastructure Partners in charge of offshore wind development projects, with over 15 years of experience in global renewable energy projects.

**Felix Pahl** – Associate Partner of Copenhagen Infrastructure Partners, senior member of the investment team with over 10 years of experience in renewable energy, with a focus on offshore wind investments.

**Laura Beane** – President and CEO of Avangrid Renewables, with more than 20 years of experience at Avangrid in a wide variety of roles, including serving as VP of Operations and Management Services for Avangrid Renewables prior to her appointment as President and CEO.

Jonathan Cole – Director of ScottishPower Renewable Energy Limited and Managing Director of Iberdrola’s Global Offshore Business since 2011, which is supporting its affiliate company, Avangrid Renewables, in Vineyard Wind 1 development.

Rany Raviv – VP Commercial and Strategic Relationships at Avangrid Renewables, with more than 15 years experience in global energy, mergers, acquisitions and project finance.

Alejandro de Hoz – Vice President of US Offshore of Avangrid Renewables, with over 13 years of experience in the renewable energy sector.

Lars Thaaning Pedersen – Chief Executive Officer Vineyard Wind and co-CEO of Copenhagen Offshore Partners. Experience in the offshore wind industry since 2008 in a variety of management roles including financing, development, construction, and operation of more than 10 offshore wind farms in Europe.

Iain Henderson – Chief Financial Officer, with more than 18 years of experience with ScottishPower, most recently as Head of Regulated Transactions, managing commercial aspects of offshore wind projects’ joint venture relationships.

Erich Stephens – Chief Development Officer and the founding principal of Vineyard Wind, with nearly 20 years of experience in the renewable energy sector, including head of development operations for Bluewater Wind, the first company in the US to be awarded a PPA for offshore wind.

Uffe Jørgensen – Chief Technical Officer, with more than 20 years offshore wind experience with respect to development and engineering of more than 3,000MW of large-scale offshore wind projects.

As counterparty to a proposed contract with the Distribution Companies, Vineyard Wind has the authority from its parent companies to submit this proposal as evidenced in attached letters of authorization attached in Attachments 5.1-1 and 5.1-2.

The information below highlights each of Vineyard Wind’s parent companies’ financing capabilities, and the roles and responsibilities of the investors’ affiliates that are supporting Vineyard Wind 1.

## **AVANGRID**

### ***Avangrid Renewables***

Avangrid Renewables is a leader in the renewable energy industry in the US and has more than \$10 billion worth of operating assets, with 6,000MW of owned and controlled wind and solar facilities, in 22 states across the United States, including in Massachusetts. **Figure 5.2-3** illustrates Avangrid Renewable’s corporate structure, including its ultimate parent company, Iberdrola S.A., and the affiliates that will support Avangrid Renewables in the development and construction of Vineyard Wind 1.

With a deep history and vast knowledge of the US renewables industry, Avangrid Renewables has the experience and expertise to deliver the project on time and within budget. Avangrid Renewables is the third largest renewable developer in the United States and has developed almost 60 renewable projects in the US with more than \$10 billion invested to date.

### ***Avangrid***

Avangrid Renewables is owned by Avangrid Inc. (NYSE: AGR), which has more than \$31 billion in assets and has operations in 27 states, with access to public debt and equity markets through its listing on the New York Stock Exchange.

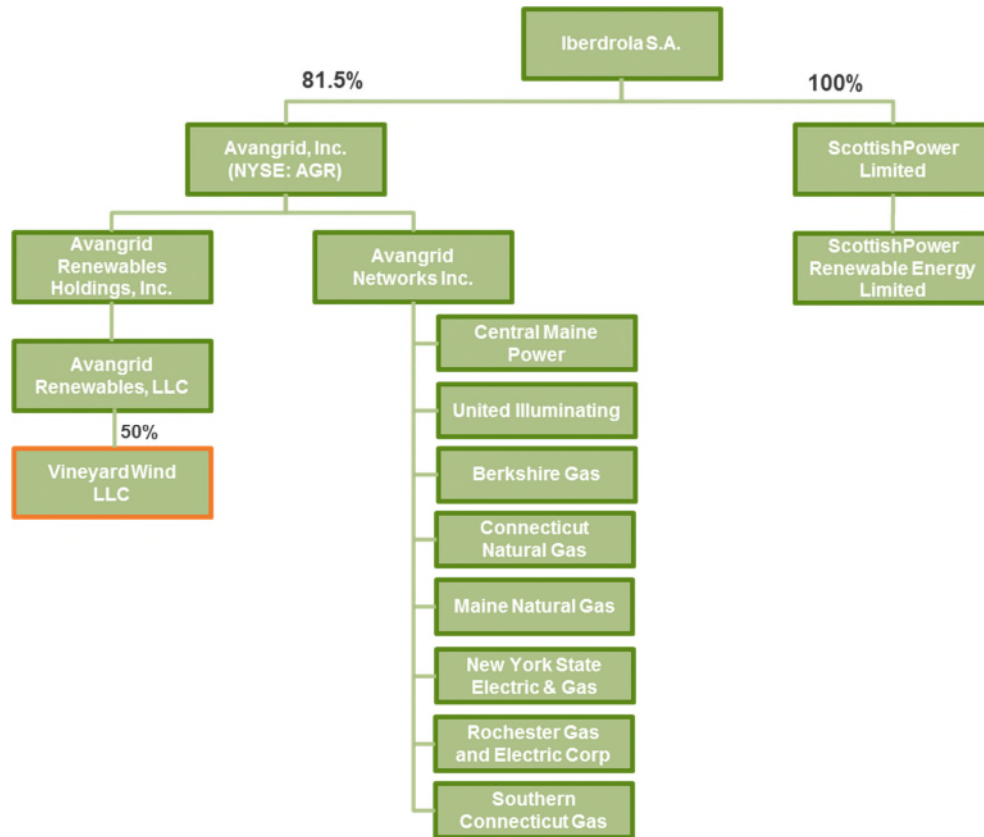


Figure 5.2-3: Avangrid's corporate structure for companies involved with Vineyard Wind.

### Avangrid Networks

Along with Avangrid Renewables, Avangrid's other business segment is Avangrid Networks, which is focused on the transmission and distribution of electricity and natural gas, principally through eight regulated electric and natural gas utilities, serving approximately 3.2 million customers in New York and New England. Vineyard Wind will be supported through a shared service agreement with individuals that have significant experience from recent successful transmission expansion projects in the ISO-NE service area, including Central Maine Powers on-schedule/on-budget \$1.4 billion Maine Power Reliability project. The shared service agreement will support the Vineyard Wind team in the development and construction of the transmission assets, including the expandable transmission proposal, should it be selected.

### IBERDROLA and SCOTTISHPOWER RENEWABLES

Avangrid Inc. is 81.5% owned by Iberdrola SA, the world's largest wind developer, with 15,902MW of installed wind capacity and total assets of \$134 billion at the end of September 2017. Vineyard Wind will also be supported by one of Iberdrola's subsidiary companies, ScottishPower Renewables Ltd (Scottish Power Renewables). Scottish Power Renewables has considerable experience in the development, construction and operation of offshore windfarms as the company responsible for Iberdrola's offshore wind projects in Europe, which total almost 5GW of projects in various stages of development and construction.

### COPENHAGEN INFRASTRUCTURE PARTNERS

Copenhagen Infrastructure Partners P/S (CIP) is a fund management company, specializing in investing in the energy infrastructure sector. CIP was established in 2012 by four senior executives from the energy industry and PensionDanmark, one of the largest labor market pension funds in Denmark. Since its



establishment in October 2012, CIP has raised four infrastructure funds to support renewable technologies with total commitments of more than EUR 6 billion from over 25 institutional investors.

The funds CI II and CI III are invested in Vineyard Wind. CI II has established a specific investment structure in form of two alternative investment vehicles (AIV), AIV I non-QFPF K/S and AIV II QFPF K/S, to bundle some of its investments in the US. This structure has been implemented in order to accommodate requirements of limited partners (investors) in CI II. The interests of the two AIVs is bundled in the holding company CI II Alice Holding LLC who owns a 25% ownership interest in Vineyard Wind LLC. CI III expects to set up a similar structure as CI II. Today CI III has established one AIV, CI III AIV K/S, which owns, through its 100% owned CI III Alice Holding LLC, a 25% ownership interest in Vineyard Wind LLC.

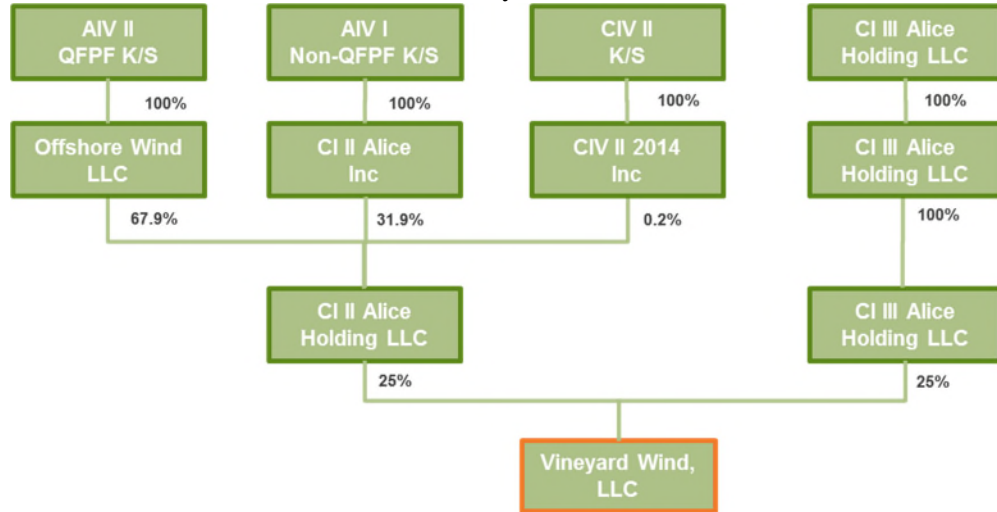


Figure 5.2-4: CIP's corporate structure for companies directly involved with Vineyard Wind.

CIP has secured financing for 12 projects and includes the following current investments in offshore wind:

- Veja Mate, Germany – 402MW project completed 2017
- Dolwin 3, a 900MW HVDC offshore wind transmission system in Germany under construction since 2014, and now in final stages of commissioning
- Beatrice, United Kingdom – 588MW project in construction since 2016

5.3. Please provide a description of the financing plan for the project, including construction and term financing. The financing plan should address the following:

- Who will finance the project (or are being considered to finance the project) and the related financing mechanism or mechanisms that will be used (i.e. convertible debenture, equity or other) including repayment schedules and conversion features
- The project's existing initial financial structure and projected financial structure
- Expected sources of debt and equity financing
- Estimated construction costs
- The projected capital structure

vi. *Describe any agreements, both pre and post commercial operation date, entered into with respect to equity ownership in the proposed project and any other financing arrangement.*

*In addition, the financing plan should address the status of the above activities as well as the financing of development and permitting costs. All bidders are required to provide this information.*

Financing the development and construction of Vineyard Wind 1 is expected to follow the plan provided below. However, there are factors that could alter the expected financing path. Financial markets undergo structural change and are subject to cyclical variation. Tax law changes, in particular, could have an impact, and while there is present uncertainty with proposed tax reforms, Vineyard Wind's bid is not conditioned on the outcome of the tax reforms currently being discussed.

With a project of this size and development time horizon, Vineyard Wind's shareholders are, as a matter of good prudence, prepared to respond to changes, seek creative alternatives, and commit their capital resources appropriately to ensure project success. Vineyard Wind's parent companies' financial strength and access to alternative sources of finance is a key strength in delivering Vineyard Wind 1.

**Pre-Construction Phase:** At present, Vineyard Wind's parent companies are providing substantial capital in the form of equity to fund development activities in connection with Vineyard Wind 1 (including lease and other property rights acquisition, physical research, bidding, permitting, and contracting, among others). This arrangement will continue until the commencement of construction. During the pre-construction phase, Vineyard Wind's management will be arranging financing for the next phases of the project.

**Construction Phase:** Construction costs are estimated to be [REDACTED] and are expected to be financed by a combination of additional parent companies' equity and potentially a construction loan facility syndicated among a group of large banks. Vineyard Wind's current expectation is that equity will be provided by parent companies' existing available funds. In addition, Vineyard Wind will consider financing part of the construction cost through third party debt. CIP has considerable experience in arranging such structures, having concluded more than EUR 3 billion of project financing during the past 3 years, as detailed in response to question 5.4. Letters of interest from JP Morgan and MUFG noting their interest in providing finance to the project is included in Attachments 5.3-1 and 5.3-2.

**Operations Phase:** On or near the commissioning date, any potential construction loan facility will be replaced by capital from, but not necessarily limited to, one or more of the sources below:

- Tax equity financing
- Bank loans or other debt instruments of long term nature, being repaid within the tenor of the PPA

In each phase, equity will be provided by Avangrid Renewables, CI-II, and CI-III. The considerable financial resources available to these organizations are described in response to question 5.5.

As indicated in the letters provided in Attachment 5.1-1 and 5.1-2, both Avangrid and CIP are following a long-term investment strategy. This long-term approach further ensures a high quality project that provides excellent value to Massachusetts ratepayers for many years, even beyond the term of the PPA.

5.4. *Provide documentation illustrating the experience of the bidder in securing financing for projects of similar size and technology. For each project previously financed provide the following information:*

i. *Project name and location*

ii.	<i>Project type and size</i>
iii.	<i>Date of construction and permanent financing</i>
iv.	<i>Form of debt and equity financing</i>
v.	<i>Current status of the project</i>

Vineyard Wind’s owners and their affiliates have significant experience financing offshore wind projects of similar size and technology, as summarized below.

#### **COPENHAGEN INFRASTRUCTURE PARTNERS**

CIP has market leading competencies and insight into offshore wind. The CIP senior partners have been involved in a significant number of the largest offshore wind projects and transactions globally. Offshore wind projects represent some of the largest and most complex projects within the energy infrastructure investment universe. CIP’s substantial hands-on experience and proven track record within offshore wind is very valuable on CIP’s other projects, such as onshore wind, biomass, solar and transmission.



Examples of the Senior Partners’ and COP’s senior management experience within offshore wind are outlined in **Figure 5.4-1** below.

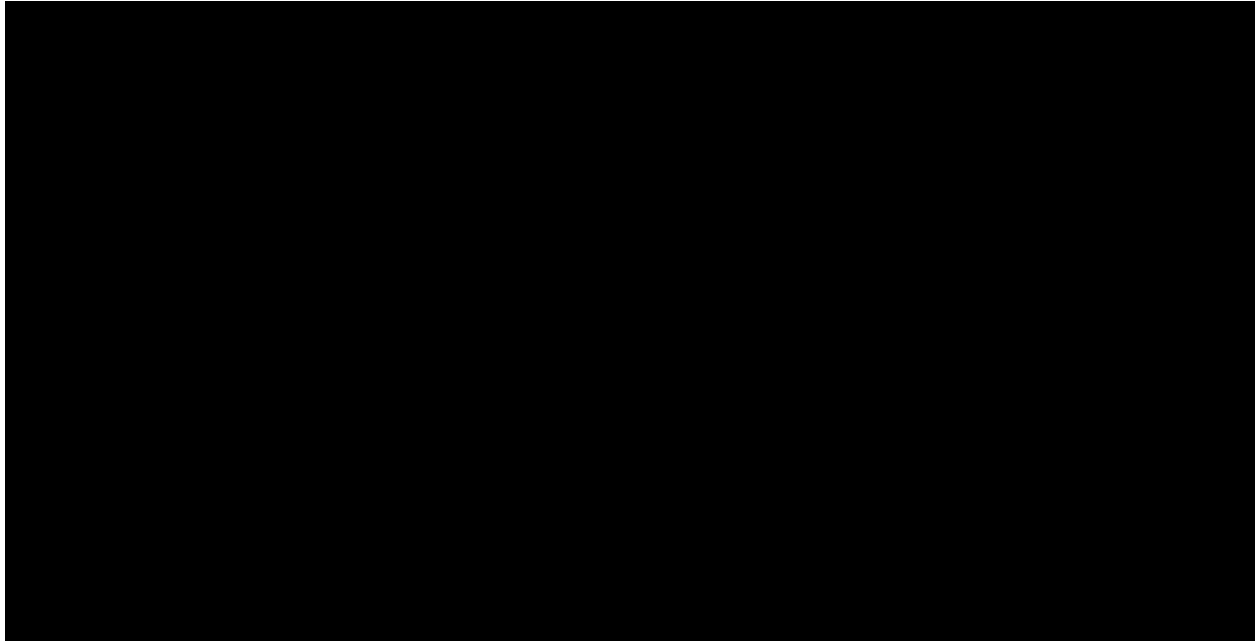


Figure 5.4-1: [Redacted]



**Table 5.4-1** is a table of projects that are funded by way of funds managed by CIP and are either operating or under construction (selected examples).

**Table 5.4-1: List of recent projects by Copenhagen Infrastructure Partners.**

Project and location	Project type and size	Date of construction and permanent financing	Form of debt and equity financing	Current status of project
<b>Dolwin 3 (Germany)</b>	900MW HVDC offshore transmission in partnership with TenneT	Financial close in Q1, 2014 and expected fully operational in Q3 2018	[Redacted]	Construction, undergoing commissioning
<b>Beatrice (United Kingdom)</b>	The project is the world's largest offshore wind farm (588MW) based on jacket foundations	Financial close in Q2, 2016 and expected fully operational in Q3 2018	[Redacted]	Construction

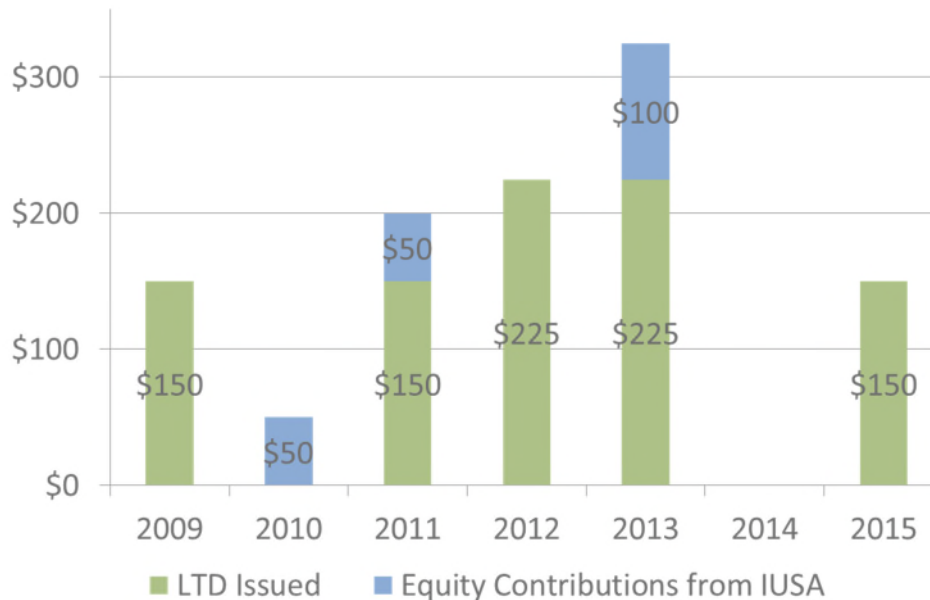
Project and location	Project type and size	Date of construction and permanent financing	Form of debt and equity financing	Current status of project
<b>Veja Mate (Germany)</b>	400 MW offshore wind project in the in the German North Sea	Financial close in Q2 2015, operational since Q2, 2017	[REDACTED]	Construction completed approx. 4 months ahead of schedule (within 23 months after FC)
<b>Bearkat I and II (United States)</b>	359MW onshore wind farm in Texas in partnership with TriGlobal Energy	Bearkat I reached financial close in Q1 2017; expected COD 4Q 2017.	[REDACTED]	Construction

### **Avangrid Renewables**

Substantially all of Avangrid Renewables' wind and solar generation projects are unencumbered by debt, having been funded by equity contributions from its parent company. Avangrid also raised tax equity financing totaling \$1.6 billion from 2006 to 2008.

### **Avangrid Networks**

Avangrid Networks has extensive experience in arranging funding for large scale transmission projects. An example of this is Central Maine Power (CMP), which recently completed the \$1.4 billion Maine Power Reliability Program (MPRP). During the period from 2009 through 2015, in order to fund the MPRP, as well as its ongoing transmission and distribution operations while maintaining a stable capital structure, CMP retained 100% of its net income (i.e., it did not pay dividends). In addition, since 2009, CMP has received \$250 million of equity contributions from Avangrid and issued \$900 million of first mortgage bonds, as shown in **Figure 5.4-2** below. CMP used its access to revolving credit to finance its variable working capital needs and to provide a source of bridge financing between its long-term debt financing transactions.



**Figure 5.4-2: 2009-2015 Long-term Debt and Equity Capital Raised by CMP (\$MM).**

### **Iberdrola**

Avangrid Renewable's ultimate parent company, Iberdrola S.A., has committed funding for the construction of more than EUR 5 billion of offshore wind projects in Europe.

Table 5.4-2: Iberdrola S.A Offshore Wind Projects in operation or construction.

Project and location	Project type and size	Date of construction and permanent financing	Form of debt and equity financing	Current status of project
<b>West of Duddon Sands (United Kingdom)</b>	389 MW offshore wind project which Iberdrola developed and constructed in a 50/50 joint venture	Financial close in Q2 2011, project fully operational 2014		Operational
<b>Wikinger (Germany)</b>	350MW offshore wind project	Financial close in Q2 2014, and expected fully operational in Q1 2018		Undergoing final commissioning
<b>East Anglia ONE (United Kingdom)</b>	714MW offshore project	Financial close in Q1 2016, and expected to be fully operational in 2020		Construction

*5.5. Please provide evidence that the bidder has the financial resources and financial strength to complete and operate the project as planned.*

Vineyard Wind parent companies are financially-sound organizations, providing the resources and financial strength to complete and operate Vineyard Wind 1 as planned. The strong financial condition of each sponsor is evidenced by its financial reports and credit ratings from major ratings agencies, as set forth below and in the response to question 5.6.

The following overview provides evidence of Vineyard Wind's parent companies' financial resources and strengths:

#### **AVANGRID RENEWABLES**

Avangrid Renewables is supported by its parent company Avangrid Inc., which is a public company with an equity market capitalization of over \$15 billion. It has a credit rating of BBB+ / Baa1 / BBB+ from S&P, Moody's and Fitch, respectively. Avangrid Inc. has the ability to raise equity capital from its majority owner, Iberdrola, S.A., or from the US public equity markets. Avangrid Inc. also has access to the investment grade debt capital markets and, in November 2017, raised \$600 million through the issuance of a 7-year green bond.

Avangrid, Inc.'s utilities also access the debt capital markets directly and have over \$4.3 billion of long-term debt outstanding. Avangrid also has a committed \$1.5 billion revolving credit facility and an active commercial paper program.

Iberdrola S.A. 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 ADR (American Depositary Receipt). Iberdrola has a market capitalization, at the end of September 2017, of \$49 billion, with 48GW of installed generation capacity, of which 28.8GW is renewable generation capacity, 16GW from wind and the remainder from hydro and other renewable technologies.

#### **COPENHAGEN INFRASTRUCTURE PARTNERS**

Copenhagen Infrastructure Partners P/S is a fund management company founded in 2012, which currently has four funds and more than \$7 billion under management. The company has the ability to deploy funds in line with its investment governance processes. Credit ratings are not provided for infrastructure funds, therefore no credit ratings are available. The investors in CIP funds are large institutional investors such as large pension funds (examples are Pension Danmark, PFA, European Investment Bank, Lærernes (teachers) Pension, Oslo Pensjonforsikring). The funds involved in Vineyard Wind are from CI-II or CI-III, which have joint funds available of more than \$3 billion.

**5.6.** *Provide complete copies of the most recent audited financial statement and annual report for each bidder for each of the past three years; including affiliates of the bidder (if audited statements are not available, reviewed or compiled statements are to be provided). Also, provide the credit ratings from Standard & Poor's and Moody's (the senior unsecured long term debt rating or if not available, the corporate rating) of the bidder and any affiliates and partners.*

As a private company, Vineyard Wind does not have any credit ratings. Details of the parent companies of Vineyard Wind are included below, including the following requested financial statements:

#### **AVANGRID RENEWABLES**

Avangrid Renewables parent company Avangrid Inc. is a NYSE traded entity and its audited annual accounts for the last three years are contained in Attachment 5.6-1 (2016), Attachment 5.6-2 (2015), and Attachment 5.6-3 (2014 – for Iberdrola USA Inc which was the company's previous name).

Avangrid Renewables ultimate parent company, Iberdrola S.A., 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 ADR (American Depositary Receipt). Annual reports for Iberdrola S.A. can be found in Attachment 5.6-4 (2016), Attachment 5.6-5 (2015), and Attachment 5.6-6 (2014).

The credit ratings of Avangrid Inc. as of September 2017 were as follows:

Sponsor	Standard & Poor	Moody's
<b>Avangrid Inc.</b>	BBB+ (Stable)	Baa1 (Stable)

#### **COPENHAGEN INFRASTRUCTURE PARTNERS**

Annual Reports of CIP affiliates are found in Attachment 5.6-7 (CI II Annual Reports 2015-16), 5.6-8 (CI II US AIV Non-QFPF Annual Report 2016), and 5.6-9 (CI II US AIV QFPF Annual Report 2016).

As common practice for infrastructure funds, CIP managed funds do not have credit or debt ratings.

**5.7.** *Please also include a list of the board of directors, officers and trustees for the past three years and any persons who the bidder knows will become officers, board members or trustees.*

Throughout the project's development and history, Vineyard Wind has drawn upon world-class leaders in finance, the offshore wind industry, and the US renewables industry to create a highly qualified senior management team.

Erich Stephens, currently Chief Development Officer, previously served as CEO of Vineyard Wind. Mr. Stephens has nearly 20 years of experience in the renewable energy sector on the US East Coast, including head of development operations for Bluewater Wind, the first company in the US to be awarded a PPA for offshore wind.

Prior to Erich Stephens serving as CEO, Peter Giller served as CEO. Mr. Giller has over 30 years senior management experience in power equipment and power project development around the world, and led the world's first non-recourse project financing of an offshore wind project, Meerwind in Germany. He continues to serve Vineyard Wind as a Senior Advisor to the Board.

Previous board members are David Foley, Sean Klimczak, JP Munfa, all senior management from the Blackstone Group, Vineyard Wind's shareholder prior to acquisition by CIP, and when the company was called Offshore MW LLC.



Vineyard Wind has the ability to draw upon the considerable management resources of its parent companies in making any future board or officer appointments, but no such appointments are planned at this time.

Vineyard Wind's current officers and board members, and their year of appointment, are as follows:

Jonathan Cole, Board of Managers Chair, 2017 – additionally Managing Director of Global Offshore Business of ScottishPower Renewables.

Laura Beane, Board of Managers member, 2017 – additionally President and CEO of Avangrid Renewables.

Torsten Lodberg Smed, Board of Managers and Executive Committee member, 2016 – additionally Senior Partner of Copenhagen Infrastructure Partners.

Felix Pahl, Board of Managers and Executive Committee member, 2016 – additionally Associate Partner of Copenhagen Infrastructure Partners.

Rany Raviv, Executive Committee member, 2017 – additionally Vice President Commercial and Strategic Relationships of Avangrid Renewables.

Alejandro de Hoz, Executive Committee member, 2017 – additionally Vice President of US Offshore of Avangrid Renewables.

Lars Thaaning Pedersen, Chief Executive Officer, Vineyard Wind, 2017.

Iain Henderson, Chief Financial Officer, 2017.

Uffe Jorgensen, Chief Technology Officer, 2016.

Erich Stephens, Chief Development Officer, 2016.

*5.8. The bidder should demonstrate its ability (and/or the ability of its credit support provider) to provide the required security, including its plan for doing so.*

Vineyard Wind will provide the security required to the Distribution Companies under the PPA by way of parent guaranty, bank letters of credit, or cash-on-hand security provided by the parent companies by way of equity capital, as referenced in Attachment 5.1-1 and 5.1-2. The security value to be provided will be equal to \$20,000 per MW of Contract Maximum value for the generation assets and \$10,000 per MW of Contract Maximum value for the expandable transmission assets selected.

*5.9. Provide a description of any current or recent credit issues/ credit rating downgrade events regarding the bidder or affiliate entities raised by rating agencies, banks, or accounting firms.*

None

*5.10. Describe the role of the Federal Production Tax Credit or Investment Tax Credit (or other incentives) on the financing of the project.*

Vineyard Wind plans to take the necessary steps to be in a position to maximize the value of the existing tax benefits for renewable energy projects in the form of Investment Tax Credits (ITC). The value of the Investment Tax Credit is planned to be realized by way of investment by a tax equity partner or partners. The financial benefits of ITCs have been taken into account when pricing the PPA, meaning that the full benefit is passed on to Massachusetts ratepayers. Therefore, given the phase-out of the ITC, the early delivery of Vineyard Wind 1 offers additional value to Massachusetts ratepayers.

The assumptions in the Vineyard Wind financial model regarding the ITC market has been analyzed by CCA Group, one of the leading financial advisors in the US for raising tax equity for renewable energy projects. CCA has provided a letter confirming that Vineyard Wind has taken a reasonable approach to the ITC tax benefits when developing the proposal (Attachment 5.10-1).

*5.11. Bidders must disclose any pending (currently or in the past three years) litigation or disputes related to projects developed, owned or managed by Bidder or any of its affiliates in the United States, or related to any energy product sale agreement.*

Vineyard Wind is not involved in any pending litigation or disputes related to projects developed, owned, or managed by Vineyard Wind.

Avangrid Renewables is part of a large corporate entity and, consequently, its affiliates are involved in litigation and disputes from time to time in the ordinary course of business. Material litigation and disputes regarding affiliates of Avangrid Renewables for the past three years are found in the annual reports and related financial information, referenced in the answer to question 5.6 and in publicly filed periodic reports by Avangrid.

To the best of CIP's knowledge (as the fund management company), no current, past, or potential future material litigation, arbitration, or regulatory action exists against any of CIP's investment professionals (regarding professional matters), the General Partner, any partnership managed by CIP or an affiliate, or CIP or any affiliate of CIP.

*5.12. What is the expected operating life of the proposed project? What is the depreciation period for all substantial physical aspects of the bid, including generation facilities, transmission lead lines to move power to the grid, transmission proposals, and mandatory and voluntary transmission system upgrades?*

## **GENERATION FACILITIES**

All major components of the generation facilities have useful lives in excess of the term of the proposed PPAs. The minimum useful life of the generation facilities is 25 years. The generator lead lines are expected to have even longer functional lives, but may have to be decommissioned at the time of the generation decommissioning per BOEM requirements. Vineyard Wind 1 will be depreciated in accordance with IRS guidelines.

Vineyard Wind will take steps from the design stage through construction to operations to ensure that the facilities are maintained to maximize the operating life to ensure clean energy is provided to the Massachusetts ratepayers for many years to come. This can include ensuring that sufficient spares are retained to maintain the project capacity throughout its life.

## **EXPANDABLE TRANSMISSION FACILITIES**

All major components of the expandable transmission facilities have useful lives in excess of the term of the current and future proposed PPAs.

*5.13. Has the bidder already obtained financing, or a commitment of financing, for the project? If financing has not been obtained, explain how obtaining a long-term agreement as proposed will help you in obtaining financing for the proposed project, in obtaining more favorable terms for the financing of the proposed project, or in supporting the future capital investment.*

Vineyard Wind's parent companies are committed to providing the equity investments needed to finance the project upon execution of a long-term agreement and other conditions, as evidenced by their letters provided in Attachments 5.1-1 and 5.1-2.

In addition, the parent companies of Vineyard Wind will work together and apply their substantial financing experience and knowledge to organize a financing package that provides a low cost of capital, and thereby very competitive prices for Massachusetts ratepayers. This financing package will be a combination of equity investment from parent companies, tax equity financing, and project financing through bank loans or bonds.

The long-term agreement will assist in obtaining finance for Vineyard Wind 1 as it will fix the price paid for electricity generated by the project for a large part of its economic life. By the removal of one of the largest economic uncertainties when estimating the future income of Vineyard Wind 1, the risk of the investors and lenders is lowered, allowing lower cost to ratepayers.

*5.14. State whether the bidder or its affiliates have executed agreements with respect to energy, RECs and/or capacity for the project (including any agreements that have been terminated) and provide information regarding the associated term and quantities, and whether bidder has been alleged to have defaulted under or breached any such agreement.*

There are no executed agreements, either terminated or effective, with respect to energy, RECs, or capacity for Vineyard Wind's proposed facility. Bidder has not been alleged to have defaulted under or breached any such agreement.

*5.15. List all of the Bidder's affiliated entities and joint ventures transacting business in the energy sector.*

Vineyard Wind's parent companies and their affiliates (including as described in Section 5.2) regularly conduct business in the energy sector.

Attachment 5.15-1 details all of Avangrid Renewables affiliate companies and Attachment 5.15-2 details all of Iberdrola S.A.'s subsidiary companies. Attachment 5.15-3 details all of CI II affiliate companies, and Attachment 5.15-4 details all of CI III affiliate companies.

*5.16. Has Bidder, or any affiliate of Bidder, in the last five years, (a) consented to the appointment of, or was taken in possession by, a receiver, trustee, custodian or liquidator of a substantial part of its assets, (b) filed a bankruptcy petition in any bankruptcy court proceeding, (c) answered, consented or sought relief under any bankruptcy or similar law or failed to obtain a dismissal of an involuntary petition, (d) admitted in writing of its inability to pay its debts when due, (e) made a general assignment for the benefit of creditors, (f) was the subject of an involuntary proceeding seeking to adjudicate that Party bankrupt or insolvent, (g) sought reorganization, arrangement, adjustment, or composition of it or its debt under any law relating to bankruptcy, insolvency or reorganization or relief of debtors?*

Neither Vineyard Wind, or any affiliate of Vineyard Wind, in the last five years, has (a) consented to the appointment of, or was taken in possession by, a receiver, trustee, custodian or liquidator of a substantial part of its assets, (b) filed a bankruptcy petition in any bankruptcy court proceeding, (c) answered, consented or sought relief under any bankruptcy or similar law or failed to obtain a dismissal of an involuntary petition, (d) admitted in writing of its inability to pay its debts when due, (e) made a general assignment for the benefit of creditors, (f) was the subject of an involuntary proceeding seeking to adjudicate that Party bankrupt or insolvent, or (g) sought reorganization, arrangement, adjustment, or composition of it or its debt under any law relating to bankruptcy, insolvency or reorganization or relief of debtors.

*5.17. Briefly describe any known conflicts of interest between Bidder or an affiliate of Bidder and any Distribution Company, or any affiliates of the foregoing.*

Neither Vineyard Wind or either of its parent companies is aware of any conflicts of interest with any of the Distribution Companies, whether directly or through affiliates of any Distribution Company.

*5.18. Describe any litigation, disputes, claims or complaints involving the Bidder or an affiliate of Bidder, against any Distribution Company or any affiliate of any Distribution Company.*

Neither Vineyard Wind or any of its parent companies is aware of any litigation, disputes, claims, or complaints against any of the Distribution Companies or any affiliate of any Distribution Company.

*5.19. Describe any litigation, disputes, claims or complaints, or events of default or other failure to satisfy contract obligations, or failure to deliver products, involving Bidder or an affiliate of Bidder, and relating to the purchase or sale of energy, capacity or renewable energy certificates or products.*

Neither Vineyard Wind or either of its parent companies or their affiliates have been implicated in any material litigation, disputes, claims, complaints, events of default, or other material failure to satisfy contract obligations or material failure to deliver products involving or relating to the purchase or sale of energy, capacity, or renewable energy certificates or products.

With regard to affiliates, Avangrid Renewables is part of a large corporate entity and, consequently, its affiliates are involved in litigation and disputes from time to time in the ordinary course of business. Material litigation and disputes regarding affiliates of Avangrid Renewables for the past three years are found in the annual reports and related financial information referenced by the parent company in Section 5.6 and in publicly filed periodic reports by Avangrid (see the links to those reports in response to Question 5.6). Any litigation and other disputes involving an affiliate will not have a material effect on that shareholder's ability to perform on the contracts described in this proposal.

With regard to affiliates in relation to CIP, no affiliates are at this point in time subject to litigation or disputes of a materiality that would negatively impact the funds ability to perform on the contracts described in this proposal.

*5.20. Confirm that Bidder, and the directors, employees and agents of Bidder and any affiliate of Bidder are not currently under investigation by any governmental agency and have not in the last four years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction involving conspiracy, collusion or other impropriety with respect to bidding on any contract, or have been the subject of any debarment action (detail any exceptions).*

Neither Vineyard Wind, nor any of its directors, employees, agents, or affiliates have been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction involving conspiracy, collusion, or other impropriety with respect to bidding on any contract, nor have been the subject of any debarment action, in the last four years.

In October 2017, the Environmental Defense Fund (EDF) released a report alleging that certain New England utility subsidiaries of Avangrid, Inc. (the indirect parent of Avangrid Renewables, an affiliate of Bidder) and Eversource engaged in pipeline capacity scheduling practices on Algonquin Gas Transmission Pipeline (AGT) that resulted in artificially increased natural gas and electricity prices in New England. On October 17, 2017, in response to the EDF report, the Connecticut Public Utilities Regulatory Authority opened a docket to review the gas supply portfolio, asset strategy, and practices of Connecticut's gas local distribution companies, or LDCs. Two utility subsidiaries of Avangrid

(Connecticut Natural Gas and Southern Connecticut Gas) expect to participate in the docket. CNG and SCG are obligated by regulation and law to provide safe and reliable gas service to homes and businesses under the oversight of state regulators and the pipeline transportation service that CNG and SCG receive from interstate pipelines is regulated by the FERC. On October 24, 2017, the Massachusetts Department of Public Utilities stated publicly that it will review the allegations in the EDF report but has not opened a formal docket in the matter. Avangrid, Inc. is the indirect parent of Berkshire Gas, a Massachusetts gas utility.

Additionally, Avangrid Renewables is part of a large corporate entity and, consequently, the parent company and their directors, employees, or agents, as well as their respective affiliates, have been involved in regulatory investigations by governmental authorities from time to time in the ordinary course of business. Any such regulatory investigations will not have a material effect on that parent company's ability to perform on the contracts described in this proposal. The parent company, nor any of their directors, employees, agents, or affiliates been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction involving conspiracy, collusion, or other impropriety with respect to bidding on any contract, nor been the subject of any debarment action in the last four years.

Neither CIP, its directors or employees, nor funds managed by CIP have been convicted on matters pointed out in 5.20.

**5.21. *Identify all regulatory and other approvals needed by Bidder to execute a binding sale agreement.***

The proposed form of PPA contains conditions that must be met, including regulatory approvals and transmission approvals, prior to that agreement taking effect. Such approvals consist of the Regulatory Approval and any Related Transmission Approvals (as each term is defined in the proposed form of PPA) and are referred to in Section 8 of the PPA(s). The Bidder does not condition its execution of a binding sale agreement on any other regulatory or other approval other than the approval of its Members and Board of Managers in accordance with the provisions of the Bidder's limited liability company agreement, which Bidder will seek prior to its execution of any such sale agreement.

The Board of Managers and the Members of Vineyard Wind, LLC must approve the execution of a binding agreement; no additional approval is necessary.

**5.22. *Describe how the project will conform to FERC's applicable regulatory requirements, including, but not limited to, FERC requirements relating to allocation of transmission capacity and open access, the justness and reasonableness of rates, the potential for undue preference or discrimination, and affiliate dealings, if any. Describe how your proposed approach is consistent with FERC precedent and ratemaking principles.***

**Generation** – Vineyard Wind LLC will ensure it has all of the necessary FERC authorizations to supply power at wholesale in connection with this proposal. Vineyard Wind will obtain market-based rate authority from FERC under Section 205 of the Federal Power Act (FPA) as necessary to sell power at wholesale pursuant to its PPAs with the EDCs. Along with its market-based rate authorization, Vineyard Wind will also obtain the blanket authorizations and waivers from FERC that are customarily granted to entities with market-based rate authority.

Vineyard Wind will also obtain self-certification with FERC as an exempt wholesale generator (EWG), under FERC's regulations under the Public Utility Holding Company Act of 2005. Avangrid Renewables has obtained market-based rate authority and EWG status for 56 affiliated generation project companies with a combined generating capacity of over 5,700 MW in its ordinary course of business, and expects no complications in obtaining market-based rate authority and EWG status for Vineyard Wind well before its generation project is initially energized.



**Transmission** – Shortly after execution of the TSAs for Phase I of the proposed offshore wind transmission facilities to be constructed, owned, and operated by Vineyard Wind Transmission (VWT), VWT will file the TSAs with FERC under Section 205 of the FPA, along with an application seeking authority to charge negotiated rates for transmission service over both the Phase I facilities (as reflected in the as-filed TSAs for the Phase I facilities) and the Phase II facilities (to be reflected in TSAs to be filed in the future for the Phase II facilities if and when those facilities are constructed and become operational), a Negotiated Rate Filing, based upon VWT’s cost-of-service.

As part of this Negotiated Rate Filing, VWT will also request that FERC grant it waiver of certain filing and reporting requirements under Part 35 of FERC’s regulations that would otherwise apply to VW when it becomes a FERC-jurisdictional public utility, but that FERC customarily grants to transmission owners or operators with negotiated rate authority. In evaluating applications for negotiated rate authority FERC has focused on four areas of concern: (1) the justness and reasonableness of the rates; (2) the potential for undue discrimination; (3) the potential for undue preference, including affiliate preference; and (4) regional reliability and operational efficiency requirements. VWT is confident that it can fully address and satisfy each of these concerns with respect to both the Phase I and Phase II facilities, given that it will assume the full market risk for the construction of these facilities, has no captive customers, and the allocation of transmission service capacity on these facilities will be awarded to the EDCs, none of which are affiliates of VWT, as a result of the selection of this bid in the open and transparent solicitation process under the 83C RFP.

Moreover, as part of the Negotiated Rate Filing, VWT will commit to either file an Open Access Transmission Tariff (OATT) for the Phase I facilities or have the Phase I facilities placed under the operational control of ISO-NE and subject to the ISO-NE OATT, and in either case to have such arrangement become effective on or before the date the Phase I facilities are initially energized. Any OATT that is filed would be comparable to OATTs filed with and accepted by FERC for similar types of transmission facilities that are radial in nature and serve to transmit electric energy from remotely-located generation facilities to a point of interconnection with transmission facilities that are part of a larger integrated transmission system, such as the ISO-NE PTF.

VWT also will commit to a similar arrangement for the Phase II facilities that would be effective on or before the date on which those facilities are initially energized. Finally, VWT will register with the North American Electric Reliability Corporation (NERC) as a Transmission Owner and Transmission Operator with regard to the Phase I facilities and comply with any and all applicable NERC Reliability Standards (and VWT will do the same for the Phase II facilities if and when they are constructed).

*5.23. Describe and document any and all direct and indirect affiliations and affiliate relationships, financial or otherwise in the past three years between the bidder and one or more of the Distribution Companies and their affiliates, including all relationships in which one of the Distribution Companies has a financial or voting interest (direct or indirect) in the bidder or the bidder’s proposed project. These relationships include:*

- *Corporate or other joint arrangements, joint ventures, joint operations whether control exists or not;*
- *Minority ownership (50% or less investee);*
- *Joint development agreements;*
- *Operating segments that are consolidated as part of the financial reporting process ;*
- *Related parties with common ownership;*

- *Credit, debenture, and financing arrangements, whether a convertible equity feature is present or not;*
- *Wholly owned subsidiaries; and*
- *Commercial (including real property) relationships with any Distribution Company*

One of the joint owners of Vineyard Wind LLC is Avangrid, Inc. Details of the corporate structure of Avangrid, Inc. are presented in Section 5.2 of Appendix B. Avangrid, Inc. owns two subsidiaries, Avangrid Renewables, LLC, and Avangrid Networks, Inc. Avangrid Renewables has three land based wind project LLCs, Lempster, Groton, and Hoosac which have executed arms-length power purchase agreements with NSTAR and Public Service Company of New Hampshire, affiliates of the Distribution Companies. These agreements are ongoing, and in good standing. They create no financial benefit or have any consequence related to the Vineyard Wind proposal, and create no conflict of interest for either party.

Avangrid Renewables, LLC participated in the Section 83D RFP in 2017 in response to the Request for Proposals for LongTerm Contracts for Clean Energy Generation Projects issued on March 31, 2017 by Fitchburg Gas & Electric Light Company (Unitil), Massachusetts Electric Company, Nantucket Electric Company (National Grid), and NSTAR Electric Company and Western Massachusetts Electric Company (Eversource). Unitil, National Grid, and Eversource (jointly referred to as the “Distribution Companies”), submitting four bids. One of those bids, “Bid A” included a delivery over a new transmission project (the “Northeast Renewable Energy Link”). GridAmerica Holdings, Inc. a subsidiary of National Grid USA (GridAmerica) is the sponsor of the Northeast Renewable Energy Link included with the proposal. No conflict of interest is created by the Vineyard Wind Proposal.

Avangrid Networks, Inc., has an indirect interest of approximately 19.73% in New York TransCo, LLC. Grid NY, LLC, an affiliate of Massachusetts Electric Company and Nantucket Electric Company, also owns an interest in New York TransCo, LLC.[1]

The United States portion of the Project facilities are owned, operated, and maintained by, among others, New England Electric Transmission Corporation, New England Hydro-Transmission Electric Company, Inc., and New England Hydro-Transmission Corporation, which are affiliates of Massachusetts Electric Company and Nantucket Electric Company. Eversource Energy and NSTAR Electric Company also have an interest in New England-Hydro Transmission Electric Company and New England Hydro-Transmission Corporation. Additionally, New England Power Company (an affiliate of Massachusetts Electric Company and Nantucket Electric Company) and NSTAR Electric Company are asset owners of certain AC transmission network facilities that were required as upgrades for Vineyard Wind 1.

Avangrid Networks affiliates, along with several other New England utilities, including Fitchburg Gas and Electric Light Company, Western Massachusetts Electric Company, NSTAR Electric Company, and some of their affiliates, provided financial support in connection to the Phase I/II project through payment of support charges to the different asset owners. The terms of such financial support are set forth in several support agreements executed by the different asset owners and the financial supporters of the interconnection facilities, including CMP (the Support Agreements).

Finally, Avangrid Networks, through its subsidiary Central Maine Power, participated in the Section 83D RFP in 2017 in response to the Request for Proposals for Long Term Contracts for Clean Energy Generation Projects issued on March 31, 2017 by Fitchburg Gas & Electric Light Company (Unitil),

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[1] SP Transmission, a Scottish Power company, which is part of Iberdrola, S.A. group, has a joint venture with National Grid (NGET/SPT Upgrades, Ltd.) with the purpose of building a submarine interconnection in the Irish Sea to increase power transmission capacity between England and Scotland.



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Massachusetts Electric Company and Nantucket Electric Company (National Grid), and NSTAR Electric Company and Western Massachusetts Electric Company (Eversource). (Unitil, National Grid, and Eversource are jointly referred to as the “Distribution Companies”), submitting five bids.

No conflict of interest is created by the Vineyard Wind Proposal.

## Section 6 OF APPENDIX B TO THE RFP SITING, INTERCONNECTION, AND DELIVERABILITY

*This section of the proposal addresses project location, siting, real property rights and interconnection issues. Bidders should ensure that the threshold criteria outlined in Section 2.2 of the RFP for generation, transmission proposals, and system upgrades are verified in their responses.*

- 6.1. Provide a site plan (or plans) including a map (or maps) that clearly identifies the location of the proposed project site, Delivery Facilities Project route, the assumed right-of-way width, the total acreage for Eligible Facilities, the anticipated interconnection point (or, if applicable, multiple points for a Transmission Project), deployment facilities, and the relationship of the site to other local infrastructure, including transmission facilities, roadways, federal and state waters, and waterways. In addition to providing the required map(s), provide a site layout plan which illustrates the location of all major equipment and facilities on the site.

Site plan included? Yes ☒ No ☐ If not, please explain:

A detailed overview map, including insets and layout plans, addressing all points of this question is provided as Attachment 6.1-1, and an overview summary map is provided below as **Figure 6.1-1**. Note that layout plans are indicative at this time, pending final design and permitting, and further that this map includes alternative routes and not all routes shown may be used.

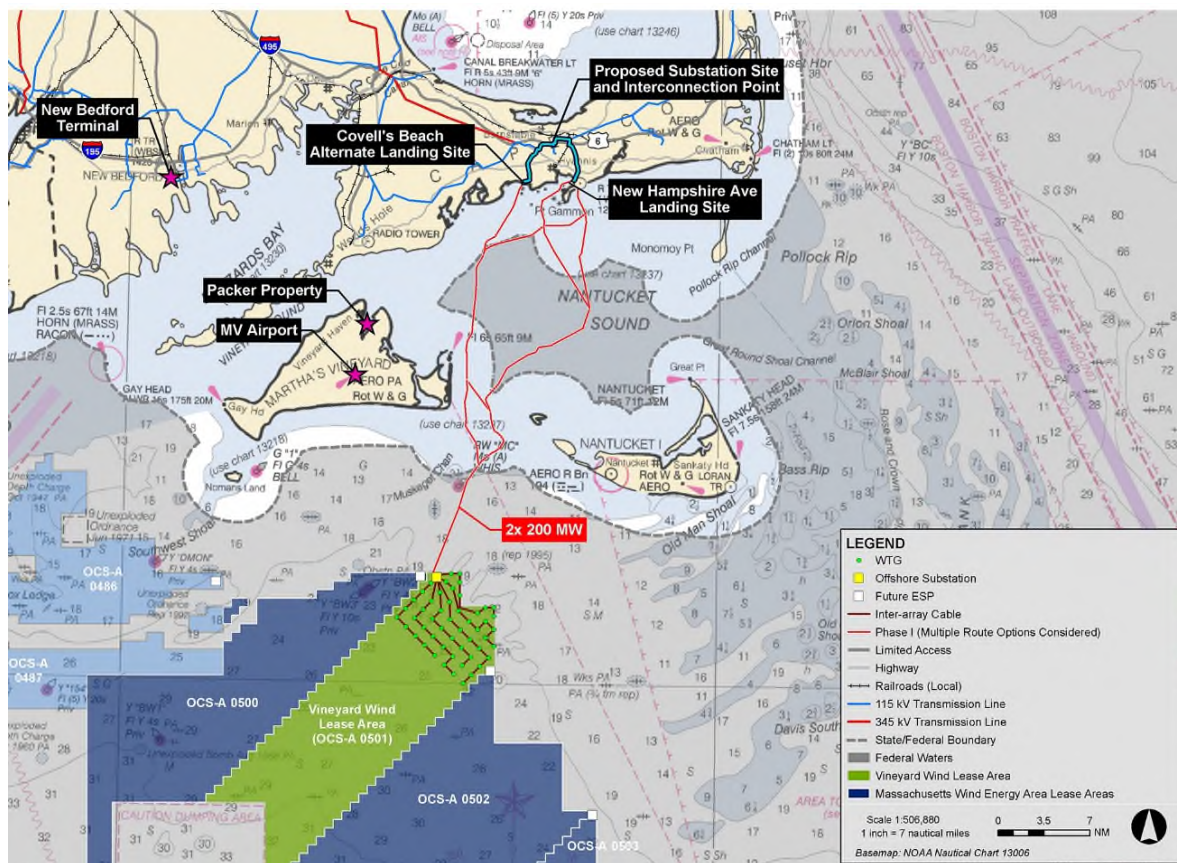


Figure 6.1-1: Overall 400MW project plan and points of interest, see Attachment 6.1-1 for full map and inset maps.

6.2. *Identify any real property rights (e.g., fee-owned parcels, rights-of-way, development rights or easements or leases) that provide the right to use the Eligible Facility site and/or Transmission Project route, including, for Eligible Facilities, and any rights of way needed for interconnection.*

i. *Does the project have a right to use the Eligible Facility site and/or Transmission Project route for the entire proposed term of the PPA or tariff (e.g., by virtue of ownership or land development rights obtained from the owner)?*

Yes ☒ No ☐ If not, please explain:

ii. *If so, please detail the Bidder's rights to control the Eligible Facility site and/or Transmission Project route control.*

iii. *Describe the status of acquisition of real property rights, any options in place for the exercise of these rights and describe the plan for securing the necessary real property rights, including the proposed timeline. Include these plans and the timeline in the overall project timeline.*

iv. *Identify any joint use of existing or proposed real property rights*

#### i. **Right to Use the Eligible Facility Site and/or Transmission Project Route**

Vineyard Wind has secured key onshore and offshore property rights needed to develop and operate this project for the proposed term of the PPA or tariff, and has high certainty of securing, or specific rights to secure, other key property rights at the appropriate time. **Table 6.2-1** indicates the status of all key property rights required. Rights that have already been secured are addressed in the following section, Section 6.1.ii.

The routes and route alternatives or variants discussed in this section refer to Vineyard Wind's preferred route as per the petition already filed with the Energy Facilities Siting Board. In addition to this preferred route, a Noticed Alternative was included in that petition; please see Attachment 6.1-1 and Figure 6.4-3. However, given Vineyard Wind's confidence in being able to secure all necessary rights within the proposed project schedule, responses to this section reference the preferred route only.

**Table 6.2-1: Status of property rights required. Onshore cable routes alternatives are shown in grey; only one of the alternatives needs to be secured in order to successfully complete the onshore cable route.**

Property right required	Status
Land for substation	<b>Secured:</b> Option agreement executed.
Onshore cable route-Yarmouth portion (~70% of total onshore cable route)	Host Community Agreement is being negotiated with Town of Yarmouth.
Onshore cable route-Barnstable portion	Letter of Interest received from Barnstable indicating interest in continuing discussions. See Attachment 6.2-1.
Onshore cable route alternative-Bike path route in Barnstable	MassDOT officials have not identified any significant issues.
Onshore cable route alternative -Utility ROW	Vineyard Wind has submitted application for co-location to the utility. Buried cable design should present no conflicts to future or current uses.
Onshore cable route alternate-MassDOT rail way	Discussions with MassDOT officials have identified no reason installation would not be feasible/allowable.
Onshore cable route alternative-Great Island cable landing area and use of private roadway to bury cable	Active communication is underway with the appropriate landowners.
Onshore cable route crossing of state highways (two or three crossings, depending on route variant)	Highly likely to secure: Discussions with MassDOT officials have identified no reason installation would not be feasible/allowable.

Property right required	Status
Offshore cable route-state waters	License is issued by MassDEP, such issuance reasonably expected after receiving necessary MEPA and Energy Facility Siting Board (EFSB) approvals; these permits have been applied for.
Offshore cable route –Federal waters	<b>Secured:</b> Right to cable corridor is included with generation lease area, which is secured per below.
Wind turbines, inter-array cable, and offshore substation locations	<b>Secured:</b> Vineyard Wind holds BOEM offshore wind lease OCS-A-501; see Attachment 6.2-2 and related Letter of Good Standing, Attachment 6.2-3.
Construction port	<b>Secured:</b> Vineyard Wind has entered into a lease option agreement with MassCEC for use of the New Bedford Marine Commerce Terminal; see Section 10.
O&M shoreside facility	Vineyard Wind has entered into a Memorandum of Agreement to negotiate an option/lease for use of working waterfront in Vineyard Haven. Please see Section 11.

Note that the onshore cable route alternatives, described in the grey shaded areas in **Table 6.2-1**, do not all need to be secured in order to secure a complete cable route. Rather, these alternatives allow for optimizing the route. Furthermore, the proposed cable route is nearly identical to that which was successfully permitted by an earlier offshore wind proposal which did not move forward for reasons unrelated to the cable route per se. Therefore, while rights to the cable route have not yet been secured, it is highly probable that at least one of the alternatives will be secured, allowing for completion of the onshore route.

## ii. Bidder's Rights to Control the Eligible Facility Site and/or Transmission Project Route

Details of Vineyard Wind's rights to control the Eligible Facility site and/or Transmission Project route are indicated in the following sections, organized by the project element referenced in **Table 6.2-1**.

**Substation Land:** Vineyard Wind has entered into an option to lease/ lease agreement with the owners of a parcel of land suitable for siting the substation. This parcel is approximately 6 acres, and is adjacent to the utility's substation that is Vineyard Wind 1's interconnection point. [REDACTED]

[REDACTED] ensuring that the substation property is available for the full duration of the operations of Vineyard Wind 1 during the terms of the proposed PPA.

**Offshore Cable Route in Federal Waters:** Per USC § 585.200(b), Vineyard Wind is entitled to one or more easements in which to locate the offshore cable in Federal waters, as needed to make grid connection for offshore wind generation located in its OCS lease, described below. This easement(s) will be issued upon approval of Vineyard Wind 1's Construction and Operation Plan, and will be recorded as an addendum to the Vineyard Wind's OCS lease. The width of the easement will be determined as part of the Construction and Operations approval process.

**Turbines, Inter-Array Cable, and Offshore Substation Locations:** Vineyard Wind holds a lease in good standing, issued by the US Department of Interior, Bureau of Ocean Energy Management (BOEM), for the purpose of offshore wind energy generation. The lease number is OCS-A-501, and a copy of the executed lease is provided as Attachment 6.2-2 and a letter of good standing from BOEM is provided as Attachment 6.2-3. The wind turbine generators (WTG), the 66-kV inter-array cables, and the Electrical Service Platforms (ESP) will all be located within this lease area, all of which is allowed by and fully pursuant to the lease.

**Construction Port:** Vineyard Wind has entered into a lease option with the Massachusetts Clean Energy Center (MassCEC) for use of the New Bedford Marine Commerce Terminal for the purpose of constructing Vineyard Wind 1. Further details are provided in Section 10.

**iii. Status of Acquisition of Real Property Rights**

The status of Vineyard Wind's acquisition of real property rights not yet acquired, any options in place for the exercise of these rights, and plans for securing the necessary real property rights, including the proposed timeline, are indicated in the following sections, organized by the particular site or route segment described in Section 6.2 i. Please also refer to the Figures provided in Attachment 6.1-1.

The plans and the timeline described in this Section 6.2 iii are included in the overall project timeline provided in Section 9.

**Onshore Cable Route Through Yarmouth and Barnstable Roadways:** Vineyard Wind's onshore cable will mostly be installed under existing public roadways in the towns of Yarmouth and Barnstable. Rights to install cables in this manner are granted through a Grant of Location issued by the appropriate town. The Grant of Location can only be issued after final design and permits are issued; Vineyard Wind will request the Grant of Location at the appropriate time given these requirements.

To better ensure the timely issuance of these Grants of Location, and as a matter of being a responsible corporate citizen, Vineyard Wind is currently seeking Host Community Agreements with the towns of Barnstable and Yarmouth. Under these agreements, Vineyard Wind would commit to certain protections and benefits the town may request. The towns do not forfeit any of their regulatory authority, such as conservation commission reviews, under these agreements.

Vineyard Wind has been in active and regular discussions with the staff of both towns; we have presented before the Barnstable Town Council and twice before the Yarmouth Board of Selectmen. A draft Host Community Agreement with Yarmouth received a first hearing before the Board of Selectmen on November 28, 2017; it is customary for agreements such as these to be considered over at least two hearings. A Letter of Interest to continue these negotiations from the Barnstable Town Manager has been received by Vineyard Wind, and is provided in Attachment 6.2-1.

**Onshore Cable Route Alternative - Bike Path:** Vineyard Wind is proposing to use the MassDOT bike path Right of Way (ROW) to locate a portion of the buried cable, as shown in Figure 6.1-4 of Attachment 6.1-1. Vineyard Wind is engaged in active and regular discussions with the Massachusetts Department of Transportation (MassDOT) regarding the use of the railroad ROW. MassDOT has scheduled a meeting during the third week of January, 2018 for further discussions. Vineyard Wind's rights to use the bike path Right of Way (ROW) will be in the form of an easement or license from the Massachusetts Department of Transportation (MassDOT). In addition, an Article 97 grant will need to be issued for use of the bike path ROW for the purpose of Vineyard Wind 1's buried cable. The current project plan allows for sufficient time for obtaining the necessary MassDOT easements or license and Article 97 approvals.

The proposed plan is for Vineyard Wind to clear the bike path ROW and install the cable underground, at which point the surface level route would then be cleared and ready for construction of the bike path. With this option, Vineyard Wind can avoid installing cable in the utility ROW and/or underneath Barnstable roads. This option would represent a "win-win-win" for the state, Barnstable, and Vineyard Wind. The state would benefit from cost savings in not having to clear the bike path route, Barnstable would benefit from having very minimal disruption of construction as a result of burying the cable in town streets, and Vineyard Wind would benefit from savings resulting from the onshore cable route being about a mile shorter than it would otherwise need to be.

**Onshore Cable Route Alternative-Utility ROW:** Vineyard Wind proposes to use an existing utility ROW, now used for overhead 115kV lines, as a route to get from Willow Street in Yarmouth into the vicinity of the Barnstable 115 kV switching station. Based on our evaluations to date, we have not identified any reasons the proposed buried cable would conflict with current or future uses of the utility's ROW. Vineyard Wind has submitted application for co-location to the utility.



**Onshore Cable Route Alternative-MassDOT Railroad roadway:** The use of a state owned railroad way is an alternative to the use of Willow Street. Vineyard Wind is engaged in active discussions with the Massachusetts Department of Transportation (MassDOT) regarding the use of this segment of railway. Vineyard Wind's rights to use the railroad way would be in the form of an easement or license from the appropriate state agency. All indications from the meetings have been positive, and Vineyard Wind believes we would be able to secure the necessary rights to use this right of way in accordance with the project schedule. While Vineyard Wind is very confident in procuring the rights to utilize the railroad ROW, there are alternative route variants to the railroad ROW option.

**Onshore Cable Route Alternative-Great Island Cable Landing Area and Use of Private Roadway:** This cable landing and related onshore route is an alternative to the preferred cable landing at New Hampshire Avenue in Lewis Bay. Vineyard Wind is in active communication with the appropriate landowners, and anticipates making a decision regarding use of this alternative in the first half of 2018.

**Onshore Cable Route Crossing of State Highway:** Vineyard Wind is in active and regular discussions with the Massachusetts Department of Transportation (MassDOT) regarding the state controlled highway crossings, which are over routes 28, 6, and, in the case of alternatives, Route 132. Vineyard Wind's rights to cross state highways will be in the form of an easement or license from the appropriate state agency. All indications from discussions with the MassDOT have been positive, and Vineyard Wind believes that approvals will be granted in accordance with the project schedule.

**Offshore Cable Route-State Waters:** Permission to locate the export cables in state waters will be granted via a license issued by the Massachusetts Department of Environmental Protection (MassDEP) under Massachusetts General Laws Chapter 91 and regulations at 310 CMR 9.00. MassDEP would issue the license after review of the state portions by the Executive Office of Energy and Environmental Affairs under the Massachusetts Environmental Policy Act, and by the Massachusetts Energy Facilities Siting Board. These permit applications have been filed, as described in Section 7.

**Shoreside O&M Facility:** Vineyard Wind and the owners of waterfront commercial land in Vineyard Haven have entered into a Memorandum of Agreement under which we will negotiate a lease and lease option. Negotiations are expected to conclude in the Summer of 2018. Further details are provided in Section 11.

#### iv. Joint Use of Existing or Proposed Real Property Rights

The concrete duct bank housing the transmission cables will be installed in public roadways and ROWs under the control of the respective towns. This joint use with existing town infrastructure will be addressed under the Host Community Agreement and/or Grant of Location with each town. A portion of the transmission route may also share the existing utility ROW located in the towns of Barnstable and Yarmouth. Use of the bike path or railroad route alternatives would also require joint use of these properties. Vineyard Wind has not identified any reason these shared uses may conflict or impact construction schedule or project operations, and such joint uses are common practice.

**6.3.** *Provide evidence that the Eligible Facility site and/or Transmission Project route is properly zoned or permitted. If the Eligible Facility site and/or Transmission Project route is not currently zoned or permitted properly, identify present and required zoning and/or land use designations and permits and provide a permitting plan and timeline to secure the necessary approvals.*

The permitting plan and timeline is depicted in **Figure 6.3-1**. For a full description, refer to Section 7 for the overall permitting plan and Section 9 for the permitting schedule.

	2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Agency consultation and permit drafting												
Initiate state permitting												
Initiate federal permitting												
MEPA review												
NEPA review												
Complete state and local permitting												
Complete federal permitting												

Figure 6.3-1: Permitting plan and timeline.

Start Date: Q1 2017

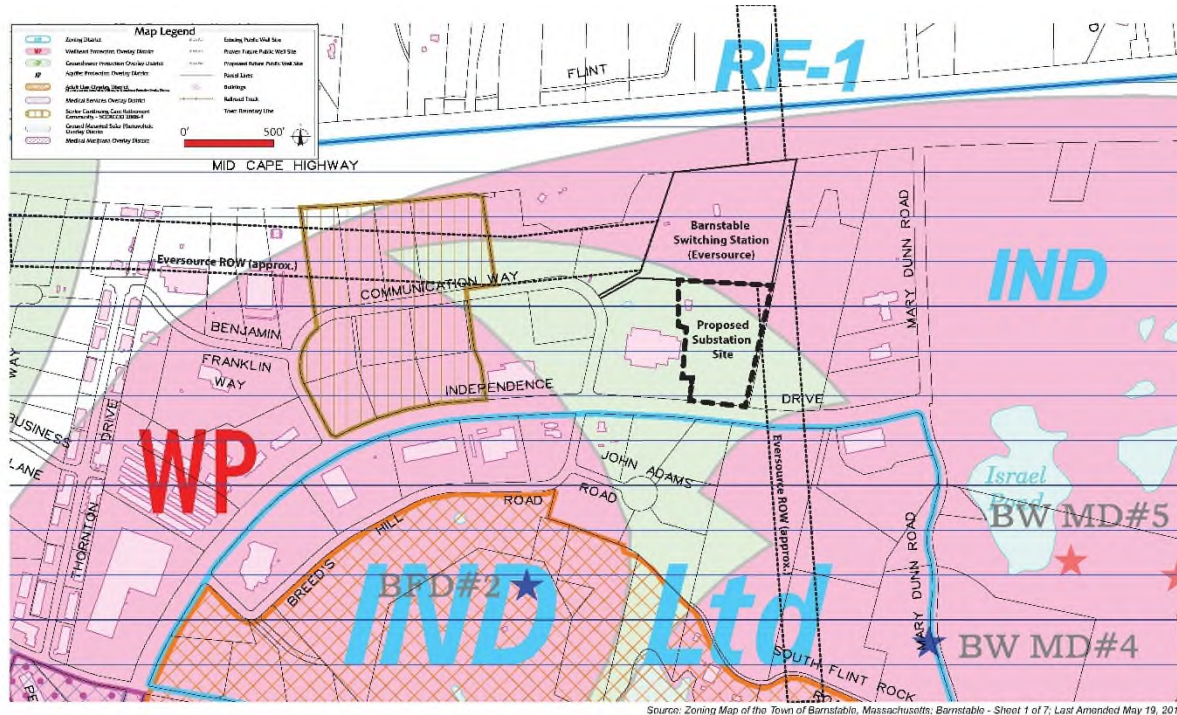
End Date: Q3 2019

*Detail the zoning and permitting issues:*

The Vineyard Wind onshore cable route and interconnection location is substantially the same, if not identical in many instances, to the route and interconnect point that had been planned for the Cape Wind project, which received all necessary zoning allowances and permits needed to construct its onshore cable and grid connection. As discussed in Section 7, we have seen positive indications of support; for example, as evidenced by our receiving a Letter of Interest from the Town of Barnstable and current ongoing negotiations with the Town of Yarmouth for a Host Community Agreement. For these reasons, Vineyard Wind is confident in its ability to obtain all necessary zoning approvals and permits necessary for the transmission facilities and grid connection equipment.

**Onshore Substation Zoning:** The substation is planned to be located on a parcel next to an existing substation, on a lot zoned for industrial use (**Figure 6.3-2**). Barnstable's zoning does not provide for substation equipment as a by-right use in industrial zones; therefore, a variance will be required. We anticipate being able to receive such a variance, given 1) that the substation location is adjacent to an existing substation; 2) because it is proposed for a lot that is already zoned for industrial use; and 3) because we have consulted with town staff about the need to locate the substation equipment in an area near or adjacent to the existing substation. In these consultations, town staff indicated issues that would be considered in issuing a zoning variance, which were: containment of fluids in the event of a leak and watershed safety, visual appearance/screening, and noise. Vineyard Wind is prepared to satisfy the town on all of these points by using a combination of design elements and available mitigation methods at the substation. These elements could include designing visual screens and vegetative buffers, building full fluids containment into the substation civil works, as included in the current project design plan, using biodegradable fluids when available, and positioning or containing sources of noise and using low-noise designs when available.





Source: Zoning Map of the Town of Barnstable, Massachusetts; Barnstable - Sheet 1 of 7; Last Amended May 19, 2016

**Figure 6.3-2: Vineyard Wind Industrial Zoned Substation Parcel.**

**Cable Route Zoning:** Proposed locations for the cable in state or local rights-of-ways will not require zoning approvals, as zoning laws do not apply to these locations; most of Vineyard Wind’s proposed cable route is in such locations. Cable or cable-landing locations on private property will likely require zoning variances.

**Permitting Substation and Cable Route:** Vineyard Wind has already submitted all state and Federal permit applications needed for the cable route and the substation, including application to the Massachusetts EFSB and necessary filings under the Massachusetts Environmental Policy Act (MEPA).

The EFSB application encompasses all Massachusetts in-state works required for the easements and permissions to interconnect the wind farm with the grid. The EFSB’s approval and certificate of public good will grant the necessary state level permissions.

Vineyard Wind’s plans are also subject to MEPA review and the company has already submitted its Environmental Notification Form (ENF), which started the MEPA process that will ultimately lead to a Final Environmental Impact Report (FEIR) certificate.

Vineyard Wind will also be subject to local permits which include Notice of Intent (NOI) to local conservation commissions, and local road opening permits from the appropriate town boards in Barnstable and Yarmouth. Because of the good relations and early, open communications between Vineyard Wind and these towns, we are confident in being able to receive these permissions per the overall development schedule.

In developing the above mentioned permit applications, Vineyard Wind identified no significant issues or potential causes for delay in issuing the necessary permits. Given the well progressed permitting effort and the lack of substantial issues of concern, and the fact that we have already applied for the permits with the longest lead before issuance, Vineyard Wind is highly confident in obtaining the permits per the development schedule.

6.4. Provide a description of the area surrounding the Eligible Facility site and/or Transmission Project route (including landfall), including a description of the local zoning, flood plain information, existing land or waterway use, and setting.

Attachment 6.1-1 shows the Eligible Facility Site, the transmission route including landfall, and existing land and waterway use, and setting.

**Existing Transmission Infrastructure in the area around the project:** Existing transmission infrastructure was assessed and considered for the routing analysis, see **Figure 6.4-1**.

**Onshore:** 345 kV transmission extends onto Cape Cod before terminating at the West Barnstable Substation, while 115 kV transmission extends past West Barnstable Substation to Barnstable Switching Station before continuing further onto the Cape.



Mid Cape Reliability Project

**Figure 6.4-1: Lower SEMA Transmission System Infrastructure.**

**Marine Infrastructure in the area around the project:** Nantucket Sound and the waters off the south shore of Cape Cod contain existing marine infrastructure including trans-Atlantic communication cables, transmission and communications cables that connect Martha's Vineyard to the mainland in Falmouth, and two transmission cables extending to Nantucket as noted in **Figure 6.4-2**. The export cable corridor to the preferred landing site in Yarmouth would cross the westernmost existing offshore cable to Nantucket. The offshore export cable corridor to the Noticed Alternative landing site at Covell Beach in Barnstable would not cross any existing offshore cables.

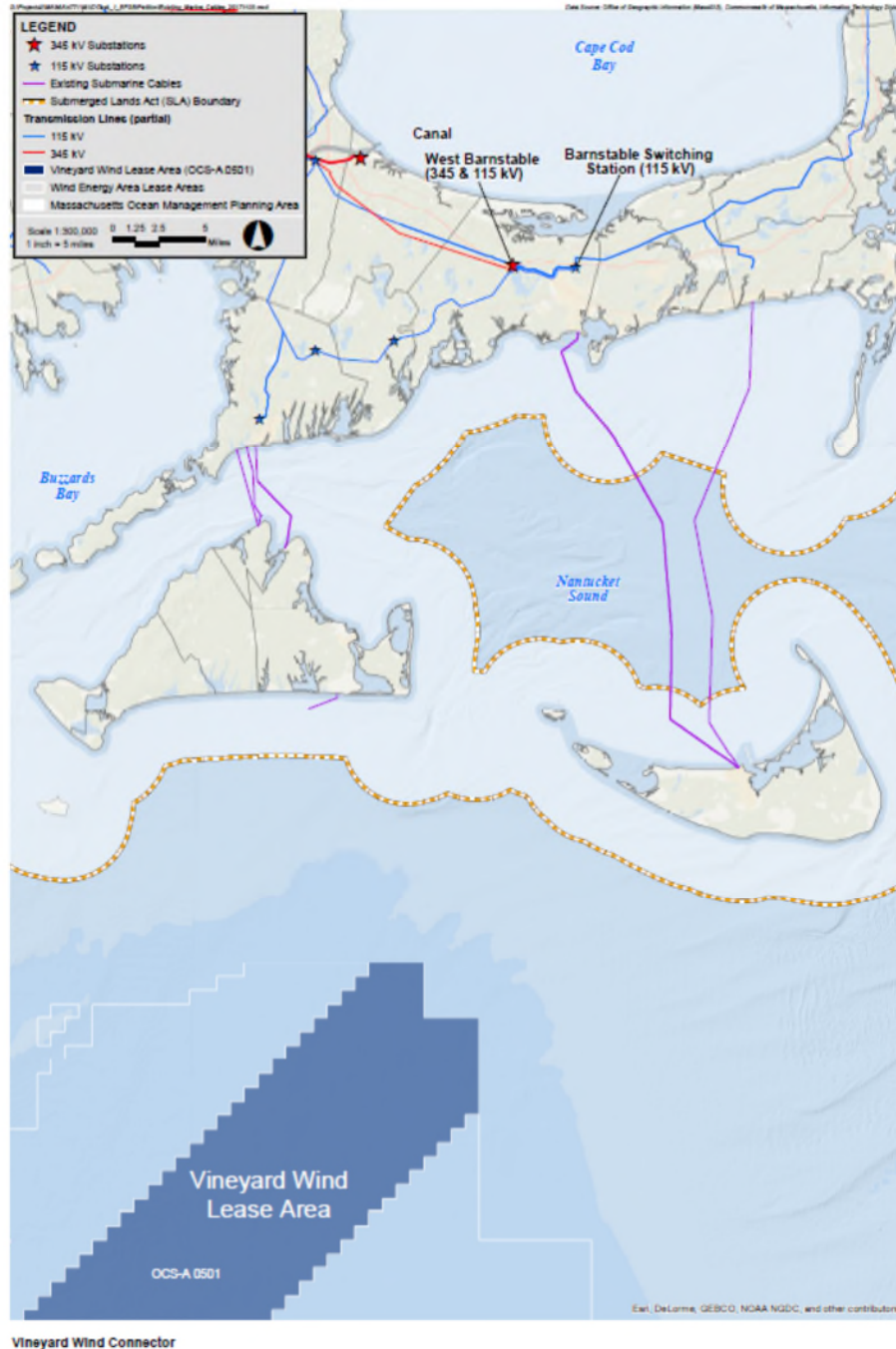


Figure 6.4-2: Existing submarine cables in Nantucket Sound.

#### Transmission Project Route (including landfall):

The preferred route passes through approximately 0.33 miles of wetland resource areas, including land subject to coastal storm flowage and riverfront area. The offshore cable landing will be accomplished either by open cut or by Horizontal Directional Drilling (HDD), which could be staged in New Hampshire Avenue and the small parking lot at Englewood Beach, thereby avoiding impacts to adjacent areas of coastal beach. However, it will require construction within land subject to coastal storm flowage at this location and elsewhere.



No aboveground structures or changes to topography are proposed within land subject to coastal storm flowage. Subsurface installation of duct bank and splicing vaults beneath the parking lot and paved road areas will have no impact to flood velocities or storage capacity and no permanent impact to land subject to coastal storm flowage is anticipated.

If the offshore cable is landed at this site using an open trench method, then additional coastal resources at the south end of New Hampshire Avenue would be temporarily impacted to allow for the trenching and installation of a cofferdam to facilitate the landing. Vineyard Wind will work with the Town of Yarmouth agencies and other stakeholders to mitigate these impacts, in coordination with mitigation measures related to the installation of submarine cable.

Further inland, the duct bank will cross over a culvert that carries the westward flow of Thornton Brook approximately 200 ft (61 m) south of the Higgins Crowell Road-Buck Island Road intersection. Thornton Brook is mapped as a perennial stream and riverfront area; therefore, it extends 200 ft (61 m) out from the culvert ends. Because the duct bank installation will be completed above the Thornton Brook culvert, there is no anticipated direct impact to inland bank or any bordering vegetated wetlands associated with this body of water. Temporary construction impacts to the riverfront area will occur within the paved road surface and not adversely affect that resource area.

The inland transmission duct bank will also cross two areas that are within land subject to coastal storm flowage. The largest of these extends inland from the New Hampshire Avenue landing site and encompasses a segment of Berry Avenue. A second smaller area is crossed at Thornton Brook. In each case, the cable will be buried beneath existing pavement and will have no impact on the flood storage capacity of the affected resource area.

**Alternative Route, Covell's Beach in Barnstable to the Barnstable Switch Station:** The Noticed Alternative Route passes through approximately 0.26 km (0.16 mi.) of wetland resource area. The Covell's Beach cable landing will be accomplished by Horizontal Directional Drilling (HDD) which will be staged in the paved parking lot, and will avoid direct impacts to adjacent areas of coastal dune and coastal beach. However, construction will directly impact a relatively small area of land subject to coastal storm flowage that encompasses the Covell's Beach parking lot and a portion of the Craigville Beach Road segment during the HDD process. This process, to take place during the winter timeframe, is anticipated to take from three to five months depending on the final drill length engineering.

No aboveground structures or changes to topography are proposed within land subject to coastal storm flowage. HDD staging within the Covell's Beach parking area and subsurface installation of duct bank and splicing vaults beneath Craigville Beach Road will have no effect on flood velocities or floodplain storage capacity, and therefore no permanent impact to land subject to coastal storm flowage is anticipated.

Both upland cable routes are characterized by residential development, much of it seasonal, in the vicinity of the shore. Inland, the land use can generally be characterized as light industrial, utility ROW, roads/highways, with some commercial development and less dense residential development.



Figure 6.4-3: Preferred and Alternative Upland Cable Routes.

6.5. *Describe how the bidder plans to gain interconnection path site control and describe the status of the plan.*

**Offshore Federal Waters:** The BOEM lease OCS-A-501 provides Vineyard Wind the mechanism to build and operate an offshore wind farm within the area identified in OCS-A-501 and to install the related necessary grid connection system within Federal waters. The approval process under the BOEM is in the form of a Construction and Operations Plan, along with submission and approval of a Facilities Design Report (FDR) and Fabrication & Installation Report (FIR). The FDR and FIR will be submitted following approval of the Construction and Operations Plan and final design of the WTG foundations and offshore substation structures.

**State Waters:** Vineyard Wind will acquire the necessary easement rights to install the offshore transmission cable within Massachusetts state waters as part of the EFSB process, as described in Section 7.

**Onshore transmission and substation locations:** Vineyard Wind has had several meetings with the Towns of Barnstable and Yarmouth to acquire the necessary permissions for the installation of the transmission line in those areas along the route that are controlled by the two towns. Vineyard Wind is seeking to enter into Host Community Agreements, as described previously in this section.

6.6. *Please provide documentation to show evidence of the interconnection request to ISO-NE, the applicable New England Transmission Owner, or any neighboring control areas, to interconnect at the Capacity Capability Interconnection Standard. Please describe the status of any planned interconnection to the grid. Additionally, any studies undertaken by ISO-NE or the bidder must be provided.*

Vineyard Wind filed an interconnection request with ISO-New England on November 11, 2016, Queue position #624 for 800MW with a Point of Interconnection (POI) at Barnstable Switch Station and

alternate locations being West Barnstable 115 kV and West Barnstable 345 kV. The service applied for was a Capacity Network Resource (CNR) Interconnection Service [REDACTED]

Vineyard Wind executed a Feasibility Study Agreement on January 21, 2017 (see Attachment 6.6-2). ISO-NE commenced the Feasibility Study analysis in September 2017. The study has been completed and is awaiting the local transmission owners cost estimates for the physical connection to the Barnstable Switch Station before ISO-NE can release the study, although release is anticipated by the end of the year.

6.7. *The studies should describe the Project's electrical system performance, its impact to the reliability of the New England Transmission system, and how the project would satisfy ISO NE's I.3.9 requirements. The studies must also provide the status of any interconnection studies already underway with ISO-NE and/or the transmission owner. Provide a copy of an interconnection agreement, if any, executed by the bidder with respect to the proposed project. If an interconnection agreement has not been executed, please provide the steps that need to be completed before an interconnection agreement can be executed and the associated timeline.*

*Performance and its impact:*

The Feasibility Study (FS) has been completed as previously mentioned and is currently in the final stages before release. It has been confirmed during recent conference calls with ISO-NE to discuss the status and results of the FS that there are no thermal or voltage violations for Vineyard Wind 1 to connect at the 115kV Barnstable Switch Station No. 958 for a project size up to 800MW.

Burns & McDonnell has studied the project per the ISO-NE Network Capability Interconnection Standards (NCIS) and Capacity Capability Interconnection Standards (CCIS) (see Attachment 6.11-1). It utilized the latest cases that were made available in support of the SEMA/RI Needs Analysis that is underway at ISO-NE. Consistent with ISO-NE study practices, the study investigated the performance of the system both with and without Vineyard Wind 1 online under a variety of case scenarios. Scenarios investigated included load levels (Peak, Light-Load, and Minimum load conditions were tested) and area generation dispatch. Results of the analysis showed that under the conditions simulated, no system upgrades (other than substation upgrades associated with the direct interconnection of the wind farm) were required to accommodate the interconnection of Vineyard Wind 1. Based on the analysis performed, there is no adverse impact to the reliability of the ISO-NE transmission system.

A generation injection of 400 MW to 800MW at the planned point of interconnect within the lower SEMA area will only enhance the reliability of the SEMA load zone. The SEMA load zone has experienced several large generation retirements; most recently, Brayton Point in Somerset MA retired removing almost 1,600 MW of coal fired generation and the Pilgrim nuclear plant has announced it will retire prior to the 2019 summer peak. ISO-NE has also identified other large generation units in the SEMA load zone that are at risk of announcing their retirement over the next five to ten years. The generation fuel sources that are retiring or anticipated to retire are coal, oil, and nuclear, thereby putting more pressure on a constrained natural gas system in the Southeastern MA region. New generation fuel diversity, specifically high capacity factor clean renewable offshore wind generation within the lower SEMA dispatch zone, will help alleviate potential price volatility in that area. Delivering qualified capacity to the SEMA/RI zone in future Forward Capacity Auctions (FCA) will lessen the likelihood of it becoming a constrained zone and separating from the other zones, due to a lack of local generation resulting in higher auction clearing prices and additional costs to rate payers.

6.8. *If multiple interconnection requests have been made, please specify all such active requests which have not been superseded by subsequent requests and information regarding the status of each. Provide copies of any requests made and studies completed.*

[REDACTED]

6.9. *Projects that do not have I.3.9 approval from ISO-NE must include technical reports or system impact studies that approximate the ISO-NE interconnection process, including but not limited to clear documentation of study technical and cost assumptions, reasoning, and justification of such assumptions. All studies must assume the project will interconnect using the Capacity Capability Interconnection Standard, must use the current ISO-NE interconnection process (including network impact scenarios from multiple projects interconnecting), and must also detail any assumptions with respect to projects ahead of the proposed project in the ISO-NE interconnection queue and any assumptions as to changes to the transmission system that differ from the current ISO-NE Regional System Plan. Please include a scenario analysis that shows how changes in the project interconnection queue could impact interconnection costs.*

Vineyard Wind's application is being studied under the Capacity Capability Interconnection Standard. Overlapping impact studies conducted by Burns & McDonnell have demonstrated that the addition of the Vineyard Wind offshore wind project for up to an 800MW nameplate does not result in any violations or trigger any additional upgrades under the overlapping impact criteria. The studies were conducted using the assumptions from the latest ISO-NE needs analysis. The qualified capacity used in the overlapping impact study is based on the requirements stipulated in Market Rule 1, Section III.13 for an intermittent resource. See also Section 6.7.

Based on the studies completed, Vineyard Wind does not anticipate any impact to the interconnection costs because of projects ahead in the queue, as all prior queue positions have already been considered in the base cases used by ISO-NE. As a result of not requiring any system reinforcements based on the Steady State and Stability analysis by Burns & McDonnell and the Feasibility Study conducted by ISO-NE, there are no additional interconnections costs beyond those considered in our proposal for the project infrastructure necessary for the physical interconnection of the wind farm to the transmission system.

See Attachment 6.11- 1 for the Burns & McDonnell report

6.10. *To the extent that you provide an alternative interconnection scenario based on ISO-proposed interconnection process changes, you must also include studies using the proposed ISO-NE-proposed process. Any such studies must be accompanied with clear documentation of study technical and cost assumptions, reasoning, and justification of such assumptions.*

We are not providing an alternative interconnection scenario. Regardless, we would not anticipate any adverse impacts should an alternative scenario be contemplated due to any future proposed changes in the interconnection study processes.

Vineyard Wind's plan was studied per the ISO-NE Network Capability Interconnection Standards (NCIS) and Capacity Capability Interconnection Standards (CCIS). It utilized the latest cases that were made available in support of the SEMA/RI Needs Analysis that is underway at ISO-NE. Consistent with ISO-NE study practices, the study investigated the performance of the system both with and without the project online under a variety of case scenarios. Scenarios investigated included load levels (Peak, Light-Load, and Minimum load conditions were tested) and area generation dispatch. Results of the analysis showed that, under the conditions simulated, no system upgrades (other than substation upgrades



associated with the direct interconnection of the wind farm) were required to accommodate the interconnection of the project. Based on the analysis performed, there is no adverse impact to the reliability of the ISO-NE transmission system.

**6.11. Provide the electrical models of all energy resources supporting the proposed project in accordance with the filing requirements of the ISO-NE Tariff Schedule 22 and 23.**

*Electrical models attached: ☒ If none, please explain:*


The electric models used in the analysis are provided as Attachment 6.11-1. System models were developed using the offshore wind delivery system information available and include some generic assumptions for wind turbine performance and response. Assumptions were based on other wind turbine units that use similar generic models. Since it would be premature at this phase to commit to a wind turbine manufacturer, specific PSSE and PSCAD models were not available. We feel this approach was conservative and would expect that models provided by the manufacturers utilizing the most recent converter designs would perform better than those demonstrated in the generic PSSE models.

ISO-NE has completed the Feasibility Study, but is waiting for required information from the local transmission owner before it can release, as previously stated. ISO has informed Vineyard Wind that the results demonstrate that the project will not result in any thermal or voltage violations for a generation injection at the POI for up to 800MWs.

**6.12. Provide a copy of an electrical one-line diagram showing the interconnection facilities and the relevant facilities of the transmission and/or distribution provider.**

*Electrical one-line diagram attached: ☒ If none, please explain:*

Please see **Figure 6.12-1**.

Please refer to the Transmission provider and Project one-line diagram 

Please refer to the Vineyard Wind one-line diagram Attachment 6.13-1.

The 115kV Barnstable Switch Station (No. 958) currently has two spare bays available for breakers. This significantly reduces the amount of work required by the transmission owner for the interconnection of the Vineyard Wind project. There are no bus extensions or substation reconfigurations necessary for this interconnection, only installation of the 115kV breakers and associated relaying. This, coupled with the fact that the project will not require any network reinforcements, streamlines the physical interconnection not requiring any lengthy system outages in the area.

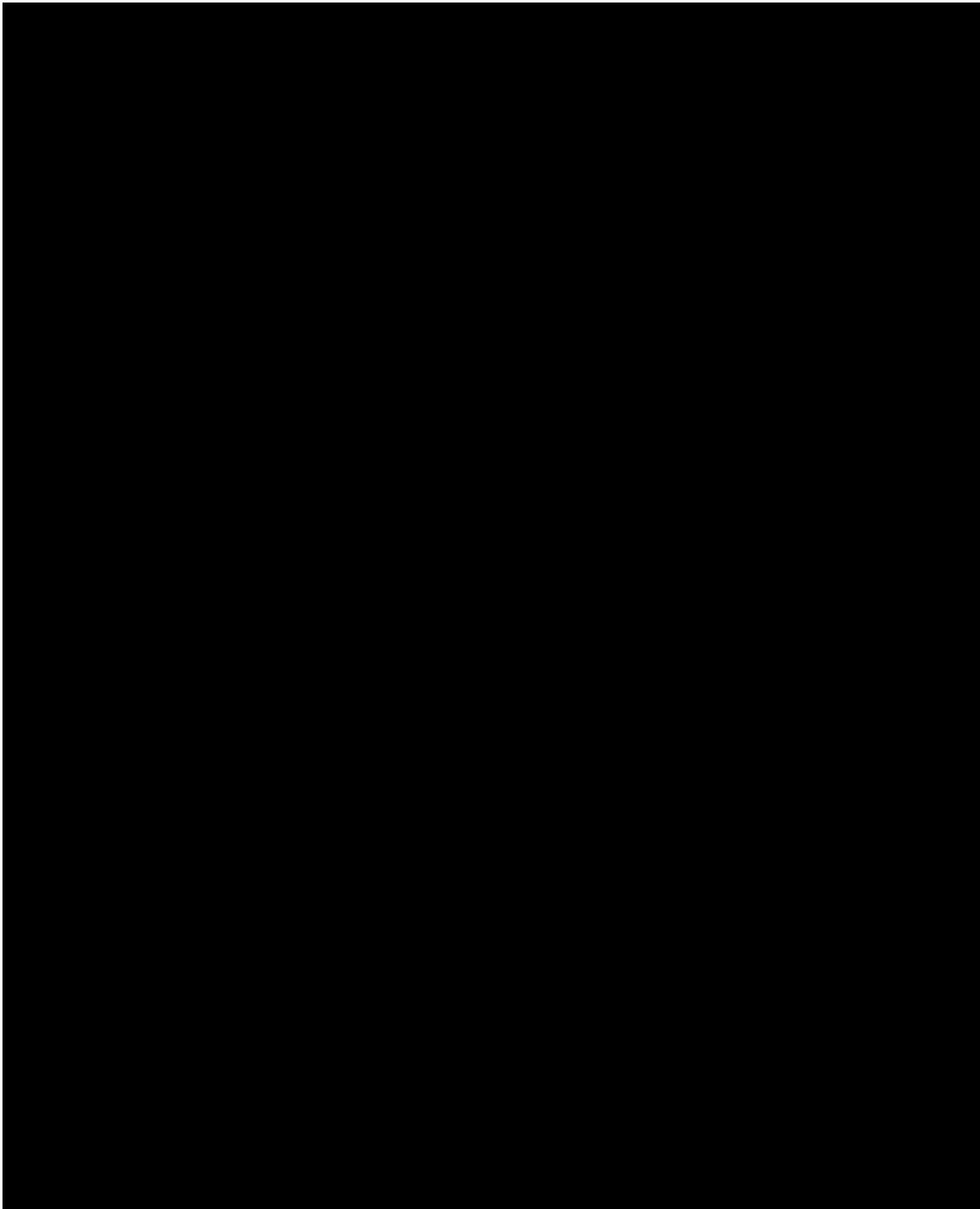


Figure 6.12-1

6.13. *Specify and describe the current or new interconnection facilities (lines, transformers, switching equipment, system control protection, etc.) that bidder owns or is intending to construct or have constructed in order to deliver the proposed energy.*

The proposed 400MW interconnection facilities (**Figures 6.13-1** and **6.13-2**) that Vineyard Wind intends to construct consist of the following (Attachment 6.13-1 and 6.13-2):

[REDACTED] The inter-array collector system will operate at 66 kVac and connect to the offshore substation, where it will be stepped up to 220 kVac by two (2) 225 MVA GSUs connected to individual buses. Each bus will have a 180 MVAR switchable reactor. There is a tie breaker between the offshore substation busses for redundancy/ reliability. Two (2) equally sized offshore cable circuits will carry the power from the offshore substation at 220 kV to Lewis Bay in the Town of Yarmouth, with an alternative landing point at Covell's Beach in Barnstable. At that point, the two (2) 3-core offshore submarine cables will transition to individual phase single core conductors (total 6 onshore) installed in a concrete encased duct bank. The duct bank will transit in public roadways and off-road ROWs for approximately 5.8 miles (primary) to 6.8 miles (alternate) to 40 Communication Way in Barnstable MA (Attachment 6.13-2), where Vineyard Wind will construct an onshore substation. The route will require an estimated 18-20 splice vaults spaced 1800 ft (549 m) to 2500 ft (762 m) apart. Actual vault number and locations will be confirmed during final engineering based on cable pulling tension limitations. The onshore substation parcel is adjacent to the Eversource 115kV Barnstable Switch Station (No. 958).

Vineyard Winds' onshore infrastructure will consist of breakers, two (2) 30-60 MVAR reactors for line compensation, two (2) 115/220/33, 225 MVA transformers, two (2) sets of 33 kV- 50MVAR switched shunts, one (1) 100 MVAR harmonic filter, and an offsetting reactor. An alternative to the switched shunts could be a  $\pm 110$  MVAR Statcom or SVC. The onshore substation will also house the control/protection building where the protective relays and associated SCADA system equipment will reside. Final engineering based on ISO-NE study results will determine the specific equipment to be installed.

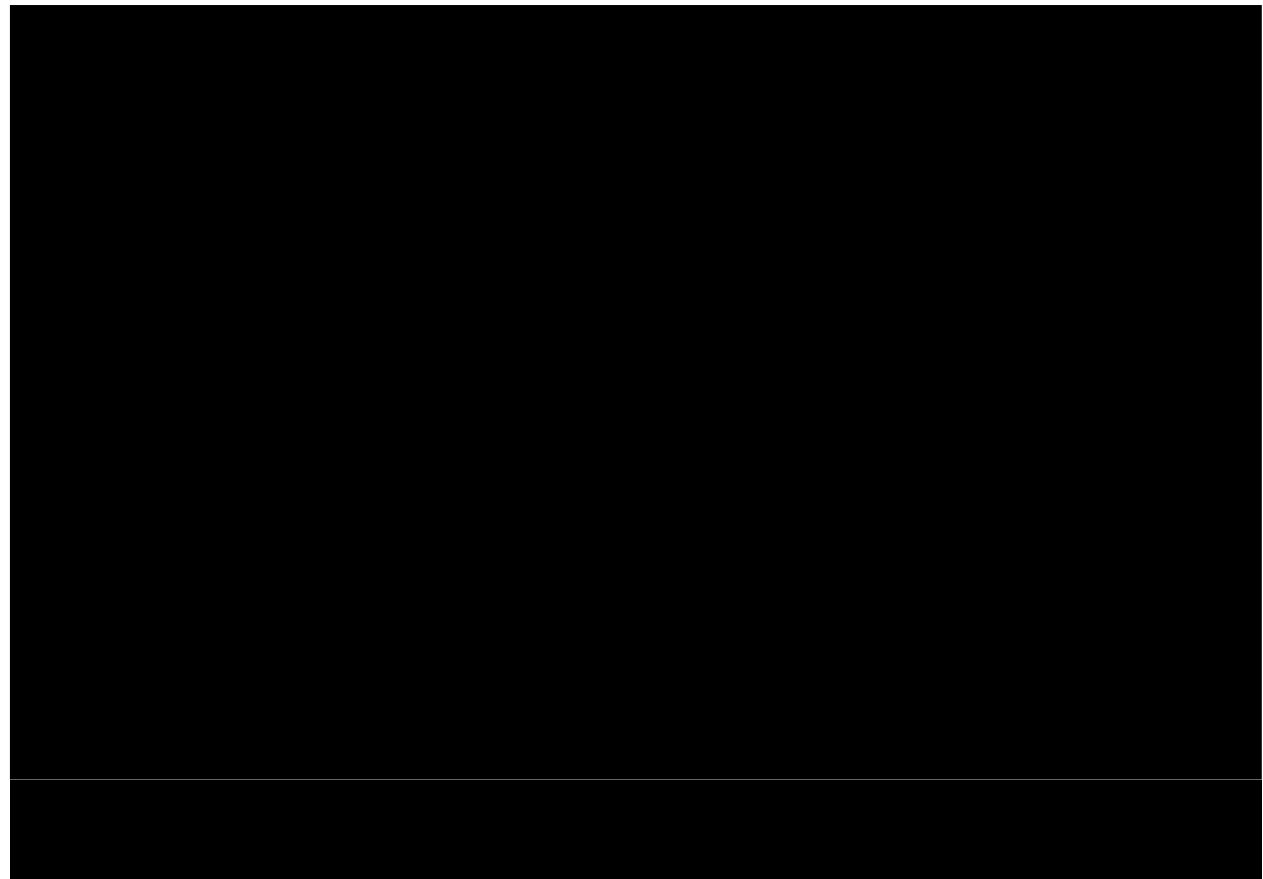


Figure 6.13-1: [REDACTED]

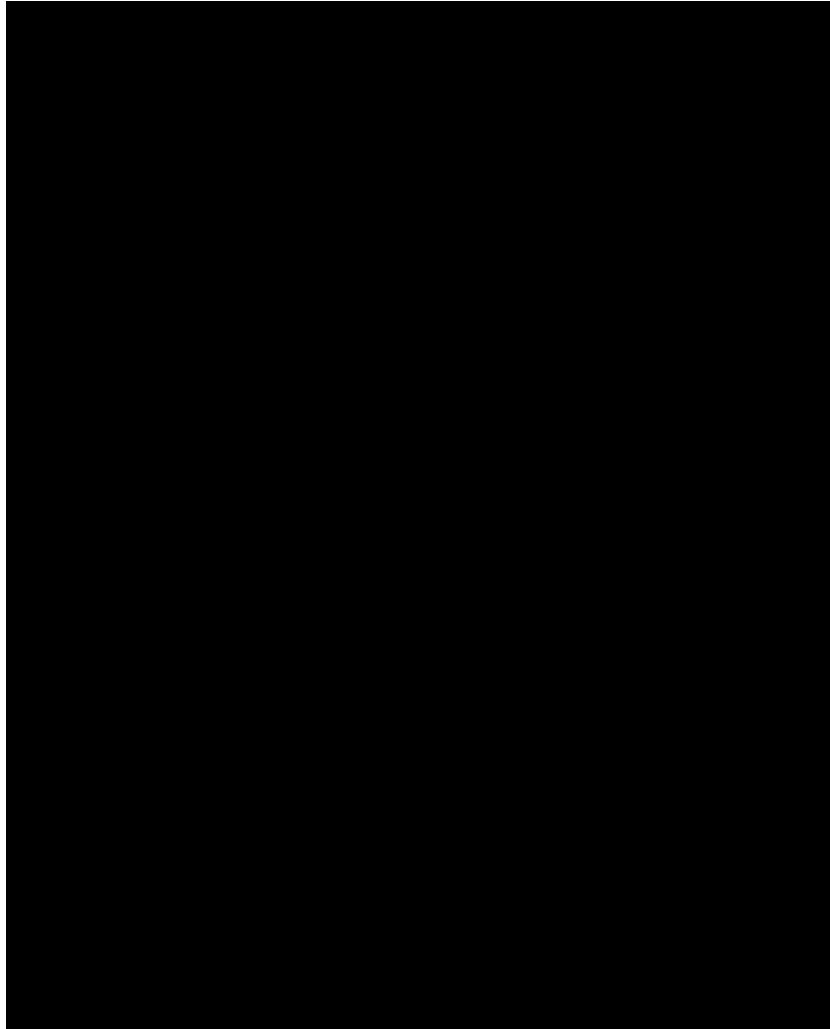


Figure 6.13-2

*6.14. Incremental data requirements for Projects that include Transmission facilities;*

*1. IDV file(s) in PSSE v32 format modeling only the new/modified Transmission components of the project. ☐ If none, please explain:*

Burns & McDonnell has used PSSE v33 format, but can provide the modeling in v32 if necessary. The PSSE model is provided in text format within the report and model files can be provided in electronic format upon request (Attachment 6.11-1).

*2. If the Bidder does not use PSSE, provide in text format necessary modeling data as follows:*

Not Applicable

*6.15. Please detail with supporting information and studies (as available) that the energy contemplated in your proposal is able to be delivered to the Distribution Companies without material constraint or curtailment.*

Vineyard Wind's proposed project was studied per the ISO-NE Network Capability Interconnection Standards (NCIS) and Capacity Capability Interconnection Standards (CCIS). It utilized the latest cases that were made available in support of the SEMA/RI Needs Analysis that is underway at ISO-NE. Consistent with ISO-NE study practices, the study investigated the performance of the system both with and without the project online under a variety of case scenarios. Scenarios investigated included load levels (Peak, Light-Load, and Minimum load conditions were tested) and area generation dispatch. Results of the analysis showed that under the conditions simulated, no system upgrades (other than substation upgrades associated with the direct interconnection of the wind farm) were required to accommodate the interconnection of the project. Based on the analysis performed, there is no adverse impact to the reliability of the ISO-NE transmission system.

In addition to the above, the project was studied with the new NCIS light load performance evaluation requirements being proposed by ISO-NE to insure projects can deliver their output in system light load scenarios under normal system conditions. This gives Vineyard Wind great confidence that constraints and curtailment will not be an issue.

See Burns & McDonnell study report [REDACTED].

Given these findings, the energy from Vineyard Wind 1 will be delivered to the Distribution Companies without material constraint or curtailment.

*6.16. Please provide sufficient information and documentation to demonstrate that the proposed point of delivery into ISO-NE, along with their proposed interconnection and transmission upgrades including any transmission upgrades beyond the point of interconnection, is sufficient to ensure full delivery of the proposal's Offshore Wind Energy Generation profile.*

See Burns & McDonnell study report including the Overlapping Impact analysis, Attachment 6.11-1.

Full delivery has been confirmed by the associated studies. The studies were conducted under the ISO-NE interconnection NCIS and Capacity Capability Interconnection Standard (CCIS) and further considered the future light load performance evaluation for reliable operation at full load under the light load conditions requirement currently being proposed by ISO-NE. The studies determined the project does not introduce any adverse impacts to the transmission system for the interconnection of up to 800MWs. The study also indicates there are no transmission reinforcements necessary for the interconnection for up to 800MW. Barnstable Switch Station (No. 958) also has two additional breaker bays that have been previously built out, so only the addition of the actual breakers are required and no additional bus work is required. The preliminary overlapping impact analysis conducted by Burns & McDonnell has also indicated there are no transmission upgrades necessary.

**Section 7 OF APPENDIX B TO THE RFP  
ENVIRONMENTAL ASSESSMENT, PERMIT ACQUISITION PLAN AND NEW  
CLASS I RPS CERTIFICATION**

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**7.1.** *Provide a list of all the permits, licenses, and environmental assessments and/or environmental impact statements required to construct and operate the project. Along with this list, identify the governmental agencies that are responsible for issuing approval of all the permits, licenses, and environmental assessments and/or environmental impact statements. If a bidder has secured any permit or has applied for a permit, please indicate this in the response.*

Vineyard Wind 1 has already submitted applications for major permits needed for construction of this project:

- The Construction and Operations Plan (COP) has been submitted to the US Bureau of Ocean Energy Management (BOEM).
- A petition has been filed at the Massachusetts Energy Facilities Siting Board for installation of the grid connection cable and onshore substation.
- An Environmental Notification Form (ENF) has been filed with the Massachusetts Environmental Policy Act (MEPA) office, kicking off the state environmental review.

With these key permit applications now having already been completed, Vineyard Wind is well on track to receive the full and final permits necessary for the start of site construction in 2019.

The Vineyard Wind permitting team is comprised of leaders in offshore wind permitting globally, Federal permitting in the US, and permitting in Massachusetts; the team is led by the previous permitting manager for the only US Federal waters offshore wind project to receive its full permits. Federal, state, and local permitting requirements are well understood and familiar to the permitting team. Vineyard Wind 1 is comprised of several major elements that determine the scope of Federal, state, and local permitting requirements: The offshore components beyond the Commonwealth's territorial waters (beyond 3 nautical miles or 5.6 km seaward of the low water mark of the shore) are exclusively within Federal jurisdiction and include the wind turbine generator (WTG) array, the 66 kV inter-array cabling, the offshore electrical service platforms (i.e., substations), and the 220 kV export offshore cables, which run from the offshore electrical service platforms to the 3-nautical mile limit. The landside elements that are subject to state permitting requirements include the 220 kV offshore export cables within the 3-nautical mile limit, the 220 kV landside underground transmission cables, the 220/115 kV substation, and the grid interconnection. Local and regional permits and reviews are required for the onshore underground cables and onshore substation, including but not limited to permits from town conservation commissions.

Vineyard Wind has filed for permits to build an 800MW offshore wind project in Lease Area OCS-A-0501. The 800MW permitting will allow for buildout in one construction cycle or in stages. Therefore, the permitting plans described here, while referencing an 800MW project, are applicable regardless of any commercial scenarios for build-out of the full 800MW that will be permitted.

**Federal Permits and Approvals**

As described in more detail below, the principal Federal authorizations and permits required to construct and operate Vineyard Wind 1 include:



- The Bureau of Ocean Energy Management (BOEM), Office of Renewable Energy Programs' approval of Vineyard Wind's Site Assessment Plan (SAP)<sup>5</sup> and Construction and Operations Plan (COP);
- A permit to construct structures in navigable waters under Section 10 of the Rivers and Harbors Act of 1899, issued by the US Army Corps of Engineers (ACOE);
- A Clean Water Act, Section 404 permit to discharge dredge or fill into waters of the United States, issued by the ACOE;
- A Clean Air Act, Outer Continental Shelf permit for emissions from vessels and equipment used during construction and operation of the project, issued by the US Environmental Protection Agency (EPA);
- An Incidental Harassment Authorization or Letter of Authorization under the Marine Mammal Protection Act (MMPA) for construction-related noise associated with pile driving, issued by the US National Marine Fisheries Service (NMFS);
- US Coast Guard issuance of Private Aids to Navigation (PATONS); and
- Federal Aviation Administration (FAA) determinations of no hazard, for any structures within FAA jurisdiction (including construction).

Other required permits that do not involve environmental or other reviews before issuance include:

- A National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater; and
- A Notification for Notice to Mariners and information to be shared with the National Ocean Survey for updates to nautical charts (for the portion in navigable waters).

#### **Bureau of Ocean Energy Management (BOEM)**

BOEM has jurisdiction under the Outer Continental Shelf Lands Act to issue leases, easements, and rights-of-ways for the development of renewable energy on the Outer Continental Shelf (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 Site Assessment Plan (SAP) and a Construction and Operations Plan (COP). A SAP describes the initial activities to characterize a lease site (e.g., installation of meteorological towers and meteorological buoys). Vineyard Wind submitted its SAP for the installation and maintenance of up to two meteorological and/or oceanographic buoys on March 31, 2017. Vineyard Wind's SAP was deemed sufficient and complete on November 21, 2017. In addition, Vineyard Wind received multiple approvals from BOEM to conduct geophysical and geotechnical survey work to characterize site conditions. These surveys were conducted in fall 2016 and late summer/early fall 2017.

Vineyard Wind submitted its Construction and Operations Plan to BOEM on December 19<sup>th</sup>, 2017. In approving the Construction and Operations Plan, 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 Clean Air Act (CAA), and the Endangered Species Act (ESA). Thus, BOEM coordinates and consults with numerous other Federal agencies, including the National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), the Environmental Protection Agency (EPA), and the United States Coast Guard (USGC) during the review process. BOEM also

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<sup>5</sup> An approved SAP is required for the installation of meteorological and/or oceanographic monitoring systems within the lease area. SAP approval is not required prior to Construction and Operations Plan submittal or Construction and Operations Plan approval. The Vineyard Wind SAP is currently under review by BOEM and has been deemed complete and sufficient.

coordinates with the state under the Coastal Zone Management Act (CZMA) to ensure that the project is consistent with the state's coastal zone management.

For more than 12 months, Vineyard Wind has been actively engaged with BOEM on the development of its COP. This has included numerous meetings and conference calls with BOEM to discuss the required technical and environmental information to ensure that the Construction and Operations Plan is comprehensive and complete. Vineyard Wind has similarly met with and had multiple discussions with the Federal agencies with whom BOEM will coordinate and consult through the NEPA process to identify and address any issues of potential impacts of concern. As a result of this extensive engagement, Vineyard Wind has received reasonable assurances that existing information and data collected to support the Construction and Operations Plan review are sufficient to meet the regulatory requirements. In addition, BOEM has already selected and is in the process of contracting a third party consultant to produce the Environmental Impact Statement (EIS).

#### **Army Corps of Engineers (ACOE)**

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 WTGs and the ESP, the installation of the offshore cable systems, and the cable landfall structures.

Section 404 of the Clean Water Act prohibits discharges of dredge or fill material into waters of the United States, which extends three nautical miles from shore. A Section 404 Clean Water Act permit, from the ACOE, is needed because construction will involve dredging and potentially backfilling portions of the seabed associated with the installation of the offshore transmission cable.

Like BOEM, the ACOE must comply with its obligations under NEPA, the NHPA, the MSFCMA, the MBTA, and the ESA. However, to avoid duplication of effort, the Army Corps will be a cooperating agency with BOEM through the NEPA process.

#### **Environmental Protection Agency (EPA)**

A Clean Air Act permit from the EPA is required for emissions from vessels and equipment used during construction and operation of Vineyard Wind 1 on the OCS. OCS sources subject to the permit include any equipment or activity that has the potential to emit any air pollutant. A vessel itself is not considered an OCS source unless it attaches to the seabed, but vessel emissions associated with an OCS source are included in the permit. The EPA will coordinate with BOEM to satisfy its obligations under the ESA and other relevant statutes.

Vineyard Wind has coordinated with EPA on its submission of an OCS permit application. Vineyard Wind submitted its Notice of Intent in December 2017, which begins the OCS permitting process.

#### **National Marine Fisheries Service**

An Incidental Harassment Authorization (IHA) or Letter of Authorization (LOA) under the Marine Mammal Protection Act (MMPA) is necessary for construction, principally because of the potential noise impacts to marine mammals associated with pile driving during construction. Under the MMPA, the noise levels associated with construction have the potential to "harass" marine mammals and, therefore, an authorization is required. In addition, consultations with NMFS under the MMPA are ongoing regarding pre-construction geophysical and geotechnical surveys. See Table 7.1-1 for more details.

Vineyard Wind is currently consulting with NMFS to decide on the appropriate permitting approach (IHA or LOA) for construction. The agreed application will be submitted in time to receive authorization prior to the commencement of construction.

#### **Federal Aviation Administration (FAA)**

The FAA requires a public notice of the proposed construction of a structure that exceeds 200 feet above ground level or which may be within certain distances of airports. The FAA reviews the proposed structure to determine whether it would obstruct navigable airspace or interfere with air navigation. The FAA's determinations are advisory. The FAA has jurisdiction to review structures within US territorial seas (12 nautical miles from the low water line), including wind turbines within that distance, as well as temporary construction structures. While not confirmed, it is possible that several of the project's WTGs may require determinations of no hazard from the FAA.

### **State Permits and Approvals**

At the state level, those portions Vineyard Wind 1 which are in Massachusetts waters, as well as the landside elements, are subject to two primary review processes:

- a broad adjudicatory review by the Energy Facilities Siting Board (EFSB), which can incorporate a request for local zoning relief (DPU, Section 40A); and
- an environmental review under the Massachusetts Environmental Policy Act (MEPA).

**Energy Facilities Siting Board:** The EFSB reviews proposals to construct certain energy facilities, including large power plants, electric transmission lines, and natural gas pipelines. Pursuant to G.L. Chapter 164, Section 69J no applicant shall commence construction of a "facility" unless a petition for approval of construction has been granted by the EFSB. Pursuant to G.L. Chapter 164, § 69G, a jurisdictional "facility" includes "a new electric transmission line having a design rating of 69 kilovolts or more and which is one mile or more in length on a new transmission corridor." The EFSB can also grant a Certificate of Environmental Impact and Public Interest (approval under G.L. c. 164, §§ 69K-69O), which has the effect of granting other state, regional, or local permits.

Vineyard Wind submitted its petition to construct the transmission line (export cable) for Vineyard Wind 1 on December 18, 2017. For the purpose of these state filings, the elements of the transmission project under state jurisdiction are called the Vineyard Wind Connector.

**Massachusetts Environmental Policy Act:** The Massachusetts Environmental Policy Act (MEPA) jurisdiction is triggered when an entity undertakes certain activities in the Commonwealth of Massachusetts that require one or more state permits. The scope of an environmental impact report (EIR) is limited to those aspects of Vineyard Wind 1 within the subject matter of any required state permits that are likely, directly or indirectly, to cause damage to the environment.

For Vineyard Wind, MEPA jurisdiction applies to only those portions of Vineyard Wind 1 located within Massachusetts, including its territorial waters (within 3 nautical miles (5.6 km) seaward of the low water mark of the shore). Therefore, those components subject to MEPA review are the upland and offshore cable system out to the mapped 3-nautical mile (5.6 km) state territorial sea boundary.

Vineyard Wind filed its environmental notification form (ENF) with the MEPA office on December 15, 2017.

**Other State, Regional, and Local Permits:** In addition, elements of Vineyard Wind 1 under the jurisdiction of the State of Massachusetts will require review and/or permits from the Massachusetts Department of Environmental Protection (MADEP), Massachusetts Department of Transportation (MassDOT), and Massachusetts Coastal Zone Management (MCZM). Consultations with the MA Natural Heritage and Endangered Species Program (NHESP), the Massachusetts Historic Commission (MHC), the Massachusetts Board of Underwater Archaeological Resources (MBUAR), and the appropriate Tribal Historic Preservation Offices will be conducted as part of the MEPA review. Vineyard Wind received provisional, updated, and final permits to conduct underwater archaeological investigations from MBUAR on May 23, 2017, August 3, 2017, and October 2, 2017, respectively. In addition, Vineyard Wind filed an application to conduct an upland archaeology reconnaissance survey with the MHC on November 14, 2017.

Elements of Vineyard Wind 1 within Barnstable County (i.e., Cape Cod) will undergo a regional level review by the Cape Cod Commission (CCC). The CCC has jurisdiction to review and approve any Development of Regional Impact (DRI) which is defined as: “a development which, because of its magnitude or the magnitude of its impact on the natural or built environment, is likely to present development issues significant to or affecting more than one municipality [in Barnstable County] . . .” Cape Cod Commission Enabling Regulations, Chapter A, § 1(c). Because these elements are subject to EFSB review, the CCC will conduct the DRI review under their adjudicatory review process. It is possible that the CCC jurisdictional elements of the project will qualify for a Limited DRI review.

Portions of the offshore cable routes being considered are within the waters of the Town of Edgartown on Martha’s Vineyard. As a result, it is possible that this element of Vineyard Wind 1 would undergo review by the Martha’s Vineyard Commission, a regional review entity for Dukes County (i.e., the island of Martha’s Vineyard).

On a local level, the cable landing area and the landside underground cables will require a road opening permit(s)/grant(s) of location, as well as a permit(s) from the appropriate Town Conservation Commission. The substation will require some Town level review as well (zoning, building permit, etc.). Some elements are proposed to be constructed within the towns of Yarmouth and Barnstable; Vineyard Wind has initiated consultations and discussions with both of these towns.

**Table 7.1-1** below lists the expected Federal, Massachusetts, regional (county), and local level reviews and permits required for the Vineyard Wind Project.

**Table 7.1-1: Environmental Permits for the Project.**

Agency/Regulatory Authority	Permit/Approval	Status
<b>Federal</b>		
Bureau of Ocean Energy Management (BOEM)	Site Assessment Plan (SAP) approval	SAP filed March 31 <sup>st</sup> 2017, deemed complete and sufficient November 21, 2017
	Construction and Operations Plan (COP) approval	Construction and Operations Plan filed with BOEM December 19, 2017
U.S. Environmental Protection Agency (EPA)	National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Activities	To be filed (TBF)
	Outer Continental Shelf Air Permit	Notice of Intent (NOI) to apply for an air permit filed on December 11, 2017
U.S. Army Corps of Engineers (USACE)	Individual Clean Water Act Section 404 Rivers and Harbors Act of 1899 Section 10 Permit	TBF
U.S. National Marine Fisheries Service	Incidental Harassment Authorization (IHA) or Letter of Authorization (LOA)	IHA application for operation of vessels submitted on November 8, 2017. Updated Geophysical concurrence for no IHA submitted on November 27, 2017. Previous concurrence received March 9, 2017.
U.S. Coast Guard	Private Aids to Navigation authorization	TBF
Federal Aviation Administration	No Hazard Determination (if needed)	TBF
<b>State/Massachusetts (for portions of the Vineyard Wind 1 within state jurisdiction)</b>		
Massachusetts Environmental Policy Act Office	Certificate of Secretary of Energy and Environmental Affairs on Final Environmental Impact Report	Environmental notification for (ENF) filed on December 15, 2017
Energy Facilities Siting Board	G.L. c. 164, § 69 Approval	Petition filed December 18, 2017
Massachusetts Department of Public Utilities	G.L. c. 164, § 72, Approval to Construct G.L. c. 40A, § 3 Zoning Exemption (if needed)	TBF

Agency/Regulatory Authority	Permit/Approval	Status
Massachusetts Department of Environmental Protection	Chapter 91 Waterways License; Water Quality Certification (Section 401 of the Clean Water Act)	To be filed in accordance with state permitting order
Massachusetts Department of Transportation	Road Crossing Permits Rail Division Use and Occupancy License	To be filed in accordance with state permitting order
Massachusetts Board of Underwater Archaeological Resources (MBUAR)	Special Use Permit	Provisional permit issued May 23, 2017, final permit issued September 28, 2017
Natural Heritage and Endangered Species Program (NHESP)	Conservation and Management Permit (if needed)	TBF (if needed)
Massachusetts Historical Commission (MHC)	Field Investigation Permits (980 C.M.R. § 70.00)	Reconnaissance survey application filed November 14, 2017
<b>Regional (for portions of the Vineyard Wind 1 within regional jurisdiction)</b>		
Cape Cod Commission (Barnstable County)	Development of Regional Impact (DRI) Review	To be filed in accordance with state permitting order
<b>Local (for portions of the Vineyard Wind 1 within local jurisdiction)</b>		
Yarmouth and Barnstable Conservation Commissions	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non zoning bylaws)	To be filed in accordance with state permitting order
Yarmouth DPW and/or Board of Selectmen	Street Opening Permits/Grants of Location	To be filed in accordance with state permitting order
Barnstable DPW and/or Town Council	Street Opening Permits/Grants of Location	To be filed in accordance with state permitting order
Barnstable Planning/Zoning	Zoning approvals as necessary	To be filed in accordance with state permitting order
Edgartown, Nantucket, and/or Mashpee Conservation Commissions	Order of Conditions (Massachusetts Wetlands Protection Act and municipal wetland non zoning bylaws) (if needed as dictated by final submarine route)	To be filed in accordance with state permitting order

**7.2.** *Provide the anticipated timeline for seeking and receiving the required permits, licenses, and environmental assessments and/or environmental impact statements. Include a project approval assessment which describes, in narrative form, each segment of the process, the required permit or approval, the status of the request or application and the basis for projection of success by the milestone date. All requirements should be included on the project schedule in Section 10.*

A full list of necessary Federal, Massachusetts, regional, and local reviews and permits, together with an explanatory discussion is provided in response to Question 7.1. The Vineyard Wind team has been hard at work for the past 18 months on field surveys, planning, design, environmental studies, and documentation. This intensive effort, together with a very active agency and stakeholder consultation effort, has allowed Vineyard Wind to complete and file its Federal (BOEM COP) and state (Massachusetts EFSB Petition, MEPA ENF) applications in advance of the December 20 RFP response date. It is expected that the Federal and state environmental reviews and subsequent Federal, Massachusetts, regional and local permitting will be complete by Q2 of 2019.

Vineyard Wind has filed for permits to build an 800MW offshore wind project in Lease Area OCS-A-0501. The 800MW permitting will allow for buildout in one construction cycle or in stages. Therefore, these permits will accommodate build out of the full 800MW regardless of commercial scenarios that lead to the full build-out. The Federal and Massachusetts/local permitting processes will be complete by mid-2019 (Q2) and will, therefore, support start of site construction in 2019. The schedule is described in



more detail below. A brief overview of the timeline is shown in **Figure 7.2-1**, and all permit requirements are included in the project schedule provided in Section 10.

	2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Agency consultation and permit drafting												
Initiate State permitting												
Initiate Federal permitting												
MEPA review												
NEPA review												
Complete State and Local permitting												
Complete Federal permitting												

**Figure 7.2-1: Overview of permitting timelines.**

Vineyard Wind conducted geophysical, geotechnical, biological, and archaeological surveys of the lease area and potential export cable corridors in 2016 and 2017, respectively.<sup>6</sup> In addition to collecting additional site data, Vineyard Wind conducted a thorough review of the available baseline data to support the permitting reviews. The available data on potential impact areas (e.g., marine mammals, birds, etc.) were examined and a study plan for each was provided to BOEM and the resource agencies. These study plans discussed all the existing data for each resource area and facilitated a comprehensive discussion on available baseline data that lead to broad agreement that the area was well understood from a baseline perspective and the existing data could support a NEPA review.<sup>7</sup> In addition to agency consultation, Vineyard Wind met with non-governmental stakeholders to review the exhaustive data sets, including local and national environmental groups.

Vineyard Wind is also planning to conduct additional pre, during, and post construction surveys in several resource areas including, but not limited to, fisheries and benthic habitat. Vineyard Wind is working with the New Bedford based UMass School for Marine Sciences and Technology (SMASST) to design pre/during/post construction surveys of the project. Input, prior to the start of the survey, regarding specific species or other information is welcomed and encouraged from fisheries, state and Federal agencies, and scientists and active outreach will be part of designing the study.

### Federal Permitting Timelines

**BOEM:** As discussed in Question 7.1, BOEM will conduct technical and environmental reviews of Vineyard Wind's COP, all of which will be coordinated through BOEM's NEPA process. Under Department of Interior Secretarial Order 3355, a Final Environmental Impact Statement (EIS) must be completed within one year of the issuance of the Notice of Intent (NOI) to prepare an EIS. It is expected that BOEM will issue a NOI in Q1 of 2018. Thus, the Final EIS and associated consultations and reviews, e.g., NHPA, ESA, CAA, MBTA, etc., are expected to be complete in Q1 of 2019. A decision on the Construction and Operations Plan is expected Q2 of 2019. In anticipation of receipt of the Construction and Operations Plan, BOEM has already selected and is in the process of contracting a third party consultant to produce the Environmental Impact Statement (EIS) for the Project.

<sup>6</sup> Vineyard Wind conducted over 1,300km of geophysical survey (including side scan sonar and bathymetry), over 20 deep geotechnical explorations, 57 vibracores, 66 benthic grab samples and 72 video transects during the 2016 and 2017 surveys.

<sup>7</sup> One exception to this agreement was that habitat and fisheries data along the cable corridors was not available at the time of these discussions with BOEM and NMFS. Surveys, including benthic grabs and video surveys, have since been conducted along the cable routes and have been supplied in the COP.



**Army Corps of Engineers:** The Army Corps of Engineers will coordinate its reviews of Vineyard Wind's Section 10 and Section 404 permits with BOEM's NEPA process. The Army Corps will actively participate in BOEM's process to allow it to adopt the Final EIS and the findings of associated reviews. Thus, the Army Corps review is expected to be complete in Q1 of 2019. The permits are expected to be issued in Q2 of 2019.

**Environmental Protection Agency:** The permit process for the Clean Air Act OCS permit begins with the submission of a Notice of Intent (NOI) to EPA, which Vineyard Wind filed on December 11, 2017. Once the EPA determines the corresponding onshore area and proposes a consistency update, a process that typically takes 60 days, Vineyard Wind will file its permit application (Q1 of 2018). EPA reviews the application for completeness within 30 days and then prepares a draft permit and preliminary determination and/or Statement of Basis. The draft permit is then available for public comment for 30 days. Following the close of the comment period, EPA will address comments and issue a final permit. The permit becomes effective 30 days after it is finalized. In issuing a permit, EPA has an obligation to comply with the ESA. However, to avoid duplication of effort, EPA will typically rely upon BOEM's ESA assessments and consultations. The permit process typically takes approximately 8 months. Thus, Vineyard Wind expects to receive the permit in Q1 of 2019.

**National Marine Fisheries Service:** Under the Marine Mammal Protection Act (MMPA), an IHA is to be issued 120 days after an application is considered complete. The process, however, has typically taken approximately 6 months. Vineyard Wind intends to submit its IHA application in late 2018 so that it will be received prior to the commencement of construction. As noted above, an IHA is effective for one year. If a LOA is the agreed approach with NMFS, they typically take a year to complete. In that case, an application will be filed earlier in 2018. In either case, the proposed approach to analysis of data and impact assessment will be conducted in consultation with NMFS prior to submittal. This will facilitate an on-time issuance of the MMPA approval.

**Federal Aviation Administration (FAA) and US Coast Guard (USCG):** Both the FAA and USCG will be engaged in the project development and ongoing permitting by Vineyard Wind and through coordination with BOEM. Applications to both, as needed, will be filed in Q1 or Q2 of 2018 and are expected to be issued by Q4 2018.

#### **Massachusetts/Regional (County) /Local Timelines**

As discussed in response to Question 7.1, the Massachusetts, regional, and local approvals will be for the portions of the offshore cables, as well as all of the landside components, over which Massachusetts and its regional and local entities have jurisdiction. Massachusetts, regional, or local approvals are not required for the elements of Vineyard Wind 1 which are in Federal waters (the WTG array, the inter-array cabling, the offshore electrical service platforms, and a portion of the offshore cables).

**Energy Facilities Siting Board:** The critical path for state permitting is the Energy Facilities Siting Board (EFSB) process, which Vineyard Wind initiated on December 18, 2017 with the filing of its petition to construct a new transmission line. Vineyard Wind expects EFSB Approval/Final Decision in Q1 of 2019. A 14 to 15 month review process is reasonably expected because the Baker Administration has streamlined the process by dropping the time consuming "bench or issues memo" step, thus shortening the process by several months. The project team has also had experience with linear projects of similar complexity which concluded the EFSB process within the expected timeframe.

**Massachusetts Environmental Policy Act:** Vineyard Wind has initiated the Massachusetts Environmental Policy Act (MEPA) process with its filing of its ENF on December 15, 2017. Subsequent steps in the MEPA process may include preparation of a DEIR and FEIR, followed by the issuance of a Certificate. The MEPA process is expected to be completed in 8 months, with the Certificate issued Q3 of 2018.

**Cape Cod Commission:** Because Vineyard Wind 1 is subject to EFSB review, the Cape Cod Commission (CCC) will conduct its review under their adjudicatory process. Vineyard Wind will file its application

for Development of Regional Impact (DRI) immediately following receipt of the MEPA Certificate (Q3 of 2018). The DRI approval is expected to take 5 months, with approval received in Q1 of 2019. If the CCC conducts a limited review, the time to approval would be shortened. Nevertheless, the MEPA and CCC review process will be completed in approximately the same time frame as the EFSB review. If a Martha's Vineyard Commission review is also required, it would be developed, filed and reviewed in parallel with the CCC DRI effort.

**State Permits:** Massachusetts permits cannot be issued until the EFSB and MEPA reviews are completed. The necessary Massachusetts permit applications (401 WQC, Chapter 91 license and MCZM consistency) are expected to be filed following the issuance of the DEIR Certificate with decisions issuing shortly after the EFSB decision in Q1 or Q2 of 2019.

**Local Permits:** On Cape Cod, local permits follow the CCC DRI process. These will include Conservation Commission filings, as well as street opening authorizations (or grants of location) in Yarmouth and Barnstable. Consultations with both of these towns are underway, including appearances before Town Council and Boards of Selectmen. Approval is expected in Q2 of 2019.

To support a comprehensive and productive permitting of Vineyard Wind 1, extensive outreach to agencies and stakeholders has been conducted. **Table 7.2-1** lists Federal, state, and local municipalities meetings, as well as meetings with local tribes. These meetings are in addition to regular calls and emails to inform and involve these parties in the development of our permitting documents.

**Table 7.2-1: Consultations with Agencies, Tribes, and Municipalities.**

Date	Group	Topic
May 2017	Army Corps of Engineers (ACOE)	Project update and permitting planning
August 2016	Aquinnah Board of Selectmen	General project information and updates including survey planning
July 2017	Aquinnah Board of Selectmen	General project information and updates including survey planning
November 2017	Aquinnah Board of Selectmen	Project update
March 2017	Barnstable: Town Manager, Assistant Town Attorney	Project overview and cable route discussion
June 2017	Barnstable: Town Manager, Assistant Town Manager, Director of the Growth Management Dept., and Assistant Town Attorney	Project update and cable route discussion
October 2017	Barnstable Town Council	Project update and cable route discussion
October 2017	Barnstable: Town Manager, Director of Growth Management, Asst. Town Attorney, Asst. Town Manager, Leisure Service Director, Conservation Admin, Harbormaster, DPW Director, Dir. Of Community Services, Town Attorney, Assessing Dept. Director	Project update and cable route discussion
June 2016	Bureau of Ocean Energy Management (BOEM)	Pre-survey meeting
July 2016	BOEM	Survey coordination
March 2017	BOEM	Review study plans
April 2017 (2 days)	BOEM	Construction and Operations Plan preparation
May 2017	BOEM	Review CVA requirements
May 2017	BOEM	Pre-survey meeting
June 2017	BOEM	Construction Operations Plan preparation
July 2017	BOEM	COP preparation
August 2017	BOEM	Review CVA scope
September 2017	BOEM	Construction Operations Plan preparation
October 2017 4+ meetings	BOEM	Construction Operations Plan preparation
November 2017	BOEM	Construction and Operations Plan preparation

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Date	Group	Topic
<b>December 2017</b>	BOEM	Construction and Operations Plan preparation
<b>April 2017</b>	BOEM, NOAA, NMFS, Massachusetts Division of Marine Fisheries (DMF)	Project overview and reviewed existing site data provided by VW and additional data provided by NMFS
<b>December 2016</b>	Cape Cod Commission	Project introduction
<b>October 2015</b>	Cape Light Compact Board (municipal aggregator representing 23 towns on the Cape & Islands), including representatives from: Aquinnah, Barnstable, Barnstable County, Bourne, Brewster, Chatham, Chilmark, Dennis, Dukes County, Eastham, Edgartown, Falmouth, Harwich, Mashpee, Oak Bluffs, Orleans, Provincetown, Sandwich, Tisbury, Truro, Wellfleet, West Tisbury, Yarmouth	General project information and updates
<b>July 2016</b>	Chilmark Board of Selectmen	General project information and updates including survey planning
<b>June 2017</b>	Chilmark Board of Selectmen	Project update and survey planning
<b>December 2017</b>	Chilmark Board of Selectmen	Project update
<b>July 2016</b>	Edgartown Board of Selectmen	General project information and updates including survey planning
<b>June 2017</b>	Edgartown Board of Selectmen	Project update and survey planning
<b>December 2017</b>	Edgartown Board of Selectmen	Project update
<b>March 2017</b>	Energy Facilities Siting Board (EFSB) & Executive Office & Energy & Environmental Affairs (EEA)	Pre-permitting meeting
<b>June 2017</b>	EFSB	Pre-permitting meeting
<b>December 2017</b>	EFSB	Pre-permitting meeting
<b>August 2017</b>	Environmental Protection Agency	Discuss OCS Air Permit
<b>January 2017</b>	Falmouth: Selectman, Assistant Town Manager, Town Manager, Department of Public Works (DPW)	Project overview
<b>May 2017</b>	MA and RI Joint Task Force Meeting: BOEM, MACEC, CZM, Tribes, Municipalities, USCG	Project update
<b>November 2016</b>	MA Coastal Zone Management (CZM) and Massachusetts Clean Energy Center (MassCEC)	Update on local outreach
<b>July 2017</b>	MA CZM	Survey planning
<b>July 2017</b>	MA Division of Marine Fisheries (DMF) and MA CZM	Discussion on available data on fishing areas and gear types
<b>September 2017</b>	MA DMF	Discussion on available data on fishing areas and gear types
<b>April 2015</b>	MA Task Force Meeting: BOEM, MACEC, CZM, Tribes, Municipalities, USCG:	General project information and updates
<b>October 2015</b>	Martha's Vineyard All-Island Selectmen's Meeting	General project information and updates
<b>August 2016</b>	Martha's Vineyard Commission: Executive Director	General project information and updates including survey planning
<b>May 2017</b>	Martha's Vineyard Commission: Executive Director	Project update
<b>October 2017</b>	Martha's Vineyard Commission: Executive Director, Regional Planner, Coastal Planner, Administrative Assistant	Project Update
<b>November 2017</b>	Martha's Vineyard Commission: Full Commission	Project update
<b>June 2016</b>	Mashpee Wampanoag Tribe (THPO)	Project introduction
<b>August 2017</b>	Mashpee Wampanoag Tribe (THPO)	Project update and survey planning Preliminary discussion on upland routing
<b>November 2017</b>	Mashpee Wampanoag Tribe (THPO)	Discuss upland route and visual simulations
<b>April 2017</b>	Mashpee: Town Manager, DPW Director, Conservation Agent	Project overview and cable routing

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Date	Group	Topic
September 2017	Massachusetts Department of Transportation, Highway and Rail Divisions	Project routing and construction techniques
April 2017	Massachusetts Ocean Team (CZM, MEPA, MassDEP, MBUAR, DMF)	Cable survey work
December 2016	Nantucket Board of Selectmen	Project introduction
June 2017	Nantucket Board of Selectmen	Project update and cable route discussion
September 2017	Nantucket Board of Selectmen	Project update
June 2017	Nantucket: DPW Director	Project update and cable route discussion
October 2017	Nantucket: DPW Director	Project update
October 2017	Nantucket: Land Bank	Project introduction
October 2017	Nantucket: Planning and Economic Development Council	Project introduction
October 2017	Nantucket: Wannacomet Water Company	Project update
June 2017	Nantucket: Wastewater Treatment Director, Town Energy Manager	Project update and cable route discussion
July 2016	Narragansett Indian Tribe (THPO)	Pre-survey meeting
October 2017	NMFS - Fisheries division	Survey update and Construction and Operations Plan needs
October 2017	NMFS – Marine mammal division	Construction and Operations Plan needs
July 2016	Oak Bluffs Board of Selectmen	General project information and updates including survey planning
July 2017	Oak Bluffs Board of Selectmen	Project update and survey planning
November 2017	Oak Bluffs Board of Selectmen	Project update
July 2017	Ocean Team (EEA, DEP, DMF, CZM)	Project update and survey planning
November 2016	Public Meeting: EEA, MassCEC, BOEM	Assessment activities for future offshore wind projects in Federal wind lease areas
January 2016	Public Meeting: Executive Office of Energy and Environmental Affairs (EEA), MassCEC, U.S. Bureau of Ocean Energy Management (BOEM)	Assessment activities for future offshore wind projects in Federal wind lease areas
September 2017	Rhode Island Department of Environmental Management (DEM) Division of Marine Fisheries	Discussion on available data on fishing areas and gear types and feedback on lessons learned for communication during construction.
September 2016	Tisbury Board of Selectmen	General project information and updates including survey planning
May 2017	Tisbury Board of Selectmen	Project overview, update
November 2017	Tisbury Board of Selectmen	Project update – letter of support request
June 2017	US Coast Guard (USCG)	Project update and review draft project layout
October 2017	USCG, BOEM	Navigation Risk Assessment discussion
May 2017	USFWS and BOEM (Avian Study Plan)	Project update and reviewed study plans and available data
August 2017	USFWS, BOEM	Project update and avian discussion on Construction and Operations Plan needs
November 2017	US Navy	Project update, discussion for Construction and Operations Plan
June 2016	Wampanoag Tribe of Gay Head (THPO)	General project introduction
July 2016	Wampanoag Tribe of Gay Head, Mashpee Wampanoag Tribe (THPOs)	Pre-survey meeting
August 2016	Wampanoag Tribe of Gay Head – Tribal Council	General project information and updates including survey planning
July 2016	West Tisbury Board of Selectmen	General project information and updates including survey planning
June 2017	West Tisbury Board of Selectmen	Project update and survey planning
December 2017	West Tisbury Board of Selectmen	Project update

Date	Group	Topic
March 2017	Yarmouth: Town Manager, DPW Director	Project overview and cable route discussion
June 2017	Yarmouth: Town Manager, DPW Director	Project update and cable route discussion
October 2017	Yarmouth Board of Selectmen	Project update
November 2017	Yarmouth Board of Selectmen	Public Hearing

In addition to the consultations described in **Table 7.2-1**, extensive and ongoing consultation has been conducted by Vineyard Wind and Vineyard Wind's community partner, Vineyard Power, with key stakeholders. Vineyard Wind conducted outreach on visual impacts and visual simulations on both Martha's Vineyard and Nantucket in August and September of 2017, respectively. Notices advertising the meetings were placed in the local newspapers. Vineyard Wind also held two community open houses in early November (November 7, 2017 in Hyannis/Barnstable and November 8, 2017 in Yarmouth) regarding the onshore cable routes. Vineyard Wind's fisheries liaisons and representative have also been active in organizing over 100 meetings with fisheries stakeholders.

The following list includes, **but is not limited to**, the groups Vineyard Wind has been consulting with and continues to meet with.

- Alliance to Protect Nantucket Sound
- Association to Preserve Cape Cod
- Bureau of Ocean Energy Management (BOEM)
- Cape and Islands Self-Reliance
- Cape and Vineyard Electrical Cooperative
- Cape Cod Fishermen's Alliance
- Cape Light Compact
- Climate Action Business Association
- Coalition for Social Justice
- Conservation Law Foundation
- Coonamessett Farm foundation
- Eastern Fisheries
- Environment Massachusetts
- Environmental Business Council of New England
- Environmental League of Massachusetts
- Hercules SLR
- Long Island Commercial Fishing Association
- MA Clean Energy Center
- MA Fisheries Institute
- MA Fisheries Working Group
- MA Fishermen's Partnership and Support Services
- MA Habitat Working Group
- MA Lobstermen's Association
- Martha's Vineyard Fishermen Preservation Trust
- Massachusetts Audubon Society
- Nantucket Rotary Club
- National Academies of Sciences, Offshore Renewable Energy Development and Fisheries Conference
- National Wildlife Federation
- Natural Resources Defense Council
- NE Fisheries Sciences Center
- NE Fishery Management Council
- NE Fishery Sector Managers X, XI, XIII, VII, VIII



- New Bedford Harbor Development Commission
- New England Aquarium
- New England Energy and Commerce Association
- Port of New Bedford
- Recreational Fishing Alliance
- Rhode Island Fishermen's Advisory Board
- Rhode Island Habitat Advisory Board
- Scallop Industry Advisors Meeting
- Sierra Club
- Stoveboat- Saving Seafood
- The Nature Conservancy
- Town Dock

**7.3. *Provide information detailing prior experience in environmental impact assessment process.***

Vineyard Wind has assembled a team with deep experience in data collection, environmental studies, marine and terrestrial environmental impact assessment, Federal permitting, Massachusetts permitting, and regional/local permitting on the Cape and the Islands. This unique depth of experience includes a successful environmental impact assessment and permitting of a large scale wind energy project in Nantucket Sound; offshore power cables from the Cape to both Nantucket and Martha's Vineyard; a number of major utility transmission projects on the Cape; several utility gas pipeline projects in and along roadways on the Cape; and major utility infrastructure projects in southeastern Massachusetts (one of which involved completing the full FERC NEPA review process and included extensive marine elements), as well as a number of marine/coastal projects in the Project Area.

Vineyard Wind's permitting team is headed up by Rachel Pachter, who led permitting for the first US offshore wind project to receive full permits, and is a recognized industry leader in offshore wind permitting.

This depth of experience in and around the Cape and the Islands is complemented by decades of experience in analyzing and permitting large scale energy infrastructure, public infrastructure, and development projects throughout the Commonwealth. The team's lead environmental consultant, Epsilon Associates, has been involved in more than 20 EFSB cases and hundreds of MEPA reviews. The senior members of the Vineyard Wind permitting team have long established working relationships with key reviewers at BOEM, EFSB, MEPA and the CCC as well as the permitting and consultation agencies (ACOE, EPA, USFW, NMFS, MaDEP, MCZM, NHESP, MHC, and MDMF).

Of equal importance, Vineyard Wind's engineering, planning, scheduling, and cost estimating team is built around engineers and managers with European experience in developing, designing, building, and operating over 10,605 MW of large scale wind energy projects (see Section 12 for details). This depth of talent is complemented with Massachusetts based engineering talent with considerable experience in designing and executing utility scale projects on the Cape and offshore.

This combination of environmental and engineering experience is particularly important for a development project such as that proposed by Vineyard Wind. Beginning with the project location (Lease Area OCS-A 0501) and objective (800 MW<sup>8</sup> of efficient offshore wind generation), the critical first step in an effective environmental impact avoidance program is to develop a design concept which avoids or minimizes potential environmental impacts and incorporates stakeholder concerns to the greatest degree possible. This is an iterative, data driven process. For the Vineyard Wind Project, the team endeavored

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<sup>8</sup> Vineyard Wind is permitting an 800MW project, to be built all at once or in stages. This will accommodate build-out of the full 800MW under any commercial scenario.



to minimize potential environmental impacts via careful sizing and siting of the WTGs within a portion of the Lease Area, extensive data collection and marine survey in support of the export cable routing, identification and screening of a range of landing areas and landside cable routes, use of existing rights of way for the landside cable routes, careful siting of a new substation location, and a host of other measures. The engineering team developed descriptions of construction/ installation techniques for use by the impact assessment team, together with realistic construction schedules. This step allows the impact assessment team to perform a realistic analysis and to have an informed discussion of potential incremental mitigation measures.

Key Vineyard Wind staff supporting the environmental impact assessment process are identified in **Table 7.3-1**.

**Table 7.3-1: Key Vineyard Wind Staff with Specific Environmental Impact Experience.**

Name / Position	Experience
Rachel Pachter Vice President, Permitting Affairs	Over 10-years' experience in permitting offshore wind projects. Finalized the successful permitting of Cape Wind, 468 MW, BOEM Lease Area OCS-A 0478. Ms. Pachter also oversaw the BOEM NEPA, ESA, and MMPA review process, completion of the state permitting, and secured the ACOE Section 10/404 permit and OCS air permit.
Matthew Robertson Senior Manager of Environmental Affairs	Extensive experience in avian and bat impact analysis, marine mammal incidental harassment authorizations, protected species environmental impact analyses, visual impact assessments; marine fisheries surveys and shellfish restoration assessments; and water quality assessments.

The Vineyard Wind permitting team includes individuals from the in-house teams of its investors, Avangrid Renewables and Copenhagen Infrastructure Partners (CIP).

#### **Avangrid Renewables & ScottishPower Renewables**

Avangrid Renewables is one the largest wind developer/operators in the US, and is affiliated with ScottishPower, a major offshore wind developer in Europe. As one of the leading providers of clean, renewable wind power in the US, with more than 6,000 MW of owned and controlled wind and solar power facilities, Avangrid has a deep bench of environmental impact assessment experience. ScottishPower is a world leader in offshore wind development with extensive permitting experience for offshore wind projects.

Avangrid Renewables has successfully worked through the impact assessment process onshore at the Federal level through the National Environmental Policy Act (Environmental Assessments [EA] and Environmental Impact Statements [EIS]) and state levels through siting boards and other state process (e.g., California Environmental Quality Act [CEQA] Environmental Impact Review [EIR] and Oregon Energy Facility Siting Council [EFSC]). These processes involve evaluating all potential impacts to the human and natural environment including birds, bats, listed species, habitat, wildlife, sound, shadow flicker, visual resources, and cultural resources. ScottishPower and Avangrid Renewables are supporting Vineyard Wind with experienced staff as depicted in **Table 7.3-2**.

**Table 7.3-2: Key staff from ScottishPower and Avangrid Renewables supporting Vineyard Wind.**

Name / Position	Experience
Dr. Laura Nagy Director of Permitting and Environmental Affairs for Avangrid Renewables LLC.	Over 20 years of experience working on wildlife interactions with renewable energy and emerging regulatory issues such as eagles and endangered species and their associated Eagle Conservation Plans (ECPs), Habitat Conservation Plans (HCPs), and National Environmental Policy Act (NEPA) documents.
Michael Clayton Senior Manager, Permitting and Environmental for Avangrid Renewables LLC.	20 years of experience siting, permitting, and assessing impacts of energy projects, focused on renewable energy projects for the past seven years, all of this time with Avangrid Renewables. Prior work includes environmental reviews and permitting on nearly 1,000 miles of natural gas and transmission lines and nearly 2,000 MW of natural gas and nuclear generation facilities.
Gillian Sutherland Head of Environmental for Scottish Power Renewables.	Over 10 years of offshore wind experience across Europe. Leads a team of specialists in environmental compliance and technical skills including ornithology, marine mammals, marine archaeology and benthic topics. Leads regional monitoring forums in the UK.

Name / Position	Experience
Tom Anderson Environmental Manager for Scottish Power Renewables	A trained Marine Biologist with a BSc in Marine Biology / Zoology and an MSc in Marine Biology. Providing advice on environmental consenting issues across ScottishPower's Offshore Wind portfolio, engaging with stakeholders and participating in industry research and development.
Captain Richard Britton Head of Development for UK Offshore Projects Scottish Power Renewables	A Master Mariner with 15 years' experience in the Merchant Navy, including a number of years involved in subsea telecom cable installation. Delivered 3.6GW of consented wind farms and currently leads the development team in consent compliance of East Anglia 1 and 3, securing consent for East Anglia 2 and 1 North, as well as all land and local stakeholder related matters.

### Copenhagen Offshore Partners (COP)

CIP has a management services agreement with COP for the purpose of developing offshore wind on behalf of the CIP. COP is currently involved in the pre-investigations and environmental impacts assessment for three offshore wind farm projects in Taiwan (Xidao, Changfang, and Fufang). In addition to reviews of benthic flora and fauna, fish and fisheries, underwater cultural heritage, navigation, aviation, and visual impacts, all three projects have now passed the Final EIA Committee and the environmental impact statements are to be approved by the Taiwanese authorities. COP is providing the support of an individual with extensive experience in environmental assessment as shown in **Table 7.3-3**.

**Table 7.3-3: Key staff from Copenhagen Offshore Partners supporting Vineyard Wind.**

Name / Position	Experience
Pernille Skytte Director for Consenting for Copenhagen Offshore Partners	Responsible for the environmental studies and assessment, and the offshore and onshore consenting procedure for Kriegers Flak (600MW) and Horns Rev 3 (400MW) in Denmark. The protected Harbor Porpoise and two species of seals are present in both project areas.

### Outside Counsel

Vineyard Wind has retained outside legal counsel experienced in environmental assessment and permitting to assist us in navigating the complex Federal, State, and local approvals and permitting processes. **Table 7.3-4** identifies key outside counsel supporting Vineyard Wind.

**Table 7.3-4: Key outside counsel supporting Vineyard Wind.**

Name / Position	Experience
Geri Edens Partner Baker Hostetler	More than 25 years of experience working with multiple Federal agencies on NEPA reviews and related permitting under numerous statutes. Represented Cape Wind Associates, where she successfully defended multiple challenges to their permits and approvals.
Adam Kahn, Partner Foley Hoag	Over 25 years of experience practicing environmental law. Coordinating Foley Hoag's work with regard to state environmental impact review of the Vineyard Wind project. A substantial portion of his practice relates to the permitting of conventional and renewable energy facilities.

### Consultants

Vineyard Wind has engaged a team of highly experienced consultants to support our environmental impact assessment and permitting efforts, as described in the following sections.

#### ***Epsilon Associates – Lead***

As noted above, Vineyard Wind's lead environmental consultant for both state and Federal permitting is Epsilon Associates. Based in Maynard, MA, Epsilon is a principal-owned fifty person consulting firm with a strong track record in routing/site selection, environmental analysis, licensing and permitting for transmission and pipeline projects, generation projects, and one of a kind energy infrastructure projects. Epsilon has been involved in more than 20 EFSB cases and hundreds of MEPA reviews. In addition to working on the Cape Wind project, Epsilon and its team of consultants have successfully completed permitting for several Cape and Islands projects. **Table 7.3-5** identifies Epsilon Associates staff supporting Vineyard Wind.

**Table 7.3-5: Key staff from Epsilon Associates supporting Vineyard Wind.**

Name / Position	Experience
Theodore (Ted) Barten Managing Principal Epsilon Associates	More than 30 years of experience in engineering and environmental consulting focused on siting, environmental analyses, licensing, and permitting and compliance work for electric utility, independent power, and industrial clients.
Holly Carlson Johnston Environmental Scientist Epsilon Associates	15 years of experience working with the Massachusetts Environmental Policy Act (MEPA) Office, Energy Facilities Siting Board (EFSB), US Army Corps of Engineers (USACE), Massachusetts Department of Environmental Protection (MassDEP), Massachusetts Office of Coastal Zone Management (MCZM), and Cape Cod Commission.
Maria Hartnett Associate Epsilon Associates	Over 16 years of experience providing environmental consulting services in support of permit applications at the local, state, and Federal level. Specializes in environmental permitting and scientific analyses for coastal and marine projects, dredging and disposal activities, and waterfront developments

***Biodiversity Research Institute (BRI)***

BRI is assisting Vineyard Wind with the assessment of potential avian and bat impacts. Established in 1998, BRI is a 501(c)3 nonprofit wildlife research organization headquartered in Portland, Maine, with over 40 scientists currently on staff. BRI has long-standing and successful working relationships with Federal and state agencies, consulting firms, energy developers, and other nonprofits.

BRI has conducted over 35 projects related to wind energy development in the US since 2009, and their research team is highly experienced in planning and conducting studies specifically designed to assess and monitor the potential for spatiotemporal effects of offshore energy developments on wildlife. BRI has substantial experience and expertise in (1) managing large-scale wildlife studies, (2) designing and carrying out broad-scale offshore surveys for birds, bats, sea turtles, marine mammals, and other fauna, (3) conducting a variety of other types of terrestrial and offshore studies of bats and birds, including individual tracking and passive acoustic studies, (4) managing and analyzing large databases and geospatial data, (5) researching and writing reports and publications, and (6) working directly with state and Federal agencies, including the Bureau of Ocean Energy Management (BOEM), Fish and Wildlife Service (USFWS), Department of Energy (DOE), Department of Defense, and state wildlife and regulatory agencies from across the US and Canada.

BRI recently completed a large-scale, \$5.1 million study of offshore wildlife in the mid-Atlantic US for the Department of Energy and the state of Maryland, which was designed to address environmental permitting requirements for offshore wind projects and serve as a starting point for more site-specific studies. Vineyard Wind identified species likely to be exposed to offshore wind energy development activities in the mid-Atlantic. Among many other studies relevant to the Vineyard Wind project, for BOEM and FWS, BRI tracked marine bird species vulnerable to offshore wind development. BRI staff supporting Vineyard Wind are identified in **Table 7.3-6**.

**Table 7.3-6: Key Biodiversity Research Institute staff supporting Vineyard Wind.**

Name / Position	Experience
Wing Goodale Senior Deputy Director, BRI	A Ph.D. candidate, Switzer Fellow, and NSF Integrative Graduate Education and Research Traineeship (IGERT) fellow in the Offshore Wind Energy Program at University of Massachusetts-Amherst, he is the principal investigator (PI) on a DOE-funded project to develop a stereo-optic camera system to track birds and bats around wind turbines.
Dr. Iain Stenhouse Senior Science Director, BRI	Dr. Stenhouse has more than 20 years of experience in research and conservation focused on the behavior and ecology of northern and Arctic-breeding seabirds. He is responsible for the development of new research projects that respond to urgent environmental issues, identifying potential funding sources, and grant writing.
Kate Williams Director of Wildlife and Renewable Energy Program, BRI	Manages several large-scale collaborative projects for BRI. Ms. Williams obtains funding, designs and manages projects, analyzes data, writes technical reports and publications, delivers public presentations at scientific and technical conferences, and works closely with a variety of collaborators at BRI and other organizations.

### ***Ecology and Environment (E&E)***

E&E is assisting Vineyard Wind with impact assessments and permitting related to marine mammals and sea turtles. Founded in 1970, E&E is a fully integrated ecological and environmental consulting firm headquartered in Lancaster, New York. E & E has offices in 29 major cities across the United States and employ respected experts in 85 scientific and engineering disciplines, including a full-time staff of nearly 900 environmental professionals. This multidisciplinary professional mix gives E & E an ability to comprehensively analyze existing or potential environmental problems and deliver experience-based insight to design and implementation of sustainable development projects. E&E's team has decades of experience working with clients to perform resource surveys and develop offshore and onshore wind, oil and gas, deepwater ports, and subsea pipelines and electric transmission lines. E&E staff supporting Vineyard Wind are shown in **Table 7.3-7**.

**Table 7.3-7: Key Ecology and Environment staff supporting Vineyard Wind.**

<b>Name / Position</b>	<b>Experience</b>
Dr. Sarah Courbis Marine Mammal Specialist, E&E	Over 21 years of experience working in marine environments, specializing in scientific research, management, and regulatory documentation and permits. Dr. Courbis has expertise in the Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), Coastal Zone Management Act, National Marine Sanctuaries Act, Migratory Bird Treaty Act, NEPA, and a variety of other statutes
Sara Mochrie Project Manager, E&E	Over 18 years of experience providing technical and management services for government and industry projects spanning wind, natural gas, LNG and transmission sectors. Most notably, Ms. Mochrie worked on the development of the Environmental Assessment (EA) for Wind Energy Leasing in offshore Massachusetts and Rhode Island.

### ***Clarendon Hill***

Clarendon Hill Consulting (ChillCons) is assisting Vineyard Wind with the Navigation Risk Assessment. ChillCons provides consulting in the areas of energy services, especially in the field of Offshore Wind energy, environmental and urban planning, infrastructure analysis, risk assessments, regulatory review, site and view shed analysis, Geographic Information Systems (GIS) services, as well as project management and public outreach. ChillCons, founded in 2010, has been an early adapter to the offshore wind industry.

ChillCons has supported a variety of offshore wind projects and studies. Isabel Kaubisch has been the DPM on the first MCEC Offshore Port Readiness study in 2009 which led to the selection of New Bedford being built out as an offshore wind port. Recently, ChillCons analyzed the port infrastructure for Virginia's Department of Mineral and Mines (DMME) in support of the Virginia Offshore Wind Technology Advancement (VOWTAP) project. This spring, ChillCons participated in the Massachusetts Port Infrastructure Study (MCEC Port Study) lead by the Urban Harbors Institute, Ramboll and Tufts University which assessed twenty ports in Massachusetts to meet the requirements of the Offshore Wind industry to develop Massachusetts' offshore energy projects in the near future. ChillCons was responsible for outreach and feedback from the offshore wind industry on their port infrastructure requirements. These requirements were used to assess port capabilities to support the offshore wind supply chain industry.

ChillCons' team consists of experts who are highly knowledgeable and very familiar with specific questions relating to Offshore Wind developments, such as the regulatory requirements, site location and access, vessels and navigation, as well as risk assessments. They have a deep understanding of the offshore wind stakeholders and operations.

Being mariners themselves, they know which factors contribute to marine navigational safety and – having conducted several risk assessments for other projects - are well versed with a range of qualitative and quantitative risk assessment methodologies. The team has also been involved in reviews of navigational risk assessments and the review of the final Atlantic Coast Port Access Route Study (ACPARS). **Table 7.3-8** identifies a key member of the Clarendon Hill staff supporting Vineyard Wind.

**Table 7.3-8: Key Clarendon Hill staff supporting Vineyard Wind.**

Name / Position	Experience
Isabel Kaubisch Principal Clarendon Hill Consulting	Deputy Project Manager on the first MCEC Offshore Port Readiness study in 2009 which led to the selection of New Bedford being built out as offshore wind port.

**RPS ASA**

RPS ASA is assisting Vineyard Wind with fishery impact assessments. RPS's office in Rhode Island (formally Applied Science Associates (ASA)) is located in South Kingston and maintains a scientific and technical staff of approximately 50 employees. In October 2011, ASA became a member of the RPS Group, one of the world's pre-eminent consulting firms, employing more than 5,000 people internationally. By combining the talents and expertise of the RPS Rhode Island office (RPS ASA), with the global reach of RPS, the collective team offers advanced environmental, energy, science, and technology services to clients around the world.

Through consulting, environmental modeling, and application development, staff members in the RPS Rhode Island office help a diverse range of clients from government, industry, and academia. The RPS staff's diverse technical backgrounds are specialized in the characterization and analysis of marine, freshwater, air, and land resources; computer modeling of physical, chemical, and biological processes; geographic information systems (GIS); operational research; and data management. The RPS Rhode Island staff is internationally recognized in the fields of oil spill risk, oil and chemical spill modeling, physical oceanography, coastal geology, sediment transport and dispersion, and metocean data and modeling. The Rhode Island staff provides scientific and engineering analyses for several aspects of offshore renewable energy projects.

The RPS Rhode Island office has been involved with several offshore renewable projects to date such as the BOEM Environmental Assessments (EA) of the Massachusetts and New York Wind Energy Areas (WEA); BOEM Review of the Risk, Fate, and Effects of Wind Turbine Chemicals on the Atlantic OCS; BOEM Development of Protocols and Modelling Tools to Support Ocean Renewable Energy; Deepwater Wind Block Island Wind Farm cable installation; Cape Wind oil spill and suspended sediment analysis; site characterization for the WindFlexibility Pacific project; an assessment of environmental sensitivity and associated risk to habitat and species on the Pacific West Coast and Hawaii with offshore floating wind technologies; and an assessment of phased approaches to offshore wind developments. As shown in **Table 7.3-9**, RPS ASA has assigned an experienced staff member to assist Vineyard Wind.

**Table 7.3-9: Key RPS ASA staff supporting Vineyard Wind.**

Name / Position	Experience
Jill Rowe Director of Environmental Risk Assessments RPS ASA	Ms. Rowe has applied her marine biological and GIS expertise to biological data set development, as well as mapping habitats and biological resource distributions that could ultimately be affected by oil/chemical spills and development projects. She performs quantitative assessments and modelling of aquatic ecosystems and populations, pollutant transport and fates, and biological response to pollutants.

**Saratoga Associates**

Saratoga Associates is supporting Vineyard Wind with visual impact analysis, an important aspect of the environmental review process. Saratoga is a multi-disciplinary professional firm with four decades of experience in providing engineering and visual assessment services throughout the northeast US. Saratoga Associates is providing a leading expert to support Vineyard Wind as shown in **Table 7.3-10**.

**Table 7.3-10: Key Saratoga Associates staff supporting Vineyard Wind.**

Name / Position	Experience
Matthew W. Allen, RLA Vice President Saratoga Associates	Mr. Allen is a recognized leader in the specialized discipline of visual impact assessment and aesthetic mitigation. He served on the peer review team for the landmark 2000 NYSDEC Program Policy concerning visual impact assessment and mitigation. Mr. Allen was the lead or involved in over 30 visual impact assessments



**Gray & Pape**

Gray & Pape is assisting Vineyard Wind with marine archeological assessment. Since 1987, Gray & Pape has completed numerous marine cultural resources management projects. Gray & Pape personnel have a solid understanding of maritime projects, and routinely apply that understanding in successful coordination with state and Federal agencies.

Gray & Pape has participated in numerous nearshore and offshore projects. Gray & Pape's maritime personnel are well qualified and provide services required from preliminary planning activities such as administrative, permitting, desktop development studies of cultural resources offshore, geophysical survey and data analysis, diver ground truthing and reportage. Gray & Pape marine and terrestrial archaeologists and historians exceed the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738- 44739). Gray & Pape personnel have extensive experience in conducting research and interpreting the resulting data for cultural resource purposes. Dr. Michael Tuttle, a recognized expert in the location and recording of shipwrecks, is supporting Vineyard Wind as shown in **Table 7.3-11**.

**Table 7.3-11: Key Gray & Pape staff supporting Vineyard Wind.**

Name / Position	Experience
Dr. Michael Tuttle, PhD Head, Maritime Heritage Practice Gray & Pape	Over twenty-five years of experience working in maritime history and archaeology conducting Phase I, II, and III archaeological survey, testing, and mitigation projects. Dr. Tuttle's experience ranges from remote sensing survey to full shipwreck site recordation.

**Geo SubSea LLC** and **Capitol Airspace Group** are also supporting Vineyard Wind with specialized technical expertise, as illustrated in **Table 7.3-12**.

**Table 7.3-12: Additional consultants supporting Vineyard Wind.**

Name / Position	Experience
Jeffrey Gardner Principal Consultant Geo SubSea LLC	Well versed in most aspects of marine operations, having supervised and conducted hundreds of surveys in the US and around the world for over 27 years, including geological, geophysical, geotechnical, and oceanographic studies. Mr. Gardner serves as the Field Program Manager for the Vineyard Wind Project and subject matter expert (SME) on marine geology and geophysics.
Ron Morgan President Morgan Aviation Consulting / Capitol Airspace Group	Mr. Morgan has 39 years of experience in global air traffic management, ATC operations, and system modernization. Mr. Morgan held various controller, staff, and managerial positions in the Western-Pacific Region of the FAA before moving to FAA Headquarters in 1988.

For additional details regarding Vineyard Wind's extensive experience in environmental impact assessment process, please see Attachment 7.3-1, as well as full qualifications of the Vineyard Wind team provided in response to Question 12.5.

**7.4.** *Provide a preliminary environmental characterization of the site and project, including both construction and operation. In addition, the bidder should identify environmental impacts associated with the proposed project and any potential impediments to development. A plan to avoid, minimize, or mitigate such impacts or impediments should also be included. The analysis should address each of the major environmental areas presented below, for the proposed project:*

- i. Air quality*
- ii. Community*
- iii. Cultural resources*



iv.	<i>Fishery, avian, and marine mammal impacts</i>
v.	<i>Other ecological biological resources (including endangered species)</i>
vi.	<i>Landscape and visual</i>
vii.	<i>Oceanography</i>
viii.	<i>Sound, noise and vibration</i>
ix.	<i>Socio-economic and land use</i>
x.	<i>Traffic and transportation (including Navigation)</i>
xi.	<i>Water resources (including quality and flood risk)</i>

The Vineyard Wind site is an environmentally superior location to build an offshore wind farm. While no energy source is without impacts, the selection and refinement of the Wind Energy Area (WEA) through the BOEM and Massachusetts Task Force process and the implementation by Massachusetts of both habitat and fisheries working groups, have resulted in minimal conflict and broad community support (see Section 7.5 for more detail).

To support the submission of a Construction and Operations Plan (COP), Vineyard Wind reviewed and analyzed the extensive data available within the WEA and in Lease OCS-A 0501 and found two important conclusions:

- The site has been extensively studied and is well understood.
- A project on the Vineyard Wind site is expected to have minimal impact to the environment and socioeconomic resources.

The discussion below is a highly simplified version of the hundreds of pages of analysis provided in the initial submittal of a Construction and Operations Plan to BOEM on December 19, 2017. The discussions and conclusions are backed up by exhaustive analysis and will also receive scrutiny by Federal, state, and local permitting agencies. Many more potential impacts have been addressed in the Construction and Operations Plan and the information below presents the most common concerns expressed by agencies and stakeholders. Plans to avoid, minimize, and mitigate impacts should be considered preliminary and will be further developed through the permitting process in consultation with agencies and stakeholders.

### Air Quality

All areas of the Project Region meet EPA’s most stringent National Ambient Air Quality Standards (“NAAQS”) for criteria air pollutants (sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead), which were developed for the protection of public health and welfare. The implementation of NAAQS and similar Massachusetts Ambient Air Quality Standards has led to significant improvement in ambient air quality in Massachusetts and the New England region. Vineyard Wind 1 construction is expected to have minor impacts on air quality. Operations will have major benefits to air quality and climate change.

<b>Potential Impacts and Impediments to Development</b>	Short-term air emissions will come primarily from vessels used during construction, operations and maintenance, and decommissioning. Since the project is approximately 14 miles (23 km) offshore, to the southeast of the mainland, and prevailing winds are from the west, the emissions within the wind farm are unlikely to have any effect on onshore areas. Air emissions from project activities are not anticipated to cause any violation of Massachusetts or National Ambient Air Quality Standards.
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<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	Air emissions from the project are expected to be minimized through the use of low-sulfur fuels and other best management practices for engine operations. The project's air quality impacts will be further mitigated and minimized through EPA's OCS Air Permit process under 40 C.F.R. 55. Some construction phase NOx emissions from the project are expected to be mitigated through purchasing and retiring Emission Reduction Credits.
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### Community

Some areas along the upland cable route(s) in Barnstable and Yarmouth meet the Commonwealth of Massachusetts' criteria for Environmental Justice (EJ) populations. A number of census blocks on the south side of both towns are mapped as EJ areas on the basis of income, while an area southwest of Barnstable airport is mapped as an EJ community on the basis of minority population.

<b>Potential Impacts and Impediments to Development</b>	The construction, operation and maintenance, and decommissioning of Vineyard Wind 1 are not anticipated to create disproportionately high and adverse health or environmental effects of federal actions on minority and low-income populations.
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>• In accordance with Massachusetts' EJ Policy, the project's Community Engagement Plan includes outreach to the EJ communities (See Attachment 7.4-1).</li> <li>• The project's activities are expected to increase employment opportunities, job training, and economic activity within the project region.</li> </ul>

### Cultural Resources

Cultural Resources are an important concern in the Project Area, both offshore and upland. Massachusetts has a rich history and there are several tribes that are involved in the project review through the Section 106 process. Vineyard Wind takes these concerns seriously and has conducted extensive outreach and fieldwork on this to address cultural resources (See Section 7.2).

<b>Potential Impacts and Impediments to Development</b>	Public Archaeology Lab ("PAL") completed an archaeological due diligence review of potential onshore cables. The desktop due diligence review determined that the Onshore Export Cable Routes pass through and are adjacent to previously recorded archaeological sites. The data from high-resolution geophysical survey along the export cables contain possible paleo landforms. At present, marine survey activities have located no direct evidence of pre-contact materials in the Project Area.
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>• PAL is presently conducting a reconnaissance level archaeology survey for terrestrial areas, including completion of background research and filing of an archaeological permit application with Massachusetts Historical Commission (MHC). Surveys planned for the 2018 field campaign in support of the Construction and Operations Plan will extend seafloor and subsurface coverage in all areas where bottom disturbance could occur during construction and operation activities.</li> <li>• Avoidance, minimization, and mitigation measures for terrestrial and submarine historical and archaeological resources within the Project Area will be determined in consultation with BOEM, MHC, and the Massachusetts Board of Underwater Archaeological Resources (MBUAR) through the Section 106 process.</li> </ul>

### Fishery

Fishery concerns are important for both their biological value and the economic value of commercial and recreational fishing to the region. Many of the fish species found off the Massachusetts coast are important due to their value as commercial and/or recreational fisheries. Total biomass of fish is low across the Project Area, while species richness is relatively high. Fishing activity, while present, is not considered extensive and the Massachusetts WEA, itself, was selected to avoid areas of high concern to commercial fishing.

<b>Potential Impacts and Impediments to Development</b>	<ul style="list-style-type: none"> <li>• Fish species may be impacted by underwater noise during pile installation and possible siltation during cable installation. Fishery habitat may also be impacted during construction and operation of the project.</li> <li>• Commercial fishing may be impacted by construction activity and the presence of Vineyard Wind 1 during operations.</li> </ul>
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<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>Underwater noise during pile installation will be mitigated through a soft start, allowing the fish to swim away. Further noise mitigation is anticipated and will be decided through consultation with BOEM and the National Marine Fisheries Service (NMFS). Possible siltation is addressed as the majority of the cables are being installed in coarse grained sediment and will settle down quickly (see Water Quality) after installation. In addition, offshore cables have been sited to avoid areas of mapped eelgrass and to limit impacts to other sensitive habitats to the greatest extent feasible.</li> <li>Vineyard Wind will not restrict fishing or transit in the Project Area, except for required safety zones during construction or maintenance. Commercial fishing impacts will be further mitigated by ongoing communication via the Fisheries Communication Plan<sup>9</sup> (Attachment 7.4-2) and the use of Fisheries Liaisons (FL) and Fisheries Representatives (FR). In addition, Vineyard Wind is developing a framework for a pre- and post-construction fisheries monitoring program to measure the project's effect on fisheries resources. Vineyard Wind is working with the Massachusetts School for Marine Science and Technology (SMAST) and local stakeholders to inform that effort and design the study. (Please see Attachment 7.4-3)</li> </ul>
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### Avian

The Massachusetts WEA, after extensive public review, was reduced in size to avoid significant bird habitat. Although the Project Area is far enough offshore to be beyond the range of most terrestrial or coastal bird species, coastal birds may forage in the Project Area occasionally, visit the area sporadically, or pass through on their spring and/or fall migrations. Marine bird distributions are generally more pelagic and widespread than coastal birds. Many of these marine bird species use the Project Area during multiple time periods, either seasonally or year-round.

<b>Potential Impacts and Impediments to Development</b>	<p>The primary potential impact of Vineyard Wind 1 to birds is mortality or injury due to collision with wind turbines. Federally listed species (Roseate Terns, Red Knots, and Piping Plovers) may have limited exposure to the project, which would largely be restricted to few individuals during the migration periods. Impacts to these birds are expected to be unlikely or insignificant.</p>
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>The offshore location of the WTGs avoids potential impacts to many bird species. To minimize impacts to birds, Vineyard Wind will use best management practices to reduce lighting, which can attract birds, as much as is practicable during construction and operation.</li> <li>Vineyard Wind will follow FAA recommendations to use red-flashing aviation lights, which are favored over steady burning and/or white lights, during operation.</li> </ul>

### Marine Mammals

Twenty-six species of marine mammals occur at least occasionally within the Vineyard Wind 1 and export cable route areas, and adjacent waters. Species that are common in the area include whales, seals, porpoises, and dolphins. Four large whale species that occur in the Offshore Project Area are listed as endangered under the Endangered Species Act (ESA): North Atlantic Right Whale, Fin Whale, Sei Whale, and Sperm Whale.

<b>Potential Impacts and Impediments to Development</b>	<ul style="list-style-type: none"> <li>For all phases of the project, disturbance to marine mammals may result from short-term, localized noise and increases in vessel traffic. Disturbance to marine mammals is expected to primarily result from pile driving noise. There is also potential for vessel collision.</li> <li>For Sei Whales, Fin Whales, and North Atlantic Right Whales (endangered species under ESA) there are no anticipated losses of individuals, but disturbance of individuals may occur.</li> </ul>
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<sup>9</sup> The Vineyard Wind fisheries communication plan was reviewed by Federal and state agencies (in Massachusetts and Rhode Island) as well as by stakeholders on Martha's Vineyard, Cape Cod, and in New Bedford. Comments from all parties were incorporated in to the current draft.

<p><b>A Plan to avoid, minimize, or mitigate impacts and/or impediments</b></p>	<ul style="list-style-type: none"> <li>Given the high sensitivity of this concern, mitigation is currently being developed in consultation with subject matter experts at BOEM and NMFS, as well as with other knowledgeable stakeholders. Measures such as the establishment of exclusion and monitoring zones, pile driving soft-start procedures, vessel speed restrictions and avoidance measures, and the use of marine mammal observers are expected to be part of the final mitigation plan. Project vessels will also comply with the National Marine Fisheries Service (“NMFS”) Regional Viewing Guidelines while in transit.</li> <li>In addition, if awarded this power contract, Vineyard Wind intends to establish a \$3 million fund to develop and demonstrate innovative methods and technologies to enhance protections for marine mammals during offshore wind development. See section 14 for more details on this fund.</li> </ul>
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### Other Biological Factors, Including Endangered Species

Endangered avian and marine mammal species are included in their respective sections. In our consultations, concerns have been raised about benthic species/habitats, especially in conjunction with cable installation. We have therefore addressed those in this section as well as the endangered sea turtles.

#### Benthic

Seafloor conditions within the turbine area are very homogenous, dominated by fine sand and silt-sized sediments that become finer in deeper water. The benthic community in the turbine area includes amphipods and other crustaceans, gastropods, polychaetes, bivalves, sand dollars, burrowing anemones, brittle stars, sea squirts, tunicates, and sea cucumbers.

#### Sea turtles

Four species of sea turtles may occur in the Project Area: Loggerhead Sea Turtle (*Caretta caretta*), Kemp’s Ridley Sea Turtle (*Lepidochelys kempii*), Green Sea Turtle (*Chelonia mydas*), and Leatherback Sea Turtle (*Dermochelys coriacea*). The presence of sea turtles in the Project Area is primarily limited to summer and fall months and no nesting sites are expected near landfall areas for the project.

<p><b>Potential Impacts and Impediments to Development</b></p>	<ul style="list-style-type: none"> <li>Mortality of benthic organisms is expected within the Project Area where temporary disturbance of the seafloor occurs due to cable and foundation installation, but the impacts are expected to be localized and not impact the population. The surrounding vicinity has an abundant area of similar habitat type, and the portion of the wind turbine development area that will be disturbed is relatively small (0.4%), and the sandy bottom community typical to the area has adapted to frequent natural sediment movement that already creates temporary impacts.</li> <li>Impacts to sea turtles may include localized noise and vessel traffic, short-term disturbance of local habitat, and long-term modification (not loss) of habitat. These impacts are expected to be short-term and localized.</li> <li>Four turtle species could be exposed to stressors from construction and operation of the project, but two of these species (Kemp’s Ridley and Green Sea Turtles) are not common in the region and have insignificant vulnerability to impacts. Loggerheads and Leatherbacks may be exposed to stressors that may result in the short-term, localized disturbance of individuals.</li> </ul>
<p><b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b></p>	<ul style="list-style-type: none"> <li>Turbines are widely-spaced so that the foundations (and associated scour protection) only occupy a minimal portion of the area, leaving a huge portion of the WDA undisturbed. Vineyard Wind will conduct post-construction monitoring to document habitat disturbance and recovery. A draft benthic habitat monitoring plan has been provided with the COP.</li> <li>Anchored vessels are not intended to be used for construction activities in the wind farm, but may be used along portions of the offshore export cable. If used, anchored vessels will avoid sensitive seafloor habitats to the greatest extent practicable. Where feasible and considered safe, Vineyard Wind will use mid-line buoys on anchor lines to minimize impacts from anchor line sweep.</li> <li>The project is located in an area that lacks critical sea turtle habitat. Landfall Sites and onshore facilities are not located near known sea turtle nesting beaches. Avoidance, minimization, and mitigation measures employed for marine mammals are also applicable to sea turtles.</li> </ul>

### Landscape and Visual

The area of potential visual effects is comprised of Martha’s Vineyard, Nantucket Island, the Elizabeth Islands, associated smaller islands and a portion of Cape Cod. The islands are generally characterized by

low elevation, with undulating hills and shallow depressions. Elevations range from sea-level to approximately 110 ft (34 m) above sea-level in the central portion of Martha's Vineyard and Nantucket. Most of the oceanfront is fringed by barrier beaches and sand dunes. The overall aesthetic character of Martha's Vineyard and Nantucket is that of a small-town landscape with minimal urban development. The horizon, looking south towards the ocean coast, is typically defined by a view of the open ocean. Lights from boats and ships, and often nearby shores, can be seen from all locations of the coastline on the ocean horizon on most nights.

<b>Potential Impacts and Impediments to Development</b>	<ul style="list-style-type: none"> <li>• The turbines will result in change to landscape conditions for viewers along the Martha's Vineyard and Nantucket coastline, but viewers will only have limited visibility of the WTGs when weather conditions allow. At distances greater than 23 km (14 mi), Vineyard Wind 1 would likely be considered visually subordinate to the wider landscape. Night lighting may have an effect on residents and vacationers in beachfront settings where they currently experience dark skies.</li> <li>• All offshore and onshore cables will be subsurface/buried and will not be visible. The power grid connection will be constructed adjacent to an existing onshore substation. The proposed improvements for the onshore substation will be consistent in scale and visual character with the existing electric substation.</li> </ul>
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>• Due to the distance of the turbines from shore (over 23 km), the Earth's curvature obstructs visibility of the project in its entirety from some locations and partially obstructs visibility elsewhere. At no point can any of the structures be viewed at their full height from shore. In addition, meteorological and atmospheric conditions could often obscure views of the WDA.</li> <li>• The proposed light gray color and matte finish of the WTGs, blends with the sky and prevents light from reflecting off the WTGs. The impact of FAA and USGC lighting is substantially limited by the distance of Vineyard Wind 1 from coastal vantage points. However, Vineyard Wind expects to use an Aircraft Detection Lighting System, which is automatically activated by approaching aircraft, or a system that adjusts lighting intensity depending on visibility. The use of either of these systems is subject to commercial availability and approval by BOEM and FAA, if applicable.</li> </ul>

### Oceanography

The Project Area consists of Nantucket Sound, which is located between the south coast of Cape Cod and Martha's Vineyard and Nantucket Island, and the area south of both islands where both the Offshore Export Cable Corridors ("OECCs") and the Wind Development Area ("WDA"). Dominant wind and sea direction is from the southwest and south with a secondary component from the northwest. Sediment is transported by longshore drift and tidal currents, with episodic storm events causing more severe erosion and redistribution. The tides are semi-diurnal (two highs and two lows daily).

<b>Potential Impacts and Impediments to Development</b>	Vineyard Wind 1 is not expected to impact oceanography.
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>• Many plans will be in place to ensure protection of the ocean resources including an Oil Spill Response Plan (OSRP), waste management plans, an emergency response plan, and an overarching Safety Management System (SMS).</li> <li>• In addition, turbines are widely spaced and bottom disturbing impacts will be minimized. The WTGs are laid out in a grid-like pattern with spacing of 0.76-1.0 nm between turbines. The project structures only impact less than 1% of the northern half of the lease where initial project structures will be installed.</li> </ul>

### Sound, Noise, and Vibration

Baseline ambient underwater noise studies have been performed close to the Project Area. Kraus et al. (2016) recorded ambient noise in the frequency range of 70.8-224 Hz in the MA/RI WEA from 2011 to 2015. Sound levels ranged from 96 dB re 1  $\mu$ Pa to 103 dB during 50% of recording time. Sound pressure levels were 95 dB re 1  $\mu$ Pa or less 40% of the time and greater than 104 dB re 1  $\mu$ Pa 10% of the time.



<b>Potential Impacts and Impediments to Development</b>	<ul style="list-style-type: none"> <li>Noise during construction and particularly during pile driving is addressed in the Marine Mammal section above and will be analyzed in-depth through the permitting process.</li> <li>Overall, current literature indicates noise generated from the operation of wind farms is minimal and only localized avoidance behaviors are expected; acclimation to the noise over time may occur.</li> </ul>
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	Vineyard Wind will apply a soft-start procedure to the pile driving process to mitigate the potential impacts of injury to fish from pile driving. Additional noise mitigation for construction activities will be implemented (see Marine Mammal section).

### Socio-economic and Land Use

The project region is the geographic area that could be affected by project-related activities. It consists of the communities in Barnstable County, Bristol County, Dukes County, and Nantucket County. Each of the counties within the project region have dramatically fluctuating seasonal populations, with much of the economy dominated by seasonal activities related to recreation and tourism. Barnstable County also hosts substantial health, social service, and professional, management, and administrative employment opportunities. Bristol County's Port of New Bedford is a full-service port with well-established fishing and cargo industries. The Port of New Bedford's operations and facilities include warehouses, ice houses, boatyards and ship repair yards, construction, engineering, tug assists, pilots and other maritime services.

<b>Potential Impacts and Impediments to Development</b>	<ul style="list-style-type: none"> <li>Impacts associated with the activities are anticipated to have a significant positive impact to the Project Area economy, as further described in Section 14.</li> <li>Vineyard Wind has staffed a New Bedford office and has engaged a number of Massachusetts-based environmental consultants, engineers, and attorneys to support elements of the design effort, licensing, and permitting. Vineyard Wind will be implementing a workforce and supply chain development program that will multiply the benefits of Vineyard Wind 1 for long-term, sustainable development.</li> <li>Construction, operations and maintenance, and decommissioning activities will provide numerous job opportunities within the marine trades and affiliated industries, and will have a positive impact on those sectors, particularly those heavily influenced by seasonal hiring. Opportunities for marine trades industries include: tug and other vessel charters, dockage, fueling, inspection/repairs, provisioning, and crew work.</li> <li>The construction of the O&amp;M Facilities will require additional engineering, construction, and trades personnel. The O&amp;M Facilities will be staffed by a team of technicians and engineers. Additional service providers will be necessary during planned inspection, maintenance, and repair of the onshore and offshore facilities.</li> <li>Vineyard Wind anticipates sourcing many goods and services throughout the multi-decade operations and maintenance phase from local and regional providers.</li> </ul>
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>To the extent feasible, construction materials and other supplies, including vessel provisioning and servicing, may be sourced from within the project region.</li> <li>Vineyard Wind will implement a comprehensive communications plan with the various port authorities; Federal, state and local authorities; and other key stakeholders, including commercial and recreational fishermen.</li> <li>Vineyard Wind will continue to work cooperatively with southeastern Massachusetts educational institutions to help create training and educational opportunities for their students and faculty throughout each phase of the project. Vineyard Wind is committed to working with BOEM, the Commonwealth of Massachusetts, local and regional officials and other stakeholders to maximize this unique and timely opportunity to establish Massachusetts as a center for the offshore wind industry in the United States. Please see Section 14 for more details.</li> </ul>

### Traffic and Transportation (including Navigation)

Commercial vessel traffic in the project region makes use of waterways, ports, and other coastal infrastructure to move goods and passengers, and is essential for the region's economy and security. Commercial vessel traffic is heaviest in three primary areas: 1) vessels approaching, entering, and exiting Narragansett Bay; 2) vessels entering and exiting Buzzards Bay; and 3) vessels traveling from Hyannis to



the Island of Nantucket. A high volume of passenger ferry traffic exists between Hyannis and Nantucket Island. The majority of vessel traffic in the wind turbine area consists of transiting fishing vessels.

Upland traffic on Cape Cod increases dramatically in the summer and is at its lowest levels in the ‘off-season,’ often considered to be after Labor Day and before July 4th.

<p><b>Potential Impacts and Impediments to Development</b></p>	<ul style="list-style-type: none"> <li>• Project-related activities may impact navigation capacity and vessels transiting to and from ports along the south coast of Massachusetts, Cape Cod and the Islands, and Rhode Island.</li> <li>• Temporary restrictions on non-project related vessels transiting in the immediate vicinity of the project's construction vessels may be necessary. Aside from this, no significant disruptions to navigation patterns or aids to navigation are anticipated during the construction. Congestion in the port(s) could also occur during project construction.</li> <li>• During the operations and maintenance phase, the presence of Vineyard Wind 1 may increase risks to navigation. However, the structures will also be considered Private Aids to Navigation (PATONS).</li> </ul> <p><u>Upland</u></p> <ul style="list-style-type: none"> <li>• As the route is primarily within roadways, traffic along the upland cable route will be impacted by project construction.</li> </ul>
<p><b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b></p>	<ul style="list-style-type: none"> <li>• Vineyard Wind 1 is sited within the MA WEA, which, after public comment, was developed to avoid shipping lanes and USCG-designated Traffic Separation Schemes.</li> <li>• The WTGs are laid out in a grid-like pattern with spacing of 0.76-1.0 nm between turbines. In consultation with local fishermen and the USCG, corridors in a northwest/southeast and northeast/southwest direction have been maintained to align with the primary transit through the area.</li> <li>• To minimize hazards to navigation, all project-related vessels, equipment, and appurtenances will display the required navigation lighting and day shapes. Notices to mariners will be distributed by Vineyard Wind to notify recreational and commercial vessels of their intended operations to/from and within the WDA. Vineyard Wind will implement a Fisheries Communication Plan to keep the relevant parties informed throughout this phase of the project (see Attachment 7.4-2).</li> <li>• Vineyard Wind will continue to work with ferry operators, harbor pilots, other vessel operators, the New Bedford Harbor Development Commission, the New Bedford Harbor Master, USCG, and other entities to ensure disruption to commercial vessel traffic and navigation is minimized to the greatest extent practicable. Vineyard Wind has also engaged with the Northeast Marine Pilots Association to coordinate construction and installation vessel approaches to the Project Region, as required by state and Federal law, and to minimize impacts to commercial vessel traffic and navigation. A traffic management plan will be developed for harbor activities.</li> <li>• To aid mariners navigating the WDA, WTGs and ESPs will contain fog horns and be lit, marked, and maintained as PATONS in reference to International Association of Lighthouse Authorities ("IALA"). Notices to Mariners ("NTMs") will be distributed by Vineyard Wind and the USCG to notify recreational and commercial vessels of construction and installation activities.</li> </ul> <p><u>Upland</u></p> <ul style="list-style-type: none"> <li>• Installation of duct bank beneath paved roadways in the Towns of Yarmouth and Barnstable will be conducted off season, thus helping to minimize any temporary traffic disruption. A Traffic Management Plan will be developed so as to minimize disruptions to residences and commercial establishments in the vicinity of construction and installation activities.</li> </ul>

### Water Resources (including quality and flood risk)

For the offshore area south of Martha's Vineyard and Nantucket, known as the outer continental shelf (OCS), oceanic circulation patterns play an increasingly larger role in transporting and dispersing anthropogenic contaminants and determining water quality. In northeastern coastal waters, levels of dissolved oxygen, turbidity, nitrogen, and phosphorous are generally rated as fair to good, as measured by EPA's WQI.

Strong winds opposing maximum tidal flow can create above average wave heights and even standing waves, particularly in constricted waterways. Similarly, water levels can rise above normal and flood low lying coastal regions when a passing storm system pushing water onshore combines with spring tides

(new moon or full moon tidal phases). While Category 3 hurricanes are rare in New England, nor'easters are much more common and also bring increased winds, seas, and coastal water levels.

<b>Potential Impacts and Impediments to Development</b>	Pile driving, offshore cable installation, horizontal directional drilling ("HDD"), open cut, installation of scour protection, and dredging may impact water quality via sediment resuspension and dispersion. Impacts to water quality from the project will be short-term and localized.
<b>A Plan to Avoid, Minimize, or Mitigate Impacts and/or Impediments</b>	<ul style="list-style-type: none"> <li>• In most cases, during installation of the offshore cable system, mobilized sediment will not be transported far by the currents and will settle rapidly. Based on sediment dispersion modelling maximum deposition is typically less than five millimeters (0.2 in).</li> <li>• Routine releases from vessels, such as domestic water, bilge water, engine cooling water, deck drainage and/or ballast water are expected, but these releases would quickly disperse, dilute, and biodegrade so that impacts to water quality would be minimal.</li> <li>• A draft Oil Spill Response Plan (OSRP) is included in the COP.</li> </ul>

*7.5. Provide documentation identifying the level of public support for the project including letters from public officials, newspaper articles, etc. Include information on specific localized support and/or opposition to the project of which the bidder is aware. Provide copies of any agreements with communities and other constituencies impacted by the project, and a stakeholder map with a plan for community engagement activities. Please discuss the status of the stakeholder plan.*

Vineyard Wind enjoys substantial public support, in particular support from those communities closest to the project.

The broad and diverse support is evidenced by the many letters of support we've received, as summarized in **Table 7.5-1**. Vineyard Wind has received letters of support from all seven towns closest to the turbine area, including the six towns of Martha's Vineyard and Nantucket. Vineyard Wind has also received a Letter of Support from the Mashpee Wampanoag Tribe, and resolutions from the Mayor and City Council of New Bedford.

We have received letters from schools, colleges, and organizations interested in partnering with us in providing training and career development opportunities in offshore wind for residents of southeastern Massachusetts.

We have received a Letter of Support from the state legislative delegation for the Cape and Islands, Senator Cyr and Representative Fernandes, as well from Representative and Speaker Pro Tempore Patricia Haddad, who represents the area of Somerset.

Vineyard Wind has received letters from individual fishermen, as well as the Fishing Partnership.

**Table 7.5-1: Letters of Support and Interest received by Vineyard Wind to Date.**

Letter From	Attachment Number	Notes
Town of Aquinnah	7.5-1	Martha's Vineyard
Town of Tisbury	7.5-2	Martha's Vineyard; O&M facility location
Town of Chilmark	7.5-3	Martha's Vineyard
Town of Edgartown	7.5-4	Martha's Vineyard
Town of Oak Bluffs	7.5-5	Martha's Vineyard
Town of West Tisbury	7.5-6	Martha's Vineyard
Town of Nantucket	7.5-7	
City of New Bedford	7.5-8	Office Opening Resolutions Mayor, Council
Barnstable Town Manager	7.5-9	Letter of Interest in HCA
Mashpee Wampanoag Tribe	7.5-10	
Speaker Pro Tempore Haddad	7.5-11	
Senator Cyr and Rep. Fernandes	7.5-12	MV and Nantucket delegation

Letter From	Attachment Number	Notes
Martha's Vineyard Commission	7.5-13	Martha's Vineyard
Fishing Partnership Support Services	7.5-14	Training Program
Fisherman Bill Blount	7.5-15	
Fisherman Bobby DeCosta	7.5-16	
Fisherman Gam Gammill	7.5-17	
Fisherman Ned Rice	7.5-18	
Fisherman Pete Kaizer	7.5-19	
Bristol Community College	7.5-20	
Cape Cod Community College	7.5-21	
Martha's Vineyard Regional High School	7.5-22	
Cape and Vineyard Electric Coop	7.5-23	Letter of Interest
Cape and Islands Self Reliance	7.5-24	Training Programs
Coonamessett Farm Foundation	7.5-25	
Cape Cod Chamber of Commerce	7.5-26	

In addition to the many letters of support received, the positive public sentiment for this project is evidenced by the many of news stories regarding the project, which are provided in Attachment 7.5-27.

There is no known organized opposition to Vineyard Wind 1 and, as evidenced by the many letters of support and press stories, considerable public support. Vineyard Wind's very early stakeholder initiative, underway since 2009, coupled with a comprehensive Community Engagement Plan, has proven to be very effective in generating community support for the project. This strong public support will help ensure the project stays on schedule to start construction in 2019.

### **Early Community Outreach**

Vineyard Wind 1 is perhaps unique among offshore wind projects in the world in that it started first as a community outreach initiative, in 2009, as opposed to a technical scoping exercise. This early outreach has proven to be a durable foundation for growing support for the project from communities in the Project Area, fishermen, and environmental groups.

In 2009, leaders from Vineyard Wind (at the time called OffshoreMW) spent considerable time with residents of the Cape and Islands to learn more about the reasons for objections to another offshore wind project proposal. From these many meetings came two important initiatives of Vineyard Wind, both of which put the project on a positive path to public support, and also were a bellwether for the US offshore wind industry generally. These initiatives related to the two stakeholder groups that have historically been at the center of offshore wind development: local communities and fishermen.

Importantly, both of these very early outreach initiatives informed Vineyard Wind's site acquisition strategy, which developed in parallel with the BOEM Intergovernmental Task Force process, as described below. This in turn means that the Vineyard Wind lease area is, by its very location, one that is likely to continue to have ongoing support, or at least not to motivate organized opposition.

### **First Fisheries Representative**

The first of Vineyard Wind's outreach initiatives was with the fishing industry. Vineyard Wind was the first US offshore wind company to engage a fisheries representative, a practice now recommended in BOEM's guidelines. Specifically, in 2010, Vineyard Wind engaged Jim Kendall, a retired fishing boat captain based in New Bedford, to solicit input from fishermen in the region regarding the area south of Martha's Vineyard.

Mr. Kendall's report indicated that the general area that included what would later be the Vineyard Wind lease area was not one that was heavily fished. Moreover, much of what fishing did occur was using fixed gear or recreational fishing, both of which are largely compatible with offshore wind.

Mr. Kendall's report also indicated that the largest impact on fisheries would likely be that the area was heavily transited by fishing vessels going to and from New Bedford and the fishing grounds to the east, on the banks. This early input was considered from the start of Vineyard Wind's site selection and design, and is today reflected in the turbine layout of the project, which allows for wide corridors between the turbines in the direction of frequent fishing vessel traffic.

Perhaps as important as the specific information Mr. Kendall reported, Vineyard Wind's engagement of him validated the fisheries representative approach for effective communication between an offshore wind project and the fishing industry. While the fisheries representative is compensated by Vineyard Wind, the fisheries representative does not represent the company. Rather, the fisheries representative's job is to represent the fishing industry back to Vineyard Wind. And by selecting a fisheries representative who is known, trusted, and respected by the fishing industry, and also knows how fishermen see the world, work, and communicate, a highly effective communication channel can be established. For example, fishermen work long hours offshore, setting sail and returning on short notice dependent on weather conditions. And when ashore, they are busy preparing for the next trip. Scheduling meetings with fishermen is, understandably, difficult at best. However, a fisheries representative who can hear a weather report and know when he is likely to find a particular type of fisherman at his dock can be much more effective.

The fisheries representative approach better ensures consistent and accurate information being made available to Vineyard Wind at an early stage, when such information can most readily be incorporated into project design so as to minimize any potential impacts. And the fisheries representative approach also enables effective communication from Vineyard Wind out to the fishing sector. For example, Vineyard Wind was first to provide information about its offshore geological survey activities to fishermen by way of the electronic chart system that most commercial fishermen routinely look to for navigation and safety updates.

Vineyard Wind's early initiative in fisheries outreach was highly effective. While the specific methods and approaches to fisheries outreach has and will continue to evolve as this project develops, the principle of early, often, transparent, and pro-active engagement with the fishermen with whom we share the project waters will continue through the lifetime of the project.

### **First Community Benefits Agreement**

In the same period that Vineyard Wind first engaged a fisheries representative, that is in 2009-2010, Vineyard Wind was also meeting with local community groups engaged on the issue of an offshore wind project located in Nantucket Sound. Through these meetings, we met Vineyard Power Cooperative (Vineyard Power). Vineyard Power is a 501(c)12 nonprofit, community-owned energy cooperative, and was formed in order to help build a sustainable energy future for Martha's Vineyard, while advocating to keep benefits and control of local energy resources within the community. Vineyard Power's growing membership is now over 1380 households and businesses, which is about 10% of the island's electricity accounts (meters). Vineyard Power has successfully completed several major solar energy projects on Martha's Vineyard, and also offers programs in smart grid and electric vehicles.

Vineyard Power learned from the controversy around a proposed Nantucket Sound project that significant and meaningful local community participation and involvement, including identifying and pursuing local community benefits, was critically important for the success of large scale offshore wind projects.

In the case of offshore wind, Vineyard Power determined that the best way forward would be to team with a private developer and, to that end, met with all offshore wind developers active on the East Coast at the time. During this time Vineyard Wind, as it continued its work to identify offshore areas suitable for a project, had continued to frequently consult with Vineyard Power regarding local community concerns and issues. In large part because of this demonstrated commitment to local community engagement, Vineyard Power ultimately decided to formalize the relationship with Vineyard Wind, then called OffshoreMW. The formal relationship between the organizations began in 2011, when Vineyard

Wind and Vineyard Power entered into an MOU and jointly submitted an offshore wind lease application in response to BOEM's Massachusetts's Request for Interest (RFI). In January 2015, Vineyard Power formally partnered with Vineyard Wind through the signing of a Community Benefits Agreement (CBA). This was and still remains the first CBA in the US between an offshore wind developer and a local community group.

The CBA is, at its essence, an agreement that Vineyard Wind and the local community group will proactively address the issues most important to each, for the sake of a mutually successful project. In the case of the Martha's Vineyard community, this was found to mean addressing a few issues that might directly impact their daily lives (such as visibility), but more importantly bringing real and tangible benefits of Vineyard Wind 1 to Martha's Vineyard. Vineyard Power, through their own outreach and by themselves being a part of the local community fabric, determined that job creation, particularly locally, and development of distributed energy projects was a key and important benefit for their community. There was a real desire on the island to diversify its economy, have more middle-income employment opportunities that would allow young residents to build careers on the island, and maintain the culture and heritage of a working waterfront. This input to, and education of, Vineyard Wind as to the importance of local job creation caused Vineyard Wind to work hard to develop an O&M solution which was effective for the project, but also worked for the local community hosting the project. The result was the current plan to base O&M activities on Martha's Vineyard, and set a target of 100% of the operations and maintenance staff being Martha's Vineyard residents within five years of Vineyard Wind 1 being operational. This target will be met by implementing training programs at Martha's Vineyard's vocational school and partnering with affiliated community colleges that have been identified in the MassCEC's offshore wind jobs program. Vineyard Wind's commitment to Martha's Vineyard job creation has been extremely well received by the local community, and has been a decisive factor in earning the support of the local community on Martha's Vineyard.

Perhaps more importantly than any particular development decision, however, has been the close working relationship between Vineyard Power and Vineyard Wind which has developed over the last seven years. Vineyard Power is now very much an integral part of the project development team, and literally has a seat at the table when many important decisions are made, and during the daily course of the development work. This has generated a level of trust and transparency with members of the local community that would likely not otherwise be possible.

The relationship between Vineyard Wind and Vineyard Power has proven highly effective in ensuring the rapid development of Vineyard Wind 1 while maintaining strong public support, better ensuring the project schedule is maintained, and that the project is successfully built and operated.

### **Community Engagement Plan**

Vineyard Wind's comprehensive Community Engagement Plan is provided as Attachment 7.4-1. As described above, Vineyard Wind has been engaging with the local community for eight years. These efforts have become more structured and formalized since the execution of the Community Benefits Agreement, culminating in the current plan. The plan includes a stakeholder map and community engagement activities plan, and is largely informed by Vineyard Wind's seven years of experience in stakeholder outreach in the project region.

Vineyard Wind's community engagement is focused on three key areas: early and transparent relationship with local communities, growing the relationship with the fishing community whenever possible, and delivering on the promise of local benefits as identified by the local communities, which means, in particular, jobs creation and improving the energy infrastructure on the islands as they move to a 100% renewables energy future.

### ***Early and Transparent Relationship with Local Communities***

Vineyard Wind's engagement with local communities will continue to be based around early, transparent, meaningful and substantial participation in the project development and implementation process. This



deep involvement in the project provides early and clear guidance on opportunities to provide local benefits – benefits as identified by the communities themselves– and avoid issues that could generate or exacerbate opposition to the project.

### ***Growing the Relationship with Fishermen***

Fishing in southern New England is both a livelihood and a community; a way of life. As such, we consider our fisheries communications plan, provided in Attachment 7.4-2, to be an important and integral part of our community engagement plan. Our fisheries outreach will continue to build on the long-time relations we have developed through Jim Kendall, who has been our fisheries representative since 2010. We will also explore engaging fisheries representatives for specific ports or gear types that may have more impacts than others.

An important new initiative Vineyard Wind will be launching in 2018 is our Fishermen and Wind: Partners for Safety program. This program is a joint initiative between Vineyard Wind and the Fishing Partnership Support Services, which provides support to fishing families through health care counseling, health and safety training, and legal and financial counseling. This program will build better and stronger relationships between the fishing industry and offshore wind from the ground up, by developing personal relationships between individuals from both industries.

These personal relationships will be developed through a series of fishermen-wind tech joint training classes, starting in the spring of 2018, with trainings in New Bedford, the project's construction port, and Martha's Vineyard, the project's O&M base location. By training together to ensure the safety of everyone who makes their living offshore, fishermen and wind technicians will be able to find common understanding and develop the personal relationships that will allow both industries to grow and succeed alongside each other for many years to come. It is anticipated that these initial safety training courses will form the basis for other programs and initiatives that enable a successful and sustainable fishing industry, and help grow the relationship between Massachusetts' oldest offshore industry, fishing, and its newest offshore industry, wind.

The Letter of Intent between the Fishing Partnership Support Services and Vineyard Wind to implement the Fishermen and Wind: Partners for Safety program is provided in Attachment 7.5-14.

### ***Delivering Local Benefits***

Providing benefits of the project to local communities is the basis of the strong support Vineyard Wind has received to date, and we are firmly committed to delivering benefits that the local communities themselves have identified as being important to them.

In the case of Martha's Vineyard, the community has indicated that on-island job creation is important to the community, as is helping the island move further to a 100% renewables energy future and providing greater energy security. In response, Vineyard Wind is moving forward with an O&M based on Martha's Vineyard, and, moreover, has set a target that 100% of the employees at this base will be residents of the island within five years Vineyard Wind 1 beginning operations. This initiative is part of Vineyard Wind's comprehensive local job creation initiative, the Offshore Wind Accelerator, which is described in detail in Section 14. In addition, Martha's Vineyard will be a participant in Vineyard Wind's Resiliency and Affordability Fund, described below.

In the case of Nantucket, initiatives that would offset potential future costs related to the island's growing electricity demand, as well as enhancing the island's energy resiliency, were identified as important benefits; this direction was received through numerous consultations with community leaders and officials of Nantucket, including appearances before the town's Board of Selectmen. In response, Vineyard Wind will be establishing a Resiliency and Affordability Fund, described in further detail in Section 14.6. The Resiliency and Affordability Fund will provide \$1 million dollars per year during the project's operation, in support of distributed solar and storage projects located in host communities of the project, including Nantucket. These projects will enhance resiliency at public safety and shelter



buildings, provide distributed storage solutions to reduce energy costs, and provide for electric bill savings for low-income ratepayers. Decisions regarding deploying resources from the fund will be guiding by a steering committee, with representatives from each of the host communities.

Local benefits for other host communities, such as Barnstable and Yarmouth, will be identified through the ongoing conversations with these communities. For example, Barnstable and Yarmouth have identified supporting the ecological health of Lewis Bay as being important to their communities, and Vineyard Wind is currently working to identify specific means to help provide benefit in this regard. It is anticipated that such benefits would be provided through a Host Community Agreement with each of these communities.

*7.6. Provide documentation demonstrating that the project was or will be qualified as New Class I Renewable Portfolio Standard Eligible Resource under M.G.L. c. 25A, § 11F, and 225 CMR 14.00.*

Vineyard Wind 1 will begin operation after 1997, will be located within the ISO-NE Control Area, and will generate electricity using wind energy as its fuel source, and, therefore, will qualify as a “New Class I Renewable Portfolio Standard Eligible Resource” as defined under M.G.L. c. 25A, section 11F and 225 CMR 14.00. Vineyard Wind will document such qualification by relevant regulatory procedures that are in place at the appropriate time in the project development, per those regulations.

*7.7. All bidders must include sufficient information and documentation that demonstrates that the bidder will utilize an appropriate tracking system to ensure a unit-specific accounting of the delivery of Offshore Wind Energy Generation, to enable the Department of Environmental Protection, in consultation with DOER, to accurately measure progress in achieving the commonwealth’s goals under chapter 298 of the acts of 2008 or Chapter 21N of the General Laws. The RECs associated with Offshore Wind Energy Generation must be delivered into the Distribution Companies’ NEPOOL GIS accounts.*

The Distribution Companies have previously confirmed, in response to a question posted on the solicitation website, that the New England Power Pool Generation Information System (NEPOOL GIS) system is an appropriate tracking system to ensure a unit-specific accounting of the delivery of Offshore Wind Energy Generation, to enable the Department of Environmental Protection, in consultation with DOER, to accurately measure progress in achieving the Commonwealth’s goals under chapter 298 of the acts of 2008 or Chapter 21N of the General Laws. Therefore, Vineyard Wind hereby certifies that the RECs associated with the Offshore Wind Generation will be delivered into the Distribution Companies’ NEPOOL GIS accounts, on the terms specified in any purchase agreements, as the means to satisfy this requirement.

*7.8. Identify any existing, preliminary or pending claims or litigation, or matters before any federal agency or any state legislature or regulatory agency that might affect the feasibility of the project or the ability to obtain or retain the required permits for the project.*

There are no existing, preliminary, or pending claims or litigation, or matters before any Federal agency or any state legislature or regulatory agency that might affect the feasibility of the project or the ability to obtain or retain the required permits for the project.

**Section 8 OF APPENDIX B TO THE RFP  
ENGINEERING AND TECHNOLOGY; COMMERCIAL ACCESS TO EQUIPMENT**

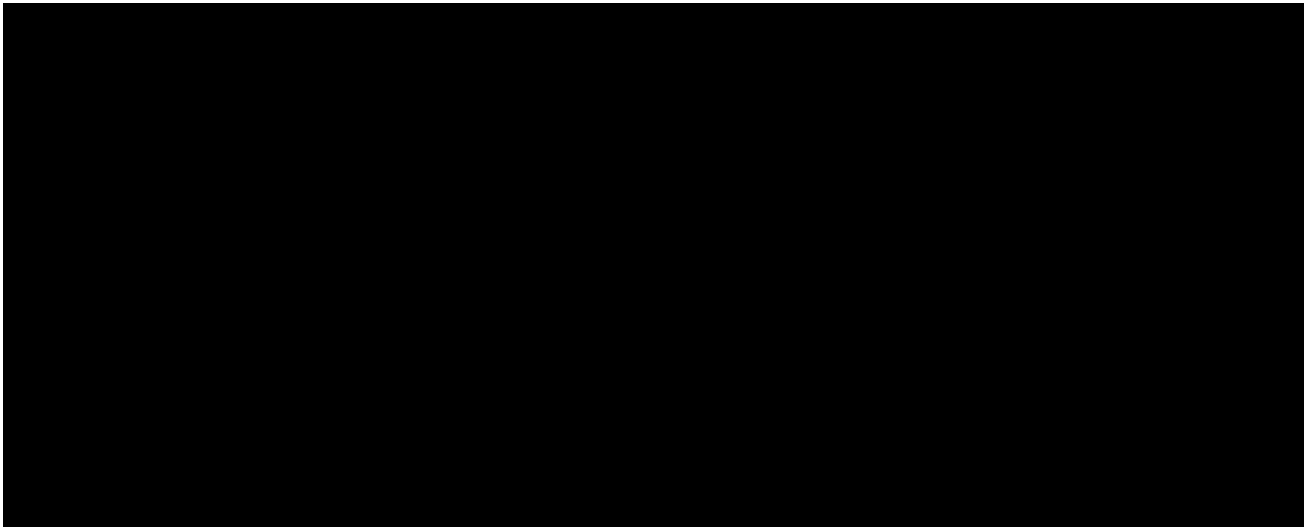
*This section includes questions pertinent to the engineering design and project technology. This section must be completed for a project that includes new facilities or capital investments for both generation and transmission components if applicable. Bidders should provide information about the specific technology or equipment including the track record of the technology and equipment and other information as necessary to demonstrate that the technology is viable.*

**8.1.** *Provide a reasonable but preliminary engineering plan which includes the following information:*

- i. Type of generation and transmission technology*
- ii. Major equipment to be used (including nacelle, hub, blade, tower, foundation, transmission structures and platforms, electrical equipment and cable)*
- iii. Manufacturer of each of the equipment components listed above as well as the location of where each component will be manufactured.*
- iv. Status of acquisition of the equipment components*
- v. Whether the bidder has a contract for the equipment. If not, describe the bidder's plan for securing equipment and the status of any pertinent commercial arrangements*
- vi. Equipment vendors selected/considered*
- vii. Track record of equipment operations*
- viii. If the equipment manufacturer has not yet been selected, identify in the equipment procurement strategy the factors under consideration for selecting the preferred equipment*

**i. Type of generation and transmission technology**

Vineyard Wind proposes to build a 400 MW offshore wind farm based on commercially available and highly reliable technology. Consisting of [REDACTED] Wind Turbine Generators (WTGs), each to be placed offshore on a monopile support structure with a Transition Piece (TP), 66kV inter-array cables will connect the WTGs to the Electrical Service Platform (ESP) where the power is transformed from 66kV to 220kV. From the ESP, two 220kV offshore export cables will transmit the power to shore. Onshore, the offshore export cable will be jointed with the 220kV onshore export cable transmitting the power to the Vineyard Wind onshore substation interconnecting at Barnstable. The Vineyard Wind substation will “step-down” the power from 220kV to 115kV, enabling the power to be delivered into the grid at Barnstable Switch Station (No. 958); for further details, refer to Section 6. The offshore wind generation and transmission system is depicted in **Figure 8.1-1**.



**Figure 8.1-1:**



*ii. Major Equipment to Be Used*

Vineyard Wind 1 will be delivered with the following seven major equipment groups, as depicted in **Figure 8.1-1:**

1. WTGs
2. Foundations
3. Inter-array cables
4. Electrical service platform
5. Offshore export cable
6. Onshore export cable
7. Onshore substation

The seven major equipment groups will be detailed in the following sections.

- 1.



A schematic presentation of the WTG is given **Figure 8.1-2.**

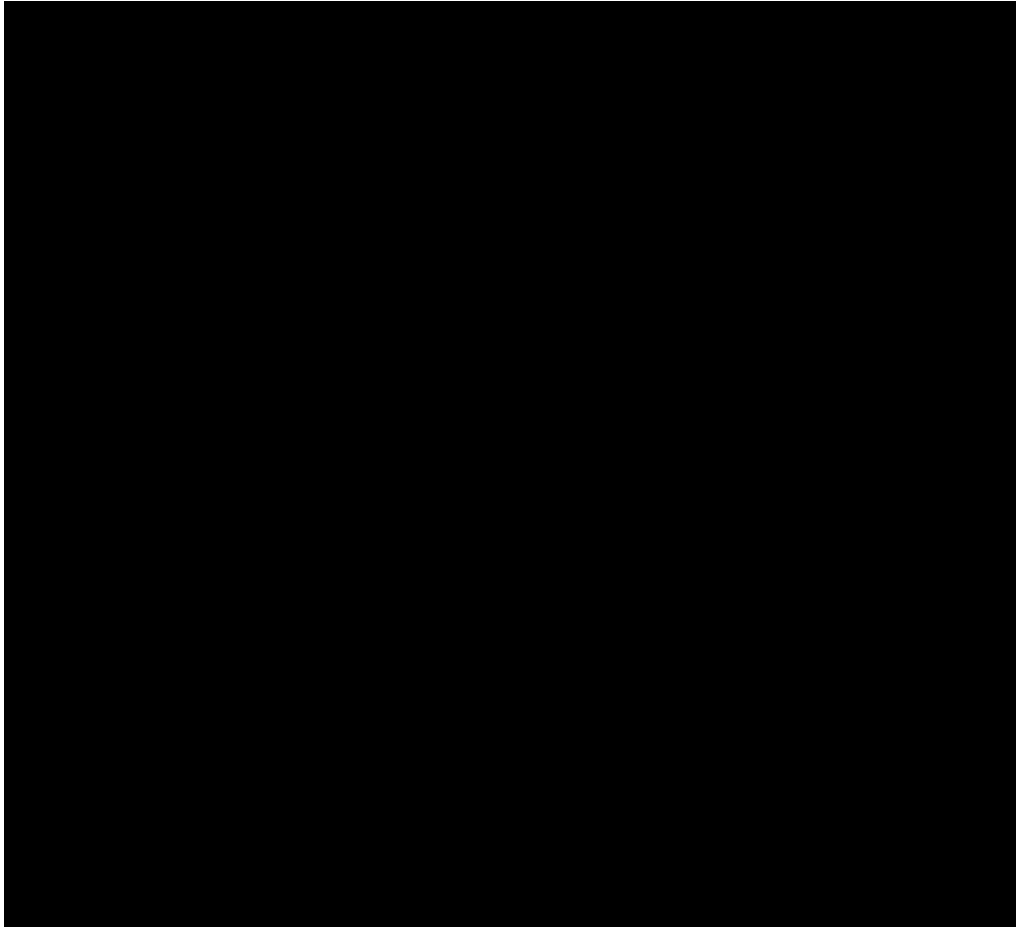


Figure 8.1-2

The WTG consists of a steel tower with a diameter of [REDACTED] bolted to the top of the TP. On top of the WTG tower are the nacelle (housing) and the hub. The nacelle features a driveshaft, a gearbox, or a direct-drive technology, depending on WTG type, as well as the electrical generator and electric motors to yaw the turbine and workspace. A full array of instrumentation, controls, fire protection systems and other safety equipment, ventilation and cooling, and other ancillary equipment is included. Wind sensors mounted on the top of the nacelle are used to control a yaw system which ensures that the nacelle is facing into the wind, thus maximizing power production.

[REDACTED] see [REDACTED].

2. **Foundations** will be monopiles. The foundation concept is illustrated in **Figure 8.1-3**.

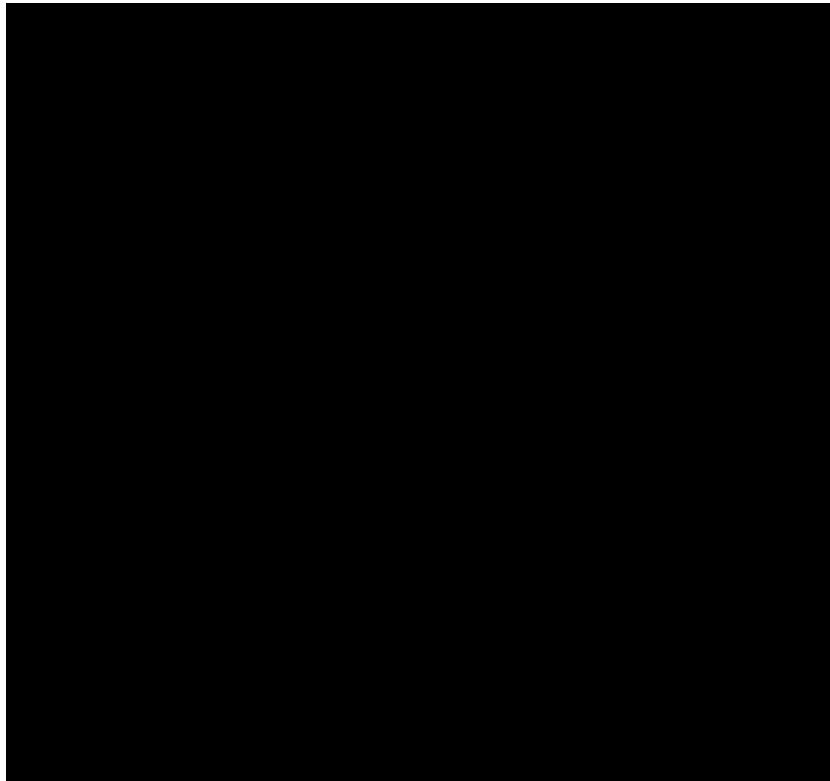


Figure 8.1-3

The foundation concept consists of a steel monopile (MP) with a grouted or bolted transition piece (TP). The MP could be up to [REDACTED] in length and will be driven to a depth of [REDACTED] below the mudline. Pile diameter will range from [REDACTED] and a single pile will weigh [REDACTED]. The TP will be [REDACTED] in length and weighs [REDACTED].

In addition, the foundation will comprise the following features; Inter-Array Cables hang-off supports, corrosion protection systems (internally and externally), boat landing for accessing each turbine, Davit crane to bring tools and parts up from the service vessel, navigation aids, ID marking, and lights, external and internal platforms, various electrical components, and scour protection.

3. **Inter-Array Cables:** The cables will be 66 kV voltage with 3-cores and fiber optics.

Medium voltage inter-array cables will connect the individual wind turbines to the ESP. The total length of the cables will be approximately [REDACTED]. Each cable includes three conductors, with each conductor encapsulated by solid cross-linked polyethylene insulation. Water blocking sheathing is used to prevent water infiltration of the cable. The three insulated conductors are twisted with a solid synthetic filler between the conductors. The twisted or bundled conductors are then wrapped in wire armoring and, finally, encased in a tough outer sheath. The cross sections are to be decided at a later stage in the design process and will depend on the final number of turbines per string and cable length. Cross sections are expected to be between [REDACTED].

4. **Electrical Service Platform:** The Electrical Service Platform (ESP) will likely be a topside mounted on a jacket foundation (however, monopile foundations are also being considered), as depicted in **Figure 8.1-4**.

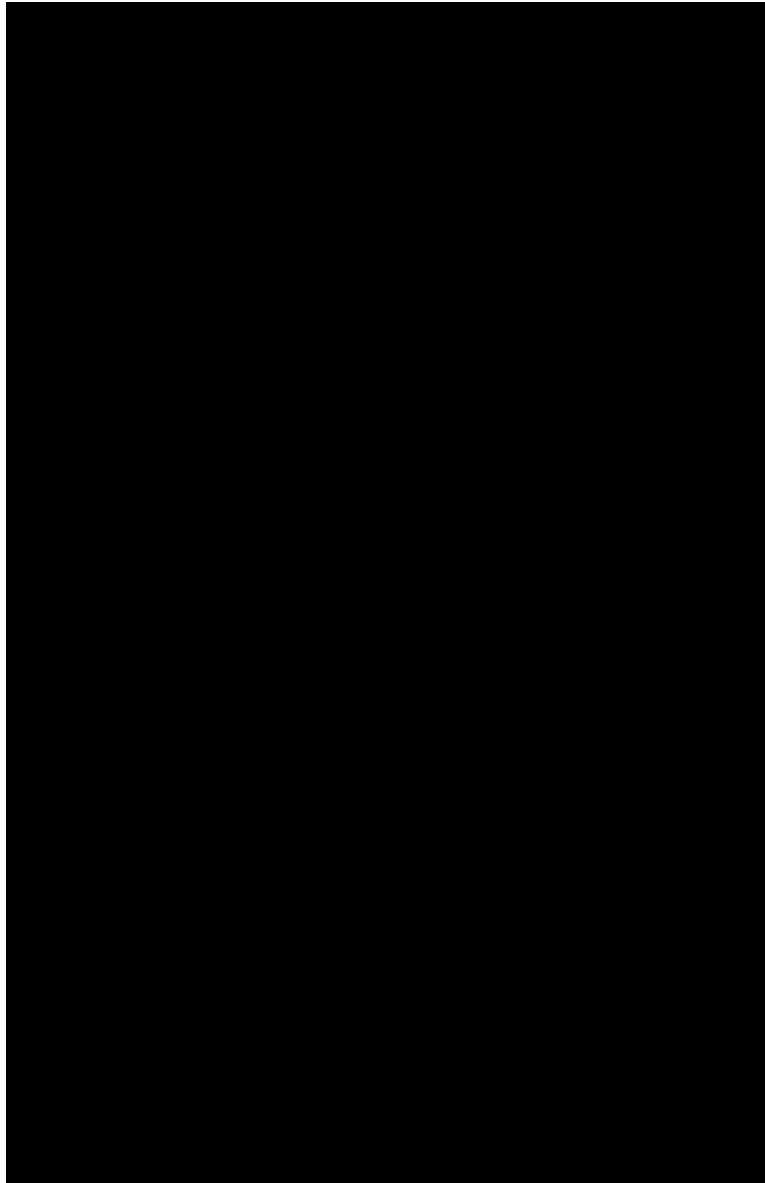


Figure 8.1-4:

The Electrical Service Platform (ESP) consists of two primary structures comprising the topside (above water), with the electrical components and the foundation substructure mainly below water.

The jacket foundation for the ESP will be placed at the seabed and three to four monopiles (smaller than the ones for the WTGs) will be driven vertically into the seabed. The piles will penetrate up to [REDACTED] below the seabed. The foundation will be mounted with boat landing for vessel access and with six J-tubes for inter-array cables and two J-tubes for export cable.

The topside will be a conventional steel frame or stretched skin structure with various deck levels, e.g., cable deck, main deck, mezzanine/intermediate deck, and roof deck, all designed to house the electrical components. Further, it is expected that a helideck will be installed on the ESP to improve the O&M workability.

Electrical components on the ESP will be:





The topside will also feature 66kV and 220kV cable connections, and cable protection and grounding resistors. The ESP will contain several features such as SCADA, HVAC, fire safety system, hydraulic platform crane, electrical hoist crane, CCTV system, communication system (including antenna), Automatic Identification System (AIS), safety kits, aviation and navigational marking, pollution prevention system, Export and Inter-Array Cables hang-off supports, corrosion protection systems, etc.

5. **Offshore Export Cable:** Vineyard Wind plans to use two 220 kV offshore cables to transmit power from the offshore substations to landfall on the south-central shore of Cape Cod. **Figure 8.1-5** illustrates the design of the Export Cable.

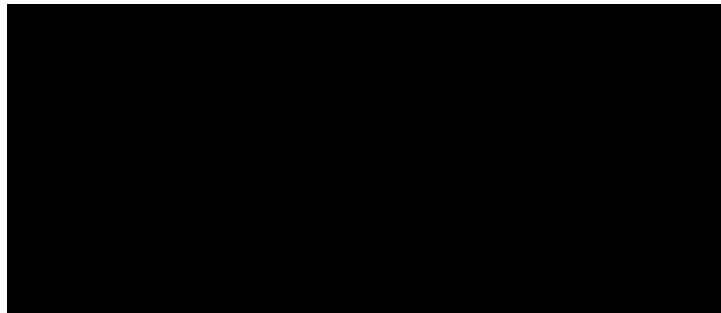


Figure 8.1-5:

export cables are expected to be in length. The export cable system is designed with redundancy to secure reliable transmission from the offshore wind farm to the grid.

As with the inter-array cables, each cable includes three copper or aluminum conductors, with each conductor encapsulated by cross-linked polyethylene insulation. Water blocking sheathing is used to prevent water infiltration of the cable. The three insulated conductors are twisted with a synthetic filler between the conductors. The twisted or bundled conductors are then wrapped in wire armoring and finally encased in a tough outer sheath.

6. **Onshore Export Cable:** Depending on the cable landing point selected, the offshore cable will be brought to shore using either an open-trench construction technique or Horizontal Directional Drilling (HDD). Both techniques have relative advantages and drawbacks that will be assessed in making the determination. The offshore cable is brought into a buried splice vault located at the landing point, where the multi-core offshore cables are transitioned to separate single-core cables, which are more efficient for underground installation. The onshore export cable will consist of
7. **Onshore Substation:** Vineyard Wind's onshore substation will house two 220 kV /115 kV , switchgear, shunt reactors and other necessary equipment. The substation has a footprint of approximately 1.4ha to 1.6ha (3.5 to 4 acres) as shown in For further details of the Onshore substation, refer to Section 6.

\_\_\_\_\_

iii.	Manufacturer of Each of the Equipment Components Listed above as well as the Location of Where Each Component Will Be Manufactured
------	--

[illegible]

**Location of manufacturer:**

Vineyard Wind has prepared a strategy for accelerating the offshore wind industry in Massachusetts. The aim is to make Massachusetts the hub for supply chain investment and the focal point for skills and employment in the sector. See section 14 for further info.

In terms of location of the component manufacturer, this will be determined as part of the final supplier selection for the individual supply packages. **Table 8.1-1** summarizes some of the potential locations for manufacture of components. It is not a final nor exhaustive list and, during the further engineering and procurement work, other locations might come into play.

Table 8.1-1: Major equipment and potential location of manufacturer.

Major equipment	Potential location of manufacturer
<b>Wind turbines</b>	
Tower	[REDACTED]
Nacelle	The potential turbine suppliers are investigating options for US manufacturing and this will be part of the evaluation in the procurement phase. Based on the current setup, it is likely that nacelles will be assembled in Europe.
Hub	The potential turbine suppliers are investigating options for US manufacturing and this will be part of the evaluation in the procurement phase. The hub is expected to be produced in Europe and then assembled with the nacelle, either at the port of New Bedford or in Europe.
Blades	The potential turbine suppliers are investigating options for US manufacturing and this will be part of the evaluation in the procurement phase. Currently, blades are expected to be produced in Europe.
<b>Foundations</b>	
Scour protection	The stones for the scour protection are available in the US and are likely to be used. However, this is subject to the availability of Jones Act compliant vessels with the ability to perform the work within the required parameters. Alternatively, suppliers are available in either Canada or Norway.
Monopile	[REDACTED]
Transition piece	[REDACTED]
<b>Inter-array cables</b>	
66 kV cables	The 66 kV inter-array cables are to be produced at a manufacturing facility with subsea cable manufacturing equipment, meaning that the 66 kV Inter-array cables are likely to come from Europe.
Cable protection system	US options for cable protection systems will be explored in 2018; if feasible solutions are not identified, then they are likely to be produced in Europe.
<b>Electrical service platform</b>	
Foundation structure	[REDACTED]
Topside structure	[REDACTED]

Major equipment	Potential location of manufacturer
<b>Offshore and onshore export cable</b>	
220 kV cables	The onshore export cables are likely to be produced in the US. The offshore export cables are to be manufactured at a facility with subsea cable manufacturing equipment, and are, therefore, likely to come from Europe.

*iv. Status of Acquisition of the Equipment Components*

As part of the first phase of its 5-year development plan, Vineyard Wind has had detailed interactions with a broad range of existing and new supply chain players based in the US in order to prepare the project plan and the costing information needed for this proposal. This section describes the supply chain interaction up until bid submission, whereas section 8.1.v. describes the plan for securing the equipment.

The supply chain interaction started in Q4-2016 and has been conducted in phases as illustrated in **Figure 8.1-7** and described in the following sections, 1, 2, and 3:

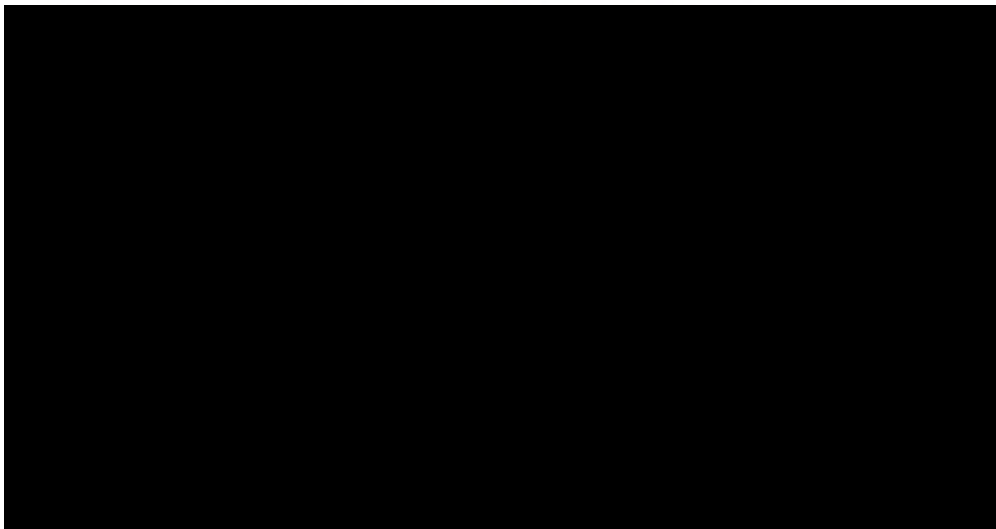


Figure 8.1-7: [REDACTED]

**1 – Supply Investigations Phase**

During the Supply Investigations phase, numerous discussions were held with US and European suppliers to understand the interest in US offshore wind and to obtain valuable input for the next phase of the commercial discussions. Furthermore, initial investigations of the Jones Act, existing port infrastructure, and other relevant project constraints and opportunities were conducted.

**2 – Structuring, Tenders, and supplier proposals**

Following the Supply Investigations phase, a base case concept was defined and suppliers were invited to submit non-binding bids in Request for Proposal (RFP) processes covering all major equipment and services required for the Project. The list of suppliers participating in these processes is illustrated in **Figure 8.1-8**.

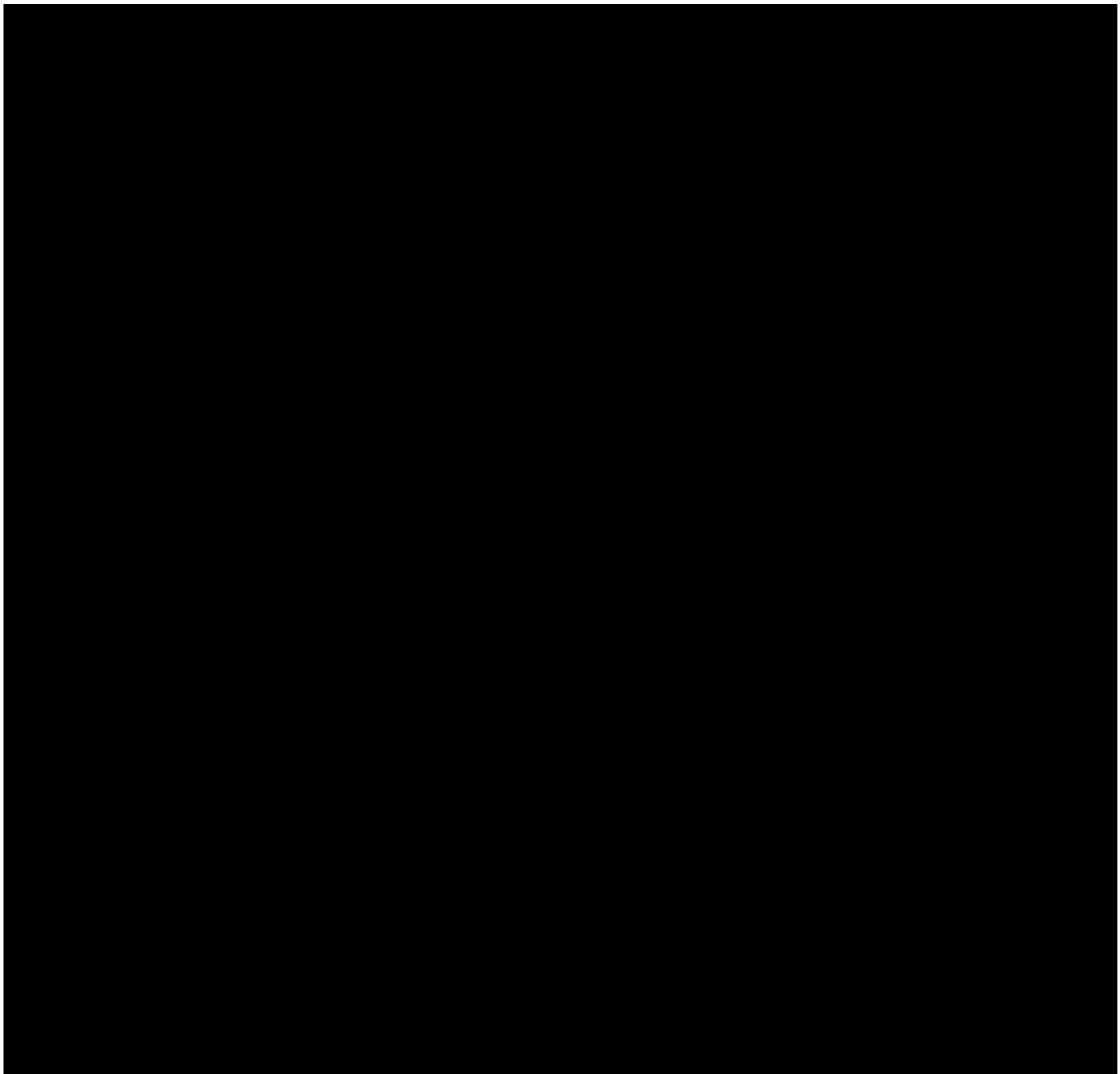


Figure 8.1-8

The RFP process also involved detailed discussions on potential for engagement of the US local supply chain with a view to maximize opportunity for local supply chain players.

Vineyard Wind has, throughout the process, been encouraging supply chain partnerships between international offshore wind industry players and the US supply chain. The Vineyard Wind team has, both on its own and jointly with a number of leading suppliers in the offshore wind industry, been doing extensive screening of the local supply chain opportunities, involving more than 20 additional potential tier-one and tier-two suppliers from the US market.



### 3 – Clarifications and PPA bid preparation

In this phase, the extensive dialogue with supply chain players has been continued with the purpose of preparing potential partners for the next procurement phase and to obtain input for:

- the bid preparation, including choice of technology concepts cf. section 8.1.i and 8.1.ii,
- the estimation of local economic benefits as further described in section 14,
- the detailed procurement strategy for Vineyard Wind 1 as further described in section 8.1.v below, and
- preparation for maximizing local benefit as part of an early project delivery.

In accordance with the 5-year project plan, no equipment has yet been procured; however, the first procurement of the first packages is under preparation, and tenders and negotiations will continue during the evaluation phase to ensure Vineyard Wind 1 meets its milestones.

v. *Whether the Bidder has a Contract for the Equipment - If not, describe the bidder's plan for securing equipment and the status of any pertinent commercial arrangements*

As outlined in Section 8.1.iv, Vineyard Wind has been in structured dialogue with key suppliers since late 2016 but has not yet contracted for the equipment. The procurement activities shown below have been planned based on the supply chain interaction and the previous experience from parent companies and members of the project team.

The procurement activities will be [REDACTED]  
[REDACTED] The procurement packages may apply different sourcing processes, but the predominant way will be to go to the market in a structured, open, and competitive approach. For all packages, partnerships between experienced US contractors and experienced contractors from the offshore wind industry will be encouraged. Furthermore, all contractors will be required to report on their proposed local content, both in the bidding and contract execution phase, in order to promote that opportunities are cascaded to lower tiers of the supply chain. For more information, regarding local content strategies and plans, please refer to Section 14.

On the basis of the procurement packages overview, and the detailed project plan as set out in Section 9, a comprehensive procurement timeline has been developed. This timeline takes into account that supplier selections will need to take place in a sequence that takes into account:

[REDACTED]



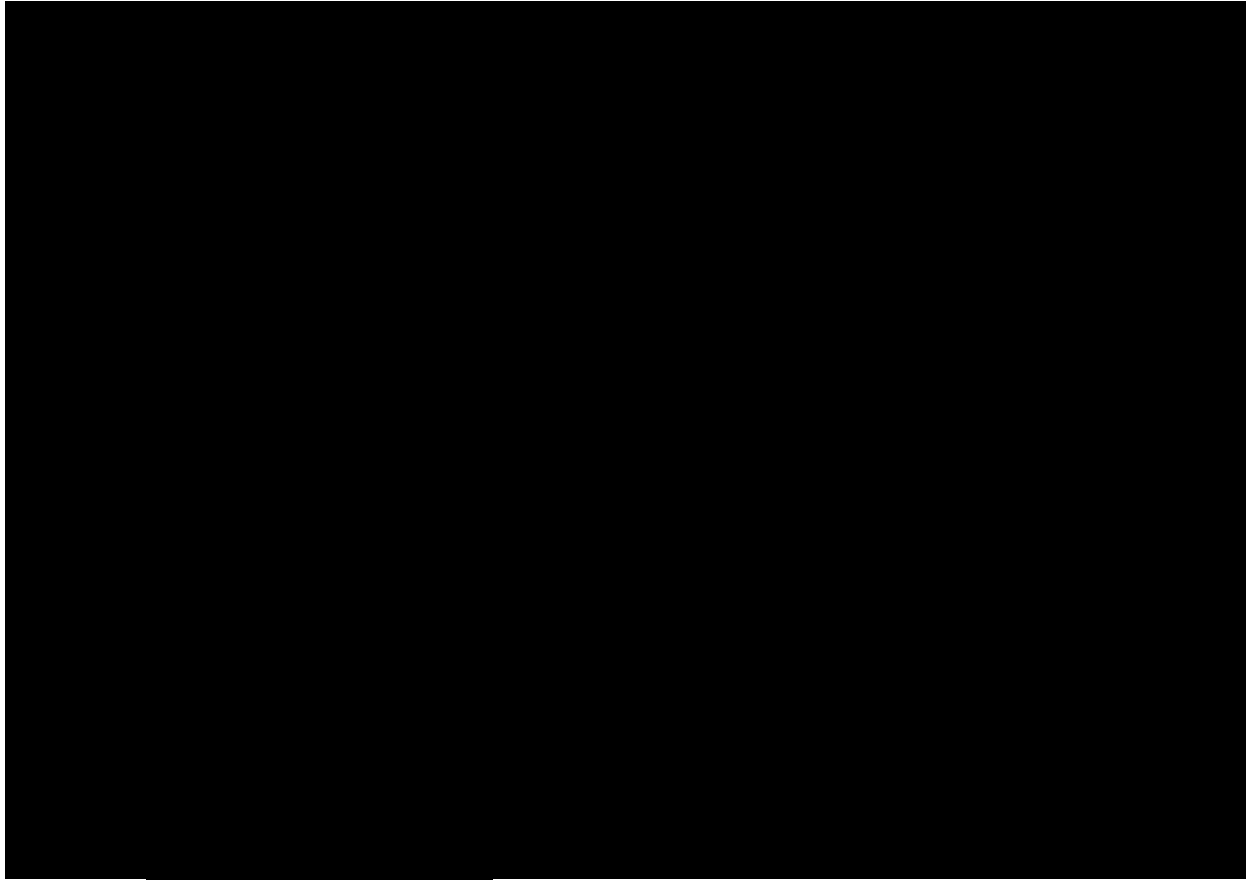


Figure 8.1-9:



Figure 8.1-10:



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

See Supply Chain Support Letters

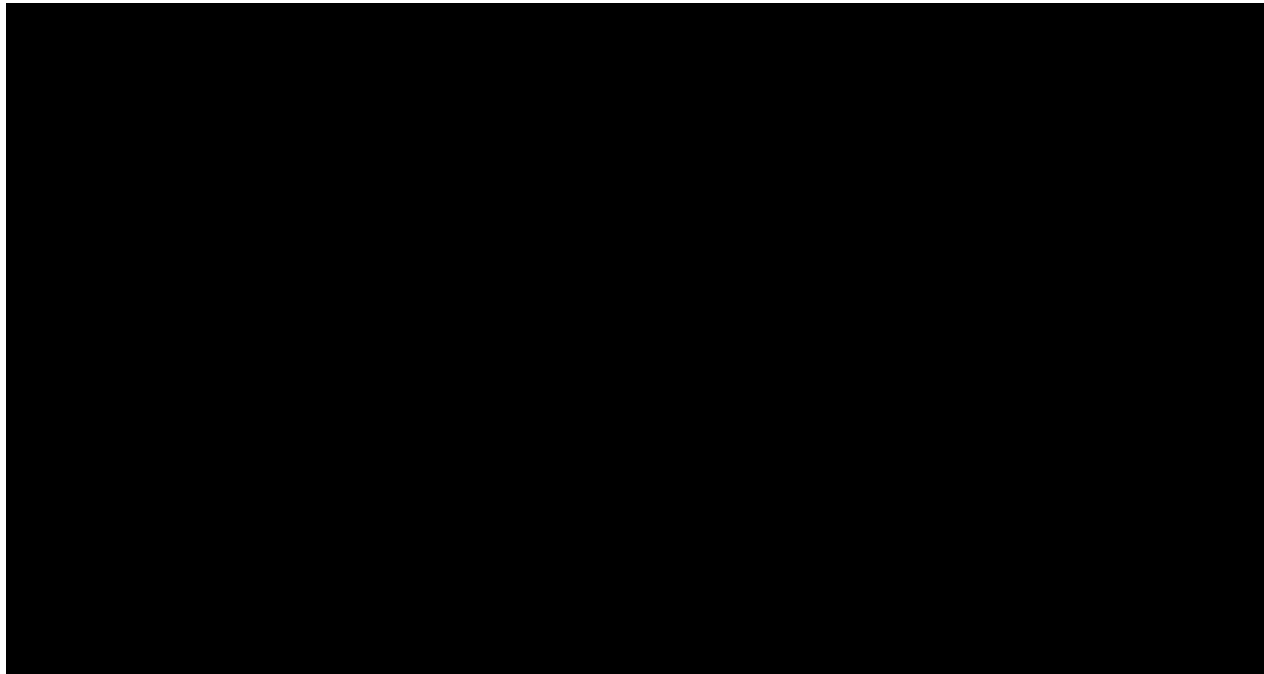
included in **Attachment 14.1-1**.

*vi. Equipment Vendors Selected/Considered*

The equipment vendors currently being considered by Vineyard Wind are included in **Table 8.1-2** below. For potential logistic contractors, reference is made to Section 10. For selection criteria, refer to section 8.1.viii.

**Table 8.1-2:**

[REDACTED]



*vii. Track Record of Equipment Operations*

The operational track record for equipment under consideration by Vineyard Wind is shown in **Table 8.1-3**.

**Table 8.1-3: Operational track record of major equipment.**

Major equipment and track record	
<b>1. Wind turbines</b>	
	[Redacted]
	[Redacted]
	[Redacted]
<i>Vineyard Wind Experience</i>	
	[Redacted]
<b>2. Foundations</b>	
<ul style="list-style-type: none"> <li>Monopiles and Transition Pieces are a technical concept that has been proven in numerous offshore wind projects worldwide.</li> <li>The first monopile projects were installed in 2000 (Blyth Windfarm) &amp; Horns Rev 1 (2002) and, since then, more than 2500 monopiles has been deployed in the offshore wind industry.</li> </ul>	
<i>Vineyard Wind Experience</i>	
<ul style="list-style-type: none"> <li>The Vineyard Wind team has extensive experience with monopiles, including monopiles in a size and weight comparable to the required dimensions for this Project. As an example, the team has direct experience managing the largest monopiles ever installed (the CIP Veja Mate project in Germany, 2016).</li> </ul>	
<b>3. Inter-Array Cables</b>	
<ul style="list-style-type: none"> <li>Inter-array Cables are a well-known technology that has been applied for many years in the wind industry.</li> <li>66 kV cables have been introduced as an alternative to 33 kV cables in many projects already and are considered especially efficient with the larger Wind Turbines being applied today.</li> </ul>	

Major equipment and track record	
<ul style="list-style-type: none"> <li>The 66 kV cables have been developed from the 33 kV technology and were first tested at the Blyth demonstrator (2017) project.</li> <li>Several suppliers now have 66 kV cable designs that are fully certified and ready for commercial applications.</li> <li>Both turbine suppliers, Siemens Gamesa and MHI Vestas, now have 66 kV connection as part of their standard offering.</li> </ul> <p><i>Vineyard Wind Experience</i></p> <ul style="list-style-type: none"> <li>The Vineyard Wind <b>parent companies</b> are obtaining direct experience with this design from the East Anglia 1 project in the UK and, once cables are required for the Vineyard Wind project, many 66 kV projects will have been installed already in Europe.</li> </ul>	
4. Electrical service platform	
<ul style="list-style-type: none"> <li>The first Electrical Service Platform (ESP) in the Offshore Wind industry was built in 2002 and many others have followed since then.</li> </ul> <div style="background-color: black; height: 100px; width: 100%;"></div> <p><i>Vineyard Wind Experience</i></p> <ul style="list-style-type: none"> <li>The Vineyard Wind team has extensive experience with ESP in size and complexity comparable to the requirement of this Project. As an example, the team has direct experience from VejaMate and Wikingen projects (both in Germany).</li> </ul>	
5. Offshore and Onshore Export cable	
<ul style="list-style-type: none"> <li>Export cables will be 220 kV designs and will be based on well-known and proven cable concepts.</li> </ul> <p><i>Vineyard Wind Experience</i></p> <ul style="list-style-type: none"> <li>The parent companies and the Vineyard Wind team have experience with 220 kV export cables from several projects, e.g., Beatrice and East Anglia 1.</li> </ul>	
6. Onshore substation	
<ul style="list-style-type: none"> <li>The electrical design work of the onshore substation will be comparable to that of almost all other offshore wind onshore substations.</li> <li>The design will be derived from the design of the entire electrical system for the wind farm and is considered to be well-known and proven.</li> <li>There are many experienced contractors with the expertise to build an onshore substation available in Massachusetts and throughout the US.</li> </ul> <p><i>Vineyard Wind Experience</i></p> <ul style="list-style-type: none"> <li>The Vineyard team will benefit from the long track record and US onshore experience of Avangrid Renewables and Avangrid Networks.</li> </ul>	

*viii. If the equipment manufacturer has not yet been selected, identify in the equipment procurement strategy the factors under consideration for selecting the preferred equipment*

When procuring equipment for this Project, a range of factors will be taken into consideration, as set out in **Table 8.1-4**, below. Vineyard Wind has already had extensive dialogue with the major suppliers and has a solid understanding of the prevailing concepts and technologies and their application to the Project.

**Table 8.1-4: Factors under consideration for equipment manufacturer selection.**

<b>Safety</b>	Assessment of safety culture and safety measures applied in both equipment design and processes
<b>Quality</b>	Assessment of the supplier's quality systems and processes and an evaluation of the quality of the equipment to be supplied
<b>Price and Project Economics</b>	An evaluation of the equipment's contribution to the overall business case including price, total lifetime costs, derived project costs, production impact, etc.
<b>Timely delivery</b>	Assessment of the proposed project timeline and the likelihood of the supplier's ability to meet the timeline requirements
<b>Local Economic Benefits</b>	Assessment of the degree to which the selection of equipment and/or supplier will contribute to the development of a viable offshore wind supply chain in Massachusetts and throughout the US

	Special focus will also be given to the supplier's willingness and capabilities to support and promote Vineyard Winds' extensive range of initiatives to provide local economic benefits to MA, as further described in section 14
<b>Risk</b>	Assessment of the risks associated with each type of equipment Assessment of the risks associated with supplier including assessment of financial security
<b>Experience</b>	Experience of suppliers, both in terms of offshore wind industry experience and in terms of experience with working on projects in the US

*8.2. If the bidder has not yet selected the major equipment for a project, please provide a list of the key equipment suppliers under consideration.*

[REDACTED]

*8.3. Please identify the same or similar equipment by the same manufacturer that are presently in commercial operation including the number installed, installed capacity and estimated generation for the past three years.*

For a general overview of the equipment track record, refer to section 8.1.vii.

As regards Wind Turbine Generators, Vineyard Wind 1 will be built using the most advanced technology available for delivery and commercial operation in 2021. Applying the latest technology will ensure that technology specific supply chain investments are not overtaken by events, but will have relevance also for future projects in Massachusetts and on the East Coast in general.

[REDACTED]

**Table 8.3-1**

[REDACTED]
------------

[REDACTED]

**Table 8.3-2**

[REDACTED]
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*8.4. For less mature technologies, provide evidence (including identifying specific applications) that the technology to be employed for energy production is ready for transfer to the design and construction phases. Also, address how the status of the technology is being considered in the financial plan for the project.*

The technology/concepts to be applied at Vineyard Wind are considered mature and, as set out in section 8.1.vii and 8.3 above, all concepts and technologies have a long track record in the offshore wind industry. Furthermore, all equipment will be manufactured by or with the involvement of industry leaders. As part of the financing process, in-depth review of the applied technologies will be performed and this process has been taken into consideration when designing the project management plan.

*8.5. Please indicate if the bidder has a full and complete list of equipment needed for all physical aspects of the bid, including generation facilities, turbine support structures, electrical platforms, transmission lead lines, and mandatory and voluntary transmission system upgrades. If not, identify the areas of uncertainty and when the full and complete list of equipment will be identified.*

The bidder has a full and complete list of the major equipment and components needed to complete the Project. This list has been developed with the contribution of both the parent companies of Vineyard Wind and key members of the project team. Together, they represent world-leading offshore wind experience. The team has members who have been involved in offshore wind since 1995 and have experience in the construction of more than 10 offshore wind farms. Furthermore, both parent companies are working on an extensive portfolio of projects around the world including North America, Europe, and the Asia Pacific region. This provides the parent companies and, thereby, also the project team, with a very good general understanding of offshore wind markets, strong supplier relations, a very large procurement portfolio, and a very good understanding of lead times, capacity constraints, and a wide variety of other industry-specific factors.


Vineyard Wind has worked intensively with the development of Vineyard Wind 1 since August 2016. This includes the development and submission of a full Construction and Operations plan (COP) that outlines in detail how and with which equipment the project will be constructed. **Table 8.5-1** summarizes key activities that Vineyard Wind has been through in order to de-risk and firm up the project design basis and schedule as part of this proposal.

**Table 8.5-1: Overview of key activities performed in designing the Project.**

Key activities performed in 2016 and 2017	Description
<b>Surveys</b>	
Initial geophysical & geotechnical campaign	From September to November 2016, Vineyard Wind carried out an initial geophysical & geotechnical campaign in order to get a deep understanding of the site and the right basis for developing the concepts.
Cable route survey	From July to August 2017, Vineyard Wind carried out additional geophysical & geotechnical surveys along the potential cable routes. The purpose was to gather data



Green Communities Act Section 83C Request For Proposal

Key activities performed in 2016 and 2017	Description
	of the seabed conditions along the cable routes to identify the optimal route for the export cable in terms of environmental disturbance and commercial effects.
Other surveys	Vineyard Wind has carried out several desktop and onshore field surveys and analyses in order to gather sufficient data for the Construction and Operations Plan and EFSB permitting.
<b>Supply chain interaction</b>	
Engagement with US supply chain	Vineyard Wind has had many meetings with companies in the US supply chain in order to assess how the US supply chain market for offshore wind is developing and to identify potential suppliers for the Project.
Request for Proposal (RFP) for major equipment packages	Through several rounds of RFPs and meetings, Vineyard Wind has engaged with more than 35 different suppliers in order to develop and strengthen the concepts and assumptions. Vineyard Wind has received offers, including budgetary quotes and concept suggestions, from a minimum of two suppliers for each of the relevant project contract packages
Alignment of procurement plan and strategy	Vineyard Wind has worked on alignment of the procurement strategy and timeline with the supply chain as depicted in the project schedule. Please also see section 8.1.iv-v and supply chain letters supporting the project plan approach in <b>Attachment 14.1-1 Supply Chain Support Letters</b> .
<b>Design &amp; layouts</b>	
Foundation front-end engineering and design (FEED) to determine optimal concept	<p>A thorough foundation concept selection process has been carried out. The process was based on an evaluation undertaken for:</p>  <p>These concepts represent the majority of foundation concepts applied to offshore wind farm developments in Europe. The foundation concept evaluation was based on the following main criteria:</p> <ul style="list-style-type: none"> <li>• Technical feasibility</li> <li>• Environmental impact</li> <li>• Commercial feasibility</li> </ul> <p>Based on the evaluation, Vineyard Wind has prepared concept designs to support the evaluation and quotations were obtained from potential installation and fabrication contractors.</p>
Electrical system FEED to determine optimal electrical configuration	A thorough FEED study on the electrical system has been carried out in order to select an optimal electrical configuration of the Electrical Service Platform, the inter-array cable system, the onshore and offshore export cables, and the onshore substation. The selected configurations have been used for pricing in the RFPs, as mentioned above. The FEED design has been verified by calculations carried out by suppliers.
Turbine layout	<p>More than 45 different turbine layouts have been made in order to secure the optimal design. The wind farm layout was prepared to secure maximum production on the basis of a number of non-technical constraints and technical cost-drivers. The non-technical constraints that were considered are:</p> <ul style="list-style-type: none"> <li>• Navigation routes</li> <li>• Fishing routes and other shareholder input</li> <li>• Buffer zones</li> <li>• Shipwrecks identified on the site</li> <li>• Input from United States Coast Guard (USCG)</li> </ul> <p>The technical cost drivers considered are:</p> <ul style="list-style-type: none"> <li>• Water depth</li> <li>• Soil conditions</li> <li>• Turbine rating and rotor sizes</li> </ul>
Inter-Array cable layouts	More than 20 different inter-array cable layouts have been developed to arrive at the optimal and most efficient design.

Key activities performed in 2016 and 2017	Description
Export cable layout and landing points	More than 15 different export cable routes have been assessed and considered. The main drivers for route selection have been: <ul style="list-style-type: none"> <li>• Installation feasibility along route</li> <li>• Burial requirements to limit risks of cable failure</li> <li>• Consenting constraints</li> <li>• Minimizing the cable length to reduce power losses</li> <li>• Limiting the environmental impact</li> </ul> The analysis has also included considerations on the different potential landing points.
<b>Site conditions</b>	
Wind assessment	The past year Vineyard Wind has acquired and analyzed wind and weather data from the available sources. The assessment has been used to optimize the project in terms of production.
Hurricane assessment	Vineyard Wind has acquired analysis and evaluation from leading experts regarding hurricanes. These assessments have been used as input into the design process.
Site Conditions Assessment	A Site Conditions Assessment has been prepared, which has been used for FEED design of Foundations and as input for the ESP contractor's assessment.

Furthermore, a detailed procurement package structure and timeline has been developed to ensure that all required equipment will be available to Vineyard Wind in due time.

Logistical equipment, ports, facilities, and vessels will be required for construction, transport, and installation.

Regarding mandatory and voluntary transmission system upgrades: Currently Vineyard Wind has not identified any need for transmission system upgrades. Vineyard Wind's feasibility study has determined that an injection of 800MW can be connected at the 115kV Barnstable Switch Station (No. 958) without having to implement any transmission system reinforcements other than the Project's own substation requirements associated with the direct interconnection of the wind farm. The Barnstable Switch Station has previously been built out with two spare bays available for breakers. As a result, no bus work extensions are necessary, significantly reducing the amount of work required by the transmission owner for the interconnection of the Vineyard Wind Project. The System Impact Study will commence over the next couple of months, but is not anticipated to identify any upgrades that would have a material impact to the interconnection process.

*8.6. Please indicate if the bidder has secured its equipment for all physical aspects of the bid, including generation facilities, transmission lead lines, and mandatory and voluntary transmission system upgrades. If not, identify the long-lead equipment and describe the timing for securing this equipment.*

As set out in section 8.1.v., components have not yet been secured. Refer to section 8.1.v for a general description of the current status and procurement plan, including status on long-lead equipment and timing of procurement activities.

The engineering and procurement plan has been prepared in full, taking into account lead times for all long-lead equipment such as:

- electrical equipment for the substations,
- steel for the manufacturing of ESP and foundations,

- export cables, and
- design lead times, especially on the foundations and the Electrical Service Platform.

The plan has been prepared by, and based on the experience of, the project team and has been validated via benchmarks from other parent company projects and by supplier dialogue; see Section 9 for further details.

As described in section 8.5, no mandatory and/or voluntary transmission system upgrades are expected. The wind farm onshore substation is being designed using conventional AIS and components with typical industry manufacturing and delivery lead times.

## Section 9 OF APPENDIX B TO THE RFP PROJECT SCHEDULE

*9.1. Identify the elements on the critical path. The schedule should include, at a minimum, preliminary engineering, financing, acquisition of real property rights, Federal, state and/or local permits, licenses, environmental assessments and/or environmental impact statements (including anticipated permit submittal and approval dates), completion of interconnection studies and approvals, procurement, facility contracts, start of construction, construction schedule, and any other requirements that could influence the project schedule and the commercial operation date.*

### Planning approach

Since winning the lease site in 2015, Vineyard Wind has worked to optimize the design and efficiency of Vineyard Wind 1, while taking into consideration input from multiple stakeholders. These efforts supported the preparation of the major Federal and Massachusetts permit applications, along with the Construction and Operations Plan and EFSB Petition, respectively, which were submitted in December 2017.

With the signing of the Section 83 legislation in August 2016, Vineyard Wind enacted a 5-year plan with a target of delivering a 400MW offshore wind farm fully commissioned by the end of 2021. Vineyard Wind remains on track to meet the early delivery target, and has since August 2016 further matured the project plan, and is now very confident that the underlying planning assumptions for the early delivery of Vineyard Wind 1 - with site construction to start in 2019- are robust, the project plan is sound, and the schedule is achievable.

Vineyard Wind has developed an integrated project schedule that allows for close alignment and integration between individual work packages. Our detailed schedule enables us to coordinate activities, monitor schedule performance, and analyze the impact of changes and adjustments to the Project, both during detailed planning and during execution.

### Project Schedule

To achieve commercial operations in 2021, Vineyard Wind first identified the critical steps across the primary work streams and mapped out the key activities.

The schedule was developed by using the extensive experience of the parent companies and the project team, as well as input from the supply chain, and is based on a rolling wave planning principle, in which the schedule will gradually expand as the project progresses.

The overview (highest level) version of the project schedule is shown in **Figure 9.1-1**, showing the main activities and their alignment. A more detailed version of the construction schedule is provided in **Attachment 9.1-1**.

### Critical activities

**Table 9.1-1** provides an overview of the critical activities for the Project. Each of the critical activities are also captured in the schedule, and included in the critical path analysis in the next section.

The supply and delivery durations, assumed in the Project, have been validated with a wide selection of potential suppliers and the offshore installation schedules have been thoroughly tested in a detailed scenario modelling to ensure robustness.

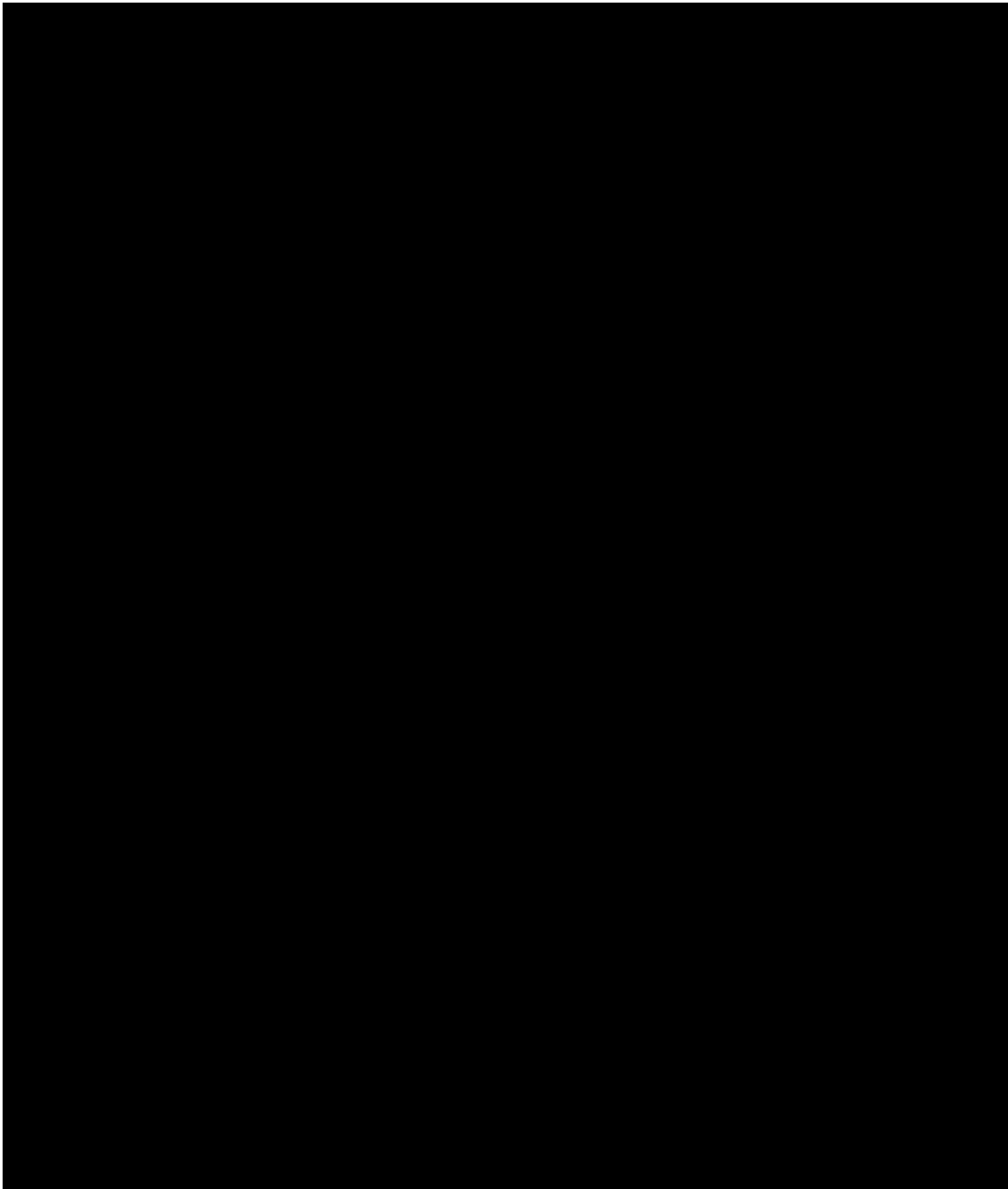
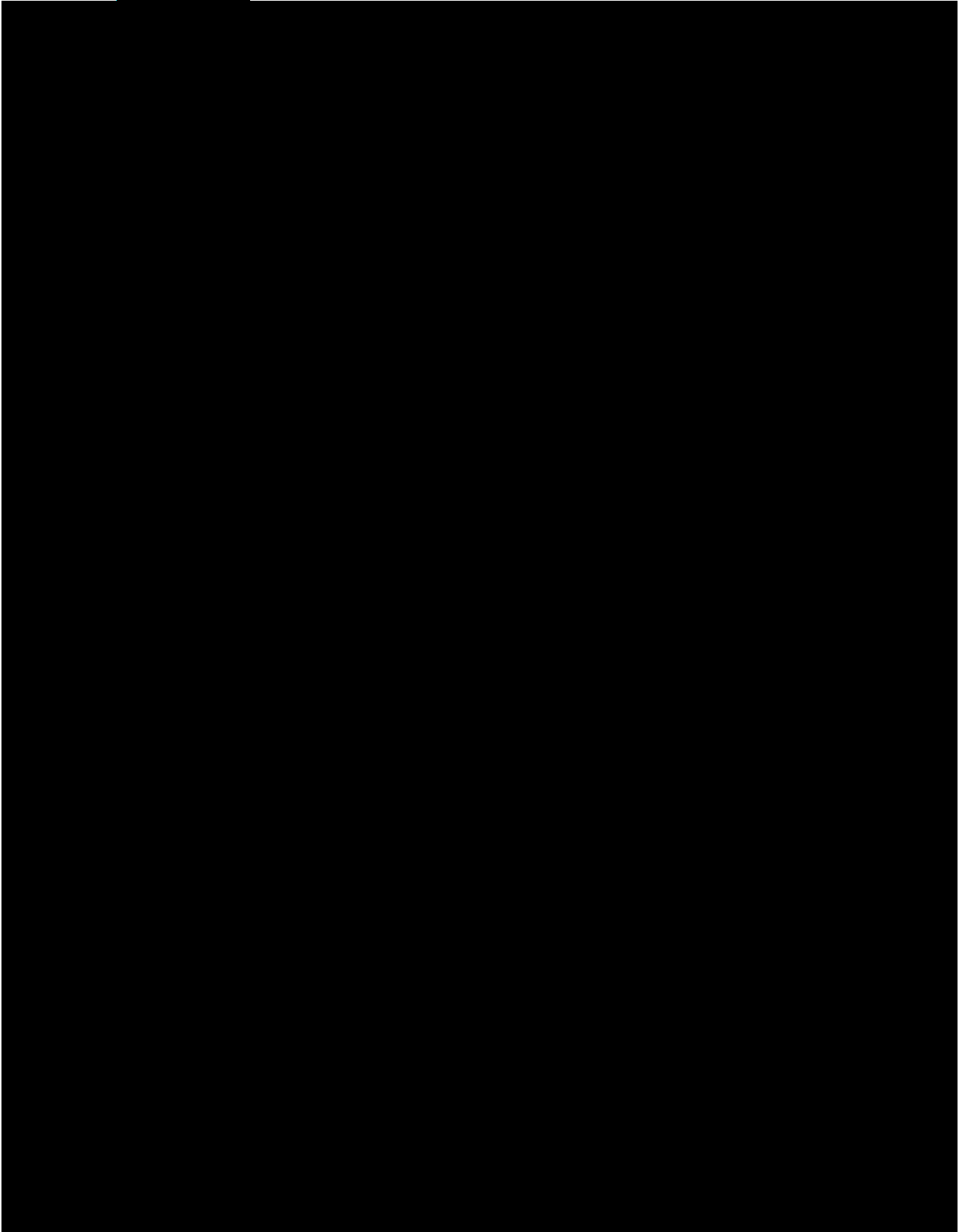


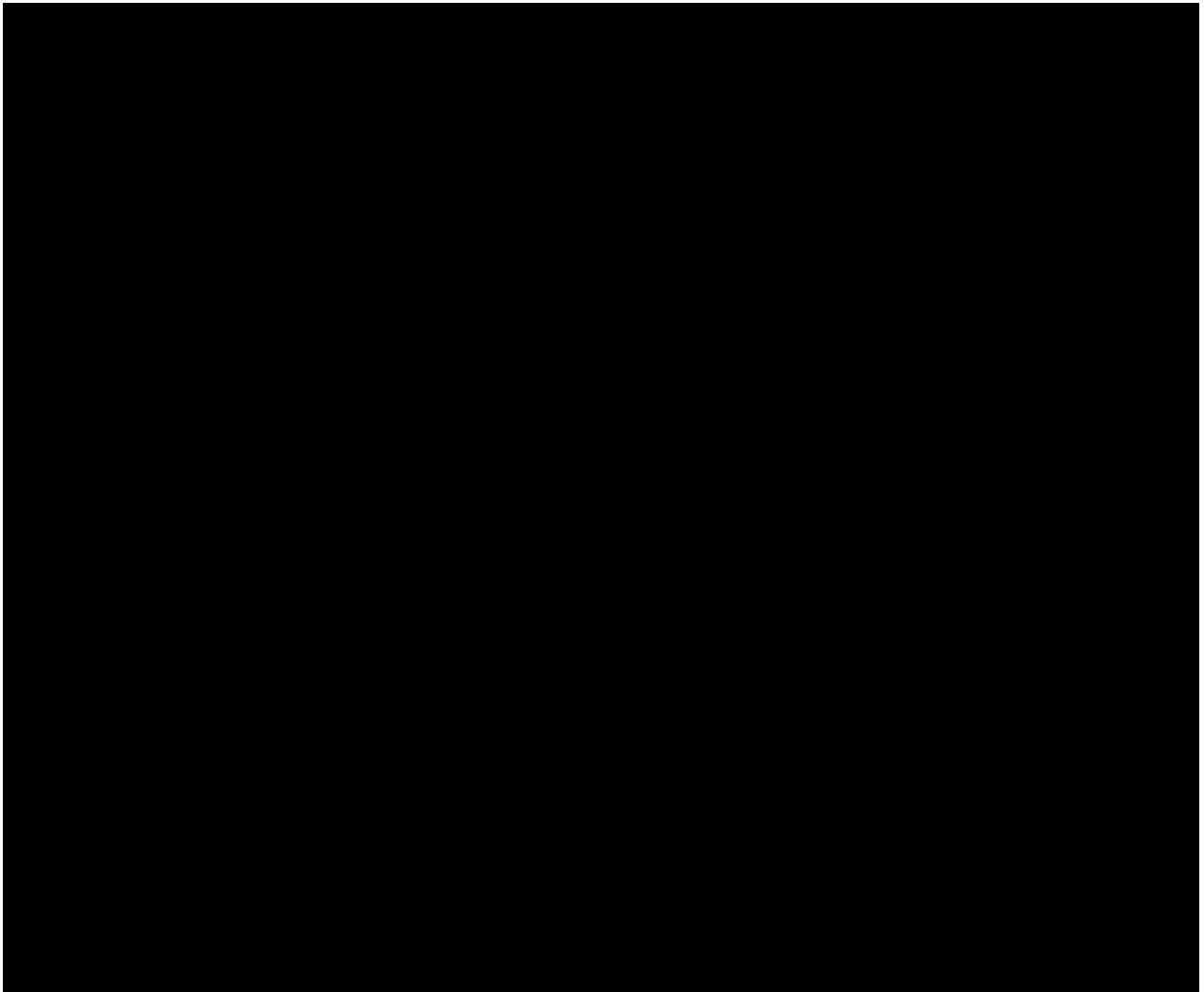
Figure 9.1-1



Table 9.1-1:







**Critical Path**

As shown in **Table 9.1-1** above, there are several critical activities in the project including procurement, engineering, and construction, as well as key activities within the permitting and grid connection work packages.



To support this schedule, the Vineyard Wind permitting team has conducted extensive consultation and coordination with regulators and stakeholders prior to filing initial permit applications in December 2017 (see section 7 for further details).

Vineyard Wind filed an Environmental Notification Form (ENF) and a Petition with the Energy Facilities Siting Board (EFSB) in December 2017. Vineyard Wind and the lead permitting consultant, Epsilon Associates, firmly believe that the state, regional, and local processes can be completed in this timeframe since the state has been very involved in the evolution of offshore wind projects.



When establishing the construction schedule, Vineyard Wind has invested considerable resources investigating potential manufacturing and logistical solutions with the supply chain.

The information gathered, combined with the in-house benchmark data, has formed the basis for an extensive modelling of multiple scenarios and potential concepts, including

use of the New Bedford harbor is described in further detail. The offshore installation schedules have been rigorously tested, based on detailed analysis taking more than 35 years of weather statistics into account.

In **Figure 9.1-2**, the result of the installation duration analysis for foundations and WTGs are shown. The suggested schedule in this proposal is considered robust, even in adverse weather scenarios.

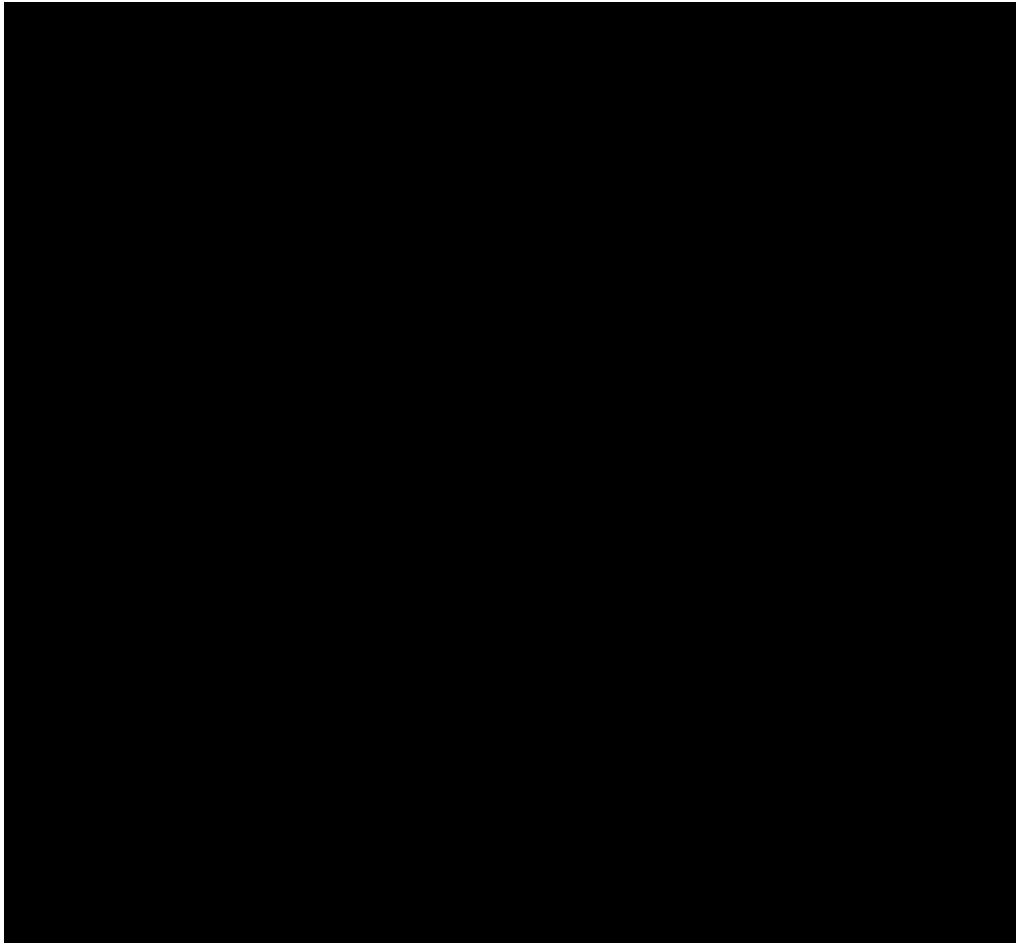
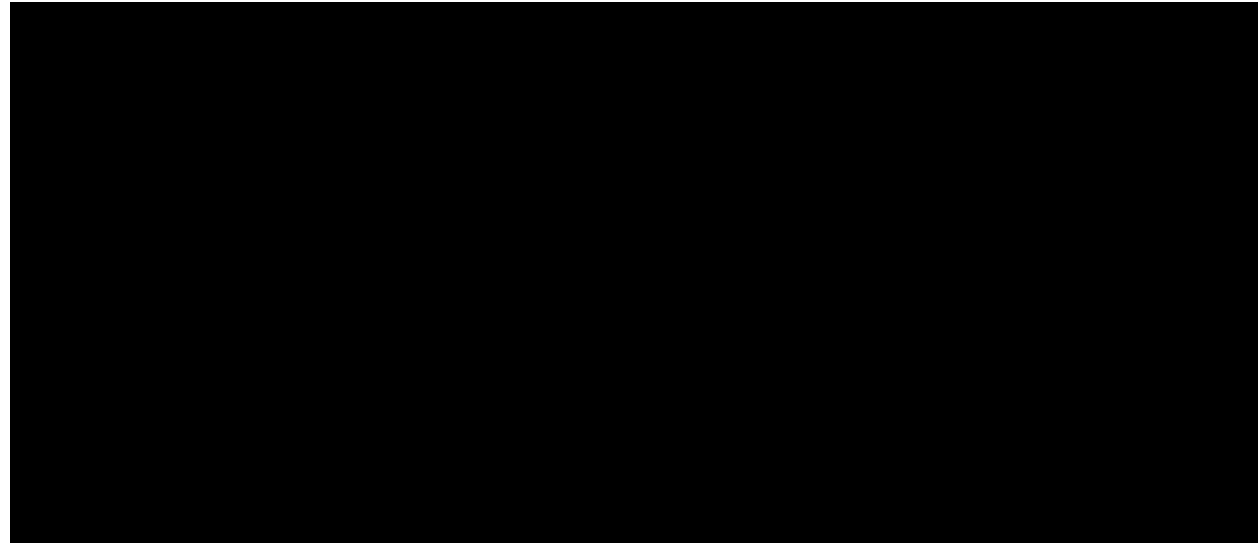


Figure 9.1-2:

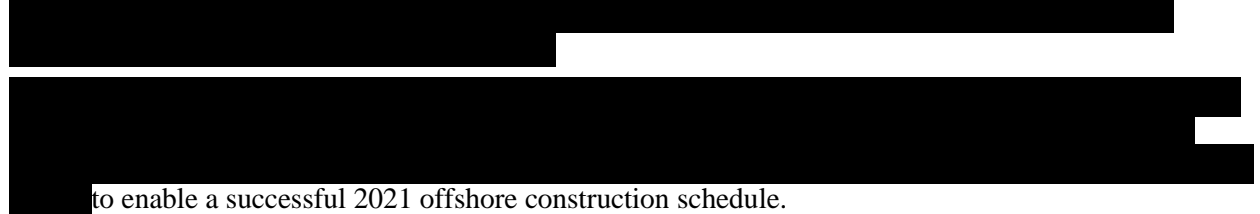
In **Figure 9.1-3**, the progress curves for the foundations, array cables, and WTGs is visualized to show the variation between the packages. The simulations give a clear indication of the robustness in the construction schedule.



**Figure 9.1-3:**

A detailed version of the construction schedule is provided in **Attachment 9.1-1**.

In **Figure 9.1-4**, the critical path of Vineyard Wind 1 is highlighted in red,



to enable a successful 2021 offshore construction schedule.

The Vineyard Wind parent companies and individual members of the project team have a long track-record and experience in managing the execution of projects of similar scope and magnitude, and are confident that this schedule is robust and achievable.

Vineyard Wind has a dedicated planning group for the Project. The planning group has experience establishing, developing, and managing schedules, each with more than 12,000 activities and milestones. We will maintain and develop an integrated plan and schedule program that supports the planning and progress reporting across all work packages. By working with an integrated program and performing thorough follow-up on the critical path and close to critical paths, Vineyard Wind's management will be in full control of the Project's progress and mitigate the potential delays and challenges that a project of this size will inevitably face.

#### **Using experience to secure schedule robustness**

Vineyard Wind has developed its schedule based on the teams' and owners' extensive experience with offshore wind farm development and construction and the schedule uses benchmarks, detailed analysis, and simulations. To validate the robustness in the Vineyard Wind schedule, a high-level project schedule comparison with the latest project that was built by one of the parent companies (CIP) - the Veja Mate project in Germany - was prepared.

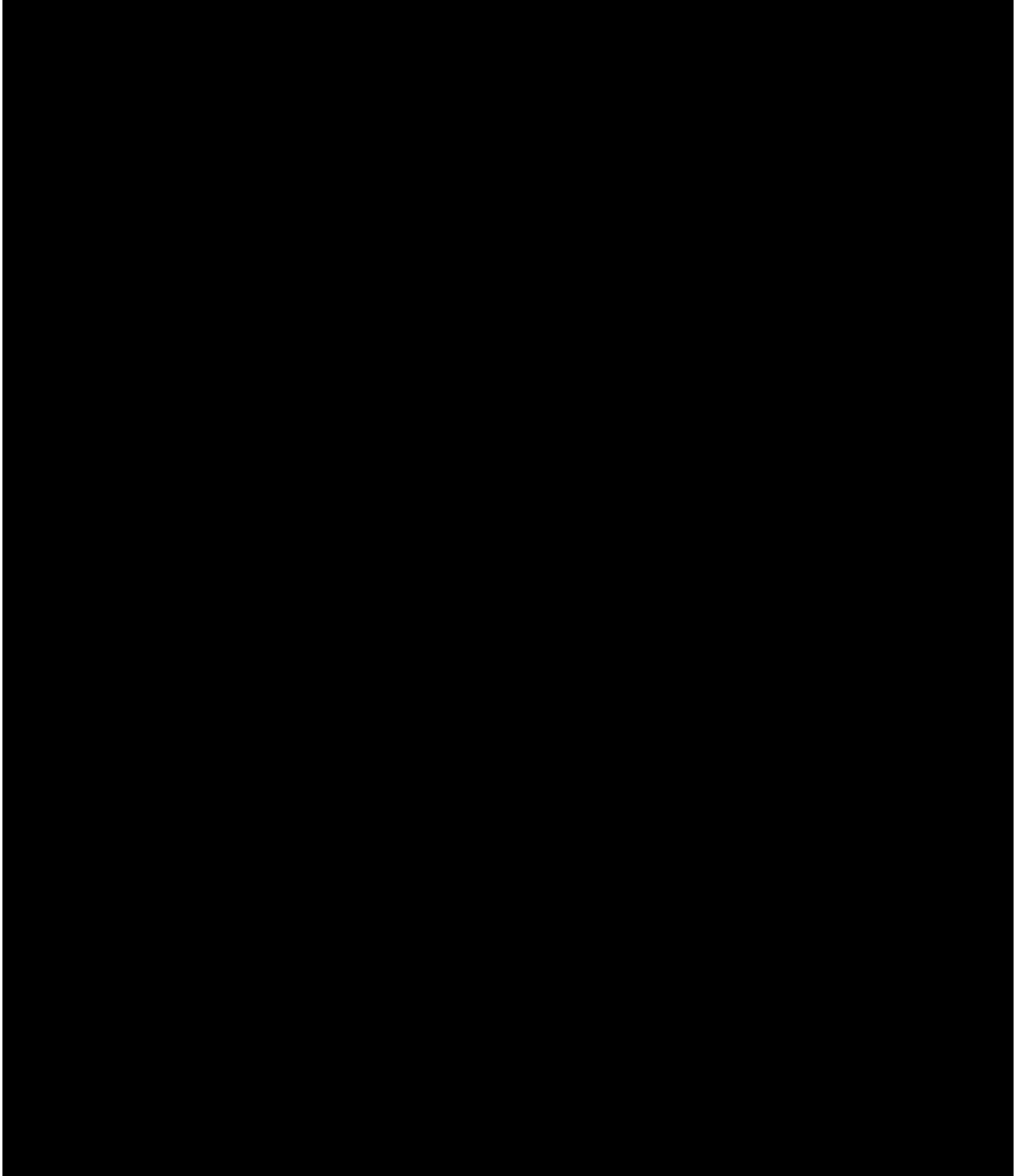


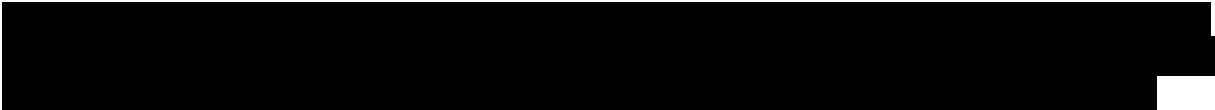
Figure 9.1-4 [Redacted]

[Redacted]



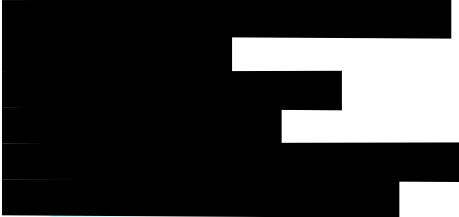
Figure 9.1-5: [Redacted]

9.2. *Include a discussion on use of maritime vessels and access to them. Also include a description and discussion of the laydown facility/facilities to be used for construction, assembly, staging, storage, and deployment.*



Since 2016, the Vineyard Wind team has been developing and analyzing potential concepts for securing a strong logistics, ports, and vessels solution to successfully complete the Project.

The project team has engaged extensively with the supply chain and has ongoing meetings with the main US and European-based installation contractors. The objective has been to identify and assess the various possibilities to establish the best and most reliable concept given restrictions and limitations such as the Jones Act, New Bedford harbor access clearances, and terminal space limitations. The key logistical and installation related scopes which were identified as being the key challenges are:



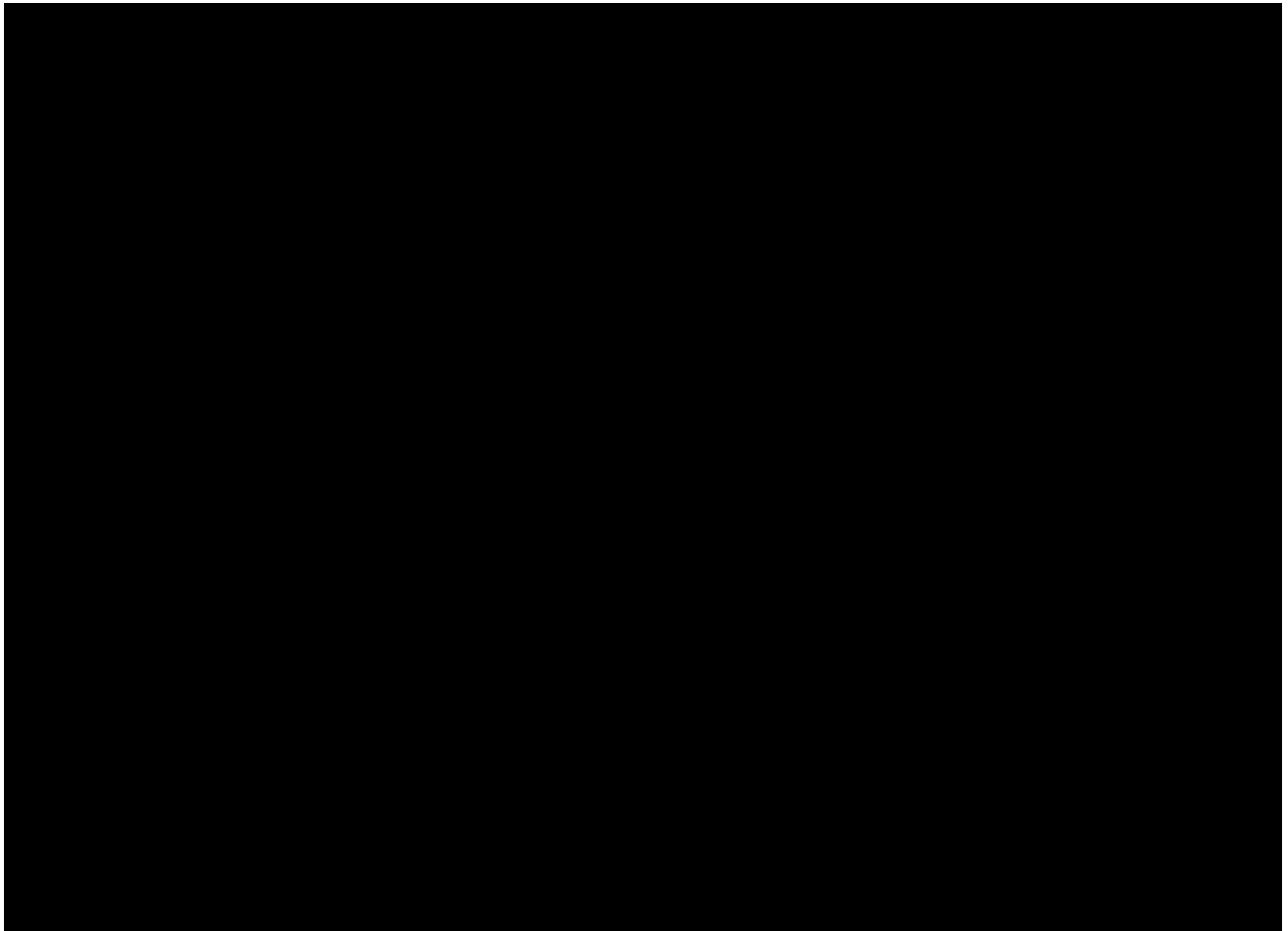
[REDACTED] For further details on the ESP and cable installation and logistics, and how Vineyard Wind addressed limitations imposed by the Jones Act, please refer to Section 10.

**Table 9.2-1** provides a description and status of the key scopes listed above. In general, robust solutions were identified for each scope, and Vineyard Wind is confident there is sufficient availability of these solutions in the market, as further evidenced by the support letters from suppliers attached to Section 14. Further details on these solutions can be found in Section 10.

**Table 9.2-1:** [REDACTED]

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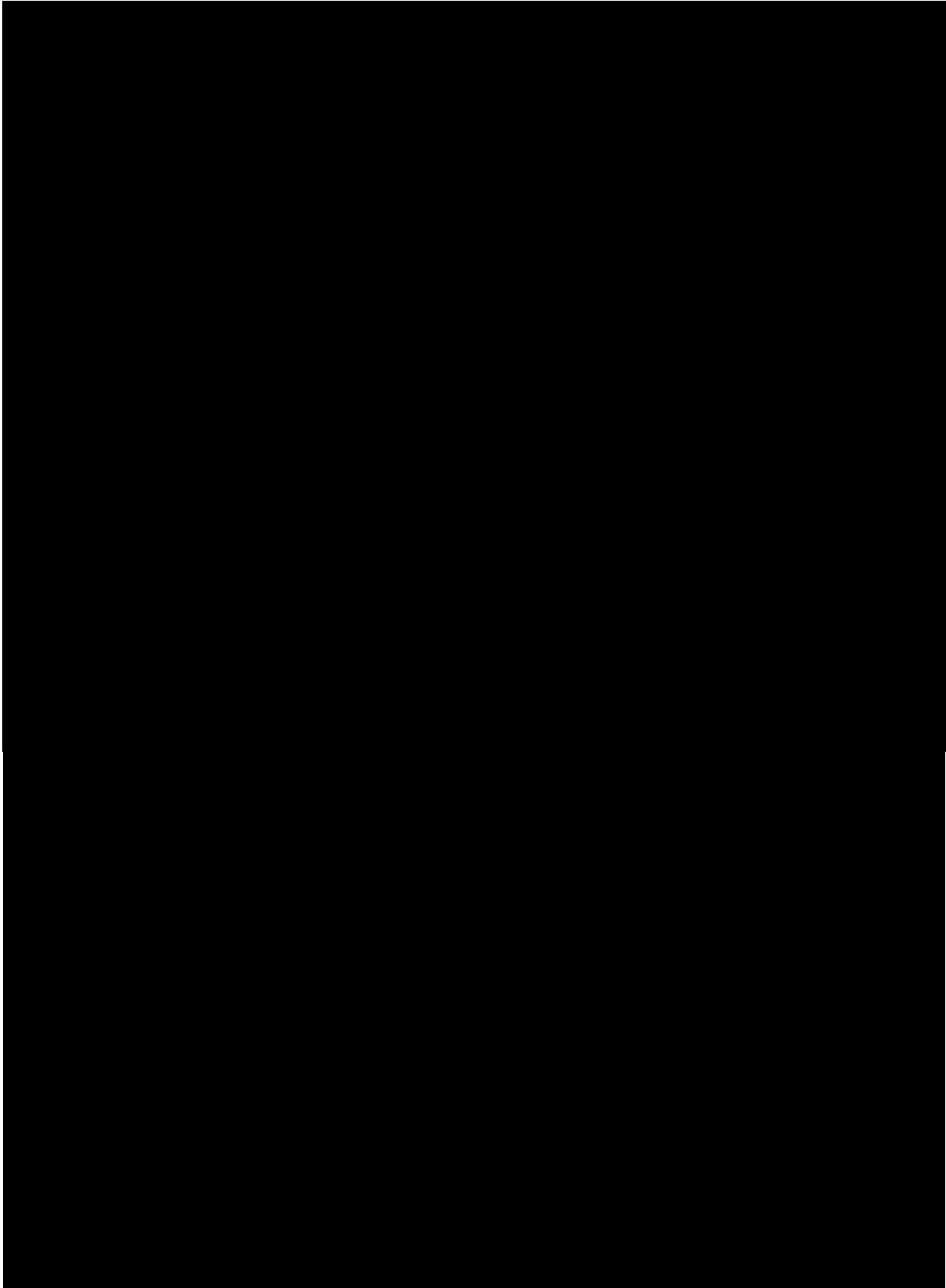


9.3. *Detail the status of all critical path items, such as receipt of all necessary siting, environmental, and ISO-NE approvals.*

Vineyard Wind is, as of December 2017, one and a half years in to the plan enacted in August 2016. The project is well under way and progressing according to the plan. The status of the critical path items and key activities in the project are depicted in **Table 9.3-1**.

**Table 9.3-1**

A large rectangular black box redacting the content of Table 9.3-1.





## Section 10 OF APPENDIX B TO THE RFP OPERATION AND LOGISTICS

*This section of the proposal addresses necessary arrangements and processes for outfitting, assembly, storage and deployment of major project components such as turbine nacelles, blades, towers, foundations, and transmission support structures. Please provide a construction plan that captures the following objectives:*

*10.1. Please list the major tasks or steps associated with deployment of the proposed project and the necessary specialized equipment (e.g. vessels, cranes).*

The project consists of the six following main work packages:

- Foundations
- Wind Turbine Generators
- Inter-array Cables
- Electrical Service Platform
- Export Cables
- Onshore Works

The Construction Plan prepared for Vineyard Wind is based on our execution experience from similar projects, such as VejaMate, Wikingen, East Anglia, West of Duddon Sands, and Beatrice. The experienced Vineyard Wind team is among the most experienced in the world, with development and construction experience from more than 30 European Offshore Windfarm and Transmission projects.

A schematic Construction Plan has been provided in **Figure 10.1-1** that depicts the projected sequence of major tasks for each work package during deployment of the Project. For more details see Section 9, where a detailed schedule has been provided.

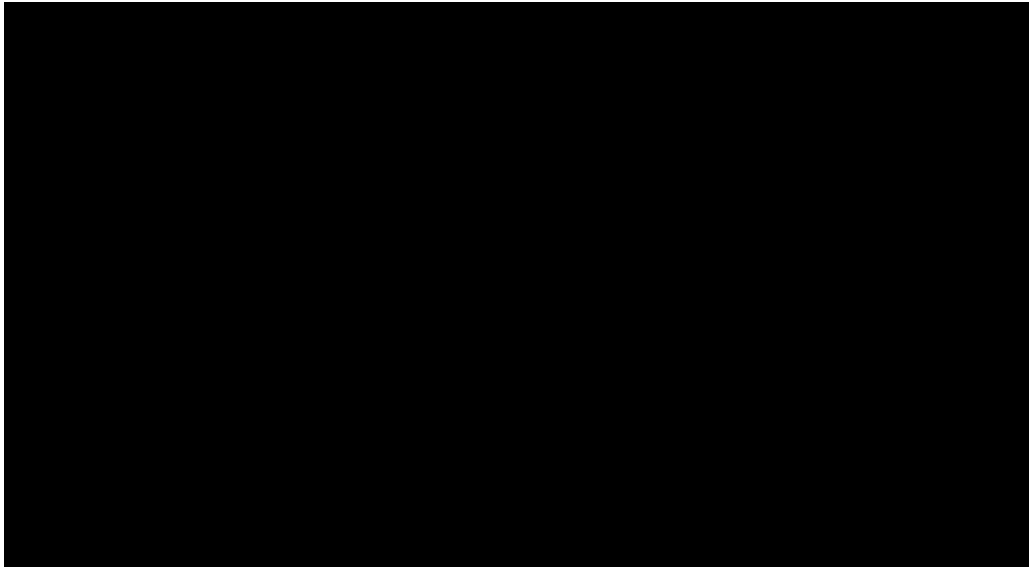


Figure 10.1-1

Additional efforts were invested in analyzing the various contractors' vessels spread and operational capability, combined with more than 30 years of site specific weather statistics. This information provides Vineyard Wind with unique insights to be able to develop and maintain an ambitious and robust Construction Plan.

An overview of the major tasks associated with deployment of the Project, including specialized equipment required to complete each of the work packages, is provided in **Table 10.1-1**.

**Table 10.1-1: The major tasks associated and specialized equipment required for deployment of the project.**

Work Package	Major task	
Foundations	<ul style="list-style-type: none"> <li>• Scour protection</li> <li>• Foundation transport</li> <li>• Harbor operation</li> <li>• Monopile foundation installation</li> </ul>	
Electrical Service Platform	<ul style="list-style-type: none"> <li>• Transport of ESP</li> <li>• ESP installation</li> <li>• ESP Offshore Commissioning</li> </ul>	
Offshore Export Cables	<ul style="list-style-type: none"> <li>• Transportation</li> <li>• Pre-installation surveys and Pre-lay grapnel run</li> <li>• Landfall installation</li> <li>• Laying and burial</li> <li>• Pulling into the ESP</li> <li>• Termination and commissioning works</li> </ul>	
Inter-Array Cables	<ul style="list-style-type: none"> <li>• Transportation</li> <li>• Pre-installation surveys and pre-lay grapnel run</li> <li>• Cable Installation (laying and burial)</li> <li>• Pulling into the foundations and ESP</li> <li>• Termination and commissioning works</li> </ul>	

Work Package	Major task	
Wind Turbine Generators	<ul style="list-style-type: none"> <li>• WTG transport to pre-assembly harbor</li> <li>• Harbor Logistics and pre-commissioning</li> <li>• WTG installation</li> <li>• WTG commissioning</li> </ul>	
Onshore Works	<ul style="list-style-type: none"> <li>• Onshore Transformer station</li> <li>• Cable works</li> <li>• Landfall works (HDD duct &amp; installation)</li> <li>• Civil ductbank works</li> </ul>	

*10.2. Please provide documentation to demonstrate site control for all marine terminals and other waterfront facilities that will be used to stage, assemble, and deploy the project for each stage of construction.*

- i. If available, evidence that the bidder or the equipment/service provider have right(s) to use a marine terminal and/or waterfront facility for construction of the offshore wind energy project (e.g., by virtue of ownership or land development rights obtained from the owner).*
- ii. If not available, describe the status of acquisition of real property rights for necessary marine terminal and/or waterfront facilities, any options in place for the exercise of these rights and describe the plan for securing the necessary real property rights, including the proposed timeline. Include these plans and the timeline in the overall project schedule.*
- iii. Identify any joint use of existing or proposed real property rights for marine terminal or waterfront facilities.*

**i. Marine Terminal** – The primary marine terminal that will be used for construction of the project is the New Bedford Marine Commerce Terminal (NBMCT), which is owned by the Massachusetts Clean Energy Technology Center (MassCEC). The NBMCT has been analyzed for logistic considerations and found sufficient for the construction of the proposed project. Vineyard Wind has a lease option agreement with MassCEC for the NBMCT on terms that provide Vineyard Wind rights to the NBMCT for the dates, durations, and uses necessary to complete construction of the project. A signed copy of this lease option with MassCEC for the NBMCT is provided as Attachment 10.2-1. While this lease option is identical to that signed by other offshore wind developers, it is provided on a confidential basis given conditions within the lease option. Potentially, Vineyard Wind may consider the use of a smaller supporting waterfront facility for WTG blade staging and several suitable sites have been identified. See below in ii.

**ii. Acquisition Of Real Property Rights** – As described in response to question 10.2(i), Vineyard Wind has real property rights to the NBMCT sufficient to complete construction of the project.



[REDACTED]

[REDACTED]

iii. **Joint Use Facilities** – Vineyard Wind is not planning for any joint use of a marine terminal or waterfront facilities. The lease for the NBMCT, described in response to question 10.2(i), specifies that in certain limited situations, when a tenant of the facility is delayed in its use of the facility, a portion of the facility may be used by a tenant aside from the main lease holder for a 6 month period. [REDACTED]

[REDACTED]

10.3. *Please describe the proposed approach for staging and deployment of major project components to the project site. Indicate the number, type and size of vessels that will be used, and their respective roles. Please include specific information on how the bidder's deployment strategy will conform to requirements of the Merchant Marine Act of 1920 (the Jones Act).*

This question has been divided in three questions, which will be responded to individually in the following three sections.

- Section 10.3.1 will include specific information on how the bidder's deployment strategy will conform to requirements of the Coastwise Laws.
- Section 10.3.2 will describe the proposed approach for staging and deployment of major project components to the project site.
- Section 10.3.3 will indicate the number, type, and size of vessels that will be used and their respective roles.

#### 10.3.1. The Coastwise Laws

This section will provide specific information on how the deployment strategy will conform to requirements of the Coastwise Merchandise Statute (Jones Act) and the Passenger Vessel Services Act (PVSA).

The installation setup is developed around the main principles of the Jones Act in close cooperation with the potential contractors and vessel owners. Blank Rome has been hired to perform a legal review for compliance of critical aspects of our proposed setups and they have confirmed feasibility.

The following summarizes Vineyard Wind's approach to compliance with the Jones Act.

##### Foundation installation:

##### Cable installation:



[illegible]

- Crew Transfer Vessels (CTVs) used to transport personnel from shore to an installation vessel, foundation, wind turbine, or substation will be Jones Act compliant vessels. Reference bullet **D** below.

[REDACTED]

[REDACTED]

\_\_\_\_\_

- \_\_\_\_\_

### 10.3.2 Description of the Approach for Staging and Deployment of Major Project Components

The following sections will provide an overview of the approach for staging and deployment of major project components for each of the following work packages:

- Foundations
- Wind Turbine Generators
- Inter-array Cables
- Electrical Service Platform
- Export Cables
- Onshore Works

#### 10.3.2.1 Foundations

The chosen Foundation concept is a monopile, which consists of a Monopile and a Transition Piece (TP).

[REDACTED]

Monopile foundation staging and deployment generally consists of the following major tasks:

- Foundation Transport
- Foundation Harbor Operation
- Scour Protection
- Monopile Foundation Installation

#### *Foundation Transport*

[REDACTED]

These vessels may be equipped with cranes capable of loading/unloading the monopiles or onshore cranes may be used for these operations, as shown in **Figure 10.3-1**.



Figure 10.3-1: Heavy Lift Vessel.

These vessels are generally very maneuverable and some of them are equipped with dynamic positioning systems (DP1/2), [REDACTED]

[REDACTED]

Table 10.3-1

Vineyard Wind has significant experience with heavy lift vessels for up to 1300 mT monopiles from previous projects. Companies such as SAL Heavy Lift, Jumbo, and BIG Lift have been engaged by Vineyard Wind to assist in determining the optimum foundation design, project schedule, and harbor setup.

The stowage plans illustrated in **Figure 10.3-2** are based on the larger heavy lift vessels with onboard cranes capable of loading and unloading the piles.

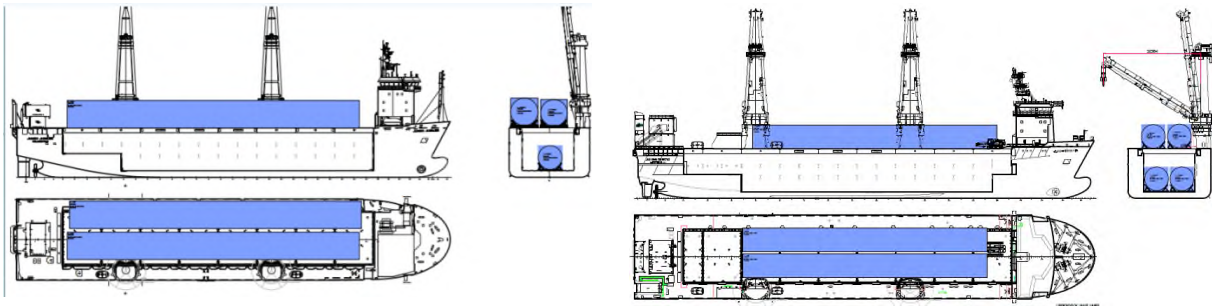


Figure 10.3-2: Stowage plan proposal for Jumbo J1800 and K3000 types.

Alternatively, vessels with less crane capacity could be used if the plan is to rely on the already present onshore cranes for offloading. The availability of these vessels is much higher than that of the vessels with the larger crane capacity. The onshore cranes planned for handling the piles within the port have been confirmed to also be capable of the offloading operation, as shown in **Figure 10.3-3**.

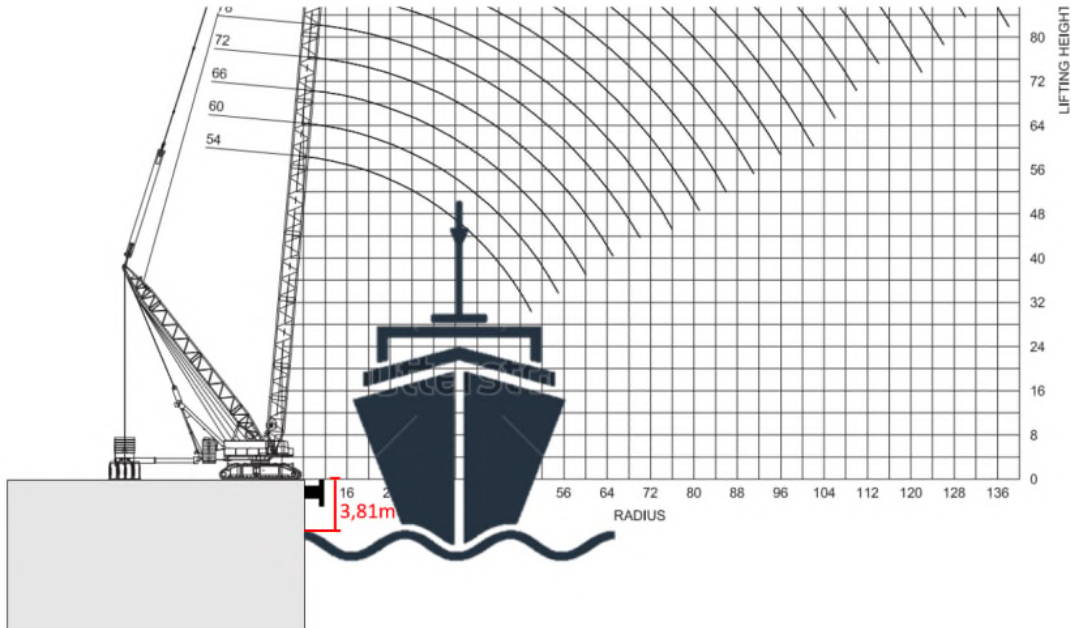


Figure 10.3-3: Crane reach with Demag CC8800 with 60m boom.

Transition Pieces (TPs) will be transported on HLVs. TPs require less crane capacity and, therefore, capable vessels are more readily available.

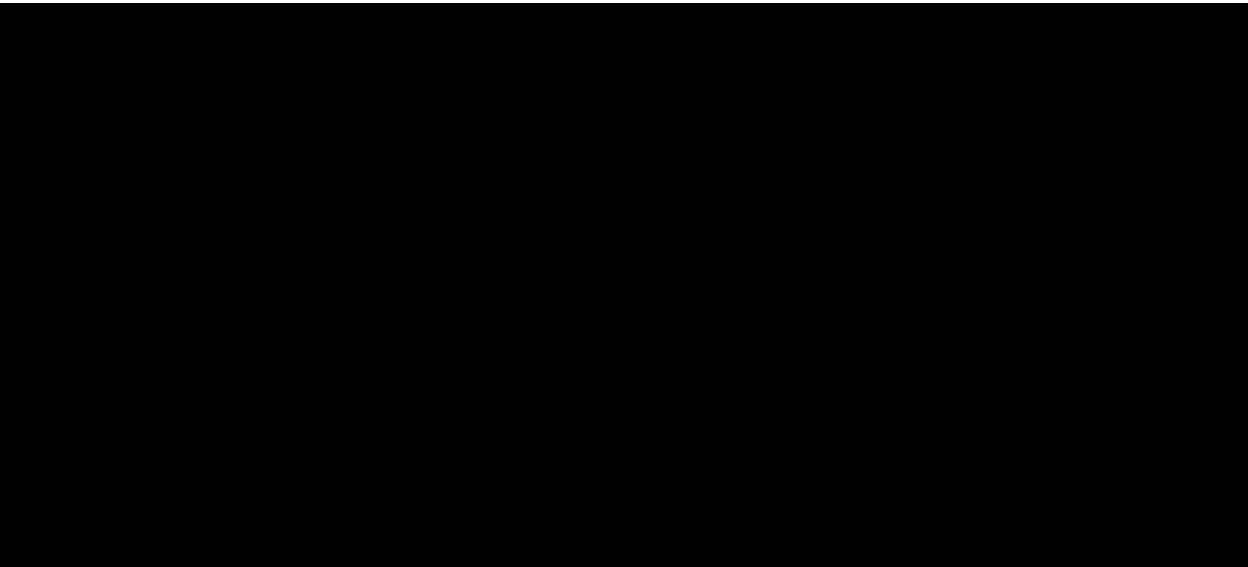
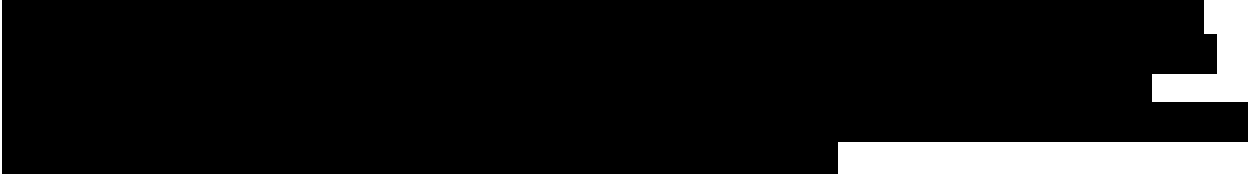
The specific steps required to transport foundations are identified in **Table 10.3-2**.

**Table 10.3-2: Foundation Transport.**

Specific Foundation Transport Steps	
Monopiles	
Transition Pieces	

*Steps are repeated until all foundations have been transported to NBMCT.*

**Foundation Harbor Operation**



**Figure 10.3-4** [Redacted]



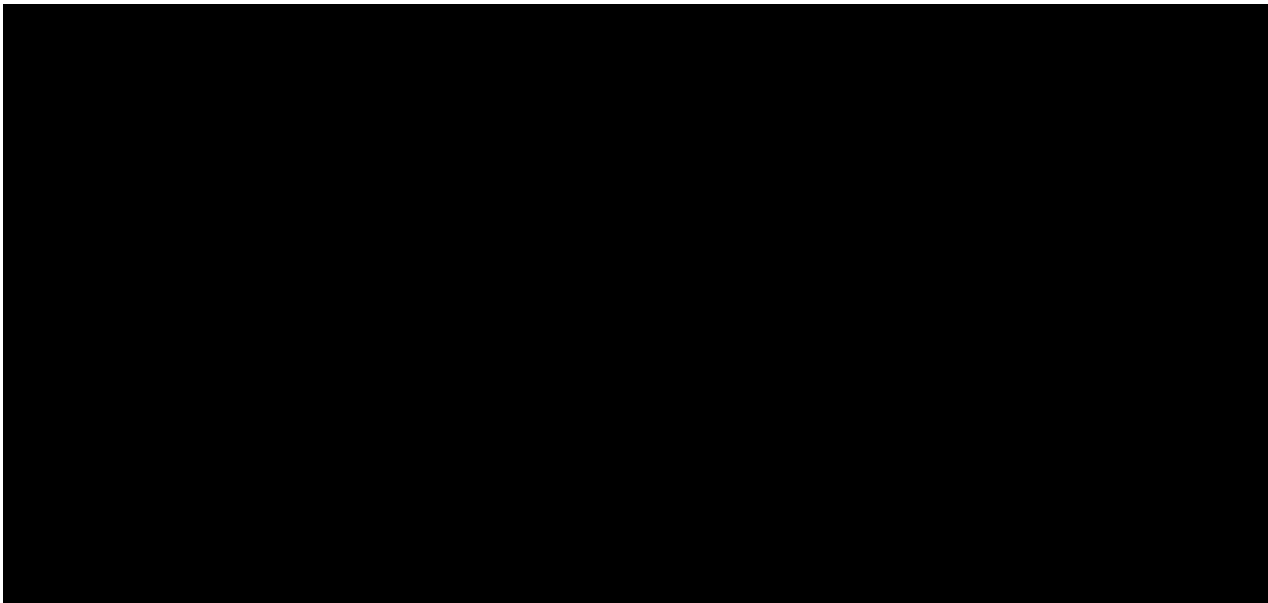


Figure 10.3-5



The specific harbor logistics steps for the handling of foundations are depicted in **Table 10.3-3**.

**Table 10.3-3: Harbor Logistics for Foundations.**

Foundations Harbor Logistics Steps	
Monopiles	<div></div> <div></div> <div></div>
Transition Pieces	<div></div>

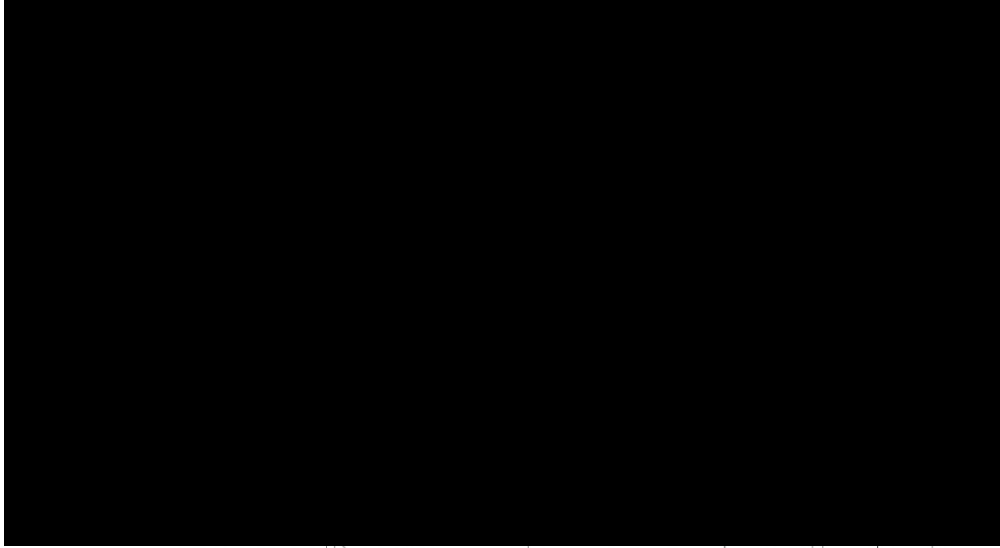


Figure 10.3-6

### ***Scour Protection Installation Steps***

The benefit of scour protection is that the foundation penetration can be minimized, as the design does not have to account for significant scour development. The scour protection is planned as a single layer of stone/rock material placed on the seabed where the foundations are to be installed. The installation of the scour protection will be carried out a few months prior to the start of foundation installation.

The steps shown in **Table 10.3-4** describe the installation of stone/rock material, which is the most widely used scour protection in the offshore wind industry.

**Table 10.3-4: Installation of Scour Protection.**

Scour Protection Installation Steps	
The scour protection is planned as a single layer of stone/rock material placed on the seabed where the foundations are to be installed.	<ol style="list-style-type: none"> <li>1. The scour protection is loaded from a quarry by conveyor belt or crane grab and transported to the site.</li> <li>2. A pre-construction survey of the bottom bathymetry is conducted.</li> <li>3. The scour protection is placed prior to installation of foundations.</li> <li>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).</li> <li>5. If needed in limited locations, for example to protect the inter-array cables, additional scour material may be placed.</li> </ol>

The stone material will be loaded on to the scour installation vessel in a designated harbor or directly at the quarry harbor. The scour installation vessel will relocate to the offshore site.

Several techniques for placing scour exist (side dumping, fall pipes, grab placement). Fall pipe, in which a pipe extends from the vessel to the vicinity of the foundation, features the best precision, sometimes supported by a ROV-guided lower end, and will be applied when possible, as depicted in **Figure 10.3-7**. Side dumping will not be used due to inaccuracy of the method. The vessels will be operating on Dynamic positions and will be moving along a predetermined route to ensure even distribution of the stone/rock material. The scour protection material is placed in a predetermined pattern to minimize usage, and will be adjusted during the operation based on bathymetry survey results, if required.

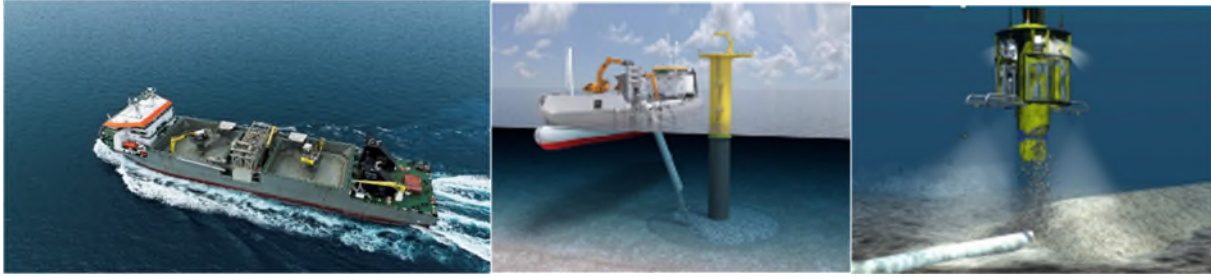


Figure 10.3-7: Typical images of Rock Dumping Vessel, Fall pipe, and ROV controlled lower end.

### ***Monopile Foundation Installation***

The foundation will consist of a monopile and a transition piece. [REDACTED]

[REDACTED] **Table 10.3-5** describes the installation of foundations.

**Table 10.3-5:** [REDACTED]

[REDACTED]	
------------	--

[REDACTED]



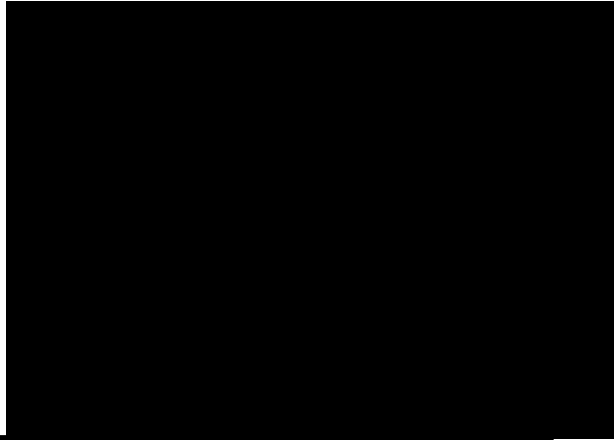


Figure 10.3-8:



If an anode cage is required, it will be installed prior to mounting the transition piece. The electrical connection is anticipated to be installed by ROV.

After the monopile is installed, the transition piece will be picked up and placed on the monopile, using either a grouted or bolted connection. This operation can be also done with the separate vessel. If the time between installation of the monopile and transition piece is longer than a few days, the amount of marine growth must be assessed and removed if required.

In case of the extended monopile variant, the secondary structures will be lifted onto the extended monopile using an insert consisting of platforms and externals (external platform, boat landing, etc.).

Other vessels required during operation include tugs, guard vessel, and a crew transfer vessel (or helicopter).

#### **10.3.2.2 Electrical Service Platform**

The Electrical Service Platform (ESP) is split into two primary components comprising the topside, which houses the electrical components, and the foundation substructure.

The ESP will be a conventional substation on a jacket substructure with piles. The ESP deployment consists of the following main steps:

- Transport of ESP
- ESP installation
- ESP Offshore Completion and Commissioning

##### ***ESP Transport***

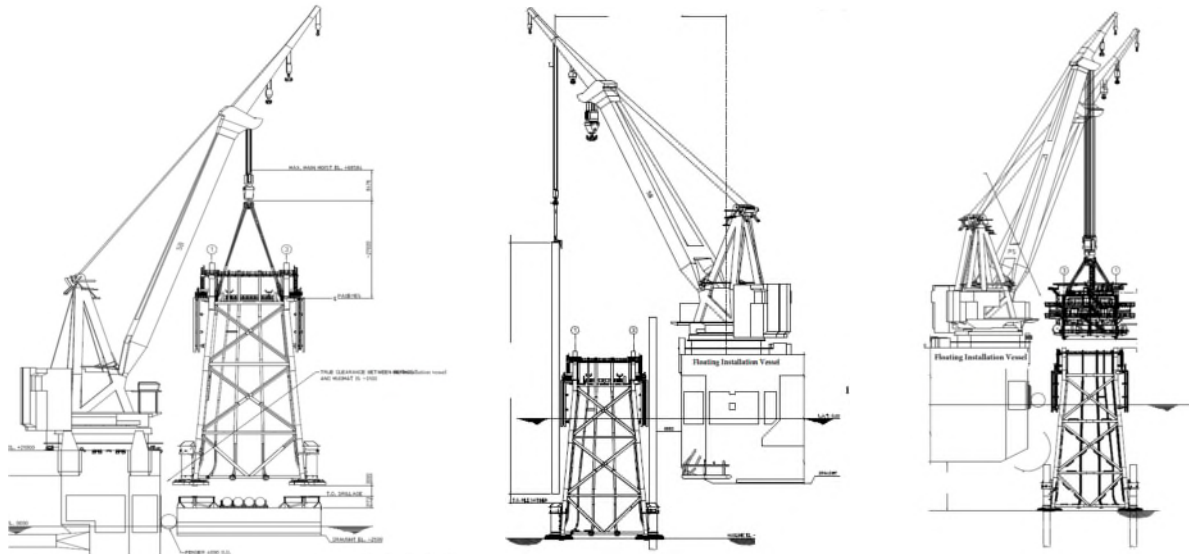
The ESP superstructure will be delivered directly to the project site on a barge or cargo vessel or brought directly by the installation vessel. The ESP transport steps are shown in **Table 10.3-6**.

### Table 10.3-6: ESP Transport.

ESP Transport Steps	
Topside and the Foundation Substructure	<ol style="list-style-type: none"> <li>1. On loading of ESP jacket, Topside, and the pin-piles onto the transport vessel/ barge using SPMTs at the manufacturer's quayside.</li> <li>2. Transport to offshore project site.</li> </ol>

## ESP Installation

In general, the ESP foundation installation will be similar to the process described under Monopile Foundation Installation, above. The ESP is anticipated to be installed by the same floating heavy lift crane vessel installing the wind turbine foundations. The topside and the foundation will be connected using a bolted connection, a welded connection, or a combination of bolts and welding. The offshore mechanical installation of each ESP is anticipated to take approximately 5-10 days, excluding down time due to adverse weather. A typical topside installation is depicted in **Figure 10.3-9**.



**Figure 10.3-9: Indicative installation concept for Jacket, Pin-Piles, and Toppide using floating vessel.**

Seabed preparation may be required prior to installation, such as the removal of large obstructions to prevent excessive seabed gradients. If scour protection is needed, then it will be installed during the same campaign as for the turbine foundations. ESP installation related activities are enumerated in **Table 10.3-7**.

Table 10.3-7

[illegible]

ESP installation Steps	
Topside installation (in continuous operation)	<ol style="list-style-type: none"> <li>1. Remove rigging platform.</li> <li>2. Have barge approach main crane vessel with topside.</li> <li>3. Pick up and place topside on jacket structure.</li> <li>4. Weld or bolt topside to jacket.</li> <li>5. After 24-48 hours, verify weld quality (if required).</li> <li>6. Repeat survey of seabed (in case of jack-up or other seabed impacting activities).</li> </ol>

After the ESP is installed, the inter-array cables and the high voltage transmission cables (export cable) will be pulled into and terminated at the ESP. These cables will be routed through J-tubes or similar means located on the substructure or routed through the interior of the substructure. If required, once the inter-array cables are connected to the ESP, the scour protection/control system will be installed around the ESP foundation structure utilizing a similar design as the WTG foundations.

#### **ESP Offshore Commissioning**

After installation of ESP, the commissioning will commence, which requires the steps indicated in **Table 10.3-8**.

**Table 10.3-8: ESP Offshore Commissioning.**

Offshore Commissioning Steps	
ESP Offshore Commissioning	<ol style="list-style-type: none"> <li>1. Bring along the accommodation jack-up vessel (if relevant).</li> <li>2. Establish connection and Walk to Work system between the accommodation vessel and ESP.</li> <li>3. Remove sea-fastenings.</li> <li>4. Test all safety equipment, fire detection and protection, and fire-fighting systems.</li> <li>5. Perform leak tests on the 220 kV GIS after the export cable installation and increase to nominal SF6 pressure.</li> <li>6. Commission the 220 kV and 66 kV equipment on the platforms.</li> <li>7. Commission the Power SCADA and HV/MV Protections.</li> <li>8. Prepare a test report with completed test sheets.</li> </ol>

#### **10.3.2.3 Offshore Export Cables**

The offshore HV export cables interconnect the ESP and transmit the power from the ESP to the cable landfall point. Export cables will be transported directly in the cable laying vessel or in a barge and installed directly at the project site upon arrival.



The export cables deployment consists of the following main steps:

- Transportation
- Pre-installation surveys and pre-lay grapnel run
- Landfall installation
- Laying and burial
- Pulling into the ESP

- Termination and commissioning works

### ***Export Cable Transportation***

Once manufactured, the export cables will be transported directly from the manufacturing facilities to the site or to port in the cable laying vessel or a barge. In case the cables are to be transported in a barge, a heavy lift vessel could be employed to transport the barge with the cables aboard across the Atlantic.

### ***Pre-Installation Surveys and Pre-Lay Grapnel Run***

A pre-installation survey will be carried out to ensure seabed changes are considered. The objective of the pre-installation survey is to assess the water depth, identify the shallow geology, and locate objects that might impede the cable installation.

The planned cable route 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 well in advance of the cable deployment in order to minimize the risk of any debris on the seabed hindering the installation of the cables.

### ***Landfall Installation***

The normal procedure is to start the installation of the cables from the landfall and continue from there to the offshore ESP. At the landfall, it is assumed that one Horizontal Directional Drilling (HDD) per offshore cable will be required to pass through the beach. HDD is a trenchless technique method of installing a pipe in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. Once the pipe is installed, the cable is pulled through it. The HDD will be ready by the time cable installation commences. Another option is an open-trench at the landfall instead.

Once at the landfall location, the cable laying vessel will position close to the HDD exit and deploy the burial tool (the burial tool can also be deployed from a separate vessel). The onshore pulling winch wire will be pulled back to the cable laying vessel, connected to the first export cable end, and the export cable will be pulled towards the shore. Buoys will be installed on the cable prior to the export cable section leaving the chute of the vessel, enabling the export cable to be flexibilityed towards the burial tool position. Once at the burial tool position, the buoys will be removed and the 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. The remaining shore cable section will be laid down in a controlled manner on the seabed.

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 duct end will then be closed.

### ***Export Cable Laying and Burial***

Once the cable landing is complete, the cable laying vessel will move along the cable route while simultaneously laying and burying the cable. Another possibility would be to lay the cable and bury it at a later stage using a separate vessel that will pull the burial tool on top of the cable.

In the shallow water areas, the cable laying vessel will need to install the cable on anchors to provide the required pulling force but, once the depth is sufficient, the vessel will continue in Dynamic Position (DP) mode. The DP mode is a computer-controlled system to automatically maintain a vessel's position and heading by using its own propellers and thrusters (without the use of anchors).

The burial tool will grade-out near the jointing location/ESP. The last part of the cable route at the jointing location or ESP will not be buried. The cable ends will be attached with easy recovery rigging markers and buoys.

At least one joint will be required per cable along the export cable route. The location and quantity of the joints will be adjusted as required to fit the marine installation layout and the seabed topography.

The jointing operations will start with 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 using a bow.



Figure 10.3-10: Vessel lowering an offshore cable joint using a bow.

#### ***Offshore Export Cable Pull-In into the ESP***

At the offshore substation platform, 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. Depending on the final planning, the cable can be wet-stored or directly pulled into the ESP.

To commence the pulling into the ESP, a 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. During pull-in, the cable laying vessel will move back towards the cable route and the cable will be lowered to the seabed as the pull-in progresses until the cable is laid in 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.

#### ***Offshore Export Cable Termination and Commissioning***

After the export cable is secured on the temporary hang-off, the termination team will start with stripping of 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 HV GIS switchgear bay or at a dedicated junction box. 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.

#### **10.3.2.4 Inter-Array Cables**

The medium voltage inter-array cables will connect the individual wind turbines to one another and to the ESPs. The cables will be transported directly from manufacture in the cable laying vessel and directly installed at the offshore project site upon arrival. As an alternative, the cables could be transported with a separate vessel and stored in the US and then be transferred to a cable laying vessel.

The inter-array cable installation will commence after the start of the foundation installation, but for part of the installation it will be performed in parallel with foundation installation. The method and extent by which inter-array cables are buried is dependent on the results from seabed surveys. [REDACTED]

[REDACTED] Cable protection measures will be required for sections of the inter-array cables which are left unburied, as well as for the cable transition from the seabed to the WTG foundation. Cable pull-in and cable termination will be conducted at each foundation location. An inter-array cable termination is the process by which inter-array cables are connected to the WTG foundations ahead of turbine installation. This process involves removing the external layers of cable protection and splicing the three core cables to the termination point.

The Inter-Array Cables deployment consists of the following main steps:

- Inter-Array cable transportation
- Pre-installation surveys and pre-lay grapnel run
- Cable installation (laying and burial)
- Pulling into the foundations and ESPs
- Termination and commissioning works

#### ***Inter-Array Cable Transportation***

The cables will be transported directly from the manufacturing facilities to the site or port in the cable laying vessel or in a barge.

#### ***Pre-Installation Surveys and Pre-Lay Grapnel Run***

A pre-installation survey will be carried out to ensure seabed changes are considered. The objective of the pre-installation survey is to assess the water depth, identify the shallow geology, and locate objects that might impede the cable installation works.

The planned cable routes within the wind farm 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. This will be performed well in advance of cable laying, in order to minimize the risk of any debris on the seabed that may hinder the installation of the cables.

#### ***Cable Installation (Laying and Burial)***

With the required cable length pulled-in, the installation vessel will move off in the direction of the other foundation, surface laying the cable along the planned route. The departure angle of the cable will be constantly monitored, along with the as laid cable length compared to relative ship movement and the position and orientation of the cable. These measures prevent the formation of loops and ensure the cable is not laid with too much tension, preventing it from sinking during burial and helping to ensure the cable minimum 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.

At this point, it is anticipated that the inter-array cables will be buried after laying. Cable burial operations will be performed by the cable laying vessel or with a dedicated separate vessel using the burial tool. The burial tool will be decided at a later stage, but it is likely to be a jetting tool. If a jetting tool is used, the cables will be buried by applying high pressure water which creates a trench and fluidizes the seabed beneath the cable. The cable will settle at the bottom of the trench due to its own weight. Trenching will start and finish as close as possible to the application of scour protection.





Figure 10.3-11: Inter-Array cable installation vessel.

#### ***Pulling Cable into Foundations and ESPs***

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

A pull-in rope will be recovered by the installation 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 simultaneously the installation vessel will pay out cable. The pull 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 protection system to ensure cable integrity. A ROV will carry out a final visual inspection of the cable protection system and cable.

#### ***Inter-Array 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 core 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.

#### **10.3.2.5 Wind Turbine Generators**

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

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

Each major task will be further detailed in the following 4 subsections.

The wind turbine consists of a number of components, each prepared at the manufacturing location or in the pre-assembly harbor, ready for final assembly offshore.

Each wind turbine consists of the following components:

- 2-3 x Tower Sections
- 1 x Nacelle + Hub
- 3 x Blades



### WTG Transport

The WTGs will be transported to the designated installation port. Prior to the commencement of the WTG installation period, components will be transported to the port to create a necessary stock of components to keep the installation activities running.

WTG components will be transported on multipurpose and heavy lift vessels with crane capacities capable of loading and unloading the components. These vessels, depicted in **Figure 10.3-12**, are readily available on the market. The transport and stowage plans will be designed to obtain the best possible utilization of the vessels. This means a vessel may carry a mix of components not necessarily adding up to complete WTGs or vessels may be dedicated to one component type (i.e., blades or towers).



**Figure 10.3-12: Multi purpose / heavylift vessels carrying WTG components.**

A number of transport vessels will be involved simultaneously in the WTG transportation. The WTG transport follows the steps shown in **Table 10.3-9**.

**Table 10.3-9: Wind Turbine Generator Transport.**

WTG transport Steps	
WTG components will be transported on multipurpose and heavy lift vessels with crane capacities capable of loading and unloading the components.	<ol style="list-style-type: none"> <li>1. Loading WTG components onto the vessel by vessel cranes at manufacturer's port of export.</li> <li>2. Transport voyage estimated to be 8-14 days from Europe depending on vessel.</li> <li>3. Offloading in NBMCT by vessel crane.</li> <li>4. Transport vessel returns to manufacturer's port of export.</li> </ol> <p>Steps are repeated until all WTG components have been transported to marshalling port(s)</p>

### Harbor Operation and Pre-Assembly

As specified in the Foundation Harbor Operation chapter, the New Bedford Marine Commerce Terminal is planned to function as laydown and pre-assembly port for WTGs.

**WTG Area:** The main activities in port will be moving the WTG components from the inbound vessels to storage and back to be loaded on the feeder vessel for transport to the offshore site when ready for installation. Preparatory work on the WTG components is primarily related to tower sections, which will be up-ended and stacked on temporary foundations near the quay side and pre-assembling of electrical / mechanical internal components. Final preparation and turbine OEM specific tests will also be performed on the nacelle to ensure fastest possible offshore commissioning.

When the nacelles and tower sections arrive at port, the handling steps depicted in **Table 10.3-10** will occur.

Table 10.3-10: WTG Harbor Logistics.

WTG Harbor Logistics Steps	
Nacelles and Tower Sections	<ol style="list-style-type: none"> <li>1. SPMTs or specialised “movers” will bring the components to temporary storage.</li> <li>2. Nacelles will be maintained, pre-commissioned, and tested to the extent possible prior to the offshore installation activities.</li> <li>3. The tower sections will be brought to a staging area where they will be upended and stacked on temporary foundations as required for the offshore installation.</li> <li>4. Towers and internal tower components will be assembled and pre-commissioned to the extent possible prior to the offshore installation activities.</li> <li>5. SMPTs will bring the nacelle/hub to the loading area.</li> </ol>
Blade Storage	<ol style="list-style-type: none"> <li>8. SPMTs or specialized “movers” will bring the blades to temporary storage.</li> <li>9. Blades will be secured against heavy winds, if required.</li> <li>10. SMPTs or specialized movers will bring the blades to the quay for loadout.</li> <li>11. Two crawler cranes (2-300t class) will load the blades onto the feeder vessel.</li> </ol>

#### WTG Installation

The WTG installation will run in continuous construction until all WTGs are in place.

This installation vessel is expected to be a jack-up crane vessel, as shown in **Figure 10.3-13**. Since only a single installation vessel is anticipated, this process will be conducted sequentially.



Figure 10.3-13: Jack-up crane vessel Apollo (Copyright DEME/GeoSea).

The steps shown in **Table 10.3-11** describe the installation of wind turbines as expected to be performed during the Vineyard Wind project.

Table 10.3-11:

WTG Installation Steps	
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
Installation Vessel Cycle	<p>9. Position installation vessel at the project site, pre-load, and jack up.</p> <p>[REDACTED]</p> <p>14. Go to next WTG location and repeat steps for remaining sets.</p>

The commencement of WTG installation represents the most intense period of vessel traffic in the offshore site with the WTG foundations, inter-array cables, and WTGs all being installed in parallel.

#### ***WTG Commissioning***

The WTG installation will be followed by the commissioning period where the WTGs will be prepared for operation and energized. Necessary tests will be carried out and documented according to the type certificate. WTG commissioning involves conducting the necessary tests of the electrical infrastructure and WTG ahead of passing the unit to the operation and maintenance teams for the duration of its service life. The WTG commissioning and testing phase will be conducted in parallel with the WTG installation phase.

#### **10.3.2.6 Onshore Works**

The Onshore Works for staging and deployment consists of the following major tasks:

- Onshore Transformer station
- Landfall Works
- Civil duct bank works
- Cable supply/installation works

#### ***Onshore Transformer Substation***

The onshore substation will be constructed on a parcel of land adjacent to the existing Eversource 115 kV Barnstable Switch Station (No. 958). Construction is planned in parallel with the upland duct bank and cable installation. Preliminary concepts have been completed, but final design cannot be completed until the ISO New England interconnection studies are completed, confirming the final equipment sizing and overall configuration. Vineyard Wind's onshore infrastructure will consist of breakers, two (2) 60 Mvar reactors for line compensation, two (2) 115/220/33, 225 MVA transformers, two (2) sets of 33 kV switched shunts, one (1) 100 Mvar harmonic filter and offsetting reactor. An alternative to the



Figure 10.3-14 [REDACTED]

switched shunts could be a  $\pm 110$  Mvar Statcom or SVC. The Project's onshore substation will connect directly at 115kV to the Eversource Barnstable Switch Station (No. 958) through a short underground cable duct system for approximately 1,000 ft (300 m) to existing available bays within the substation. The Project's onshore substation will also house the control/protection building where the protective relaying and associated SCADA system equipment will reside. The substation will be commissioned and tested.

### **Landfall Activities**

At the offshore cable landing, the cable will be installed in 18" HDPE conduits approximately 60m (200') in length. The conduits will be installed by either horizontal directional drilling (HDD) or by installing an approximately 30m (100') sheet pile cofferdam assembly where open cut trenching can be applied, similar to the construction methodology for the remaining upland route in Figure 10.3-15. The conduits will connect to the shore end transition vaults (2) measuring roughly 2,1m (W) x 10,3m (L) x 2,3 m (H) (7' x 34' x 7'6"). There, the 220 kV three core offshore cables will be spliced to individual phase single conductor 220 kV core cross-linked Polyethylene (XLPE) insulated cables.

The spliced onshore cables will run in individual conduits within the concrete encased duct bank through public roads and existing ROW before terminating at the onshore substation in Barnstable, Massachusetts, **Figure 10.3-15**. The conduits will be installed in open trench cut into the pavement or off-road areas by excavation. The trench opening is anticipated to be between 8-10 ft (2.4-3 m) wide and 4.5-5 ft (1.3-1.5m) in depth, except for locations that must pass over or under existing infrastructure. Once conduits are positioned in place, they will be formed around and concrete will be poured around the conduits forming a protection covering and stability for the conduits. The duct bank is anticipated to be approximately 4-5 ft (1.2-1.5 m), except in areas where a more shallow configuration is required. The trenches will be backfilled and the road restored to its original condition through repaving.



**Figure 10.3-15: Onshore open trench and duct bank.**

The route will transit through the following streets and rights of way (ROW) for approximately [REDACTED]. Vineyard Wind has evaluated multiple route solutions with the intention of eliminating higher risk trenchless methods such as HDD and pipe jacking/boring. The current routes achieves that goal.

It is anticipated that the route will require between 18-20 splice vaults, to be confirmed during final engineering and cable pulling tension limitations.

The civil contractor will repave all impacted public roads to the towns' specifications. The cable supplier and installer will prove duct bank conduit with video and mandrel pulling prior to commencing cable installation. Civil construction and cable installation in public ways will take place during the off-peak season. Following completion of the duct bank sections, the cable installer will commence cable pulling.

**Cable Installation**

Cable will be single conductor 220 kV core Cross-linked Polyethylene (XLPE) insulated cables. Cable installation could commence in some of the road sections that have been completed. It is anticipated the onshore cable will be transported to the site by truck. This will reduce the need for a large staging area for cable laydown as it can be delivered in small lots as required. 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 winch will be at the other end manhole 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 cable following cable installation and terminations.

**10.3.3. Number, Type and Size of Vessels That Will Be Used and Their Respective Roles**

An overview of vessels (number, type, and size) and respective roles expected to be used for Vineyard Wind 1 is shown in Attachment 10.3-1.

**10.4.** *List the party (e.g. the bidder, or equipment/service providers under contract to the bidder) responsible for each deployment activity and describe the role of each party. Describe the status of bidder's contractual agreements with third-party equipment/service providers.*

**10.4.1. Responsible Party for Each Deployment Activity and the Role of Each Party**

**Table 10.4-1** has a list of the potential parties involved in project deployment and their scope of responsibility for each of the work packages that have been identified. This list represents the suppliers with whom Vineyard Wind has been in direct dialogue. Second tier suppliers have been approached (such as harbor owners, crane companies, supply vessel and transport vessel owners, etc.), but are not shown in the table. Further, this list is not to be considered complete and other suppliers could be considered relevant.

**Table 10.4-1: Parties potentially involved in wind farm deployment.**

Work Package	Deployment activity	Scope of responsibility (Major tasks)	Potential Suppliers	
Foundation	Foundation Installation	<ul style="list-style-type: none"> <li>• Transport of Component from Manufacture to Marshalling port</li> <li>• Port &amp; Harbor logistics</li> <li>• Foundation Installation</li> <li>• Scour protection installation</li> </ul>		
Electrical Service Platform	ESP installation and commissioning	<ul style="list-style-type: none"> <li>• Transport of ESP</li> <li>• ESP installation</li> <li>• ESP Offshore Completion and Commissioning</li> </ul>		
Offshore Export Cables	Export cable installation and commissioning	<ul style="list-style-type: none"> <li>• Transportation</li> <li>• Pre-installation surveys and pre-lay grapnel run</li> <li>• Landfall installation</li> <li>• Laying and burial</li> <li>• Pulling into the ESP</li> </ul>		

Work Package	Deployment activity	Scope of responsibility (Major tasks)	Potential Suppliers	
		<ul style="list-style-type: none"> <li>Termination and commissioning works</li> </ul>		
<b>Inter-Array Cables</b>	Inter-Array cable installation and commissioning	<ul style="list-style-type: none"> <li>Inter-Array cable transportation</li> <li>Pre-installation surveys and pre-lay grapnel run</li> <li>Cable installation (laying and burial)</li> <li>Pulling into the foundations and ESPs</li> <li>Termination and commissioning works</li> </ul>		
<b>Wind Turbine Generators</b>	Supply of installation vessel spread	<ul style="list-style-type: none"> <li>WTG transport to pre-assembly harbor</li> <li>Harbor Logistics Laydown and pre-assembly</li> <li>WTG installation</li> <li>WTG commissioning</li> </ul>		
<b>Onshore Works</b>	Onshore Civil Works & Substation	<ul style="list-style-type: none"> <li>Onshore Transformer station</li> <li>Landfall Works</li> <li>Civil duct bank works</li> <li>Cable supply/installation works</li> </ul>		

#### 10.4.2. Status of Bidder's Contractual Agreements with Third-Party Equipment/Service Providers

During the development of Vineyard Wind 1 and in the preparation of this proposal, Vineyard Wind has had detailed interactions with a broad range of supply chain players. The interaction up until bid submission has been conducted in phases. For more details, see Section 8.1.iv of this proposal.

As set out in Section 8.1.iv, orders will be placed in accordance with the Procurement Plan provided in Section 8.1.v of this proposal. As stated in the Procurement Plan, several deployment procurement activities will be initiated prior to bid and continue after bid.



Section 11 OF APPENDIX B TO RFP  
OPERATION AND MAINTENANCE

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*Projects that can demonstrate that the operation and maintenance (“O&M”) plan, level of funding, and mechanism for funding will ensure reliable operations during the term of the contract or the tariff are preferred.*

*11.1. Provide an O&M plan for the project that demonstrates the long term operational viability of the proposed project. The plan should include the location of the O&M base, a discussion of the staffing levels proposed for the project, the expected role of the project sponsor or turbine manufacturer/outside contractor, scheduling of major maintenance activity, and the plan for testing equipment.*

**Introduction**

The Vineyard Wind parent companies have significant experience in safely and successfully developing, constructing, and operating large scale offshore wind farms, onshore wind farms, and other renewable generation plants, as well as transmission assets, as detailed in response to question 11.6, for over 25 years.

Vineyard Wind is able to take direct advantage of the lessons learned, technological improvements, and other optimizations during this period in developing its O&M plan for this project. The result is a robust and mature O&M concept that has been benchmarked and validated against other offshore windfarm projects and transmission assets which are currently operated by the Vineyard Wind parent companies.

The operational strategy for the project is based on establishing an O&M base at Vineyard Haven on Martha’s Vineyard

[REDACTED]



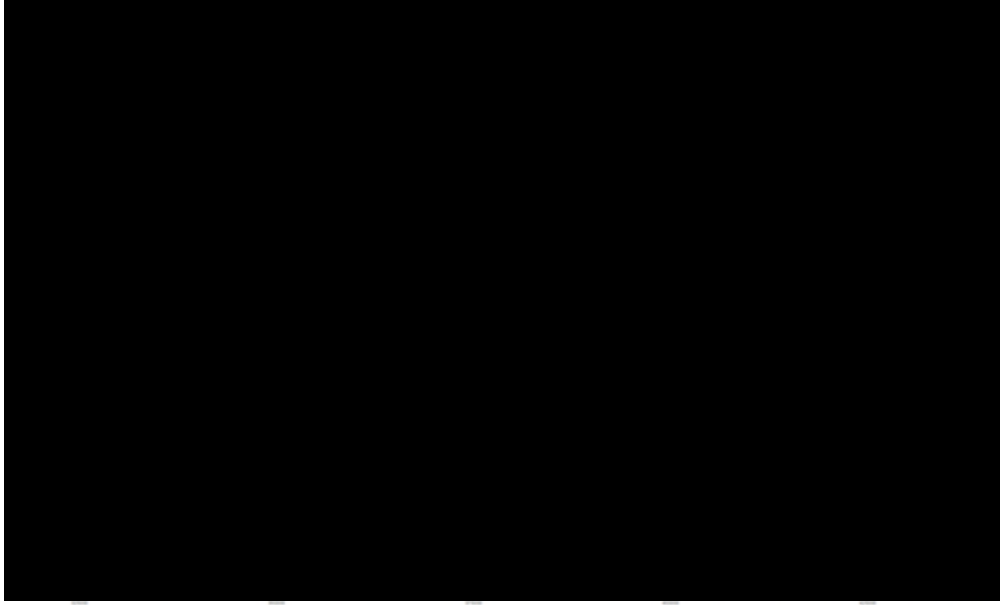


Figure 11.1-1.

Initially, the WTG OEM will provide scheduled and unscheduled maintenance services and will be responsible for operating the WTGs under the terms of a full-service warranty agreement. After this period, Vineyard Wind may extend the duration of the services provided by the OEM in whole or in part, or these works may be executed by Vineyard Wind directly.

The Balance of Plant (BOP) will be operated and maintained by Vineyard Wind from the start of operations.

Vineyard Wind has, since January 2017, developed a detailed O&M mobilization plan towards COD in December 2021 (as detailed below in **Figure 11.1-2**) and execution of the initial workstreams have already commenced.

Further details on the operational plan are summarized below:

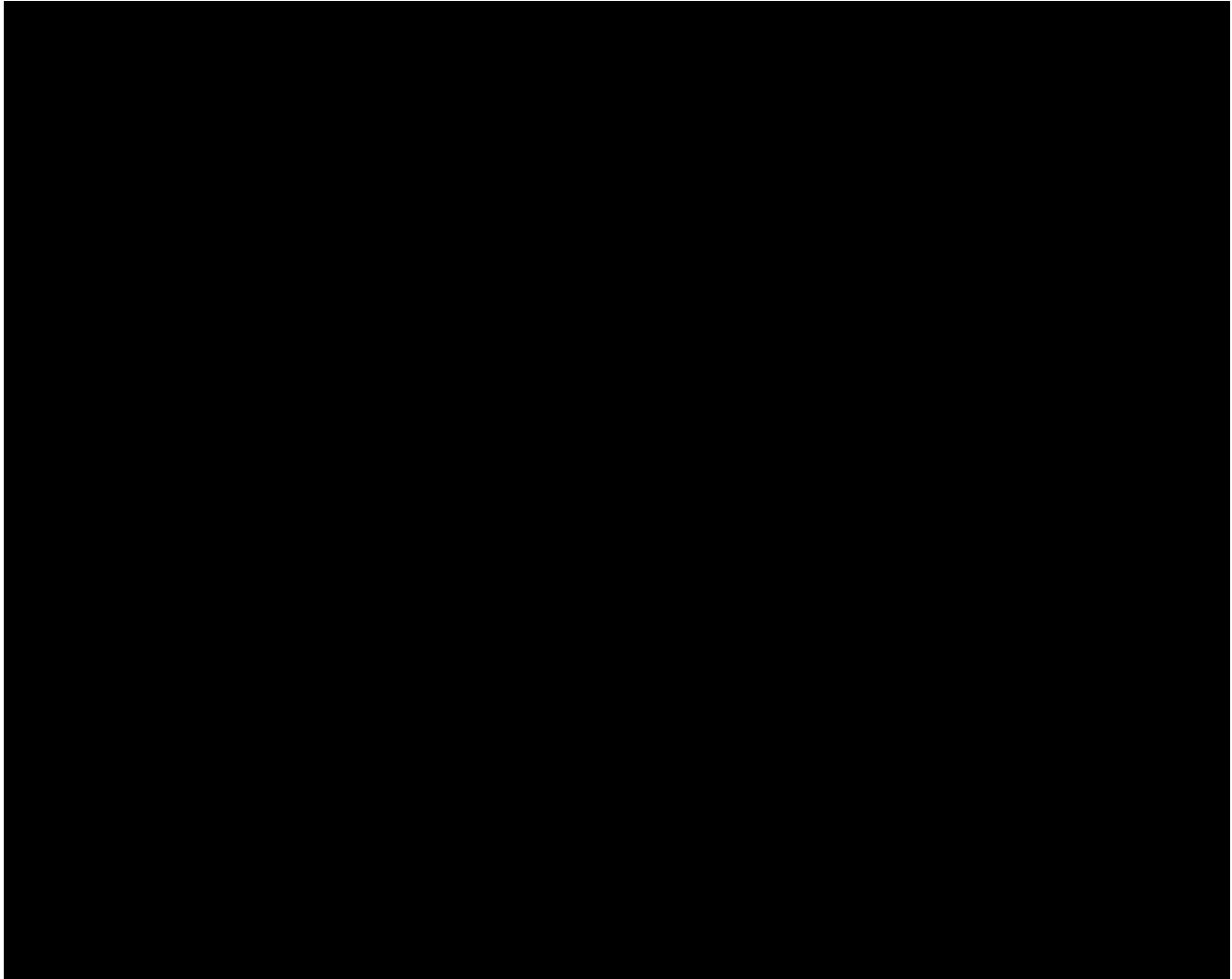


Figure 11.1-2

**O&M Base**

The O&M Base will include:

- A quayside area for vessel mooring, loading, and material handling
- A warehouse for the storage of spare parts and tools
- Office and welfare facilities consisting of locker rooms, toilets, showers, canteen, etc.
- Parking lot and access ways

The preferred location for the O&M Base is within the Vineyard Haven port area. Vineyard Wind has identified a location currently owned by R.M. Packer and has executed a MoA with R.M. Packer for the potential redevelopment of the port area. In order to fully utilize this area for the O&M Base, a redevelopment of the port area will be required to create suitable berthing facilities. Vineyard Wind has already engaged a port engineering firm and has explored several development concepts for these port facilities. The currently preferred development scenario is shown in **Figure 11.1-3**.



Figure 11.1-3:

Although not a final detailed design, this plan is a suitable and viable development concept which has been priced by Vineyard Wind. If successful, Vineyard Wind is prepared to fund this redevelopment and firmly believes the solution can be permitted and constructed within the necessary timescales.

In addition to the port infrastructure, Vineyard Wind will also require buildings for storage (warehousing), offices, and welfare facilities for the staff. We will either make use of existing buildings (this may involve refurbishment) within or close to the Vineyard Haven port area, or we will construct new, purpose-built buildings.

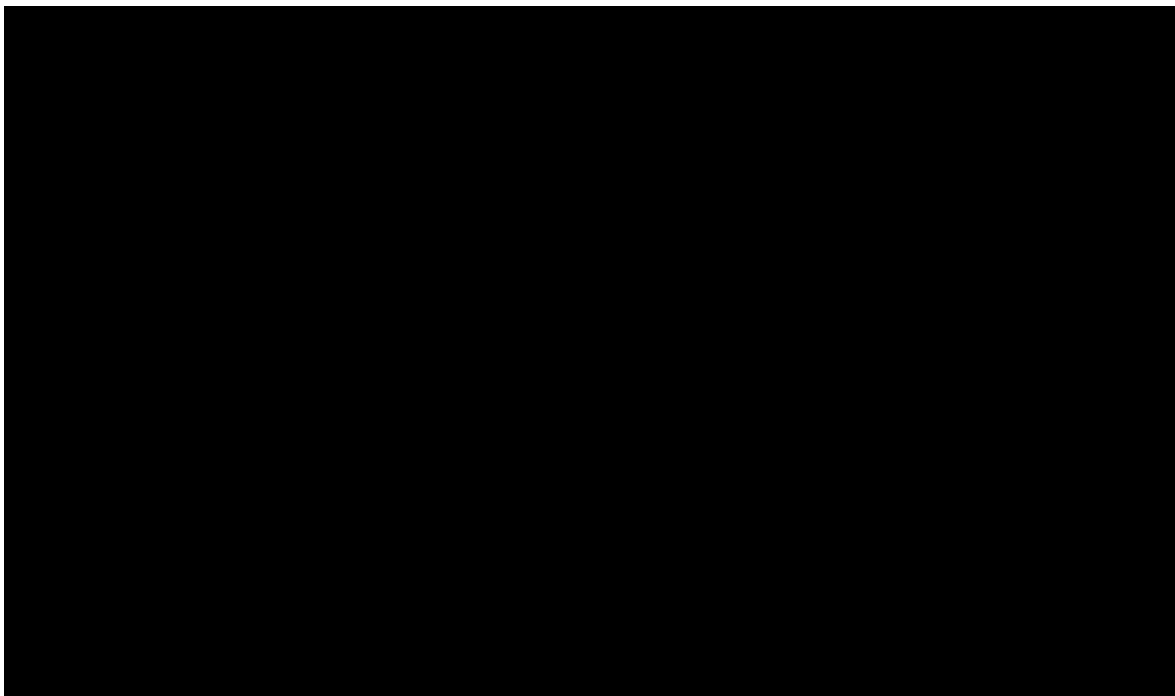
The final detailed design of the O&M Base will be optimized for the number of vessels, the type and number of WTGs to be installed, and the number of staff required for the Project.

Vineyard Wind's parent companies have extensive experience in setting up O&M Bases for similarly sized offshore wind farms, as well as multiple onshore facilities. Within the last two years, Vineyard Wind's parent companies have developed offshore O&M Bases for the 350 MW Wikingen Windfarm in Germany and the 402 MW Veja Mate Windfarm, also in Germany.

### ***Staffing Levels***

Given the significant experience of Vineyard Wind's parent companies in the long-term operation and maintenance of wind farms and transmission assets, we have a clear understanding of the resources required to safely and efficiently operate Vineyard Wind 1 in order to maximize the availability of the plant and associated production. Our parent companies have prior experience with the large offshore wind turbines currently available in the market (e.g., Wikingen 5MW turbines, Veja Mate 6 MW turbines, East Anglia One 7 MW turbines). As a result, Vineyard Wind has direct experience developing staffing models for similar projects. The staff numbers set out below are a result of our parent companies' experience and are consistent with the O&M resources of similarly sized offshore wind farms by Vineyard Wind's stakeholders in Europe (i.e. Veja Mate (402 MW), Wikingen (350MW), West of Duddon Sands (389 MW)) along with Avangrid's experience performing self-service maintenance on their own WTGs and BoPs across America.

There are four key resource phases in the Project; pre-operation, warranty period, end of warranty period, and post warranty period. A description of each phase is provided in **Figure 11.1-4**.



**Figure 11.1-4**

**Pre-Operational Phase:** During the pre-operational phase a team of approximately [REDACTED] supported by additional consultants/contractors as required, will be deployed. This phase can start as early as four years prior to the start of turbine operations. The primary role of the individuals in this phase is to prepare the site for the start of operations by executing tasks such as:

- Preparation of Health and Safety systems and documentation.
- Placing major O&M contracts, e.g., turbine service agreement, logistics contracts, BOP maintenance contracts etc.
- Designing, obtaining usage or land rights and permits, and constructing the O&M facilities.
- Development of specific Standard Operating Procedures (SOP) necessary for the day to day operation of the Project.
- Implementation of IT systems/software to support control, monitoring, performance, and reporting.
- Recruitment of the site management team and technicians.

**Warranty Period:** [REDACTED]

After this warranty period, Vineyard Wind will be fully responsible for determining the labor required to maintain the WTGs.

The workforce can be divided into two categories; the offshore technicians, comprised of technical staff normally working offshore performing inspection and maintenance; and local administrative and management staff who manage the site on a day to day basis (e.g., the site manager, assistant site manager, engineers, planner, and warehouse employees). Above the local site management sits a commercial/financial (corporate) organization managing higher level issues such as regulatory compliance, financial accounting, commercial contracts, and general business performance. A representative organization is presented in **Figure 11.1-5**.

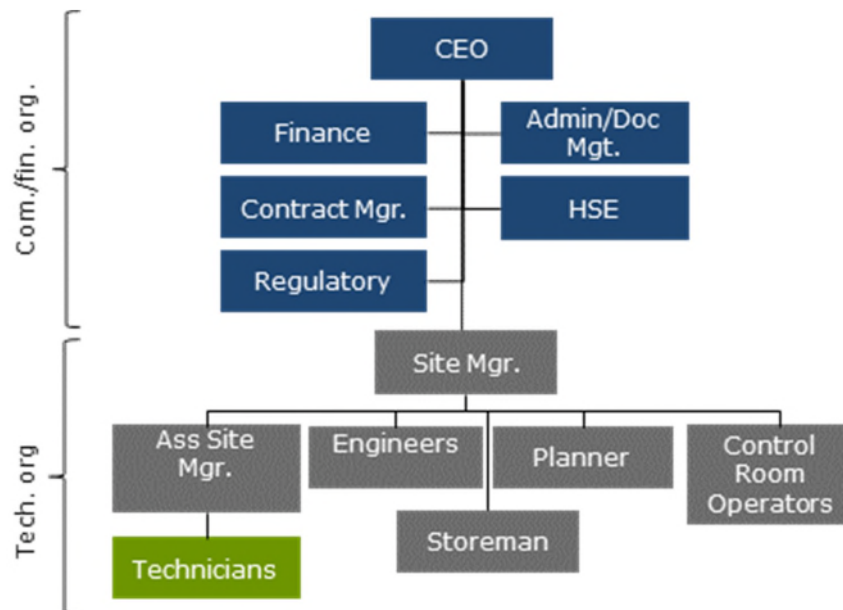


Figure 11.1-5: Representative Organization chart for the Vineyard Wind O&M organization.

The number of technicians required at any particular time will depend on the amount of work to

be done during a scheduled maintenance campaign. The workload and resource requirements will vary from year to year as the scope of scheduled maintenance changes, as described in the answer to question 11.3.

It is estimated that an average of [REDACTED] will be required to cover the administrative, commercial, and technical management functions. This resource utilization is higher in the early years in order to support the establishment of steady state operations. As the staff become more experienced and familiar with the day to day activities, the total number of FTEs gradually reduces. The site management organization is likely to be based at the O&M base, whereas the business staff may largely be based at another location.

In the event of a significant increase in workload, for example a requirement for a major repair, additional resources will be brought in as needed. It should be noted that it is common practice to bring in additional resources, including both offshore technicians and onshore site management staff, to support the peak summer workload or in the event of major repair/replacement.

It should also be noted that WTG control operations (i.e., the remote monitoring and control of the WTGs) are likely to be carried out by the WTG OEM during [REDACTED]

**End of Warranty Period:** The end of the Warranty Period is typically the final years of the warranty with the WTG OEM. [REDACTED]

[REDACTED] would be considered the end of warranty period. During this period, Vineyard Wind will either use existing resources, utilize resources from within the shareholder companies, and/or use external labor (consultants/contractors) to carry out additional quality inspections on the WTGs, and to analyze maintenance records to ensure that all necessary warranty work and preventive and corrective maintenance has been carried out. The primary purpose of this process is to ensure that the turbines complete the warranty period in the best possible condition, facilitating high reliability and production post warranty.

**Post Warranty Period:** Upon expiration of the warranty period, Vineyard Wind will be responsible for providing staff to support all elements Vineyard Wind 1 operation and maintenance, if the service contract is not extended with the WTG OEM. [REDACTED]

[REDACTED] The parent companies hold an extensive database of component failure rates and it is these rates that are utilized to inform the overhaul strategy. The result is fewer breakdowns, less corrective maintenance, and higher energy production.

#### ***Martha's Vineyard Resource Deployment***

Vineyard Wind plans to establish an O&M Base on Martha's Vineyard. As a consequence, a number of employment opportunities will be directly created on the island. These opportunities will be advertised and made available to suitably qualified local residents.

The majority of the technical organization (site management) staff are likely to be based permanently on Martha's Vineyard. It is considered that the resources required will not only diversify employment opportunities on the island, but will also have a positive wider economic impact as goods and services are needed to support this workforce (e.g., hotels, restaurants etc.).

It should also be noted that second and third tier suppliers will also be required to support the operational phase, which is also expected to create jobs and bring wider benefit to Massachusetts.

Please refer to section 14.1 for further details regarding job creation during operations.

***Expected Role of Vineyard Wind, WTG OEM, and Contractors***

Vineyard Wind's parent companies have significant experience with industry standards and best practices and, in many cases, we have been directly involved in shaping industry guidelines. In Europe, the parent companies are directly involved in collaborative work groups which are designed to share knowledge and experiences in order to improve safety, increase production, and reduce the overall cost of energy production. For example, the parent companies participate in groups such as the G+ (a grouping of the leading offshore wind companies focusing on Health and Safety topics), which is primarily designed to share lessons learned and shape best practices. The partners also participate in initiatives such as the Offshore Wind Cost Reduction task force, which is designed to reduce the lifecycle cost of offshore wind while maintaining the highest safety standards and productivity. Specific initiatives such as The Crown Estate SPARTA program in the UK, which exchanges details of component failures across operators, is designed to allow the wider industry to optimize their O&M strategies to improve the overall reliability of offshore wind farms. Additionally, within Iberdrola (parent company to Avangrid), there are dedicated teams of technical experts involved in ongoing optimization initiatives across the global fleet. Vineyard Wind's O&M strategy has been directly influenced by these efforts and, moving forward, the strategy will be updated to reflect the ongoing results from these initiatives to ensure that Vineyard Wind always remains at the forefront of best practice.

Vineyard Wind is committed to a strong focus on Health, Safety, and Environmental (HSE) management, ensuring the work is properly planned and risk-assessed, and that only competent and suitably trained personnel are utilized. Vineyard Wind partners have dedicated safety management systems for their offshore wind projects. The system applied by Avangrid's affiliate, Scottish Power Renewables, aims to be accredited to the OSHA 18001 standard by the end of 2018. Vineyard Wind will be able to draw directly on this experience in order to ensure that, during the O&M phase, site HSE management is robust.

During the WTG warranty period, the WTG OEM will primarily be responsible for all WTG operations, as well as the planning and execution of maintenance work. Vineyard Wind will retain critical control functions, such as invoking WTG emergency stop functions, and will be consulted on the planning and execution of all activities performed by the OEM.

Vineyard Wind's current strategy is to execute the O&M work through a combination of the resources described above, supported by a number of competent contractors. It is anticipated that the majority of maintenance work required offshore will be executed by contractors.

***Control Room Function***

During the WTG OEM warranty period, the monitoring and control of the turbines will primarily be carried out by the WTG OEM. During the post-warranty period, the monitoring and control of the turbines will be carried out by Vineyard Wind. The BOP will be monitored and controlled by Vineyard Wind from the start of production.

As of this writing, there are multiple approaches Vineyard Wind is considering for managing the control room function:

- Use of a third party control room (control room function subcontracted)
- Development of a control room (in house)
- Use of the control room already established by Avangrid, currently used for their ~6GW onshore fleet

Because Avangrid Renewables is one of the Vineyard Wind parent companies, Vineyard Wind 1 will have the opportunity to utilize the Avangrid Renewables National Control Centre (NCC). The NCC is a state of the art 24x7 generation system control room which performs key operational control functions in order to meet safety, regulatory, contractual, and business obligations.



The NCC is set up such that it:

- Satisfies North American Electric Reliability Corporation (NERC) cyber and physical security standards
- Maintains compliance with NERC operations standards, including generation and voltage set points, required communications, and data systems
- Supports safe operations in the field by notifying field personnel of severe weather
- Acts as a point of contact and information flow when emergencies occur in the field
- Performs required FAA notifications
- Provides services to remotely operate and reset wind turbines in compliance with proscribed protocols
- Handles planned and unplanned outages

The NCC supports generation plants (wind, solar, biomass, thermal and hydro) operating across 20 Transmission System Operators, including ISO New England.

#### **Scheduling of Major Maintenance and Testing of Equipment**

The Vineyard Wind maintenance philosophy is based on the execution of robust preventive maintenance designed to minimize the need for corrective intervention. With respect to corrective maintenance, our philosophy is centered on being prepared to execute repairs effectively, efficiently, and as early as possible.

In general, all Vineyard Wind 1 components will undergo at least one scheduled maintenance per year [REDACTED] however, specific maintenance and inspection requirements will be defined at the asset level based on the OEM's maintenance instructions, statutory inspection requirements, and the experience of Vineyard Wind and its parent companies. Scheduled maintenance will include visual inspection, mechanical and electrical checks/tests, tightening of mechanical connections if required, and the exchange of consumable products such as filters, oil, grease, and coolant. Equipment testing will occur concurrently with scheduled maintenance but, depending on maintenance requirements, may occur more frequently such as six-month intervals or less, if deemed necessary.

Vineyard Wind will maintain a detailed plan for all preventive maintenance activity required to be carried out on the Project. This plan will be reviewed on a monthly, weekly, and daily basis and adjusted if necessary to ensure that Vineyard Wind 1 remains as productive as possible. This plan will also serve to ensure the necessary labor, spare parts, tools, and logistics are available.

*11.2. Please provide documentation to demonstrate site control for all marine terminals and other waterfront facilities that will be used to for the O&M.*

- If available, evidence that the bidder or the equipment/service provider have right(s) to use a marine terminal and/or waterfront facility for O&M of the offshore wind energy project (e.g., by virtue of ownership or land development rights obtained from the owner).*
- If not available, describe the status of acquisition of real property rights for necessary marine terminal and/or waterfront facilities, any options in place for the exercise of these rights and describe the plan for securing the necessary real property rights, including the proposed timeline. Include these plans and the timeline in the overall project schedule.*

*iii. Identify any joint use of existing or proposed real property rights for marine terminal or waterfront facilities.*

- i. As stated in section 11.1 Vineyard Wind is basing the O&M concept on the waterfront facility and land area on [REDACTED]
- ii. As mentioned above, Vineyard Wind has entered into a MoA for the relevant property.
- iii. Vineyard Wind may develop waterfront facilities for its sole use (preferred) and/or share facilities with the land owner/other commercial/recreational users. It should be noted that the associated improvements to waterfront infrastructure may provide benefits to other users and the wider community – for example, [REDACTED]

In addition, Vineyard Wind may utilize other local or regional port infrastructure or warehousing for the storage of key strategic spare parts, such as spare inter-array and export cables.

*11.3. Describe in detail the proposed O&M funding mechanism and funding levels to support planned and unplanned O&M requirements.*

As a base case, it is considered that the Vineyard Wind 1's income will be used to fund operational expenditures. [REDACTED]

[REDACTED] Any additional funding requirements not covered by the above will be covered by the way of equity from the parent companies.

In order to determine the funding levels required, a preliminary estimate of the Operational Expenditure (OPEX) required to operate and maintain Vineyard Wind 1 for its entire lifetime has already been prepared and approved by the Vineyard Wind parent companies. This OPEX budget estimate is based on offers received from suppliers, for example WTG OEMs, as well as market prices for other elements such as logistics and labor based on direct engagement with local Massachusetts and other US suppliers.

The OPEX is further validated by utilizing the experience of Vineyard Wind's parent companies in operating and maintaining similar wind farm projects in Europe (e.g., West of Duddon Sands 389 MW, Wikinger 350 MW, East Anglia One 714 MW, and Veja Mate 402 MW). The OPEX model is the result of a detailed analysis which has looked at expected WTG and BOP failure rates/maintenance requirements and the time and volume of labor required to execute corrective and preventive maintenance, as well as the expected cost of consumables, spare parts, and logistics. This model has then been benchmarked against the European projects identified above in order to confirm its accuracy. As a result, Vineyard Wind is confident in our estimate of the funding levels required for the Project. Throughout the life of the Project, the budget will be reviewed at least annually and revised as necessary. During this review, the parent companies will be able to provide insight into new technologies and/or approaches coming from Europe which can serve to further optimize the operating expenditure.

Over the lifetime of Vineyard Wind 1 it is estimated that the funding level required will range [REDACTED]

**11.4. Describe the terms (or expected terms) of the warranties and/or guarantees on major equipment that the bidder is utilizing or proposing to utilize.**

As part of equipment supply agreements, Vineyard Wind will negotiate industry standard warranty periods on all major project components. These warranties will be typical for offshore wind farms, aligned with industry best practices, and are expected to be as follows:

**WTGs:**

[REDACTED]

There are several options open to developers with respect to WTG OEM warranty periods, including:

[REDACTED]

**Electrical Service Platform and Onshore Substation:**

Vineyard Wind will likely procure the entire offshore substation (ESP) [REDACTED] [REDACTED] For major components at the onshore substation, such as transformers and switchgear, Vineyard Wind would seek to procure industry standard defect warranties in the region of [REDACTED] in duration, subject to negotiation with suppliers. Different warranty durations may be agreed upon with different component suppliers.

These defect warranties would, as described above, typically cover all direct cost to rectification.

After the specified warranty period, it is currently assumed that the equipment will be maintained by Vineyard Wind or an independent third party service provider.

**Inter-Array and Export Cables:**

For Inter-Array and Export cabling, Vineyard Wind will seek to secure material and serial defect warranties in the region of [REDACTED] (there may be different warranties agreed to on different components; e.g., cables, cable hang offs, connectors, etc.) duration.

After the specified warranty period, it is currently assumed the equipment will be maintained by Vineyard Wind.

**Structures (WTG and OSS foundations):**

Vineyard Wind will seek to secure material and serial defect warranties for a period of [REDACTED], subject to negotiation with suppliers.

After the specified warranty period, the equipment will be maintained by Vineyard Wind.

**Service Defects Warranty:**

Where possible, Vineyard Wind will seek to include within its maintenance contracts a service defect warranty which will provide coverage in the event that services are not executed to the required standard. The purpose of this warranty is to initially ensure that services are carried out properly in the first instance, but additionally to ensure that defective services can be remedied quickly.

*11.5. Describe the status of the project sponsor in securing any O&M agreements or contracts. Include a discussion of the sponsor's plan for securing a medium-term or long-term O&M contract, including the expected provider of O&M services.*

Vineyard Wind has prepared an operations preparations plan as outlined in **Table 11.5-1**, [REDACTED]

**Table 11.5-1** [REDACTED]

[REDACTED]

At the time of this submission, Vineyard Wind will not have secured any specific O&M agreements or contracts. This is quite normal at this stage of the Project. All necessary contracts required to support the operational phase of Vineyard Wind 1 will be put in place prior to the commencement of wind farm operations. The Vineyard wind parent companies have significant experience in placing such contracts, having done this for their operation projects in Europe (West of Duddon Sands, Wiker, East Anglia, Veja Mate). Because of this experience, Vineyard Wind has direct access to scopes of work and terms and conditions which can be utilized (subject to adjustment for Vineyard Wind specific requirements) for the Project.

**WTG:**

Vineyard Wind will enter into a full service agreement with the wind turbine OEM prior to the commencement of the operational phase. The service agreement will be procured simultaneously with the WTG turbine supply agreement, according to the procurement plan as set out in section 8.1.v. Vineyard Wind is currently preparing an Invitation to Tender (ITT) and plans to have entered the service agreement by [REDACTED] though there are several other options available to the project team, as set out above in section 11.4:

**Balance of Plant:**

With respect to balance of plant operations and maintenance, Vineyard Wind [REDACTED]

[REDACTED] These contractors may provide full scope services (i.e., corrective and preventive maintenance) or limited services (e.g., scheduled maintenance only). The use of OEMs or competent contractors may be more prevalent during the period where OEM warranties are in place in order to maintain the warranty coverage.

Alternatively and/or additionally, Vineyard Wind may utilize labor contracts (i.e., supply of manpower), together with contracts which provide spare parts, to operate and maintain the BOP. This labor and parts approach would be managed directly by Vineyard Wind.

The decision on the exact strategy will be based on an evaluation of the capabilities of the OEMs, contractors, and labor providers available in the market and their ability to deliver a high level of service. A tender process will be used to assess these capabilities, together with the cost of these services. The evaluation of the tender returns will be used to determine the optimal contracting/maintenance solution.

All required maintenance contracts will be in place in advance of the commencement of operations.

**11.6. Provide examples of the bidder's experience with O&M services for other similar projects.**

CIP is active in the development and operation of other offshore projects across the globe. CIP is currently involved in the operation of the 402MW Veja Mate offshore wind farm project in the German North Sea (together with project partners). Experience from preparing this wind farm for operation, as well as the ongoing experience from operating this wind farm, will also flow directly into the Vineyard Wind Project.

CIP is also a shareholder in the 588MW Beatrice Offshore Wind Farm in the UK North Sea, which is currently under construction. The experience and lessons learned from developing this project and preparing this site for operations will also be available to the Project.

In addition, CIP/COP is also actively developing offshore wind projects in Taiwan, Canada, and Australia.

Avangrid Renewables operates more than 6 gigawatts of owned and controlled renewable generation capacity, primarily through wind and solar, in 22 American states across the United States. Avangrid employs approximately 6,800 people.

Avangrid is the American subsidiary of Iberdrola, a Forbes Global 2000 company. Iberdrola has the largest renewable energy asset base of any company in the world with over 28 Gigawatts (28,000 MW) of installed capacity globally. In terms of wind power, Iberdrola is the largest owner operator of wind power plants in the world.

Iberdrola's geographic focus areas for operational wind generation are:

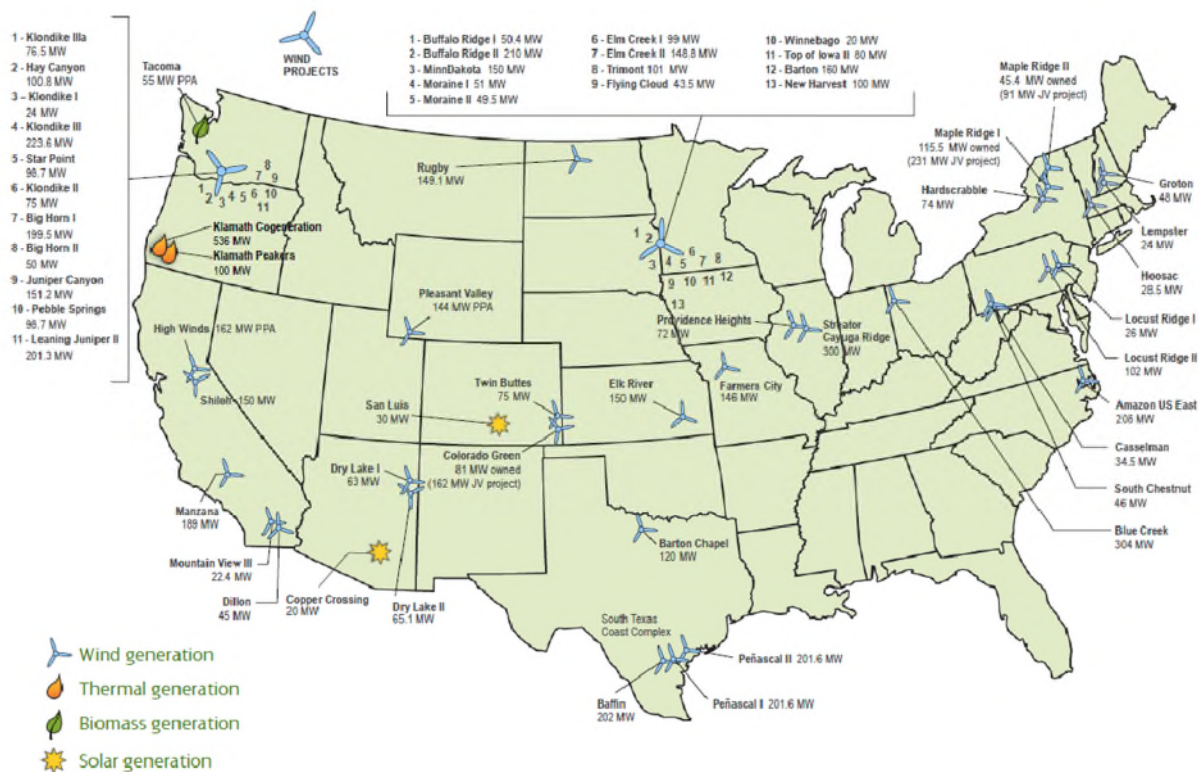
- Spain Onshore Wind – 5,508 MW
- US Onshore Wind – 5,693 MW
- Mexico Onshore Wind – 367 MW
- UK Onshore Wind – 1,796 MW
- UK Offshore Wind – 194 MW
- Brazil Onshore Wind – 187 MW

An overview of all of the operational Avangrid Renewables portfolio can be seen in **Figure 11.6-1**.

With respect to offshore wind, Avangrid's parent company Iberdrola is currently operating, constructing, and developing a number of projects globally, including:

- Iberdrola is 50% owner of the operational 108 turbine, 389 MW West of the Duddon Sands Offshore Wind Farm.
- Iberdrola is the owner and operator of the 70 turbine, 350 MW Wikinger Offshore Wind Farm in the German Baltic Sea.
- Iberdrola is also constructing the 102 turbine, 712 MW East Anglia ONE wind farm in the UK North Sea. This project is due to be operational in 2019.
- Iberdrola is 70% owner of the 496 MW St Bruieac wind farm off the coast of Brittany in France, which is currently under development.

In addition to the projects referenced above, Iberdrola is also pursuing a number of further development opportunities globally, including the further development of the East Anglia Zone in the UK, further opportunities in Germany, and the Kitty Hawk project which is proposed for offshore North Carolina in the US.



**Figure 11.6-1: Overview of the entire operational Avangrid Renewables portfolio.**

Vineyard Wind is currently supported by experienced O&M advisors with a strong track record in the set-up and operation of many MW of offshore wind power. Where necessary, Vineyard Wind will continue to use experienced O&M advisors to support the set-up and operation of the Vineyard Wind Project.



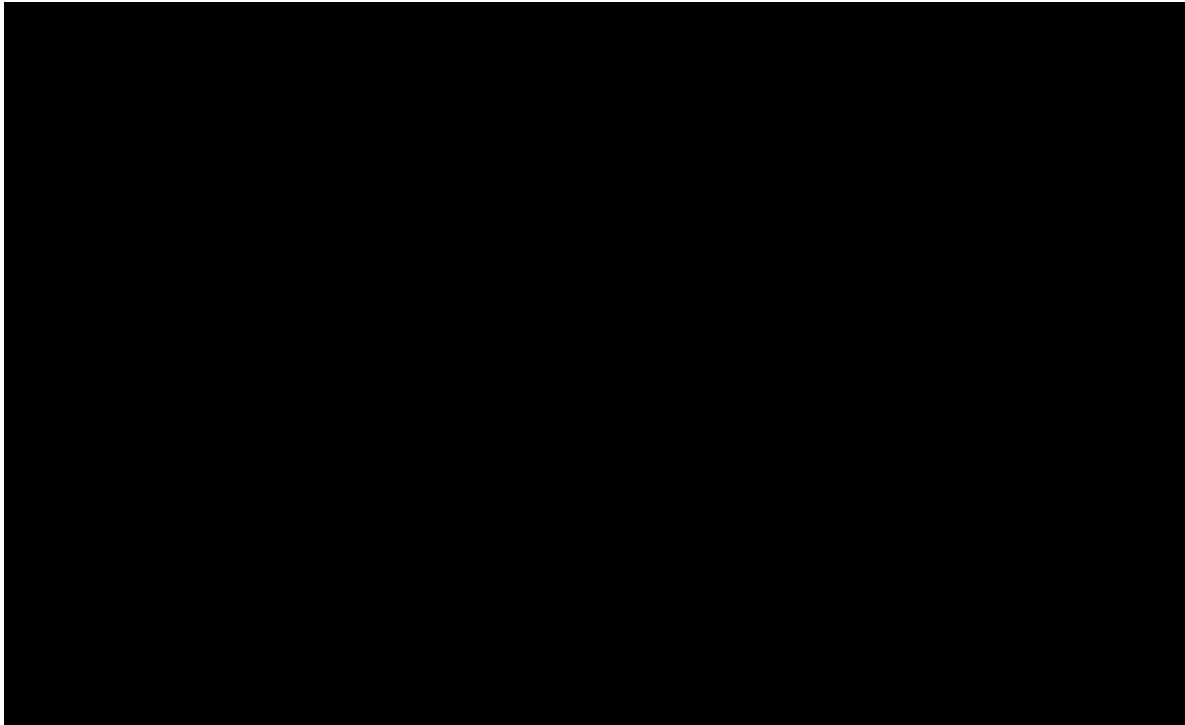
**Section 12 OF APPENDIX B TO RFP  
PROJECT MANAGEMENT/EXPERIENCE**

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*Bidders are required to demonstrate project experience and management capability to successfully develop and operate the project proposed. The Distribution Companies are particularly interested in project teams that have demonstrated success in projects of similar type, size and technology and can demonstrate an ability to work together effectively to bring the project to commercial operation in a timely fashion.*

**12.1.** *Provide an organizational chart for the project that lists the project participants and identifies the corporate structure, including general and limited partners.*

Vineyard Wind's corporate structure is demonstrated in the organizational chart shown in **Figure 12.1-1**, listing the Vineyard Wind project participants, and identifying the corporate structure. The organizational chart portrays both the shareholder companies, which are described in more detail in response to question 5.2 in Section 5 of Appendix B, and the main consultants that have provided resources during the current development phase of the project. Please refer to **Figure 12.3-1** for a detailed key personnel management team organizational chart.



**Figure 12.1-1:**

*12.2. Provide statements that list the specific experience of the bidder and each of the project participants (including, when applicable, the bidder, partners, and proposed contractors), in developing, financing, owning, and operating generating and transmission facilities, other projects of similar type, size and technology, and any evidence that the project participants have worked jointly on other projects.*

Vineyard Wind, established in 2009, headquartered in New Bedford, MA, with an additional office in Boston. The Vineyard Wind team of industry experts has a long track record of developing and establishing offshore and onshore wind projects throughout Europe and the United States. Copenhagen Infrastructure Partners (CIP) (through two investment funds CI-II and CI-III) and Avangrid Renewables (AR), a subsidiary of Avangrid, Inc. have equal ownership (i.e., 50% equity ownership each) of the US-based company, Vineyard Wind LLC. The management team of Vineyard Wind has successfully partnered together previously in the construction and operation of the 389 MW West of Duddon Sands project in the UK.

CIP, a fund management company with nearly \$6 billion in investment funds under management, and Avangrid, a leading energy and utility corporation with more than 3 million customers in the US and over 6,000 MW of operational renewable generation in the US, have joined forces in establishing Vineyard Wind to take advantage of the substantial experience and capability of each of the partners. This well-balanced ownership, combined with each of the company's diverse business portfolios and expertise in the renewable and clean energy wind sector, positions Vineyard Wind to become America's first commercial scale offshore wind owner and operator.

The Vineyard Wind organization draws on the demonstrated project experience gained from the successful development, permitting, financing, construction, and operation of over 25 offshore wind generation projects in the US, UK, Denmark, France, and Germany which comprise over 10GW of capacity.

CIP and AR each have very recent experience in the construction of offshore projects of similar type, size, and technology, including operating offshore projects of 389 MW (West of Duddon Sands) and 402 MW (Vēja Mate) and projects in construction of over 1,000 MW (East Anglia & Wikinger) (see 12.4 below).

The partnership brought together for Vineyard Wind plans to build on the core strengths and experience of this team, with the addition of substantial renewable energy management and operating experience of ISO New England (ISO-NE) and the transmission development capabilities of Avangrid Networks (AN), its utility arm consisting of 8 New England and Northeast utilities (Berkshire Gas, Central Maine Power, Connecticut Natural Gas, Maine Natural Gas, New York State Electric & Gas, Rochester Gas & Electric Corporation, Southern Connecticut Gas, and United Illuminating).

The Vineyard Wind organization is comprised of both resources provided from the partners, as well as consultants that have been selected to ensure the complete skill set required to develop, finance, construct, and operate Vineyard Wind 1 is available.

### **Copenhagen Infrastructure Partners**

CIP has market-leading competencies and experience gained from offshore wind projects in Europe. The senior partners have been involved in a significant proportion of the largest offshore wind projects and transactions globally. Offshore wind projects represent some of the largest and most complex projects within the energy infrastructure investment universe.

CIP provides management oversight, which brings rigor in the evaluation of the assumptions used to propose this project, as well as access to funds for financing the construction and operation of the project. CIP has extensive experience in project financing, having secured financing for more than 12 projects in offshore, onshore, solar, biomass, and other clean energy investments.



Figure 12.2-1:

### **Avangrid**

Avangrid brings three affiliates together (Avangrid Renewables (AR), Avangrid Networks (AN), and ScottishPower Renewables (Scottish Power Renewables)) to add offshore wind, onshore wind, and transmission project development, finance, construction, and operating experience, including market participant experience in the ISO-NE. The corporate relationship between these three affiliates is fully described in Section 5.2 of Appendix B.

### **Avangrid Renewables**

Avangrid Renewables (AR) is the third largest developer of wind farms in the United States and has nearly 6,000 MW of renewable generation in its portfolio of owned and developed projects. AR also successfully brought to completion three wind farms in ISO-NE and is expecting completion on a fourth project in Vermont by December 31, 2017(see Section 12.4 below). AR has extensive experience in operating wind farms under the rules of ISO-NE as a Lead Market Participant, and is in full compliance with North American Electric Reliability Corporation (NERC) and ISO-NE requirements for maintaining the security and reliability of its operations in its National Control Center in Portland, OR.

AR's capabilities include the following:

**Development:** AR is the third largest renewable developer in the United States, pursuing greenfield projects, repowering projects, and acquisitions. AR currently has more than 25,000 MW of both wind and solar projects under active development. In ISO-NE, AR has developed, constructed, and currently operates wind farms in Vermont, Massachusetts, and New Hampshire.

**Financing:** AR has financed the construction of over 6,000 MW of renewable capacity in the US on balance sheet, raising funds at the corporate level as described in Section 5 of Appendix B. Also, as described in Section 5, AR has brought in tax equity investment in portfolios to monetize the production tax credit (PTC) and accelerated depreciation benefits available to onshore wind energy projects.

**Forecasting and Resource Analysis:** AR leads the market in its ability to predict generation through forecasting techniques. AR has a 24/7 forecasting group that provides hourly forecasts for each renewable project. AR's meteorology group is responsible for placing wind, solar, and other climatological measurement tools on project sites and analyzing data to better predict project generation.

**Energy Management:** AR has established robust systems, including its 24-hour, real-time, and day-ahead desks, to manage renewable energy into short-term markets.

**Transmission:** While AR has significant experience in the interconnection process, and has built and operated thousands of miles of collector power lines up to points of interconnection with the high voltage transmission system, AR does not own or operate any transmission assets. AR's affiliate, AN, has significant experience in owning and operating transmission as described below.

**Origination:** AR 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 ISO-NE, AR has long-term power purchase agreements with NSTAR, Public Service of New Hampshire, and Green Mountain Power.

**Operations and Maintenance:** AR Technical Services has been maintaining assets for more than 10 years. AR's operations and maintenance group currently operates 24-hours a day, 7 days a week, to oversee the operations of more than 6,000 MW of installed renewable capacity in the US. AR has developed in-house expertise for the maintenance of the fleet and AR staff is present at each of our facilities, providing balance-of-plant operations and maintenance, substation oversight, and inventory of spare parts and equipment.

**National Control Center (NCC):** In early 2010, AR launched a 24-hour, 7-days a week National Control Center (NCC) in Portland, Oregon. AR uses the most sophisticated technology available to lead the industry in asset monitoring and system control. AR has the ability to control every turbine at over 6,000 MW under management across North America. The company's expert technicians can troubleshoot 24/7, adjust turbine activity to comply with local grid demands, shut down individual turbines for safety or reliability concerns, and manage turbine output for maximum efficiencies.

**Diverse Asset Base:** The map in **Figure 12.2-2** represents AR's combined wind, solar, biomass, gas-fired power plants, and natural gas storage facilities. The geographical diversity of the project fleet allows AR to optimize "lessons learned" across the country and maximize each project's generation capabilities.

#### **Avangrid Networks**

Avangrid's second affiliate involved in Vineyard Wind 1 is Avangrid Networks which is focused on the transmission and distribution of electricity and natural gas principally through 8 regulated electric and natural gas utilities, serving approximately 3.2 million customers in New York and throughout New England. Vineyard Wind will be supported through its shared service employees, who have significant experience working on similar successful transmission expansion projects, including the Central Maine Power Company's \$1.4 billion Maine Power Reliability project which has an impressive on-schedule and on-budget record.



Figure 12.2-2: Map of AR assets in the US.

### ScottishPower Renewables

Avangrid's final affiliate that will be involved in Vineyard Wind is ScottishPower Renewables Ltd. (Scottish Power Renewables), which has considerable experience in the development, construction, ownership, and operation of offshore wind farms, and is the company responsible for Iberdola's offshore wind projects in Europe:

- West of Duddon Sands, United Kingdom – 389 MW project completed 2014
- Wikinger, Germany – 350 MW project commissioning 2017
- East Anglia 1, United Kingdom – 714 MW project began construction on 2016
- Additionally, a total of 3.6GW of projects are currently in development across the United Kingdom, Germany, and France.

### Key Consultants

In addition to the two partners, Vineyard Wind has engaged several key consultants and other partners in the project development (refer to **Table 12.2-1**).

Table 12.2-1: Key consultancies and partners supporting the project.

Key Consultants	Expertise and Project Support Areas
Copenhagen Offshore Partners	COP is comprised of individuals with deep direct experience, in developing, financing, constructing, and operating offshore wind farms. COP is currently leading offshore wind projects in Germany, the United Kingdom, Taiwan, and Australia on behalf of CIP as its exclusive development partner. For Vineyard Wind, COP is providing personnel to key project roles, including the Chief Executive Officer, Chief Technical Officer, Supply Chain and Procurement Management, Engineering, and Construction Management
Epsilon	Epsilon is the lead consultant in the preparation of all key state and Federal permits. Epsilon has been used heavily to provide all the site-specific permitting studies and work described in Section 6 and Section 7. Epsilon has extensive experience in supporting energy projects and working in Massachusetts.
Ecology and Environment	Ecology and Environment is assisting Vineyard Wind with impact assessments and permitting related to marine mammals and sea turtles. Founded in 1970, Ecology and Environment is a fully integrated ecological and environmental consulting firm headquartered in Lancaster, New York.

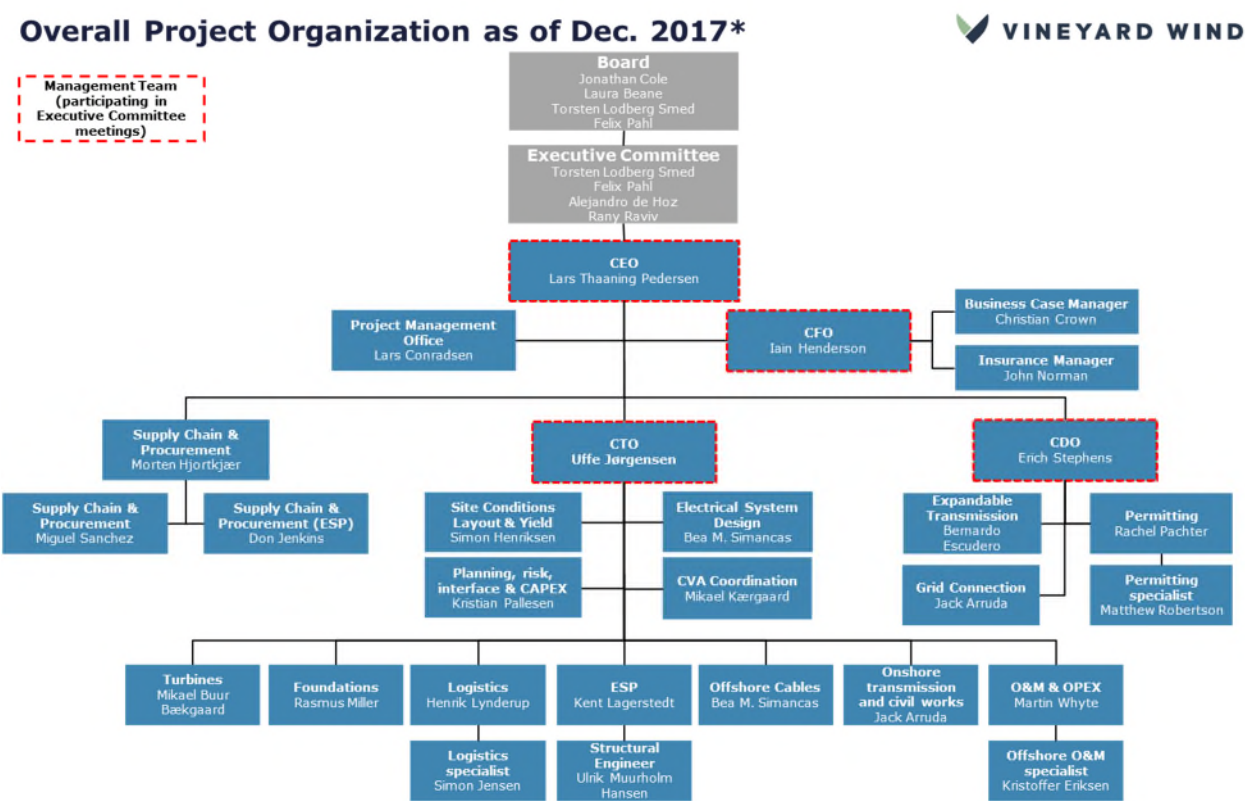
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Key Consultants	Expertise and Project Support Areas
Vineyard Power	Vineyard Power is the community partner serving Martha's Vineyard. Vineyard Power is a community owned non-profit co-operative providing community outreach, fisheries outreach, and permitting support.
Stantec	Providing support in onshore transmission civil design, Stantec has extensive experience in similar civil works globally and, in particular, in the state of Massachusetts.
Burns & McDonnell	Burns & McDonnell is a reputable consultancy within electrical transmission and distribution, providing support namely within grid connection and grid studies and within the expandable transmission development.
CLE Engineering	CLE Engineering provides support in civil engineering, harbor development, and coastal permitting. CLE Engineering is a market leader within coastal engineering within the US.
DNV GL	DNV GL is a global assurance and risk management company which was nominated as the Certified Verification Agent as a result of its successful project with the Bureau of Ocean Energy Management (BOEM). DNV GL is the largest worldwide accredited body providing project certification of offshore wind farms and type certificates for offshore wind turbines.
Foley Hoag	Foley Hoag is a leading Boston legal partnership in business for 75 years. Foley Hoag will be providing state permitting and real estate transaction support, as well as general legal counsel services on the Vineyard Wind project.
BakerHostetler	BakerHostetler has been successfully providing legal services since 1916 and is one of the largest US law firms. BakerHostetler is providing Federal permitting advice on the Vineyard Wind project.
PEAK Wind	PEAK Wind is a leading offshore wind technical and commercial management consultancy specializing in O&M and asset management. PEAK Wind has experience in the development and operation of over 15 offshore projects totalling 8,300 MW and is providing management resources currently leading the Project Management Office and the development of the O&M strategy for the project.
Lautec	Lautec is providing the planning and risk support for the project, along with the development of the installation solution and detailed installation simulations, based on their significant experience in the industry.
Blue Power Partners	Blue Power Partners has extensive experience in value chain optimization and is providing support in the development of the Jones Act compliant feeder installation and logistics concept for the project.
C2Wind	C2Wind is one of the most experienced wind energy forecasting companies in the world and their experts have over 50 years of combined experience in offshore wind resource assessment and energy production estimates. The C2Wind team has been working in offshore wind since 2003, and has been involved in more than 15 constructed offshore wind farms and numerous others on conceptual levels at locations around the world. C2Wind has also worked with the top five wind turbine suppliers in the market and has key knowledge and insight regarding turbine behavior and support structure design drivers. As part of the Vineyard Wind team, C2Wind is undertaking the meteorology and wind assessment.
Wood Thilsted	They are experts in structural and geotechnical engineering, optimizing foundation design for wind turbine generators. The Wood Thilsted partners and employees have worked in the offshore wind sector for the last 10 years, refining their expertise and tools on foundation design related aspect. Wood Thilsted is engaged in geotechnical work, including structural FEED design and survey work for the project
Geo Subsea	Geo SubSea brings 27 years of experience in assessment of marine geology and geophysics, and has conducted hundreds of geological surveys around the world, including two other US offshore wind projects.



12.3. Provide a management chart that lists the key personnel dedicated to this project and provide resumes of the key personnel. Key personnel of the bidder's development team having substantial project management responsibilities must have:

- i. Successfully developed and/or operated one or more projects of similar size or complexity or requiring similar skill sets; and
- ii. Experience in financing power generation projects (or have the financial means to finance the project on the bidder's balance sheet).



\* See appendix for detailed biographies

Figure 12.3-1: Key Personnel Management Organizational Chart.

Vineyard Wind has assembled a qualified and experienced team for this important wind energy project. Most importantly, the Vineyard Wind management team members all share a history of more than 10 years working seamlessly on offshore wind projects throughout Europe, Canada, and the US, having worked together at prior employers. Currently, more than 25 seasoned professionals are working full-time developing the project as set-out in the organizational chart, **Figure 12.3-1**.

Vineyard Wind's management team is committed and dedicated to the project with the leadership team fully based in Massachusetts. It has the full resources available of its parent companies to support the team in successfully executing the project.



## Executive Committee

An Executive Committee (ExCom) has been established by the partners to bring management expertise from both parties to make key decisions regarding the strategy and to direct execution of tactical decisions by Vineyard Wind.

**Torsten Lodberg Smed** is Senior Partner at CIP, overseeing CIP's wind development projects. Torsten has more than 20 years of experience in the energy sector, including mergers and acquisitions (M&A). Prior to establishing CIP in 2012 together with the other senior partners, Torsten held various senior positions within DONG Energy, during the period 2003-2012, most recently as Senior Vice President of Partnerships in the offshore wind division. Torsten was also responsible for developing DONG Energy's offshore wind partnership model, and he established DONG Energy's offshore wind transaction team. From his time in DONG Energy and CIP, Torsten is today acknowledged as a leader in this sector who has executed the most offshore wind transactions. At CIP, Torsten was instrumental in bringing the Beatrice offshore wind project (588 MW) in Scotland and the Veja Mate offshore wind project in Germany (402 MW) to Financial Close. In addition to his offshore wind experience, Torsten had a key role in the consolidation of the Danish energy sector between 2002-2006. Prior to joining DONG Energy, Torsten worked as a lawyer for Kromann Reumert, a leading Danish law firm where he focused on M&A and tax structuring. Torsten holds a Master in Law degree from the University of Copenhagen, a MBA from Rotterdam School of Management (Erasmus), and a Graduate Certificate in Business Administration and Finance (HD) from Copenhagen Business School. His resume is included as Attachment 12.3-1.

**Felix Pahl** has been with CIP since 2014 and is the Asset Manager for the offshore wind projects Veja Mate and Vineyard Wind. Felix has 15 years of experience in the infrastructure sector, with focus on energy investments for the past ten years. Prior to joining CIP, Felix held a position as Head of Asset Management, Germany, in DONG Energy. Felix began his career in Hochtief AG (2003) as a Structural Engineer and progressed to Project Manager of Corporate Development M&A. Afterwards, he worked two years as Investment Manager in Siemens Financial Services. Felix holds a BS in Engineering from Kiel Technical University and a MBA from Elmshorn Nordakademie. His resume is included as Attachment 12.3-2.

**Jonathan Cole**, ScottishPower Renewable Energy Ltd, Member of the Executive Team of ScottishPower Renewables and Managing Director of Global Offshore Business. He has acted as Offshore Managing Director of Iberdrola Renewables since 2011 and is responsible for the management of Iberdrola's global offshore business, including development, construction, and operation of projects in the UK, Germany, and France. Jonathan sits on the Board of a number of industry bodies related to offshore wind, including the Offshore Wind Program Board, the G9 Health & Safety Board, and the Offshore Renewable Energy Catapult Industry Advisory Board (as Chairman). Jonathan started his professional career at ScottishPower Renewables in 2008, where he previously held the positions of UK Legal Director and Commercial Director. Jonathan completed the Bachelor of Laws, with Honors, at the University of Strathclyde, Glasgow in 1998 and thereafter completed the Postgraduate Diploma in Legal Practice in 1999. He was admitted to the Law Society of Scotland in 2000 and to the Law Society of England and Wales in 2003. His resume is included as Attachment 12.3-3.

**Laura Beane**, President and CEO of Avangrid Renewables has spent more than 20 years with AR, including its original parent, holding a wide variety of roles and responsibilities in myriad facets of the business. Her previous executive role as VP of Operations and Management Services followed her tenure as Director of Market Structure and Policy. In addition, she has led numerous initiatives including the company's innovative Self-Supply program, which involves Avangrid Renewables taking responsibility for the balancing obligation of its 1,400 MWs of wind in the Pacific Northwest. Laura holds an MBA from Comillas and Strathclyde Universities as part of Iberdrola's Master in the Global Energy Industry and previously earned an MBA and BS degree from the University of Utah. Laura also serves as the Chairman of the Board of The Climate Trust, a national leader in carbon offset projects and innovative climate change solutions. Her resume is included as Attachment 12.3-4.

**Alejandro de Hoz García-Bellido**, Vice President (VP) of US Offshore Wind, is in charge of developing the US offshore wind business for the Iberdrola Group through its US-based company, Avangrid Renewables. Alejandro has 13 years of direct experience in the renewable energy sector, preceded by 14 years in the telecommunications sector. Before taking the VP role within Avangrid Renewables, he was Offshore Business Performance director within the Iberdrola Offshore business for 5 years and in charge of preparing Iberdrola's offshore pipeline for competitive auction processes in the UK and Germany, as well as coordinating the teams to take awarded projects through financial close. He was behind the award and Financial Close of the 714 MW East Anglia 1 project, the first UK project to have been awarded a "Contract for Differences" through a competitive process. Prior to this, he held different positions within the Iberdrola Group in developing the onshore wind business internationally, including the construction and operation of 30 onshore wind farms over a 10-year period. Alejandro holds an MBA from ICAI-ICADE University of Madrid and a BS in Physics from the University Complutense of Madrid. His resume is included as Attachment 12.3-5.

**Rany Raviv**, Vice President (VP) of Commercial and Strategic Relationships for AR, joined Iberdrola Renewable Energies USA as VP in 2007. Previously, he was a 10-year veteran of Ormat, a geothermal energy leader where he led growth activities in the US. He has more than 15 years experience in global energy, mergers and acquisition, and project finance, and brings a valuable track record of closing complex and diverse deals, including several tax/equity transactions. Rany holds a BS in Computer Science and Business Studies from the University of Buckingham (UK) and a MBA from City University Business School (UK). His resume is included as Attachment 12.3-6.

**Lars Thaaning Pedersen**, Chief Executive Officer (CEO) of Vineyard Wind, co-founded Copenhagen Offshore Partners (COP) in 2015, a leading offshore wind development and construction management company working exclusively with CIP. COP 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, COP completed the construction of the 402 MW Veja Mate project in the German North Sea 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 DONG Energy, and has been involved in more than 10 offshore wind projects in Europe, including managing 6 offshore wind joint ventures. Lars has significant experience in development, construction, and operations of offshore wind farms, and has been instrumental in bringing new wind turbine technology to the market such as the Siemens 3.6 MW-120 in 2009 and the 6 MW Siemens Direct-Drive turbine in 2012. He also headed the development of the in-house Operations and Maintenance (O&M) and Asset Management business units while at DONG Energy. Lars holds a Master's degree in Mechanical Engineering from the Technical University of Denmark. His resume is included as Attachment 12.3-7.

**Iain Henderson**, Chief Financial Officer (CFO) of Vineyard Wind, has been working in the energy industry for 18 years and in offshore wind since 2011. Most recently, he was the Head of Regulated Transaction for ScottishPower Renewables Limited, responsible for managing the disposal of the transmission assets of the UK offshore wind projects required by government regulations. Iain was also responsible for negotiating and managing joint venture agreements for offshore wind projects. Prior to this, Iain had been involved in mergers and acquisition activities for 10 years in the utilities market, covering renewable, thermal, gas storage, and nuclear projects. Iain holds a BA in Accounting and Business Law from the University of Strathclyde (UK) and is a qualified chartered accountant. His resume is included as Attachment 12.3-8.

**Erich Stephens**, Chief Development Officer (CDO) of Vineyard Wind, has been working in renewable energy for nearly 20 years, and since 2009 has been a leader in US offshore wind development. Erich served as Head of Development Operations at Bluewater Wind, which was the first company in the US to win a PPA with a utility through a competitive procurement process. Erich then served as CEO of OffshoreMW, a Blackstone Group offshore wind project development company, and the company that is now Vineyard Wind. Erich also led Blackstone's offshore wind development business in the UK,

Netherlands, and Denmark. Erich was a founding partner of SolarWrights, which became the largest solar installer in New England, was the founding Executive Director of People's Power & Light, Rhode Island's non-profit consumer energy organization, and he was a founder and first Director of New England's leading "green" electricity program, GreenStart. Erich is a graduate of Brown University with a degree in Marine Ecology, and has studied evolutionary ecology at UC Davis and energy project finance at Vermont Law School. His resume is included as Attachment 12.3-9.

### **Vineyard Wind Key Personnel**

As described above, the CEO, CFO, and CDO of Vineyard Wind are also members of the Executive Committee. In addition to those key management leaders of Vineyard Wind, the following key personnel are vital to the team at Vineyard Wind. As noted below, some team members are employees of the partners, but nearly all of the team members have worked together on similar projects during a period of 10 years.

**Lars Conradsen**, Project Management Office (PMO) lead at Vineyard Wind. He is a Founding Partner at PEAK Wind, a leading wind farm technical and commercial management consultancy specializing in O&M asset management. Lars has more than 10 years of wind industry experience acquired at prior employers that include Siemens Financial Services, DONG Energy, and Danske Markets Corporate Finance, where he held management positions including Head of Operations Business Development and Strategy and Head of Service Contracts and Key Supplier Management. Lars has a Master's degree in Finance and Applied Economics from Copenhagen Business School in Denmark.

**Morten Hjortkjaer**, Supply Chain and Procurement on the Vineyard Wind project, is the VP and Chief Procurement Officer at Copenhagen Offshore Partners. He has more than 12 years of experience in offshore wind projects, supply chain and procurement, and renewable energy. Morten has a successful track record of CAPEX Procurement of 5,000 MW large-scale offshore wind projects and has negotiated the first commercial Siemens 6 MW direct drive and Vestas V164 turbine supply agreements. His previous experience includes serving as Head of CAPEX Procurement at DONG Energy where he held numerous roles since 2008 working in group procurement for power renewables, Capex procurement renewables, WTG, and contract management. He received his Master's degree in Business Administration and Commercial Law from Copenhagen Business School in Frederiksberg.

**Uffe Jørgensen**, Chief Technical Officer (CTO) on the Vineyard Wind project, brings a successful track record of development and engineering of more than 3,000 MW large-scale offshore wind projects to the team, starting with the completion of the world's 2nd offshore wind farm ever to be built, the Tunø Knob project in Denmark in 1995. Currently, he is part of the executive management team serving as Vice President and Chief Technology Officer at Copenhagen Offshore Partners in Denmark. Uffe has an accomplished career spanning over 20 years working on offshore wind projects and has held roles such as Senior Director Project Development for Concept and Technology at DONG Energy since 2005. Uffe has a MS in Civil Engineering from the Technical University of Denmark and a BS in Marketing from Copenhagen Business School in Frederiksberg.

**Bernardo Escudero**, Project Management for Grid Connection/Interconnection, brings nearly 15 years of experience in wind energy in the areas of business development, project management, project development, and project controls. Since 2011, he has been serving in a variety of roles such as Project Controls Manager for Central Maine Power, Manager of Project Development on the Maine Power Reliability Program (MPRP), and more recently as Director of Business Development at Avangrid, Inc. in Maine. Bernardo has a Master's degree in Industrial Engineering from the Universidad Pontificia Comillas in Madrid. He is a certified Project Management Professional (PMP) from the Project Management Institute (PMI).

**Rachel Pachter**, Permitting Lead, is Vineyard Wind's Vice President of Permitting since 2016, solely dedicated to the offshore Vineyard Wind project. Rachel has more than 15 years of experience in offshore wind development, in particular in permitting and regulatory compliance, environmental and site

investigation, Federal, state, and local regulations, NEPA, NHPA, ESA, Clean Water Act, Rivers and Waters Act, and Clean Air Act. She has developed geophysical, geotechnical, and avian surveys, performed community outreach and public relations, and brings her expertise in offshore and onshore wind projects to the Vineyard Wind project. Additionally, she is the only person to have successfully managed and completed permitting of an offshore wind project located in Federal waters in the US, to date. Prior to joining Vineyard Wind, she advised and planned all environmental and permitting aspects of offshore wind development while managing offshore geophysical and geotechnical site investigations at OffshoreMW LLC. Other roles held include Permitting and Environmental Manager at Energy Management, Inc./Cape Wind Associates, where she worked for nearly 14 years. Rachel has a BS in Geology, Cum Laude, from the University of Alaska at Fairbanks and received the Geology & Geophysics Award for outstanding scholastic achievement.

**Simon Sigurd Henriksen** is Senior Consultant and Project Manager who has recently worked on the Veja Mate project, where he was responsible for the engineering management of the design and certification for the WTG Foundation package. Simon has worked for Keystone Engineering in the US and has extensive offshore wind industry experience including project development, due diligence, and project execution. Simon has a MS in Wind Energy (Mechanical Engineering) from the Technical University of Denmark and a MS in Civil and Environmental Engineering from the University of Washington in Seattle, WA. Additionally, Simon will work for Vineyard Wind as consultant and he will assume the role as Foundation Engineering Manager.

**Kristian Pallesen**, Planning, Risk, and CAPEX, on the Vineyard Wind project, is a Senior Consultant at Blue Wind Consulting. Kristian has extensive knowledge in project management and project planning of offshore wind power projects and brings more than 10 years of experience to this project. Prior to joining the Vineyard Wind project team, he was Lead Project Planner and a member of the project management team at DONG Energy working on numerous offshore wind farms. Kristian has a MS in Manufacturing and Management Engineering from the Technical University of Denmark, and is certified as PMI Project Management Professional (PMI-PMP) and as a PMI Scheduling Professional (PMI-SP).

**Mikkel Ask Buur Bækgaard**, Senior Manager Copenhagen Offshore Partners is WTG Package Manager on the Vineyard Wind project, and has worked the last 9 years at DONG Energy in various project management roles, most recently as the WTG Package Manager for the 450 MW Borkum Riffgrund 2 project in Germany. Mikkel has a Master's Degree in Engineering from the Technical University in Denmark.

**Rasmus Miller**, Foundations and offshore logistics Manager, is Senior Director at Copenhagen Offshore Partners with 17 years of experience in the development and construction of large-scale offshore wind projects, delivering foundations and other technical packages covering 4,000+ MW in more than 20 offshore wind projects. Prior to joining COP, he was the Senior Manager and Head of Foundation Management at DONG Energy, where he worked on numerous global offshore wind projects alongside many of the Vineyard Wind team members. Rasmus has a MS in Hydrodynamics from the Technical University in Denmark and is currently furthering his education in Business Administration at the Copenhagen Business School.

**Henrik Lynderup**, Logistics Lead Consultant on the Vineyard Wind team. He is presently a Managing Director and Partner at Blue Power Partners with 18 years of experience in offshore technology. Prior to joining Blue Power Partners, Henrik held various positions at Siemens Wind Power from 1999 through 2016. At Siemens, he was responsible for design, procurement, manufacturing and installation of innovative foundations concepts. Henrik's educational background includes a degree in Building Construction from Bygningsteknik BTH University in Denmark.

**Kent Lagerstedt**, Electrical Service Platform (ESP) Lead on the Vineyard Wind project team, is a highly experienced electrical power system engineer with 25 years of experience with a broad technical background ranging from planning, design and construction of high voltage (HV) cable systems, HV-

transmission lines, and HV-sub-stations. Most recently, Kent has assisted Ørsted with Walney 1+2, West of Duddon Sands and Walney Extension offshore wind farms. He has headed procurement from tender to project close out, both for supply and design-build EPCI contracts for onshore and offshore projects. Kent has BS in Electrical Engineering from the Technical University of Denmark.

**Bea M. Simancas**, Offshore Cables Lead, has been working for Iberdrola and Scottish Power for more than 10 years. Bea has demonstrated her leadership and management abilities working on projects in Europe, Eastern Europe, South America, and northern Africa, including the East Anglia 714 MW offshore wind project in the UK. Bea brings exceptional expertise in offshore wind power generation, renewable energy, engineering, project coordination and project planning. Bea has a BS in Industrial Engineering and Electrical Engineering from the Universidad Pontificia Comillas in Madrid.

**Mikael Kærgaard**, CVA Coordination Lead on the Vineyard Wind project team, is a structural engineer and project manager with vast experience in offshore wind development working with WTG foundations. At C2Wind he manages large projects, principally WTG foundations and CVA process coordination. Mikael has experience from a number of large offshore wind farms like Gode Wind I+II, Burbo Bank 2, Race Bank, Walney 3+4, Borkum Riffgrund 2 (jackets and monopiles), and Hornsea 1 (jackets and monopiles). Mikael has in-depth experience in offshore structural engineering, piled foundations, design basis, detailed design, fabrication, and certification. Mikael has a Master's Degree in Civil Engineering from Aalborg University in Denmark.

**Jack Arruda**, Offshore Facilities Lead on the Vineyard Wind project. At Vineyard Wind, Jack is also the Package Manager for the onshore grid interconnection which includes the interconnection process with ISO-NE, and is also responsible for local permitting and town agreements related to the onshore works. He has a distinguished 20-year career in operating and managing wind energy projects as well as cycle power generation in New England. Previously, Jack worked 5 years on the Cape Wind project as the Electrical Infrastructure and Interconnection Project Manager along with leading other areas related to O&M and Environment, Health and Safety. Jack has a BS in Marine Engineering from the Massachusetts Maritime Academy.

**Martin Whyte**, O&M and OPEX Lead on the Vineyard Wind project, is Senior Offshore O&M Engineer and O&M Manager within Iberdrola's offshore wind business at ScottishPower. Martin is the O&M lead on the Vineyard Wind project, and has previously also been the lead for the O&M package on the Wiking project, a 350 MW project located in the German Sector of the Baltic Sea. Martin brings more than 10 years of experience in O&M preparation works where he is instrumental in ensuring that the project is fully set up for the efficient transfer of responsibilities from construction to O&M as well as ensuring that the O&M site team has the necessary resources to operate the wind farm safely and effectively. Martin earned his MS degree, with distinctions, in Renewable Energy Engineering and his BS, with Honors, in Sustainability and Environmental Management from Heriot-Watt University (Edinburgh).

**Don Jakins**, has worked in the construction industry for more than 20 years in various roles as Commercial Executive, Commercial Director, Managing Executive, and General Manager. Most recently, Don comes from DONG Energy where he has held a position as Senior Module and Execution Contract Manager, primarily focusing on offshore substations (ESP). At DONG Energy, he worked on the offshore substation procurement for the US, Taiwan, UK, and European markets.

**Ulrik Muurholm Hansen**, a structural engineer with 7 years of experience working on offshore wind projects at COWI, brings his expertise in modelling and structural design of fixed marine structures to the Vineyard Wind team. His background includes working on offshore wind projects that include DanTysk, Wiking, Hohe See, Formosa, and Horn Rev 3 OSS. On the Horn Rev 3 project, Ulrik worked alongside COWI colleagues to develop the detailed design of the OSS jacket and the topside. He has a strong theoretical background in structural engineering combined with geotechnical and hydraulic engineering. Ulrik has also worked on the developing detailed designs of grouted connections using non-linear finite

element modelling and offshore standards. Ulrik has a MS in Structural Engineering from the Technical University of Denmark.

**Kristoffer Lundbak Eriksen**, OPEX Lead on the Vineyard Wind project team, has 8 years of offshore wind O&M, project management, OPEX, and O&M concepts experience. Prior to joining PEAK Wind, Kristoffer held varying positions at DONG Energy serving as Project Manager, Concept Group Owner, and other roles while working on O&M life cycle costs (OPEX) models for on and offshore wind farms, OPEX development, O&M Offshore logistics, operational analyses, and wind power operations. Kristoffer has a MS in Mechanical Engineering from the Technical University of Denmark and a BS from Copenhagen Business School.

**Miguel Sanchez**, Procurement Specialist for the Vineyard Wind project team, is also the Head of Offshore Supply Chain at Avangrid Renewables in the US. Miguel has more than 13 years of experience working on offshore wind energy projects, managing contracts for wind farm projects in the US, South America, Europe, and the UK. Miguel previously performed the role of Wikinger Offshore Substation (OSS) Package Leader within Iberdrola's Offshore Wind Business, leading the team with all aspects of the Wikinger Windfarm Offshore Substation (350 MW) in the Baltic sea. Miguel has a PhD in Engineering and he holds an Advance Studies Degree in Cartography, Topography, and Photogrammetry from the Technical University of Madrid and a MBA in Energy Management Companies from Nebrija University.

**Matthew J. Robertson**, Environmental Lead on the Vineyard Wind team. Matthew is Senior Manager of Environmental Affairs at Vineyard Wind. He is presently managing all environmental permitting activities as part of the overall permitting activity of the Vineyard Wind project. He has a background working on New England offshore projects throughout Massachusetts, Rhode Island, and Connecticut, as well as in Washington State and in New Zealand. Matthew has a BS in Biological Sciences with a minor in Evolution and Ecology and a focus in Ornithology from the University of Connecticut in Storrs, CT.

**Christian Crown** has more than 10 years of experience in energy, financial planning, risk management, M&A, and due diligence. Prior to joining the Vineyard Wind team, Christian was the Head of Operational Intelligence & Risk Management at DONG Energy where he established and developed a new risk management function and oversaw all aspects of operational intelligence initiatives. Christian has a MS in Finance and Strategic Management and a BS in Economics and Business Administration from Copenhagen Business School.

**John C. Norman**, Insurance Manager on the Vineyard Wind team, is an insurance, risk, claims, property/casualty underwriting expert with nearly 30 years of experience. John is Director of Insurance & Risk at Avangrid where he directs the performance risk reviews, leads loss control activities (e.g., property, risk consulting) and manages outside risk on project staff and consultants. John holds dual Master's degrees, MBA and MBS, from Husson College in Bangor, Maine and a BS in Business Administration from the University of Southern Maine in Portland/Gorham, Maine. Additionally, John has extensive insurance training from the Insurance Institute of America (IIA).

12.4. Provide a listing of all projects the project sponsor has successfully developed or that are currently under construction. Provide the following information as part of the response:

- i. Name of the project
- ii. Location of the project
- iii. Project type, size and technology
- iv. Commercial operation date
- v. Estimated and actual capacity factor of the project for the past three years
- vi. Availability factor of the project for the past three years
- vii. References, including the names and current addresses and telephone numbers of individuals to contact for each reference.

Projects listed in **Table 12.4-1** below include the ISO-NE land-based projects in operation or under construction for AR, the offshore projects operating, in pre-construction or in construction for ScottishPower Renewable Energy, and CIP. The remainder of the 6,000 MW of AR operating onshore projects are listed in Attachment 12.4-1.

**Table 12.4-1. Project experience of AR in New England, ScottishPower, and CIP**

Project name	Location	Project type, size, and technology	Commercial operation date	Actual capacity factor (est.) (YTD Nov 2017 where given)	Availability (YTD Nov 2017 where given)
<b>Avangrid Renewables (US Onshore Wind in ISO-NE Excerpt)</b>					
Lempster	New Hampshire, US	24 MW	Nov. 2008		
Hoosac	Massachusetts, US	28.5 MW	Dec. 2012		
Groton	New Hampshire, US	48 MW	2012		
Deerfield	Vermont, US	30 MW	Under construction	N/A	N/A
<b>Scottish Power Renewable Energy Offshore</b>					
East Anglia ONE	East Anglia Zone, England, North Sea	714 MW	Under Construction	N/A	N/A
East Anglia THREE	East Anglia Zone, England, North Sea	1200 MW	Pre-construction	N/A	N/A
West of Duddon Sands (partnered with DONG Energy)	20 km off NW England coastline	389 MW	Oct. 2014		
Wikinger	German zone, Baltic Sea	350 MW	Under Construction	N/A	N/A
Saint Brieuc (partnered with	Bay of St. Brieuc off Brittany coast,	496 MW	Pre-construction	N/A	N/A



Project name	Location	Project type, size, and technology	Commercial operation date	Actual capacity factor (est.) (YTD Nov 2017 where given)	Availability (YTD Nov 2017 where given)
<b>Saint Brieuc (partnered with RES)</b>	Bay of St. Brieuc off Brittany coast, France	496 MW	Pre-construction	N/A	N/A
<b>Copenhagen Infrastructure Partners</b>					
<b>Fluvanna I (onshore wind)</b>	Texas, US	155 MW	4Q, 2017	N/A	N/A
<b>Beatrice</b>	UK	588 MW	3Q, 2018	N/A	N/A
<b>Veja Mate</b>	Germany	402 MW	May, 2017		
<b>Dolwin 3 (offshore transmission partnership)</b>	Germany	900 MW			
<b>CIP Taiwan Portfolio (1) Xidao, (2) Zone 27 and (3) Zone 28</b>	Taiwan	(1) 400 MW (2) 500 MW (3) 500 MW	Development projects	N/A	N/A

### References

Vineyard Wind is providing the following client references from our parent companies' similar wind clean energy projects that have been developed, executed, and currently in operation. Additional references will be provided upon request.

- Avangrid Renewables

Project Names: Lempster, Hoosac, and Groton  
James Daly, VP Power Supply, Eversource

[REDACTED]

Project Name: Deerfield  
Charlotte Ancel, VP Power Resources

[REDACTED]

12.5. With regard to the bidder's project team, identify and describe the entity responsible for the following, as applicable:

- Construction Period Lender
- Operating Period Lender and/or Tax Equity Provider
- Financial Advisor
- Environmental Consultant

v.	<i>Facility Operator and Manager</i>
vi.	<i>Owner's Engineer</i>
vii.	<i>Transmission Consultant</i>
viii.	<i>Legal Counsel</i>

Most of the entities described in this Section 12.5 are engaged after the execution of a Power Purchase Agreement when the economics and obligations of Vineyard Wind are known. Vineyard Wind and the partners that form the business have extensive contacts and access to all of the companies required to satisfy the financing, environmental assessment, operation, engineering, transmission, and legal counsel. Those relationships will be memorialized in contracts at the appropriate time in the further development of the project.

- i. Construction Period Lender – construction financing is described in response to Section 5.3 and will be finalized during the period following the signature of the PPA.
- ii. Operating Period Lender and/or Tax Equity Provider – as point i above, this will be finalized at the appropriate time of the project development. Vineyard Wind has received advice in relation to tax equity options from Norton Rose Fulbright and CCA.
- iii. Financial Advisor – Vineyard Wind will appoint a financial advisor in the period following award of the PPA, and have made use of the significant internal experience available within the shareholder organizations.
- iv. Environmental Consultant – Vineyard Wind has appointed Epsilon to provide environmental support during the development phase of the project.
- v. Facility Operator and Manager – as described in Section 11, Vineyard Wind plans to manage operations internally based on the experience of operating onshore projects in the US and offshore wind projects across Europe.
- vi. Owners' Engineer – to be appointed. DNV GL has been nominated as the Certified Verification Agent.
- vii. Transmission Consultant – Vineyard Wind will be supported by experienced staff drawn from Avangrid Networks, Stantec, and Burns & McDonnell.
- viii. Legal Counsel – the general legal consul for the project company has been provided by Foley Hoag LLP, with expert advice on Federal permitting provided by BakerHostetler LLP.

#### **12.6. Experience in ISO-NE**

*Provide details of the bidder's experience in ISO-NE Markets. With regard to bidder's experience with ISO-NE markets, please indicate the entity that will assume the duties of Lead Market Participant for your Project. Please provide a summary of the proposed Lead Market Participant's experience with each of the ISO-NE markets.*

#### **Lead Market Participant**

In ISO-NE, AR is the owner and operator of 100.5 MW at three projects. The 24 MW Lempster wind farm in New Hampshire has been in operation since 2008, and the output is sold to Public Service of New Hampshire (now Eversource) under a long-term contract. AR contracted out the ISO-NE market functions for this first project. The 28.5 MW Hoosac wind farm in Massachusetts and the 48 MW Groton wind farm in New Hampshire are under long-term contracts with NSTAR, and AR is the Lead Market

Participant and Designated Entity performing all bidding, scheduling, and settlement function with the ISO-NE. AR also performs all auction-related activities for Hoosac and Groton in the Forward Capacity Auctions.

In merchant operations, the energy and asset management teams of AR have extensive history moving power and RECs into New England from New York both under contracts with purchasers including NSTAR, and as an independent power marketer.

AR continues to invest in the ISO-NE footprint, with the ongoing construction of Deerfield wind farm in Vermont, which is 30 MW under a long-term 25-year contract with Green Mountain Power. AR is also the Lead Market Participant and Designated Entity under the Deerfield Power Purchase Agreement.

Upon selection, AR anticipates acting as Lead Market Participant and Designated Entity for Vineyard Wind, bringing AR's total ISO-NE market presence to more than 500 MW.

On behalf of the affiliated project companies owned and operated, and under contract through other power purchase agreements, Avangrid Renewables is responsible for selling all energy and energy-related products generated by more than 2,000 MW of renewable and thermal generating assets in the United States. With approximately 630 employees, and 24 hours per day, 365 days per year operations based in the National Control Center in Portland, OR, AR 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, AR has extensive experience in marketing power across ISOs and balancing authorities in the US.

## Section 13 OF APPENDIX B TO THE RFP EMISSIONS

*13.1. Provide emissions estimates based on available data from the unit manufacturer. Alternatively, provide actual emissions data determined in accordance with the paragraph above for a similar facility built within the past 3 years. Include copies of supporting documentation for all emissions estimates.*

*Project Anticipated Emissions, expressed in pounds/megawatt-hour (lbs/MWh)*

Since the units are wind turbine generators, they will generate no emissions, as shown in **Table 13.1-1**.

**Table 13.1-1. Anticipated emissions in pounds/megawatt-hour (lbs./MWh).**

Source of Information	Date of Test (if applicable)	Greenhouse Gases (all except methane) Expressed as Carbon Dioxide equivalent (CO <sub>2</sub> e)	Nitrogen Oxides (NO <sub>x</sub> )	Sulfur Oxides (SO <sub>x</sub> )	Carbon Monoxide (CO)	Particulate Matter (PM 2.5)	Methane (CH <sub>4</sub> )
0	0	0	0	0	0	0	0

*13.2. Describe any past investments that will, or have been made to your facility to improve its emissions profile or any planned future investments made to your facility in order to improve its emissions profile.*

Because the offshore wind generation project is non-emitting, no technological changes are planned to improve the emissions profile.

*13.3. Describe how your project will contribute to the Massachusetts 2008 Global Warming Solutions Act (GWSA) and the 2010 Clean Energy and Climate Plan for 2020, updated in 2015. Describe how your project will contribute to the Commonwealth's 2030, 2040 and 2050 GHG emission targets and any benefits associated with an earlier operational date.*

### **Earliest possible operational date means substantial GHG emission reductions — and dollar savings**

Vineyard Wind 1 will be operational in 2021, the earliest feasible date as described in Section 9, and this early operational date provides significant greenhouse gas (GHG) emissions reduction benefits relative to later projects. By delivering an operational project in 2021, Vineyard Wind will provide **\$76 million in GHG emissions reductions savings**, relative to a project coming on-line two years later, and **\$112 million in savings, relative to a project coming on-line three years later**. These savings are the difference in NPV value of the CES Clean Energy Credits, assuming a 20 year contract.

Vineyard Wind engaged Daymark Energy Advisors, a leading energy markets analytics firm, to analyze Vineyard Wind's contribution to the Global Warming Solutions Act (GWSA). Daymark's report is the basis for all figures provided in this section, and the report is provided in Attachment 13.3-1.

### **GHG emission reductions: 627,000 metric tons each year**

Vineyard Wind will start providing greenhouse gas (GHG) reductions in 2021, generating GHG emission reductions of about 627,000 metric tons each year across the New England electric system. If attributed to Massachusetts residential customers, such reductions would be equivalent to about 500 pounds of GHG emissions per household each year. These GHG emissions reductions provide significant benefits to Massachusetts ratepayers, and make important contributions to the Commonwealth's ability to meet the Global Warming Solutions Act and the Commonwealth's 2030, 2040, and 2050 GHG emission targets

### Up to \$273 million in savings in meeting the Global Warming Solutions Act

The Global Warming Solutions Act (GWSA) tasks the Massachusetts Department of Environmental Protection (MassDEP) with conducting an inventory of greenhouse gas emissions for GWSA compliance purposes; this inventory is based on the premise that, while emissions reductions from a renewable energy project (such as Vineyard Wind) will occur system-wide, as reported above, only a portion of these total emissions are to be allocated to Massachusetts for the purpose of implementing the GWSA. Therefore, Daymark estimated changes in Massachusetts GHG emissions with methodologies consistent with MassDEP's approach.

The Massachusetts-allocated portion of these reductions can be calculated in two different ways.

Recognizing that the Commonwealth is part of the larger New England Control Area, the first method is to derive New England-wide emissions reductions and then allocate to Massachusetts its share of the total reductions. Based on this method, Vineyard Wind 1 would lead to approximately 295,000 fewer metric tons of carbon emissions on an average year from electric load in the Commonwealth, as compared to a status quo case.

The second method is to attribute to Massachusetts the generation and emissions from units physically located in Massachusetts. If only Massachusetts-located generators are counted, the reduction would be an annual reduction of 302,000 metric tons of carbon emissions on an average year.

GWSA regulations include a cap on GHG emissions (and thus energy generation) from existing generating facilities located in Massachusetts. Implementation of limits on GHG emissions from generators located in Massachusetts will cause locational marginal price (LMPs) to increase in the system as a result of changes in economic dispatch with the current generating fleet. To illustrate potential benefits that Vineyard Wind 1 would provide in this case, Daymark calculated the additional LMP savings that would occur by adding the project into the economic model of the system with the GHG limits in place. In this scenario, the 400 MW Vineyard Wind project provides \$582 million NPV in LMP savings to Massachusetts ratepayers for a 20-year contract. After netting out reference case LMP savings already attributed to the project in the calculations for Section 2.3.1.2(i) benefits (see Section 14), the 400 MW Vineyard Wind provides an additional \$273 million NPV in LMP savings for a 20-year contract, using the GWSA methodology.

These numbers can then be used to calculate the value of Vineyard Wind's early (2021) delivery date, as mentioned earlier, based on the difference in NPV value of the CES Clean Energy Credits, assuming a 20 year contract. **Table 13.3-1** shows the amount of GHG reductions, and the dollar value of such reductions, due to Vineyard Wind's early operational date. The Vineyard Wind project, coming on-line in the earliest feasible year, will provide \$112 million in Clean Energy Credit savings relative to a project coming on-line three years later.

**Table 13.3-1: Additional near-term GHG reduction benefits of Vineyard Wind's project, relative to later projects, as reported by Daymark Energy Advisors.**

Benefit Relative to a later project:	Project one year after Vineyard Wind	Project two years after Vineyard Wind	Project three years after Vineyard Wind
GHG emission reductions towards GWSA target (metric tons)	310,000	660,000	870,000
GHG emissions reductions savings (NPV \$2022)	\$39 million	\$76 million	\$112 million

### Optimizing contributions to the Commonwealth's 2030, 2040, and 2050 GHG emission targets

Vineyard Wind's 2021 operational date, coupled with its 25 year operational life, means that all of the Project's lifetime output will be available to make contributions to the Commonwealth's GHG emissions targets for 2030, 2040, and 2050. The GWSA's targets will require overall reductions of 75.5 million metric tons (80%) from all sector emissions relative to 1990 levels. The MassDEP estimates that 2013

emissions were 18.6 million metric tons (20%) below 1990 levels.<sup>10</sup> Although specific targets on an annual emissions basis have not been established for 2030 or 2040, assuming linear increases in reductions to 2050 would require reductions relative to 2013 levels on the order of 20, 40, and 60 million metric tons per year for 2030, 2040, and 2050, respectively. Given that the Vineyard Wind project will result in Massachusetts GHG emissions reductions of approximately 0.3 million metric tons per year, this means that Vineyard Wind would contribute to meeting 1.3% of a 2030 target, 0.8% for a 2040 target, and 0.5% for a 2050 target. These are significant contributions to come from a single project—and a project which will be operational by 2021.

The “2015 Update to the Massachusetts Clean Energy and Climate Plan for 2020”<sup>11</sup> recognizes that while emissions from the electricity sector were almost cut by half from 1990 – 2012, most of these reductions were achieved through closures of existing large fossil fuel (particularly coal-fired) generators, providing a significant share of the total emission reductions. The opportunities for emission rate reductions within the fossil fuel fleet are limited, with coal plants virtually eliminated from the region and oil-burning units retiring or generating at very low output levels. The recent and planned retirement of emission-free nuclear plants increases the focus on renewable energy as the key source for emission-free electric generation. Furthermore, it is widely recognized that a key element in any path to achieving GWSA’s aggressive emission reduction goals is electrification of the transportation sector, which will increase the need for emission-free electric generation. All of these factors mean that quickly bringing on-line large amounts of emission free energy, such as will be provided by the Vineyard Wind project, is essential to meeting GWSA targets.

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<sup>10</sup> Statewide Greenhouse Gas Emissions Level: 1990 Baseline and 2020 Business As Usual Projection Update, July 2016, Massachusetts Department of Environmental Protection.

<http://www.mass.gov/eea/docs/dep/air/climate/gwsa-update-16.pdf>

<sup>11</sup> Massachusetts Clean Energy and Climate Plan for 2020, 2015 update, December 31, 2015, Secretary of Energy and Environmental Affairs. <http://www.mass.gov/eea/docs/eea/energy/cecp-for-2020.pdf>

## Section 14 OF APPENDIX B TO THE RFP CONTRIBUTION TO EMPLOYMENT AND ECONOMIC DEVELOPMENT AND OTHER DIRECT AND INDIRECT BENEFITS

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Vineyard Wind's proposed near-term construction of the Vineyard Wind 1 project, with on-site construction starting in 2019, is a historic opportunity to ignite the Massachusetts supply chain and workforce, and start a new industry for Massachusetts.

This new industry will start with the Vineyard Wind project, which will create up to 2,493 direct employment full-time equivalent jobs in the Commonwealth over the 25 year life of the Project, according to a study by the University of Massachusetts, Dartmouth, Public Policy Center (UMassD PPC); the full study is provided as Attachment 14.4-1.

As important as this near-term job creation is, Vineyard Wind considers the Vineyard Wind 1 project to be only the start, and is committed to accelerating the development of the Massachusetts offshore wind industry.

### **Accelerating the Massachusetts Offshore Wind Industry**

Vineyard Wind is committed to leveraging the early start of construction of Vineyard Wind **1** to maximize near-term job creation, as well as build a foundation of workforce and supply chain development that will set the Massachusetts offshore wind industry on a path of sustained growth and job creation.

The partners of Vineyard Wind have many years of experience in developing a local supply chain in Europe, most notably in the UK. Vineyard Wind acknowledges and appreciates the fact that all projects, but especially the first project, needs to have a clear strategy for enabling a long-term industry development.

In order to make the most of Vineyard Wind's plans to give the Massachusetts offshore wind industry a strong and sustainable start, Vineyard Wind is committing up to \$15 million after signing an irrevocable PPA (and TSA if relevant) in three initiatives that will

- **build** a skilled offshore wind workforce centered in southeastern Massachusetts,
- **attract** additional investment in infrastructure and supply chain development, and
- **advance** technologies that will allow for greater expansion of offshore wind, while continuing to protect marine mammals.

We are calling this suite of initiatives – to be deployed alongside the first large-scale commercial scale wind project in the US – the Massachusetts Offshore Wind Accelerator, or the Accelerator program.

**Figure 14.1-1** summarizes and illustrates the Accelerator strategy for kick-starting offshore wind in Massachusetts.

The Offshore Wind Accelerator program will make Massachusetts the powerhouse of the US offshore wind industry, and the Commonwealth the hub for supply chain investments and home to the nation's most skilled and experienced offshore wind workforce.

### **First Large-Scale, Commercial Project: Site Construction starts in 2019**

The Offshore Wind Accelerator has as its foundation the Vineyard Wind project, which will quickly bring commercial scale offshore wind to Massachusetts. Vineyard Wind will be the first large scale, commercial offshore wind project in the US, beginning construction in 2019 and fully operational by 2021.

In addition to significant near-term and long-term job creation, the Vineyard Wind project will immediately capture the attention of the global offshore wind industry, giving Massachusetts first mover advantage, and putting it at the center of the US offshore wind industry and signaling that Massachusetts



is the place to invest and find new partners. Vineyard Wind is actively working actively with potential supply chain partners, encouraging the establishment of partnerships and the development of sustainable and cost competitive local arrangements, that can serve not only Vineyard Wind and Massachusetts, but the entire global offshore wind industry for years to come.



**Figure 14.0-1: The Accelerator program for kick-starting the Massachusetts offshore wind industry is built on the foundation of Vineyard Wind’s 2019 on-site construction start, and has three pillars to build up the Massachusetts offshore wind industry.** Building on the foundation of the Vineyard Wind project, the three pillars of the Accelerator are:

### 1. Offshore Wind Industry Accelerator Fund: \$10 million

Vineyard Wind is committing to invest up to \$10 million in projects and initiatives to accelerate the development of the offshore wind supply chain, businesses, and infrastructure in Massachusetts.

This fund will be launched during 2018 after Vineyard Wind has signed an irrevocable PPA (and TSA, if relevant) and will be used to attract investments to upgrade or create new facilities or infrastructure needed to develop the offshore wind industry in the Commonwealth.

Vineyard Wind is proposing that the Massachusetts Clean Energy Center (MassCEC) manage the fund, working with a steering committee to guide investment decisions. Members of the steering committee would include representatives from the New Bedford Economic Development Council, the Bristol County Chamber of Commerce, and Vineyard Power (representing Martha’s Vineyard), so as to best ensure that investments are effective in making southeastern Massachusetts the center of the US offshore wind industry. Any investments by the fund will require a matching contribution, as a means to extend the fund’s capital, as well as further ensure the highest quality investments.

Examples of possible investments by the Offshore Wind Industry Accelerator Fund include

- **expanding and improvement of ports** to support offshore wind construction,
- **enabling the establishment of offshore wind manufacturing** facilities in Massachusetts

By working with supply chain companies to identify opportunities in Massachusetts, Vineyard Wind 1 will be able to leverage both the Industry Accelerator Fund, and the purchasing power of the first commercial scale offshore wind project in the US, to attract significant investment in Massachusetts’s new offshore wind industry, and do so in a sustainable way such that ratepayers and future projects will benefit from this initiative for years to come.

Letters from supply chain companies are provided in Attachment 14.1-1, and illustrate the wide range of businesses with which Vineyard Wind is already in discussion. Examples of opportunities to build the Massachusetts supply chain that we have already identified include:

- Manufacture in part or full of the Electrical Service Platform (ESP)
- Establishment of fabrication facilities in Massachusetts for offshore wind turbine towers
- Sourcing of sub-components for WTG manufacturing
- Final assembly site for foundations outfitting
- Construction of marine support vessels
- Opening of Massachusetts offices of suppliers selected by Vineyard Wind

## **2. Windward Workforce: \$2 million**

The Windward Workforce program is a set of initiatives, with \$2 million underlying support commitment, which will recruit, mentor, and train residents of Massachusetts, particularly southeast Massachusetts, for careers in the Commonwealth's new offshore wind industry, with the ultimate objective of Massachusetts having the best trained, most experienced offshore wind workforce in the US.

With the experience gained from working on the first commercial offshore wind project in the US, Vineyard Wind, will be invaluable in launching careers in offshore wind for Massachusetts residents. The Windward Workforce program will be undertaken in partnership with vocational schools, community colleges, the Fishing Partnership Support Services, and others. Vineyard Wind has already initiated conversations with potential partners including the Bristol Community College, Martha's Vineyard Regional High School, Cape Cod Community College, and Cape and Islands Self-Reliance. Letters of support and interest from these organizations are provided in Section 7.5.

The Windward Workforce program includes several education/training initiatives and company policies, including:

- **Look Local First:** Vineyard Wind will commit to require all its major contractors to proactively identify Massachusetts individuals and companies as candidates for positions and contracts whenever feasible. These opportunities will be promoted in the Massachusetts business community via a series of "Meet the Buyer/Employer" events, local Chambers of Commerce, social media, and through the Vineyard Wind website.
- **Martha's Vineyard Wind Working Waterfront:** Vineyard Wind has set itself the goal of 100% of its operations and maintenance staff being Martha's Vineyard residents within five years of the project being operational.
- **Career development in offshore wind:** Vineyard Wind will fund curriculum development and instructor education for courses in "Offshore Wind 101" and other applicable subjects at local vocational schools, high schools, and community colleges within host communities.
- **Specialized training:** Vineyard Wind will coordinate and fund curriculum development and specific training programs, such as globally recognized certifications for offshore wind technicians, and component OEM certifications.
- **Offshore wind careers mentoring:** Vineyard Wind will implement a mentoring program, within its own organization and encourage its contractors to do the same, to ensure skills and know-how are brought to Massachusetts through the Vineyard Wind Project, so that evermore Massachusetts residents are qualified and ready to build the next offshore wind projects around the US.

### 3. Innovations for Marine Mammals Protection Fund: \$3 million

The Innovations for Marine Mammals Protection Fund will fund development and demonstration of innovative methods and technologies to enhance protections for marine mammals as the Massachusetts and US offshore wind industry continues to grow. Investments by the fund will be guided by a steering committee which will include representatives of environmental advocacy groups with particular expertise in the field of marine mammal protection.

To allow the sustainable growth of the US offshore wind industry, it will be essential to develop and adapt new technologies and practices to ensure effective protection for marine mammals.

Vineyard Wind's early project will provide an opportunity to test or demonstrate new technologies and methods, so they are more likely to be available for future projects. Such technologies and methods could include, for example, quieter pile driving technologies or technologies to better detect whales and maintain exclusion zones.

The Innovations for Marine Mammals Protection Fund will also be another opportunity for the Massachusetts economy to benefit from offshore wind, given the large existing base of ocean technology companies and ocean-oriented academic institutions.

#### A vision for sustainable development of the Massachusetts offshore wind industry

The Massachusetts Offshore Wind Accelerator will capture synergies of Vineyard Wind's \$15 million investment in the industry and the Vineyard Wind project's 2019 start-of-site-construction to accelerate the development of the offshore wind industry, creating employment and business opportunity for Massachusetts in both the short-term and long-term—creating jobs, and careers.

Given the Vineyard Wind team's experience with the offshore wind industry in Europe, and land-based wind in the US, we are convinced that a comprehensive economic development and job creation strategy, building on the opportunity of an early project and growing the local industry organically, is the right course to maximize the economic development opportunity of offshore wind for the Commonwealth.

*14.1. Please provide an estimate of the number of jobs to be created directly during project development and construction, and during operations, and a general description of the types of jobs created, estimated annual compensation, the employer(s) for such jobs, and the location. Please treat the development, construction, and operation and maintenance periods separately in your response.*

The Vineyard Wind 1 project will create up to 2493 direct employment full-time equivalent jobs in the Commonwealth over the 25 year life of the Project, according to the UMassD PPC study. Of these 2,493 Massachusetts jobs, 2,366 will be in southeastern Massachusetts, defined for this study as Bristol and Plymouth Counties, Cape Cod, Martha's Vineyard, and Nantucket.

These jobs will span a diverse range of professions, from construction to engineering and science to managerial. As the first offshore wind project in Massachusetts, these jobs created by Vineyard Wind will be springboards for entire careers for many.

#### Pre-construction development direct jobs

Vineyard Wind's contribution to the Massachusetts economy has already begun, with an estimated 108 full-time equivalents directly employed and working on the project's design, permitting, and financing in Massachusetts, according to the UMassD PPC study.

Almost all of these jobs are in a professional positions, and include engineers and scientists, for the permitting and project design, along with legal positions or executives managing the project and project financing. Employers for these positions are typically consulting, legal, and engineering firms, in addition to the project team itself. Further details are provided in **Table 14.1-1**.

The average annual compensation package during pre-construction development is estimated to be \$148,767.

**Table 14.1-1: Direct job creation during pre-construction development.**

Category	Types of jobs
Permitting	Environmental engineer, civil engineer, field ecologist, GIS specialists, graphic designer, visual analyst, lawyer and paralegal, public communications, editor, acoustic modeler, archeologist, subject matter expert
Geological Surveys and Analysis	Acoustical engineer, vessel captain and crew, ocean engineer, protected species observers, geologist, archeologist, marine ecologist, meteorologist
Engineering and Design	Civil engineer, structural engineer, electrical engineer, mechanical engineer, risk and schedule analyst, CAD and GIS specialist, meteorologist, oceanographer
Procurement and Financing	Lawyer, procurement professional, investment specialist
Legal	Lawyer, paralegal
Management and Administrative	Management executive, office and business manager, IT specialist, contracts manager, HR specialists

### Direct jobs during construction

An estimated 825 direct full-time equivalent jobs will be created during the construction of Vineyard Wind 1, of which 705 will be located in southeast Massachusetts, according to the UMassD PPC study. Given that construction will be staged from New Bedford, we expect most of these positions will also be based in New Bedford.

Typically, these positions are with engineering and construction management firms, construction firms utilizing building and maritime trades, and vessel and port operations companies. Examples of the wide range of job opportunities in Massachusetts during construction of the Vineyard Wind Project are shown in **Table 14.1-2**.

Average annual compensation packages for jobs in the construction phase are estimated to be \$91,257, which compares to a statewide average annual wage of \$67,444.

**Table 14.1-2: Direct job creation during construction.**

Category	Types of jobs
Wind Turbines	Rigging & Lifting Engineer, Company Representative, Vessel Manager, Marine Coordinator, Yard Supervisor, Marine Warranty Surveyor, Welders and Welding Supervisors, Coaters and Coating Inspectors, Quality Assurance Inspectors and Manager, Quality Assurance Representatives, IT Technicians, Project Management, Engineering Management, Construction Management, Commissioning Manager, Site Manager, Controller, Health & Safety Representatives, Structural Engineer, Permit Coordinator, General Supervision and Management, Administrators
Foundation	Plater, Welder, Pipefitter, Electrician, Riggers, Crane Driver, Scaffolder, Painter, Rigging & Lifting Engineers, Welders, Supervisors, Quality Assurance Representatives, Quality Assurance Manager, Health & Safety Representatives, Structural Engineer, CAD Technicians, Coating Inspectors, Electrical Inspector, Welding Inspector Project Management, Engineering Management, Construction Management, Site Representative, Fabrication Manager, Quality Assurance Manager, Health & Safety Manager, Heavy Lift Specialist, Dimensional Controller, Supply Chain & Procurement Management, Contract Managers, Administrators, Vessel Manager, Vessel Master, Marine Coordinator, Marine Warranty Surveyor
Cables	Site Representative, Rigging & Lifting Engineers, Network Controller, Permit Coordinator, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives, Structural Engineer, CAD Technicians, Vessel Manager, Vessel Masters, Marine Coordinator, Yard Supervisor, Marine Warranty Surveyor, Project Management, Cable Installation Manager, Commissioning Manager, Engineering Management, Construction Management, Supply Chain & Procurement Management, Contract Managers, Administrators
Electric Service Platform	Plater, Welder, Pipefitter, Electrician, Riggers, Crane Driver, Scaffolder, Painter, Supervisors, Heavy Lift Specialist, Rigging & Lifting Engineer, Yard Supervisor

Category	Types of jobs
	Quality Assurance Representatives, Health & Safety Representatives, Welding Inspector, Coating Inspector, Electrical Inspector, Project Management, Commissioning Manager, Network Controller, Permits Coordinator, Platform Design Manager, Grid Manager, Interface Manager, Certification Manager, Insurance Liaison, Engineering Management, Construction Management, Site Representative, Vessel Manager, Vessel Master, Marine Coordinator, Marine Warranty Surveyor, Mate
Construction	Project Management, Engineering Management, Construction Management, Commissioning Manager, Administrators, Site Representative, Rigging & Lifting Engineers, Vessel Manager, Marine Coordinator, Network Controller, Permit Coordinator, Fisheries Liaison and Representatives, Structural Engineer, CAD Technicians, Supply Chain & Procurement Management, Contract Managers Yard Supervisor, Marine Warranty Surveyor, Welding Supervisors, Coating Inspectors, Quality Assurance Manager, Quality Assurance Representatives, Health & Safety Representatives

### Direct job creation during operations & maintenance: Diversifying Martha's Vineyard's economy

From the very beginning of the Project's development, Vineyard Wind has been committed to maximizing local community benefits, as identified by the local communities themselves. By way of our local community partner, Vineyard Power, the community of Martha's Vineyard has indicated a strong desire to have operations and maintenance of the Vineyard Wind project based on Martha's Vineyard. Vineyard Wind is very pleased to have been able to accommodate this desire in designing the Vineyard Wind project, and thereby provide the benefit of significant, year round job creation to be based on the Vineyard's working waterfront.

Vineyard Wind's O&M operation will create an estimated 60 direct, full-time equivalent jobs each year of the project's operation, according to the UMassD PPC study, and Vineyard Wind estimates that about 90% of these positions will be based on Martha's Vineyard

Moreover, Vineyard Wind has set a target of 100% of the jobs based on Martha's Vineyard be held by year-round residents of the island within five years of the project's operation. This commitment will help diversify and stabilize Martha's Vineyard's economy, which is otherwise highly dependent on tourism and related seasonal employment opportunities. Vineyard Wind's operations and maintenance facility will also help preserve the Vineyard's maritime heritage, and maintain the tradition and benefits of a working waterfront in Vineyard Haven. The feasibility and the job potential of the decision to use Martha's Vineyard as the operations and maintenance base has been confirmed with the potential wind turbine suppliers. Examples of the anticipated jobs opportunities are listed in **Table 14.1-3**.

The average annual compensation package during operations is estimated to be \$104,256, according to the UMassD PCC study.

**Table 14.1-3: Direct job creation during operations and maintenance.**

Category	Types of jobs
Operations and maintenance	WTG Technicians, Vessel Crew, Control Room Management & Operator, High-Voltage Operator, Structural & Coating Inspector, Helicopter Flight and Maintenance Personnel Site Operations Management, Marine Coordinator, Administrator, Warehouse Coordinator, Technical Support, Health & Safety Manager, Supply Chain & Procurement Management, Marine Logistics Personnel, Facilities Coordinator

### Good Paying Jobs

As important as the number of jobs the Vineyard Wind Project will create is the fact that these positions are largely well-paying jobs, including those positions that do not require a post-secondary education. These positions will contribute to maintaining middle-class career opportunities for Massachusetts workers, especially in Southeastern Massachusetts where quality job opportunities are in short supply.



The average annual salary of all Massachusetts positions working on the project is \$81,978, and for those located in southeastern Massachusetts, is \$82,570; which compares favorably with current average salaries of \$67,444 (QCEW 2016 Annual) for all of Massachusetts and \$48,142 (QCEW 2016 Annual) for Southeastern Massachusetts.

### **Credible Jobs Estimates**

Vineyard Wind is proposing a comprehensive, long-term strategy of economic development and job creation, kicked off by the early construction of the Vineyard Wind Project. Vineyard Wind has selected the University of Massachusetts, Dartmouth's Public Policy Center (Umass PPC) to undertake a forecast of job creation and other economic benefits resulting from the Vineyard Wind Project. An interdisciplinary applied public policy research and technical assistance provider, the Center seeks to inform evidence-based policymaking at the state, regional, and local level through collaborative engagements with public, private, and non-profit partners. UMass PPC is supported by a highly-experienced team of professionals who leverage the skills and expertise of UMass faculty, staff, and students.

The principal investigators of the Vineyard Wind study have extensive experience analyzing the state, local, and regional economy and supporting economic and workforce development initiatives. Dr. Michael Goodman, Executive Director of the UMass PPC, has authored or co-authored over fifty publications on a wide range of public policy issues, including regional economic development, and is a leading expert on the Massachusetts economy. Professor Goodman currently serves as Co-Editor of MassBenchmarks, the journal of the Massachusetts economy published by the University of Massachusetts Donahue Institute, in cooperation with the Federal Reserve Bank of Boston. David Borges's research focus includes program evaluation, economic impact analysis, and workforce development. Dr. Goodman and Mr. Borges were lead authors on a "A Comprehensive Analysis of the Massachusetts Maritime Economy," which was recently completed for the Massachusetts Seaport Economic Council.

Full details of UMassD PPC the UMassD PPC's methods of analysis results can be found in their detailed report, which can be found in Attachment 14.0-1. This analysis was the basis for the economic development impacts referenced in this section.

It is important to note that the jobs creation and employment numbers reported above do not reflect the additional job creation and economic development that can be expected from the \$15 million investment in Massachusetts offshore wind through the Offshore Wind Accelerator program, and leveraging these dollars with other investment and Vineyard Wind's project development. Rather, the numbers above, while significant, relate only to building the Vineyard Wind project.

*14.2. Please provide the same information as provided in response to question 14.1 above but with respect to jobs that would be indirectly created as a result of the proposed project.*

Vineyard Wind will create up to 254 indirect full-time equivalent jobs in the commonwealth during the development and construction of the project, of which 143 will be in southeastern Massachusetts, according to the UMassD PPC study.

A detailed study by the UMassD PPC study found that Vineyard Wind's project will create 26 full-time equivalent indirect jobs each year during the operation phase, most of which will be located in Southeastern Massachusetts.

Indirect job creation is expected to be in the areas of transport and support services, as well as professional services such as legal and accounting.

*14.3. Please describe any other economic development impacts (either positive or negative) that could result from the proposed project, such as creating property tax revenues, creating lease revenues to public and private parties, or purchasing capital equipment, materials or services for local businesses. Please provide the location(s) where these economic development benefits are expected to occur.*

Other economic benefits of Vineyard Wind 1 include:

#### **Induced Job Creation and Total Economic Impact**

Offshore wind projects, such as Vineyard Wind, are expected to have substantial induced job effects. This is because induced impacts (the jobs created by the expenditure of wages) are driven by wage amounts, both of workers directly working on the project and supply chain workers.

The Public Policy Center at UMass Dartmouth (PPC) UMassD PPC estimates that Vineyard Wind will create up to 717 full-time equivalent positions in Massachusetts over the development and construction of the project, and another 55 each year during the operational phase.

Vineyard Wind's Pre-Construction, Development, and Construction expenditures are estimated to generate up to \$295.4 million in total economic output statewide, as well as \$163.8 million in value added impacts..

#### **Offshore Wind Accelerator: Long-term job creation and economic development**

Long-term job creation and economic development created by the Accelerator program, described above, was not included in the analysis by UMass PPC. This analysis was limited to job creation specifically from the construction of the Vineyard Wind project. Therefore, significantly more jobs and economic development can be expected as a result of the Vineyard Wind project, given the simultaneous implementation of the Accelerator program and its \$15 million investment in the local economy. Of the \$15 million investment of the Accelerator program,

- \$12 million will be specifically in Massachusetts as a requirement of the program, and most would be in southeastern Massachusetts. Of this \$12 million, \$10 million would require a 1:1 match, generating a total of \$20 investment in the commonwealth and the southeastern Massachusetts area.
- \$3 million is designated to fund and incentivize development of technologies and methods that enhance marine mammal protection during the installation of offshore wind projects. While this expenditure will not necessarily be made entirely in Massachusetts, it is expected that Vineyard Wind 1 would be used to demonstrate some of these new technologies and methods. And given the extensive "Blue Tech" industry in Massachusetts, and the world-leading academic and research institutions in the Commonwealth, it is expected that much of this funding will be spent in Massachusetts.

#### **Resiliency and Affordability Fund**

Working with partners Citizens Energy and Vineyard Power, Vineyard Wind will, upon signing an irrevocable PPA (and TSA if relevant), establish a Resiliency and Affordability Fund, and contribute \$1 million each year to the fund for 15 years.

This fund will be used to support the development and construction of distributed battery storage and solar projects, and in addition to the economic benefits of the projects once they are operational, constructing the projects will create additional jobs in the areas of construction and solar installation.

Full details on the fund are provided in Section 14.6.

#### **Host Community Agreement benefits**



Vineyard Wind is currently negotiating a Host Community Agreement with the Town of Yarmouth, and we have confirmed our interest to do the same with the Town of Barnstable. As contemplated in the current draft of the agreement with Yarmouth, Vineyard Wind will be contributing up to \$1M in infrastructure improvements to the town, and a \$150,000 payment to the town for use at the Town's full discretion. Moreover, Vineyard Wind will also pay an annual host community payment, which provides a "floor" mechanism to the annual revenue paid to the town, such that the town always receives at least \$450,000/year in payments from Vineyard Wind through a combination of property tax payments and host community agreement payments. Unlike a PILOT, if the property tax owed is in excess of \$450,000, the full property tax amount is paid. Vineyard Wind's expenditures under the Host Community Agreements would be entirely in, or to, the towns in which we have agreements (currently expected to be Barnstable and Yarmouth).

### **Property Taxes**

Vineyard Wind estimates it will directly pay over \$1.5 million to Massachusetts communities each year during the construction and operations phases of the proposed project. It is anticipated that these taxes will be paid to:

- Town of Yarmouth (in addition to a proposed \$1 million in local infrastructure improvements offered during cable installation)
- Town of Barnstable (for personal property and substation parcel tax payments);
- City of New Bedford (for leased offices and equipment);
- City of Boston (for leased offices);
- Town of Vineyard Haven (related to an estimated minimum of \$3.5 million investment in an O&M facility)

In addition to these direct tax payments, the UMassD PPC Public Policy Center at UMass Dartmouth estimates that project related expenditures in Massachusetts will generate additional state and local tax impacts. For details, please see Attachment 13.3-1.

### **State Tax Revenue**

UMass PPC estimates that the amount paid in state and local taxes as a result of the development, construction, and first year of operations of the Vineyard Wind project is between \$10.6 million.

### **Lease Payments**

Vineyard Wind will pay hundreds of thousands of dollars in lease payments during the construction and operation of the project, most of which will be paid in New Bedford and Martha's Vineyard.

For the period during which Vineyard Wind will utilize the New Bedford Marine Commerce Terminal for construction, Vineyard Wind will pay \$503,150 per month in rent to the Massachusetts Clean Energy Center (MassCEC), per the terms of the uniform Lease Option and Lease Agreement between offshore wind developers and MassCEC.

Vineyard Wind will also pay the US Bureau of Ocean Energy Management \$560,000/year in lease payments for our project lease site during the period prior to development, and then an estimated operational fee in excess of \$ 1.5 million once operations begin.

*14.4. Please describe any tracking or reporting mechanisms, such as an annual report(s) of milestones achieved and jobs created, to verify the contributions to employment and economic development identified in 14.1, 14.2 and 14.3.*

Vineyard Wind will continue our commitment to highly credible economic impact assessment through the construction and operation phases of Vineyard Wind 1 by continuing our engagement of the UMass PCC to conduct a monitoring and reporting program during construction, and after one year of operations.

Developing the first large scale offshore wind installation in Massachusetts will provide this research group with an excellent opportunity to “capture and record” the emergence of a major new industry in the Commonwealth and the United States. Systematically tracking and monitoring the direct and indirect economic activities associated with the proposed project will facilitate accountability for results and yield insights that can assist Massachusetts officials in maximizing the local economic benefits of this first project, future projects, and the nascent offshore wind industry generally. This study will further help to position the Commonwealth to be the location of choice for expected future large private investments in the offshore wind supply chain.

Toward these ends, UMass PPC’s tracking and monitoring efforts are anticipated to include the following mechanisms:

Annual progress reports to the Commonwealth and MassCEC summarizing:

- the total number of project staff on our payroll, as well as the number who reside in the Commonwealth and where they live;
- the total number of workers employed our subcontractors and vendors, as well as the number who reside in the Commonwealth;
- an estimate of the direct, indirect, and induced economic impact of work to date on the Massachusetts economy and on employment in Massachusetts;
- the extent to which the reported results align with the estimates of the project’s contributions to employment and economic development contained in the project proposal; and
- any lessons learned that Massachusetts officials can use to improve economic outcomes for Massachusetts and inform future state procurement and programmatic efforts.

Additionally, the progress reports will summarize the impact of programs developed outside of the main Vineyard Wind project, including:

- the impact of the Offshore Wind Accelerator program, which we anticipate will create a significant number of jobs and economic development beyond what is expected as a result of the proposed OSW project alone.
- any projects supported by the Resiliency and Affordability Fund, specifically focusing on whether these projects generated additional revenue for the Fund and the impacts on the communities in which they are located;
- how the communities in Massachusetts have benefitted from the payments they received under the Host Community Agreements Vineyard Wind has negotiated with them; and
- the share of the Innovations in Marine Mammals Protection Fund spent in Massachusetts, which institutions received funding, and the projects supported.

Written reports summarizing the data and analysis described above will be submitted to DOER, MassCEC, and/or other designated agencies annually, with the first being delivered 12 months from the date project work commences, and continue until the formal completion of the project.

**14.5. To the extent not already specified elsewhere in your response, please address the factors listed in Section 2.2.2.7 and describe any benefits or impacts associated with the proposed project.**

Vineyard Wind engaged Daymark Energy Advisors, a leading provider of integrated planning, policy, and strategic analysis and advisory services to the North American electric and natural gas industries, to identify and quantify other economic benefits of the Vineyard Wind project. Daymark has been providing energy market analysis services to New England and North America since 1980, and has earned a reputation for providing robust and objective analyses across the full range of the energy sector including electric and gas utilities, suppliers and large end-use consumers, developers and investors, and regulatory commissions and public policy organizations.

Daymark used hourly production data from Vineyard Wind to quantify benefits of Vineyard Wind 1 from analysis using the AURORA<sup>®</sup> zonal model for the Eastern Interconnect (AURORA), developed by EPIS, Inc. The results of the market simulation performed with AURORA provided the data upon which Daymark relied to prepare estimates of the following benefits; a full description of methodologies and details results is provided in Attachment 13.3-1.

**Direct Contract Benefits: \$1.87 billion**

The direct benefits of the generation are measured as the market value of the generation and RPS Class I eligible RECs at the contract delivery point with the project in-service. Daymark's estimate of direct contract benefits assumes that the alternative to contracting with Vineyard Wind is purchasing wholesale energy and RPS Class I RECs at forecast spot prices. The benefits are calculated as the net present value in 2022 of the wholesale energy and REC purchases avoided by contracting with Vineyard Wind over 20 years. The cost of the contract is not netted against the calculated benefits.

Vineyard Wind's 400 MW project was found to offer direct contract benefits of up to \$1.87 billion net present value (NPV).

**Changes in LMPs and wholesale costs of energy for the ratepayers: \$409 million**

Vineyard Wind 1 offers significant benefits to Massachusetts throughout the proposed contract period by creating a persistent reduction in regional Locational Marginal Prices (LMPs) and production costs. After deriving total LMP and production cost benefits, Daymark weighted the LMP and production cost benefits by 70% and 30%, respectively, to calculate the final benefits. This approach is consistent with the evaluation of the 2015-16 Three State Clean Energy RFP. With these weighting factors applied, the portion of the LMP reduction benefits included in the benefits of the 400 MW project are \$217 million over the 20 year contract, with production cost benefits of \$192 million NPV for the 20 year contract.

**Economic Proxy Value for Contribution to GWSA Requirements: \$837 million**

The Vineyard Wind's 400 MW project offers 1.7 million MWh of Clean Energy. This energy will contribute to the Commonwealth's Global Warming Solutions Act (GWSA) goals. Vineyard Wind 1 could provide \$837 million NPV in Clean Energy Credit value for a 20-year contract. These estimates of an economic proxy value are based on the Alternative Compliance Payment (ACP) cap included in the Clean Energy Standard regulations (310 CMR 7.75) finalized in August 2017 by the Massachusetts Department of Environmental Protection (MassDEP).

Further economic benefits of these greenhouse gas reductions, in particular the value of Vineyard Wind 1 going on-line in 2021, are discussed in Section 13.

### **Capacity Market Price Impacts: \$49 million**

Daymark analyzed the potential impact of Vineyard Wind 1 on the ISO-NE Forward Capacity Market (FCM) and the resulting benefits to Massachusetts ratepayers. For the purposes of this analysis, Daymark assumed that the Vineyard Wind 400 MW bid would qualify to offer 96 MW in FCA13. We have assumed that the capacity qualifies and offers as a Renewable Technology Resource (RTR) in FCA13 at a price that clears the market.

Vineyard Wind 1 would provide capacity price benefits to the ratepayers of the Commonwealth of Massachusetts from the reduction in capacity prices resulting from participation in the FCM. The reference value of these benefits is approximately \$49 million NPV for the 400 MW project.

### **Reliability Benefits**

Vineyard Wind 1 will provide the Commonwealth with enhanced electric reliability benefits in several ways. First, it enhances fuel diversity of the region's generation mix. To the extent that resources face risks to their output that are correlated by resource type – such as natural gas generators being susceptible to pipeline interruptions or congestion, or solar generators not producing output at night – increased fuel diversity can enhance reliability. Offshore wind provides the highest capacity factor of intermittent generation and tends to have a different production profile than solar and even onshore wind.

Vineyard Wind 1 would also enhance reliability by injecting power to the regional grid in the capacity constrained SEMA zone, very close to New England's largest load center of Greater Boston. The SEMA zone is seeing significant retirements of baseload generation resources with the recent closure of 1,600 MW Brayton Point Station and the announced closure of 670 MW Pilgrim Nuclear Power Station in May 2019. Other large resources, including the 1,165 MW Canal Station Units 1 and 2 are considered at risk for retirement. In the forward capacity auction for 2018/2019 the SEMA/Rhode Island zone was determined to have inadequate supply to meet local sourcing requirements. The addition of a significant generation resource here will ease some of the most significant potential transmission constraints currently facing the region, enhancing reliability.

*14.6. Please demonstrate any benefits to low-income ratepayers in the Commonwealth, and the impact, if any, those benefits will have on the cost to the project.*

### **Resiliency and Affordability Fund**

Vineyard Wind will contribute \$1 million each year for 15 years to a Resiliency and Affordability Fund, which will provide substantial and sustaining low-income and community benefits by supporting the development of solar and distributed battery storage projects. A key strategy of this fund will be to assist low-income residents to access state and Federal programs in renewables and energy efficiency, while supporting the development of high-impact distributed battery storage projects.

The fund will be housed within Citizens Energy, and projects will be implemented by Citizens Energy and Vineyard Wind's community partner, Vineyard Power, a non-profit energy cooperative serving Martha's Vineyard (see Section 7.5 for a full description of the relationship between Vineyard Power and Vineyard Wind). Citizens Energy, a Massachusetts-based non-profit energy company founded in 1979 by Joseph P. Kennedy II brings a 39-year track-record of developing successful energy ventures that ultimately provide significant benefits to low-income households.

An advisory committee, composed of representatives from each of the host communities, will help identify new project opportunities and guide funding decisions.

Vineyard Wind's contributions to the Resiliency and Affordability Fund will be at no cost to the Vineyard Wind 1 or impact the price of Vineyard Wind 1 to other ratepayers, and will commence when the Vineyard Wind project becomes operational in 2021. A letter from Citizens Energy to Vineyard Wind,

which confirms their desire and intent to partner with Vineyard Wind and Vineyard Power on the Resiliency and Affordability Fund, is provided in Attachment 14.6-1.

**Distributed battery storage and solar projects with low-income benefits**

Vineyard Wind's Resiliency and Affordability Fund (the "Fund") will support the construction of solar and energy storage projects in the communities hosting the Vineyard Wind project, defined as Bristol County (which includes New Bedford), Martha's Vineyard, Nantucket, Barnstable and Yarmouth. These projects will then deliver significant and on-going benefits to these communities in the form of direct electricity bill-credits or net-metering for low-income residents, and back-up power and cost savings for public buildings.

Citizens Energy can deliver an effective low-income benefit program for Vineyard Wind for two main reasons

- Citizens Energy has capital reserves that it is able to invest alongside Vineyard Wind's annual contribution.
- Citizens Energy has a long history of implementing successful business initiatives to maximize and extend benefit dollars for low-income families, often working with area utilities in doing so.

Specifically, Citizens' Energy will use its own working capital and energy project development expertise to access other low-income, clean energy programs, such as the Low-Income Community Shared Solar (LICSS) program that is part of the broader Solar Massachusetts Renewable Target (SMART) solar program. Citizens' Energy has a target to leverage every \$1.00 of Vineyard Wind's contribution into ~\$1.50 to \$1.80 of actual, delivered benefit to low-income ratepayers. This compares very favorably to most other assistance programs, which typically deliver to beneficiaries less value than what is contributed, given program administrative costs.

Citizens' Energy's partnership with Vineyard Wind will also provide immediate benefits to the host communities through an additional contribution from Citizens' Energy of \$500,000, which will be deployed as a revolving loan program for energy efficiency improvements to low to moderate-income multi-family housing in the host communities.

Citizens Energy and Vineyard Power will also target using the Fund to support battery back-up and solar projects at emergency services buildings, hospitals, and emergency shelters – critical infrastructure needed by host communities to become safer and more secure as coastal storms become more destructive due to global warming. For example, the towns of Martha's Vineyard have agreed that several of the island's schools will be used for emergency evacuation shelters. Vineyard Power will work with their communities' agencies to support these locations with solar and back-up storage capability.

The Fund may also support increased access to electric vehicles for low-income residents of Martha's Vineyard and Nantucket. Electric vehicles offer significant cost savings for island residents, given the price premium of liquid transportation fuels shipped to the islands. Electric vehicles can also enhance reliability and help island communities manage peak loads that strain existing transmission lines to the island.

In addition to the direct low-income and distributed storage benefits of any particular installation, the Resiliency and Affordability Fund will also demonstrate a new model to quickly and sustainably deploy energy storage systems at scale, in furtherance of the Commonwealth's energy storage policies.

Section 15 OF APPENDIX B OF THE RFP  
ADDITIONAL INFORMATION REQUIRED FOR TRANSMISSION PROJECTS (AND  
ALL SYSTEM UPGRADES ASSOCIATED WITH PROPOSED TRANSMISSION  
PROJECTS)

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[Note: Inserted v. 26 from Bernado]

15.0 *Expandable Transmission Executive Summary*

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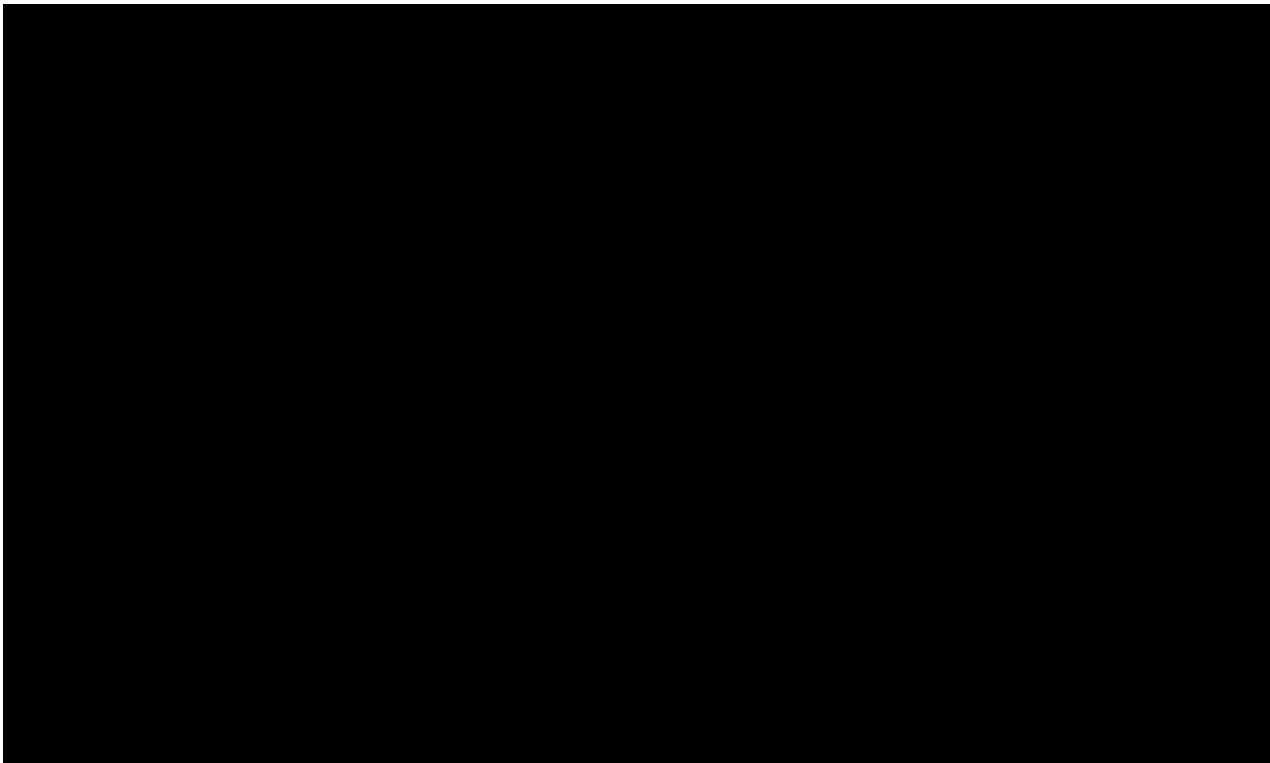
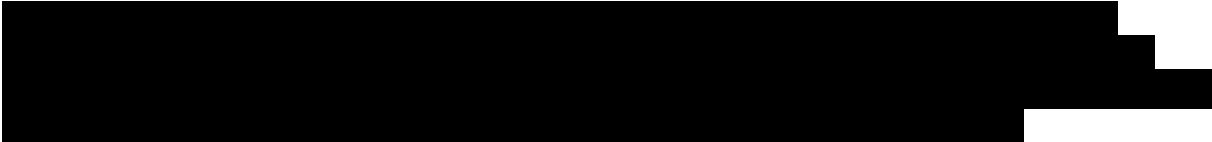


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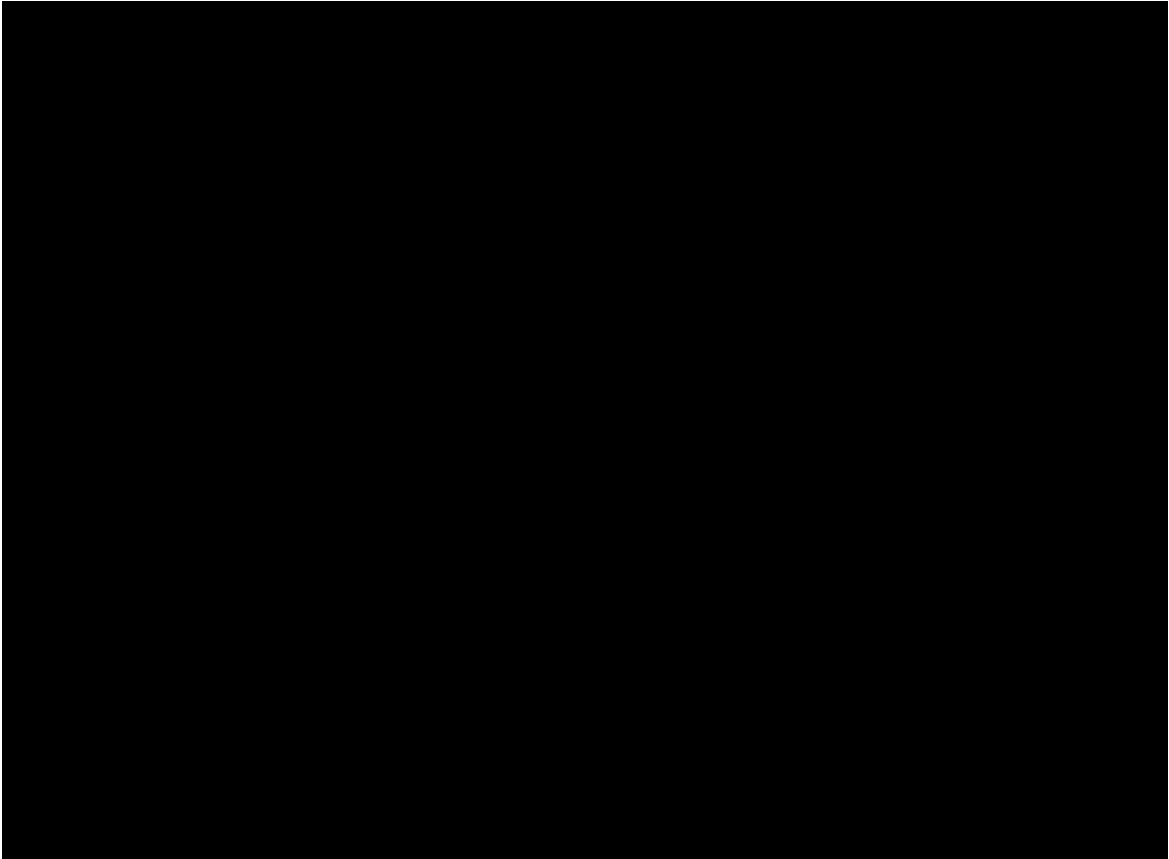


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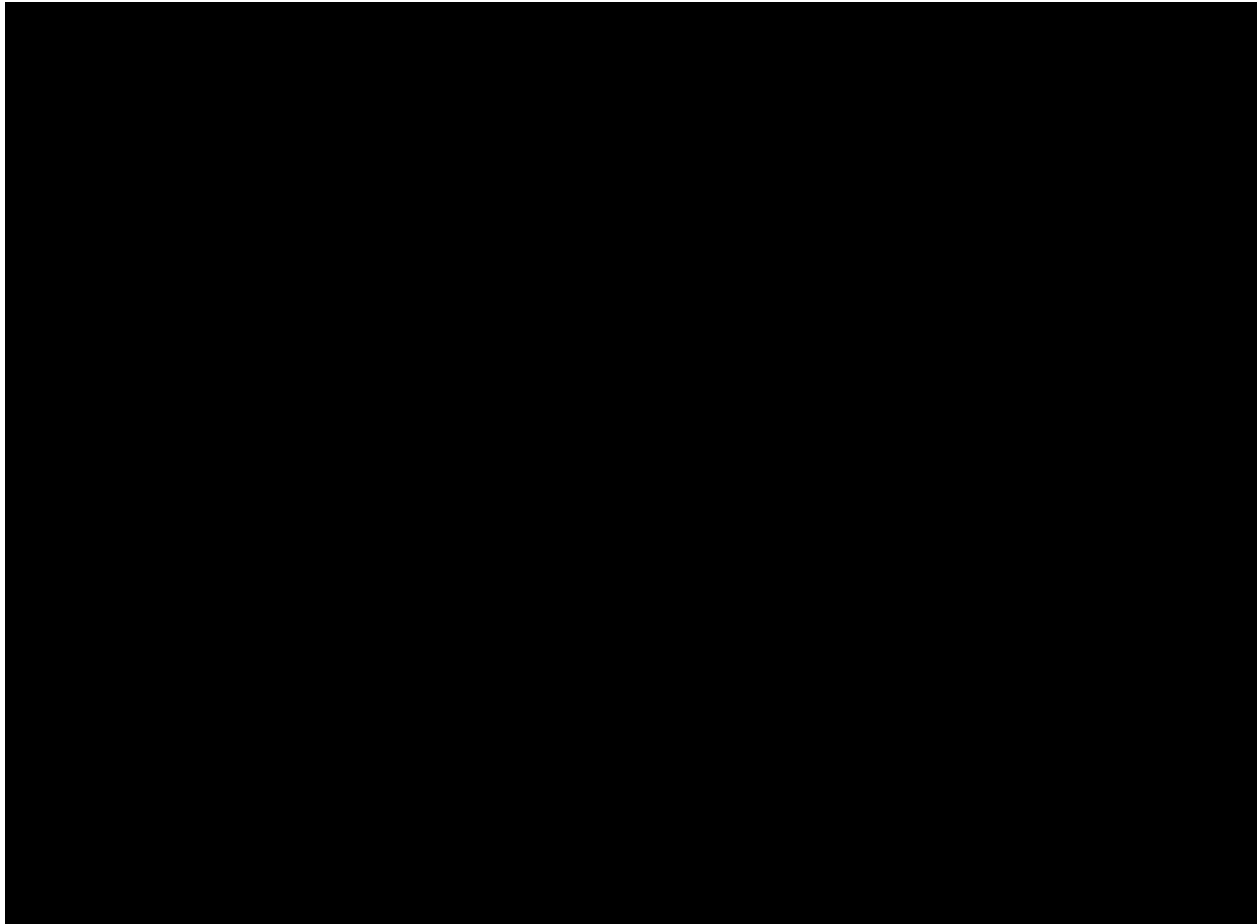


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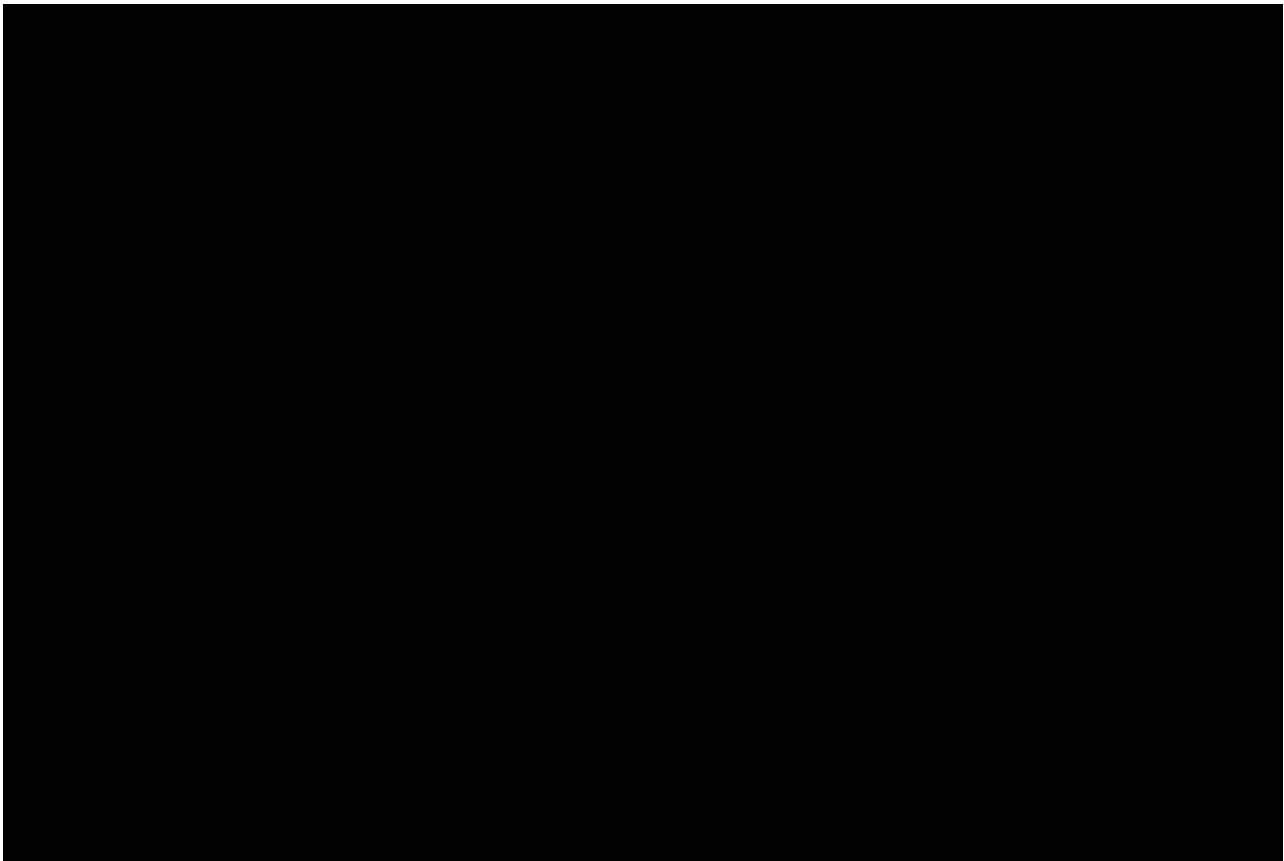
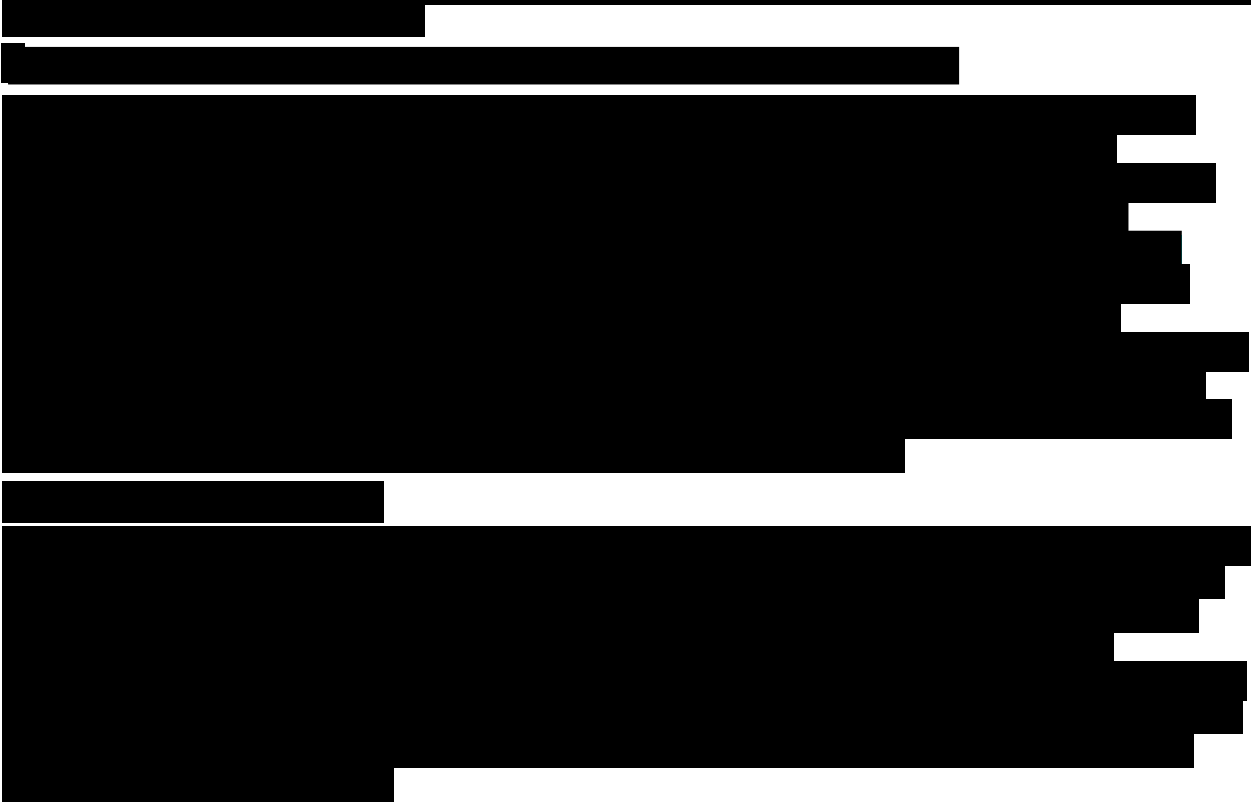


Figure 15.0-5:





*Bids that include Transmission Projects (and all System Upgrades) must also provide the following information:*

*15.1. Transmission Project Information:*

- i. Overall project description*
- ii. The operating voltage of the proposed project: kV:*
- iii. The type of structures (such as steel towers or poles) that would be used for the proposed project*
- iv. The length of the proposed transmission line and the type(s) of terrain and land ownership of the proposed ROW*
  - Overhead miles:                      Underwater/underground miles:*
  - Terrain:*
- v. The substation facilities (number of breakers, transformers, etc.) required at each terminal of the proposed project and information as to how the new facilities would interconnect to any existing facilities.*
- vi. If the proposed payment is based on the Transmission Project's cost of service and may change during the contract term based on changes in the cost of service, a full revenue requirements model must be included and submitted as a working Excel spreadsheet with the formulas intact.*
- vii. Provide a proposed schedule for project development through release for operation that includes key critical path items, such as:*
  - a. Completion of studies and receipt of approvals needed for the interconnection;*
  - b. Material and equipment procurement, including identification of long lead time equipment;*
- viii. Bidder must indicate whether it proposes to recover abandonment costs for its transmission project from the Distribution Companies, as described in Section 2.2.2.5.2 of this RFP. If so, Bidder must acknowledge that recovery of any such abandonment*

*costs shall be in accordance with FERC rules and policies, and also acknowledge that in no event will a Bidder seek to recover abandonment costs if the abandonment was caused directly or indirectly by some act or failure to act of the Bidder. Bidder must further affirmatively commit not to seek from FERC or any other agency or authority any treatment of abandonment costs inconsistent with the provisions of Section 2.2.2.5.2 of the RFP. To the extent the Bidder proposes to recover abandonment costs, such proposal should be further described as set forth in Appendix C-3 of this RFP.*

*i. Overall project description*

Both Expandable Transmission phases are described in this section.

**Phase I Expandable Transmission**

Phase I of the Expandable Transmission consists of upgrading components already planned for the 400MW gen-tie plan, allowing for a cost effective Expandable Transmission option that is available for use as early as 2021. Application for major state and Federal permits for the components of Phase I have already been filed.

The transmission configuration for the 800MW expandable transmission comprises the same four components as the Gen-tie project, with minor incremental investment [REDACTED] to provide transmission capacity from the off-shore facilities to an on-shore PTF facility:

- One High-Voltage Gas Insulated Switchgear (HV GIS) with eight entry bays to connect the two transformers that gather the 400 MW from the wind farm inter-array cables, the two shunt reactors to compensate the reactive power generated by the export cables, two export cables to shore (circa 400 MW capacity each), and two export cables to interconnect with other wind farms (circa 400 MW capacity each).
- Export transmission consisting of two 220 kV circuits (circa 400 MW capacity each dynamically rated) connecting an offshore substation, or Electrical Service Platform (ESP), in the northwestern portion of the Vineyard Wind lease area to a new on-shore substation in Barnstable using offshore and underground cable installation.
- Onshore voltage step-down at a new 220/115 kV substation at #40 Communication Way in Barnstable.
- Grid tie transmission consisting of two 115 kV circuits in duct bank connecting the new 220/115 kV substation to the Eversource 115 kV Barnstable Switch Station (Station No. 958) (see map below).

**6. ESP (Offshore Substation)**

The ESP will be located along the northwestern edge of lease area OCS-A-0501, providing an interconnect point that is effectively in the center of all possible future project locations.

To expand the transmission capacity from 400 MW needed for the Gen-tie to 800 MW for the full Expandable Transmission Phase I, the only modification required in the offshore substation is to add two

additional entry line bays in the 220 kV GIS to accommodate two additional 220 kV cables of 200 MW capacity, each to receive cables and make connections for future wind farms in the area.

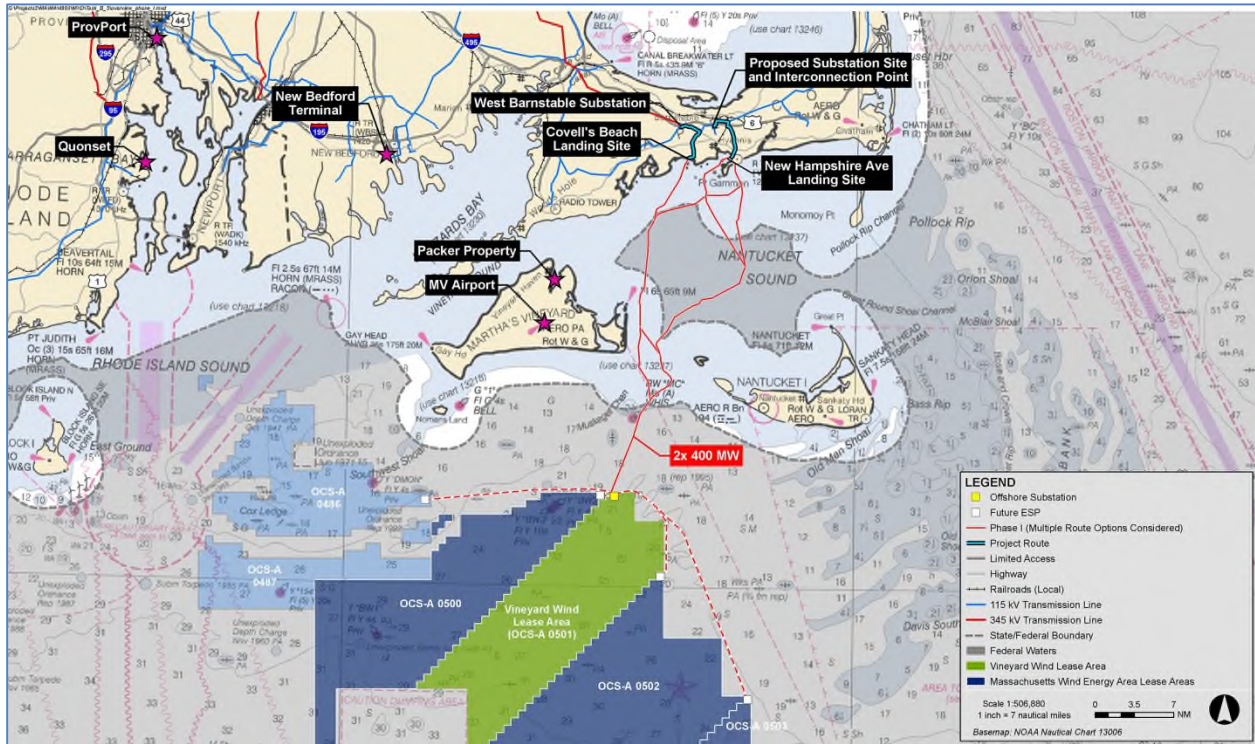


Figure 15.1-1: Overview of Phase I of Expandable Transmission. All cable corridors being permitted are shown, but not all will be used.

## 7. Offshore Cable

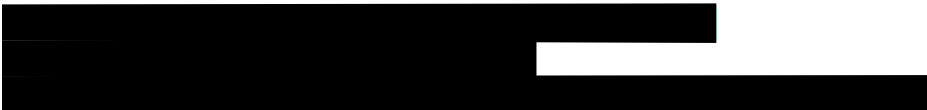
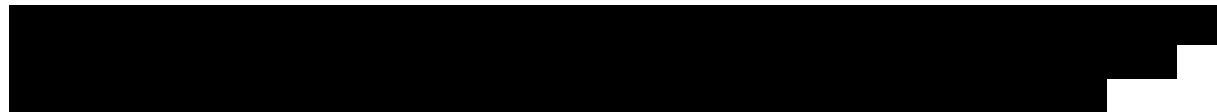
For Phase I, the two 220 kV export cables planned for the Gen-tie will be substituted by cables with larger conductors to increase their carrying capacity.



The two transmission cables will be routed from the offshore substation through Muskeget Channel, following a



## 8. Onshore Cable





[REDACTED]

**9. Onshore Substation**

The route will terminate at the eastern edge of #40 Communication Way in Barnstable, where Vineyard Wind will install its substation equipment for interconnection to the Eversource 115 kV Barnstable Switch Station.

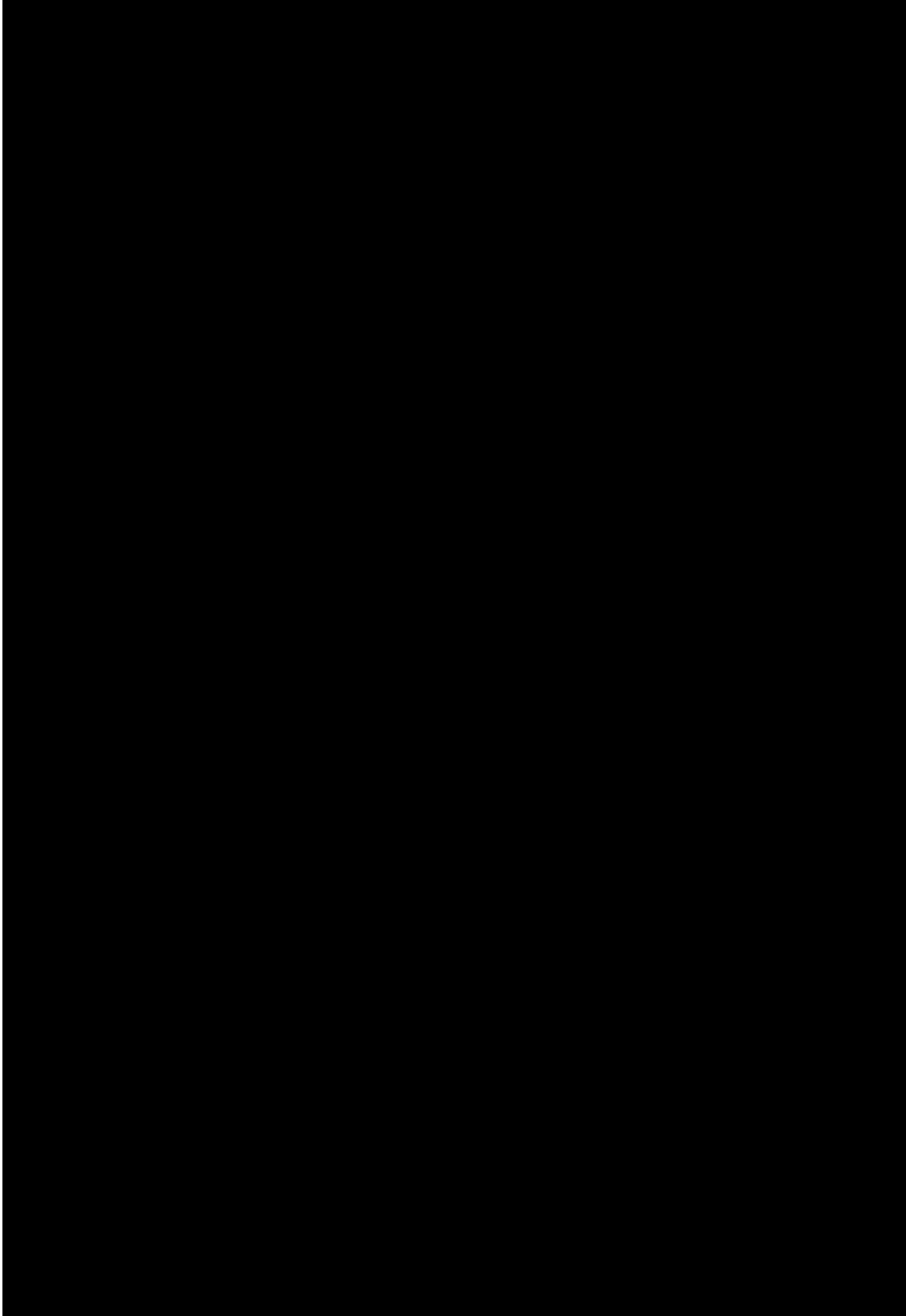


Figure 15.1-2:

[Redacted text]

[REDACTED]

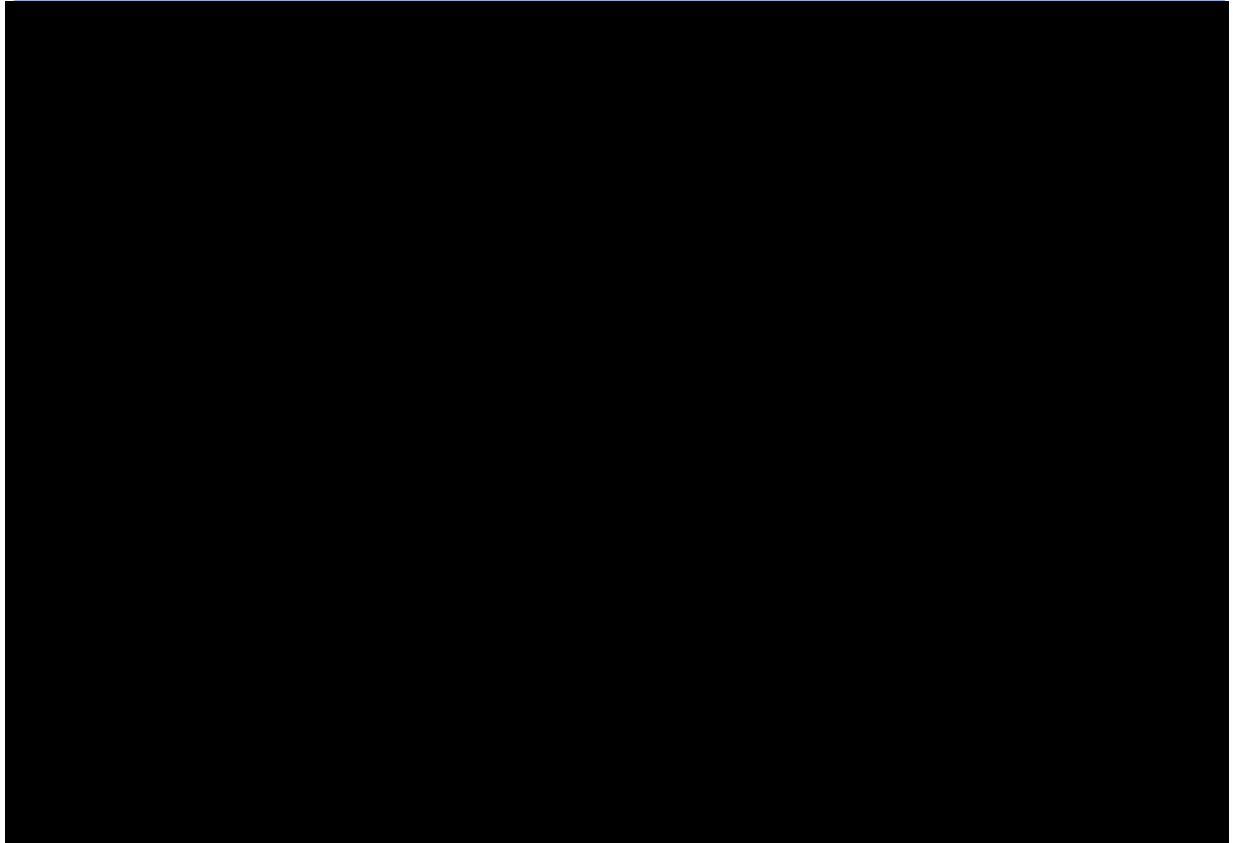


Figure 15.1-3: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

## 10. System Upgrades

The System Planning analyses conducted by the firm Burns and McDonnell, provided in Attachment 6.11-1, demonstrate that no system upgrades are required to facilitate this expandable transmission.

### Phase II Expandable Transmission

The expandable transmission configuration to provide capacity for an additional 800 MW (Phase II) off-shore wind generation would comprise five additional components (see map below):

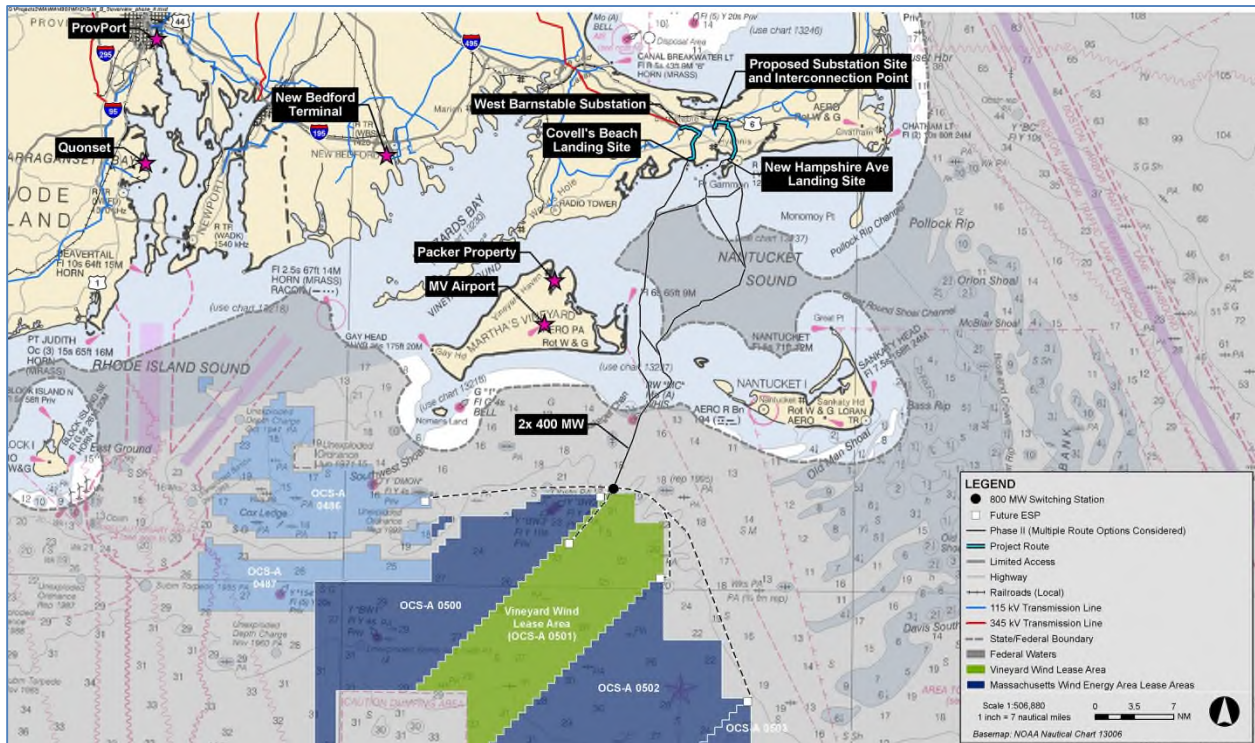


Figure 15.1-4: Overview of Phase II of Expandable Transmission. All cable corridors being permitted are shown, but not all will be used

The export cables for the expandable transmission to 1600MW (second 800MW) would originate from the switching station in the northwestern portion of the Vineyard Wind lease (OCS-A-0501) and pass east of Martha's Vineyard [REDACTED]

[REDACTED] On shore, the underground cables will be placed in concrete conduit following a combination of public roads, paths, and existing utility rights of way in the town of Barnstable to a proposed substation site adjacent to the Eversource 345 kV West Barnstable substation (approximately 7 miles).

#### **11. Offshore Switching Station**

The Offshore Switching Station would be essential to collect the power of up to two times 400 MW offshore generation by two entry bays for 200 MW, 220kV cables, and exporting the power to shore via the offshore cables.

The Offshore Switching Station would be centrally located to serve turbine arrays to the west, east, or in the Vineyard Wind lease area. While the Vineyard ESP locations described in Phase I are currently proposed and undergoing permitting for the location shown in **Figure 15.1-1**, given the existing longer timeframe for Phase II, adjusting the Offshore Switching Station location may be feasible, although some permitting delay would result. Vineyard Wind is open to discussing the exact location of the Phase II Offshore Switching Station, if an adjustment would provide increased utility to the Phase II project.

#### **12. Offshore Cable**

Two 220kV offshore cables, of 400MW each, would utilize the most western of the cable route options identified, and make landfall at Covell's Beach.

#### **13. Onshore Cable**

The onshore 220kV cables will follow the route as described below:

[REDACTED]

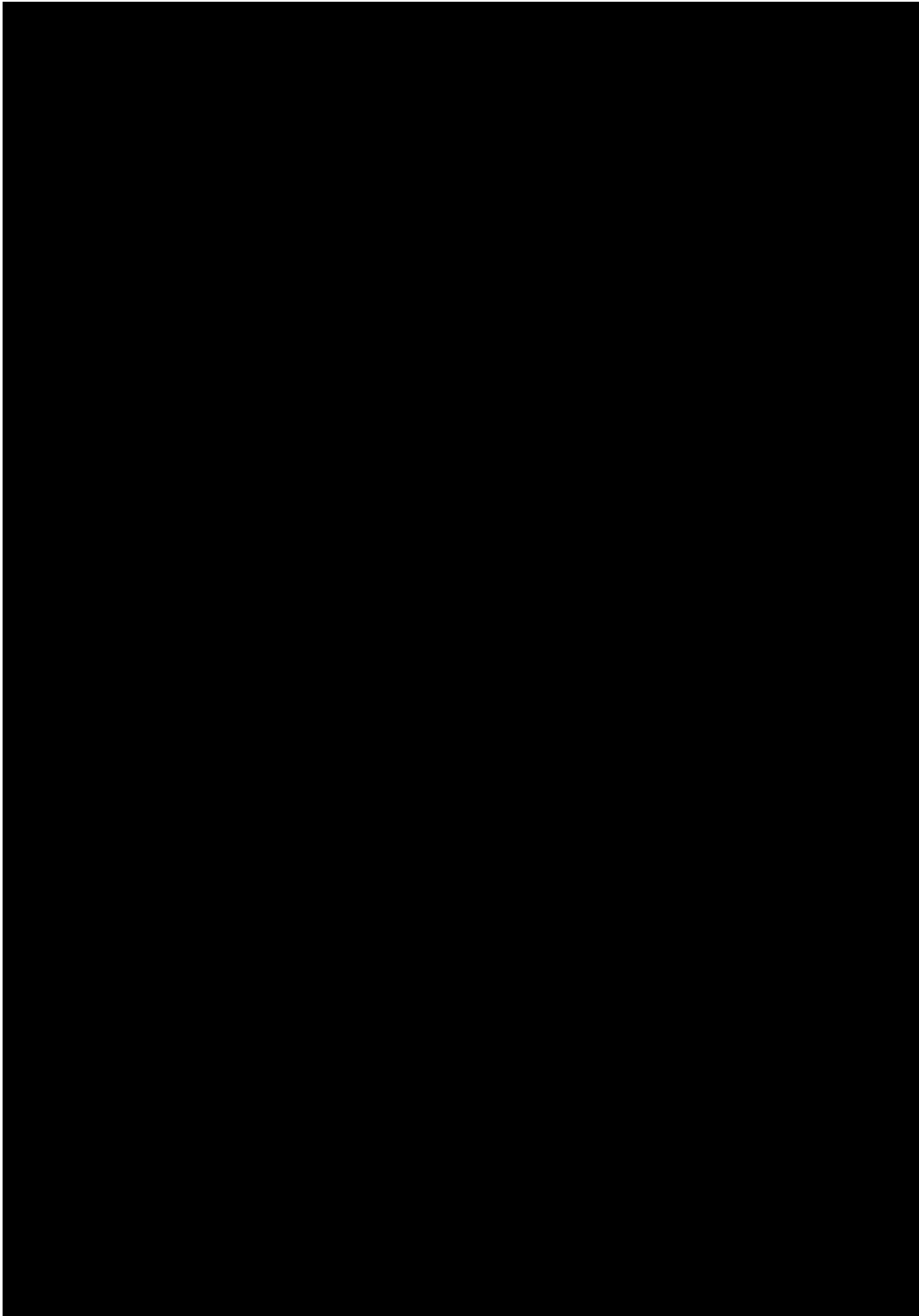


Figure 15.1-5:

[Redacted text]

[Redacted text]



#### 14. Onshore Substation

The Vineyard Wind onshore substation follows the same design principal as the baseline Gen-tie proposal, with the exceptions that the network connected side is 345kV and the bus design will be Gas Insulated Switchgear (GIS) instead of open air (AIS) due to physical constraints of the available real estate.

The proposed location for the substation would be on an undeveloped 5.3-acre parcel of land adjacent to the Eversource 345kV West Barnstable substation. The land is currently owned by Eversource and it is anticipated a land acquisition or lease arrangement would be worked out as part of the interconnection agreement process.

The existing Eversource West Barnstable 345kV substation consists of a radial 345kV line terminated in a single 345kV A-frame with a 345kV circuit breaker. In compliance with the substation design requirements outlined in ISO-NE Planning Procedure 9 (PP9) and Eversource's interconnection guidelines, the five noted major transmission elements proposed at West Barnstable 345kV Substation (two new 345kV lines to Vineyard Wind onshore substation, one new 345kV line to Canal, one existing 345kV line S399 to Carver, and one existing 345/115kV Autotransformer) will need to be connected in a 345kV breaker and a half configuration with space left in the design for a series tie breaker in each rung to sectionalize the existing S399 345kV line and facilitate termination of all the elements noted above. This 345kV GIS expansion of the existing West Barnstable 345kV substation will be a network upgrade and will be Eversource owned and operated.

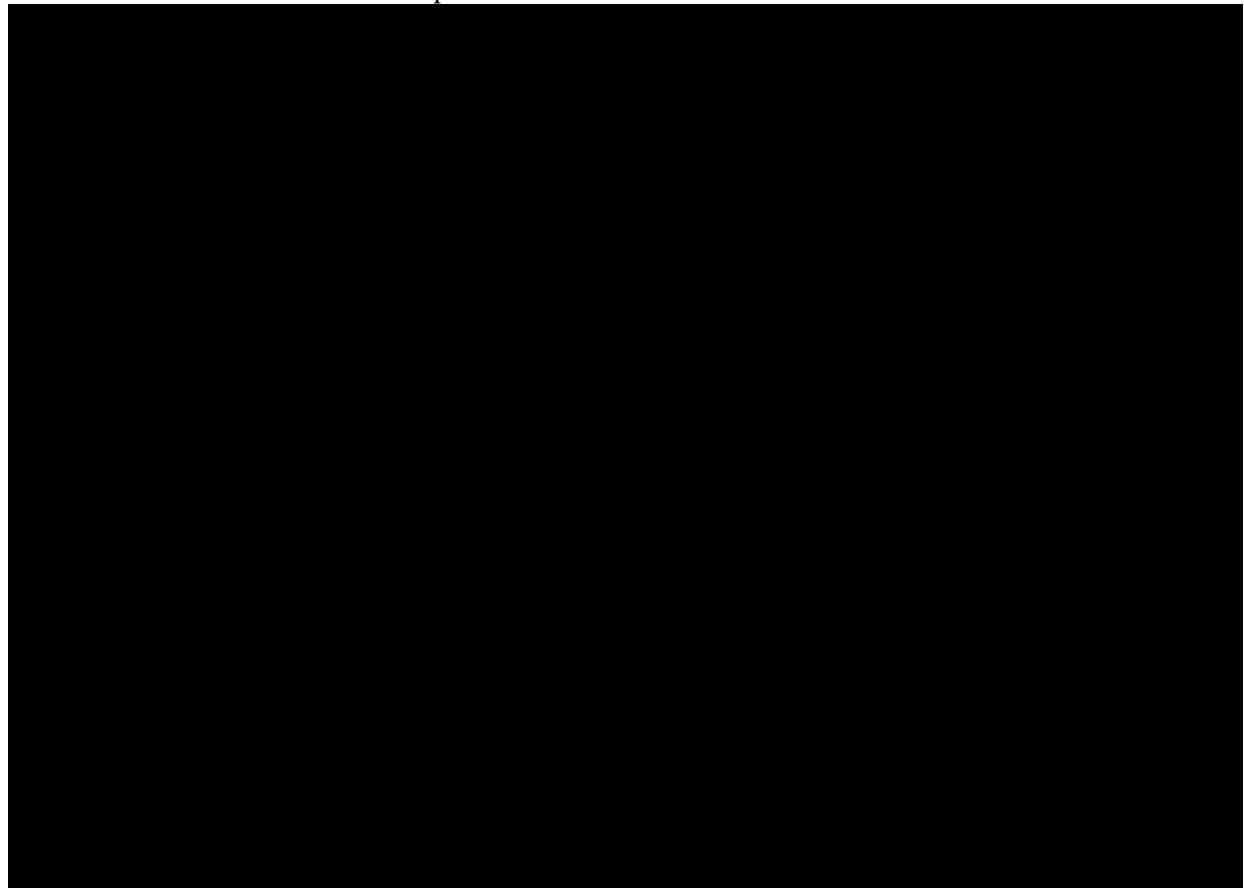


Figure 15.1-6:



## 15. System Upgrades



In general, Vineyard Wind intends to work with Eversource to negotiate the necessary land rights for the new onshore substation adjacent to the existing West Barnstable 345kV substation and the onshore cable route within the Eversource ROW. It is expected that Eversource will negotiate the remaining land rights as required to facilitate the required System Upgrades between West Barnstable and the Canal Substation. Vineyard Wind will negotiate and acquire the necessary use permits for the elements described in sections 2 and 3 above.

<i>ii.</i>	<i>The operating voltage of the proposed project:</i>	<i>kV:</i>
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### Phase I Expandable Transmission

The Expandable Transmission system commences at the high voltage side of the transformer located at the ESP, where voltage is stepped up to 220 kV.

Two circuits will carry the power from the offshore substation at 220 kV to the onshore substation.

At the onshore substation, the voltage will step down to 115kV, where it will connect to the adjacent pool transmission facility (PTF).

### Phase II Expandable Transmission

Phase II of the Expandable Transmission proposal includes all the same voltages included in the Phase I proposal noted above, with the exception that instead of interconnecting at 115kV it will interconnect at 345kV.

This will change the voltage of the transformers, buswork, and other associated substation elements at the Vineyard Wind onshore substation.

In addition, a new transmission line between the West Barnstable and Canal substations will be designed and operated at 345kV.

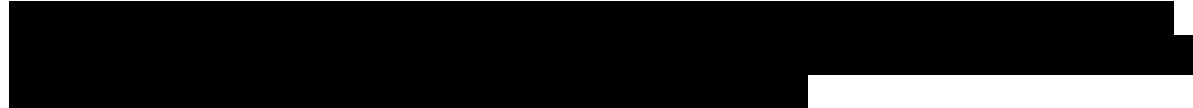
<i>iii.</i>	<i>The type of structures (such as steel towers or poles) that would be used for the proposed project</i>
-------------	---

With the few exceptions noted below, the Expandable Transmission will consist of a combination of offshore and onshore buried cable. The offshore cables will be buried wherever feasible, and protected in areas where burial is not feasible. The transition from the offshore cable to the onshore cable will take place in underground concrete vaults. Onshore, the cable will be placed in an underground duct bank. The only visible indication of the cable will be access points to the splice vaults and manholes at various locations between the splice vaults.

The ESP proposed in Phase I of the Expandable Transmission consists of two primary structures comprising the topside (above water) with the electrical components and the foundation substructure mainly below water. Further detail is provided in Section 8.

The offshore switching station proposed in Phase II of the Expandable Transmission can be placed on a light version of the ESP jacket or be placed on a monopole structure similar to the WTG foundation with a crown structure to carry the topside, depending on the final design. A topside would be placed on top of the foundation to house the electrical components.

The onshore substation equipment will be located on concrete pads, with integrated containment systems to prevent any fluids from entering the environment in the event of equipment failure. Biodegradable oils will be used if commercially available for the application.



iv. *The length of the proposed transmission line and the type(s) of terrain and land ownership of the proposed ROW*

*Overhead miles:                      Underwater/underground miles:*


*Terrain:*

#### **Phase I Expandable Transmission**

Length: approximately 45 miles of offshore cable and 6 – 7 miles of underground onshore cable.

Terrain: onshore terrain is a combination of paved roadways and existing utility rights of way. Elevations are relatively consistent without large variations.

#### Land ownership:

- **Public Roadways:** the public streets are under the control of the respective towns. This joint use with existing town infrastructure is planned to be addressed through Host Community Agreements with each town, and grants of location from each town will allow for installation of the cable duct bank within the towns' roads and publicly controlled areas. Vineyard Wind has been presented to both the Yarmouth Board of Selectmen (BOS) and the Barnstable Town Council. Both towns have expressed a willingness to work with Vineyard Wind to facilitate the process described, and a letter of intent from the Barnstable Town Manager is provided in Attachment 6.2-1. Negotiations are well underway with the Town of Yarmouth for the Host Community Agreement and Vineyard Wind anticipates executing the agreement in first half of 2018.
- **Utility Rights of Way:** A portion of the transmission route will share the existing Eversource transmission ROW in the Towns of Barnstable and Yarmouth. Use of the ROW will be granted through the ISO New England interconnection process and executed via a subsequent interconnect agreement, anticipated in the fourth quarter 2018. A request for co-location has been submitted to Eversource.
- **Private Ownership:** The parcel for the project substation is in private ownership. Vineyard Wind has entered into a long-term lease agreement for the undeveloped portion of the property. 
- **Railroad and State Rights of Way:** Rights to use the railroad Right of Way (ROW) and cross state highways will be in the form of an easement or license from the appropriate local or state agency. Vineyard Wind is engaged in discussions with Mass DOT for the state controlled

highway crossing and use of the railroad ROW. All indications from the meetings have been positive and it is anticipated that approvals will be granted.

## Phase II Expandable Transmission

[REDACTED]

Terrain: onshore terrain is a combination of paved roadways and existing utility rights of way. Elevations are relatively consistent without large variations.

### Land ownership:

- Public Roadways: the public streets are under the control of the Town of Barnstable. Joint use with existing town infrastructure is planned to be addressed by way of a Host Community Agreement with the Town. A grant of location will allow installation of the cable duct bank within the town's roads and publicly controlled areas. The project has been presented to the Barnstable Town Council, and a letter of intent from the Barnstable Town Manager is provided in Attachment 6.2-2.
- Utility Rights of Way: A portion of the transmission route will share the existing Eversource transmission ROW in the Town of Barnstable.
- Private Ownership: The substation is proposed to be located adjacent to the existing Barnstable substation.
- State Rights of Way: Rights to cross state highways will be in the form of an easement or license from the Department of Transportation.

v. *The substation facilities (number of breakers, transformers, etc.) required at each terminal of the proposed project and information as to how the new facilities would interconnect to any existing facilities.*

## Phase I Expandable Transmission

### Onshore Substation

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Barnstable Switch Station (No. 958) has two additional breaker bays that have been previously built out so only the addition of the actual breakers and associated relaying are necessary; no additional bus work

is required. The projects onshore substation will also house the control and protection building where the protective relaying and associated SCADA system equipment will reside.

#### Offshore Substation

The Phase I ESP will be almost identical to the baseline Gen-tie ESP, as described in Section 8.1, with the main differences being:

- The foundation substructure will be mounted with two additional J-tubes for the export cables coming from a future project making use of the Expandable Transmission.
- Two additional HV GIS bays will be installed to receive the export cables from the future project. The deck length of the topside of the Expandable Transmission ESP will be expanded by about three meters compared to the Gen-tie ESP, to accommodate these two additional HV GIS bays.

#### **Phase II Expandable Transmission**

##### Onshore Substation

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Note that all elements above will be connected in a 345kV breaker and a half configuration with space left in the design for a series tie breaker in each rung.

The GIS powerhouse will also house the protective relaying and associated SCADA system equipment.

*Existing West Barnstable 345kV Substation*



Offshore Switching Station

Phase II of the Expandable Transmission features an offshore switching station consisting of two primary structures comprising the topside (above water) with the electrical components and the foundation substructure (mainly below water).

A jacket foundation concept is currently being considered for the foundation, where 3-4 steel piles will be used to secure the jacket to the seabed. The piles will penetrate up to 75 meters below the seabed. However, during detailed design the foundation concept can be changed to a MP and TP concept similar to the one used for turbine foundations. The foundation will be mounted with a boat landing for vessel access. The foundation will be mounted with two times two J-tubes for export cables from future wind farms and two J-tubes for export cable to shore. Spare J-tubes might be included for redundancy.

The topside will be a conventional steel frame or stretch skin structure with various deck levels, e.g., cable deck, main deck, mezzanine/intermediate deck, and roof deck, all designed to house the electrical components.

Electrical components on the Offshore Switching Station will be:

Main HV/MV equipment

- 2 x Shunt reactors - 100 Mvar – 220 kV – 60Hz
- 1 x 220 kV Gas Insulated Switchgear (9 bays)
- 1 x Bus Coupler

Further, the topside will include cable protection, several features such as SCADA, HVAC, fire safety system, CCTV system, communication system (including antenna), Automatic Identification System (AIS), safety kits, aviation and navigational marking, pollution prevention system, etc. Auxiliary supply will be taken from auxiliary windings in the reactors

The main differences between “Gen-tie” ESP (see Section 8.1) and Offshore Switching Station are:

- The foundation substructure for the Offshore Switching Station can be designed lighter, potentially even a shift to a simpler monopile concept.
- The Offshore Switching Station would have 4 more J-tubes for export cables, but 6 less J-tubes of Inter-array cables.
- No transformer is situated on the Offshore Switching Station, compared to two on the ESP.
- Only one 2x220 kV GIS bays will be installed, compared to two on the ESP.
- No 66 KV GIS bays will be installed, compared to two on the ESP.

- The deck length of the topside of the Offshore Switching Station can be considerably reduced compared to the Gen-tie ESP, due to fewer electrical components.

vi. *The estimated costs of the proposed project broken out into separate categories as described below for transmission facilities and substation facilities in nominal year dollars.*

a. *For cost of service or modified cost of service proposals:*

1. *Provide the capital cost estimate presented as a buildup of costs by category, such as environmental, engineering, civil works, materials, equipment, construction, construction management, physical and price contingencies, allowance for funds used during construction (AFUDC), and all other categories for which recovery under FERC would be sought. These categories are illustrative; aggregate costs into the categories most relevant to the development of the proposed project. All costs should be provided in nominal dollars.*

[REDACTED]

[REDACTED]

2. *For projects with transmission and substation components, separate the costs into two rows (e.g. use one row for substation construction and a second for transmission construction). Describe the detailed financial plan on a monthly basis during the construction period, e.g., for 3 years or as long as necessary. The plan should present the costs and financial outlays in each month of the construction period, and the corresponding sources of financing (equity contribution and debt drawdown), as in the following illustrative table. Data should include an estimate of the cost of both physical and price contingencies during the construction period. The financing plan should indicate the ability to finance the construction of the proposed project under base case and contingency scenarios. For the capital cost estimate of the different options that make up the Vineyard Wind Expandable Transmission proposal, please refer to the Attachments, as follows:*

#### Phase I Expandable Transmission

[REDACTED]

Attachment 15.1.1

Expandable Transmission (Phase I) Capital Cost Estimate and Cash Flow

## Phase II Expandable Transmission

Attachment 15.1.2

Expandable Transmission (Phase II) Capital Cost Estimate and Cash Flow

### *3. Describe the proposed financing sources and instruments.*

The Expandable Transmission is expected to be funded largely by the same sources as described in Section 5. A detailed financing plan for the Expandable Transmission is provided in Attachment 15.1-7.

### *4. Sources of funds for construction and working capital - include name of entity providing debt financing, loan amounts, interest rates, repayment period, grace period during construction; and equity provided by project sponsor.*

Sources of construction and working capital for the Expandable Transmission are expected to be largely the same sources as described in Section 5. A detailed financing plan for the Expandable Transmission is provided in Attachment 15.1-7.

### *5. Sources of funds for unexpected repairs or replacement construction during the operating period, e.g., replacement of tower. Note: the operating period is the applicant's estimate of the useful life or accounting life of the transmission project element(s).*

The sources for funds for unexpected repairs or replacement construction during the operating period is expected to be covered by operational revenue or through insurance coverages. Further detail is provided in the financing plan for Expandable Transmission, provided in Attachment 15.1-7. for the Vineyard transmission project as described in Section 5.3.

### *b. If the bidder is proposing fixed-rate pricing rather than cost-of-service or modified cost-of-service pricing, provide sufficient information and assessment to show that the proposed project, including any necessary transmission System Upgrades, is financially viable. In this regard, provide capital cost estimates and operation and maintenance cost estimates and the basis for your estimates, including the extent to which estimates are based on vendor contracts or vendor quotes, your experience in the development, construction and/or operation of similar projects, your approach regarding contingency and risk management, and your proposed financing plan. All costs should be provided in nominal dollars, although inflation and cost escalation estimates should be provided. Please describe in detail the due diligence you have conducted in developing your pricing and tariff proposal.*

Please also refer to the Expandable Transmission financing plan provided in Attachment 15.1-7 for further details in response to this question.



**Expandable Transmission Phase I**

Attachment 15.1.1	Expandable Transmission (Phase I) Capital Cost Estimate and Cash Flow
Attachment 15.1.3	Expandable Transmission (Phase I) O&M Cost Estimate



*vii. Provide a proposed schedule for project development through release for operation that includes key critical path items, such as:*

*a. Completion of studies and receipt of approvals needed for the interconnection;*

Please see below for a list of Attachments that contain the requested information, as well as a list of key milestones that address this particular question:

**Phase I Expandable Transmission**

Attachment 15.1.5	Expandable Transmission (Phase I): Transmission Project Schedule
-------------------	--

Key milestones related to completion of studies and receipt of approvals needed for the interconnection are:

STUDIES AND APPROVALS FOR INTERCONNECTION	Date
Commence Feasibility study	Sep, 2017
Evaluate result of draft System Impact Study (SIS)	
Final SIS Report	
Submit proposed plan applications to Task Forces	
Present to Reliability Committee – > Obtain I.3.9 Approval	
Complete negotiation of Interconnect and E&P agreements	
Utility to complete procurement & ordering long lead items	
Utility to commence needed grid construction	
Grid ready to receive power from project	

**Phase II Expandable Transmission**

Attachment 15.1.6	Expandable Transmission (Phase II): Transmission Project Schedule
-------------------	---

Key milestones related to completion of studies and receipt of approvals needed for the interconnection:

STUDIES AND APPROVALS FOR INTERCONNECTION	Date
Commence Feasibility study	
Evaluate result of draft System Impact Study (SIS)	
Final SIS Report	
Submit proposed plan applications to Task Forces	
Present to Reliability Committee – > Obtain I.3.9 Approval	
Complete negotiation of Interconnect and E&P agreements	
Utility to complete procurement & ordering long lead items	
Utility to commence needed grid construction	
Grid ready to receive power from project	

*b. Material and equipment procurement, including identification of long lead time equipment;*

Please see below for a list of Attachments that contain the requested information, as well as a list of key milestones that address this particular question:

#### Phase I Expandable Transmission

Attachment 15.1.5      Expandable Transmission (Phase I): Transmission Project Schedule

Key milestones related to material and equipment procurement:

MATERIAL AND EQUIPMENT	Date
<b>DYNAMIC REACTIVE DEVICES</b>	
Order	
Manufacturing	
Factory Acceptance Test (FAT)	
Transport and delivery to site	
<b>HARMONIC FILTER</b>	
Order	
Manufacturing	
FAT	
Transport and delivery	
<b>SHUNT REACTOR</b>	
Order	
Manufacturing	
FAT	
Transport and delivery to site	
<b>AIS</b>	
Order	
Manufacturing	
FAT	
Transport and delivery to site	
<b>TRANSFORMERS</b>	
Order	
Manufacturing	
FAT	
Transport and delivery to site	

#### Phase II Expandable Transmission

Attachment 15.1.6      Expandable Transmission (Phase II): Transmission Project Schedule

Key milestones related to material and equipment procurement:

MATERIAL AND EQUIPMENT		Date
<b>DYNAMIC REACTIVE DEVICES</b>		
Order		
Manufacturing		
FAT		
Transport and delivery to site		
<b>HARMONIC FILTER</b>		
Order		
Manufacturing		
FAT		
Transport and delivery		
<b>SHUNT REACTOR</b>		
Order		
Manufacturing		
FAT		
Transport and delivery to site		
<b>AIS</b>		
Order		
Manufacturing		
FAT		
Transport and delivery to site		
<b>TRANSFORMERS</b>		
Order		
Manufacturing		
FAT		
Transport and delivery to site		

- viii. Bidder must indicate whether it proposes to recover abandonment costs for its transmission project from the Distribution Companies, as described in Section 2.2.2.5.2 of this RFP. If so, Bidder must acknowledge that recovery of any such abandonment costs shall be in accordance with FERC rules and policies, and also acknowledge that in no event will a Bidder seek to recover abandonment costs if the abandonment was caused directly or indirectly by some act or failure to act of the Bidder. Bidder must further affirmatively commit not to seek from FERC or any other agency or authority any treatment of abandonment costs inconsistent with the provisions of Section 2.2.2.5.2 of the RFP. To the extent the Bidder proposes to recover abandonment costs, such proposal should be further described as set forth in Appendix C-3 of this RFP.

#### Phase I Expandable Transmission



## Phase II Expandable Transmission



- 15.2. *The proposed payment required for the transmission project and all system upgrades.*
- i. *All proposals must include significant cost containment as stated in the RFP.*
  - ii. *List all situations which may change the proposed payments by consumers during the contract term.*
  - iii. *Identify any limits placed upon the bidder's post-contract term rates according to current FERC rules.*
  - iv. *Identify all other project revenues which may be received by the bidder during the contract term which would not reduce rates paid by consumers.*
  - v. *If the proposed payments may change during the contract term or the proposal is based on cost of service, the bidder must provide the method that transmission owner shall use to determine the payment for the Transmission Project under the transmission Rate Schedule or Tariff and Service Agreement to be filed with FERC. If the proposed payment is a formula rate, the Eligible Bidder must also provide the formula and its proposed inputs that the transmission owner will file with FERC.*
  - vi. *If the proposed payment is based on the Transmission Project's cost of service and may change during the contract term based on changes in the cost of service, a full revenue requirements model must be included and submitted as a working Excel spreadsheet with the formulas intact.*
    - a. *Provide the annual revenue requirement forecasts for the project – including assumptions. Provide a draft version of the revenue requirement calculation in a format that is similar to what would be included in the Rate Schedule or Tariff and Service Agreement application to FERC, indicating the forecast revenue requirement amounts and all assumptions used in the calculations. This should include but not be limited to the assumptions regarding rate of return, depreciation life, split between debt and capital, AFUDC and weighted cost of capital, and a detailed estimate of the anticipated average annual operating and maintenance cost. Provide the information requested in Section 14.1.a of the Bidder Response Package.*
  - vii. *If the pricing proposed is based on cost of service, detail all cost containment commitments. Examples of such commitments include fixed price components, cost overrun restrictions, or other cost bandwidth provisions that are proposed to limit ratepayer risk must be clearly defined.*

- viii. *Please include full and complete descriptions of all cost containment measures that you propose to be included in your pricing. Additionally provide any supporting documentation for any savings or methods of savings including cost caps on any portion of your project. Please include working excel spreadsheets to more fully explain how your cost containment measures should work. Please provide details and notes that describe the nexus between the cost containment provisions in your proposal and those supporting documents and spreadsheets. Please provide examples about how any cost containment measures you are proposing would work.*
- ix. *To the extent that you are proposing different interconnection scenarios that affect cost please include full and complete cost information on each scenario. Please describe all interconnection and transmission upgrade costs required to interconnect at the Capacity Capability Interconnection Standard and to ensure full delivery of the proposed Offshore Wind Energy Generation profile, including transmission upgrades that may need to occur beyond the point of interconnection.*
- x. *Please describe the coordination of the availability of the Offshore Wind Energy Generation and any associated transmission or distribution facilities. All proposals must include a project schedule, and proposals including a combination of transmission and Offshore Wind Energy Generation should propose complete critical path schedules, for both elements of the project, from the notice of selection for contract consideration to the start of commercial operations (the “Baseline Schedule”). Please describe all aspects of your proposal that protect ratepayers from risks associated with payments for transmission costs when any associated expected Offshore Wind Energy Generation, as proposed by the bidder, is absent, reduced, or curtailed as compared to the Baseline Schedule.*
- xi. *Please describe your approach to avoid line losses.*

- i. *All proposals must include significant cost containment as stated in the RFP.*

Please see discussion below on the proposed payments for Phase I and Phase II, under the terms of the Phase I TSA and Phase II TSA:

#### **Phase I Expandable Transmission**



Vineyard Wind conducted robust studies to estimate the capital and operations and maintenance (O&M) costs of developing, constructing, operating, and maintaining the Phase I over the initial term of the Phase I TSA. The capital cost estimates and operation and maintenance estimates are included in Section

15.1.vi.b, which also addresses the process undertaken by Vineyard Wind to determine such costs and develop its pricing proposal.

**Phase II Expandable Transmission**

[REDACTED]

- ii. *List all situations which may change the proposed payments by consumers during the contract term.*

**Phase I Expandable Transmission**

[REDACTED]

[REDACTED]

**Phase II Expandable Transmission**

[REDACTED]

[REDACTED]

- iii. *Identify any limits placed upon the bidder's post-contract term rates according to current FERC rules.*

**Phase I Expandable Transmission**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

**Phase II Expandable Transmission**

[REDACTED]

- iv. *Identify all other project revenues which may be received by the bidder during the contract term which would not reduce rates paid by consumers.*

**Phase I Expandable Transmission**

[REDACTED]

**Phase II Expandable Transmission**

[REDACTED]

- v. *If the proposed payments may change during the contract term or the proposal is based on cost of service, the bidder must provide the method that transmission owner shall use to determine the payment for the Transmission Project under the transmission Rate Schedule or Tariff and Service Agreement to be filed with FERC. If the proposed payment is a formula rate, the Eligible Bidder must also provide the formula and its proposed inputs that the transmission owner will file with FERC.*

[REDACTED]

[REDACTED]

**Phase II Expandable Transmission**

The revenue requirement model with the method to determine payments under the Phase II TSA is provided within the following Attachment:

Attachment 15.1.4

[REDACTED]



[REDACTED]

vi. *If the proposed payment is based on the Transmission Project's cost of service and may change during the contract term based on changes in the cost of service, a full revenue requirements model must be included and submitted as a working Excel spreadsheet with the formulas intact.*

a. *Provide the annual revenue requirement forecasts for the project – including assumptions. Provide a draft version of the revenue requirement calculation in a format that is similar to what would be included in the Rate Schedule or Tariff and Service Agreement application to FERC, indicating the forecast revenue requirement amounts and all assumptions used in the calculations. This should include but not be limited to the assumptions regarding rate of return, depreciation life, split between debt and capital, AFUDC and weighted cost of capital, and a detailed estimate of the anticipated average annual operating and maintenance cost. Provide the information requested in Section 14.1.a of the Bidder Response Package.*

A complete revenue requirement model is provided in the following Attachment, which includes the rate calculations used for the determination of the project pricing, including the assumptions listed above:

**Phase II Expandable Transmission**

Attachment 15.1.4 [REDACTED]

The above attachment, as requested, provides a full revenue requirement model and is submitted as a working Excel spreadsheet with the formulas intact.

vii. *If the pricing proposed is based on cost of service, detail all cost containment commitments. Examples of such commitments include fixed price components, cost overrun restrictions, or other cost bandwidth provisions that are proposed to limit ratepayer risk must be clearly defined.*

**Phase I Expandable Transmission**

[REDACTED]

**Phase II Expandable Transmission**

[REDACTED]

- viii. *Please include full and complete descriptions of all cost containment measures that you propose to be included in your pricing. Additionally provide any supporting documentation for any savings or methods of savings including cost caps on any portion of your project. Please include working excel spreadsheets to more fully explain how your cost containment measures should work. Please provide details and notes that describe the nexus between the cost containment provisions in your proposal and those supporting documents and spreadsheets. Please provide examples about how any cost containment measures you are proposing would work.*

#### **Phase I Expandable Transmission**

Please see 15.2.i. and 15.2.vii.



#### **Phase II Expandable Transmission**



- ix. *To the extent that you are proposing different interconnection scenarios that affect cost please include full and complete cost information on each scenario. Please describe all interconnection and transmission upgrade costs required to interconnect at the Capacity Capability Interconnection Standard and to ensure full delivery of the proposed Offshore Wind Energy Generation profile, including transmission upgrades that may need to occur beyond the point of interconnection.*

The entire project (Phase I and Phase II) was studied per the ISO-NE Network Capability Interconnection Standards (NCIS) and Capacity Capability Interconnection Standards (CCIS). It utilized the latest cases that were made available in support of the SEMA/RI Needs Analysis that is underway at ISO-NE. Consistent with ISO-NE study practices, the study investigated the performance of the system both with and without the project online under a variety of case scenarios.

Scenarios investigated included load levels (Peak, Light-Load, and Minimum load conditions were tested) and area generation dispatch.

#### **Phase I Expandable Transmission**

Results of the analysis showed that under the conditions simulated, no system upgrades (other than substation upgrades associated with the direct interconnection of the wind farm) were required to accommodate the interconnection of Phase I of the Expandable Transmission project.

Based on the analysis performed, there is no adverse impact to the reliability of the ISO-NE transmission system. The qualified capacity used in the overlapping impact study is based on the requirements stipulated in Market Rule 1 Section III.13 for an intermittent resource.

The base cases used in the system studies were conducted to demonstrate compliance with the NCIS and CCIS were obtained from public ISO-NE data and were not modified to reflect speculative generator additions or retirements. It is not anticipated that earlier queued generation projects would have a significant impact on the project interconnection costs as under the NCIS study methodology, generation can be dispatched down against the project to avoid reliability issues. In addition, preliminary feasibility study results from ISO-NE have not indicated a need for additional upgrades.

#### Phase II Expandable Transmission

[REDACTED]

[REDACTED]

- x. *Please describe the coordination of the availability of the Offshore Wind Energy Generation and any associated transmission or distribution facilities. All proposals must include a project schedule, and proposals including a combination of transmission and Offshore Wind Energy Generation should propose complete critical path schedules, for both elements of the project, from the notice of selection for contract consideration to the start of commercial operations (the “Baseline Schedule”). Please describe all aspects of your proposal that protect ratepayers from risks associated with payments for transmission costs when any associated expected Offshore Wind Energy Generation, as proposed by the bidder, is absent, reduced, or curtailed as compared to the Baseline Schedule.*

A key benefit and ratepayer protection of Vineyard Wind’s Expandable Transmission proposal is the direct linkage between the phases of the Expandable Transmission and construction of offshore wind generation that will make use of the Expandable Transmission. Each of the two phases of Vineyard Wind’s Expandable Transmission serves a near-term project in proximity to the ESP (Phase I) or Switching Station (Phase II), and also has additional capacity for connecting future projects to these offshore stations. This phased, building block approach minimizes the probability of stranded assets that have plagued other shared transmission plans, but also affords most of the benefits of shared transmission.

The generation that would use the first 400MW building block of Phase I is Vineyard Wind’s own 400MW project. Please refer to Section 9 for the complete project schedule of the Vineyard Wind generation project and Section 15.1.vii for the specific transmission schedules associated to Phase I of the Expandable Transmission. It should be noted, again, that because of the inherent linkage between the transmission and generation in the Vineyard Wind transmission proposal, the two schedules are one and the same in terms of physical construction.

No offshore wind generation that seeks to utilize Phase II has been identified, and so no generation-transmission coordination schedule is included for Phase II. See section 15.1.vii for the specific transmission schedules associated to Phase II of the Expandable Transmission.

[REDACTED]

In addition, for both Phase I and Phase II, the applicable Power Purchase Agreements between the Distribution Companies and Vineyard Wind or other future offshore wind generation developers shall include cover damages that make the Distribution Companies whole in the case of a delivery failure, considering also any payments that the Distribution Companies are obligated to make under the Phase I TSA or Phase II TSA, as applicable.

*xi. Please describe your approach to avoid line losses.*

Line losses are being minimized by optimizing the length of the overall offshore and onshore routes. This optimization was achieved by making interconnection at the nearest substations practical and by extensive offshore geological surveys, allowing for offshore route selection that took the most direct path while also avoiding sensitive habitats and allowing for practical installation. Similarly, onshore, the route selection took the most direct routes feasible while minimizing disturbance to local communities and avoiding sensitive habitats.

Line losses are also avoided by transmitting the power from the wind farm to the Point of Interconnection (POI) at 220kV, the highest practical voltage based on commercially available offshore cable technology.

Line losses are also avoided by optimizing equipment sizing, selection, and configuration at the offshore and onshore substations, and by locating the onshore substation adjacent to the transmission system POI.

*15.3. The schedule of the payments defined in 14.2 above including when the payments will commence, how often payments will be required and the length of time over which payments will be required. In no event may payments commence before the Transmission Project is placed in service.*

#### Phase I Expandable Transmission

[REDACTED]

#### Phase II Expandable Transmission

[REDACTED]

Attachment 15.1.4

*15.4. The design life of the project*

The design life of the Vineyard Wind transmission project is [REDACTED]

*15.5. A description of the reliability benefits of the proposed Transmission Project and its impact on existing transmission constraints*

The entire Vineyard Wind project and its transmission configuration, from 400MW all the way up to 1600MW, has been studied by the firm Burns and McDonnell and has been based on the ISO-NE Network Capability Interconnection Standard (NCIS) and Capacity Capability Interconnection Standard (CCIS), mimicking the approach anticipated by ISO-NE in the System Impact Study scheduled to be conducted in early 2018. The study has been conducted to show that the project would not cause an adverse impact on the ISO-NE network.

The study is provided in Attachment 6.11-1.



**Attachment 15.1-5**

**Expandable Transmission – Phase I  
Project Schedule and Critical Path**



**Attachment 15.1-6**

**Expandable Transmission – Phase II  
Project Schedule and Critical Path**

**Attachment 15.1-7**

**VINEYARD WIND EXPANDABLE TRANSMISSION FINANCING PLAN**

**EXPANDABLE TRANSMISSION PHASE I**

Because Phase I of the Vineyard Wind Expandable Transmission will be built as an integral part of Vineyard Wind's generation project, the financing plan for Phase I is effectively the same as the financing plan for the generation project during the development and construction phases (details of which are also provided in **Section 5.3**).

Equity provided by the shareholders will fully fund all development activities. Construction costs are expected to be financed by a combination of additional shareholders' equity and a construction loan facility syndicated among a group of large banks.

An important difference from the generation project financing is that the transmission aspects of the project are not eligible for the federal Investment Tax Credit (ITC) and therefore any construction loan finance will be replaced by either:

- Bank loans with tenor ranging from 1 to 15 years or
- Private debt capital market bonds with tenors extending to the end of the PPA period.

The contractual foundation for financing Phase I will be a Transmission Service Agreement (TSA) as described in the **Section 17**. This TSA provides for a fixed-rate pricing.

During the operational phase, as a base case, it is considered that the Project income will be used to fund operational expenditures.

Any additional funding requirements not covered by the above will be covered by the way of equity from the shareholders.

The financial plan provided in **Attachment 15.1.1** details the capital costs that will be incurred during the construction of the project. The financial requirements will be provided in the form of equity from the shareholders or debt drawn down from the construction loan facility in proportions to be finalized, but that will maintain the targeted overall debt to equity split.



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



Section 16 OF APPENDIX B TO THE RFP  
EXCEPTIONS TO FORM PPA

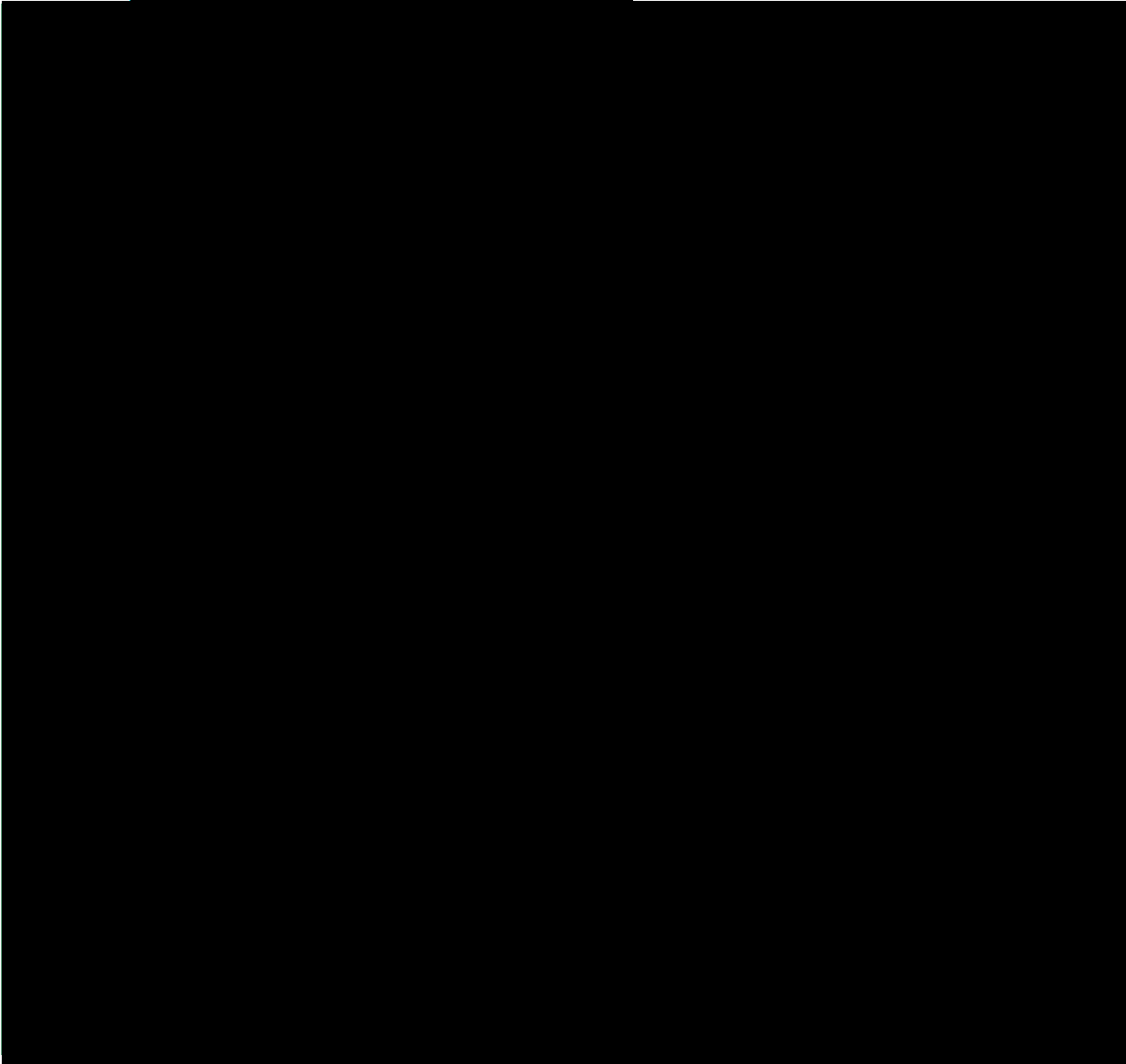
*Please attach an explanation of any exceptions to the Form PPA set forth in Appendix C-1. Comments to the proposed Form PPA must include any specific alternative provisions in a redline format to the Form PPA.*

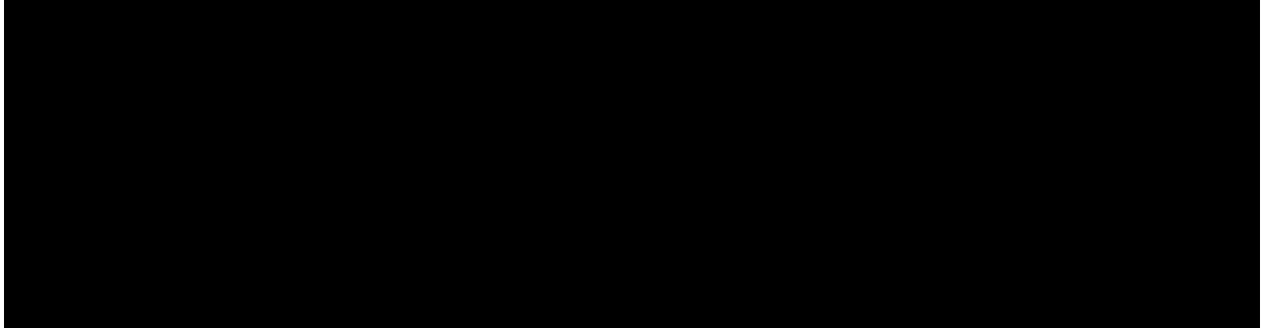
***Bidders are discouraged from proposing changes to the Form PPA and or variations from the Proposed Tariff requirements.***

**Summary**

In the PPA redlines, included as Confidential Attachments 16.1-1 and 16.1-2 for the two PPA forms, certain requested changes are included, to be negotiated between Vineyard Wind and the EDC Buyers. A summary of the material changes is included here as **Table 16.0-1**.

**Table 16.0-1.**





Section 17 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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**Table 17.0-1.**

[illegible]

