Final General Conformity Determination
Cape Wind Energy Project

Prepared by
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1.0 INTRODUCTION TO THE PROPOSED ACTION

The Cape Wind Energy Project developer, Cape Wind Associates, LLC (the applicant), proposes to build, operate, and eventually decommission an electric generation facility with a maximum electric output of 468 megawatts and an average output of 182.6 megawatts, in Federal waters in Nantucket Sound off the coast of Massachusetts (proposed action). The proposed action would generate electricity from wind energy resources on the Outer Continental Shelf. The applicant seeks to commence construction in late 2010 and begin full operation two years later.

The applicant requests a lease, easement, right-of-way, and any other related approvals from the Department of the Interior, Minerals Management Service (MMS) necessary to authorize construction, operation and eventual decommissioning of the proposed action. The MMS's authority to approve, deny, or modify the Cape Wind Energy Project derives from the Energy Policy Act of 2005 (EPAct). Section 388 of the Act amended the Outer Continental Shelf Lands Act by adding subsection 8(p), which authorizes the Department of the Interior to grant leases, easements or right-of-ways on Outer Continental Shelf lands for activities that produce or support production, transportation, or transmission of energy from sources other than oil and gas, such as wind power. More information about the MMS renewable energy program may be found at: http://www.mms.gov/offshore/RenewableEnergy/index.htm

The proposed project would consist of the following components:

- An array of 130 wind turbine generators (WTG) arranged in a grid pattern in the Horseshoe Shoal region of Nantucket Sound, Massachusetts;
- An interconnecting 33-kV solid dielectric submarine inner-array cable system running from the wind turbine generators to an electrical service platform (ESP);
- A 115-kV submarine transmission cable system approximately 12.5 miles in length (7.6 miles of it within Massachusetts state waters) running from the electric service platform to a landfall location in Yarmouth, Massachusetts;
- An onshore transmission cable system approximately 6.9 mi in length between landfall and the Barnstable switching station along the NSTAR electric right-of-way; and
- A staging site during the construction phase at the Quonset Davisville Port & Commerce Park in the town of North Kingstown, Rhode Island.

The proposed action would consist of three phases: (1) preconstruction geologic and geophysical (G&G) data gathering and construction, (2) operations, and (3) decommissioning. Offshore emissions would be associated with G&G survey vessels, transport vessels, barges, tugboats, cranes, pile drivers, and crew boats. Onshore emissions associated with the construction of the 115kV cable would consist of excavators, backhoes, trenchers, dump trucks, drill rigs, cranes, and graders. At Quonset emissions would be associated with transport vessels, cranes, and vehicles at the staging site.

Massachusetts and Rhode Island are classified moderate non-attainment for ozone. Since projected emissions of nitrogen oxides (NO_x) in each of the States exceeded the 100 tons/year threshold, MMS conducted a general conformity analysis and published a draft general conformity determination document on November 26, 2008. It concluded that the proposed action would conform to the Massachusetts and Rhode Island State Implementation Plans (SIPs) with the stipulation that Cape Wind purchase the needed emission offsets in the respective non-attainment areas. Since the publication of the draft conformity determination, based on EPA guidance, changes were made in the methodology used in estimating vessel emissions. The revised NO_x emissions are lower than the original estimates. Revised emissions in Massachusetts are now below the 100 tons/year threshold for conformity. A conformity determination is therefore no longer required for Massachusetts. The revised emissions for Rhode Island remain above the threshold.

2.0 GENERAL CONFORMITY REGULATORY BACKGROUND

The EPA promulgated the General Conformity Rule on November 30, 1993 in Volume 58 of the Federal Register (58 FR 63214) to implement the conformity provision of Title I, section 176(c)(1) of the Clean Air Act (CAA). Section 176(c)(1) requires that the Federal government not engage in, support, or provide financial assistance for licensing, permitting, or approving any activity not conforming to an approved CAA implementation plan. The approved implementation plan could be a Federal, State, or Tribal Implementation Plan (i.e., FIP, SIP, or TIP).

The General Conformity Rule is codified in Title 40 of the Code of Federal Regulations (CFR) Part 51, Subpart W and Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." The General Conformity Rule applies to all Federal actions except highway and transit programs. The latter must comply with the conformity requirements for transportation plans in 40 CFR Part 93, Subpart A.

2.1 GENERAL CONFORMITY REQUIREMENTS

Title I, section 176(c)(1), of the CAA defines conformity as the upholding of "an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National ambient air quality standards (NAAQS) and achieving expeditious attainment of such standards." Conforming activities or actions should not, through additional air pollutant emissions:

- Cause or contribute to new violations of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS; or
- Delay timely attainment of any NAAQS or interim emission reductions.

The General Conformity Rule is designed to ensure that air pollution emissions associated with actions that are federally funded, licensed, permitted, or approved, do not contribute to air quality degradation or prevent achievement of State and Federal air quality goals. In short, General Conformity refers to the process of evaluating plans, programs, and projects to determine and demonstrate that they meet the requirements of the CAA and applicable SIP. The purpose of the conformity process is for the Federal agency to work with the State to ensure that the Federal action does not negatively impact a State's control strategy and conforms to the SIP.

2.2 GENERAL CONFORMITY APPLICABILITY

The proposed Cape Wind Project would be located in Federal waters in Nantucket Sound, an area where the EPA has jurisdiction over air emissions associated with OCS activities authorized by the Department of the Interior (DOI) under the OCS Lands Act (OCSLA) of 1953 (43 U.S.C. 1331 et seq.). The EPA OCS regulations were mandated by the 1990 CAA Amendments and promulgated by EPA in 1992 (40 CFR Part 55). At the time of promulgation, the regulations were intended to apply to oil and gas development, production, and extraction facilities. The EPAct amended OCSLA to grant authority to the DOI to manage renewable energy projects on the OCS. The various activities associated with the Cape Wind Project were examined to determine if any of them would be subject to Section 328(a) of the CAA and the implementing regulations in 40 CFR Part 55.

Section 328(a) of the CAA states that OCS activities located within 25 miles of the seaward boundary of a State are subject to the same requirements as those applicable to the nearest onshore area, the "Corresponding Onshore Area." On December 7, 2007 Cape Wind submitted to the EPA a Notice of Intent (NOI) as required by 40 CFR 55.4. Subsequently, EPA Region 1 conducted a consistency review and finalized regulations incorporating the relevant Massachusetts air rules into Appendix A to 40 CFR Part 55 (September 17, 2008 Federal Register, p 53718).

Section 328 (a)(4)(c) of the CAA defines an OCS source to include any equipment, activity, or facility which (1) emits, or has the potential to emit, any air pollutant, (2) is regulated or authorized under the OCSLA, and (3) is located on the OCS or in or on waters above the OCS. This definition includes vessels when they are permanently or temporarily attached to the seabed (40 CFR 55.2). The following equipment and activities associated with the proposed Cape Wind project are subject to permitting by the EPA as OCS sources: G&G survey activities including seafloor boring, installation of the WTGs and ESP, offshore cable laying, maintenance and repair, and de-commissioning. Since the emissions generated in the two-year construction phase exceed the major threshold for an ozone nonattainment area, the proposed project is subject to new source review (NSR) as specified in Massachusetts Department of Environmental Protection (MassDEP) regulation 310 CMR 7.00, Appendix A. Emissions from vessels servicing or associated with the proposed Cape Wind construction activities are included in the "potential to emit" while at the activity location and while in transit within 25 miles of the activity (40 CFR 55.2). These vessel emissions would be included in the EPA permit and along with the stationary sources would be offset according to MassDEP regulations as incorporated by EPA into 40 CFR Part 55. They are therefore not included in the general conformity determination (40 CFR 93.153(d)(1)).

Onshore activities and vessel transit in State waters more than 25 miles from Cape Wind are subject to the general conformity requirements. They include the following emission sources:

- Vessel emissions within Massachusetts state waters (from the shoreline out 3 miles) and more than 25 miles from the Cape Wind project;
- Construction of the 115 kV transmission line in Massachusetts;
- Vessel emissions within Rhode Island state waters; and

- Unloading, staging, and loading activities at Quonset Point, Rhode Island.

3.0 ASSESSMENT OF CONFORMITY EMISSIONS

This section evaluates conformity emissions during the construction phase and the operation phase. This conformity determination does not address emissions during de-commissioning. If needed, a new conformity determination would be performed prior to that activity.

3.1 Massachusetts

Construction Phase

Figure 1 shows a general map of project area with the 25-mile boundary around the Cape Wind Project, the 3-mile state water boundaries (shown by red lines), and the vessel route from the Quonset staging area to the Cape Wind construction site. Falmouth, MA would be the base for the G&G vessels and crew boats during the pre-construction and construction activities, respectively. The route is entirely within the 25-mile zone and thus the vessel emissions would be included in the OCS permit and, as explained in the previous section, would not be subject to conformity. Barges and transport vessels for the installation of piles, wind turbines, scour protection, ESP, and cables would originate at Quonset Point, RI. A portion of the travel route, 7.3 nautical miles (nmi) long, traverses across Massachusetts waters more than 25 miles from Cape Wind. There would be 10 round trips by barge for installation activities, 381 round trips by barge for transport of components (piles, scour protection material, and cables), and 43 round trips by a specialized vessel for transport of the turbines. Most of the tugboats and the specialized vessel would be powered by engines with a combined rated capacity of 6,000 hp.

For the draft conformity determination, vessel emissions were calculated using AP-42 emission factors for diesel engines, except for NO_x, where the emission factor was set equal to the Tier 1 emission standard of 6.86 g/hp-hr. Total NO_x and VOC emissions from vessels in the 2-year construction period subject to conformity were 99.9 and 4.8 tons, respectively.

Since the publication of the draft conformity determination, a number of changes were made in the vessel emission calculations upon recommendations by EPA Region 1 and MMS. The revised method uses emissions and load factors from the U.S. EPA document entitled "*Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories*" (USEPA, 2009a). The NO_x emission factor was 13.2 g/hp-hr, which is the factor applicable to Category 2 and ocean going vessels. The load factor for the 6,000 hp tugboats was 0.68 and the load factor for the 3,000 and 1,500 hp tugboats was 0.31. These values were obtained from Table 3-4 in the EPA Port Study (USEPA, 2009a) which listed a load factor of 0.31 and 0.68 for tugboats and ocean going tugboats, respectively. The load factor for the 6,000 hp specialized vessel was 0.83, consistent with the load factor for ocean going vessels in cruise mode in the EPA Port Study.

The original calculation assumed a 4-hour travel time for the vessels. It was later determined that this value was overly conservative. The revised emission calculations assumed a 1-hour travel time per one-way trip for the 7.3-nmi segment, based on a vessel speed of 8 knots. The changes in the calculations resulted in lower emissions. The revised NO_x and VOC emissions from vessels over the 2-year construction period are 37.6 and 1.4 tons, respectively. Detailed information on the equipment and calculations can be found in Appendix A, Table A-1.

Emission sources associated with the installation of ductbank, conduit, and vault, and cable laying of the 133 kV power cable in Massachusetts would include construction equipment such as excavators, backhoes, trenchers, borehole drill rigs, front end loaders, graders, and on-road mobile sources that include dump trucks, heavy-duty delivery trucks, and worker transport vehicles. Construction work would involve breaking pavement or stripping of topsoil, trench excavation, drilling, concrete casting, backfilling, supply trucks, and worker transport. Individual pieces of equipment would be operating 10 hours/day over a period of 75-150 days. Onshore construction emissions were calculated using factors in technical support documents for the EPA NONROAD emissions model (USEPA, 2009b and 2004). Emissions for the crane and the winch used in the onshore 115kV cable installation were based on AP-42 emission factors, except for NO_x, for which a factor equal to the Tier 1 emission standard for nonroad engines was used. Emissions from heavy-duty trucks and pick-up trucks were calculated using factors in the EPA MOBILE 6 model (USEPA, 2009c and 2004). The onshore construction activities would occur over a period of about 150 days and would generate 23.0 tons of NO_x and 8.2 tons of VOC. These emissions are the same as those presented in the draft conformity determination document. Detailed information on the equipment and calculations can be found in Appendix A, Table A-2.

With the revised emissions for the vessels, the total offshore and onshore NO_x emissions for the 2-year construction period dropped from 122.0 tons to 60.6 tons and the total VOC emissions dropped from 13.0 to 9.6 tons. Table 1 summarizes the emissions for Massachusetts for the construction phase. In the calculation of annual emission rates, it is assumed that 70% of the emissions would occur in Year 1 and the remaining 30% in Year 2. Total highest annual emissions in Massachusetts are 42.4 tons of NO_x and 6.7 tons of VOC. The emissions are below the 100 tons/year threshold for a moderate ozone nonattainment area and therefore no general conformity determination is needed for Massachusetts.

Table 1. Air Emissions from Cape Wind Construction Activities – Massachusetts

	Emissions, tons/year			
	Year 1		Year 2	
	NO_x	VOC	NO_x	VOC
MA waters				
Vessel transit	26.3	1.0	11.3	0.4
Onshore construction – 115 kV transmission line				
Construction activities	14.4	3.5	6.2	1.5
Delivery vehicles and worker commute	1.7	2.2	0.7	1.0
Total Emissions	**42.4**	**6.7**	**18.2**	**2.9**

Operations Phase

During the operations phase, there would not be any air emissions from the wind turbine generators or the ESP, and therefore there would be no OCS sources. Falmouth, MA would be used as the base for crew vessels and support vessels. There would be 252 round trips per year each (or two drips daily on weekdays) by a 750 hp crew boat, a 1,500 hp support vessel, and a 100 hp Zodiac boat for inspections. For maintenance and repair trips, New Bedford, MA would be used as a base. From New Bedford there would be 252 round trips per year by a 1500 hp maintenance vessel and 24 round trips per year by a 3,000 hp special duty supply vessel. Total emissions are estimated to be 13.0 tons/year of NO_x and 0.8 tons/year of VOC. Most of these emissions would occur in Massachusetts State waters, but they are well below the 100 tons/year threshold for conformity. Therefore, no general conformity determination would be needed for the operations phase.

If there were to be any major repairs required that would result in an OCS source, the vessel emissions within 25 miles of the repair site would be included in the emissions for the source and only emissions in State waters more than 25 miles would be subject to conformity. Total emissions would be lower than those for the Cape Wind construction phase. Therefore, emissions would be well below the levels for triggering a conformity determination.

3.2 Rhode Island

Construction Phase

The staging site for all Cape Wind construction operations would be located in the Port of Davisville at Quonset Point in Rhode Island. Most of the components, materials, and supplies are expected to arrive via cargo barge. A total of 427 cargo barge visits are planned, primarily utilizing 6,000 hp tow tugs. One of two existing docks at the Port of Davisville would be used for arrival and departure of vessels. The vessels would travel a distance of about 19 nautical miles per one-way trip through RI waters. Assuming a speed of 8 knots, the transit time in RI waters would be 2.4 hours per one-way trip. As was explained in Section 3.1, some changes were made in the emissions calculations. The revised vessel emissions were calculated using factors in the U.S. EPA document entitled "*Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories*" (USEPA, 2009a). Load factors for the vessels were the same as those used in the emission calculations for Massachusetts.

In the draft conformity determination, the total NO_x and VOC emissions for the delivery vessels were 75.2 and 3.6 tons, respectively. In the revised calculations, NO_x and VOC emissions increased to 80.2 and 3.0 tons, respectively.

No new structures would be built at the site. An 800-hp crane would be employed at the docking facility to load and unload components and materials for the Cape Wind Project. It was assumed that there would be 427 loading and unloading operations lasting 8 hours per loading/unloading cycle. The estimated emissions for port operations, including workers commute are 21.1 tons of NO_x and 1.6 tons of VOC. Detailed information for the emissions calculations for delivery vessels and port operations are presented in Appendix A, Table A-3.

Barges and transport vessels for the installation of piles, wind turbines, scour protection, ESP, and cables at the Cape Wind Project site would depart from Quonset Point, RI. There would be a total of 427 port visits by vessels, most of which would be 6,000 hp heavy-duty cargo barge tow tugboats. The vessels would travel about 16 nmi in Rhode Island State waters. Assuming a speed of 8 knots, the transit time in RI waters would be 2 hours per one-way trip. In the revised emissions calculations, NO_x emissions from construction vessels dropped from 260.1 tons to 97.8 tons while VOC emissions dropped from 12.5 tons to 3.7 tons. Detailed information on the emissions calculations is presented in Appendix A, Table A-4.

Table 2 summarizes emissions associated with Quonset Point port operations and vessel transit. In the calculation of annual emission rates, 70% of the emissions were assumed to take place in Year 1, while the remaining 30% would occur in Year 2. The total emissions for Year 1 are 139.4 tons of NO_x and 5.8 tons of VOC. Total emissions for Year 2 are 59.7 tons of NO_x and 2.5 tons of VOC. The NO_x emissions in Year 1 exceed the 100 tons/year threshold for conformity. Therefore, in Year 1 of the construction phase, a conformity determination is required for Rhode Island.

Table 2. Air Emissions from Cape Wind Construction Activities – Rhode Island

	Emissions, tons/year			
	Year 1		Year 2	
	NO_x	VOC	NO_x	VOC
RI waters				
Construction vessels transit	68.5	2.6	29.3	1.1
Delivery vessels transit	56.1	2.1	24.1	0.9
Quonset Point port operations				
Unloading, staging, and loading operations	14.4	0.7	6.2	0.3
Worker commute	0.4	0.4	0.2	0.2
Total Emissions	**139.4**	**5.8**	**59.7**	**2.5**

<u>Operations Phase</u>

In the operations phase all inspection, maintenance and repair operations would be based in Massachusetts. There would be no vessel emissions within Rhode Island State waters. Therefore, in the operations phase no conformity determination is needed for Rhode Island.

4.0 GENERAL CONFORMITY DETERMINATION

In accordance with General Conformity requirements listed in Title 40 CFR Part 93.158(a), in order for a Federal agency to issue a conformity determination, any of the following criteria applicable to ozone or nitrogen dioxide must be met:

- For any criteria pollutant, the total of direct and indirect emissions from the action are specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration; or
- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action are fully offset within the same nonattainment or maintenance area through a revision to the applicable SIP or similar enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant.

In addition, 40 CFR 93.158(c) has the following requirements:

- An action may not be determined to conform to the applicable SIP unless the total direct and indirect emissions from the action is in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP, such as elements identified as part of the reasonable further progress schedules, assumptions specified in the attainment or maintenance demonstration, prohibitions, numerical emission limits, and work practice requirements; and

- Any analysis required under section 40 CFR 93.158 must be completed, and any mitigation measures necessary for a finding of conformity must be identified before the conformity determination is made.

The following sections describe how the project would conform to these requirements.

The Rhode Island Department of Environmental Management (RIDEM) submitted to the EPA its State Implementation Plan to demonstrate attainment of the 8-hour National Ambient Air Quality Standard for Ozone in the Rhode Island Nonattainment Area. The standard is to be achieved by the end of the 2009 ozone season. This document also demonstrates that by 2008 Rhode Island will achieve the Reasonable Further Progress (RFP) goals that are prescribed by the Clean Air Act (CAA) and subsequent EPA guidance.

Rhode Island has the same emission standards for nonroad mobile sources and marine diesel engines as those promulgated by EPA and has applied these standards in generating the emission inventories for the demonstration of RFP and attainment. The emission sources associated with the Cape Wind project would be subject to the EPA standards and therefore would be consistent with the Rhode Island SIP.

The estimated emissions from the Cape Wind Project were not specifically identified or accounted for in the SIP. As a result, 139.4 tons of NO_x emissions would need to be offset in Year 1. No emission offsets are needed for Year 2 since emissions are below the threshold for conformity. The quantity of available offsets in Rhode Island is extremely limited. Currently there are 259.9 tons per year of banked NO_x available in Rhode Island (McVay, 2009). This would be sufficient to cover the emissions from Cape Wind. However, there are potential transactions that could reduce this figure to 124.9 tons per year (McVay, 2009). This would leave 14.5 tons per year that would still have to be mitigated.

Cape Wind has submitted a contingency plan to MMS that contains a commitment to meet conformity through purchase of offsets or a combination of offsets and emission control measures for Cape Wind construction vessels (see Appendix B). Assuming that Cape Wind is granted the lease for development of its wind energy project, the company will identify, negotiate for, secure, and purchase available ERCs in Rhode Island. Concurrently with this process, Cape Wind will, if necessary, implement measures to reduce emissions from vessels and diesel engines used in the construction activities. Cape Wind identified the use of a NO_x reducing catalyst (NRC) and exhaust gas recirculation (NRC) as potential control technologies. The NO_x reductions that could be achieved range from 28 to 56 tons per year (see Appendix B). Cape Wind would have to procure services from companies that either operate equipment with one of these control technologies or agree to terms that include the retrofit of the engines.

Should the Cape Wind Project be approved by MMS, the lease would contain stipulations to assure that the project would meet conformity requirements for Rhode Island. Prior to commencement of construction activities, Cape Wind would provide MMS documentation of the purchase of offsets. Cape Wind would describe any emission control technologies it plans to use, quantify the emission reductions that would be achieved, and provide the necessary documentation demonstrating emission reductions. This would include appropriate source testing for all engines equipped with controls, or providing data from source tests done on similar engines with identical control technologies. MMS would obtain emission data from all Quonset Point activities and vessel operations in Rhode Island waters. For each vessel Cape Wind would be required to provide data on horsepower rating of all propulsion and auxiliary engines, duration of time operating in State waters, load factor, and fuel consumption. The emission data will be used to verify that actual emissions in Year 1 do not exceed the amount of emission offsets purchased.

Based on recommendations by RIDEM, MMS will also stipulate the following requirements for construction operations: (1) use of ultra low sulfur fuel, if available, for construction equipment and (2) for construction activities in Rhode Island compliance with the RIDEM Office of Air Resources' Air Pollution Control Regulation No. 25, Rhode Island Diesel Engine Anti-idling Program, which limits unnecessary idling of any onroad or nonroad diesel engine.

An air quality modeling analysis using the Offshore and Coastal Dispersion (OCD) version 5 model was used to determine compliance with National and State ambient air quality standards (AAQS) for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), and carbon dioxide (CO). The highest annual average concentrations of NO_2, SO_2, and $PM_{2.5}$ occurred over Nantucket Sound just outside the boundary of the wind farm project area. The highest 24-hour average concentrations of SO_2, PM_{10}, and $PM_{2.5}$ and the highest 3-hour average concentration of SO_2 occurred along the 115 kV cable installation route just offshore Hyannis Port, MA. The highest 8-hour and 1-hour average CO concentrations also occurred just off Hyannis. All modeled concentrations were within the NAAQS. Modeling was done for points along the vessel route between Quonset and Cape Wind. Modeled concentrations were significantly lower than those at the point with highest concentration. While modeling did not extend out to Rhode Island waters, impacts should be similar there because emissions come from the same vessels.

5.0 CONCLUSION

Based on the information presented here, the Cape Wind construction activities would meet Rhode Island conformity requirements with the stipulations that would be included in the lease. Should the Cape Wind Project be approved by MMS, the bureau will issue a lease to Cape Wind that will stipulate that prior to commencing construction activities, Cape Wind shall meet general conformity requirements through purchase of offsets that meet the requirements under RIDEM regulations or a combination of offsets and emission control measures. Furthermore, MMS will collect data from Cape Wind to calculate emissions to ensure that actual emissions do not exceed the offsets purchased. Commencement of construction would also be contingent on Cape Wind obtaining the needed air permit from EPA as well as any other permits needed from Federal, State, and local entities as required by law and regulation. If there are any requirements in the EPA air permit that would affect the assumptions in this analysis, or if there are any changes in Cape Wind's construction plan, this conformity determination may need to be revised. Should this situation arise, MMS will consult with EPA Region 1, RIDEM, and Cape Wind to assure that the project would continue to meet conformity requirements.

6.0 REFERENCES

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USEPA, 2009b. NONROAD2008a Emissions Model, **http://www.epa.gov/oms/nonrdmdl.htm** posted July 2009.

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Appendix A

AIR EMISSION CALCULATION SPREADSHEETS

Table A-1. Cape Wind Energy Project Air Emissions in Massachusetts
Vessel Transit in MA Waters Outside 25-mile Zone

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

Emission Factors from EPA's "Current Methodologies and Best Practices in Preparing Port Emission Inventories", April 2009

Diesel Fuel Sulfur Content:	500 ppm

Emission Factors - Ocean Going Vessel Main Engines, Medium-Speed Diesel, Marine Diesel Oil, g/kWh (Table 2-9)								
Engine	**NOx**	**VOC (HC)**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
MSD & MDO	13.2	0.50	0.20	1.10	0.47	0.43	646.08	0.00635

Emission Factors - Harbor Craft, Tier 0, g/kWh (Table 3-8)								
Engine Power	**NOx**	**VOC (HC)**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
225 - 449 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.0161
450 - 559 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.0161
560 - 999 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.00635
1,000 kW (Cat. 1)	13.0	0.27	0.043	2.50	0.30	0.29	690.00	0.00635
1,000 - 3,000 kW (Cat. 2)	13.2	0.50	0.043	1.10	0.72	0.70	690.00	0.00635

Category 1 vessels are defined by EPA as small harbor craft and recreational propulsion (<1,000 kW)
Category 2 vessels are defined by EPA as OGV auxiliary engines, harbor craft, and smaller OGV propulsion (1,000-3,000 kW)
Category 3 vessels are defined by EPA as OGV propulsion engines (>3,000 kW)
HAP emission factors are from AP-42 (Sections 3.3 & 3.4)
Load Factors are from Table 3-4 of the EPA Port Emissions Guidance Document
Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/KWh) x (1 lb/454 g) x (1 ton/2000 lb) x (# of sources)

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration (hrs/trip)	Operating Hours (per unit)	Assumptions	Load Factor	Auxiliary Engine Power Adjustment	Emissions (tons) NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Activities beyond 25 Miles of the Project and in MA Waters																			
Move jack up barge	attendant tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	4 trips	1	4		0.31	1.100	0.04	0.00	0.00	0.00	0.00	0.00	2.12	0.00
Transport piles and transition pieces	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	86 trips	1	78	avg. 3 piles per trip, 130 piles	0.68	1.100	3.82	0.14	0.06	0.32	0.14	0.12	186.87	0.00
Move scour installation equipment	attendant tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	4 trips	1	4	This is done twice (once per year)	0.31	1.100	0.04	0.00	0.00	0.00	0.00	0.00	2.12	0.00
Transport rock armor barges	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	276 trips	1	252	Spd. 8 knts	0.68	1.100	12.25	0.46	0.18	1.02	0.44	0.40	599.74	0.01
Transport filler material barges	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	370 trips	1	338	Spd. 8 knts	0.68	1.100	16.43	0.62	0.25	1.37	0.58	0.54	803.99	0.01
Subtotal												**32.6**	**1.2**	**0.5**	**2.7**	**1.2**	**1.1**	**1,595**	**0.0**
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**
Cable laying																			
115 kV Cable laying barge	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	4 trips	1	4		0.31	1.100	0.02	0.00	0.00	0.00	0.00	0.00	1.06	0.00
33 kV Cable laying barge	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	26 trips	1	24	13 round trips	0.31	1.100	0.13	0.00	0.00	0.01	0.01	0.01	6.88	0.00
Move Crane barge to cofferdam location	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	4 trips	1	4		0.31	1.100	0.02	0.00	0.00	0.00	0.00	0.00	1.06	0.00
Subtotal												**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**9**	**0.0**
Turbine installation																			
Turbines	one specialized vessel	1	6,000	4,474	Trips to/fr Quonset Point, RI	86 trips	1	78		0.83	1.100	4.66	0.18	0.07	0.39	0.17	0.15	228.10	0.00
Subtotal												**4.7**	**0.2**	**0.1**	**0.4**	**0.2**	**0.2**	**228**	**0.0**
ESP Installation																			
Crane barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	1	2		0.31	1.100	0.02	0.00	0.00	0.00	0.00	0.00	1.06	0.00
Pile Installation barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	1	2		0.31	1.100	0.02	0.00	0.00	0.00	0.00	0.00	1.06	0.00
ESP deck to wind farm	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	2 trips	1	2		0.68	1.100	0.09	0.00	0.00	0.01	0.00	0.00	4.35	0.00
Crane barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	1	2		0.31	1.100	0.02	0.00	0.00	0.00	0.00	0.00	1.06	0.00
Subtotal												**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**8**	**0.0**
TOTAL Construction Emissions Over 2-year Construction Duration												**37.6**	**1.4**	**0.6**	**3.1**	**1.3**	**1.2**	**1,839**	**0.0**

MA Border to 25-mile limit = 7.3 Miles
Miles are nautical milles
A vessel speed of 8 knots was assumed to determine the duration for each trip
All operating hours will be metered to track actual emissions.

Table A-2. Cape Wind Energy Project
Construction Emissions Onshore Activities - Massachusetts

Emission Factors (g/hp-hr) from EPA's Nonroad Engine Model Guidance Document, EPA420-P-04-009								
Equipment	**NOx**	**VOC**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Backhoes	7.220	1.850	0.950	8.210	1.370	1.330	691.100	
Bore/Drill Drigs	7.150	0.600	0.730	2.290	0.500	0.490	529.700	
Cement Mixers	7.280	0.610	0.730	2.320	0.480	0.470	529.700	
Dump Trucks	5.490	0.440	0.740	2.070	0.410	0.400	536.000	
Excavators	4.600	0.340	0.740	1.300	0.320	0.310	536.300	
Front End Loaders	5.000	0.380	0.740	1.550	0.350	0.340	536.200	
Graders	4.730	0.350	0.740	1.360	0.330	0.320	536.300	
Trenchers	5.810	0.510	0.740	2.440	0.460	0.440	535.800	

Emission Factors (g/mile) from EPA's MOBILE6 Vehicle Model Guidance Document, EPA420-F-05-022								
Vehicle	**NOx**	**VOC**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Heavy-Duty Trucks	4.97	0.29		1.32	0.13	0.13		
Pick-up Trucks	1.22	1.61		15.70	0.0065	0.006		

Emission Factor (tons/acre-month) from Mid-Atlantic Regional Air Management Association guidance.								
Emission	**NOx**	**VOC**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Fugitive Emissions					0.11	0.02		

Emission Factors (g/hp-hr) Diesel Recip. <600 hp Based on AP-42 Vol.1 , Tables 3.3-1 - 3.3-2								
Equipment	**NOx ****	**TOC ***	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Crane/Winch	6.86	1.14	0.01	3.02	1.00	1.00	521.63	0.00003

Diesel Fuel Sulfur Content:	15 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	Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Units	Emissions (tons) NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Onshore - Massachusetts																	
Ductbank, Conduit, and Vault Installation																	
Breaking Pavement/Stripping Topsoil	Excavators	1	300	224		75 days	10 hrs/day	750	hours	1.1	0.1	0.2	0.3	0.1	0.1	133	0.0
	Backhoes	1	100	75		75 days	10 hrs/day	750	hours	0.6	0.2	0.1	0.7	0.1	0.1	57	0.0
	Dump Trucks	1	300	224		75 days	10 hrs/day	750	hours	1.4	0.1	0.2	0.5	0.1	0.1	133	0.0
Trench Excavation	Excavators	1	300	224		75 days	10 hrs/day	750	hours	1.1	0.1	0.2	0.3	0.1	0.1	133	0.0
	Trenchers	1	175	131		75 days	10 hrs/day	750	hours	0.8	0.1	0.1	0.4	0.1	0.1	77	0.0
	Dump Trucks	1	300	224		75 days	10 hrs/day	750	hours	1.4	0.1	0.2	0.5	0.1	0.1	133	0.0
	Bore/Drill Rigs	1	300	224		75 days	10 hrs/day	750	hours	1.8	0.1	0.2	0.6	0.1	0.1	131	0.0
HDD Boring	HDD Drill Rig	1	300	224		20 days	10 hrs/day	200	hours	0.5	0.0	0.0	0.2	0.0	0.0	35	0.0
Concrete Casting of Ductbank	Cement Mixer	1	300	224		75 days	10 hrs/day	750	hours	1.8	0.2	0.2	0.6	0.1	0.1	131	0.0
Install Manholes	Front End Loaders	1	300	224		75 days	10 hrs/day	750	hours	1.2	0.1	0.2	0.4	0.1	0.1	133	0.0
Backfill Ductbank	Excavators	1	300	224		75 days	10 hrs/day	750	hours	1.1	0.1	0.2	0.3	0.1	0.1	133	0.0
	Backhoes	1	100	75		75 days	10 hrs/day	750	hours	0.6	0.2	0.1	0.7	0.1	0.1	57	0.0
	Dump Trucks	1	300	224		75 days	10 hrs/day	750	hours	1.4	0.1	0.2	0.5	0.1	0.1	133	0.0
	Graders	1	300	224		75 days	10 hrs/day	750	hours	1.2	0.1	0.2	0.3	0.1	0.1	133	0.0
Fugitive Emissions	All Types/Activities					1 acre	5 months	5	acre-months	0.0	0.0	0.0	0.0	0.6	0.1	0.0	0.0
Delivery of Supplies	Heavy-Duty Trucks	2		-		150 days	60 mi/day	18,000	miles	0.2	0.0	0.0	0.1	0.0	0.0	0	0.0
Worker Transport	Pick-up Trucks	10		-		150 days	120 mi/day	180,000	miles	2.4	3.2	0.0	31.1	0.0	0.0	0	0.0
Subtotal										**18.6**	**4.7**	**2.1**	**37.4**	**1.8**	**1.4**	**1,552**	**0.0**
115kV Transmission Line Installation																	
Cable Pulling	Heavy-Duty Trucks	1		-		75 days	10 mi/day	750	miles	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
	Winch	1	300	224		75 days	10 hrs/day	750	hours	1.7	0.3	0.0	0.7	0.2	0.2	129	0.0
Power Pole Installation	Bore/Drill Rigs	1	300	224		2 days	10 hrs/day	20	hours	0.0	0.0	0.0	0.0	0.0	0.0	4	0.0
	Crane	1	400	298		2 days	10 hrs/day	20	hours	0.1	0.0	0.0	0.0	0.0	0.0	5	0.0
	Heavy-Duty Trucks	1		-		2 days	10 mi/day	750	miles	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Fugitive Emissions	All Types/Activities					1 acre	5 months	5	acre-months	0.0	0.0	0.0	0.0	0.6	0.1	0	0.0
Delivery of Supplies	Heavy-Duty Trucks	2		-		150 days	60 mi/day	18,000	total miles	0.2	0.0	0.0	0.1	0.0	0.0	0	0.0
Worker Transport	Pick-up Trucks	10		-		150 days	120 mi/day	180,000	total miles	2.4	3.2	0.0	31.1	0.0	0.0	0	0.0
Subtotal										**4.4**	**3.5**	**0.0**	**32.0**	**0.8**	**0.4**	**137**	**0.0**
TOTAL Emissions Over Construction Duration										**23.0**	**8.2**	**2.1**	**69.4**	**2.7**	**1.8**	**1689.4**	**0.0**

All operating hours will be metered to track actual emissions.

Table A-3. Cape Wind Energy Project
Construction Emissions Onshore Activities - Rhode Island

Emission Factors (g/mile) from EPA's MOBILE6 Vehicle Model Guidance Document, EPA420-F-05-022								
Vehicle	**NOx**	**VOC**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Pickup truck/SUV	1.22	1.61		15.7	0.0065	0.006		
Emission Factors (g/hp-hr) Diesel Recip. >600 hp Based on AP-42 Vol.1 , Tables 3.4-1 - 3.4-4								
Equipment	**NOx ***	**VOC**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
Diesel Engine	6.86	0.33	0.01	2.4	0.32	0.32	526.16	0.00474

Diesel Fuel Sulfur Content:	15 ppm

* NOx emission factor used is the Tier 1 Emission Standard for nonroad engines (40 CFR 89.112(1)).

Emission Factors from EPA's "Current Methodologies and Best Practices in Preparing Port Emission Inventories", April 2009

Emission Factors - Ocean Going Vessel Main Engines, Medium-Speed Diesel, Marine Diesel Oil, g/kWh (Table 2-9)								
Engine	**NOx**	**VOC (HC)**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
MSD & MDO	13.2	0.50	0.20	1.10	0.47	0.43	646.08	0.00635
Emission Factors - Harbor Craft, Tier 0, g/kWh (Table 3-8)								
Engine Power	**NOx**	**VOC (HC)**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**HAPs**
225 - 449 kW (Cat. 1)	10.0	0.27	0.000	1.50	0.30	0.29	690.00	0.0161
450 - 559 kW (Cat. 1)	10.0	0.27	0.000	1.50	0.30	0.29	690.00	0.0161
560 - 999 kW (Cat. 1)	10.0	0.27	0.000	1.50	0.30	0.29	690.00	0.00635
1,000 kW (Cat. 1)	13.0	0.27	0.000	2.50	0.30	0.29	690.00	0.00635
1,000 - 3,000 kW (Cat. 2)	13.2	0.50	0.000	1.10	0.72	0.70	690.00	0.00635

Diesel Fuel Sulfur Content:	500 ppm

Category 1 vessels are defined by EPA as small harbor craft and recreational propulsion (<1,000 kW)
Category 2 vessels are defined by EPA as OGV auxiliary engines, harbor craft, and smaller OGV propulsion (1,000-3,000 kW)
Category 3 vessels are defined by EPA as OGV propulsion engines (>3,000 kW)
HAP emission factors are from AP-42 (Sections 3.3 & 3.4)
Load Factors are from Table 3-4 of the EPA Port Emissions Guidance Document
Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/KWh) x (1 lb/454 g) x (1 ton/2000 lb) x (# of sources)

Activity Type	Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration	Operating Hours (per unit)	Units	Load Factor	Auxiliary Engine Power Adjustment	Emissions (tons) NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Onshore - Rhode Island																			
Port Worker Commute																			
Vehicle Emissions	pickup trucks/SUV	25			240 days	480 trips	30 miles/trip	14,400	miles			0.5	0.6	0.0	6.2	0.0	0.0	0.0	0.0
Subtotal												**0.5**	**0.6**	**0.0**	**6.2**	**0.0**	**0.0**	**0**	**0.0**
Delivery of Parts & Materials																			
Cargo Barge Tow Tug - Light	tow tug	1	1,500	1,119	Cable	15 trips	4 hrs/trip	60	hours	0.31	1.100	0.3	0.0	0.0	0.0	0.0	0.0	17.4	0.0
Cargo Barge Tow Tug - Middle	tow tug	1	3,000	2,237	Scour	2 trips	4 hrs/trip	8	hours	0.31	1.100	0.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0
Cargo Barge Tow Tug - Heavy	tow tug	1	6,000	4,474	All Else	410 trips	4 hrs/trip	1,640	hours	0.68	1.100	79.8	3.0	1.2	6.6	2.8	2.6	3905.4	0.0
Subtotal												**80.2**	**3.0**	**1.2**	**6.7**	**2.9**	**2.6**	**3,927**	**0.0**
Construction Staging Activities - Unloading/Staging/Loading																			
Piles & Transition Pieces	Crane	1	800	597		43 trips	8 hrs/trip	344	hours			2.1	0.1	0.0	0.7	0.1	0.1	159	0.0
Scour Installation Equipment	Crane	1	800	597		2 trips	8 hrs/trip	16	hours			0.1	0.0	0.0	0.0	0.0	0.0	7	0.0
Rock Armor	Crane	1	800	597		138 trips	8 hrs/trip	1,104	hours			6.7	0.3	0.0	2.3	0.3	0.3	512	0.0
Filler Material	Crane	1	800	597		185 trips	8 hrs/trip	1,480	hours			8.9	0.4	0.0	3.1	0.4	0.4	686	0.0
115 kV Cable	Crane	1	800	597		2 trips	8 hrs/trip	16	hours			0.1	0.0	0.0	0.0	0.0	0.0	7	0.0
33 kV Cable	Crane	1	800	597		13 trips	8 hrs/trip	104	hours			0.6	0.0	0.0	0.2	0.0	0.0	48	0.0
Turbines	Crane	1	800	597		43 trips	8 hrs/trip	344	hours			2.1	0.1	0.0	0.7	0.1	0.1	159	0.0
ESP Deck	Crane	1	800	597		1 trip	8 hrs/trip	8	hours			0.0	0.0	0.0	0.0	0.0	0.0	4	0.0
Subtotal								**3,416**				**20.6**	**1.0**	**0.0**	**7.2**	**1.0**	**1.0**	**1,584**	**0.0**
TOTAL Emissions Over Construction Duration												**101.3**	**4.7**	**1.2**	**20.1**	**3.8**	**3.6**	**5,511**	**0.1**

Tow tug hours were based on traveling 32 nautical mile round-trips from the RI Border to Quonset Point and back to the RI Border at a speed of 8 knots (4 hours per round trip).
Assumes 8 hours of total crane operating time for unloading/staging/loading for each vessel trip.
All operating hours will be metered to track actual emissions.

Table A-4. Cape Wind Energy Project Air Emissions in Rhode Island
Vessel Transit in RI Waters

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

Diesel Fuel Sulfur Content:	500 ppm

Emission Factors from EPA's "Current Methodologies and Best Practices in Preparing Port Emission Inventories", April 2009

Emission Factors - Ocean Going Vessel Main Engines, Medium-Speed Diesel, Marine Diesel Oil, g/kWh (Table 2-9)								
Engine	NOx	VOC (HC)	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
MSD & MDO	13.2	0.50	0.20	1.10	0.47	0.43	646.08	0.00635
Emission Factors - Harbor Craft, Tier 0, g/kWh (Table 3-8)								
Engine Power	NOx	VOC (HC)	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
225 - 449 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.0161
450 - 559 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.0161
560 - 999 kW (Cat. 1)	10.0	0.27	0.043	1.50	0.30	0.29	690.00	0.00635
1,000 kW (Cat. 1)	13.0	0.27	0.043	2.50	0.30	0.29	690.00	0.00635
1,000 - 3,000 kW (Cat. 2)	13.2	0.50	0.043	1.10	0.72	0.70	690.00	0.00635

Category 1 vessels are defined by EPA as small harbor craft and recreational propulsion (<1,000 kW)
Category 2 vessels are defined by EPA as OGV auxiliary engines, harbor craft, and smaller OGV propulsion (1,000-3,000 kW)
Category 3 vessels are defined by EPA as OGV propulsion engines (>3,000 kW)
HAP emission factors are from AP-42 (Sections 3.3 & 3.4)
Load Factors are from Table 3-4 of the EPA Port Emissions Guidance Document
Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/KWh) x (1 lb/454 g) x (1 ton/2000 lb) x (# of sources)

Activity Type	Vessel Type/ Emission Source	Number of Sources	Equipment Size (HP)	Equipment Size (kW)	Activity	Count	Duration (hrs/trip)	Operating Hours (per unit)	Assumptions	Load Factor	Auxiliary Engine Power Adjustment	Emissions (tons) NOx	VOC	SO_2	CO	PM_{10}	$PM_{2.5}$	CO_2	HAPs
Construction Period - Activities beyond 25 Miles of the Project and in RI Waters																			
Move jack up barge	attendant tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	4 trips	2	10		0.31	1.100	0.11	0.00	0.00	0.01	0.01	0.01	5.51	0.00
Transport piles & transition pieces	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	86 trips	2	204	avg. 3 piles per trip, 130 piles	0.68	1.100	9.94	0.38	0.15	0.83	0.35	0.32	486.38	0.00
Move scour installation equipment	attendant tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	4 trips	2	10	This is done twice (once per year)	0.31	1.100	0.11	0.00	0.00	0.01	0.01	0.01	5.51	0.00
Transport rock armor barges	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	276 trips	2	656	Spd. 8 knts	0.68	1.100	31.89	1.21	0.48	2.66	1.14	1.04	1560.95	0.02
Transport filler material barges	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	370 trips	2	879	Spd. 8 knts	0.68	1.100	42.75	1.62	0.64	3.56	1.52	1.39	2092.58	0.02
Subtotal												**84.8**	**3.2**	**1.3**	**7.1**	**3.0**	**2.8**	**4,151**	**0.0**
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
Cable laying																			
115 kV Cable laying barge	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	4 trips	2	10		0.31	1.100	0.05	0.00	0.00	0.00	0.00	0.00	2.75	0.00
33 kV Cable laying barge	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	26 trips	2	62	13 round trips	0.31	1.100	0.34	0.01	0.00	0.03	0.02	0.02	17.90	0.00
Move Crane barge to cofferdam location	tow tug	1	1,500	1,119	Trips to/fr Quonset Point, RI	4 trips	2	10		0.31	1.100	0.05	0.00	0.00	0.00	0.00	0.00	2.75	0.00
Subtotal												**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**23**	**0.0**
Turbine installation																			
Turbines	one specialized vessel	1	6,000	4,474	Trips to/fr Quonset Point, RI	86 trips	2	204		0.83	1.100	12.13	0.46	0.18	1.01	0.43	0.40	593.67	0.01
Subtotal												**12.1**	**0.5**	**0.2**	**1.0**	**0.4**	**0.4**	**594**	**0.0**
ESP Installation																			
Crane barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	2	5		0.31	1.100	0.05	0.00	0.00	0.00	0.00	0.00	2.75	0.00
Pile Installation barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	2	5		0.31	1.100	0.05	0.00	0.00	0.00	0.00	0.00	2.75	0.00
ESP deck to wind farm	tow tug	1	6,000	4,474	Trips to/fr Quonset Point, RI	2 trips	2	5		0.68	1.100	0.23	0.01	0.00	0.02	0.01	0.01	11.31	0.00
Crane barge towing	tow tug	1	3,000	2,237	Trips to/fr Quonset Point, RI	2 trips	2	5		0.31	1.100	0.05	0.00	0.00	0.00	0.00	0.00	2.75	0.00
Subtotal												**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20**	**0.0**
TOTAL Construction Emissions Over 2-year Construction Duration												**97.8**	**3.7**	**1.5**	**8.1**	**3.5**	**3.2**	**4,788**	**0.0**

- Quonset Point to RI Border = 19 Miles
- Miles are nautical milles

A vessel speed of 8 knots was assumed to determine the duration for each trip
All operating hours will be metered to track actual emissions.

Appendix B

Cape Wind Letters of Commitment to Mitigation

ESS Group, Inc.

Engineers
Scientists
Consultants

888 Worcester Street
Suite 240
Wellesley
Massachusetts
02482
p 781.431.0500

October 8, 2009

Rodney E. Cluck, Ph.D.
Office of Offshore Alternative Energy Programs
U.S. Department of the Interior
Minerals Management Service
381 Elden Street, Mail Stop 4042
Herndon, Virginia 20170

Re: Cape Wind Energy Project
Mitigation & Offset Plan
EPA Comment Letter Response

Dear Dr. Cluck:

ESS Group, Inc. (ESS) presented a mitigation and offset plan for the Cape Wind Energy Project in a letter to MMS dated September 4, 2009 (updated and revised from a letter submitted on June 25, 2009). The plan identified specific offsets and mitigation measures for the project to satisfy general conformity, and a timeline for accomplishing them. On October 5, 2009, the EPA issued a comment letter to MMS, which requested some additional clarification on the plan. The following are clarifications to the plan, which have been prepared in response to the EPA comment letter.

- In the September 4, 2009 letter, the term "secure" means that Cape Wind will commit to purchasing sufficient NO_X emissions offsets to satisfy general conformity through written agreements, such as letters of intent or options to purchase, within the time frame specified in the plan, assuming no project delays. Cape Wind will then purchase the offsets prior to initiating any construction activities that will result in emissions which are subject to general conformity, as described in the plan.

- Cape Wind provided MMS and EPA with revised estimates of the emissions from the project during construction activities in July of 2009. According to the estimates, the NO_X emissions from the project are expected to exceed the general conformity threshold of 100 tons per year during the first year of construction. Cape Wind therefore anticipates that the final determination will conclude that the project is subject to general conformity. To comply with the requirements of the general conformity determination, Cape Wind will offset all direct and indirect project emissions for any year that the emissions from the project equal or exceed the threshold levels.

I hope that this letter adequately addresses the issues raised in the EPA comment letter and provides you with the information you need for the completion of the general conformity determination for the Cape Wind Energy Project. If you have any questions regarding this submittal, do not hesitate to call me at (781) 489-1149.

Sincerely,

ESS GROUP, INC.

Michael E. Feinblatt
Project Manager

C: Andy Krueger, MMS
Dirk Herkhof, MMS
Craig Olmsted, Cape Wind Associates
Rachel Pachter, Cape Wind Associates
Chris Rein, ESS
Terry Orr, ESS

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September 4, 2009

James F. Bennett
Chief, Environmental Assessment Branch
U.S. Department of the Interior
Minerals Management Service
381 Elden Street
Herndon, Virginia 20170

Re: ***Mitigation & Offset Plan***
General Conformity Determination
Cape Wind Energy Project

Dear Mr. Bennett:

The Minerals Management Service (MMS) issued a Draft General Conformity Determination for the Cape Wind Energy Project (the Project) on November 26, 2008 to satisfy the requirements of 40 CFR 93, Subpart B. The conclusion of the Draft Determination was that the Project will satisfy the Massachusetts and Rhode Island conformity requirements on the condition that Cape Wind purchases sufficient, approved Emission Reduction Credits (ERCs) to offset the nitrogen oxides (NO_x) emissions projected during its construction.

According to the current emission estimates for the Project, the NO_X emissions during construction from project vessels and equipment will not exceed 100 tons per year in Massachusetts. The Project will therefore not be subject to the conformity requirements and no offsets will be required in Massachusetts.

The NO_X emissions from project vessels and equipment are estimated to be approximately 140 tons in Rhode Island during the first year of construction, thus requiring an equal amount of offsets to satisfy conformity. In a letter to MMS dated June 25, 2009, Cape Wind proposed to acquire the required ERCs in accordance with the General Conformity offset rules in place at the time construction commences. If there are not sufficient ERCs available at that time, Cape Wind will reduce the NO_X emissions in Rhode Island resulting from the Project's construction below the conformity threshold by reducing the activity levels of emission sources and/or by utilizing sources equipped with add-on NO_X emissions control systems.

In a letter to Cape Wind dated August 24, 2009, MMS requested a more detailed plan regarding mitigation and offsets than outlined in the June 25 letter, including identification of specific offsets and/or mitigation measures, and a timeline for accomplishing them. The following are responses to the specific information requests made by MMS in the August 24 letter:

<u>Item 1: Quantification of currently available emission reduction credits in Rhode Island</u>

ESS made an inquiry regarding the availability of ERCs to the Rhode Island Department of Environmental Management (RIDEM) on August 25, 2009. According to Ted Burns of RIDEM's Air Resources Division, there are 144 tons per year of NO_X ERCs currently available

www.essgroup.com

from Rhode Island sources. The quantity of currently available ERCs in Rhode Island would be sufficient to offset the Project's construction emissions.

Item 2: An approximate timeline for the acquisition of offsets following granting of a lease

Figure 2.3.1-1 in the January 2009 MMS Final Environmental Impact Statement (FEIS) for the Project outlined a complete project schedule from the initiation of the permitting process through completion of permitting, construction, operation, and decommissioning. According to Figure 2.3.1-1, the granting of a lease under the NEPA Process was anticipated to be completed by January 8, 2009. Construction activities were then anticipated to begin April 1, 2009, or approximately 80 days following granting of a lease. However, according to the timeline, the first construction activity which would result in emissions in Rhode Island would be the ESP installation. The ESP installation was anticipated to begin October 29, 2009, or approximately 290 days following the granting of a lease.

Due to delays in project permitting, Cape Wind now anticipates the granting of a lease and project permitting being completed in late 2009, with construction activities within Rhode Island commencing by the end of October of 2010. Following the granting of a lease in the timeframe described above, Cape Wind will identify the available ERCs. The process of identifying and securing ERCs will be conducted concurrently with equipment procurement activities, and will be completed by June 1, 2010.

Cape Wind estimates that the process of negotiating and consummating a purchase agreement for ERCs will take approximately 120 days. Based on these assumptions, Cape Wind anticipates, assuming no further project delays, initiating the process of acquiring offsets on or about June 1, 2010, and concluding by about October 1, 2010.

Item 3: Estimates of achievable emission reductions for the control measures identified

Cape Wind has investigated potential NO_X emissions add-on control systems for diesel engines and there are several viable technologies currently available that include NO_X reducing catalyst (NRC) and exhaust gas recirculation (EGR). There may be additional options available when offsets are required for the Project to reduce the NO_X emissions. The following table summarizes the achievable emission reductions for the control measures identified:

Control Technology	NO_X Reduction Efficiency [1]	Achievable NO_X Reductions [2]
NO_X Reducing Catalyst (NRC)	20%-30%	28-42 tons
Exhaust Gas Recirculation (EGR)	30%-40%	42-56 tons

[1] "Sources and Strategies for the Control of Diesel Emissions", RIDEM, January 2007
[2] Based on 140 tpy of diesel emissions

As shown in the table, implementation of either of the identified control systems for the diesel engines associated with the Project could have the capability of reducing the annual NO_X emissions during construction below the 100 tpy conformity threshold, thus eliminating the need for the acquisition of offsets for the Project's construction to satisfy conformity.

Through its procurement process, Cape Wind will, if required due to the insufficient availability of ERCs, contractually require that diesel engines associated with vessels and equipment used on the Project be retrofitted with add-on control systems to achieve the emissions reductions that will satisfy conformity. The diesel engines for which such retrofits could be implemented include ships delivering parts and materials to the staging area, and cranes and other equipment used at the staging area to move and load parts and materials. Cape Wind will have the ability, through its procurement process, to implement retrofits on any of the vessels and equipment used on the Project, as is required to satisfy conformity.

Item 4: A schedule for making any required modifications to vessels' diesel engines

As described above, it is anticipated that there will be a period of approximately 9-10 months, assuming there are no unanticipated delays, between the granting of a lease and the start of Project construction activities in Rhode Island. It is during that time that Cape Wind will procure its contractors for the construction of the Project. Cape Wind anticipates that the procurement process will take approximately 6 months to complete. It is during this procurement process that Cape Wind will specify to its contractors the engine specifications and emissions control requirements for vessels and equipment to be used during the construction of the Project. The procurement process will occur concurrently with Cape Wind identifying and securing available ERCs, so that the need for additional emission reductions to satisfy conformity can be determined.

Assuming the lease is granted in late 2009, and no additional delays occur, Cape Wind will have completed the procurement process around June 1, 2010. This will allow Cape Wind sufficient time to evaluate the actual need for offsets in Rhode Island, the availability of ERCs, and the need for additional emission control measures prior to commencing construction activities within Rhode Island.

Conclusions

Cape Wind will need to offset its NO_X emissions in Rhode Island during construction prior to initiating construction activities, if emissions will exceed 100 tpy. There currently are sufficient ERCs available in Rhode Island to offset emissions to satisfy conformity. In the event that sufficient ERCs are not available, according to the offset rules in place at the time, Cape Wind will utilize other emission reduction methods to reduce the amount of offsets needed to the level of ERCs available, or to a level below the conformity threshold, so that offsets are not required for conformity. These emission reductions will come from the use of add-on controls, which have been identified above, or a reduction in the construction activities and resulting emissions within Rhode Island.

Additionally, as noted in the June 25th letter to MMS, the EPA has advised Cape Wind that a rule has been proposed that would allow the use of ERCs from a downwind state as offsets for conformity. (73 Federal Register 1402, Jan. 8, 2008). Cape Wind has followed EPA's rulemaking and has learned that EPA has transmitted the final rule to the Office of Management and Budget for review. If the rule is finalized in the near future, as it appears it may be, Cape Wind would likely have the option to acquire ERCs from Massachusetts to satisfy conformity if ERCs are not available in Rhode Island. This would negate the need for modifications to diesel engines as it is anticipated that there will be more than adequate offsets available in Massachusetts. The revised general conformity rule should be clearly accounted for in the conformity analysis.

In conclusion, there will be sufficient time between the granting of a lease and the start of construction activities in Rhode Island for Cape Wind to finalize and implement its mitigation and offset plan. Once construction activities begin, Cape Wind will provide MMS with the required equipment activity and fuel consumption data to verify that the actual emissions from the Project support the conformity determination.

Cape Wind therefore requests that the General Conformity Determination be finalized and the lease from MMS be granted on the condition that the NO_X emissions from the Project will be mitigated in accordance with the applicable regulations.

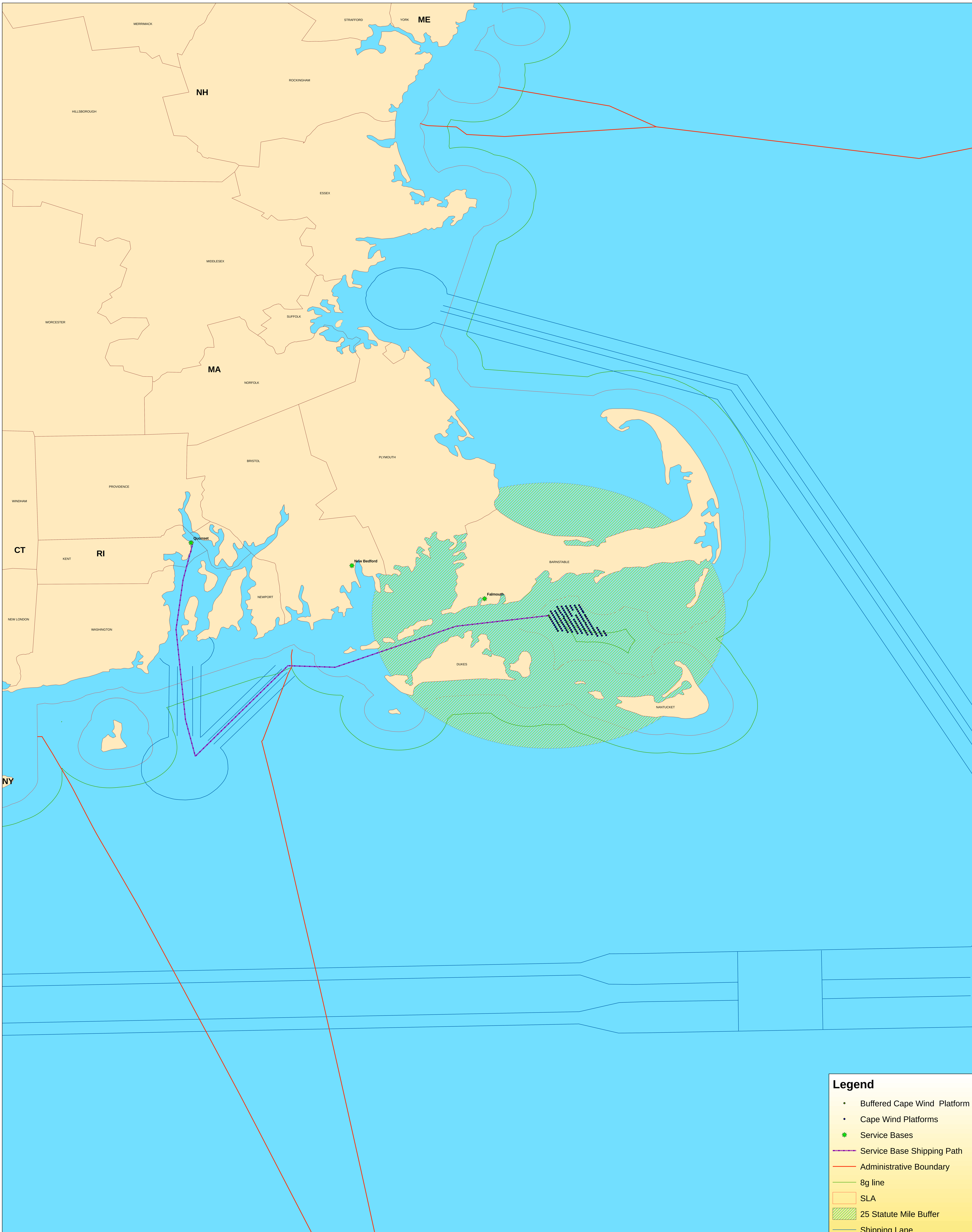
I hope that this letter provides you with the information you need for the completion of the General Conformity Determination for the Project. If you have any questions regarding this submittal, do not hesitate to call me at (781) 489-1149.

Sincerely,

ESS GROUP, INC.

Michael E. Feinblatt
Project Manager

C: Andy Krueger, MMS
Dirk Herkhof, MMS
Donald Cooke, EPA
Doug McVay, RIDEM
Craig Olmsted, Cape Wind Associates
Rachel Pachter, Cape Wind Associates
Chris Rein, ESS
Terry Orr, ESS



0 3 6 12 18 24 Nautical Miles

NOAA Nautical Chart 13003_1
NAD 1983 Geographic

CAPE WIND ENERGY PROJECT
Cape Wind Air Quality Map
Figure 1

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