UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
FOUR PENN CENTER – 1600 JOHN F. KENNEDY BLVD.
PHILADELPHIA, PENNSYLVANIA 19103

MEMORANDUM

SUBJECT: Model Clearinghouse review of an alternative model application of AERCOARE in conjunction with AERMOD in Support of Outer Continental Shelf PSD air permitting of the US Wind Maryland Offshore Wind Project

FROM: Timothy A. Leon Guerrero, Meteorologist
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THROUGH: Alice Chow, Branch Chief
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TO: George Bridgers, Director of Model Clearinghouse
Air Quality Modeling Group, Air Quality Assessment Division,
Office of Air Quality Planning and Standards

The U.S. Environmental Protection Agency (EPA) Region 3 office seeks concurrence from the Model Clearinghouse regarding its approval of a request for the use of an alternative model for an Outer Continental Shelf (OCS) Prevention of Significant Deterioration (PSD) permit. Region 3 seeks Model Clearinghouse concurrence to use the Coupled Ocean-Atmosphere Response Experiment (COARE) bulk flux algorithm, as implemented in the meteorological data processor program (AERCOARE), to prepare meteorological data for use with the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). AERCOARE, a meteorological data preprocessor program, will be used in conjunction with AERMOD (AERCOARE/AERMOD) to conduct an air quality impact analysis as part of the OCS air permit application for US Wind's Maryland Offshore Wind Project located off the coast of Maryland; Worcester County, Maryland is the nearest onshore area for the Project.

On 11 July 2023, EPA Region 3 received a letter from Serena McIlwain, Secretary, Maryland Department of the Environment (MDE), formally submitting a request to use AERCOARE/AERMOD as an alternative model for assessing air quality standards compliance for US Wind's Maryland Offshore Wind Project emission sources located over water. AERCOARE/AERMOD was proposed in lieu of the Offshore and Coastal Dispersion (OCD) model, which is the current Guideline on Air Quality Models (40 CFR 51 Appendix W) preferred model for over-water dispersion.

Section 3.2.1(b) of Appendix W outlines the general process of how alternative models are approved. In accordance with this section, Regional Administrators have delegated authority to issue such approvals under section 3.2. Such approvals are issued after consultation with the EPA's Model Clearinghouse and formally documented in a concurrence memorandum from the EPA's Model Clearinghouse which demonstrates that the requirements within section 3.2 for use of an alternative model have been met.

EPA Region 3 based its approval of US Wind's request to use the AERCOARE/AERMOD model for its air quality impact analysis, under 40 CFR Part 51, Appendix W §3.2.2(b)(3). Under 3.2.2(b)(3), an alternative model may be used if the Regional Office finds the conditions specified in Appendix W §3.2.2(e) are satisfied. MDE's 11 July 2023 letter outlining its alternative model request presents specific responses to the 5 points (*i-v*) outlined in section 3.2.2(e).

EPA Region 3 thoroughly reviewed MDE's submittal on behalf of US Wind and agrees that an alternative model (AERCOARE/AERMOD) is justified for this application. A summary of these points will be presented in the following sections of this memo. MDE's alternative model request submittal is also included as an enclosure. We seek the Model Clearinghouse's concurrence as part of the modeling demonstration for the US Wind's Maryland Offshore Wind Project's permit application process.

Background and Project Overview

US Wind's Maryland Offshore Wind Project will be located in the Commercial Lease of Submerged Lands for Renewable Energy Development on the OCS offshore Maryland (Lease No. OCS-A-0490). This lease area was awarded through the Bureau of Ocean Energy Management competitive renewable energy lease auction in December 2014. The Lease Area covers approximately 350 square kilometers. The nearest shoreward boundary is approximately 18.5 km off the Maryland coastline, while the farthest oceanward boundary is located approximately 43 km from the nearest point of land. A figure showing the lease area and nearest land features is included in MDE's original request (see enclosure).

When completed, US Wind's Maryland Offshore Wind Project is expected to provide approximately 2,000 megawatts (MW) of clean, reliable offshore wind energy. US Wind's preferred buildout design scenario for the Maryland Offshore Wind Project includes:

- Up to 121 wind turbine generators (WTGs) and associated WTG foundations
- Up to 4 Offshore Substations (OSSs) and associated offshore substation foundations
- Up to four (4) new export cables into new onshore substations in Delaware

Although the wind turbines themselves do not emit air pollutants and are, therefore, not "OCS sources" as defined in 40 CFR 55, jack-up vessels are expected to be used to construct the wind turbines. Air emissions from US Wind's Maryland Offshore Wind Project will primarily consist of products of combustion from the vessels associated with the construction and operation phases of this project.

Technical Basis for Alternative Model Request

MDE is requesting to use AERCOARE as an alternative to replace the regulatory AERMET preprocessor program that is specifically designed for applications over land. AERCOARE will read and process overwater meteorological data using the COARE methodology that was specifically designed for marine applications. The output from AERCOARE can then be used for input to AERMOD for modeling applications in a marine environment, such as the Maryland Offshore Wind Project's primary OCS sources. The Offshore and Coastal Dispersion or OCD dispersion model is currently listed as EPA's preferred model for over-water modeling and is briefly described in Section 4.2.2.3 of 40 CFR Part 51 Appendix W.

The following technical advantages, options, and features available in the model, AERCOARE-AERMOD, were put forth by US Wind in the 10 March 2023 letter to MDE's Suna Y. Sariscak, Manager, Air Quality Permits Program (see attachment). MDE prefers AERCOARE/AERMOD over OCD based on the technical reasons in this letter and include the following points:

1. The Plume Rise Model Enhancements (PRIME) downwash algorithm can be used to assess impacts in the cavity and wake regions of structures. While the AERMOD model does not incorporate platform downwash, US Wind has proposed use of PRIME considering the platform as a solid structure which will result in conservative, overprediction of concentrations.
2. The use of EPA Tier 2 and 3 NOx modeling options are not available in OCD but could be utilized with an AERCOARE-AERMOD approach. Specifically, the Ambient Ratio Method (ARM2), Plume Volume Molar Ratio Method (PVMRM) and Ozone Limiting Method (OLM) could be used by the Project to estimate the conversion of NOx to NO_2.
3. Output can be generated in the statistical form that is needed to assess compliance with the newer percentile-based NAAQS, such as 1-hour NO_2, SO_2 and 24-hour PM-2.5.
4. AERMOD-AERCOARE has the capability of handling a wider array of source configurations and does not limit the number of modeled sources compared to OCD, including multiple line sources, and more than 5 areas sources within the same model run.
5. The AERMOD-AERCOARE model can model volume sources, whereas OCD cannot.
6. Calm wind conditions can be processed by the AERMOD-AERCOARE model, whereas OCD cannot.
7. The dispersion algorithms used in the AERMOD portion of AERCOARE-AERMOD are considered state-of-art by EPA. OCD dispersion algorithms have not been updated to account for current advancements in boundary layer physics.
8. AERCOARE-AERMOD does not have a limit on the number of receptors that can be considered in an analysis, whereas OCD does limit the total number of receptors.
9. AERCOARE has the capability to utilize prognostic data from the Weather Research and Forecasting (WRF) model and output from the Mesoscale Model Interface (MMIF) program.
10. AERMOD incorporates options for the inclusion of varying ambient background concentrations by season and hour of day during the model run. In contrast, OCD does not have an option to incorporate ambient background concentrations within the model. Ambient background concentrations could be applied to the OCD predicted concentrations in a postprocessing step. A custom postprocessor for OCD would need to be developed.
11. Unlike OCD, AERMOD does not include algorithms to evaluate shoreline fumigation conditions. However, shoreline fumigation is not expected to be an important impact consideration for the Project emission sources. Shoreline fumigation can occur when plumes traveling in relatively stable air near the shoreline encounter the thermal internal boundary layer (TIBL) and fumigate downward, potentially resulting in elevated pollutant concentrations at the ground. The TIBL is the boundary layer that can form between the more stable over-water air mass and the less stable over-land air mass and typically forms during sea breeze conditions. EPA modeling guidance indicates that shoreline fumigation can be an important phenomenon on and near the shoreline of bodies of water for sources with tall stacks located on or just inland of a shoreline. However, the Project emissions (primarily vessels) are emitted from stacks with low release heights that will generally be located far offshore (the Project site is located 18.5 km offshore). Exhaust plumes are expected to be substantially dispersed before encountering the TIBL and potential fumigation conditions. Therefore, shoreline fumigation is not expected to be

an important impact condition for Project emissions and is not proposed to be specifically evaluated for the air quality analysis.

Unlike OCD, AERMOD does not include algorithms to evaluate shoreline fumigation conditions. As noted in US Wind's documentation, they do not expect shoreline fumigation to be an important impact consideration for their primary emission sources. Shoreline fumigation can occur when plumes traveling in relatively stable air near the shoreline encounter the thermal internal boundary layer (TIBL) and fumigate downward, potentially resulting in elevated pollutant concentrations at the ground. The TIBL is the boundary layer that can form between the more stable over-water air mass and the less stable over-land air mass and typically forms during sea breeze conditions.

EPA modeling guidance indicates that shoreline fumigation can be an important phenomenon on and near the shoreline of bodies of water for sources with tall stacks located on or just inland of a shoreline. US Wind's (primarily vessels) emissions are emitted from stacks with low release heights and are located well offshore (the lease area is between 18.5 and 43 km from land). Under these circumstances, exhaust plumes may be substantially dispersed before encountering the TIBL and potential fumigation conditions. MDE and US Wind may need to consider evaluating the possibility of shoreline fumigation in their final air quality impact analysis.

Modeling Approach

A modeling protocol was submitted to MDE and shared with EPA Region 3 by US Wind. This modeling protocol was developed by TRC Environmental Corporation and dated September 2022 and outlined general modeling procedures to be followed for US Wind's Maryland Offshore Wind Project. An air quality impact analysis is required under 40 CFR Part 52.21 and 40 CFR Part 55.

US Wind surveyed the closest offshore buoy collected data to its Maryland Offshore Wind Project. There are only 2 active buoys collecting meteorological data in the area; the Ocean City Inlet Buoy and the Delaware Bay 26 NM Buoy (ID #44009), which is 19 miles offshore of Ocean City MD. To run AERCOARE, the overwater meteorological file must contain the necessary hourly observations to estimate surface fluxes using the COARE algorithm, plus additional variables that are directly passed through to AERMOD. Buoy data can be used with AERCOARE, provided that it meets US EPA completeness requirements described under section 8.4.3 of Appendix W (at least 90% annual and at least 90% per calendar quarter, on average, across the 5 years processed).

A recent 5-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 was conducted by the applicant. Neither buoy collect the relative humidity data that are necessary inputs to AERCOARE. Additionally, annual capture statistics were calculated and it was determined that the primary meteorological variables had capture statistics ranging from 88.6 to 92.7% for the Ocean City Inlet Buoy and from 38% to 64% for the Delaware Bay Buoy. Meteorological data from these buoys, therefore, does not meet minimum criteria for completeness requirements on an annual basis.

US Wind, therefore, proposed to use 12-km WRF data and MMIF for 2019-2021 for its Maryland Offshore Wind Project. As such, US Wind requested and received prognostic (i.e., WRF data) data from US EPA Office of Air Quality Planning and Standards (OAQPS). US EPA processed the 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.

Section 8.4.5 of EPA's Appendix W provides the framework for utilizing prognostic meteorological data for dispersion model applications. US Wind followed recommendations outline in this section of Appendix W including a prognostic model evaluation, assessment of representativeness and grid-cell resolution. These are presented in more detail in US Wind's 10 March 2023 letter to MDE's Suna Y. Sariscak, Manager, Air Quality Permits Program. US Wind noted that a similar alternative model request for the use of AERCOARE/AERMOD using WRF-MMIF data had been made and approved for the Park City Wind OCS wind farm project[1].

Alternative Model Proposal Review

Regulatory Analysis and Background

The PSD regulations, 40 CFR Part 52.21(l), state that all applications of air quality modeling shall be based on the preferred models specified in Appendix W. Section 40 CFR Part 52.21(l)(2) also provides on a case-by-case basis that an alternative air quality dispersion model may be used if written approval from the EPA Regional Administrator is obtained. The alternative model approval process and conditions are outlined in Section 3.2 of the Appendix W. Section 3.2.2(a) specifies that the determination of acceptability of an alternative model is an EPA Regional Office responsibility in consultation with EPA's Model Clearinghouse (MCH). An alternative model may be used subject to Regional Office approval if found to satisfy the requirements listed in Section 3.2.2. Section 3.2.2(e) sets forth the 5 elements that must be satisfied for alternative model approval:

i. The model or technique has received a scientific peer review;
ii. The model or technique can be demonstrated to be applicable to the problem on a theoretical basis;
iii. The databases which are necessary to perform the analysis are available and adequate;
iv. Appropriate performance evaluations of the model or technique have shown that the model or technique is not inappropriately biased for regulatory application a; and
v. A protocol on methods and procedures to be followed has been established.

EPA will provide a more detailed analysis of these 5 elements from Appendix W section 3.2.2(e) in the next section of this alternative model concurrence request.

Evaluation of Approach Under Appendix W Section 3.2.2(e)

Justification for the use of AERCOARE/AERMOD in Dominion's air modeling analysis are discussed in more detail below for each of the 5 elements in Appendix W section 3.2.2(e). EPA Region 3 has reviewed US Wind's support under these 5 elements and determined that the alternative model request is supported through these points.

i. The model or technique has received a scientific peer review

[1] See Model Clearinghouse Information Storage and Retrieval System Record No: 22-I-01

As described in the 2011 EPA Region 10 approval (and referenced in the 2019 EPA Region 6 approval and 2022 EPA Region 1 and 2 approvals[2]), the science behind the COARE algorithm, which is incorporated into AERCOARE, has been published in scientific peer review journals. In its approval, Region 10 confirmed the scientific legitimacy and applicability of the COARE algorithm to various over-water conditions through a sufficient body of peer-reviewed literature. The Region 10 approval also documented that the algorithms in COARE are configured to handle a wide range of temperature gradient conditions including the extremes that could be found in the Arctic or the tropics.

A key peer reviewed article that demonstrated the effectiveness of the COARE 3.0 algorithm when compared to datasets from multiple air-sea flux and bulk meteorological data collection campaigns was presented by Fairall *et al.* in 2003.

Wong *et al*. also described the concepts and configuration of the AERCOARE model and its association with AERMOD in the 2016 peer-reviewed article by Region 10 and partner scientists.

These points demonstrate that AECOARE has undergone scientific peer review.

ii. The model or technique can be demonstrated to be applicable to the problem on a theoretical basis.

EPA has previously found the AERCOARE/AERMOD approach to be applicable, on a theoretical basis, for the simulation of pollutant dispersion in the marine atmospheric boundary layer for other OCS projects. In the April 2011 Region 10 alternative model approval, EPA deemed AERCOARE/AERMOD to be appropriate for use in the Arctic marine ice-free environment. In the 2019 Region 6 AERCOARE/AERMOD alternative model approval, EPA determined the model was also appropriate on a theoretical basis for use in the subtropical marine environment off the coast of Louisiana. In the 2022 AERCOARE/AERMOD approval for the Park City Wind project, EPA Region 1 deemed it was appropriate on a theoretical basis for use in the marine environment off the coast of Massachusetts. In addition, as shown below, EPA's current user manual for AERCOARE (U.S. EPA, 2012) indicates that AERCOARE is expected to be appropriate for marine conditions at all latitudes:

> "AERCOARE uses Version 3.0 of the COARE algorithm that has been updated several times since the initial international TOGA-COARE field program in the western Pacific Ocean from November 1992 to February 1993. The basic algorithm uses air-sea temperature difference, overwater humidity, and wind speed measurements to estimate the sensible heat, latent heat, and momentum fluxes. The original algorithm was based on measurements in the tropics with winds generally less than 10 m/s but has since been modified and extensively evaluated against measurements in high latitudes with winds up to 20 m/s. Based on these studies, AERCOARE is expected to be appropriate for marine conditions found at all latitudes including the Arctic."

As described in the AERCOARE user's manual, AERCOARE calculates the meteorological input parameters needed for AERMOD by accounting for heat flux to and from the atmosphere due to the difference in temperature between the water surface and the air. AERMOD alone does not depend on parameterizations specific to overland conditions. The meteorological inputs provided by AERCOARE (for input into AERMOD) provide the information necessary to parameterize the structure of the marine atmospheric boundary layer using Monin-Obukhov Similarity Theory. This parameterization scheme is universally applicable to over-land and over-water domains. The COARE 3.0 algorithms use standard

[2] See EPA's Model Clearinghouse Information Storage and Retrieval System at: https://cfpub.epa.gov/oarweb/mchisrs/ Individual concurrence memos referenced here can be accessed by selecting the year and EPA region.

meteorological variables such as wind speed, air temperature, relative humidity, and water temperature to determine bulk transfer coefficients used in Monin-Obukhov Similarity Theory to describe the structure of the atmospheric surface layer.

Based on the information summarized above, we believe that the coupled AERCOARE/AERMOD modeling approach is applicable to US Wind's Maryland Offshore Wind Project on a theoretical basis.

iii. The databases which are necessary to perform the analysis are available and adequate.

Appendix W refers to the databases collected to develop and verify the proposed modeling methodologies. The meteorological databases that were used to develop the COARE algorithms for marine conditions are publicly available in the scientific literature. Datasets from previous dispersion experiment studies have been used to verify the accuracy of the AERCOARE/AERMOD modeling approach. There are 4 comprehensive historical overwater dispersion datasets available in the record that involve study of air pollutant dispersion in the marine atmospheric boundary layer. The following 4 tracer gas studies from the 1980s have been used in performance evaluations of OCD, CALPUFF, and AERCOARE/AERMOD:

- Cameron, Louisiana: July 1981 and February 1982 (Dabberdt, Brodzinsky, Cantrell, & Ruff, 1982)
- Carpinteria, California: September 1985 (Johnson & Spangler, 1986)
- Pismo Beach, California: December 1981 and June 1982 (Schacher, et al., 1982)
- Ventura, California: September 1980 and January 1981 (Schacher, et al., 1982)

The Region 10 alternative model approval of AERCOARE/AERMOD utilized tracer gas experiments from the 4 studies listed above. In all of the previous alternative model approvals, EPA determined that these datasets were adequate for verification of the AERCOARE/AERMOD system.

US Wind took a similar approach and provided statistics for key meteorological parameters for the Ocean City Inlet Buoy station and Delaware Bay 26 NM Buoy station (#44009) located in the Maryland Wind Farm Project area. The Delaware Bay 26 NM buoy is located 14 kilometers northeast of the project's centroid and is the nearest offshore meteorological station. The Ocean City Inlet buoy is located 29 km west of the project's centroid. Multiple WRF-MMIF extraction points were also included in US Wind's comparison to the 4 tracer studies.

Table 2 in US Wind's alternative model request summarizes key meteorological data and compares them to data from 4 tracer studies. WRF-MMIFF extraction points were also included in this comparison. Additionally, Figures 2 and 3 from US Wind's alternative model request present whisker plots visually showing the ranges of variables for the 4 trace studies versus observation points and WRF-MMIF extraction points. The comparisons of data demonstrates that the range of atmospheric conditions that typically occur in the Ocean City, Maryland offshore region fit the range of conditions used to develop and verify the COARE 3.0 algorithm.

Based on US Wind's analysis included in MDE's alternative model request, EPA believes the databases which are necessary to perform the analysis are available and adequate for determining the effectiveness of the proposed modeling approach. Thus, we feel this requirement has been fulfilled.

iv. Appropriate performance evaluations of the model or technique have shown that the model or technique is not inappropriately biased for regulatory application.

Model evaluation results for AERCOARE were presented in detail in 2 documents: (1) April 1, 2011, memorandum from EPA Region 10 and (2) EPA/ENVIRON October 2012 Model Evaluation Study. The results of both model performance evaluations indicated the model is not biased toward underestimates as discussed below.

As documented in the October 2012 Model Evaluation Study, AERCOARE Version 1.0 (12275) was applied to prepare the overwater meteorological data for the Cameron, Louisiana, and the Pismo Beach, California offshore datasets. AERCOARE simulations were conducted using 5 different methods for the preparation of the meteorological data, including the estimation of mixing heights, the use of horizontal wind direction (sigma theta data), and limitations on other variables provided to AERMOD to calculate concentrations from the field studies.

For both evaluation studies, AERMOD was run using AERCOARE along with default options for rural flat terrain for both simulations. Quantile-quantile (Q-Q) plots were prepared based on a comparison of independently ranked modeled versus observed concentrations. These Q-Q plots were included as part of MDE's alternative model request. The AERCOARE-AERMOD modeled concentrations are biased toward over-prediction for the highest concentrations, with less than a factor of 2 underprediction bias at the lower concentrations. Importantly, AERCOARE-AERMOD does not appear to be biased toward underestimates for the higher end of the frequency distribution, regardless of the 5 different meteorological preparation options examined in this study.

In EPA Region 1's review of Park City Wind, examination of whether the use of prognostic meteorological data (also used in Maryland Offshore Wind Project) generated by WRF could result in systematic underprediction of concentrations lead to the following conclusions:

> *"Additionally, Region 1 reviewed U.S. EPA (2015) to see if the WRF-MMIF inputs for AERCOARE resulted in underprediction. U.S. EPA (2015) used the four overwater dispersion study datasets listed above to compare AERCOARE/AERMOD predicted concentrations against the measured concentrations from the campaigns. This study also compared results across a set of combinations of WRF-MMIF inputs and settings. The results of this study show AERCOARE/AERMOD driven by WRF-MMIF inputs resulted in the high-end of the distribution of concentrations exceeding the measured concentrations in the Pismo and Ventura studies. Concentrations agreed well for the Carpinteria study at the high-end of the distribution in most cases. In the Cameron study, and under some of the scenarios in the Carpinteria study, the modeling resulted in underpredictions at the high-end of the distribution in some scenarios. Namely, when mixing heights were diagnosed by MMIF, instead of using the mixing heights directly from WRF, AERCOARE/AERMOD concentrations were underpredicted in some cases. The model runs using WRF-simulated mixing heights performed better, when compared to measured concentrations. Overall, however, the U.S. EPA (2015) study noted concentration bias could be attributed mainly due to error in sea-surface temperatures output from the WRF model.*
>
> *A key element to both the original Region 10 approval study and the U.S. EPA (2015) study was an evaluation of the sensitivity of the modeling results to a minimum mixing height. The Region 10 approval found AERCOARE/AERMOD results were highly overpredicted when using AERMOD's default minimum mixing height of 1 meter. EPA Region 10's sensitivity study, summarized in ENVIRON (2012) found a minimum mixing height of 25 meters for overwater*

applications was more physically realistic and resulted in better model performance. The EPA Region 10 approval allowed for the use of a minimum mixing height of 25 meters for the application of AERCOARE/AERMOD and a minimum limit on the absolute value of Monin-Obukhov Length of 5 meters. These limits are recommended in the EPA's AERCOARE User's Guide[3].

Based on the findings from the studies reviewed in the prior EPA approvals and the additional WRF-MMIF-based study, Region 1 concludes it is evident the AERCOARE/AERMOD approach does not result in systematic underprediction of concentrations. Instead, the evidence more likely leads to the conclusion the approach is conservative."

In accordance with EPA Region 1's analysis noted above, US Wind proposes to use 12-km WRF data and MMIF for 2019-2021. The proposed AERCOARE settings will include the recommendations of 25 meters for the minimum mixing height and a minimum Monin-Obukhov length of 5 meters.

Based on the study information described above, we believe it is evident the AERCOARE/AERMOD approach is not likely to result in underprediction of concentrations, but rather more likely the approach is conservative.

v. A protocol on methods and procedures to be followed has been established.

US Wind originally submitted a modeling protocol describing modeling methodologies and procedures consistent with the Guideline on Air Quality Models (Appendix W of 40 CFR 51) on September 16, 2022. US Wind amended its original approach from using EPA's OCD model to using AERCOARE/AERMOD in its alternative model request.

US Wind requested prognostic (i.e., WRF data) data from EPA Office of Air Quality Planning and Standards (OAQPS) which was received on February 9, 2023. EPA processed the WRF data using MMIF (Version 4.0) to convert the WRF prognostic meteorological data (2019-2021) into a format suitable for dispersion modeling applications. Default settings for AERCOARE processing (i.e., settings specific to AERMET are not applicable) as provided in the User's Manual to the Mesoscale Model Interface Program, Version 4.0.

US Wind intends to run AERCOARE using the following settings recommended in EPA's AERCOARE User's Guide, as specified below:

1. The default threshold wind speed will be used to identify calm hours (i.e., WSCALM = 0.5 m/s). Wind speeds below this value will be considered calms.
2. Mixing heights provided by WRF-MMIF will be used, instead of calculated by AERCOARE. The default minimum mixing height of 25 meters will be assigned.
3. Warm layer and cool-skin effects will not be considered.
4. Friction velocity will be determined from wind speed only; wave-height will not be considered.

AERCOARE parameters noted above were previously approved by EPA Regions 2 and 3 and EPA OAQPS in their approvals of the Alternative Model Request for the Dominion Coastal Virginia Offshore Wind-Commercial Wind Farm and Atlantic Shores Projects.

These actions should demonstrate that the protocol establishment element is adequately addressed.

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[3] See AERCOAREv1.0 User's Manual.

Conclusion

EPA Region 3 has reviewed MDE's alternative model request submittal and has determined that the proposed AERCOARE/AERMOD using WRF-MMIF prognostic meteorological data in their modeling approach is acceptable as an alternative model for the air quality impact analysis submitted in support of its OCS air permit application. We find that the proposed approach addresses the 5 elements contained in Section 3.2.2(e) of 40 CFR 51 Appendix W.

In accordance with Appendix W sections 3.0(b) and 3.2.2(a), Region 3 currently intends to approve the use of AERCOARE/AERMOD as an acceptable alternative model for the US Wind's Maryland Offshore Wind Project. We seek the concurrence from the Model Clearinghouse. As with the other alternative model approvals of AERMOD-COARE, approval to use this alternative model is made on a case-by-case basis. Should an air permit applicant or state desire to use AERCOARE/AERMOD in an overwater modeling analysis for a different facility and/or location, a request for alternative approval must be made to the appropriate EPA Regional Office containing the appropriate technical justifications/demonstrations consistent with applicable sections of Appendix W.

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Enclosure

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