ESS Group, Inc.

Engineers
Scientists
Consultants

888 Worcester Street
Suite 240
Wellesley
Massachusetts
02482
p 781.431.0500
f 781.431.7434

December 17, 2008

Ida E. McDonnell
United States Environmental Protection Agency
Region 1 Headquarters
One Congress Street, Suite 1100
Boston, MA 02114-2023

Re: Outer Continental Shelf Air Regulations Permit Application
Cape Wind Energy Project

Dear Ms. McDonnell:

The enclosed Permit Application for the proposed Cape Wind Associates' Offshore Renewable Energy Project (the Project) has been prepared by ESS Group, Inc. (ESS) to fulfill the regulatory requirements of the United States Environmental Protection Agency's (EPA) Outer Continental Shelf (OCS) Air Regulations, codified under Title 40 Code of Federal Regulations, Part 55 (40 CFR § 55). The Project, as proposed by Cape Wind Associates, LLC (Cape Wind), will be located at Horseshoe Shoal, Nantucket Sound, Massachusetts, and will utilize offshore wind energy as its renewable fuel to generate electricity for sale.

In accordance with 40 CFR § 55.3(a), OCS sources located within 25 miles of States' seaward boundaries are subject to the Federal requirements (40 CFR § 55.13) and the Federal, state, and local requirements (40 CFR § 55.14) of the Corresponding Onshore Area (COA). A Notice of Intent (NOI) was submitted to the EPA on December 7, 2007 for the Project, to satisfy the requirements of 40 CFR § 55.4(a). 40 CFR § 55.6(b) requires operators of OCS sources located within 25 miles of States' seaward boundaries to submit an application for a permit prior to commencing with construction.

Copies of this application have also been forwarded to Brian Hennessey and Ronald Fein from EPA Region I and to Karen Regas and John Winkler of the Massachusetts Department of Environmental Protection (MassDEP). If you have any questions regarding the application, do not hesitate to call me at (781) 489-1149.

Sincerely,

ESS GROUP, INC.

Michael E. Feinblatt
Project Manager

Enclosures

C: Brian Hennessey, EPA Region I
Ronald Fein, EPA Region I
Karen Regas, MassDEP
John Winkler, MassDEP

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Craig Olmsted, Cape Wind Associates
Rachel Pachter, Cape Wind Associates
Chris Rein, ESS
Terry Orr, ESS

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Outer Continental Shelf Air Regulations Permit Application

CAPE WIND ENERGY PROJECT
HORSESHOE SHOAL
NANTUCKET SOUND,
MASSACHUSETTS

SUBMITTED TO

United States Environmental Protection Agency
Region I Headquarters
One Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

PREPARED FOR

Cape Wind Associates, LLC
75 Arlington Street, Suite 704
Boston, Massachusetts 02116

PREPARED BY

ESS Group, Inc.
888 Worcester Street, Suite 240
Wellesley, Massachusetts 02482

Project No. E159-504.8

December 17, 2008

OUTER CONTINENTAL SHELF AIR REGULATIONS
PERMIT APPLICATION
Cape Wind Energy Project
Horseshoe Shoal
Nantucket Sound, Massachusetts

Prepared For:

Cape Wind Associates, LLC
75 Arlington Street, Suite 704
Boston, Massachusetts 02116

Prepared By:

ESS Group, Inc.
888 Worcester Street, Suite 240
Wellesley, Massachusetts 02482

ESS Project No. E159-504.8

December 17, 2008

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TABLE OF CONTENTS

SECTION **PAGE**

TABLE

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TABLE OF CONTENTS
(Continued)

SECTION **PAGE**

FIGURE

APPENDIX

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1.0 INTRODUCTION

The following Permit Application for the proposed Cape Wind Associates' Offshore Renewable Energy Project (the Project) has been prepared by ESS Group, Inc. (ESS) to fulfill the regulatory requirements of the United States Environmental Protection Agency's (EPA) Outer Continental Shelf (OCS) Air Regulations, codified under Title 40 Code of Federal Regulations, Part 55 (40 CFR § 55). The Project, as proposed by Cape Wind Associates, LLC (Cape Wind), will be located at Horseshoe Shoal, Nantucket Sound, Massachusetts, and will utilize offshore wind energy as its renewable fuel to generate electricity for sale. The Project is described in Section 2.0 of this Application. Figure 1-1 shows the proposed location of the Project, which is located within federal waters approximately 4.7 miles offshore Cape Cod, Massachusetts.

In accordance with 40 CFR § 55.3(a), OCS sources located within 25 miles of States' seaward boundaries are subject to the Federal requirements (40 CFR § 55.13) and the Federal, state, and local requirements (40 CFR § 55.14) of the Corresponding Onshore Area (COA). A Notice of Intent (NOI) was submitted to the EPA on December 7, 2007 for the Project, to satisfy the requirements of 40 CFR § 55.4(a). 40 CFR § 55.6(b) requires operators of OCS sources located within 25 miles of States' seaward boundaries to submit an application for a permit prior to commencing with construction.

An OCS source is defined in 40 CFR § 55.2 as follows:

> OCS source means any equipment, activity, or facility which:
> 1) Emits or has the potential to emit any air pollutant;
> 2) Is regulated or authorized under the Outer Continental Shelf Lands Act ("OCSLA") (43 U.S.C. §1331 et seq.); and
> 3) Is located on the OCS or in or on the waters above the OCS.
>
> This definition shall include vessels only when they are:
> 1) Permanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing or producing resources therefrom, within the meaning of Section 4(a)(1) of OCSLA (43 U.S.C. §1331 et seq.); or
> 2) Physically attached to an OCS facility, in which case only the stationary sources aspects of the vessels will be regulated.

The Cape Wind Energy Project, when fully constructed (the Facility), will have no stationary emission sources during normal operation. OCS sources will exist during preconstruction activities, during the construction of the Project, and during its operational phase maintenance and repair activities. For the purposes of the OCS permit, the preconstruction and construction activities will be considered as Phase 1, and the operation of the Project will be considered as Phase 2 of Cape Wind's development of the OCS wind resource.

The OCS sources to be used during Phase 1 include electrical generators and a boring drill rig during preconstruction, and jacking systems, cranes, and hydraulic rams for pile installation, cable laying, turbine installation, and ESP installation activities during construction. There will be no stationary emission sources associated with the Project during normal Phase 2 operation. However, jacking systems

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and cranes could potentially be used during maintenance or repair activities. During such activities, these emission sources will be considered OCS sources.

40 CFR § 55.2 also defines the potential emissions of an OCS source, and states that the "emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while enroute to or from the source when within 25 miles of the source, and shall be included in the 'potential to emit' for an OCS source." During Phase 1 and Phase 2 of the Project, there will be various vessels involved in transport of equipment, materials, and personnel to and from the Project, as well as within the Project area. In accordance with 40 CFR § 55.2, the potential emissions of all vessels associated with the Project, while within 25 miles of the Project, have been included in the total potential emissions of the Project. Section 3.0 of this Application describes the Phase 1 and Phase 2 sources and emissions. Table 1-1 summarizes the potential emissions of the OCS (stationary) sources and vessels associated with the Project during Phase 1 and Phase 2.

40 CFR § 55.5 sets forth the requirements for the designation of the COA. According to 40 CFR § 55.5(a), the Nearest Onshore Area (NOA) shall be the COA for sources located within 25 miles of States' seaward boundaries. For this Project, Massachusetts is the NOA and therefore the COA. In accordance with 40 CFR § 55.14(11), the Project must therefore comply with all applicable sections of the Massachusetts Department of Environmental Protection (MassDEP) Regulations listed in 40 CFR § 55, Appendix A. Section 4.0 addresses the applicability of the listed MassDEP Regulations, the Federal requirements for OCS sources listed in 40 CFR § 55.13 to the Project, and the Project's compliance with the applicable regulations.

The potential NO_x emissions from the Project during Phase 1 exceed the major source threshold. Massachusetts is in nonattainment for ozone. The Project is therefore subject to Nonattainment Review for its Phase 1 NO_x emissions (310 CMR 7.00, Appendix A). As a major source located in a nonattainment area for ozone, the Project will be required to acquire offsets and implement the Lowest Achievable Emission Rate (LAER) for its Phase 1 NO_x emissions.

Massachusetts is in attainment for the remaining criteria pollutants. The potential emissions from the Project during Phase 1 and Phase 2 subject to OCS permitting are below the permitting thresholds of the Prevention of Significant Deterioration (PSD) program. Under the PSD program, construction emissions are considered to be temporary, and not related to attainment. The Project is therefore not subject to PSD review, and a demonstration of compliance with National Ambient Air Quality Standards (NAAQS), Significant Impact Levels (SILs), or PSD increments through dispersion modeling is not required for the purposes of this OCS Permit Application.

The Project is not subject to a New Source Performance Standard (NSPS) established in 40 CFR § 60. The Project will not be a major source of hazardous air pollutants, and is therefore not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAPS), as promulgated in 40 CFR § 61 and 40 CFR § 63.

MassDEP requires projects that meet the Plan Approval thresholds (310 CMR 7.02) to implement Best Available Control Technology (BACT) to minimize air emissions. The determination of BACT is made

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through a "top-down" analysis of potentially viable control technologies starting with the approach that provides the greatest level of emission reduction. Technologies that result in higher emissions can be considered only if the more efficient control technology evaluated is determined to be either technically or economically infeasible. Section 5.0 of this Application presents the BACT and LAER analyses completed for the Project.

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2.0 PROJECT DESCRIPTION

The Project, as defined for the purposes of this Application, includes preconstruction geotechnical and geophysical field investigations, and the construction and operation of 130 wind turbine generators (WTGs) located in a grid pattern on and near Horseshoe Shoal in Nantucket Sound, Massachusetts, as well as an Electrical Service Platform (ESP), inner-array cables, and two transmission cables. Each of the 130 WTGs will generate electricity independently of each other. Solid dielectric submarine inner-array cables from each WTG will interconnect within the grid and terminate at their spread junctions on the ESP. The ESP will serve as the common interconnection point for all of the WTGs. The proposed submarine transmission cable system is approximately 12.5 mile (20.1 km) in length (7.6 mile [12.2 km] within the Massachusetts 3.5-mile [5.6 km] territorial line) from the ESP to the landfall location in Yarmouth. The two submarine transmission cables will travel north to northeast in Nantucket Sound into Lewis Bay past the westerly side of Egg Island, and then make landfall at New Hampshire Avenue. Cape Wind seeks to commence construction in 2009 and begin operation in 2010.

2.1 Phase 1 OCS Activities

2.1.1 Preconstruction

Following issuance of the lease for the Project, a marine shallow hazards survey and a supplemental geotechnical program will be conducted prior to construction. The geotechnical and geophysical (G&G) field investigations will be designed to collect sufficient information, along with previously collected data, to characterize the surface and subsurface geological conditions in the areas affected by the Project, in preparation for final design and construction. These areas include the offshore construction footprints and associated work areas for all facility components, including the WTGs, the ESP, the inner-array cables, and the transmission cables. It is expected that the G&G field investigations will take several months for completion.

2.1.1.1 Shallow Hazards Survey Geophysical Program

The shallow hazards survey will be designed to identify and evaluate conditions that might affect the safety of the proposed activities. The survey plan will identify and delineate potential shallow hazards. The survey will be conducted using a lobster-fishing sized vessel. During the survey, an array of geophysical tools will be towed within the water column behind the vessel at certain depths above the seafloor. There will be no disturbance of the seafloor.

The vessel will operate approximately 10 hours per day during relatively calm sea conditions in the warmer seasons. It will travel at approximately 15 knots when transiting between port at Falmouth to the survey area (1 hour each way), and at approximately 3 knots during the 8 hours of actual survey time per day. The vessel will continuously transect the area, obtaining an estimated 30 linear miles of data each day, before returning to port each night.

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2.1.1.2 Supplemental Geotechnical Program

The geotechnical program will further analyze sediments and physical conditions within the affected areas, for use in final foundation design and to develop site-specific Best Management Practices (BMP) for constructability. The program will involve the use of coring and boring equipment to collect sediment samples for laboratory analysis.

2.1.1.2.1 Vibracores

As required, vibracores will be taken along the proposed inner-array and transmission cable routes. The sediments from the vibracores will be evaluated for thermal resistivity for final cable design. The vibracores will be advanced from a small gasoline-powered vessel likely less than 45 feet in length. The diameter of the core barrel will be approximately 4 inches, and the cores will be advanced up to a maximum of 15 feet. The vessel will be anchored during coring.

2.1.1.2.2 Borings

Borings will be advanced at selected WTG sites, including those at the approximate corners of the Project area to collect site-specific geotechnical data. The borings will be advanced from a truck-mounted drill rig placed upon a jack-up barge that rests on spuds lowered to the seafloor. Each of the four spuds will be approximately 4 feet in diameter, with a pad approximately 10 feet on a side on the bottom of each spud.

The barge will be towed between the boring locations by a tugboat. The drill rig will be powered by either a gasoline or diesel powered electric generator. The crew will access the boring barge daily from port using a small boat. The borings will be advanced to a target depth of 100 to 200 feet, depending on the location, within 1 to 3 days, subject to weather and substrate conditions. Drive and wash drilling techniques will be used; the casing will be approximately 6 inches in diameter.

2.1.2 Construction

Construction is expected to take one to two years for completion. The anticipated construction sequence is as follows: (1) the onshore ductbanks will be installed; (2) the ESP and onshore 115 kV cables will be installed; (3) the monopiles, scour protection, WTGs, and submarine cables will be installed; and (4) full operation will begin.

The major construction activities will be supported by onshore facilities, which are anticipated to be located in Quonset, Rhode Island. Material and equipment will be staged onshore, at existing port facilities and then loaded onto various vessels for transportation to the offshore site, and ultimately installation. Construction personnel will be ferried by boat and/or helicopter depending upon weather conditions and other factors. Once loaded, the vessels will travel from Quonset through Narragansett Bay to Rhode Island Sound to Vineyard Sound, north of Martha's Vineyard to the Main Channel, which is a total travel distance of approximately 55 miles.

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The OCS Air Regulations are not applicable to the activities associated with the installation of the onshore ductbanks. The OCS Air Regulations are applicable to construction activities only when the activity is taking place within 25 miles of the Project area. The following is a conservatively outlined, general description of the activities involved in the Project's construction.

2.1.2.1 Electrical Service Platform Installation

The ESP design is based on a piled jacket/template design with a superstructure mounted on top. The platform jacket and superstructure will be fully fabricated on shore and delivered to the work site by barge. The jacket will be removed from the barge by lifting with a crane mounted on a separate derrick barge. The jacket assembly will then be sunk and leveled in preparation for piling. The six piles will be driven through the pile sleeves to the design tip elevation of approximately 150 ft (46 m) below the surface of the sea bottom. The piles will be vibrated and hammered as required.

The superstructure will be installed by lifting it from the transport barge onto the jacket. It will then be connected to the jacket in accordance with the detail design requirements. After attachment, additional components including ladders, heliport and vessel docking structure will be lifted from a barge and set onto the superstructure for attachment. The installation of the ESP is anticipated to take approximately one month to complete.

After the ESP is fully constructed, installation of the inner-array cables and the high voltage transmission cables will take place. These cables will be routed through J-tubes located on the outside of the support jackets. Once the inner-array cables are connected to the ESP, the scour control will be installed to the ESP piles utilizing a similar design as the WTG foundations.

2.1.2.2 Transmission Cable Installation

The transmission cable system will consist of two 115 kV solid dielectric AC submarine transmission circuits (two three-conductor cable systems per trench equals one circuit, for a total of 4 cables). The two circuits of interconnecting transmission cables linking the ESP to the landfall location will be embedded by jet plow approximately 6 ft (1.8 m) below the sea floor, with approximately 20 ft (6.1 m) of horizontal separation between circuits.

The 115 kV cable will be transported from the manufacturer to the mobilization point. The cable will be transferred to the installation barge by pulling via the linear cable machines mounted on the barge. After the cable has been transferred, the installation barge will be towed to the Lewis Bay installation site offshore of the New Hampshire Avenue landfall. A second smaller barge, capable of operating in shallow water, will also be used in conjunction with the larger installation barge.

Prior to pulling the cable ashore to the sea-land transition vault, the jet plow will be set up in the pre-excavation pit located at the offshore end of the drilled conduit. The cable will then be floated from the barge with assistance of small support vessels. The cable end will be

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anchored in place after being pulled through the Hydroplow and into the High Density Polyethylene (HDPE) conduits installed during the HDD and secured beyond the transition vault.

From the HDD exit point, the cable will be embedded across the shallows by means of towing the jet plow along the cable route from the smaller barge's winch. The cable and jet hose will be supported by cable floats to maintain control of cable slack and the amount of hose out.

When the cable embedment has proceeded into deeper water and nears the larger installation barge, the operation will be transferred, and the barge will lift its spuds and begin winching along the cable route, with the six point mooring system towing the jet plow and feeding cable off the barge and into the plow funnel as it moves along the route at a rate equal to the barge movement. This will be repeated for the second circuit.

The barge will propel itself along the route with the forward winches, and the other moorings holding the alignment of the route. When the barge nears the ESP, the barge spuds will be lowered to secure the barge in place for the final end float and pull-in operation. The transmission cable will be pulled into the J-tube and terminated at the switchgear.

The installation of the submarine transmission cable via jet plow embedment is anticipated to take approximately two to four weeks to complete. As the jet plow progresses along the route, the water pressure at the jet plow nozzles will be adjusted as sediment types and/or densities change to achieve the required minimum burial depth of 6 ft (1.8 m). In the event that the minimum burial depth of 6 ft (1.8 m) below present bottom is not met during jet plow embedment, additional passes with the jet plow device or the use of diver-assisted water jet probes will be utilized to achieve the required depth.

2.1.2.3 Wind Turbine Generator Installation

The installation of the WTGs will consist of four activities: (1) installation of the foundation monopiles; (2) erection of the WTGs; (3) installation of the inner-array cables; and (4) installation of the scour protection mats or rock armor.

2.1.2.3.1 Installation of the Monopiles

Monopile installation will begin by loading individual monopiles onto a barge, three to four at a time, for transport to the work site. Depending upon the actual barge utilized and other logistical requirements, approximately 43 trips are anticipated to move all of the monopiles to the work site.

A jack-up barge with a crane will be utilized for the actual installation of the monopiles. The jack-up barge will have six legs with pads a minimum of four meters on a side (approximately 172 ft^2 [0.0039 acre or 16 square meter [m^2]). The crane will lift the monopiles from the transport barge and place them into position. The monopiles will be

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installed into the seabed by means of a pile driving ram or vibratory hammer to an approximate depth of 85 ft (26 m). This will be repeated at all of the WTG locations. Only two pieces of pile driving equipment will be present within the area at any one time, and they are not planned to be operated simultaneously.

The monopile length, insertion distance, and finished elevation will vary by individual location due to water depth and structural and geotechnical parameters. The monopiles will range in length from approximately 122 ft (37 m) for those installed in the shallowest locations to more than 172 ft (52.4 m) at the deepest sites. The anticipated time to install all of the monopiles is expected to be approximately eight months plus any delays due to weather.

2.1.2.3.2 Installation of the Wind Turbine Generators

The installation of the WTGs will be accomplished using a specialized vessel configured specifically for this purpose. This vessel will be loaded at the staging location with the necessary components to erect two to four WTGs. The components include transition pieces to place on the monopiles, towers, nacelles, hubs, and blades.

The vessel will transit from the staging location to the work site as described above and set up adjacent to one of the previously installed monopiles. A jacking system will then stabilize the vessel in the correct location. Six jacking legs will raise the vessel to a suitable working elevation. A transition piece unique to the specific WTG will be placed by the vessel's crane onto the monopile, then leveled and set at the precise elevation for the tower. This piece will be a fabricated steel structure complete with a turbine tower flange, J-tubes for cable connections and a boat landing device. The transition piece will then be grouted in place to the foundation monopile. The crane will then place the lower half of the tower onto the deck of the transition piece. Once this piece is secured, the upper tower section will be raised and bolted to the lower half. In order, the nacelle, hub and blades will be raised to the top of the tower and secured. Several of these components may be pre-assembled prior to final installation.

This process is anticipated to take approximately 30 to 40 hours to cycle through one complete WTG and will be repeated for each of the 130 WTG locations. Including the anticipated forty three trips from the staging location to Horseshoe Shoal, this process will take approximately eight months plus any delays due to weather. The installation of the WTGs will overlap with the installation of the monopiles.

2.1.2.3.3 Installation of the Inner-Array Cables

The 33 kV inner-array cable will be transported to the staging point from the cable manufacturer's factory in a special cable transport vessel. The cable will be transferred onto the cable installation barge. The linear cable machines on-board the barge will pull the cables from coils on the transport vessel onto the barge, and into prefabricated tubs. The installation barge and auxiliary barge loading will take place at the staging location. After the

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cable has been transferred, the installation barge will be towed to the Horseshoe Shoal site. This will be repeated to deliver and install all of the required cable.

The proposed method of installation of the submarine cable is by the hydroplow embedment process, commonly referred to as jet plowing. This method will involve the use of a positioned cable barge and a towed hydraulically-powered jet plow device that will simultaneously lay and embed the submarine cable in one continuous trench from WTG to WTG and then to the ESP. The barge will propel itself along the route with the forward winches, with the other moorings holding the alignment during the installation. The four point mooring system will allow a support tug to move anchors while the installation and burial proceeds uninterrupted on a 24-hour basis.

When the barge nears the ESP, it will be held in place for the final end float and pull-in operation. The cable will then be pulled into the J-tube and terminated at the switchgear.

2.1.2.3.4 Installation of Scour Protection

After the submarine inner-array cables are laid in order to connect each string of wind turbines (up to 10 WTGs), the seabed scour control system will be installed on the seabed around each monopile. The scour control system will help to prevent underwater currents from eroding the substrate adjacent to the WTG foundation. It will consist of a set of six scour-control mats arranged to surround the monopile. Each mat will be 16.5 ft by 8.2 ft (5 m by 2.5 m) with eight anchors that will be securely tied to the seabed. It is anticipated that the process of completing one string of WTGs (10 WTGs with associated inner-array cable and scour mats) will take up to approximately one month.

The scour mats will be placed on the seabed by a crane or davit onboard the support vessel. Final positioning will be performed with the assistance of divers. After the mat is placed on the bottom, divers will use a hydraulic spigot gun fitted with an anchor drive spigot to drive the anchors into the seabed.

Rock armor scour protection has also been proposed for an alternative approach to scour control. Rock armor design is driven by wave action (wind-driven and ocean swell) and currents (tidal and wind-driven). The armor stones would be sized so that they are large enough not to be removed by the effects of the waves and currents, while being small enough to prevent the stone fill material placed underneath it from being removed. If it were used, the rock armor and filter layer material would be placed on the seabed using a clamshell bucket or a chute after installation of the monopile.

2.2 Phase 2 OCS Activities

The service and maintenance activities associated with Phase 2 fall into two distinctive categories:

(1) The work that only requires personnel activity; and

(2) The work requiring large marine vessel operation.

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The latter requires a harbor base that can accommodate vessels with a significant draft whereas crew boats can operate from a typical sailing harbor located as close to the wind farm as possible. While much of the routine service and maintenance operations will likely occur during summer months because of the greater number of days with lower wave heights, other weather windows (approximately 3 days duration for maintenance of a single WTG) will be used throughout the year in order to minimize wear and tear and the potential for excessive equipment breakdown or parts replacement.

2.2.1 Operation

It is anticipated that the main operation center for the proposed offshore farm will be located in the town of Yarmouth. The remote monitoring and command center where all decisions concerning the operation of the marine generating facility will be made will be located here. These operational decisions will also include any instructions received either manually or automatically from the operator of the ISO-NE. It is also to this center that all commands, instructions or requests will be received from government entities with marine and aviation safety and protection jurisdiction, such as the USCG, MMS and the FAA.

The service and maintenance personnel will be stationed at one of two additional onshore locations: one for the parts storage and larger maintenance supply vessels, which will likely be in the vicinity of New Bedford, and the second located closer to the site for crew transport.

The location for the larger vessels will include dock space for two 65 ft (19.8 m) maintenance vessels, as well as a warehouse for parts and tool storage, and crew parking. An off-site warehouse may be utilized to increase parts storage. The facility will house tools, spare parts and maintenance materials and will be organized to support daily work assignments. These will be loaded into small containers, assigned to each of the work teams and loaded onto the maintenance vessel for deployment to the wind farm site. The maintenance vessel will then go to either the WTG or the ESP and offload the containers for the work crews. During maintenance operations, one vessel per day will leave the facility, go to the site of the proposed action, and then return.

From the facility located closer to the site, work crews will be deployed to either the WTG and/or the ESP in 35 to 45 ft (10.7 to 13.7 m) long crew boats manned by professional mariners. In addition, a high-speed emergency response boat (20 to 25 ft long boat) will be maintained at this harbor ready to respond whenever there is marine activity taking place.

2.2.2 Service

While much of the routine service and maintenance operations will likely occur during summer months because of the greater number of days with lower wave heights, other weather windows (approximately 3 days duration for maintenance of a single WTG) will be used throughout the year in order to minimize wear and tear and the potential for excessive equipment breakdown or parts replacement.

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If a WTG required this level of repair, a longer period of low wave heights and suitable weather conditions would be required in order to allow access and suitable working conditions. The duration necessary to complete a repair would be determined and the next available weather opportunity would be capitalized upon to complete the repair. Given the typically more suitable conditions during summer months, more repairs may occur during summer than winter months.

Planned preventative service and maintenance of a WTG would include:

- Cleaning of the machine rooms;
- Changing of carbon brushes;
- Changing of filters for air and all liquids as necessary;
- Topping up of all fluids;
- Replacement of defective instruments;
- Change-out of calibrated anemometers;
- Cleaning of lenses;
- Recharging of auto-grease systems;
- Appropriate local measurements;
- Control of dehumidifiers;
- Torquing of bolts;
- Replacement of brake pads;
- Testing of fog horns;
- Control / replacement of hazard warning lights; and
- Heavy duty electrical connections.

Routine service, excluding the 100 percent bolt torquing and major oil change will usually be a two day exercise for 3 to 4 persons. Such a 3 to 4 man crew will normally consist of an electrical technician, an electronics/instrumentation technician, a mechanical technician and a general helper.

2.2.3 Maintenance

Unplanned maintenance on any part of the WTG will be carried out in response to a breakdown or failure. This activity may be simple and require only hand tools, in which case the normal crew vessels would suffice. If there is a requirement to exchange larger items, the use of the 65 ft maintenance vessel would be required to transport and lift the particular items. Such items of equipment could be an electrical control cabinet, and 33kV voltage transformer, generator, gearbox parts, etc.

Based on both offshore and onshore WTG operational experience, five days per year per turbine has been established as the anticipated maintenance requirement. These visits cover two days of planned or preventative maintenance, and three days of unplanned or forced outage emergency maintenance. The WTG design is based on a twenty year operating life and all components have been analyzed to meet this design criterion. Based on 130 WTGs, this is equivalent to 650 maintenance days. Based on 252 workdays per year (which adjusts for weather days and holidays) this results in 2.5 work teams or conservatively three teams being deployed. During these deployments, maintenance on the ESP would be included.

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Based on the above analysis the normal activity would include two vessel trips per working day (252 days/year), which would include one crew boat from each location. In addition, an occasional second vessel trip could take place in times of fair weather or for emergency service.

2.2.4 Major Repairs

Major repairs are classed as those that require the intervention of a special heavy lift jack-up vessel similar to the one that will be used during the original construction of the wind farm.

The items requiring replacement could include:

- Turbine blades;
- Hub unit;
- Main drive shaft;
- Gearbox; and
- Complete nacelle.

Limitations on jack-up vessels are usually related to the sea state at the time of jacking up/down. Due to the height of their jib crane, they are restricted to lifting when wind speeds are less than 12 m/s (25 mph). If a WTG required this level of repair, a longer period of low wave heights and suitable weather conditions would be required in order to allow access and suitable working conditions. The duration necessary to complete a repair would be determined and the next available opportunity would be capitalized upon to complete the repair. Given the typically more suitable conditions during summer months, more repairs may occur during summer than winter months.

2.2.5 Inspections

Under the terms of any MMS authorization, MMS would require inspections to take place to ensure worker, structural, engineering and environmental safety. Such inspections would be carried out on a regular basis, as determined by MMS and set forth in the authorizing instrument, and would include the following equipment:

- Blades
- Towers
- Foundations
- Cathodic Protection
- Scour Protection
- Marine cables

2.2.6 Submarine Cable Repair

The potential for a fault occurring during the operational lifetime of a buried cable system is minimal, based on industry experience. However, a cable repair plan will be formulated by the applicant to cover the remote possibility of a fault occurring in the offshore submarine cable

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system. The focus would be to repair the cable quickly, while minimizing or eliminating environmental and community impacts.

Should a cable failure occur, a cable repair plan will be implemented. Once the location of the fault is identified, should the cable fault occur in the onshore sections of the project, then typical trench, repair and backfill methods would be used and no formal fault plan would be required. Communication with the appropriate people would take place at least 48 hours prior to repair and would specify the location, method, and date of work. Along the submarine cable, the procedures listed below are one way of repairing a cable fault.

- Mobilize the appropriate repair equipment and fine tune the location of the fault;
- The repair equipment would likely consist of a barge, equipped with water pumps, jetting devices, hoisting equipment and other tools typically used in repairs of cables;
- Expose the cable with hand-operated jet tools and cut the cable in the middle of the damaged area;
- Position the repair vessel above the cut cable, and raise one end;
- Cut off the damaged portion of the cable;
- Perform a cable splice between the retrieved cable and one end of the spare cable onboard;
- Pay out cable and move to the other end of the spare cable, keeping a portion of the spare cable onboard;
- Retrieve the other damaged cable end;
- Cut off the damaged portion of the cable;
- Perform a cable splice between the retrieved cable and the remaining end of the spare cable onboard;
- Lower the second joint and position it on the sea bottom;
- Hand jet the repaired and exposed sections into the sea bottom; and
- Demobilize the repair vessel.

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3.0 PROJECT EMISSIONS

The OCS sources to be used during Phase 1 include electrical generators and boring drill rigs during preconstruction, and jacking systems, cranes, and hydraulic rams for pile installation, cable laying, turbine installation, and ESP installation activities during construction. There will be no emission sources associated with the Project during normal Phase 2 operation. However, jacking systems and cranes could potentially be used during maintenance or repair activities. During such activities, these emission sources will be considered to be OCS sources.

During Phase 1 and Phase 2 of the Project, there will be various vessels involved in transport of equipment, materials, and personnel to and from the Project, as well as within the Project area. In accordance with 40 CFR § 55.2, the potential emissions of all vessels associated with the Project, while within 25 miles of the Project, have been included in the total potential emissions of the Project.

Table 1-1 summarizes the Project's potential emissions from activities conducted inside of 25 miles, in total tons for Phase 1, and in tons per year for Phase 2. Emission calculation summaries for the sources involved in the Project for activities that will occur inside of 25 miles have been included in Appendix A. For each emission source associated with the Project, an estimation of its potential–to–emit the following pollutants was made:

- Nitrogen Oxides (NO_x)
- Volatile Organic Compounds (VOC)
- Sulfur Dioxide (SO_2)
- Carbon Monoxide (CO)
- Particulate Matter smaller than 10 microns (PM_{10})
- Particulate Matter smaller than 2.5 microns ($PM_{2.5}$)
- Carbon Dioxide (CO_2)
- Hazardous Air Pollutants (HAPS)

The determination of the potential emissions from each source utilized the following equation:

ER= EF x EHP x TM

Where:

ER = emission rate (lbs. per period)
EF = full load pollutant specific emission factor (lb/hp-hr)
EHP = engine maximum rated horsepower (hp)
TM = time in mode (operating hours/period)

The potential emissions from each source were calculated using EPA approved emission factors as follows:

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- The emission factor used for the NO_x emissions from all of the diesel-fired engines to be used for the Project is the EPA's Tier 1 Emission Standard for New and In-Use Nonroad Compression Ignition Engines (40 CFR § 89.112(a)).
- The VOC, SO_2, CO, PM_{10}, $PM_{2.5}$, CO_2, and HAPS emissions from all of the diesel-fired engines to be used for the Project have been estimated using the appropriate emissions factors from EPA's AP-42, "Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources".
- The SO_2 emissions from all of the diesel-fired engines to be used for the Project have been estimated assuming a diesel fuel sulfur content of 500 ppm, which is the current fuel sulfur content standard for all nonroad and marine diesel fuel (40 CFR § 80.510(a)).
- For the Zodiac Boats that will be used, emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", EPA420-R-05-019, Table 10, were used. Worst case emissions factors were selected from carbureted, indirect injection and direct injection emission factors for 50-100 hp outboard, marine engines. When calculating emissions, the emission factors for HC and PM were used to calculate the potential emissions of VOC and PM_{10}, respectively.

3.1 Emission Sources

3.1.1 Crew Boats

Crew Boats will be used for a variety of purposes to support Phase 1 and Phase 2 activities. They will be equipped with diesel–fired IC engines rated at approximately 750 hp. During Phase 1, crew boats will average 1 round trip per day between the Project and Falmouth or other piers or ports. During Phase 2, it is assumed that a crew boat will make 1 round trip per day between the Project and its port approximately 252 days per year. Crew boats will be used for the following activities:

1. Load, transport (receipt, movement and delivery) and unload personnel, supplies, and equipment to and from the Project and pier locations for routine operations and maintenance.

2. Support operations in conjunction with construction, maintenance and/or repairs in the wind farm, including diving operations.

3. Support/participate in safety, health, and emergency drills and actual incidents, including storm, vessel collision, bomb and terrorist threat and man overboard.

3.1.2 Supply and Support Boats

The supply and support boats assigned to the Project will be equipped with diesel-fired IC engines. It is anticipated that supply and support boats for the Project will include the following:

- Tow tugs identified for the transport of the barges containing the piles, transition pieces, rock armor, filler material, WTGs, and the ESP deck during Phase 1 are rated at approximately 6,000 hp.

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- Attendant tugs identified for the transport of the jack up barge and the scour protection installation equipment, and the handling of the pile and transition piece barge, the armor/filler barge, and the ESP crane barge during Phase 1 are rated at approximately 3,000 hp.
- The tow and attendant tugs to be used for borings and cable laying during Phase 1 are rated at approximately 1,500 hp.
- The special duty supply vessel identified for the transport of materials during irregular repairs as required during Phase 2 is rated at approximately 3,000 hp.
- The support vessels identified to transport materials and supplies during routine maintenance and repair activities during Phase 2 are rated at approximately 1,500 hp.
- The lobster and vibracore boats used during Phase 1 preconstruction activities are rated at approximately 1,000 hp.

The Phase 1 supply and support vessels will come from the staging location and make varying numbers of trips to and from the Project site, depending on the nature of their use, as detailed in Appendix A. The use of the special duty supply vessel during Phase 2 will be irregular, and occur when more complex maintenance activities are required. It has been assumed that this vessel will make up to 2 round trips per month to and from the Project site. It has also been assumed that up to two support vessels will make a round trip to and from the Project site approximately 252 days per year.

3.1.3 Zodiac Boats

Zodiac boats may be used during Phase 1 during the boring program and during Phase 2 for the transport of crew to the Project area for routine maintenance and repair activities. The Zodiac boats would be equipped with approximately 100-hp gasoline burning outboard motors and would most likely come from Falmouth. It is assumed that 1 round trip per day may be made by a Zodiac boat, for approximately 252 days per year during Phase 2.

3.1.4 Stationary Sources

There will be various stationary sources operated from barges during Phase 1 of the Project. These sources will be equipped with diesel-fired IC engines, and will likely include the following:

- The hydraulic ram identified for pile driving during the ESP installation is rated for approximately 3,200 hp.
- The crane identified for setting the template and the piles for the ESP installation is rated at approximately 3,000 hp.
- The hydraulic ram identified for pile driving during the WTG installation is rated at approximately 1,600 hp.
- The cranes identified to be used for putting piles in place, setting the transition pieces, and installing the towers, nacelles, and rotors are rated at approximately 800 hp.
- The jacking system identified to be used to stabilize the vessel during the turbine installation is rated at approximately 476 hp.

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- The cranes identified for use during the installation of scour protection and the cable laying equipment are rated at approximately 400 hp.
- The boring drill rig to be used during preconstruction activities is rated at approximately 350 hp.
- The compressor drive identified for use during cable laying is rated at approximately 100 hp.
- The electrical generators used during the boring program are less than 10 hp.

The Phase 1 stationary sources will be transported to the Project site and to the installation locations by barge. The expected hours of operation of each source are detailed in Appendix A. There are no stationary sources associated with routine maintenance activities during Phase 2. If required for more complex repairs, equipment similar to the Phase 1 equipment will be utilized during Phase 2, depending on the equipment being repaired or replaced.

3.2 Fuels

Diesel oil and gasoline are the fuels which will be used for the Project. Diesel oil will be used extensively throughout both phases of the Project, while the use of gasoline will be limited to the Zodiac boats that may be used for crew movement during Phase 2. The fuels used for the Project will be obtained from commercial sources located at the onshore staging areas.

3.3 Air Pollution Control Equipment

The engines used for the Project will not be required to be equipped with any add-on pollution control equipment, as long as they are certified by the manufacturer to meet the applicable nonroad or marine engine emission standards.

3.4 Operational Limits

All of the diesel engines used for the Project will utilize diesel fuel that meets EPA's Nonroad and Marine Diesel Fuel Standards, as promulgated in 40 CFR § 80.510. Beginning June 1, 2007, all nonroad and marine diesel fuel is subject to a 500 ppm maximum sulfur content standard. Beginning June 1, 2010, all nonroad diesel fuel will be subject to a 15 ppm maximum sulfur content standard. Beginning June 1, 2012, all marine diesel fuel will be subject to the 15 ppm maximum sulfur content standard.

3.5 Emission Limits

All of the nonroad engines used for the Project will comply with the applicable short-term emission limits specified in EPA's Emission Standards for New and In-Use Nonroad Compression Ignition Engines (40 CFR § 89, Subpart B). All of the vessels used for the Project will comply with the applicable short-term emission limits specified in EPA's Exhaust Emission Standards for Compression-Ignition Marine Engines (40 CFR § 94, Subpart A).

The Phase 1 emissions will be limited to the potential emissions provided in this application, over any 12-month rolling period, or the full duration of the several month preconstruction period and the one to two year construction period. The annual NO_x emissions during Phase 2 will be limited to less than

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50 tons per 12-month rolling period, in order to remain below major source levels. Although the potential NO_x emissions during Phase 2 are well below 50 tons per year, permitting up to the major source level will provide a contingency for unexpected maintenance and/or repair activities in any given year. Limiting operations to maintain NO_x emissions below 50 tons per 12-month rolling period during Phase 2 will effectively limit the emissions of the other emitted pollutants below major source levels.

3.6 Recordkeeping and Reporting

Compliance with the applicable short term emission limits will be demonstrated through the required engine manufacturers' certifications. Compliance with the EPA's diesel fuel sulfur limits will be demonstrated through certification from the fuel suppliers. Cape Wind will require that all equipment and fuel suppliers associated with the Project utilize equipment with engines that have been certified to be in compliance with the applicable EPA standards.

The emissions from all nonroad and marine engines will be tracked by keeping records of the hourly use of each engine when engaged in activities within 25 miles of the Project area, and assuming full load operation of each engine at all times. Vessel trips to the Project area by each vessel will be recorded, so that the total trip travel time can be pro-rated for the time spent traveling within 25 miles of the Project area. In some cases where it is more practical, fuel usage may be tracked, and used along with the average brake-specific fuel consumption (BSFC) of the fuel used, to determine the equivalent hours of operation at maximum power for the engine, for the purposes of tracking its emissions.

A Project recordkeeping system will be established so that the hours of use of each vessel and engine will be entered into a tracking system that will combine the hours of usage, along with the engine sizes, and appropriate emission factors, to determine the emissions from each source, and the total Project emissions on a monthly basis. The monthly emissions will be used to track the 12-month rolling emission totals during both Phase 1 and Phase 2 to track compliance with the permitted annual emission limits. If during either Phase 1 or Phase 2, if the emissions tracking system indicates that an exceedance of a 12-month rolling emission limit may occur in future months, Cape Wind will either limit its operations to maintain compliant emissions, or apply for a permit to account for the increased level of emissions.

The recordkeeping system established for the Project will be used to report the annual emissions from the Facility, as required by the MassDEP.

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4.0 REGULATORY REQUIREMENTS

40 CFR § 55.6(b)(1) prohibits OCS sources located within 25 miles of States' seaward boundaries that are subject to the Federal requirements (40 CFR § 55.13) and the Federal, state, and local requirements (40 CFR § 55.14) of the OCS Air Regulations to begin construction without a permit requiring the source to meet those requirements. The following sections describe the preconstruction requirements for the Project, in order to satisfy the OCS Air Regulations.

4.1 Federal Requirements

40 CFR § 55.13 sets forth the federal requirements that apply to OCS sources.

New Source Performance Standards

40 CFR § 60 sets forth Standards of Performance for New Stationary Sources (NSPS) in specified source categories. According to 40 CFR § 55.13(c), the NSPS apply to OCS sources in the same manner as in the COA.

There are no emission sources that are in any of the regulated source categories specified in the subparts of the NSPS associated with either Phase 1 or Phase 2 of the Project. The Project is therefore not subject to the requirements of the NSPS.

Prevention of Significant Deterioration Program

40 CFR § 52.21 establishes the requirements of the federal Prevention of Significant Deterioration (PSD) Program. According to 40 CFR § 55.13(d)(1), PSD applies to OCS sources located within 25 miles of a State's seaward boundary if the PSD requirements are in effect in the COA.

The PSD program applies to the construction of a new major stationary source in an area designated as being in attainment with the NAAQS (40 CFR § 52.21(a)(2)). A major stationary source is defined as a stationary source of air pollutants within the defined source categories and capacities that has the potential to emit 100 tons or more per year of any regulated New Source Review (NSR) pollutant (40 CFR § 52.21(b)(1)(a)). For stationary sources not within the specified source categories or capacities such as the Project, a major stationary source has the potential to emit 250 tons per year or more of a regulated NSR pollutant (40 CFR § 52.21(b)(2)(b)).

The PSD program considers the emissions occurring during construction activities to be temporary, and they do not affect the maintenance of attainment with NAAQS, so they are not included in any determination of applicability with the program. Phase 1 of the Project is therefore not subject to PSD review. The potential emissions of Phase 2 of the Project are below the PSD applicability threshold. Therefore, Phase 2 of the Project is also not subject to PSD review.

National Emission Standards for Hazardous Air Pollutants

40 CFR § 61 establishes National Emission Standards for Hazardous Air Pollutants (NESHAPS) in specified source categories. According to 40 CFR § 55.13(e), the NESHAPS apply to OCS sources if it

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is rationally related to the attainment and maintenance of Federal or State ambient air quality standards.

There are no emission sources that are in any of the source categories specified in the subparts of 40 CFR § 61 associated with either Phase 1 or Phase 2 of the Project. The Project is therefore not subject to the requirements of 40 CFR § 61.

Federal Operating Permit Program

40 CFR § 71 outlines the Federal Operating Permit Program. According to 40 CFR § 55.13(f)(1), 40 CFR § 71 applies to OCS sources located within 25 miles of the States' seaward boundaries if its requirements are in effect in the COA.

The EPA has delegated the authority to administer the 40 CFR § 71 Operating Permit Program to the State of Massachusetts. 310 CMR 7.00, Appendix C sets forth the Massachusetts Operating Permit and Compliance Program. Section 4.2 describes the applicability of the state Operating Permit Program requirements to the Project.

Other Federal OCS Air Permit Requirements

The provisions of 40 CFR § 52.10, 40 CFR § 52.24, and 40 CFR § 51 (and accompanying Appendix S) apply to OCS sources located within 25 miles of States' seaward boundaries if these requirements are in effect in the COA. These regulations provide guidance on the review procedures for new sources in the absence of an approved State Implementation Plan (SIP) or New Source Review (NSR) program. The Massachusetts Air Regulations have been adopted in an approved SIP, including the NSR program of 310 CMR 7.00, Appendix A, so that these regulations are not applicable to new Massachusetts sources such as the Project.

40 CFR § 89 – Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines

40 CFR § 89 applies to all compression-ignition nonroad engines, including marine engines not subject to 40 CFR § 94, manufactured on or after the specified dates, depending on the power rating of the engine. Engines with a power rating greater than 650 kW that were manufactured on or after January 1, 2000, are subject to the emission standards and certification provisions of 40 CFR § 89, Subpart B.

40 CFR § 89.112(a), Table 1, lists the exhaust emission standards for nonroad engines, depending on the engine's rating and model year. For engines with a power rating greater than 560 kW, Table 1 lists Tier 1 emission standards for NO_x, HC, CO, and PM starting with the 2000 model year. There are also Tier 2 emission standards for NMHC+NO_x, CO, and PM, starting with the 2006 model year. The exhaust opacity from nonroad engines is also limited to 20 percent during acceleration mode, 15 percent during the lugging mode, and 50 percent during the peaks in either the acceleration or lugging modes.

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40 CFR § 89 outlines the required procedures for the manufacturers of nonroad engines to certify that each of their engine models and model years to meet the specified emission standards. Cape Wind will require that all equipment suppliers associated with the Project utilize equipment with engines that have been certified to be in compliance with the applicable EPA nonroad emission standards.

40 CFR § 94 – Control of Emissions from Marine Compression-Ignition Engines

40 CFR § 94 applies to marine engines that are compression-ignition engines manufactured on or after January 1, 2004. 40 CFR § 94.8(a) outlines the Tier 1 NO_x emission standards for model year 2004 and later engines with displacement of 2.5 or more liters per cylinder. Table A-1 lists the Primary Tier 2 exhaust emission standards from marine compression-ignition engines, depending on the engine's displacement and power rating.

40 CFR § 94 outlines the required procedures for the manufacturers of marine engines to certify that each of their engine models manufactured after the effective date meet the specified emission standards. Cape Wind will require that all equipment suppliers associated with the Project utilize vessels with engines that have been certified to be in compliance with the applicable EPA marine emission standards.

4.2 State Requirements

The OCS regulations are based on the requirements of the COA, and since onshore requirements may change, updates of the OCS requirements are mandated by the regulation to maintain consistency with onshore requirements. According to 40 CFR § 55.12(b), in an area where an OCS activity is occurring within 25 miles of States' seaward boundaries, a consistency review must occur at least annually. Consistency reviews must also occur upon receipt on an NOI and when a rule is submitted to the EPA by a State or local agency to be considered for incorporation by reference in 40 CFR § 55.

During the update, EPA reviews all state rules to ensure that they are rationally related to the attainment or maintenance of federal or state ambient air quality standards or Part C of Title I of the Clean Air Act. They are also reviewed to ensure that they are not designed expressly to prevent exploration and development of the OCS, that they are applicable to OCS sources, and that they are not arbitrary or capricious (40 CFR § 55.12(d)(2) & (e)). Administrative and procedural rules are excluded from the review, as are rules regulating air toxics, which are not related to the attainment and maintenance of air quality standards.

In response to the submittal of the NOI for the Project, the EPA issued a 40 CFR § 55 Consistency Update on February 27, 2008, proposing to incorporate the rules applicable to OCS sources for which Massachusetts will be the COA. 40 CFR § 55.14 sets forth the requirements that apply to OCS sources located within 25 miles of States' seaward boundaries, by state. A listing of the Massachusetts state and local requirements incorporated by reference into 40 CFR § 55 is included in Appendix A of the update.

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The following is a summary of the Massachusetts state requirements incorporated by reference into the OCS Air Regulations, as well as a description of how these requirements apply and will be satisfied for the Project.

310 CMR 4.00: Timely Action Schedule and Fee Provisions

310 CMR 4.00 establishes the administrative procedures for the MassDEP's regulatory programs. 310 CMR 4.01 details the purpose, authority, effective date, applicability, and computation of time procedures for the Department. 310 CMR 4.02 includes definitions for terms used in the administrative procedures. 310 CMR 4.03 establishes the annual compliance assurance fees and procedures for paying these fees for MassDEP permit programs. The annual compliance assurance fee for each permit is set forth in 310 CMR 4.03(2), Table 4.03.

The Project will be subject to the general administrative procedures established in 310 CMR 4.01. Once in operation, the Project will be subject to an annual compliance fee as a Minor Group One air emissions source, with potential emissions equal to or greater than 25 but less than 50 tons per year of NO_x. The Project will meet the applicable annual compliance assurance fee requirements, in accordance with the procedures established in 310 CMR 4.03.

310 CMR 6.00: Ambient Air Quality Standards for the Commonwealth of Massachusetts

310 CMR 6.00 establishes primary ambient air quality standards as levels of air quality defined by the Department to protect the public health with an adequate margin of safety. Secondary ambient air quality standards are also defined as levels necessary to protect the public welfare from any know or anticipated adverse effects of a pollutant. The promulgation of the standards, which are subject to revision as is necessary to protect the public health and welfare, cannot be considered to allow significant deterioration of existing air quality in any portion of the Commonwealth. Section 6.01 includes definitions and the scope of the regulation is established in Section 6.02. Section 6.03 details the ambient air reference conditions for all air quality measurements, while the standards are established in Section 6.04.

The emissions associated with Phase 1 of the Project will be temporary, as defined by the PSD program, and therefore not related to attainment with ambient air quality standards. The potential emissions associated with Phase 2 of the Project are below PSD permitting thresholds. Therefore, a demonstration of attainment with ambient air quality standards is not required as part of the OCS Permit for the Project.

310 CMR 7.00: Air Pollution Control

Section 7.00: Statutory Authority; Legend; Preamble; Definitions

This administrative section applies to the Project generally but imposes no specific requirements.

Section 7.01: General Regulations to Prevent Air Pollution

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This section prohibits operators of emission sources from willfully causing a condition of air pollution. It also establishes the requirements for accurate and complete recordkeeping and submittals, as well as the certification of all submittals to be accurate. It requires a written notice of a change in ownership of a facility with an approval. Finally, it requires compliance with the terms and conditions of all approvals granted by the Department.

This administrative section applies to the Project. The Project will comply with the General Regulations established in 310 CMR 7.01 by certifying the accuracy and completeness of its recordkeeping systems and submittals, and by complying fully with the terms and conditions of any approvals granted by the Department.

Section 7.02: U Plan Approval and Emission Limitations

This section provides procedures and standards for the issuance of approvals, and establishes the emission limits and/or restrictions for a facility or emission unit. 310 CMR 7.02(1) establishes the purpose and applicability of the section. A plan approval is required prior to construction of a facility that may emit contaminants to the ambient air. 310 CMR 7.02(2) lists the exemptions from a plan approval, including specified source categories and sources with potential emissions or operational capacities below specified de minimis thresholds.

The General Requirements for Plan Approval are detailed in 310 CMR 7.02(3), including the requirement that the emissions from a facility do not result in air quality exceeding either the Massachusetts or National Ambient Air Quality Standards. It includes the form of plan approval or disapproval, and specifies that conditions of approval, and monitoring, testing, recordkeeping and reporting requirements may be imposed in a plan approval. It also includes the conditions for revoking a plan approval, defines the duration for a plan approval, provides guidance on reactivating an inactive emission unit, and prohibitions for concealing emissions or the deactivation of air pollution control equipment without Department consent.

The requirements for a Limited Plan Application (LPA) are established in 310 CMR 7.02(4). An LPA is required for any facility where the construction or operation would result in an increase in potential emissions of a single contaminant equal to or greater than one ton per year and less than five tons per year, calculated over any 12 consecutive month time period. An LPA is also required for fuel utilization emissions units where construction or operation results in an increase in potential emissions of a single contaminant equal to or greater than one ton per year and the unit has a maximum energy input capacity within the specified range for each fuel type.

The requirements for a Comprehensive Plan Application (CPA) are established in 310 CMR 7.02(5). A CPA is required for any facility where the construction or operation would result in an increase in potential emissions of a single contaminant equal to or greater than five tons per year, calculated over any 12 consecutive month time period. A CPA is also required for fuel utilization emissions units where construction or operation results in an increase in potential emissions of a single contaminant equal to or greater than one ton per year and the unit has a maximum energy input capacity equal to or greater than the specified heat input rate for each fuel type.

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Internal combustion engines installed on or after March 23, 2006 must comply with the requirements of 310 CMR 7.26(40) through (44). A CPA is not required for an internal combustion engine regulated by EPA as a non-road engine pursuant to 40 CFR 89, 90, 91 and 92. However, a CPA is required for any facility, regardless of any exemption established elsewhere, where the construction causes it to be subject to PSD, NANSR, or MACT. Subject facilities must comply with the applicable PSD, NANSR, and MACT requirements.

310 CMR 7.02(6) sets forth the requirements for tracking the aggregated emissions from sources at a facility that are individually not subject to plan approval to determine if a plan approval is required.

310 CMR 7.02(7) establishes the authority of the Department to require any facility suspected of causing or contributing to a condition of air pollution to document facility emissions, operating parameters of emission control equipment, and standard operating and maintenance procedures. The Department will use the submitted information to determine the adequacy and application of existing air pollution control technology. The Department may then require compliance monitoring and the submittal of a compliance certificate, or an application for a plan approval. The Department may allow the facility to temporarily continue to operate, pending reconstruction or repair, provided that the facility complies with all requirements and deadlines.

The emission limitations in Plan Approvals are established in 310 CMR 7.02(8). The Lowest Achievable Emission Rate (LAER) is required for projects subject to Nonattainment Review (310 CMR 7.00, Appendix A). Best Available Control Technology (BACT) is required for all approvals. BACT cannot be less stringent than any applicable state or federal emission limitation. BACT may include a design feature, equipment specification, work practice, operating standard, or combination thereof. All Plan Approvals emission limits must comply with any applicable NSPS (40 CFR § 60) or NESHAPS (40 CFR § 61 or 40 CFR § 63), case-by-case Maximum Achievable Control Technology (MACT) standards, or the emission limits listed in the regulation.

310 CMR 7.02(9) details the requirements for a Restricted Emission Status (RES) to restrict potential emissions of regulated air contaminants to allow redesignation for purposes of annual compliance fee assessments, or to remain below a state or federal applicability threshold.

310 CMR 7.02(10) provides guidance for modifying an RES for the purpose of increasing the facility-wide emission limit, amending the list of emission units included in the existing RES approval, adding emission units not included in the RES approval, or to make administrative changes.

310 CMR 7.02(11) establishes the requirements for a 50% or 25% Facility Emission Cap Notification. This is an alternative means for an owner or operator to establish an emission cap on a facility's federal potential to emit. This section also establishes the application, recordkeeping, and reporting requirements for a facility with an emissions cap.

The Project is required to comply with the applicable CPA requirements because it has potential emissions of more than five tons per year of a pollutant. Although the individual sources associated with the Project are regulated as non-road engines by the EPA and are exempt from plan approval,

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the Phase 1 potential NO_x emissions exceed the major source threshold. As a major source of NO_x emissions located in nonattainment area for ozone, the Project is subject to nonattainment review, which includes the acquisition of offsets and the implementation of LAER for its Phase 1 NO_x emissions. The Project is required to implement BACT for all of its emission sources. Section 5 describes the BACT/LAER analyses for the Project. The Project is required to meet the general requirements for plan approval, including all recordkeeping and reporting requirements.

Section 7.03: U Plan Approval Exemption: Construction Requirements

310 CMR 7.03 lists the specific emission units that are exempted from the plan approval requirements of 310 CMR 7.02, and details the operating, recordkeeping, and reporting requirements for those exempted sources. 310 CMR 7.03 is not an alternative to obtaining a plan approval if construction would violate the requirements of PSD, NANSR, or MACT.

The emission sources associated with the Project are not among those listed as exempt from plan approval in 310 CMR 7.03.

Section 7.04: U Fossil Fuel Utilization Facilities

310 CMR 7.04 establishes the requirements for smoke density indicators, inspection, maintenance and testing, fuel oil viscosity, and used oil fuel use for fossil fuel utilization facilities with energy input capacities above specified minimums.

The Project, when constructed, will not be a fossil fuel utilization facility, and is therefore not subject to the requirements of 310 CMR 7.04.

Section 7.05: U Fuels All Districts

310 CMR 7.05 sets forth the allowable sulfur content, residual fuel oil or hazardous waste fuel restrictions, allowable ash content, and fuel additive restrictions for fuel utilization facilities. It also establishes restrictions for fuel suppliers as well as standards for used oil fuel for fossil fuel utilization facilities.

The Project will utilize fuels for all vessels and engines that meet the specified sulfur content limit of 0.3% for diesel oil. No residual fuel oil, hazardous waste fuel, used oil fuel, or fuel additives will be used by the Project.

Section 7.06: U Visible Emissions

310 CMR 7.06 allows the emission of smoke from stationary sources other than incinerators which has a shade, density, or appearance equal to or greater than No. 1 of the Ringelmann Scale (Chart) for an aggregate period of more than six minutes during any one hour, provided that the shade, density, or appearance is less than No. 2 of the Chart during the six-minute period. It also allows the opacity of the emissions from such sources to exceed 20% for up to two minutes during any one hour, provided that at no time does the opacity exceed 40% during that two-minute period.

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Marine vessels in specified Air Pollution Control Districts are also subject to these visible emissions limits. Visible emissions are prohibited from non-motor vehicle, spark-ignited internal combustion engines for longer than ten consecutive seconds. Excessive visible emissions are prohibited from a diesel engine.

The marine vessels and stationary sources associated with the Project will be subject to the 310 CMR 7.06 visible emissions standards. Compliance with the standards will be achieved by the use of clean burning fuels, the use of engines that meet all applicable EPA nonroad and marine specifications, and through good operating and maintenance practices. Manufacturer certifications of the engines to be used for all vessels and stationary sources will serve as verification of compliance with these visible emissions standards.

Section 7.07: U Open Burning

310 CMR 7.07 prohibits the open burning of any combustible material, except for specified activities. It also prohibits the storing of combustible material in a manner as to cause or allow presumption by the Department that the material may be subject to reduction by open burning. It also provides guidance for the issuance of an open burning permit.

There will be no open burning or aggregated storage of combustible material associated with the Project's OCS activities, therefore the provisions of 310 CMR 7.07 are not applicable.

Section 7.08: U Incinerators

310 CMR 7.08 establishes operating practices, emission limits, compliance and performance testing, recordkeeping, and reporting requirements for incinerators, including municipal waste combustors and hazardous waste incinerators.

There will be no incinerators or incineration of waste associated with the Project. Therefore the provisions of 310 CMR 7.08 are not applicable.

Section 7.09: U Dust, Odor, Construction, and Demolition

310 CMR 7.09 prohibits dust or odor emissions which cause or contribute to a condition of air pollution from specified operations, including from the construction or demolition of buildings. It also prohibits emissions which cause or contribute to a condition of air pollution resulting from the handling, transportation, or storage of any material.

There will be no odors or dust emissions associated with the Project. All materials transported to the Project area will be covered and secured.

Section 7.11: U Transportation Media

310 CMR 7.11 includes specific requirements for motor vehicles, diesel trains, aircraft, and marine vessels. Marine vessels are prohibited from tube blowing or soot removal activities that cause or contribute to a condition of air pollution.

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All marine vessels associated with the Project will comply with the tube blowing or soot removal activity restriction set forth in 310 CMR 7.11.

Section 7.12: U Source Registration

310 CMR 7.12 establishes the Source Registration requirements for facilities meeting specified criteria, including fuel utilization facilities with a maximum energy input capacity above specified thresholds, and facilities with non-combustion federal potential to emit specified contaminants above the listed thresholds.

A facility with an operating permit or RES, with actual NO_x or VOC emissions equal to or greater than 25 tons per year, or that is subject to a MACT standard must submit a Source Registration annually, by April 15th of each year. Facilities not subject to the annual reporting requirements must submit a Source Registration once every three years. All Source Registrations are to be submitted using the forms specified by the Department.

The potential emissions of Phase 2 of the Project exceed the annual NO_x threshold of 4.4 tons per year to require a Source Registration. Phase 2 of the Project will be permitted with a potential to emit up to 50 tons of NO_x per year. If the actual NO_x emissions from the Project exceed 25 tons in a year, which exceeds the annual reporting threshold, an annual Source Registration will be submitted for the Project. If the actual NO_x emissions from the Project remain less than 25 tons per year for multiple years, a Source Registration will be submitted at least once every three years. The Project's Source Registrations will include the required information and be submitted using the forms provided by the Department.

Section 7.13: U Stack Testing

310 CMR 7.13 provides guidelines for stack testing conducted for the purposes of compliance demonstrations. It requires that all stack testing be conducted by a person knowledgeable in stack testing, that all testing be conducted in accordance with a test protocol approved by the Department, that testing be conducted in the presence of a Department representative when it is deemed necessary, and that the results should be summarized and reported to the Department. It also requires facility operators to provide suitable testing facilities, such as sampling ports, staging, ladders, and a suitable power source for the test equipment.

There will be no stack testing conducted for this Project. Compliance with emission standards for the vessels and engines to be used will be demonstrated through manufacturer certifications, as required by the EPA nonroad and marine engine standards.

Section 7.14: U Monitoring Devices and Reports

310 CMR 7.14 establishes requirements for emission monitoring devices that are required to be installed on specified stationary sources. It requires that the Department approve the design and installation of such devices, and that periodic reports are made to the Department on the nature and amount of emissions from the source.

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The sources associated with the Project do not require emission monitoring devices. Emissions monitoring will be done through recordkeeping of hours of operation and/or fuel use. The provisions of 310 CMR 7.14 do not apply to the Project.

Section 7.15: U Asbestos

310 CMR 7.15 establishes guideline for the demolition and renovation activities involving asbestos materials, including notification, emission control, air cleaning, and waste disposal requirements.

There will be no demolition or renovation associated with the Project. The provisions of 310 CMR 7.15 do not apply.

Section 7.18: U Volatile and Halogenated Organic Compounds

310 CMR 7.18 establishes requirements for any facility that emits VOCs. It requires that VOCs be stored and disposed in a manner which will minimize evaporation to the atmosphere. It then establishes specific emission limits and requirements for specified surface coating, degreasing, paving, printing, finishing and refinishing, baking, coating mixing and chemical manufacturing activities. It also sets forth Reasonable Available Control Technology (RACT) requirements for any facility which has the potential to emit, before the application of air pollution control equipment, 25 tons or more of VOC per year.

The Project sources will emit VOCs from the combustion of fuel. All fuels and any other materials containing VOCs, such as lube oils, will be stored in closed containment systems. The Project will not include any of the operations specified in 310 CMR 7.18. The Project's potential VOC emissions are below the VOC RACT threshold.

Section 7.19: U Reasonably Available Control Technology (RACT) for Sources of Oxides of Nitrogen (NO_x)

310 CMR 7.19 establishes NO_x RACT requirements for any facility having the potential to emit, before application of air pollution control equipment, greater than 50 tons per year of NO_x. 310 CMR 7.19 does not apply to a facility that obtains an approval that establishes BACT or LAER to be no less stringent than RACT for a facility size and type at the time of the plan approval. These requirements apply to stationary reciprocating internal combustion engines with a heat input capacity of 3 MMBtu/hr or greater. For oil-fired engines operated less than 1,000 hours per year, the NO_x RACT emission standard is 9.0 g/bhp-hr.

The potential NO_x emissions from the Project during Phase 2 are less than 50 tons per year. Therefore, the 310 CMR 7.19 NO_x RACT requirements do not apply to the Project.

Section 7.21: Sulfur Dioxide Emissions Limitations

310 CMR 7.21 establishes a limitation on the total statewide actual annual sulfur dioxide emissions. It also requires the Department to prepare and make available to the public an annual report of the statewide sulfur dioxide emissions. If the annual emissions exceed the specified trigger or the

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previous four year average exceeds the cap, the Department must prepare a second report detailing why the cap was triggered, and what actions will be taken to reduce projected emissions, including the adoption of further regulations.

The Project will report its annual sulfur dioxide emissions as required. There are no requirements specified in 310 CMR 7.21 that apply to the Project.

Section 7.22 Sulfur Dioxide Emissions Reductions for the Purpose of Reducing Acid Rain

310 CMR 7.22 establishes a sulfur dioxide emissions limit, and emission control plan requirements for fossil or alternative fuel utilization facilities with a capacity to burn fuel at a rate greater than or equal to 100 MMBtu/hr.

The Project, when constructed, will not be a fuel utilization facility with a heat input capacity greater than 100 MMBtu/hr. The requirements of 310 CMR 7.22 do not apply to the Project.

Section 7.24: U Organic Material Storage and Distribution

310 CMR 7.24 establishes requirements for the storage and distribution of organic materials and fuels.

There will be no on-site storage of any organic materials or fuels associated with the Project. The Project's vessels and engines will be fueled at commercial dispensing stations not associated with the Project. The requirements of 310 CMR 7.24 do not apply to the Project.

Section 7.25: U Best Available Controls for Consumer and Commercial Products

310 CMR 7.25 sets forth requirements for the control of volatile organic compound emissions from the use of consumer and commercial products. It applies to those who manufacture, blend, supply, sell, or apply specified materials, and specified VOC content limits and other requirements for the use of those materials.

The Project will not involve the use of any of the specified materials. The requirements of 310 CMR 7.25 do not apply to the Project.

Section 7.26: Industry Performance Standards

310 CMR 7.26 establishes performance standards for specified industries and sources, such as dry cleaners, printers, and boilers. 310 CMR 7.26(40) through (44) includes standards for specified engines and combustion turbines. According to 310 CMR 7.26(40)(b), owners and operators of engines regulated under 40 CFR 89, 90, 91, and 92 are exempt from the requirements of 310 CMR 7.26(40) through (44) in its entirety.

All of the diesel engines associated with the Project are regulated under 40 CFR 89 as nonroad engines. The Project is therefore exempt from the requirements of 310 CMR 7.26.

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Section 7.27: NO_x Allowance Program

310 CMR 7.27 establishes the NO_x Allowance Program, which controls emissions of nitrogen oxides during the summertime ozone season through a state-wide emissions cap and allowance system. The Program applies to Budget Units. A Budget Unit is defined as a fossil fuel fired boiler or indirect heat exchanger with a maximum heat input capacity of 250 MMBtu/hr, a fossil fuel fired electric generating unit with a rated output of 15 MW or more, any unit that chooses to opt in to the program, and any unit which the Department chooses to include in the program. All Budget Units are allocated NO_x allowances by the Department, must submit an Emissions Control Plan, and must meet specified certification, monitoring, recordkeeping and reporting requirements.

The Project sources do not meet any of the applicability criteria for a Budget Unit under 310 CMR 7.27. The requirements of 310 CMR 7.27 do not apply to the Project.

Section 7.28: NO_x Allowance Trading Program

310 CMR 7.28 establishes a state NO_x allowance trading program for the control of NO_x emissions during each summertime control period from 2003 through 2008. According to 310 CMR 7.28(1)(a), the Massachusetts Clean Air Interstate Rule (310 CMR 7.32) will supersede this program beginning with the control period in 2009. It applies to all Budget Units. A Budget Unit is defined as a fossil fuel fired boiler, combustion turbine, or indirect heat exchanger which emits NO_x to a stack and has a maximum heat input capacity of 250 MMBtu/hr or more; or any fossil fuel fired electric generating unit with a nameplate capacity of 15 MW or more, which provides electricity for sale.

The Project sources do not meet any of the applicability criteria for a Budget Unit under 310 CMR 7.28. The requirements of 310 CMR 7.28 do not apply to the Project.

Section 7.29: Emissions Standards for Power Plants

310 CMR 7.29 is for the control of emissions of NO_x, SO_2, mercury (Hg), CO, CO_2, and $PM_{2.5}$ from affected facilities in Massachusetts. An affected facility is a facility that emitted greater than 500 tons of SO2 and 500 tons of NO_x during any of the calendar years 1997, 1998, and 1999, and which includes a fossil fuel fired boiler or indirect heat exchanger that is regulated by the Federal Acid Rain Program, serves a generator with a capacity of 100 MW or more, was permitted prior to August 7, 1977, and had not subsequently received a NSR Plan Approval or a PSD Permit prior to October 31, 1998.

The Project does not meet any of the criteria for an affected facility under 310 CMR 7.29. The requirements of 310 CMR 7.29 do not apply to the Project.

Section 7.60: U Severability

310 CMR 7.60 establishes that each section of 310 CMR 7.00 should be construed as separate to the end that if any regulation or sentence, clause, or phrases are held invalid for any reason, the remainder of 310 CMR 7.00 and all other regulations will continue in full force.

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310 CMR 7.60 applies to the Project generally, as it concerns the applicable sections of 310 CMR 7.00; however it imposes no specific requirements on the Project.

Section 7.00, Appendix A: Emission Offsets and Nonattainment Review

310 CMR 7.00, Appendix A sets forth the Massachusetts preconstruction review program for a new major source or major modification that is located in an area designated as nonattainment. Applicable sources must undergo a control technology review as follows:

- Meet each applicable emissions limitation under the Massachusetts SIP and each applicable emissions standard of performance under 40 CFR 60 (NSPS) and 40 CFR 61 (NESHAPS).
- Meet the LAER for each pollutant that would have federal potential emissions above major source thresholds.

Sufficient offsetting emissions must be in effect so that the total emissions from existing sources in the area, which are not major stationary sources, and from the proposed source, will be sufficiently less than the total emissions from existing sources prior to approval, to represent reasonable further progress by the time the proposed source commences operations. The determination of total emissions prior to the application, and when the source commences operation, must be made in a manner consistent with the Massachusetts SIP.

Emission offsets must be made federally enforceable prior to the issuance of a plan approval. For a new major source located in a nonattainment area, the offsets must actually occur and be obtained from other sources in the same nonattainment area, prior to commencing operation. The offsets may be obtained from a source in another nonattainment area if the other area has an equal or higher nonattainment classification, and the emissions from such area contribute to the nonattainment status in the area of the proposed source. Emission offsets for an OCS source may be obtained from land-based stationary sources.

The increase in emissions from the new source must be offset by an equal or greater reduction in the actual emissions of the pollutant from the same or other sources. The ratio of total actual emission reductions to the increase in actual emissions for VOC or NO_x must be at least 1.26:1 (a 1.2:1 offset ratio coupled with a 5% public benefit set aside). Emissions reduction credits (ERCs) withdrawn from the Massachusetts Emission Reduction Credit Bank (310 CMR 7.00, Appendix B) may be used as offsets, providing the ERCs are federally enforceable.

Applicants must conduct a source impact analysis demonstrating the following:

- The required emissions offsets, when considered in conjunction with the proposed emissions increase, will have a net air quality benefit in the affected area; and
- The emissions from the proposed new major stationary source will not contribute to nonattainment in, or interfere with maintenance by any other state of any national primary or secondary national ambient air quality standard; and

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- The emissions from the proposed new major stationary source will not interfere with measures required to be included in the applicable implementation plan for any other State under a program for the prevention of significant deterioration or for the protection of visibility.

Additional conditions for approval include the following:

- All major stationary sources in Massachusetts owned or operated by the owner or operator of the proposed source which are subject to federally enforceable emissions limitations must be in compliance, or on a federally enforceable schedule for compliance with all applicable emissions limitations and standards.

- By an analysis of alternative sites, sizes, production processes, and environmental control technologies, a demonstration must be made that the benefits of the proposed source significantly outweigh the environmental and social costs imposed as a result of its locations, construction, or modification.

- The Administrator has not determined that the Massachusetts SIP is not being adequately implemented for the nonattainment area in which the proposed source is to be constructed.

Phase 1 of the Project has potential NO_x emissions that exceed the major source threshold. Massachusetts is a nonattainment area for ozone. The Project is therefore subject to the 310 CMR 7.00, Appendix A, Nonattainment Review requirements for its Phase 1 NO_x emissions. The Project's Phase 2 NO_x emissions do not exceed the major source threshold, and Phase 2 is therefore not subject to nonattainment review.

The Project will implement LAER for its Phase 1 NO_x emissions. Section 5 addresses the LAER determination for the Project. Discrete emission offsets for the Project's Phase 1 NO_x emissions will be made federally enforceable prior to approval, and will be obtained from other sources within the same nonattainment area prior to commencing operation. These emission offsets will be obtained at a ratio of at least 1.26:1 to the actual Phase 1 NO_x emissions. As the Phase 1 NO_x emissions from the Project will be temporary, they will have no effect on NAAQS attainment.

The Project is not subject to NSPS or NESHAPS. By implementing LAER and obtaining offsets for its Phase 1 NO_x emissions, the Project will fully comply with the 310 CMR 7.00, Appendix A, Nonattainment Review requirements.

Section 7.00, Appendix B: U Emission Banking, Trading, and Averaging

310 CMR 7.00, Appendix B establishes principles and procedures which can be utilized by facilities to comply with the requirements of 310 CMR 7.18, 310 CMR 7.19, and 310 CMR 7.00: Appendix A. It contains provisions to allow emission averaging and provisions to allow for the creation and use of emission reduction credits to be banked, used or traded among facilities.

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The provisions of 310 CMR 7.00, Appendix B will be applicable to the purchase of ERCs obtained by the Project to be used as offsets under nonattainment review. The Project will comply with the applicable provisions of 310 CMR 7.00, Appendix B, as it applies during the process of obtaining ERCs for emissions offsets.

Section 7.00, Appendix C: Operating Permit and Compliance Program

310 CMR 7.00, Appendix C establishes the requirements of the Massachusetts Operating Permit and Compliance Program. It applies to any facility that has federal potential emissions which equal or exceed 50 tons per year of VOC or NO_x, 10 tons per year of any HAP, or 100 tons per year of any other regulated pollutant. It also applies to any facility that is subject to a standard under NESHAPS, is subject an NSPS, is an affected source under the federal Acid Rain Program, or is in another source category EPA determines not to exempt from the requirement to obtain an operating permit.

The Project, when constructed, will not meet any of the applicability criteria of 310 CMR 7.00, Appendix C. It will therefore not be subject to the requirements of the MassDEP Operating Permit and Compliance Program.

310 CMR 8.00: The Prevention and/or Abatement of Air Pollution Episode and Air Pollution Incident Emergencies

Section 8.01 establishes the purpose of 310 CMR 8.00, which is to prevent ambient air concentrations at any location in the Commonwealth from reaching levels that would constitute significant harm, or imminent and substantial endangerment to health. These ambient air contaminant concentration levels, as prescribed by the EPA, are set forth in Table 1 of this section. Section 8.02 defines the meanings of specified words and phrases when they are used in 310 CMR 8.00.

Section 8.03 establishes the conditions under which the Department will make the determination to declare that an air pollution alert, an air pollution warning, or an air pollution emergency condition exists. Section 8.04 requires that when the Department receives Atmospheric Stagnation Advisories, it should evaluate potential effects on ambient air contamination levels, and maintain close liaison with the National Weather Service to exchange information of mutual benefit.

Section 8.05 directs the Commissioner to declare an Air Pollution Episode Alert, an Air Pollution Episode Warning, or an Air Pollution Incident Emergency, if conditions warrant. The table included in Section 8.05 directs different operations and facilities to cease specified activities, depending on the nature of the episode. All construction activities that generate pollutants are directed to stop during alerts, warnings, and emergencies. Section 8.06 requires that the level of episode declared remain in effect until the criteria are no longer being met, and at such time, the next lower level will be assumed. When the conditions for an Air Pollution Episode or Incident Emergency no longer exist, the Commissioner should declare a termination.

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Section 8.07 requires that upon the declaration of an Air Pollution Episode, operators of emission sources should implement, to the extent possible, the listed emission reduction strategies for the episode level and contaminant of concern. Section 8.08 requires operators of specified emission sources, including the operators of a stationary emission source with the capability of emitting 100 tons or more per year of SO_2, NO_x, PM, CO, or hydrocarbons, or any other source specified in writing by the Department to prepare a standby Emission Reduction Plan (ERP) to reduce or eliminate emissions of air contaminants.

Section 8.15 outlines the requirements for the declaration of an Air Pollution Incident Emergency. It authorizes the Commissioner or his designees to exercise authorities and powers necessary to effect the prevention or an abatement of the conditions present, and requires that the appropriate agencies of the Commonwealth cooperate with the commissioner in those efforts. Section 8.30 establishes that each section of 310 CMR 8.00 be construed as separate so that if any regulation or sentence, clause, or phrase is held invalid for any reason, the remainder of this and all other regulations continue in full force.

During Phase 1, the Project will monitor the appropriate communication sources, so that construction activities can be stopped during declared Air Pollution Episode Alerts, Warnings, and Incident Emergencies. If requested by the Department, an ERP will be prepared for Phase 1 of the Project.

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5.0 BACT/LAER ANALYSIS

The controlling requirements for purposes of this emissions control technology analysis are MassDEP's Air Pollution Control Regulations. As required by the MassDEP regulations, the proposed emission rate for criteria air pollutants must be demonstrated to meet the requirement of BACT. BACT is defined by MassDEP in 310 CMR 7.00 as follows:

Best available control technology means an emission limitation based on the maximum degree of reduction of any regulated air contaminant emitted from or which results from any regulated facility which the Department, on a case-by-case basis taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques for control of each such contaminant. The best available control technology determination shall not allow emissions in excess of any emission established under the New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants or under any other applicable section of 310 CMR 7.00, and may include a design feature, equipment specification, work practice, operating standard, or combination thereof.

As a major source of NO_x emissions located in a nonattainment area for ozone, the Facility is also required to implement the LAER for its Phase 1 NO_x emissions. LAER is defined by the EPA and MassDEP as the most stringent emission limitation contained in any State Implementation Plan (SIP) for a source category, or the most stringent emissions limitation which is achieved in practice for a source category. LAER may be achieved by a combination of a change in the raw material processes, a process modification, and/or add-on emission controls.

5.1 Engines

Nonroad diesel engines manufactured after the effective date designated for each range of power output (and marine engines manufactured prior to January 1, 2004) must be certified by their manufacturer to meet the applicable emission standards established in 40 CFR § 89. Marine compression-ignition engines manufactured on or after January 1, 2004 must be certified by their manufacturer to meet the applicable emission standards established in 40 CFR § 94. Cape Wind will require that all equipment suppliers associated with the Project utilize equipment with engines that have been certified to be in compliance with the applicable EPA nonroad or marine engine emission standards.

5.2 Fuels

EPA's Nonroad and Marine Diesel Fuel Standards are promulgated in 40 CFR § 80.510. Beginning June 1, 2007, all nonroad and marine diesel fuel is subject to a 500 ppm maximum sulfur content standard. Beginning June 1, 2010, all nonroad diesel fuel will be subject to a 15 ppm maximum sulfur content standard. Beginning June 1, 2012, all marine diesel fuel will be subject to the 15 ppm maximum sulfur content standard. Cape Wind will require that all fuel suppliers associated with the Project provide fuels that have been certified to be in compliance with the applicable EPA fuel content standards at the time of their use.

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5.3 BACT/LAER Determination

Cape Wind will satisfy MassDEP's BACT requirement by requiring its equipment and fuel suppliers to provide equipment and fuels for the Project that have been certified to be in compliance with the applicable EPA standards. These standards are reflective of the best available control technology for nonroad and marine engines, and account for the use of state-of-the-art fuels, combustion controls and optimization, and all available add-on controls for the power rating and model year of the specific nonroad engine.

In order to satisfy the nonattainment review LAER requirement, Cape Wind will require their Phase 1 equipment suppliers to utilize nonroad engines that meet the more stringent Tier 2 or Tier 3 NO_x emission standards, that are applicable to each engine power rating and model year, when such equipment is available and its use is practical for the application required for the Project. Cape Wind will make every reasonable effort to maximize the use of Tier 2 and Tier 3 compliant equipment engines during Phase 1 of the Project. However, there may be certain operations for which such equipment is either unavailable or not suitable for the required operation. The use of engines that meet the most stringent, applicable Tier 2 and Tier 3 NO_x emission standards, wherever practical, will ensure the lowest achievable emission rate for NO_x during Phase 1 of the Project.

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Table

Table 1-1
Cape Wind Energy Project
Project Emissions Subject to OCS Permitting

PHASE 1 - PRECONSTRUCTION & CONSTRUCTION								
Potential Emissions	Total Emissions (Tons)							
	NO_X	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPS
Preconstruction Potential Emissions - Total	12.3	0.8	0.3	7.7	0.7	0.7	937	0.0
Inside 25 Miles - Transit	11.8	0.7	0.3	7.5	0.6	0.6	896	0.0
Inside 25 Miles - Stationary Sources	0.5	0.1	0.0	0.2	0.1	0.1	41	0.0
Construction Potential Emissions - Total	266.4	13.9	7.1	94.0	13.3	13.3	20,427	0.2
Inside 25 Miles - Transit	243.8	12.3	6.5	85.7	11.8	11.8	18,695	0.2
Inside 25 Miles - Stationary Sources	22.6	1.6	0.6	8.3	1.5	1.5	1,732	0.0
Potential Emissions - Total	278.7	14.7	7.4	101.7	14.0	14.0	21,364	0.2
Inside 25 Miles - Transit	255.6	13.0	6.8	93.2	12.4	12.4	19,591	0.2
Inside 25 Miles - Stationary Sources	23.1	1.7	0.6	8.5	1.6	1.6	1,773	0.0
Emissions Offsets	Total Emissions (Tons)							
	NO_X	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPS
Required Emissions Offsets (1.26:1 Offset Ratio)	351.2	0.0	0.0	0.0	0.0	0.0	0	0.0

PHASE 2 - OPERATION								
Potential Emissions	Annual Emissions (Tons Per Year)							
	NO_X	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPS
Potential Emissions - Total	19.7	1.3	0.5	15.2	0.9	0.9	1,486	0.0
Inside 25 Miles - Transit	19.6	1.2	0.5	15.2	0.9	0.9	1,477	0.0
Inside 25 Miles - Stationary Sources	0.1	0.0	0.0	0.0	0.0	0.0	9	0.0
Permit Emissions (Note 6)	Annual Emissions (Tons Per Year)							
	NO_X	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPS
Permit Emissions - 12-month rolling total	49.9	3.2	1.3	38.6	2.3	2.3	3,764	0.0

Notes

1) Project emissions have been estimated using conservative equipment usage assumptions and EPA approved emission factors. The operating hours of all equipment used will be metered to track actual emissions.

2) The emission factor used for NOx emissions from all of the nonroad diesel-fired engines to be used for the project is the Tier 1 Emission Standard for New and In-Use Nonroad Compression Ignition Engines (40 CFR 89.112(a)).

3) The VOC, SO_2, CO, PM_{10}, $PM_{2.5}$, CO_2, and HAP emissions from all of the nonroad diesel-fired engines to be used for the project have been estimated using the appropriate emission factors from EPA's AP-42, "Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources".

4) The SO_2 emissions from all of the diesel-fired engines to be used for the project have been estimated assuming a diesel fuel sulfur content of 500 ppm, which is the current fuel sulfur content standard for all nonroad and marine diesel fuel (40 CFR 80.510(a)).

5) The emissions from the zodiac boats to be used for the project have been estimated using worst-case emission factors from the EPA document: "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", EPA420-R-05-019, Table 10.

6) The Project will be permitted for up to 49.9 tons per year of NOx emissions during Phase 2, to include a contingency for unexpected equipment maintenance and/or repair activities, while remaining a minor source of emissions. The permit emissions of the other pollutants have been determined by scaling their individual potential emissions by the ratio of the permit versus potential NOx emissions.

Figure

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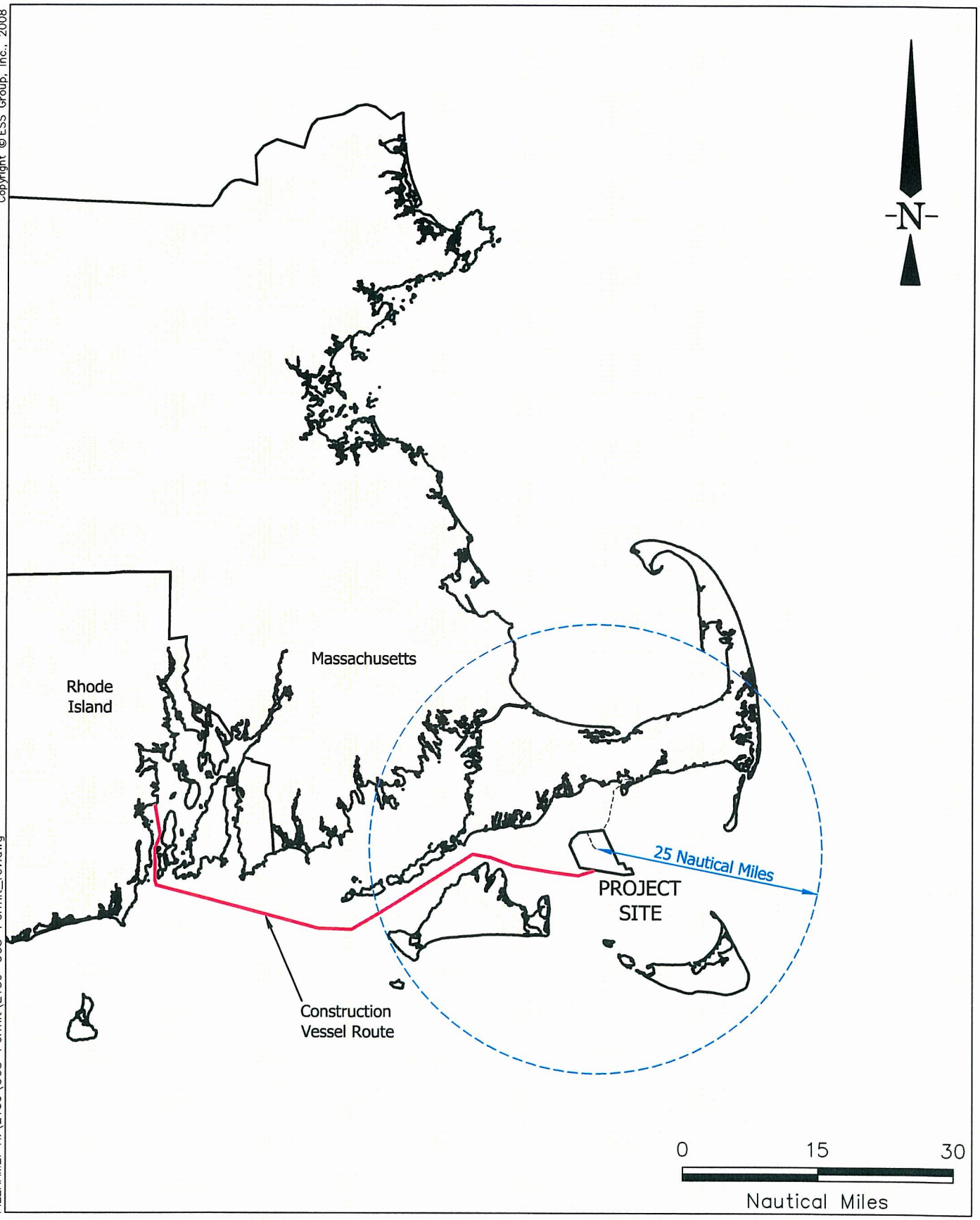

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ESS Group, Inc.
Engineers
Scientists
Consultants

Cape Wind Associates, LLC
Cape Wind Energy Project

Project Site Locus Map

Figure 1-1

Appendix A

Emission Source Calculation Summaries

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Transit

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Transit Activities within 25 Miles of the Project																		
Pile Installation																		
Move jack up barge to Wind Park	attendant tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16	This is done twice (once per year)	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Transport piles and transition pieces to wind park	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	86 trips	4 hrs/trip	344	avg. 3 piles per trip, 130 piles, duration only w/in 25 miles	Quonset Point, RI	15.6	0.8	0.4	5.5	0.7	0.7	1196.0	0.0
Pile barge handling tug @ Wind Park	attendant tug	1	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520	3 piles per week, attendant tugs only operate equiv of 1/2 day		11.8	0.6	0.3	4.1	0.5	0.5	904.0	0.0
Moving crew in and out	crew boats	2	750	559	daily travel b/w Falmouth and WP	130 days	2 hrs/day	260			2.9	0.1	0.1	1.0	0.1	0.1	226.0	0.0
Transition piece handling tugs @ Wind Park	attendant tug	1	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520	3 pieces per week, attendant tugs only operate equiv of 1/2 day		11.8	0.6	0.3	4.1	0.5	0.5	904.0	0.0
Installation of scour protection																	0.0	0.0
Move scour protection installation equipment to Wind Park	attendant tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16	This is done twice (once per year)	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Transport rock armor barges	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	276 trips	4 hrs/trip	1,104	Spd. 8 knts	Quonset Point, RI	50.0	2.4	1.3	17.5	2.3	2.3	3838.5	0.0
Transport filler material barges	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	370 trips	4 hrs/trip	1,480	Spd. 8 knts	Quonset Point, RI	67.1	3.2	1.8	23.5	3.1	3.1	5145.7	0.0
Armor/filler barge handling tugs @ Wind Park	attendant tugs	2	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520			23.6	1.1	0.6	8.2	1.1	1.1	1808.0	0.0
Subtotal											183.6	8.8	4.9	64.2	8.6	8.6	14,078	0.1

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Transit

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Cable laying																		
115 kV Cable laying barge to wind farm	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16		Quonset Point, RI	0.2	0.0	0.0	0.1	0.0	0.0	13.9	0.0
Put cable in place	crane barge	1	400	298		15 days	10 hrs/day	150	10 hrs/day for 15 work days		0.5	0.1	0.0	0.2	0.1	0.1	34.5	0.0
Put cable in place	attendant tug	1	1,500	1,119		15 days	10 hrs/day	150	10 hrs/day for 15 work days		1.7	0.1	0.0	0.6	0.1	0.1	130.4	0.0
Put cable in place	anchoring tug	1	4,000	2,983		15 days	10 hrs/day	150	10 hrs/day for 15 work days		4.5	0.2	0.1	1.6	0.2	0.2	347.7	0.0
Moving crew in and out	crew boats	1	750	559		15 days	2 hrs/day	30			0.2	0.0	0.0	0.1	0.0	0.0	13.0	0.0
33 kV Cable laying barge to wind farm	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	26 trips	4 hrs/trip	104	13 round trips	Quonset Point, RI	1.2	0.1	0.0	0.4	0.1	0.1	90.4	0.0
Put cable in place	crane barge	1	400	298		130 days	10 hrs/day	1300	10 hrs/day for 10 work days/string - 13 strings		3.9	0.7	0.1	1.7	0.6	0.6	298.7	0.0
Put cable in place	attendant tug	1	1,500	1,119		130 days	10 hrs/day	1300	10 hrs/day for 10 work days/string - 13 strings		14.7	0.7	0.4	5.2	0.7	0.7	1130.0	0.0
Move Crane barge to cofferdam location	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	4 trips	3 hrs/trip	12		Quonset Point, RI	0.1	0.0	0.0	0.0	0.0	0.0	10.4	0.0
HDD Cofferdam Excavation	crane barge	1	400	298	Excavation	2 days	10 hrs/day	20	2 day @10 hrs/day - Spd. ~ 12 knts		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Moving crew in and out	crew boat	1	750	559		10 days	2 hrs/day	20	1hr each way per crew boat		0.1	0.0	0.0	0.0	0.0	0.0	8.7	0.0
Subtotal											27.2	1.8	0.7	9.9	1.7	1.7	2,082	0.0
Turbine installation																		
Turbines to Wind Farm	one specialized vessel	1	6,000	4,474	Travel b/w 25-mile boundary and WP	86 trips	4 hrs./trip	344	Only emissions within 25 miles of Wind Park	Quonset Point, RI	15.6	0.8	0.4	5.5	0.7	0.7	1196.0	0.0
Moving crew in and out	crew boats	4	750	559		130 days	2 hrs/day	260	2 days per WTG		5.9	0.3	0.2	2.1	0.3	0.3	452.0	0.0
Subtotal											21.5	1.0	0.6	7.5	1.0	1.0	1,648	0.0
ESP Installation																		
Crane barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	12 hrs/trip	24	12 hrs. out, 12 hours back	Quonset Point, RI	0.5	0.0	0.0	0.2	0.0	0.0	41.7	0.0
Handling crane barge	attendant tug	1	3,000	2,237		1	16 hrs.	20	4 hrs. transit and 16 hrs. on site		0.5	0.0	0.0	0.2	0.0	0.0	34.8	0.0
Pile Installation barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Handling barge	attendant tug	1	3,000	2,237		6	3 hrs.	18			0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
ESP deck to wind farm	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back	Quonset Point, RI	0.8	0.0	0.0	0.3	0.0	0.0	62.6	0.0
Crane barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	12 hrs/trip	24	12 hrs. out, 12 hours back	Quonset Point, RI	0.5	0.0	0.0	0.2	0.0	0.0	41.7	0.0
Setting the deck for ESP installation	crane barge	1	6,000	4,474		1	16 hrs.	16			0.7	0.0	0.0	0.3	0.0	0.0	55.6	0.0
Handling crane barge	attendant tug	1	3,000	2,237		2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back		0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Moving crew in and out	crew boats	4	750	559		160 trips	2 hrs/trip	320	40 days, 2 RT/day - 2 hrs.each way		7.3	0.3	0.2	2.5	0.3	0.3	556.3	0.0
Subtotal											11.6	0.6	0.3	4.0	0.5	0.5	887	0.0
TOTAL Construction Emissions Over 1 to 2-Year Construction Duration											243.8	12.3	6.5	85.7	11.8	11.8	18,695	0.2

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Stationary Activities

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Stationary Activities within 25 Miles of the Project																		
Pile Installation																		
Put piles in place	primary 500 ton crane	1	800	597	Set piles	130 days	4 hrs/day	520			3.1	0.2	0.1	1.1	0.1	0.1	241.1	0.0
Pile driving	Hydraulic ram	1	1,600	1,193	Set piles	130 piles	4 hrs/pile	520	IHC S-1200 hydrohammer		6.3	0.3	0.2	2.2	0.3	0.3	482.1	0.0
Set transition pieces	primary 500 ton crane	1	800	597	Set Pieces	130 days	4 hrs/day	520			3.1	0.2	0.1	1.1	0.1	0.1	241.1	0.0
Installation of scour protection																		
Install rock armor	crane	1	400	298	Daily activity	65 days	8 hrs/day	520	2 towers per day		1.6	0.3	0.0	0.7	0.2	0.2	119.5	0.0
Install filler material	crane	1	400	298	Daily activity	65 days	8 hrs/day	520	2 towers per day		1.6	0.3	0.0	0.7	0.2	0.2	119.5	0.0
Subtotal											15.7	1.1	0.4	5.8	1.0	1.0	1,203	0.0
Cable laying																		
Sheet Pile Driving for cofferdam		1	400	298		2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Compressor Drive		1	100	75		2 days	8 hrs/day	16	2 day @8 hrs/day		0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Sheet Pile Removal		1	400	298		2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Cofferdam Backfill	crane barge	1	400	298	Backfill	2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Subtotal											0.2	0.0	0.0	0.1	0.0	0.0	15	0.0
Turbine installation																		
Stablizing the the WTG vessel in correct location and elevation	jacking system with 6 legs	1	476	355		130 days	2 hrs/day	260			0.9	0.2	0.0	0.4	0.1	0.1	71.1	0.0
Tower Installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Nacelle installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Rotor installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Subtotal											5.6	0.4	0.2	2.1	0.4	0.4	433	0.0
ESP Installation																		
Setting template for ESP installation	crane	1	3,000	2,237		1	16 hrs.	16			0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Pile setting	crane	1	3,000	2,237		6	3 hrs.	18			0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Pile driving	Hydraulic ram	1	3,200	2,386		6	2 hrs.	12	IHC S-500 hydrohammer		0.3	0.0	0.0	0.1	0.0	0.0	22.3	0.0
Subtotal											1.1	0.1	0.0	0.4	0.0	0.0	81	0.0
TOTAL Construction Emissions Over 1 to 2-Year Construction Duration											22.6	1.6	0.6	8.3	1.5	1.5	1,732	0.0

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Preconstruction Emissions Inside of 25 miles

Emission Factors (g/hp-hr) Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474

Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Emission Factors (lb/MMBtu) Natural Gas 4-Stroke Based on AP-42 Vol.1 , Table 3.2-2							
NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
0.85	0.12	0.00059	0.56	0.000077	0.000077	110.00	0.072

Emission Factors (g/bhp-hr) for 50-100HP 4-stroke, outboard marine engines. Based on Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. EPA420-R-05-019, Table 10. Worst case emissions factors were selected from carbureted, indirect injection and direct injection engine types. When calculating emissions, HC and PM were equated with VOC and PM10, respectively.							
NOx	HC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
5.82	5.82		152.25	0.06			

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Emissions (tons)							
										NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Preconstruction Period - Activities within 25 Miles of the Project																	
Geophysical - WTG's	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	6 days	10 hrs/day	66	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	0.5	0.0	0.0	0.2	0.0	0.0	38.2	0.000
Geophysical - 33 kV Inner Array Cable	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	20 days	10 hrs/day	220	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	1.7	0.1	0.0	0.6	0.1	0.1	127.5	0.001
Geophysical - 115 kV Interconnect Cable	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	7 days	10 hrs/day	77	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	0.6	0.0	0.0	0.2	0.0	0.0	44.6	0.000
Electrical Generator	Gas Fired	1	8.7	6.5		30 days	10 hrs/day	300		0.008	0.001	0.000	0.005	0.000	0.000	1.007	0.001
Borings	Tug Boat	1	1,500	1,119	Travel b/w Falmouth and	30 days	24 hrs/day	720	Full Load @ 1hr/day	8.2	0.4	0.2	2.9	0.4	0.4	625.8	0.006
Boring Drill Rig	Truck mtd Rig	1	350	261	1 boring/day	20 days	10 hr/day	200	Rig Stays on HSS till done	0.5	0.1	0.0	0.2	0.1	0.1	40.2	0.0
Vibracore Boat		1	1,000	746	Final Cable Design and Constructability survey	8 days	10 hr/day	80	- 33 kV: 1 core/3 miles of cable, total 22 - 115 kV: 2 /mile of cable, total 26 - 6 /day	0.6	0.0	0.0	0.2	0.0	0.0	46.4	0.000
Multibeam Survey	26' Boat	1	300	224	Shallow area multibeam survey	8 days	10 hr/day	80		0.2	0.0	0.0	0.1	0.0	0.0	13.8	0.0
Electrical Generator	Gas Fired	1	4	3		8 days	10 hr/day	80		0.001	0.000	0.000	0.001	0.000	0.000	0.124	0.000
Crew Movement	Zodiac Boat	1	100	75	1 boring/day	20 days	10 hr/day	200	Zodiac only needed for boring program	0.1	0.1		3.4	0.001			
Preconstruction Emissions - Stationary Sources										0.5	0.1	0.0	0.2	0.1	0.1	41	0.0
Preconstruction Emissions - Transit										11.8	0.7	0.3	7.5	0.6	0.6	896	0.0
Total Preconstruction Emissions										12.4	0.8	0.3	7.7	0.6	0.6	938	0.0

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Preconstruction Emissions Inside of 25 miles

Emission Factors (g/hp-hr) Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474

Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Emission Factors (lb/MMBtu) Natural Gas 4-Stroke Based on AP-42 Vol.1 , Table 3.2-2							
NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
0.85	0.12	0.00059	0.56	0.000077	0.000077	110.00	0.072

Emission Factors (g/bhp-hr) for 50-100HP 4-stroke, outboard marine engines. Based on Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. EPA420-R-05-019, Table 10. Worst case emissions factors were selected from carbureted, indirect injection and direct injection engine types. When calculating emissions, HC and PM were equated with VOC and PM10, respectively.

NOx	HC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
5.82	5.82		152.25	0.06			

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Emissions (tons)							
										NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Preconstruction Period - Activities within 25 Miles of the Project																	
Geophysical - WTG's	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	6 days	10 hrs/day	66	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	0.5	0.0	0.0	0.2	0.0	0.0	38.2	0.000
Geophysical - 33 kV Inner Array Cable	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	20 days	10 hrs/day	220	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	1.7	0.1	0.0	0.6	0.1	0.1	127.5	0.001
Geophysical - 115 kV Interconnect Cable	42' Diesel Lobster Boat	1	1,000	746	-Travel b/w Falmouth and WP - 30 miles of transect	7 days	10 hrs/day	77	- 2 hrs. @ 15 knots then 8 hrs. @ 3 knots - 10% Contingency	0.6	0.0	0.0	0.2	0.0	0.0	44.6	0.000
Electrical Generator	Gas Fired	1	8.7	6.5		30 days	10 hrs/day	300		0.008	0.001	0.000	0.005	0.000	0.000	1.007	0.001
Borings	Tug Boat	1	1,500	1,119	Travel b/w Falmouth and	30 days	24 hrs/day	720	Full Load @ 1hr/day	8.2	0.4	0.2	2.9	0.4	0.4	625.8	0.006
Boring Drill Rig	Truck mtd Rig	1	350	261	1 boring/day	20 days	10 hr/day	200	Rig Stays on HSS till done	0.5	0.1	0.0	0.2	0.1	0.1	40.2	0.0
Vibracore Boat		1	1,000	746	Final Cable Design and Constructability survey	8 days	10 hr/day	80	- 33 kV: 1 core/3 miles of cable, total 22 - 115 kV: 2 /mile of cable, total 26 - 6 /day	0.6	0.0	0.0	0.2	0.0	0.0	46.4	0.000
Multibeam Survey	26' Boat	1	300	224	Shallow area multibeam survey	8 days	10 hr/day	80		0.2	0.0	0.0	0.1	0.0	0.0	13.8	0.0
Electrical Generator	Gas Fired	1	4	3		8 days	10 hr/day	80		0.001	0.000	0.000	0.001	0.000	0.000	0.124	0.000
Crew Movement	Zodiac Boat	1	100	75	1 boring/day	20 days	10 hr/day	200	Zodiac only needed for boring program	0.1	0.1		3.4	0.001			
Preconstruction Emissions - Stationary Sources										0.5	0.1	0.0	0.2	0.1	0.1	41	0.0
Preconstruction Emissions - Transit										11.8	0.7	0.3	7.5	0.6	0.6	896	0.0
Total Preconstruction Emissions										12.4	0.8	0.3	7.7	0.6	0.6	938	0.0

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Transit

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Transit Activities within 25 Miles of the Project																		
Pile Installation																		
Move jack up barge to Wind Park	attendant tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16	This is done twice (once per year)	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Transport piles and transition pieces to wind park	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	86 trips	4 hrs/trip	344	avg. 3 piles per trip, 130 piles, duration only w/in 25 miles	Quonset Point, RI	15.6	0.8	0.4	5.5	0.7	0.7	1196.0	0.0
Pile barge handling tug @ Wind Park	attendant tug	1	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520	3 piles per week, attendant tugs only operate equiv of 1/2 day		11.8	0.6	0.3	4.1	0.5	0.5	904.0	0.0
Moving crew in and out	crew boats	2	750	559	daily travel b/w Falmouth and WP	130 days	2 hrs/day	260			2.9	0.1	0.1	1.0	0.1	0.1	226.0	0.0
Transition piece handling tugs @ Wind Park	attendant tug	1	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520	3 pieces per week, attendant tugs only operate equiv of 1/2 day		11.8	0.6	0.3	4.1	0.5	0.5	904.0	0.0
Installation of scour protection																	0.0	0.0
Move scour protection installation equipment to Wind Park	attendant tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16	This is done twice (once per year)	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Transport rock armor barges	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	276 trips	4 hrs/trip	1,104	Spd. 8 knts	Quonset Point, RI	50.0	2.4	1.3	17.5	2.3	2.3	3838.5	0.0
Transport filler material barges	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	370 trips	4 hrs/trip	1,480	Spd. 8 knts	Quonset Point, RI	67.1	3.2	1.8	23.5	3.1	3.1	5145.7	0.0
Armor/filler barge handling tugs @ Wind Park	attendant tugs	2	3,000	2,237	Daily activity	130 days	4 hrs/day (load factor.33)	520			23.6	1.1	0.6	8.2	1.1	1.1	1808.0	0.0
Subtotal											183.6	8.8	4.9	64.2	8.6	8.6	14,078	0.1

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Transit

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Cable laying																		
115 kV Cable laying barge to wind farm	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	4 trips	4 hrs/trip	16		Quonset Point, RI	0.2	0.0	0.0	0.1	0.0	0.0	13.9	0.0
Put cable in place	crane barge	1	400	298		15 days	10 hrs/day	150	10 hrs/day for 15 work days		0.5	0.1	0.0	0.2	0.1	0.1	34.5	0.0
Put cable in place	attendant tug	1	1,500	1,119		15 days	10 hrs/day	150	10 hrs/day for 15 work days		1.7	0.1	0.0	0.6	0.1	0.1	130.4	0.0
Put cable in place	anchoring tug	1	4,000	2,983		15 days	10 hrs/day	150	10 hrs/day for 15 work days		4.5	0.2	0.1	1.6	0.2	0.2	347.7	0.0
Moving crew in and out	crew boats	1	750	559		15 days	2 hrs/day	30			0.2	0.0	0.0	0.1	0.0	0.0	13.0	0.0
33 kV Cable laying barge to wind farm	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	26 trips	4 hrs/trip	104	13 round trips	Quonset Point, RI	1.2	0.1	0.0	0.4	0.1	0.1	90.4	0.0
Put cable in place	crane barge	1	400	298		130 days	10 hrs/day	1300	10 hrs/day for 10 work days/string - 13 strings		3.9	0.7	0.1	1.7	0.6	0.6	298.7	0.0
Put cable in place	attendant tug	1	1,500	1,119		130 days	10 hrs/day	1300	10 hrs/day for 10 work days/string - 13 strings		14.7	0.7	0.4	5.2	0.7	0.7	1130.0	0.0
Move Crane barge to cofferdam location	tow tug	1	1,500	1,119	Travel b/w 25-mile boundary and WP	4 trips	3 hrs/trip	12		Quonset Point, RI	0.1	0.0	0.0	0.0	0.0	0.0	10.4	0.0
HDD Cofferdam Excavation	crane barge	1	400	298	Excavation	2 days	10 hrs/day	20	2 day @10 hrs/day - Spd. ~ 12 knts		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Moving crew in and out	crew boat	1	750	559		10 days	2 hrs/day	20	1hr each way per crew boat		0.1	0.0	0.0	0.0	0.0	0.0	8.7	0.0
Subtotal											27.2	1.8	0.7	9.9	1.7	1.7	2,082	0.0
Turbine installation																		
Turbines to Wind Farm	one specialized vessel	1	6,000	4,474	Travel b/w 25-mile boundary and WP	86 trips	4 hrs./trip	344	Only emissions within 25 miles of Wind Park	Quonset Point, RI	15.6	0.8	0.4	5.5	0.7	0.7	1196.0	0.0
Moving crew in and out	crew boats	4	750	559		130 days	2 hrs/day	260	2 days per WTG		5.9	0.3	0.2	2.1	0.3	0.3	452.0	0.0
Subtotal											21.5	1.0	0.6	7.5	1.0	1.0	1,648	0.0
ESP Installation																		
Crane barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	12 hrs/trip	24	12 hrs. out, 12 hours back	Quonset Point, RI	0.5	0.0	0.0	0.2	0.0	0.0	41.7	0.0
Handling crane barge	attendant tug	1	3,000	2,237		1	16 hrs.	20	4 hrs. transit and 16 hrs. on site		0.5	0.0	0.0	0.2	0.0	0.0	34.8	0.0
Pile Installation barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back	Quonset Point, RI	0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Handling barge	attendant tug	1	3,000	2,237		6	3 hrs.	18			0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
ESP deck to wind farm	tow tug	1	6,000	4,474	Travel b/w 25-mile boundary and WP	2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back	Quonset Point, RI	0.8	0.0	0.0	0.3	0.0	0.0	62.6	0.0
Crane barge towing	tow tug	1	3,000	2,237	Travel b/w 25-mile boundary and WP	2 trips	12 hrs/trip	24	12 hrs. out, 12 hours back	Quonset Point, RI	0.5	0.0	0.0	0.2	0.0	0.0	41.7	0.0
Setting the deck for ESP installation	crane barge	1	6,000	4,474		1	16 hrs.	16			0.7	0.0	0.0	0.3	0.0	0.0	55.6	0.0
Handling crane barge	attendant tug	1	3,000	2,237		2 trips	9 hrs/trip	18	12 hrs. out, 6 hours back		0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Moving crew in and out	crew boats	4	750	559		160 trips	2 hrs/trip	320	40 days, 2 RT/day - 2 hrs each way		7.3	0.3	0.2	2.5	0.3	0.3	556.3	0.0
Subtotal											11.6	0.6	0.3	4.0	0.5	0.5	887	0.0
TOTAL Construction Emissions Over 1 to 2-Year Construction Duration											243.8	12.3	6.5	85.7	11.8	11.8	18,695	0.2

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Construction Emissions Inside of 25 miles - Stationary Activities

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr)Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Travel Origin beyond 25 Mile Radius	Emissions (tons)							
											NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Stationary Activities within 25 Miles of the Project																		
Pile Installation																		
Put piles in place	primary 500 ton crane	1	800	597	Set piles	130 days	4 hrs/day	520			3.1	0.2	0.1	1.1	0.1	0.1	241.1	0.0
Pile driving	Hydraulic ram	1	1,600	1,193	Set piles	130 piles	4 hrs/pile	520	IHC S-1200 hydrohammer		6.3	0.3	0.2	2.2	0.3	0.3	482.1	0.0
Set transition pieces	primary 500 ton crane	1	800	597	Set Pieces	130 days	4 hrs/day	520			3.1	0.2	0.1	1.1	0.1	0.1	241.1	0.0
Installation of scour protection																		
Install rock armor	crane	1	400	298	Daily activity	65 days	8 hrs/day	520	2 towers per day		1.6	0.3	0.0	0.7	0.2	0.2	119.5	0.0
Install filler material	crane	1	400	298	Daily activity	65 days	8 hrs/day	520	2 towers per day		1.6	0.3	0.0	0.7	0.2	0.2	119.5	0.0
Subtotal											**15.7**	**1.1**	**0.4**	**5.8**	**1.0**	**1.0**	**1,203**	**0.0**
Cable laying																		
Sheet Pile Driving for cofferdam		1	400	298		2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Compressor Drive		1	100	75		2 days	8 hrs/day	16	2 day @8 hrs/day		0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Sheet Pile Removal		1	400	298		2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Cofferdam Backfill	crane barge	1	400	298	Backfill	2 days	10 hrs/day	20	2 day @10 hrs/day		0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Subtotal											**0.2**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**15**	**0.0**
Turbine installation																		
Stablizing the the WTG vessel in correct location and elevation	jacking system with 6 legs	1	476	355		130 days	2 hrs/day	260			0.9	0.2	0.0	0.4	0.1	0.1	71.1	0.0
Tower Installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Nacelle installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Rotor installation	primary 500 ton crane	1	800	597		130 days	2 hrs/day	260			1.6	0.1	0.0	0.5	0.1	0.1	120.5	0.0
Subtotal											**5.6**	**0.4**	**0.2**	**2.1**	**0.4**	**0.4**	**433**	**0.0**
ESP Installation																		
Setting template for ESP installation	crane	1	3,000	2,237		1	16 hrs.	16			0.4	0.0	0.0	0.1	0.0	0.0	27.8	0.0
Pile setting	crane	1	3,000	2,237		6	3 hrs.	18			0.4	0.0	0.0	0.1	0.0	0.0	31.3	0.0
Pile driving	Hydraulic ram	1	3,200	2,386		6	2 hrs.	12	IHC S-500 hydrohammer		0.3	0.0	0.0	0.1	0.0	0.0	22.3	0.0
Subtotal											**1.1**	**0.1**	**0.0**	**0.4**	**0.0**	**0.0**	**81**	**0.0**
TOTAL Construction Emissions Over 1 to 2-Year Construction Duration											**22.6**	**1.6**	**0.6**	**8.3**	**1.5**	**1.5**	**1,732**	**0.0**

All operating hours will be metered to track actual emissions.

Cape Wind Energy Project
Operation Emissions Inside of 25 miles

Note: All trips are one-way (not round trips).

Emission Factors (g/hp-hr) Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4							
NOx **	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	0.33	0.18	2.40	0.32	0.32	526.16	0.00474
Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2							
NOx **	TOC*	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
6.86	1.14	0.18	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	500 ppm

* Emission factor for VOC was not available; TOC emission factor is used instead, which will result in a very conservative estimation of VOC emissions.
** NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Outboard Emission Factors (g/bhp-hr) for 50-100HP 4-stroke, outboard engines. Based on Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition. EPA420-R-05-019, Table 10. Worst case emissions factors were selected from carbureted, indirect injection and direct injection engine types. When calculating emissions, HC and PM were equated with VOC and PM10, respectively.

HC	Nox	SO_2	CO	PM	$PM_{2.5}$	CO_2	HAPs
5.82	5.82		152.25	0.06			

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Assumptions	Emissions (tons)							
										NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Operation Period - Activities within 25 Miles of the Project																	
Electrical Service Platform (ESP)																	
ESP's crane		1	50	37				300		0.1	0.0	0.0	0.0	0.0	0.0	8.6	0.0000
Sub-Total										**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**8.6**	**0.0**
Maintenance - per year																	
Crew transport	Crew boats	1	750	559	Travel b/w Falmouth and WP	504 trips	1 hr/trip	504	avg. 1 trips/day X 252 days	2.9	0.1	0.1	1.0	0.1	0.1	219.0	0.0020
Support vessel	Maintenance vessels	1	1,500	1,119	Travel b/w Falmouth and WP	504 trips	1 hr/trip	504	avg. 1 trips/day X 252 days	5.7	0.3	0.2	2.0	0.3	0.3	438.1	0.0039
Special duty supply vessel	Maintenance vessel	1	3,000	2,237	Travel b/w New Bedford and WP	48 trips	5 hrs/trip	230	Required irregularly - assume 2 rund trips per month	5.2	0.3	0.1	1.8	0.2	0.2	400.2	0.0036
Support vessel	Maintenance vessels	1	1,500	1,119	Travel b/w New Bedford and WP	504 trips	1 hr/trip	483	avg. 1 trips/day X 252 days	5.5	0.3	0.1	1.9	0.3	0.3	420.2	0.0038
Crew Movement	Zodiac Boat	1	100	75	Daily activity	504 trips	1 hr/trip	504	avg. 1 trips/day X 252 days	0.3	0.3		8.5	0.003			
Sub-Total										**19.6**	**1.2**	**0.5**	**15.2**	**0.9**	**0.9**	**1477.5**	**0.0**
Total Annual Operation Emissions (tons per year)										**19.7**	**1.3**	**0.5**	**15.2**	**0.9**	**0.9**	**1486.1**	**0.0**

Note: Hours were prorated based on the following assumptions:
- New Bedford to 25-mile Radius Border = 2.2 Miles
- New Bedford to Wind Park = 53.8 Miles
- Miles are nautical milles

All operating hours will be metered to track actual emissions.