UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

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 Empire Wind offshore wind power project

FROM: George Bridgers, Model Clearinghouse Director
Air Quality Modeling Group, Air Quality Assessment Division
Office of Air Quality Planning and Standards

GEORGE BRIDGERS
Digitally signed by GEORGE BRIDGERS
Date: 2022.07.27 15:37:06 -04'00'

TO: Neha Sareen, Regional Air Quality Modeler
Permitting Section, Air Programs Branch, Air and Radiation Division
EPA Region 2, New York, New York

Rick Ruvo, Director
Air and Radiation Division
EPA Region 2, New York, New York

INTRODUCTION

Empire Offshore Wind LLC (Empire Wind) has proposed the construction of an offshore electrical generation windfarm on the Outer Continental Shelf (OCS) off the coast of Long Island, New York. The project will be developed in two windfarms (Empire Wind 1 at 816 MW and Empire Wind 2 at 1260 MW) that are both being covered under the current Prevention of Significant Deterioration (PSD) permit application and alternative model justification and request for concurrence and approval. The project triggers the requirement for PSD review based on significant emissions of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM) with diameter 10 microns or less (PM_{10}), PM with diameter 2.5 microns or less ($PM_{2.5}$), and greenhouse gases (GHGs). Also, the project triggers Nonattainment New Source Review (NNSR) for ozone (O_3) precursors, oxides of nitrogen (NO_X), and volatile organic compounds (VOCs). Empire Wind is seeking alternative model approval to allow the use of the coupled AERCOARE-AERMOD model methodology or approach (*described in the next section*) over the preferred Offshore and Coastal Dispersion (OCD) model for their air quality modeling analysis, under the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) Section 3.2.2(b), Condition (3), for the project's OCS permit application.

REGIONAL OFFICE REVIEW

The U.S. Environmental Protection Agency (EPA) Region 2 seeks concurrence from the EPA's Model Clearinghouse (Model Clearinghouse or MCH) regarding the prospective EPA Region 2 approval of an alternative model for the Empire Wind OCS PSD permitting effort. Empire Wind has requested to use the Coupled Ocean-Atmosphere Response Experiment (COARE) bulk flux algorithm, as implemented in the AERCOARE meteorological data preprocessor program, to prepare meteorological data for use in the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) dispersion program to assess ambient impacts in a marine environment. As noted above, Empire Wind is seeking alternative model approval to allow the use of the coupled AERCOARE-AERMOD model methodology per the requirements of the *Guideline*, Section 3.2.

EPA Region 2 has reviewed the alternative model request submittal provided by Empire Wind and has determined that the proposed AERCOARE-AERMOD modeling approach is acceptable as an alternative model for the air quality modeling analysis submitted in support of its OCS PSD permit application. Based on their review, EPA Region 2 has found that the proposed approach addresses the five elements contained in Section 3.2.2(e) of the *Guideline*. As such, pursuant to Sections 3.0(b) and 3.2.2(a), Region 2 currently intends to approve the use of AERCOARE-AERMOD as an acceptable alternative model for the Empire Wind project.

MODEL CLEARINGHOUSE REVIEW

The technical elements of the EPA Region 2 review and the basis for their intention to approve the proposed AERCOARE-AERMOD alternative modeling approach for the Empire Wind project are logically outlined in the EPA Region 2 alternative model concurrence request memorandum submitted to the Model Clearinghouse on July 13, 2022. For the sake of brevity, we will not reiterate each of the technical elements in this concurrence response memorandum, especially considering the parallels with several recent Model Clearinghouse actions regarding the use of the coupled AERCOARE-AERMOD approach in EPA Regions 1 and 6. The circumstances surrounding and the alternative model approach sought with the Empire Wind project closely mimic that of these other recent alternative model approvals. The Model Clearinghouse encourages reviewers of this alternative model concurrence to reference the EPA Region 2 alternative model concurrence memorandum for specific details of EPA Region 2's review of the Empire Wind alternative model request and justification.

This said, the Model Clearinghouse would like to highlight a couple of noteworthy aspects of the Empire Wind alternative model justification package in an effort to continue the growth of the knowledge base surrounding the application of the coupled AERCOARE-AERMOD alternative model methodology over the preferred OCD model:

1) As noted in the previous AERCOARE-AERMOD alternative model approvals, there are a limited number of historical overwater dispersion datasets available that involve study of air pollutant dispersion in the marine atmospheric boundary layer. Historically, four robust tracer studies from the 1980s have been used in the performance evaluations of OCD, CALPUFF, and AERCOARE-AERMOD. These tracer studies were located in the

northern Gulf or Mexico and off the coast of southern California.

Empire Wind has continued the effort put forth with recent Region 1 AERCOARE-AERMOD alternative model approvals to assess and demonstrate that the tracer studies were sufficiently representative of the marine environment in the area of their proposed project based on observed (buoy) meteorological data.[1] The data demonstrates that the range of atmospheric conditions that typically occur in the New York Long Island offshore region fit the range of conditions used to develop and verify the COARE algorithm.

2) While the AERMOD Modeling System is technically and scientifically superior to the preferred OCD model in numerous ways that will not be covered in this concurrence response memorandum, AERMOD does lack two formulation features that are often very important in overwater assessments, namely platform downwash and shoreline fumigation.

   For each of the previous AERCOARE-AERMOD alternative model approvals, platform downwash has been adequately addressed through justification that the use of the PRIME downwash algorithm in AERMOD is accepted to be conservative to that of the platform downwash algorithm in OCD by treating platforms as solid structures that extend downward to the sea surface versus porous structures with open space and air flow below the platform. This same justification is being put forth in the Empire Wind alternative model request.

   For shoreline fumigation, it has been generally accepted to not be of substantial concern and adequately addressed in the previous AERCOARE-AERMOD alternative model approvals on the basis that there was sufficient separation between the project location and the closest shoreline, such that any controlling concentrations in the air quality assessment would occur far offshore and the emissions plume would not encounter the thermal internal boundary layer (TIBL) and fumigate downward to the surface. However, there had not been a quantitative assessment of this qualitative justification regarding shoreline fumigation.

   To confirm this understanding, Empire Wind conducted test modeling with the OCD model, which includes algorithms to assess shoreline fumigation conditions. A set of four OCD test runs demonstrated that shoreline fumigation is not a concern with emission sources having an emissions configuration consistent with the marine vessels to be used for the Empire Wind project construction and located far offshore the coast. The Model Clearinghouse would like to commend Empire Wind for the extra effort put forth with this additional assessment with respect to shoreline fumigation.

[1] Please reference the EPA Model Clearinghouse Information Storage and Retrieval System (MCHISRS) database for more specific details on the recent EPA Region 1 AERCOARE-AERMOD alternative model approvals:
https://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=22-I-01
https://cfpub.epa.gov/oarweb/MCHISRS/index.cfm?fuseaction=main.resultdetails&recnum=22-I-02

CONCURRENCE SUMMARY

The Model Clearinghouse fully concurs with EPA Region 2's proposed approval of a coupled AERCOARE-AERMOD alternative modeling approach for the air quality modeling analysis required in the Empire Wind project based the alternative model justification package provided by Empire Offshore Wind LLC and the review documentation in the alternative model concurrence request memorandum provided by EPA Region 2. The Model Clearinghouse encourages EPA Region 2 to respond to Empire Offshore Wind LLC and to the docket for federal permitting actions related to the Empire Wind project with a letter of alternative model approval, as appropriate. The information associated with the EPA Region 2 alternative model approval and the Model Clearinghouse concurrence should be available for comment during the appropriate public comment period(s).

Given the possible importance of platform downwash and shoreline fumigation, the Model Clearinghouse continues to recommend caution and careful review before additional alternative model considerations of the coupled AERCOARE-AERMOD model methodology in other projects. This case-specific Model Clearinghouse concurrence does not constitute a generic approval of a coupled AERCOARE-AERMOD approach for other applications elsewhere. However, the scope of the technical assessment submitted here and with similar AERCOARE-AERMOD alternative model requests continue to provide a good basis for such considerations.

For any future projects considering the use of a coupled AERCOARE-AERMOD approach, including differing phases of a project to which those phases were not considered as part of a previous EPA alternative model approval, EPA Regional Office approval with Model Clearinghouse concurrence is required per the *Guideline*, Section 3.2. Early consultation with the appropriate reviewing authority and EPA Regional Office is always strongly recommended for any alternative model application other than the preferred OCD model approach for overwater or OCS sources.

cc: Richard Wayland, C304-02
Scott Mathias, C504-01
Tyler Fox, C439-01
Rochelle Boyd, C504-03
EPA Air Program Managers
EPA Regional Modeling Contacts