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Mr. Brendan McCahill
Environmental Engineer
Air Permits, Toxics and Indoor Air Unit
U.S. Environmental Protection Agency – Region 1
5 Post Office Square
Suite 100, Attn: OEP-5-2
Boston, Massachusetts 02109-3912

Re: Draft OCS Air Permit Number OCS-R1-01
Cape Wind Energy Project
ESS Project No. E159-504.1

Dear Mr. McCahill:

The purpose of this letter is to respond to EPA's request that Cape Wind assess the potential impacts of the project on air quality, taking into consideration the recently promulgated 1-hour nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS). ESS Group, Inc. (ESS) conducted air dispersion modeling which shows that the emissions from the project sources during its construction will not result in air quality exceeding these NAAQS.

By way of background, an air quality impact analysis was conducted in September of 2008 in support of the general conformity determination for the project. The results of that analysis demonstrated that the ambient air impacts from the project during its construction, when combined with very conservative onshore background concentrations, would not cause or contribute to an exceedance of the NAAQS. The EPA subsequently promulgated a 1-hour NO_2 NAAQS of 100 parts per billion (ppb), which became effective on January 22, 2010. The final rule for a 1-hour SO_2 NAAQS of 75 ppb was signed by the EPA on June 2, 2010. On October 7, 2010, the EPA requested that Cape Wind conduct additional analyses to assess potential air quality impacts relative to these NAAQS.

On November 4, 2010, Cape Wind submitted a letter report to the EPA detailing the results of the additional modeling analysis, which demonstrated that the emissions from the Outer Continental Shelf (OCS) sources associated with the project would not cause or contribute to an exceedance of the 1-hour NAAQS. This letter also described how the analysis (1) grossly overestimated the potential impacts on air quality and (2) would not otherwise be required for onshore sources with similar attributes.

In a conference call on November 23, 2010, the EPA directed Cape Wind to conduct additional modeling analyses for vessels while in transit to the project site and the vessels associated with cable laying activities during the project's construction. Even though Cape Wind has conducted the requested analyses, the vessels while in transit and the vessels engaged in cable laying activities are not OCS sources regulated by the OCS Permit.

The definition of an OCS source (§ 55.2) includes 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; or
(2) Physically attached to an OCS facility, in which case only the stationary sources aspects of the vessels will be regulated.

The definition of potential emissions says, in part:

"Pursuant to section 328 of the Act, 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. This definition does not alter or affect the use of this term for any other purpose under §§55.13 and 55.14 of this part, except that vessel emissions must be included in the "potential to emit" as used in §§55.13 and 55.14 of this part."

§ 55.3(a), "Applicability", states:

"This part applies to OCS sources except those located in the Gulf of Mexico west of 87.5 degrees longitude."

Neither the vessels used to deliver materials nor the vessels associated with the cable laying activities will be permanently or temporarily attached to the seabed, or physically attached to an OCS facility. Even if such a vessel were to be attached temporarily to one of the project's OCS sources or the seabed, only the stationary source aspects of the vessel would be regulated as an OCS source, not the propulsion engine. Although the emissions from the propulsion engines are required to be included in the potential to emit of the OCS source, the definition of potential to emit in the OCS Air Regulations states that their inclusion is limited to that determination, and should not be applied for any other regulatory purpose.

The OCS Air Regulations (40 CFR 55) regulate OCS sources only. The sources and activities associated with the transport of materials to the Cape Wind project site during its construction, or the laying of cable from the wind farm to the landfall are not OCS sources, are beyond the scope of the OCS Air Regulations, and are therefore not regulated by the OCS Permit. As a result, a demonstration of compliance with the NAAQS for these sources should not be required by the EPA to satisfy the OCS permitting requirements. Nonetheless, Cape Wind has undertaken the following air quality modeling analysis at the request of EPA.

MODELING ANALYSIS

Air dispersion modeling was conducted to predict the ambient air impacts resulting from the emissions from the project vessels in transit to and from the staging area (within 25 miles of the project) and during cable laying activities during its construction. The air dispersion modeling analysis was conducted using the Offshore and Coastal Dispersion (OCD) Model (Version 5).

Construction Methodology

Cape Wind will employ various vessels, including barges and tugs, to transport parts and materials from the staging area to the various construction locations at the wind farm, throughout the 1-2 year construction period. Cape Wind has previously provided the EPA with the vessel types, activities, engine specifications and expected number and duration of transit trips for each project vessel within 25 miles of the project. It is has been assumed for this analysis that all of the vessels will travel the same transit route, which has previously been identified, from the 25-mile boundary to the wind farm. It has also been assumed, consistent with previous submittals, that each vessel will travel at a nominal speed of 8 knots while in transit.

The installation of the 115 kilovolt (kV) transmission cable system to transmit electrical power from the ESP to the landfall in Yarmouth is described in detail in Section 2.1.3 of the FEIS for the project. Two AC circuits are necessary to provide the required transmission capacity. Each circuit consists of two three-conductor cables, resulting in a total of four (4) cables. The submarine cables will be installed 6 feet below the seafloor by jetplow embedment, with approximately 20 feet of horizontal separation between circuits.

The proposed transmission cable route from the ESP to the landfall is approximately 12.5 miles in length. There will be two passes along the cable laying route, with a single pair of cables installed during each pass. Cable laying activities will be conducted continuously for 24 hours per day, at a nominal rate of approximately 300 feet per hour, during each pass. There will likely be a break for resupply between cable laying passes of up to several days, depending on equipment and personnel availability and weather conditions. Each pass along the cable route will take approximately 9 days to complete. It is expected that cable laying activities will be completed during a single 2 to 4 week period.

Emission Sources & Emission Rates

The emission rates for each source considered for the modeling analysis were the rates provided to the EPA in the most recent revision (July 2009) of the project construction emissions estimates. It was assumed for this analysis that all of the vessels have the same exhaust stack dimensions and exhaust parameters. The exhaust stack dimensions and exhaust parameters used for this analysis were the same as were used for the 2008 modeling analysis for the project.

Cape Wind has previously provided EPA with a list of the various vessels expected to be used to transport parts and materials during construction and their emission rates. Since it has been assumed that each vessel has the same exhaust stack dimensions and exhaust stack characteristics, the only differentiating factor between the various transit vessels for modeling purposes is the emission rates. The 6,000 Hp specialized vessel which will be used to transport the turbines to the wind farm has the highest NO_X and SO_2 emission rates (118.77 lb/hr and 1.79 lb/hr respectively) of the transit vessels proposed for the project. The modeling analysis for vessel transit was conducted using the emission rates from this vessel, to provide the most conservative estimate of impacts. The impacts from the other vessels will be lower than the impacts predicted by the modeling, as these vessels will have lower NO_X and SO_2 emission rates.

There are three vessels associated with the laying of the 115 kV submarine transmission cable from the ESP to the landfall in Yarmouth: a 400 Hp crane barge, a 1,500 Hp attendant tug, and a 4,000 Hp anchoring tug. The combined NO_X and SO_2 emission rates from these three sources are 43.6 lb/hr and 0.15 lb/hr, respectively. For this analysis, these sources were modeled as a single source, with a single exhaust point with the same dimensions and exhaust parameters as were used for the 2008 analysis, at their combined emission rates.

The sources associated with installing the 33 kV inner array cables for the project are of similar type, but will generally have smaller engines and will have lower combined emission rates than the sources associated with laying the 115 kV cable. By demonstrating compliance with the NAAQS for the 115 kV cable laying sources, compliance for the sources associated with the 33 kV inner array cables has been effectively demonstrated, because their emission rates will be lower.

Meteorological Data

The same meteorological data that was used for the 2008 modeling analysis was used for this analysis. Cape Wind has previously provided the EPA with all of the meteorological data used for this modeling analysis.

Modeling Methodology – Vessel Transit

Modeling was conducted to determine the worst-case impact concentrations from the worst-case transit vessel at any location along the expected transit route. Consistent with the 2008 modeling analysis, vessel transit locations were spaced at 500 meter intervals. This interval distance was selected because the modeling analysis demonstrated that there is minimal interaction in the impact concentrations resulting from multiple sources along the transit route at this distance.

At a speed of 8 knots, the vessel will traverse approximately 14,826 meters (30 vessel transit locations) per hour, and will traverse 500 meters in approximately 2 minutes. The hourly emission rate at any given location from the vessel was determined as the hourly rate divided by 30, to reflect the fact that the vessel will only produce emissions at that location for a 2 minute period in any hour. There will be zero emissions from the vessel at that location for the remaining 58 minutes of the hour. The resulting hourly NO_X and SO_2 emission rates used for the modeling were 3.9 lb/hr and 0.059 lb/hr, respectively.

A rectangular receptor grid was placed at 100-meter spacing around the vessel out to 500 meters, reflecting potential impact concentrations anywhere along the sea route. The OCD Model was applied for the full year of meteorological data to determine the maximum predicted ambient concentrations resulting from the emissions from a vessel in transit. The predicted NO_X impact concentrations were adjusted using the default Ambient Ratio Method (ARM) factor of 0.75 for conversion to NO_2 impacts, which are the basis of the standard.

The OCD Model predicted the average impact values for each hour for the full year of meteorological data, as well as the daily maximum 1-hour values. The eighth high of the daily maximum 1-hour NO_2 impact values was selected as the modeled project impact resulting from vessel transit, consistent with the basis of the 1-hour NO_2 NAAQS and the applicable EPA modeling guidance. The maximum modeled 1-hour SO_2 impact concentration for the full year of meteorological data resulting from vessel transit was used in the determination of compliance with the 1-hour SO_2 NAAQS.

Modeling Methodology - Cable Laying

Modeling was also conducted to determine the maximum distance at which an impact concentration greater than the 1-hour NO_2 NAAQS standard concentration could occur as a result of the emissions from the cable laying sources. Three separate rectangular grids were centered on the combined cable laying source, using the emission rates and exhaust parameters detailed above, to determine the maximum impact concentrations over the full year of meteorological data as follows:

- 100-meter spacing out to 1 kilometer
- 200-meter spacing out to 2 kilometers
- 250-meter spacing out to 2.5 kilometers

A separate modeling run was conducted for each of these three receptor grids. The results of the analysis determined that the maximum distance at which an impact concentration which could potentially exceed the 1-hour NO_2 standard concentration, utilizing the default ARM factor of 0.75 to convert modeled NO_X impacts to NO_2 impacts, and in combination with background concentrations, could occur was approximately 1.9 kilometers from the source. So for any given receptor along the route, impact concentrations above the standard concentration could occur from the cable laying combined source when the source is approaching the receptor within 1.9 km, and when the source is moving away from the receptor out to a distance of 1.9 km. The total travel distance in which the source could impact any receptor during a single pass at a level which could exceed the standard concentration is 3.8 km.

The cable laying equipment will travel at an approximate speed of 300 feet per hour. At this rate, the cable laying source will travel through the 3.8 km distance in approximately 41.6 hours, or 1.7 days. This represents the longest duration that any receptor could be exposed to concentrations which could exceed the standard concentration during each pass. Because cable laying will involve two passes, the total exposure time for each receptor was determined to be 3.4 days.

The 1-hour NO_2 NAAQS is based on the eighth highest daily maximum 1-hour concentration over a full year. The standard allows a source to produce impacts that exceed the standard concentration at least once per day for up to seven days per year. This analysis has determined that the longest period that any receptor along the cable laying route could potentially be exposed to impact concentrations above the standard is less than seven days per year, thus complying with the standard.

The maximum modeled 1-hour SO_2 impact concentration from cable laying, in combination with background, was used to determine compliance with the 1-hour SO_2 NAAQS.

Background Concentrations

Compliance with the NAAQS is accomplished by combining modeled project impacts with existing background concentrations. The background concentrations used for this analysis were the same as were used and detailed in the November 4, 2010 modeling report. As described in that report, the background concentrations used were the most representative available; however it is likely that the actual background concentrations within the project area are significantly lower than the background values used.

Modeling Results

The highest eighth high (98^{th} percentile) of the modeled daily maximum 1-hour NO_2 impact concentrations resulting from vessels in transit was added to the background concentration to determine compliance with the NAAQS. The maximum modeled 1-hour SO_2 concentration resulting from vessels in transit was also added to background to determine NAAQS compliance. The results of the air dispersion analysis for vessel transit are summarized in the following table:

Pollutant & Averaging Period	Modeled Project Impact (μg/m^3)	Background Concentration (μg/m^3)	Total Project Impact (μg/m^3)	NAAQS (μg/m^3)
NO_2 – 1 hour	44	88	132	188
SO_2 – 1 hour	1.5	61	63	196

The 1-hour NO_2 NAAQS is based on the eighth highest daily 1-hour maximum over a full year. The analysis conducted has demonstrated that the longest duration any receptor along the cable route could potentially be exposed to 1-hour NO_2 concentrations which could exceed the standard concentration is less than four days. Thus the analysis has demonstrated that the eighth highest daily maximum 1-hour NO_2 impact concentration resulting from cable laying activities, when combined with background, will not result in an exceedance of the NAAQS.

The maximum modeled 1-hour SO_2 concentration resulting from cable laying was added to background to determine NAAQS compliance as follows:

Pollutant & Averaging Period	Modeled Project Impact (µg/m^3)	Background Concentration (µg/m^3)	Total Project Impact (µg/m^3)	NAAQS (µg/m^3)
SO_2 – 1 hour	3.7	61	65	196

Conclusions

The results of the modeling analyses conducted demonstrate that the emissions from the Cape Wind project during its construction will not cause or contribute to an exceedance of the newly promulgated short-term NAAQS. The pertinent dispersion modeling analysis files from the additional analyses discussed in this letter have previously been provided to the EPA by email. If you have any questions regarding this analysis, or if you require any additional information, do not hesitate to call me at (781) 489-1149.

Sincerely,

ESS GROUP, INC.

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