MARYLAND DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION ADMINISTRATION
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PREVENTION OF SIGNIFICANT DETERIORATION APPROVAL TENTATIVE DETERMINATION AND FACT SHEET

US WIND, INC.
MARYLAND OFFSHORE WIND PROJECT
PSD APPROVAL - PSD-2024-01

I. DEFINITIONS

All terms defined in the Permit-to-Construct for the Maryland Offshore Wind Project (ARA Premises No. 047-0248) and Permit-to-Construct Tentative Determination and Fact Sheet apply to the PSD Approval (PSD-2024-01) and the PSD Tentative Determination and Fact Sheet.

II. INTRODUCTION

Major new or modified sources of air pollution to be located in areas of attainment are subject to Prevention of Significant Deterioration (PSD) regulations promulgated in 40 CFR §52.21.

The Maryland Department of the Environment (Department), Air and Radiation Administration (ARA) received an air quality permit application from US Wind, Inc. on August 17, 2023 and revised on November 30, 2023 for the construction and operation of the Maryland Offshore Wind Project consisting of up to 121 wind turbine generators (WTG), up to four (4) offshore substations (OSS), and one (1) meteorological tower (Met Tower). The proposed project will be located approximately 10 nautical miles (NM) at its closet point off the coast of Worcester County, Maryland on the outer continental shelf (OCS). The application includes an air quality permit-to-construct application, an application for a New Source Review (NSR) Approval, and an application for a Prevention of Significant Deterioration (PSD) Approval.

The Department has reviewed the PSD Approval application and has made a tentative determination that the proposed project is expected to comply with all applicable air quality control regulations. In accordance with the Environment Article, Section 1-604, Annotated Code of Maryland, the Department will schedule a public hearing and ask the public to comment on the application, the Department’s tentative determination, the draft approval conditions, and other supporting documents. A notice will be published at least once in the legal section of a daily or weekly newspaper of general circulation in Worcester County.

If the Department has not received any comments adverse to the tentative determination, the Department will issue the Approval after the comment period expires. If the Department receives adverse comments, it will review them and will make a final determination as to whether to issue or deny the permit. A notice of final determination, if required, will be placed in a newspaper of general circulation in the area.

III. PROJECT DESCRIPTION

US Wind, Inc. proposes to install up to 121 WTGs on the OCS across approximately 80,000 acres located on the Renewable Energy Lease Area OCS-A 0490 awarded by the Bureau of Ocean Energy Management (BOEM). US Wind, Inc. will develop the Maryland Offshore Wind Project where the pollutant-emitting activities within the Wind Development Area (WDA) are part of a single plan to construct and operate the project. It is anticipated that the Maryland Offshore Wind project will generate approximately two (2) gigawatts of electrical power. The WTGs use the energy of the wind, a source of renewable energy, and convert it to electricity. The project will be located about 10 NM at its closet point off the coast of Worcester County, Maryland on the OCS.

The proposed project's offshore components include the WTGs, and up to four (4) offshore substations (OSSs) that will receive the electricity generated by the WTGs via cables. The interarray cables will link the individual WTGs together to the OSSs, and the project will use 230-275 kV of export cables into onshore substations in Delaware. US Wind, Inc. will mount the WTGs on monopile foundations. A transition piece would then be fitted over the monopile and secured via bolts or grout. Finally, the nacelle and the blades are placed on the transition piece.

The OSSs are anticipated to be installed on piled jacket foundations. Where required, scour protection would be placed around foundations to stabilize the seabed near the foundations. The OSSs would serve as the interconnection points between offshore and onshore components. Each OSS will include electric generators, transformers, switchgears, and reactors to increase the voltage of the power captured from the interarray cables and control the flow through the export cables, so that the electricity can be efficiently transmitted onshore through submarine export cables. These offshore components are on the OCS.

The proposed project's onshore components are not subject to the OCS air regulations and thus will not be covered by the OCS air permit. Those onshore components include components such as the following: up to four (4) export cable landfall areas in MD state; up to three (3) onshore export and interconnection cable routes; new onshore substations in Delaware state where electricity will be transmitted to the electric grid; an onshore staging port where project components and equipment will be staged; and one (1) operation and maintenance facility with offices, control rooms, warehouses, workshop space, and pier space. Onshore components are being addressed in separate federal, state, and/or local permitting or government review processes that may have their own public comment processes and are not a subject of the public review for this OCS air permit.

The Maryland Offshore Wind Project will consist of three phases: construction and commissioning (C&C), operations and maintenance (O&M) and decommissioning. Offshore construction is anticipated to begin in 2025 and be completed within four (4) years. The anticipated commercial lifespan of the project (which is O&M) is over 30 years.

US Wind, Inc. proposes to use various marine vessels, which have onboard marine engines and construction equipment, for the following purposes: (1) for the C&C to construct the above-described offshore project components; and (2) for the O&M to maintain and repair the offshore project components.

The PSD Approval covers the offshore portion of C&C and O&M of the project located on the OCS. Decommissioning, which would be the reverse of C&C and will involve the use of various marine vessels and construction equipment, is not addressed in this Approval. The OCS air permitting requirements for decommissioning will be determined at that time because it is expected that marine vessel technology will substantially change over the next 30 years.

IV. PREVENTION OF SIGNIFICANT DETERIORATION APPLICABILITY

The basic goal of the PSD program is to ensure that economic growth will occur in harmony with the preservation of existing clean air quality. The primary provisions of the PSD program require major new stationary sources or major modifications to an existing major stationary source located in the air quality attainment areas to comply with the National Ambient Air Quality Standards (NAAQS), the applicable PSD air quality increments and Best Available Control Technology (BACT) requirements.

The proposed project was evaluated to determine whether potential emissions of regulated pollutants will be above the PSD major source thresholds for this type of source. Table 1 summarizes the potential air emissions of all PSD regulated pollutants from the project.

TABLE 1
POTENTIAL EMISSIONS – CRITERIA POLLUTANTS
INCLUSIVE OF NORMAL OPERATIONS, STARTUP, AND SHUTDOWN

Pollutant	Maximum Annual C&C and O&M, Combined During C&C (tons/rolling 12-months)	Total C&C and O&M, Combined During C&C (tons)	Maximum O&M (tons/rolling 12-months)
NOx	616	1380	25
CO	149	344	24
PM-10	20	45	0.66
PM-2.5	19	44	0.65
VOC	11	26	2
SO_2	2	4	0.07
Pb	0.003	0.007	0
GHG (as CO_2e)	41,673	95,898	6763

The Maryland Offshore Wind Project is not one of the listed source categories that trigger PSD at the 100 tons per year (tpy) threshold. However, this project does have the potential to emit 250 tpy of a regulated pollutant and is considered a new major source with respect to PSD requirements. If a new source is major for at least one PSD regulated attainment pollutant, then all other criteria pollutants for which the area is not classified as nonattainment and which are emitted in amounts greater than the PSD Significant Emission Rates (SER), are also subject to PSD review.

Table 2 provides a summary of the PSD applicability analysis for the proposed project, including the PSD SER.

TABLE 2
SUMMARY OF PSD APPLICABILITY ANALYSIS FOR PROPOSED PROJECT

Pollutant	Potential Emissions (tpy)	PSD Significant Emission Rates (tpy)	PSD Review?
NO_2	616	40	**Yes**
VOC	11	40	No
CO	149	100	**Yes**
PM-10	20	15	**Yes**
PM-2.5	19	10	**Yes**
SO_2	3	40	No
Pb	0.003	0.6	No
Sulfuric Mist (H2SO4)	---	7	No
Total Reduced sulfur (including H_2S)	---	10	No
Reduced Sulfur Compounds (including H2S)	---	10	No
GHG Emissions (CO_{2e})	41,673	75,000	No

As indicated in Table 2, potential emissions of NO_2, CO, PM-10 and PM-2.5 exceed the significance thresholds, and are, therefore, subject to PSD review.

V. PREVENTION OF SIGNIFICANT DETERIORATION REQUIREMENTS

For regulated pollutants with potential emissions that exceed the PSD significance thresholds, US Wind must:

(1) Demonstrate use of BACT for pollutants with significant emissions;
(2) Assess the ambient impact of emissions through the use of dispersion modeling;

(3) If the impact is significant, evaluate (through the use of dispersion modeling) compliance with the NAAQS and consumption of air quality increments; and

(4) Conduct additional impact assessments which analyze impairments to visibility, solids, and vegetation as a result of the modification, as well as impacts on Class I areas.

VI. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

(1) BACT Requirements and Analysis

BACT for any source is defined in COMAR 26.11.17.01(B)(5) as:

(a) "Best available control technology" means an emissions limitation, including a visible emissions standard, based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Department, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for that source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of the pollutant.

(b) Application of best available control technology may not result in emissions of any pollutant which would exceed the emissions allowed by an applicable standard under 40 CFR 60 and 61.

(c) If the Department determines that technological or economic limitations on an application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination of these, may be prescribed instead to satisfy the requirement for the application of best available control technology. These standards shall, to the degree possible, set forth the emissions reduction achievable by implementation of the design, equipment, work practice, or operation, and shall provide for compliance by means which achieve equivalent results.

BACT analyses are conducted using EPA's "top-down" BACT approach as described in EPA's *Draft New Source Review Workshop Manual* (EPA 1990). The five basic steps of a top-down BACT analysis are listed below:

Step 1: Identify potential control technologies
Step 2: Eliminate technically infeasible options
Step 3: Rank remaining control technologies by control effectiveness
Step 4: Evaluate the most effective controls and document results
Step 5: Select BACT

The first step is to identify potentially “available” control options for each emission unit triggering PSD, for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emission unit in question. The list includes technologies used to satisfy BACT requirements, innovative technologies, and controls applied to similar source categories.

For the Maryland Offshore Wind Project, the following sources were investigated to identify potentially available control technologies:

(1) EPA’s RACT/BACT/LAER Clearinghouse (RBLC) database;
(2) In-house experts;
(3) EPA’s New Source Review website;
(4) Other State air regulatory agency contacts;
(5) Technical articles and publications; and
(6) Recently issued offshore wind permits.

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible for BACT, a technology must be both available and applicable.

The third step is to rank the technologies not eliminated in Step 2 in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform any further technical or economic evaluation. Potential adverse impacts, however, must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or “cost-effectiveness” analysis is conducted in a manner consistent with EPA’s OAQPS Control Cost Manual, Fifth Edition (EPA 1996) and subsequent revisions.

The fifth and final step is to select as BACT the emission limit from application of the most effective of the remaining technologies under consideration for each pollutant of concern.

(2) BACT Determination for the Maryland Offshore Wind Project

Although potential annual emissions from the entire offshore portion of C&C and O&M located on the OCS must be considered for the PSD applicability analysis, only OCS sources associated with the project are subject to BACT requirements per 40 CFR, Part 55.

US Wind, Inc. evaluated the use of engine design (including turbocharging and aftercooling), selective catalytic reduction, selective non-catalytic reduction, use of certified engines, and good design and operating practices. It has been established that replacing, retrofitting, or waiting for vessels that utilize add-on controls like selective catalytic reduction would impose detrimental costs to the project. Also, all vessels will be contracted through a third party.

US Wind, Inc. is required to apply for and obtain a major NSR Approval for NOx (an ozone precursor), because it will be located in the Ozone Transport Region. LAER under NSR by definition must be at least as stringent as BACT under PSD. US Wind, Inc. has not yet contracted for the vessels it will require for the Maryland Offshore Wind Project. The ability for US Wind, Inc. to contract for specific vessels will depend on the pool of vessels that are available on the timeline needed for deployment.

Due to this uncertainty, the NSR Approval requires that all vessels contracted by US Wind, Inc. be equipped with marine engines (main and auxiliary) that meet the most stringent, applicable EPA Tier or MARPOL Annex VI emissions standard available and at a minimum, are engines certified to EPA Tier 2 emissions standards or MARPOL Annex VI emissions standards for foreign flagged vessels. LAER for NOx emissions from OCS sources has been specified as the proposed combination of the use of the vessels with the highest certified EPA Tier engine or EIAPP engine available at the time of deployment.

For the non-marine portable diesel generator engines used during C&C and O&M and for the permanent diesel generator engines on the four (4) OSSs used during O&M, to meet LAER requirements, the Permittee shall ensure that each of the engines is certified to meet the EPA Tier 4 emission standard from 40 C.F.R. § 1039, that applies to each engine.

Finally, US Wind, Inc. must also use good combustion practices to meet LAER requirements for OCS sources.

Since LAER must be at least as stringent as BACT, the LAER strategy for NOx emissions from OCS sources is also considered BACT for NO_2 emissions from OCS sources. For emissions of CO, PM-10, and PM-2.5 from OCS sources, BACT would be the same EPA Tier and MARPOL Annex VI emissions standard requirements for those pollutants and the use of good combustion practices.

Additional BACT Considerations for PM-10 and PM-2.5

The Permittee shall comply with the following additional BACT fuel requirements for PM-10 and PM-2.5 from the Maryland Offshore Wind Project, while the vessel is an OCS source:

(a) The Permittee shall use ultra-low-sulfur diesel (ULSD) fuel in all Category 1 and 2 engines, Non-Marine Engines, Portable Diesel Generator Engines used during C&C and O&M, and Permanent Diesel Generator Engines on OSS during O&M that meets the per-gallon standards below.
  (i) A maximum sulfur content of 15 parts per million (ppm); and
  (ii) A minimum cetane index of 40; or
  (iii) A maximum aromatic content of 35 volume percent.

(b) The Permittee shall use fuel with a maximum sulfur content of 1000 ppm in all Category 3 engines.

Since both C&C and O&M occur on the OCS, add-on technologies and inherently lower emitting practices are not technically feasible. The combination of using engines certified to EPA Tier and MARPOL Annex VI emissions standards and using good combustion practices and low sulfur fuels are the best available controls for emissions of NO_2, CO, PM-10, and PM-2.5 from OCS sources.

VII. AIR QUALITY ANALYSIS

The main purpose of the air quality analysis in a PSD application is to demonstrate that the proposed facility's emissions will not cause or contribute to a violation of any National Ambient Air Quality Standard (NAAQS) or PSD increment. The NAAQS are concentrations in the ambient air that are established by EPA at levels intended to protect human health and welfare, with an adequate margin of safety. The air quality analysis required for sources subject to PSD includes an evaluation of the impact of a source's emissions on the NAAQS, and also includes an evaluation of the impact on applicable PSD increments. PSD increments established by EPA as allowable incremental increases in ambient air concentration due to new or modified sources in attainment areas, have been set at levels that are substantially less than the NAAQS. PSD increments cannot be exceeded even if the NAAQS evaluation would allow for impacts from sources that are greater than the PSD increments.

An air quality analysis is required for each criteria pollutant subject to a NAAQS with a significant emissions increase. An air quality analysis is not required for non-criteria pollutants, or those pollutants not subject to a NAAQS. With respect to GHG, there are currently no NAAQS or PSD increments established for GHG, and therefore these PSD requirements would not apply to GHG, even when PSD is triggered for GHG. For this project, an air quality analysis is required for the following criteria pollutants with a significant emissions increase: CO, NO_2, PM-2.5, and PM-10.

Dispersion models are the primary tools used to project the ambient concentration that will result from the proposed PSD source emissions. The dispersion modeling analysis usually consists of two distinct phases: (1) a preliminary analysis; and (2) a full impact analysis.

(1) Modeling Overview

The modeling analysis is based on information provided by US Wind, Inc. and its consultant TRC in the following documents:

- Revised Air Quality Modeling Protocol received March 10, 2023;
- Responses to the Department's request for additional information received November 30, 2023;
- Revised Maryland Offshore Wind Project Outer Continental Shelf Air Permit Application submitted to the Department on November 30, 2023;
- Response to the Department's Supplemental Request for Additional Information received December 7, 2023;
- Addendum to OCS Air Permit Application received January 5, 2024;
- Response to the Department's Supplemental Request for Additional Information for OCS Air Permit received January 5, 2024;
- Class I AQRV Assessment Modeling Protocol, received on May 23, 2024;
- Class I AQRV Assessment Modeling Report, received on July 31, 2024; and
- Response to the Department's Comments received October 25, 2024.

(2) Modeling Methodology

The dispersion modeling analysis completed for the Maryland Offshore Wind Project was conducted in accordance with the EPA's Guideline on Air Quality Models or the Guideline. The EPA published the Guideline as Appendix W to 40 CFR Part 51.

Dispersion Model Selection
US Wind Inc.'s air dispersion modeling analyses were conducted using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 23132, combined with the AERCOARE meteorological data preprocessor program.

The following paragraphs summarize the major elements of the project's dispersion modeling analysis.

Meteorological Data
US Wind, Inc. used AERCOARE to generate the meteorological parameters used in AERMOD. AERCOARE applies the Coupled Ocean Atmosphere Response Experiment (COARE) air-sea flux algorithm to over water meteorological measurements to estimate surface energy fluxes and assembles these estimates and other measurements for subsequent dispersion model simulations with AERMOD.

The use of AERCOARE-AERMOD is considered an alternative model as per the Guideline. In accordance with the requirements of section 3.2.2(e) of the Guideline, US Wind, Inc. has satisfactorily demonstrated that it meets the requirements of this section and has received approval from EPA Region 3 with concurrence from EPA's Model Clearinghouse ("MCH") to proceed with this approach[1]. All information associated with the alternative model approval are included with the permit record.

The minimum set of over-water observations for the COARE algorithm must include wind speed, air temperature, sea temperature, and relative humidity. US Wind, Inc. assessed a recent five-year period (2017-2021) of meteorological data collected at the Ocean City Inlet Buoy and the Delaware Bay 26 NM Buoy, offshore of Ocean City and determined that neither of these buoys collect sufficient data that are necessary inputs to AERCOARE.

As an alternative to measured data, US Wind requested and received prognostic data from USEPA Office of Air Quality Planning and Standards (OAQPS). USEPA processed the Weather Research and Forecasting (WRF) data using the MMIF (Version 4.0) to convert the WRF prognostic meteorological data (2019-2021) into a format suitable for dispersion modeling applications. US Wind, Inc. then ran AERCOARE using the prognostic data and used the output as the meteorological database for the modeling analysis.

Source Characterization and Emissions

The air quality analysis for this project was conducted to account for construction and commissioning (C&C) and operation and maintenance (O&M). US Wind, Inc. assessed emissions from all emission units that are considered OCS sources. Vessel transit emissions when they are within 25 NM of the project centroid, vessel maneuvering emissions, as well as emissions from the emergency generators were included in the modeling analysis.

i. OCS Sources and Modeled Locations

A number of vessels would be required to support activities carried out during the C&C and O&M. The following activities may be taking place in various areas of the WDA simultaneously:

- Monopile (MP) Foundation Installation;
- Scour protection installation;
- WTG Installation;
- WTG Commissioning;
- OSS Installation;
- OSS Commissioning;
- Inter-Array Cable Installation;
- Offshore Export Cable Installation; and
- Overlapping O&M activities.

[1] The concurrence memos for the alternative model request are available at: https://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=23-III-01

O&M emissions would consist of the following activities:

- Vessel transit within the OCS area;
- Onsite maneuvering at the WTGs and OSSs; and
- Onsite diesel generators.

Activities would occur throughout the 25 NM OCS area and will be transient. US Wind, Inc. determined that, for simplification of the modeling given this spatial and temporal uncertainty regarding vessel locations, it was conservative to assume that these activities occur at the same location for the entire modeled period. Thus, all of the emission sources, except for transit emissions, were modeled at one single location with the same coordinates. The Department agrees that this approach is conservative. By modeling all activities in one single location, the predicted air quality impacts are considered to be concentrated. In reality, the air quality impacts are presumed to be distributed across all of the WTGs and the OSSs.

While maneuvering emissions were modeled at a single point, the transit emissions were modeled as a set of individual point sources along the length of the transit route. The total aggregate emissions of the individual point sources are the same as the total line source emissions calculated for the vessel activity. The point sources representing the line source are spaced approximately 0.6 mile (1 km) apart. The line source geometry was developed by conservatively assuming that all transiting vessels would follow the exact same route from the Sparrows Point route starting at a point 25 NM from the Project Centroid until the vessel reaches the Project Centroid.

ii. Temporal Variability

For averaging periods longer than 1-hour, the maximum source operation time for any given mode of operation and construction or O&M activity was modeled using the maximum hourly emissions rate that is scaled by the number of hours that source could be in operation by the number of hours in the averaging period. US Wind, Inc. noted that a propulsion or auxiliary engine can only be in one mode of operation at a time, and it would be reasonable to scale emissions to take into consideration the actual amount of time that an engine can be operated in either a transit or maneuvering mode over the course of the averaging period.

US Wind, Inc. used the following approach for modeling short-term standards:

- Model each C&C/O&M operation (i.e., including all the vessels and engines that would be in a single area at the same time), at a single location.
- Model as if the operation takes place at that single location for the entire modeling period (three years of meteorological data); and
- Separate modeling for individual construction/O&M scenarios.

US Wind, Inc. made the following argument to the above modeling approach: “The likelihood that any two (2) C&C/O&M scenarios could overlap in space and time is negligible and would likely not occur in practice. Thus, the chances of overlapping plumes is small, and combined with the additional levels of conservatism described above represent a possibility of overlapping (i.e., cumulative) impacts that is exceedingly small. To support the statement that overlapping impacts are unlikely, US Wind, Inc. provides the following:

1. The concentration gradient associated with individual source operations is limited and localized. The location of maximum modeled impacts for individual source operations are similar provided that sources have similar stack heights and exhaust parameters given that they are combustion sources (i.e., engines).
2. The entire C&C operation covers hundreds of positions over 10,000s of acres, and will take more than three (3) years to complete. The C&C/O&M scenarios with substantial emissions each take less than two (2) to three (3) days or less to complete. Unless specifically scheduled to occur near each other, the chances of operations with substantial emissions occurring in nearby positions is very low.
3. US Wind, Inc. has no intention of scheduling major construction operations near each other. For safety and logistics reasons, US Wind would avoid having large groups of vessels operating near one another.
4. The chance of an O&M activity having overlapping impacts with a construction activity is minimal as construction activities would not be anticipated nearby to an operating wind turbine.
5. Construction activities will happen only once per location. For O&M, the vessel’s position will not be the same visit to visit. Some inspections will not involve disembarking at the WTG or OSS; the vessel will instead slowly circumnavigate the WTG or OSS while crew visually inspect for damage or wear. When crew are disembarking from service vessels, the vessel will approach from different directions depending on the wind and ocean conditions. After transfer of crew, the vessel will then back away from the WTG or OSS and station nearby while the crew is working. The vessel would station itself at a different location each time depending on the wind and ocean conditions.
6. The timing and order of the O&M activities will not be in a set pattern, and the schedule will change regularly based on weather conditions. Each construction activity will happen for a single stretch of time, which for activities such as foundation installation is a few days or less. C&C activities at any one (1) position will be scheduled based on the weather and based on shifting logistics for the entire construction effort.”

To ensure compliance with the NAAQS and PSD increments and total daily emissions in Part D(2), Table 4 of the PSD Approval, vessels used for each of the following operations may not be operated simultaneously unless the Permittee can ensure compliance at other operating conditions: Foundation Installation, WTG Installation, WTG Commissioning, OSS Installation, Interarray Cable Installation, Export Cable Installation, and O&M.

iii. Refined Modeling for 1-hour NO_2 and 24-hour PM to Account for the Temporal Variability

In its refined modeling (shared with the Department on Feb. 5, 2024 upon request), US Wind, Inc. adjusted the modeling for 1-hour NO_2 and 24-hour PM to only include those vessels and engines that would be expected to operate together over an hourly or daily basis. The modeled scenarios included the following activities: foundation installation, WTG installation, WTG commissioning, OSS installation, inter-array cable installation, export cable installation, and O&M. This matrix was based on US Wind, Inc.'s determination of the feasibility that a vessel may be in operation simultaneously with another vessel, while taking into consideration need, availability, logistics, and security.

For example, multiple towing tugs during WTG installation would not be needed simultaneously as determined by US Wind, Inc.'s construction management team.

Stack Configurations

US Wind, Inc. provided estimates of source parameters (exit velocity, stack diameter, stack exit temperature) in Appendix A, Tables A-42 through A-44 of its November 30, 2023 application. Many of the offshore wind vessels have stack configurations other than vertical stack. AERMOD is configured to treat vertical or horizontal venting stacks, but not angled stacks. As such, US Wind, Inc. calculated the vertical component of the exhaust velocity using trigonometry based on the stack angle from vertical. This vertical component of the exhaust velocity was used as input into AERMOD.

Downwash

Aerodynamic downwash caused by buildings and structures in the vicinity of exhaust stacks can lead to an increase in ground level concentrations. Downwash effects are modeled within AERMOD by using algorithms derived from the ISCPRIME model. AERMOD requires information about buildings and structures to be input in a prescribed format. US Wind, Inc. used EPA's Building Profile Input Program for PRIME (BPIPPRM, version 04274 [September 30, 2004]) for this purpose. The BPIP program generates information on the location and size of buildings and structures relative to each stack, and AERMOD uses this information to calculate downwash effects.

US Wind, Inc. asserted that "The main structure for scenarios that could influence dispersion is the OSS platform." As such, US Wind assessed building downwash effects only for those vessels involved in OSS construction that may be attached to or near the OSS platform. In its response to the Department's comments dated October 25, 2024, US Wind, Inc. stated that "modeling vessel downwash from the vessel themselves is not technically feasible or practicable for several reasons including:

i. Specific vessels have not been selected for the OCS air permit application.
ii. Vessels are in motion during transit and maneuvering.
iii. The vessel cavity region will not extend to the safety exclusion zone."

Receptor Grid Development

i. NAAQS and PSD Class II Modeling Receptor Grid

For NAAQS and PSD Class II increment modeling, a polar grid of receptors was utilized in which receptors are placed in 10-degree increments around the ring. Receptor ring spacing were 25 m out to 1000 m, 250 m out to 2,500 m, 500 m out to 5,000 m, 2.5 km out to 10 km, and 5 km out to 50 km. Based on the results of the modeling with maximum impacts located within 1000 m, the receptor field did not need to be refined to ensure that the maximum impacts from the different C&C and O&M activities are being captured.
The EPA's AERMAP (version 18081) processor was used to determine the terrain and hill height scale elevations at each land-based receptor. All over water receptors were assigned an elevation of 0.0 m above mean sea level and a hill-height scale of 0.0 m.

For construction activities, it was assumed that a 500-meter exclusion zone would be established to keep the public away from the immediate area of the activity. The 500-meter exclusion zone was not applied in the O&M modeling.

ii. PSD Class I Modeling Receptor Grid

For PSD Class I modeling, receptors were placed at a distance of 50 km in those directions to Class I areas downwind of the project to conservatively model the impacts at the Brigantine NWR. Per the Department's request, receptors were also placed in an arc of receptors in those directions to the locations of Shenandoah National Park Class I area that are located within 300 km of the project. A ring of polar receptors was placed 50 km from the centroid of the WDA and receptors were placed at each degree. This methodology resulted in 26 receptor locations at 50 km downwind of the project in the direction of the Brigantine NWR and 22 receptor locations at 50 km downwind of the project in the direction of locations within Shenandoah National Park that are within 300 km of the project. The receptors were placed with base elevations that are representative of the minimum and maximum heights within the Class I areas. Brigantine NWR was modeled at sea level as this Park is located on the New Jersey Coastline and is flat.

In its refined modeling (shared with the Department on February 5, 2024 upon request), US Wind, Inc. adjusted its Class I modeling for the Brigantine NWR with a revised approach: "For Class I increment modeling for the 50 km receptors representative of the downwind locations to the Brigantine NWR, the vessel sources were modeled as an arc of sources at 50 km from the center of the 26 Brigantine NWR receptors. The sources were evenly spaced with 1 kilometer separation. …, the initial assumption that all of the annual emissions are located at a single point is overly conservative, and the assumption that annual emissions are spread throughout the WDA at a 50 km distance from the Class I receptors is a refined methodology."

NO_2 Modeling

Section 5.2.4 of the USEPA's Guideline on Air Quality Models, Appendix W to 40 CFR Part 51, recommends a three-tiered screening approach to estimate ambient concentrations of NO_2:

- Tier 1 – assume complete conversion of all emitted NO to NO_2;
- Tier 2 – multiply Tier 1 results by a representative equilibrium NO_2/NOx ratio; and
- Tier 3 – perform a detailed analysis on a case-by-case basis.

The 1-hour NO_2 modeling analysis utilized the USEPA Tier 3 modeling approach for 1-hour NO_2 modeling assessment results using the AERMOD Plume Volume Molar Ratio Method (PVMRM) that adjusts NOx emissions to estimate more realistic ambient NO_2 concentrations by modeling the conversion of NOx to NO_2.

PVMRM incorporates three sets of data into the calculation of 1-hour NO_2 concentrations: source-specific in-stack NO_2/NOx emission rate ratios, an ambient NO_2/NOx concentration ratio, and hourly average background ozone concentrations.

A default NO_2/NOx ambient equilibrium concentration ratio of 0.90 was used.

i. In Stack NO_2/NOx Concentration Ratio

US Wind, Inc. reviewed the USEPA NO_2/NOx In-Stack Ratio (ISR) Database[2] to determine representative NO_2/NOx ratios for diesel engines. The USEPA ISR database includes NO_2/NOx ratios that range from 0.02 to 0.09 for diesel engines that are representative of the envelope of vessels for project C&C/O&M that were modeled for the project. Based on data reviewed in the ISR Database, an in-stack NO_2/NOx ratio of 0.10 for the diesel engines was selected.

ii. Hourly Average Background Ozone Concentrations

US Wind, Inc. reviewed the locations of ambient air monitoring sites and selected the closest "regional" monitoring site to represent the current background ozone air quality in the site area. A monitor in Lewes, Delaware (USEPA AIRData # 10-005-1003) was identified to represent the ozone background values during the three (3) year period 2019–2021, concurrent with the three (3) years of surface meteorological data. When ozone data is missing from the Lewes monitor, missing hours were substituted using data from the 2nd nearest monitoring station, located in Seaford, Delaware (USEPA AIRData # 10-005-1002).

Hourly average background ozone concentrations were input to AERMOD.

iii. 1-hour NO_2 Background Concentrations

Background concentrations are added to model-predicted concentrations to calculate the total concentrations for comparison to the NAAQS. Based on review of the locations of Maryland, Delaware, and New Jersey ambient air quality monitoring sites, the closest "regional" monitoring site was selected to be a monitoring station in Millville, New Jersey (EPA AIRData # 34-011-0007).

[2] https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database

Short-term ambient NO_2 concentrations are known to have diurnal patterns as well as seasonal variability. While using a "first tier" assumption by applying a uniform monitored background concentration based on a representative monitor's 1-hr NO_2 design value concentration would be acceptable without further justification in most cases. The EPA recognizes that this approach could be overly conservative in many cases. In the EPA's March 1, 2011, clarification memorandum entitled Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, an alternative methodology for developing background concentrations based on season and hour of day was presented. Page 19 of this clarification memo outlines how a 1-hr NO_2 season, by hour of day background concentration can be developed.

An appropriate methodology for incorporating background concentrations for the 1-hour NO_2 standard would be to use a multi-year average of the 98th-percentile of the available background concentrations by season and hour-of-day. The EPA recommends that background values by season and hour-of-day used in this context should be based on the (average of the) 3rd-highest value for each season and hour-of-day.

US Wind, Inc. used this seasonal and hour of day methodology. The background values were first divided by season for each year. Those seasonal groups were further binned into 24-hour groups for a total of 96 bins of values (product of 4 seasons and 24 hours) for each year (2019, 2020, and 2021). The 3rd highest value from each bin was found per year. Finally, to obtain the values to be summed with the modeled concentrations, the average of those 3rd highest values was taken over three (3) years. This results in 96 values that were used in the modeling analysis. The AERMOD model option (keyword BACKGROUND) was used to sum each modeled concentration with the background concentration that was calculated for that season and hour-of-day.

Ozone and PM-2.5 – Secondary Formation

US Wind, Inc. assessed secondarily formed PM-2.5 and ozone impacts using EPA's guidance "Photochemical Model Estimated Relationships Between Offshore Wind Energy Project Precursor Emissions and Downwind Air Quality (O3 and PM-2.5) Impacts" (2022)[3]. Because the activities of this wind energy application are close to shore, it is not expected that high concentrations of chemically produced ozone or particles will occur at the near shore. The detailed summary of the maximum secondary formation for PM-2.5 and ozone can be found in US Wind, Inc.'s January 5, 2024 Addendum to air permit application.

(3) Preliminary Analysis

The preliminary analysis models criteria pollutants with a significant emissions increase from the project (CO, NO_2, PM-2.5, and PM-10) to determine:

[3] The EPA's guidance for estimating secondarily formed PM2.5 and ozone impacts offshore is available at: https://www.epa.gov/system/files/documents/2023-01/EPA454-R-22-007%2029DEC2022.pdf

(i) whether pre-construction ambient air monitoring is required;
(ii) whether further air quality analyses are required;
(iii) where the impact area is located; and
(iv) whether a full impact analysis including all the major emission sources in the impact area is required.

Pre-construction Ambient Air Monitoring Determination

PSD regulations require an ambient air quality evaluation that involves the analysis of monitored concentrations in the vicinity of the PSD source if model predicted source impacts are greater than the monitoring de minimis value for each criteria pollutant. If representative monitoring data is not available, a PSD source may be required to collect pre-construction ambient data for up to a year.

US Wind, Inc. has asserted that the existing ambient monitoring program operated by MDE, DNREC, and NJDEP is sufficient to meet the needs of any pre-construction monitoring requirements and thus may be used in lieu of source specific preconstruction monitoring requirements. The Department agrees with this approach.

As provided in EPA guidance[4], "If the proposed source or modification is remote and not affected by other readily identified man-made sources, two options for determining existing air quality concentrations from existing data are available. The first option is to use air quality data collected in the vicinity of the proposed source or modification; the second option is to use average measured concentrations from a 'regional' site to establish a background concentration."

The proposed source's location is offshore and in a remote location. Since there is no monitoring station offshore, US Wind, Inc. used monitoring data from the closest land monitors for each pollutant (CO, NO_2, PM-2.5, and PM-10). Details are discussed in the next paragraphs.

Ambient Background Concentrations

US Wind, Inc. selected ambient background concentrations from the US EPA Air Data website[5] for data over the 2019 – 2021 time period. Background concentrations were selected from the ambient air monitors located nearest to the project lease area. These monitors are located in Virginia, Delaware, and New Jersey. US Wind, Inc. provided the description and locations of these monitors in its March 10, 2023 Air Quality Modeling Protocol. US Wind, Inc. also summarized its background concentrations in Table 5-1 of its January 5, 2024, Addendum to OCS Air Permit Application. Based on the data submitted by US Wind, Inc., the Department compiled additional data, and its findings are summarized in Table 3.

[4] U.S. Environmental Protection Agency, 1987. Ambient Air Monitoring Guidelines for Prevention of Significant Deterioration (PSD), Appendix A, Procedures to Determine if Monitoring Data will be Required for a PSD Application. Publication No. EPA–450/4–87–007

[5] https://www.epa.gov/outdoor-air-quality-data

TABLE 3
MEASURED AMBIENT AIR QUALITY CONCENTRATIONS AND SELECTED BACKGROUND LEVELS

Pollutant	Averaging Period	Location	EPA Design Value	Pollutant Concentration			Units	2019-2021 Background Level (µg/m3)
				2019	2020	2021		
CO	1-Hour	Wilmington, DE	1.8	1.23	1.8	1.4	ppm	2,061
CO	8-Hour	Wilmington, DE	1.3	1	1.3	0.9	ppm	1,489
NO2	Annual	Millville, NJ	6	6.31	6.33	6.3	ppb	11.9
NO2	1-hour	Millville, NJ	34	34.8	32.4	34	ppb	63.4
PM10	24-Hour	Hampton, VA	-	16	16	44	µg/m3	44
PM2.5	24-Hour	Millville, NJ	-	18.7	16.1	19.3	µg/m3	18.03
PM2.5	Annual	Millville, NJ	-	7.80	8.32	7.03	µg/m3	7.72

The EPA design value for the selected monitors for 2019 – 2021 was used when available. If design value is not available, then data from the US EPA Air Data website was used. For 24-hour PM-10, the Department selected the daily high-2nd high (H2H) value for each year for 2019 – 2021, then used the maximum over the 3 years as model background. For the 24-hour PM-2.5, the Department calculated the 98th percentile of the measured 24-hour values for each year, then took the average of the three (3) years. For annual PM-2.5, the average over the three (3) years was used as model background.

Note that for 1-hour NO_2, seasonal hourly background concentrations were used, instead of the value above. This approach is discussed in detail earlier in this factsheet.

Full Impact Analysis Determination

All areas of Maryland are designated as PSD Class II areas. Significant Impact Levels (SIL) for Class II areas have been established by EPA to serve as an initial evaluation of air quality impacts. If the dispersion model predicts that the impact of a criteria pollutant's emissions from the proposed project are less than the applicable Class II SIL for that pollutant, then the pollutant is considered insignificant and poses no threat to the applicable NAAQS or PSD increment. Additional analyses relative to attainment of the NAAQS and PSD increments are not required or necessary for criteria pollutants with predicted impacts less than the SIL.

For criteria pollutants with impacts greater than the SIL, further evaluation is required to determine whether additional modeling or analysis is necessary to demonstrate NAAQS and increment attainment. Table 4 compares the impacts from the criteria pollutants with a significant emissions increase from the project to the Class II SIL for each pollutant.

TABLE 4
FULL IMPACT ANALYSIS DETERMINATION
SIGNIFICANT IMPACT LEVELS (SIL)

Pollutant	Averaging Period	Recommended Significant Impact Levels for NAAQS Analyses	Scenario	Maximum Modeled SIL Concentration	Exceed SIL?
CO	1-Hour	2,000	Foundation Installation	490.3	NO
			WTG Installation	206.8	NO
			WTG Commissioning	142.7	NO
			OSS Installation	345	NO
			Interarray Cable Installation	158.2	NO
			Export Cable Installation	124.5	NO
			O&M	668	NO
	8-Hour	500	Foundation Installation	275.1	NO
			WTG Installation	115.6	NO
			WTG Commissioning	72.1	NO
			OSS Installation	165.6	NO
			Interarray Cable Installation	75.2	NO
			Export Cable Installation	52.8	NO
			O&M	289.2	NO
NO2	1-Hour	7.5	Foundation Installation	179	YES
			WTG Installation	85.8	YES
			WTG Commissioning	97.1	YES
			OSS Installation	169.9	YES
			Interarray Cable Installation	107.3	YES
			Export Cable Installation	87.8	YES
			O&M	205.9	YES
	Annual	1	Annual Construction and O&M	6	YES
PM2.5	24-Hour	1.2	Foundation Installation	6.4	YES
			WTG Installation	7.2	YES
			WTG Commissioning	3.5	YES
			OSS Installation	7.1	YES
			Interarray Cable Installation	4.7	YES
			Export Cable Installation	3.7	YES
			O&M	5	YES
	Annual	0.13	Annual Construction and O&M	0.5	YES

Pollutant	Averaging Period	Recommended Significant Impact Levels for NAAQS Analyses	Scenario	Maximum Modeled SIL Concentration	Exceed SIL?
PM10	24-Hour	5	Foundation Installation	8.7	YES
			WTG Installation	9.6	YES
			WTG Commissioning	4.9	NO
			OSS Installation	9.2	YES
			Interarray Cable Installation	6.5	YES
			Export Cable Installation	4.6	NO
			O&M	7.1	YES
	Annual	1	Annual Construction and O&M	0.5	NO

As shown in Table 4, the maximum concentrations for selected C&C and O&M scenarios exceed the applicable SILs for 1-hour and annual NO_2, 24-hour PM-10, and 24-hour and annual PM-2.5. A full impact analysis is required for the 1-hour and annual NO_2, 24-hour PM-10, and 24-hour and annual PM-2.5 impacts from the project.

(4) Full Impact Analysis

A full impact analysis is required for any criteria pollutant for which the proposed source's estimated ambient pollutant concentrations exceed the prescribed SIL. The full impact analysis expands the preliminary analysis in that it considers emissions from (1) the proposed source; (2) existing sources; and (3) residential, commercial, and industrial growth that accompany the new activity at the new source (i.e., secondary emissions). The full impact analysis consists of a separate analysis for the NAAQS and PSD increments.

The Department evaluated the modeling methodology including the model used, the development and application of the meteorological database, the use and application of BPIPPRM to determine downwash effects, the design of the receptor grid, and the actual model application. The conclusion, based on this evaluation, is that the methodology is adequate to determine the impact of significant emissions from the US Wind, Inc.'s offshore wind project.

Significant Impact Area Determination

The significant impact area (SIA) is the geographical area for which the full impact air quality analyses for the NAAQS and PSD increments are carried out. The SIA includes all locations where a significant increase in the potential emissions of a criteria pollutant from a proposed project will cause a significant ambient impact. The SIA is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur, or (2) a modeling receptor distance of 50 km, whichever is less.

The areas of impact for 24-hour PM-10, 24-hour and annual PM-2.5, and 1-hour and annual NO_2, under normal operations are as follows:

- 24-hour PM-10 AOI = 1,250 meters;
- Annual PM-2.5 AOI = 1,500 meters.
- 24-hour PM-2.5 AOI = 5,000 meters;
- Annual NO_2 AOI = 7,500 meters; and
- 1-hour NO_2 AOI = 50,000 meters.

Required Emissions Inventory for Full Impact Analysis

Per 40 CFR Part 51, Appendix W Section 8.3.3, specific modeling should be performed for sources in the vicinity of the proposed project for emissions sources that are not adequately represented by ambient monitoring data. US Wind, Inc. reviewed MDE and DNREC major source air permits within 50 km of the project centroid, and determined there are no major air emissions sources in the vicinity of the project with emissions of NOx or PM-10/PM-2.5. Impacts of existing emission sources should be adequately captured by the conservative background monitors used for this analysis. As such, it was not necessary to add in any offsite (i.e., nearby) emissions sources into the analysis. The maximum modeled concentrations were added to the representative background concentrations for comparison to the NAAQS.

(5) Compliance with the NAAQS

Compliance with the NAAQS is determined by comparing the predicted ground level concentrations (with background air quality data) at each receptor to the applicable NAAQS. If the predicted total ground level concentration is below the applicable NAAQS for each pollutant, then the project is in compliance with the NAAQS.

The results of the NAAQS modeling analysis for each C&C and O&M scenario are presented in Table 5. As shown in Table 5, the project impacts, plus background, do not exceed or threaten to exceed the NAAQS.

TABLE 5
MAXIMUM MODELED CONCENTRATIONS FOR PROJECT CONSTRUCTION AND O&M SCENARIOS FOR COMPARISON TO NAAQS

Pollutant	Averaging Period	Scenario	NAAQS	Background	Maximum Modeled NAAQS Concentration	Total NAAQS Concentration with Background
NO2	1-Hour	Foundation Installation	188	Variable by Season and Hour of Day	106.9	145
		WTG Installation			50.8	92.3
		WTG Commissioning			64.6	84.3
		OSS Installation			88.2	126.3

Pollutant	Averaging Period	Scenario	NAAQS	Background	Maximum Modeled NAAQS Concentration	Total NAAQS Concentration with Background
		Interarray Cable Installation			70.3	113.1
		Export Cable Installation			37	85.7
		O&M			142.3	172.3
	Annual	Annual Construction and O&M	100	9	6	17.9
PM2.5	24-Hour	Foundation Installation	35	18	3.6	21.6
		WTG Installation			4	22
		WTG Commissioning			1.8	19.8
		OSS Installation			4.7	22.7
		Interarray Cable Installation			2.6	20.6
		Export Cable Installation			2	20
		O&M			2.9	20.9
	Annual	Annual Construction and O&M	12	8	0.5	8.5
PM10	24-Hour	Foundation Installation	150	44	8.7	52.7
		WTG Installation			9.6	53.6
		WTG Commissioning			4.9	48.9
		OSS Installation			9.2	53.2
		Interarray Cable Installation			6.5	50.5
		Export Cable Installation			4.6	48.6
		O&M			7.1	51.1
	Annual	Annual Construction and O&M	NA	NA	0.5	NA

(6) Compliance with PSD Increments

There is no PSD increment standard for 1-hour NO_2 impact. US Wind, Inc. compared modeled impacts with PSD Class II Increments for 24-hour PM-10, 24-hour and annual PM-2.5, and annual NO_2. The results are summarized in Table 6 below.

TABLE 6
MAXIMUM MODELED CONCENTRATIONS FOR PROJECT CONSTRUCTION AND O&M SCENARIOS FOR COMPARISON TO PSD CLASS II INCREMENTS

Pollutant	Averaging Period	Scenario	Class II Increment	Maximum Modeled Increment Concentration	Exceed Increment?
NO_2	Annual	Annual Construction and O&M	25	6	NO
PM-2.5	24-Hour	Foundation Installation	9	6.2	NO
		WTG Installation		6.9	NO
		WTG Commissioning		3.4	NO
		OSS Installation		8.2	NO
		Interarray Cable Installation		4.6	NO
		Export Cable Installation		4	NO
		O&M		5.6	NO
	Annual	Annual Construction and O&M	4	0.5	NO
PM-10	24-Hour	Foundation Installation	30	6.4	NO
		WTG Installation		7.1	NO
		WTG Commissioning		3.5	NO
		OSS Installation		8.4	NO
		Interarray Cable Installation		4.8	NO
		Export Cable Installation		4	NO
		O&M		5.7	NO
	Annual	Annual Construction and O&M	17	0.5	NO

(7) Impacts on Class I Areas

PSD Class I areas are those that are designated as requiring special protection from the effects of pollutants emitted by PSD sources due to the pristine quality of their natural resources. There is one Class I area within 300 km of the project centroid: Brigantine Wilderness area located in the Edwin B. Forsythe National Wildlife Refuge in New Jersey, approximately 126 kilometers north of the project. In addition, the northeast corner of the Shenandoah National Park, which is approximately 290 km away, was also included in the Class I area impact analysis upon the Department's request.

Clean Air Act regulations provide that the Federal Land Manager (FLM) has the affirmative responsibility to protect the Air Quality Related Values ("AQRVs") in Class I areas, including visibility. The Federal Land Manager for Class I areas managed by the U.S. Fish and Wildlife Service ("USFWS") is the Department of the Interior's Assistant Secretary for Fish and Wildlife and Parks.

US Wind, Inc. conducted modeling to assess the impacts on visibility and nitrogen and sulfur deposition in both Class I areas, as well as the Assateague Island National Seashore Class II area, as per the request of the National Park Services (NPS). A procedure, as described in the FLM's Air Quality Related Work Group ("FLAG") guidance (2010)[6], was used to determine the potential AQRV impacts in the Class I area. Following the FLAG guidance, CALPUFF was used for the AQRV analysis.

US Wind, Inc. submitted a Class I AQRV modeling report to the FLM on July 31, 2024. The FLM's determination was received via e-mail by the Department on November 7, 2024. The FLM has determined that the project is not anticipated to cause significant visibility impairment to Class I areas. However, the FLM has requested that the Department include daily emissions limits to minimize the potential of visibility impairments as more wind turbine projects are built in the area. The daily emissions limits, based on the values used in the modeling analyses, are included in Part D of the PSD Approval.

VIII. ADDITIONAL IMPACT ANALYSIS

A PSD application must address additional impacts for each pollutant subject to the PSD application. These analyses assess the potential impacts of air, ground, and water pollution on soils, vegetation, and visibility caused by emissions increases of any regulated pollutant emitted from the proposed project and from associated growth.

The additional impacts analysis generally contains the following parts:
(a) growth;
(b) soils, vegetation, and wildlife impacts; and
(c) visibility impairment.

[6] The FLAG guidance can be found at: https://irma.nps.gov/DataStore/DownloadFile/420352 .

For the Maryland Offshore Wind Project, the Department also requested an analysis of shoreline fumigation as part of the additional impact analysis.

Growth Impact Analysis

The purpose of the growth analysis is to quantify associated growth; that is, to predict how much new growth is likely to occur to support the source under review and then to estimate the emissions which will result from that associated growth.

US Wind, Inc. discussed project-related activities and infrastructure that could potentially result in direct or indirect impacts to population, economy, and employment resources in Section Volume II of the project's Construction and Operations Plan (COP). The analysis found that the project will support an estimated 18,717 job-years during the C&C and an estimated additional 3,702 job-years in the O&M.

US Wind, Inc. expects the temporary addition of the non-local workforce for the duration of construction would not result in a sizeable population change. Additionally, given the population in the study area, the number of workers needed for operation of the US Wind, Inc. onshore and offshore facilities would not result in a sizeable population change. Due to the number of new individuals expected to move into the area to support the project and the significant level of existing commercial activity in the area, new commercial construction is not foreseen to be needed to support the project's work force.

For reasons described above, no significant emissions from secondary growth are anticipated to occur during either the C&C or the O&M. Therefore, the air quality impacts of the modest residential, commercial, or industrial growth associated with the project will be insignificant.

Soils, Vegetation, and Wildlife Impacts Analysis

The analysis of soils, vegetation, and wildlife air pollution impacts should be based on an inventory of soils, vegetation, and wildlife types found in the impact area. This inventory should include all vegetation with any commercial or recreational value.

US Wind, Inc. evaluated potential impacts on vegetation in accordance with "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (USEPA, 1980). The screening procedure provides vegetation screening thresholds which are minimum pollutant concentration levels at which damage to the natural vegetation and predominant crops could occur.

US Wind, Inc. conducted the analysis by comparing the maximum modeled concentrations, plus background, with the screening thresholds for CO and NO_2. Upon review, the Department added secondary NAAQS thresholds to the analysis as the secondary (welfare-based) standards are set to protect against environmental damage caused by certain air pollutants. Secondary NAAQS for PM-2.5 and PM-10 were added to the comparison.

Table 7 below summarizes the screening results for CO, NO_2, and PM-10 and PM-2.5. Modeled concentrations are expected to be below screening thresholds for impacts on vegetation. As such, no impacts to soils, vegetation, or wildlife in the facility site vicinity are anticipated.

TABLE 7
TOTAL FACILITY COMPARISON OF MAXIMUM MODELED CONCENTRATIONS OF POLLUTANTS TO VEGETATION SCREENING CONCENTRATIONS

Pollutant	Averaging Period	Maximum Modeled Concentration (µg/m3)	Background (µg/m3)	Total Concentration (µg/m3)	Vegetation Screening Threshold – Sensitive (µg/m3)	Secondary NAAQS (µg/m3)
NO2	4-Hour	205.9	63.3	269.2	3,760	-
	8-Hour	205.9	63.3	269.2	3,760	-
	Annual	6	11.9	17.9	-	100
CO	1-Week	289.2	1,495	1,784.20	1,800,000	-
PM10	24-hour	9.6	44	53.6	-	150
PM2.5	24-hour	7.2	18	25.2	-	35
	Annual	0.5	8	8.5	-	15

Visibility Impairment Analysis
The visibility impairment analysis pertains particularly to Class I area impacts and other areas where good visibility is of special concern. A quantitative estimate of visibility impairment is conducted, if warranted by the scope of the project.

US Wind, Inc. conducted a Class II visibility screening analysis for important nearby vistas (i.e., Ocean City, MD) using the visual impact screening model or VISCREEN model (U.S. EPA, 1992). In order to assess the potential impact on regional visibility, the conservative Level–1 screening analysis using the VISCREEN model was conducted. The screening procedure involves calculation of three plume contrast coefficients using emissions of NO_2, PM/PM-10, and sulfates (H2SO4). These coefficients consider plume/sky contrast, plume/terrain contrast, and sky/terrain contrast. The Level-1 VISCREEN results indicate that the visibility impairment related to the project's plume is below the plume contrast (Cp) and plume perceptibility (ΔE) threshold criteria for all three contrast coefficients. Additional details of US Wind Inc.'s Class II visibility analysis can be found in its January 5, 2024, addendum to revised air permit application.

In summary, results of the visibility screening analysis indicated that the visibility impact caused by the project is expected to be minimal.

Shoreline Fumigation Analysis
US Wind, Inc. conducted an analysis to assess the potential impact of shoreline fumigation to onshore receptors. US Wind, Inc. prepared the modeling analyses at distances to the shoreline of 26.5 km and 500 meters for comparison purposes. The results indicate that the potential impacts from shoreline fumigation are nearly two (2) orders of magnitude lower at the actual project distance to shoreline when compared to a theoretical distance of 500 meters, where shoreline fumigation would lead to higher impacts than would otherwise occur. US Wind, Inc. also compared the maximum normalized shoreline fumigation results to the maximum normalized results using the full receptor grid and assuming no shoreline fumigation. For all representative vessels, the maximum modeled concentrations are higher in the local area around the sources when compared to the maximum shoreline fumigation results.

Thus, with the project's location well offshore and outside of the distance where shoreline fumigation is a concern, US Wind, Inc. has determined that shoreline fumigation is not a concern for this project and that the maximum modeled concentrations are well offshore and nearby to the WTGs, export cables, and OSSs.

Additional details of US Wind Inc.'s analysis can be found in its January 5, 2024, addendum to revised air permit application.

IX. TENTATIVE DETERMINATION

Based on the above analyses, the Department has made a tentative determination that the proposed Maryland Offshore Wind Project will comply with all applicable Federal, State, and local air quality requirements and has made a tentative determination to issue the PSD Approval.

Wes Moore
Governor

Aruna Miller
Lt. Governor

Serena McIlwain
Secretary

Air and Radiation Administration
1800 Washington Boulevard, Suite 720
Baltimore, MD 21230

DRAFT

[X] PSD Approval [ ] Operating Permit

PERMIT NO.	PSD-2024-01	DATE ISSUED	TBD
PERMIT FEE	$57,000.00 (Paid)	EXPIRATION DATE	In accordance with COMAR 26.11.02.04B

LEGAL OWNER & ADDRESS	SITE
US Wind, Inc. 401 East Pratt Street Baltimore, MD, 21201 Attn: Mr. Jeffrey Grybowski, CEO US Wind, Inc.	Maryland Wind Energy Area (WEA) Atlantic Ocean, Offshore, Ocean City, Maryland Lat 38.352747º N; Long 74.753546º W Premises # 047-0248 AI # 153737

SOURCE DESCRIPTION

Installation of a wind energy project (Maryland Offshore Wind Project), in a lease area of approximately 18.5 km (11.5 miles, 10.0 nautical miles [NM]) off the coast of Maryland on the outer continental shelf (OCS) consisting of up to 121 wind turbine generators (WTG), up to four (4) offshore substations (OSS), and one (1) meteorological tower (Met Tower).

This source is subject to the conditions described on the attached pages.

Program Manager

Director, Air and Radiation Administration

This Prevention of Significant Deterioration (PSD) Approval covers the following equipment for US Wind, Inc.'s Maryland Offshore Wind Project:

Table 1A – Types of marine vessels, and associated main and auxiliary marine engines, to be used during Construction and Commissioning (C&C)

Vessel Types to be used for Scour Protection Installation	Number of Vessels of this Type	Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kilowatts (kW)/engine)
Fallpipe Vessel (HC)	1	Main engines (3): 4,500 Auxiliary engines (1): 492 Auxiliary engines (1): 1,200
Vessel Types to be used for Foundation Installation	**Number of Vessels of this Type**	**Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)**
Heavy Lift Vessel (HC)	1	Main engines (5): 4,500 Auxiliary engine (1): 4,500
Foundation Installation Tugs (HC)	4	Main engines (2): 2,540 Auxiliary engine (1): 199
Crew Transfer Vessel (HC)	1	Main engines (2): 749 Auxiliary engine (2): 20
Noise Mitigation Offshore Service Vessel (HC)	1	Main engines (2): 3,310 Auxiliary engines (3): 499
Acoustic Monitoring Offshore Service Vessel (HC)	1	Main engines (2): 2,540 Auxiliary engine (1): 199
Environmental Crew Transfer Vessel (HC)	2	Main engines (2): 749 Auxiliary engine (2): 20
Vessel Types to be used for WTG Installation	**Number of Vessels of this Type**	**Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)**
Jack-up Vessel (HC) **[OCS Source]**	1	Main engines (3): 3,800 Auxiliary engines (1): 2,880
Tugs (HC)	3	Main engines (2): 2,540 Auxiliary engines (1): 199

Table 1A – Types of marine vessels, and associated main and auxiliary marine engines, to be used during C&C (continued)

Vessel Types to be used for WTG Commissioning	Number of Vessels of this Type	Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)
Commissioning Crew Transfer Vessels (HC)	3	Main engines (2): 749 Main engines (2): 20
Vessel Types to be used for OSS Installation	**Number of Vessels of this Type**	**Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)**
Heavy Lift Vessel (HC)	1	Main engines (5): 4,500 Auxiliary engines (1): 4,500
Tug (HC)	2	Main engines (2): 2,540 Auxiliary engines (1): 199
Noise Mitigation Offshore Service Vessel (HC)	1	Main engines (2): 3,310 Auxiliary engines (3): 499
Acoustic Monitoring Offshore Service Vessel (HC)	1	Main engines (1): 2,500 Auxiliary engines (1): 199
Topside Tug (HC)	1	Main engines (2): 2,540 Auxiliary marine engines (1): 199
Refueling Offshore Service Vessel (HC)	1	Main engines (2): 749 Auxiliary engine (2): 20
Hotel Jack-up Vessel (HC) **[OCS Source]**	1	Main engines (2): 2,350 Auxiliary engine (2): 1,000
Vessel Types to be used for Array Cable Installation	**Number of Vessels of this Type**	**Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)**
Cable Lay Vessel (HC)	1	Main engines (3): 1,750 Auxiliary engine (1): 1,750
Offshore Support Vessel (HC)	1	Main engines (1): 1,611 Auxiliary engine (2): 123
Crew Transfer Vessel (HC)	2	Main engines (2): 749 Auxiliary engine (2): 20
Trenching Vessel (HC)	1	Main engines (5): 3,000 Auxiliary engine (1): 3,000
Guard Crew Transfer Vessel (HC)	1	Main engines (2): 749 Auxiliary engine (2): 20

Table 1A – Types of marine vessels, and associated main and auxiliary marine engines, to be used during C&C (continued)

Vessel Types to be used for Export Cable Installation	Number of Vessels of this Type	Marine Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)
Cable Lay Vessel (HC)	1	Main engines (3): 1,750 Auxiliary engine (1): 1,750
Multipurpose Offshore Support Vessel (HC)	1	Main engines (1): 1,611 Auxiliary engine (2): 123
Trenching Vessel (HC)	1	Main engines (5): 3,000 Auxiliary engine (1): 3,000
Horizontal Directional Drilling Lift Vessel (HC)	1	Main engines (2): 2,350 Auxiliary engine (2): 1,000
Horizontal Directional Drilling Pull-In Vessel (HC)	1	Main engines (1): 1,611 Auxiliary engine (2): 123
Pull-In Support Vessel (HC)	1	Main engines (2): 392 Auxiliary engine (2): 135

Vessel Types to be used for Met Tower Installation	Number of Vessels of this Type	Marine Engines: Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)
Heavy Lift Vessel (HC)	1	Main engines (5): 4,500 Auxiliary engine (1): 4,500
Tugs (HC)	3	Main engines (2): 2,540 Auxiliary engines (1): 199
Noise Mitigation Offshore Service Vessel (HC)	1	Main engines (2): 3,310 Auxiliary engines (3): 499
Acoustic Monitoring Offshore Service Vessel (HC)	1	Main engines (2): 2,540 Auxiliary engines (1): 199
Refueling Offshore Service Vessel (HC)	1	Main engines (2): 749 Auxiliary engine (2): 20
Hotel Jack-up Vessel (HC) **[OCS Source]**	1	Main engines (2): 2,350 Auxiliary engine (2): 1,000

Table 1B. Types of marine vessels, and associated main and auxiliary marine engines, to be used during Operations and Maintenance (O&M)

Vessel Types to be used for Offshore Marine Operations	Number of Vessels of this Type	Marine Vessel Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)
Fallpipe Vessel (Scour Protection Repairs) (HC)	1	Main engines (3): 4,500 Auxiliary engines (1): 492 Auxiliary engines (1): 1,200
Crew Transfer Vessel (OSS O&M Refueling Operations) (HC)	1	Main engines (2): 749 Auxiliary engines (2): 20
Jack-Up Vessel (WTG Inspection/Maintenance/Repairs Main Repair Vessel) (HC) **[OCS Source]**	1	Main engines (2): 2,350 Auxiliary engines (2): 1,000
Survey Vessel (WTG Inspection/Maintenance/Repairs Multi-role Survey Vessel) (HC)	1	Main engines (2): 392 Auxiliary engines (2): 135
Vessel Types to be used for Offshore Maintenance	**Number of Vessels of this Type**	**Marine Vessel Engines (per each vessel): Type (Main or Auxiliary), Number & Maximum Engine Power (kW/engine)**
Survey Vessel (Cable Inspection/Repairs Multi-role Survey Vessel) (HC)	1	Main engines (2): 392 Auxiliary engines (2): 135
Crew Transfer Vessel (Daily O&M and Miscellaneous) (HC)	4	Main engines (2): 749 Auxiliary engines (2): 20
Sportfisher (Daily O&M and Miscellaneous) (HC)	1	Main engines (2): 749 Auxiliary engines (2): 20

Table 2A – Non-Marine Engines – Portable Diesel Generator Engines used during C&C

Activity	Engine Description	Number of Engines	Maximum Engine Power (kW)
OSS Installation	OSS Installation Generator Engine **[OCS Source]**	4	150

Table 2B - Non-Marine Engines – Portable Diesel Generator Engines used during O&M

Activity	Engine Description	Number of Engines	Maximum Engine Power (kW)
Daily O&M and Miscellaneous (Electrical Service)	Generator Engine **[OCS Source]**	4	150

Table 2C. Non-Marine Engines – Permanent Diesel Generator Engines used during O&M

Activity	Engine Description	Number of Engines	Maximum Engine Power (kW)
OSS	OSS Generator Engine **[OCS Source]**	4	150

PART A – GENERAL PROVISIONS

(1) The following Air and Radiation Administration (ARA) applications and supplemental information are incorporated into this permit by reference:

(a) Application for Prevention of Significant Deterioration (PSD) Approval received on August 17, 2023 (hardcopies received on September 3, 2023), with revised application received November 30, 2023 (hardcopies received on December 7, 2023) for the construction of the Maryland Offshore Wind Project.

(b) Application for Non-Attainment New Source Review (NA-NSR) Approval received on August 17, 2023 (hardcopies received on September 3, 2023), with revised application received November 30, 2023 (hardcopies received on December 7, 2023) for the construction of the Maryland Offshore Wind Project.

(c) Application for Fuel Burning Equipment (Form 11) for the following vessels supporting the construction and/or operation of the Maryland Offshore Wind Project: Foundation Installation Fallpipe Vessel; Foundation Installation Heavy Lift Vessel; Foundation Installation Tugs; Foundation Installation Crew Transfer Vessel; Foundation Installation Offshore Support Vessel Noise Vessels; Foundation Installation Environmental Crew Transfer Vessels; Wind Turbine Generator Installation Jack-up vessel; Wind Turbine Generator Installation Tugs; Wind Turbine Generator Commissioning Crew Transfer Vessels; Offshore Substation Installation Heavy Lift vessel; Offshore Substation Installation Tug; Offshore Substation Installation Offshore Support Vessel; Offshore Substation Installation Topside Tug; Offshore Substation Installation Refueling Offshore Support Vessel; Offshore Substation Installation Hotel Jack-up vessel; Array Cable Lay vessel; Array offshore support vessel; Array Crew Transfer Vessel; Array trenching vessel; Array guard vessel; Export Cable lay vessel; Export Cable Multipurpose Offshore Support Vessel; Export Cable Trenching Vessel; Export Cable Horizontal Directional Drilling Lift Vessel; Export Cable Horizontal Directional Drilling pull in Vessel; Export Cable pull in support vessel; Operation Scour Protection Repair Vessel; Operation Refueling Vessel; Operation Main Repair Vessel; Operation survey vessel; Operation Crew Transfer Vessel; and the Operation Environmental Monitoring Vessel, received on August 17, 2023 with revised forms received November 30, 2023.

(d) Application for Internal Combustion Engines (Form 44) received on August 17, 2023 (hardcopies received on September 3, 2023) with revised form received November 30, 2023 (hardcopies received on December 7, 2023) for the construction/installation of four (4) 150 kW electric generators, each to be located on the four (4) Offshore Substations.

(e) Supplemental Information:

(i) Air Quality Impact Analysis for 24-hour PM-10, annual PM-2.5, 1-hour and annual NO_2 Impacts received on August 17, 2023, and revised copies on November 30, 2023;

(ii) Response to the Department's Supplemental Request for Additional Information for OCS Air Permit (i.e., revised Section 5, and revised Appendix A) received January 5, 2024;

(iii) Class I AQRV Assessment Modeling Protocol, received on May 23, 2024;

(iv) Class I AQRV Assessment Modeling Report, received on July 31, 2024;

(v) Revised potential to emit emission calculations, received September 20, 2024, for air pollutants originating from various marine vessels, each powered by their own diesel engine and other construction equipment all servicing the construction and operation of the Maryland Offshore Wind Project using the EPA's "Ports Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions", EPA-420-B-22-011, April 2022; and

(vi) Narrative on vessel selection criteria and information on the assumptions taken to support the facility wide potential to emit, received November 6, 2024.

If there are any conflicts between representations in this Approval and representations in the applications, the representations in this Approval shall govern. Estimates of dimensions, volumes, emissions rates, operating rates, feed rates and hours of operation included in the applications do not constitute enforceable numeric limits beyond the extent necessary for compliance with applicable requirements.

(2) Upon presentation of credentials, representatives of the Maryland Department of the Environment ("MDE" or the "Department"), the EPA, and the Worcester County Health Department shall at any reasonable time be granted, without delay and without prior notification, access to the Permittee's property and permitted to:

(a) inspect any construction authorized by this Approval;

(b) sample, as necessary to determine compliance with requirements of this Approval, any materials stored or processed on-site, any waste materials, and any discharge into the environment;

(c) inspect any monitoring equipment required by this Approval;

(d) review and copy any records, including all documents required to be maintained by this Approval, relevant to a determination of compliance with requirements of this Approval;

(e) obtain any photographic documentation or evidence necessary to determine compliance with the requirements of this Approval; and

(f) the Department may exercise its right of entry through use of an unmanned aircraft system to conduct inspections, collect samples, or make visual observations through photographic or video recordings.

(3) Nothing in this Approval authorizes the violation of any rule or regulation or the creation of a nuisance or air pollution.

(4) If any provision of this Approval is declared by proper authority to be invalid, the remaining provisions of the Approval shall remain in effect.

(5) All terms defined in the Permit-to-Construct for the Maryland Offshore Wind Project (ARA Registration No. 047-0248) apply to this PSD Approval.

(6) Any notifications, records, reports, plans, and documents referenced in this Approval shall be made available to the EPA as specified in this Approval or upon request by the EPA.

PART B – APPLICABLE REGULATIONS

(1) The Permittee may not construct or operate a PSD source, as defined in COMAR 26.11.01.01B(37), which will result in violation of 40 CFR §52.21, as amended.

(2) COMAR 26.11.06.14, which states that the Permittee shall not construct, modify, or operate a PSD source as defined in COMAR 26.11.01.01B(37) without first obtaining a PSD Approval in accordance with the provisions of 40 CFR §52.21.

PART C – BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

(1) To meet Best Available Control Technology (BACT) requirements, emissions of nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter (PM-10 and PM-2.5) from each OCS source shall be limited to the following:

(a) All vessels contracted by the Permittee shall be equipped with marine engines (main and auxiliary) that meet the most stringent, applicable EPA Tier or MARPOL Annex VI emissions standard available at the time the marine vessel is hired for the specific work required in the timeframe required. Marine vessels with the next highest-tier engines may be hired and deployed, if the Permittee documents the basis for its conclusion that the highest-tier vessel, and any other higher-tiered vessels, are not available. The engines may also meet the next most stringent emission standards if the total emissions associated with the use of a vessel with an engine(s) that meet the most stringent emission standards would be greater than the total emissions associated with the use of the vessel with an engine(s) that meet the next most stringent emission standards.

For purposes of this subparagraph, when determining the total emissions associated with the use of a vessel with a particular engine, the Permittee shall include the emissions of the vessel that would occur when the vessel would be in transit to the OCS source from the vessel's starting location.

(b) Each Category 1 main and auxiliary marine engine of a vessel shall be certified to the applicable engine EPA Tier emission standard specified in 40 CFR §1042.101, meeting Tier 2 requirements at the minimum.

(c) Each Category 2 main and auxiliary marine engine shall be certified to the applicable engine EPA Tier emission standard specified in 40 CFR §1042.101, meeting Tier 2 requirements at the minimum.

(d) Each Category 3 main and auxiliary marine engine shall be certified to the applicable engine EPA Tier emission standard specified in 40 CFR §1042.104, meeting Tier 2 requirements at the minimum.

(e) For marine engines (main and auxiliary) onboard foreign-flagged marine vessels, each engine shall be certified to the applicable engine emission standard specified in 40 CFR §1043, meeting MARPOL Annex VI requirements at the minimum.

(f) For Non-Marine Engines, Portable Diesel Generator Engines used during C&C and O&M, the Permittee shall ensure that each of the portable diesel generator engines is certified to meet the EPA Tier 4 emission standard from 40 CFR §1039, that applies to each engine.

(g) For Permanent Diesel Generator Engines on OSS during O&M, the Permittee shall ensure that each of the portable diesel generator engines is certified to meet the EPA Tier 4 emission standard from 40 CFR §1039, that applies to each engine.

(h) The Permittee shall use good combustion practices based on the manufacturer's specifications for all marine and non-marine engines associated with the Maryland Offshore Wind Project.

(2) The Permittee shall comply with the following additional BACT fuel requirements for PM-10 and PM-2.5 from the Maryland Offshore Wind Project, while the vessel is an OCS source:

(a) The Permittee shall use ultra-low-sulfur diesel (ULSD) fuel in all Category 1 and 2 engines, Non-Marine Engines, Portable Diesel Generator Engines used during C&C and O&M, and Permanent Diesel Generator Engines on OSS during O&M that meets the per-gallon standards below.

(i) a maximum sulfur content of 15 parts per million (ppm); and
(ii) a minimum cetane index of 40; or
(iii) maximum aromatic content of 35 volume percent.

(b) The Permittee shall use fuel with a maximum sulfur content of 1000 ppm in all Category 3 engines.

(3) Prior to the C&C Start Date, the Permittee shall provide the Department an initial report, for review and approval, that defines each vessel contracted, each anticipated representative vessel, and each marine and non-marine engine to be used during the initial C&C and O&M of the Maryland Offshore Wind Project. The report shall include, at a minimum, the following information:

(a) All the information required by Part G(1)(a), (b), (c), (d) of this Approval;
(b) The proposed BACT for each OCS source engine for NO_2, CO, PM-10, PM-2.5 in units of grams per kilowatt-hour (g/kW-hr);
(c) The regulatory citation for each BACT proposal for NO_2, CO, PM-10, PM-2.5;
(d) The proposed BACT compliance demonstration for NO_2, CO, PM-10, PM-2.5; and
(e) Updated Potential to Emit estimates and calculations for NO_2, CO, PM-10, PM-2.5 as per the emission estimation methods as required in Part F of this Approval.

(4) C&C shall not commence until the Department has approved the proposed BACT for NO_2, CO, PM-10, PM-2.5 and the proposed BACT compliance demonstrations for NO_2, CO, PM-10, PM-2.5 in writing.

(5) For any vessel or non-marine engine substitutions during the life of the Maryland Offshore Wind Project, the Permittee shall provide the information required by Part C(3), prior to use of that vessel or engine.

PART D – EMISSIONS RESTRICTIONS

(1) Total emissions of NO_2, CO, PM-10, and PM-2.5 from the Maryland Offshore Wind Project shall be less than the following limits including periods of startup, shutdown, and malfunction:

Table 3 – Emissions Limits

Pollutant	Maximum Annual C&C and O&M, Combined During C&C (tons/rolling 12-months)	Total C&C and O&M, Combined During C&C (tons)	Maximum O&M (tons/rolling 12-months)
NO_2	616	1380	25
CO	149	344	24
PM-10	20	45	0.66
PM-2.5	19	44	0.65

(2) Total daily emissions from the Maryland Offshore Wind Project shall be less than the following limits, expressed as tons per day (tpd). These limits are derived from the emissions modeled in the application and ensure compliance with the NAAQS and PSD increments.

Table 4 – Daily Emissions Limits

Pollutant	Maximum C&C (tpd)	Maximum O&M (tpd)
NO_2	2.68	1.63
CO	0.76	0.33
PM-10	0.11	0.06
PM-2.5	0.11	0.05

PART E – OPERATING AND MONITORING REQUIREMENTS

(1) For the Maryland Offshore Wind Project, the Permittee shall develop and implement a plan that will ensure good combustion practices and combustion efficiency, per manufacturer recommendations. The Good Combustion Practices and Combustion Efficiency Plan shall include practices to minimize engine idling, a summary of the good combustion practices for each engine, a preventative maintenance schedule, and any additional information as deemed necessary by the Department.

(2) The Good Combustion Practices and Combustion Efficiency Plan shall be submitted to the Department for review and approval. C&C shall not commence until the Permittee receives approval of the Good Combustion Practices and Combustion Efficiency Plan from the Department in writing.

(3) To ensure compliance with the NAAQS and PSD increments and total daily emissions limits in Part D(2), Table 4 of this Approval, only vessels for one of the following operations may be operated simultaneously unless the Permittee can demonstrate, by conducting additional emissions modeling approved by the Department, compliance at other operating conditions: Foundation Installation, WTG Installation, WTG Commissioning, OSS Installation, Interarray Cable Installation, Export Cable Installation, and O&M.

PART F – COMPLIANCE DEMONSTRATION

(1) The Permittee shall calculate actual total NO_2, CO, PM-10, and PM-2.5 emissions from the Maryland Offshore Wind Project for each calendar month and for each consecutive rolling 12-month period. For marine engines, the Permittee shall use the most recent version of the EPA Ports Emissions Inventory Guidance. For non-marine engines the Permittee shall use the most relevant data available, which may include actual test data, tier standards, EPA's annual engine certification data, and any emissions information obtained from equipment vendors. The Permittee must obtain approval from the Department to use an alternate emissions estimation method.

(2) The Permittee shall use actual vessel and engine data to calculate emissions as required by Part F(1). The Permittee shall include all data to support the calculations.

(3) The Permittee shall demonstrate compliance with applicable BACT emission limits (g/kW-hr) for each OCS source engine by ensuring that each engine has an EPA Certificate of Conformity to the applicable Tier emission standard, or a MARPOL Annex VI, IAPP Certificate for the vessel and an EIAPP certificate for the engine, as required in Part C(1).

PART G – REPORTING AND RECORDKEEPING REQUIREMENTS

(1) The following records with supporting documentation shall be maintained on site for at least five (5) years and made available to the Department and EPA upon request:

(a) For each vessel associated with the Maryland Offshore Wind Project: the vessel's owner, vessel name, year that the vessel was built, nation of origin of the vessel, exact vessel function, whether the vessel is an OCS Source, and documentation specifically supporting whether (1) the vessel requires attachment to the seabed (either via anchors, spuds (type of jack-up vessel), or other type of attachment) during the C&C or O&M activities; (2) the vessel could be maintained in a fixed position using only the vessel engines and without any attachment to the seabed during the C&C and O&M activities; or (3) the vessel would require attachment to other vessels, while those other vessels are OCS sources, or to the WTGs or OSSs structures during the C&C or O&M activities;

(b) For each marine engine of each vessel associated with the Maryland Offshore Wind Project, regardless of whether the vessel is considered an OCS source or not: the engine's category (1 through 3), marine engine function (i.e., main (or propulsion) or auxiliary marine engine), engine type (e.g., slow-speed diesel, gas turbine…), rated engine size and total installed propulsion power (maximum continuous rated engine power in kW), vessel speed and maximum vessel speed, maximum draft, make and model year or remanufacture year, keel-laid year, engine stroke type (e.g. 2- or 4-stroke), displacement in liters/cylinder, install date, maximum in-use engine speed in rotations per minute, type of fuel used (e.g. marine gas oil, marine diesel oil…), brake specific fuel consumption, average loads, and the EPA Certificate of Conformity to a Tier engine rating, or EIAPP certificate and IAPP certificate, as applicable;

(c) For each vessel deployed during C&C and/or O&M, the Permittee shall maintain a record of the alternate vessels that, during the time of contract deployment, were available for hire for the required work needed at the time needed, as well as the Tier levels for each vessel's engines. The alternate vessels available for hire shall be listed in ranking order from the one with the highest-tiered engines to the one with the lowest tiered-engines. The record should indicate if the vessel with the highest tiered-engines from the list was the actual vessel hired and deployed. If the vessel with the highest tiered-engines from the list was not the actual vessel hired and deployed, the record should document the reason(s) for the Permittee selection of a vessel with lower-tiered engines;

(d) For each non-marine engine of each vessel that will be associated with the Maryland Offshore Wind Project: maximum engine power (kW), model year, type of fuel used, and the EPA Certificate of Conformity to the Tier 4 emission standards in 40 CFR §1039.101(b);

(e) The daily operating hours for each engine associated with the Maryland Offshore Wind Project. The hours of operation shall be recorded from a non-resettable hour meter or, if a non-resettable hour meter is not available, by monitoring and maintaining records of the actual daily operating hours;

(f) The daily fuel use, in units of gallons per day, for each engine associated with the Maryland Offshore Wind Project and records of fuel supplier certifications for all fuelings to demonstrate compliance with all applicable fuel sulfur content limitations;

(g) Daily records of marine engine load factors calculated per vessel associated with the Maryland Offshore Wind Project; load factor shall be calculated per the most recent version of the EPA Ports Emissions Inventory Guidance, unless the Permittee obtains approval from the Department to use an alternate emissions estimation method.

(h) The daily, monthly, and consecutive rolling 12-month actual NO_2, CO, PM-10, and PM-2.5 emissions with the Maryland Offshore Wind Project, including calculations and data to support the calculations; and

(i) The Good Combustion Practices and Combustion Efficiency Plan that will ensure good combustion practices and combustion efficiency, per manufacturer recommendations and all associated records.

(2) All air quality notifications, records, reports, plans, and documents required by this Approval shall be submitted electronically to the Air Quality Compliance Program to:

mdeair.othercompliance@maryland.gov