UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
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BOSTON, MA 02109-3912

FACT SHEET

Outer Continental Shelf Preconstruction Air Permit
Revolution Wind Farm Project
Revolution Wind, LLC

Offshore Renewable Wind Energy Development
Renewable Energy Lease Area OCS-A 0486
EPA Draft Permit Number: OCS-R1-05

Acronyms and Abbreviation List

APPS	Air to Prevent Pollution from Ships
BACT	Best Available Control Technology
BOEM	Bureau of Ocean Energy Management
CAA	Clean Air Act
CA SIP	California State Implementation Plan
CERC	Continuous Emission Reduction Credit
C.F.R.	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
COA	Corresponding Onshore Area
CO_2	Carbon Dioxide
CO_2e	Carbon dioxide equivalent
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
DERC	Discrete Emission Reduction Credit
EAB	Environmental Appeals Board
EGRID	Environmental Protection Agency's Emissions and Generation Resource Integrated Database
EPA	United States Environmental Protection Agency
EJ	Environmental Justice
ERC	Emission Reduction Credit
ESA	Endangered Species Act
EUG	Emission Unit Group
FWS	U.S. Fish and Wildlife Service
g/kW-hr	Grams per kilowatt-hour
H_2SO_4	Sulfuric acid
HAP	Hazardous Air Pollutant
ISO NE	ISO New England
KV	Kilovolt
KW	Kilowatt
LAER	Lowest Achievable Emission Rate
MassDEP	Massachusetts Department of Environmental Protection
MW	Megawatt
NHPA	National Historical Preservation Act
NMFS	National Marine Fisheries Service
NMHC	Non-methane hydrocarbons
NNSR	Nonattainment New Source Review
NSR	New Source Review
N_2O	Nitrous oxide
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
OCS	Outer Continental Shelf
OECLA	Offshore Export Cable Laying Activities
OSS	Offshore Substation
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter with an Aerodynamic Diameter <= 10 Microns
$PM_{2.5}$	Particulate Matter with an Aerodynamic Diameter <= 2.5 Microns
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
RW	Revolution Wind LLC
SER	Significant Emission Rate
SFW	South Fork Wind LLC
SIL	Significant Impact Levels
SO_2	Sulfur Dioxide
TPY	Tons Per Year
U.S.C.	United States Code
VOC	Volatile Organic Compounds
WDA	Wind Development Area
WTG	Wind Turbine Generator

Table of Contents

I. General Information

Applicant's name and address:	Revolution Wind Farm Project 56 Exchange Terrace, Suite 300 Providence, Rhode Island 02903
Location of regulated activities:	Outer Continental Shelf (OCS) Lease Area OCS-A 0486 is in federal waters, approximately 7.5 nautical miles (nm) south of Nomans Land Island, Massachusetts. See Section II.A for more information.
Draft OCS permit number:	OCS-R1-05
EPA contact:	Morgan M. McGrath, P.E.

On May 1, 2022, Revolution Wind, LLC (RW or the applicant) submitted to EPA Region 1 (EPA) an initial application requesting a Clean Air Act (CAA or the Act) permit under Section 328 of the CAA for the construction and operation of an offshore wind farm, including export cables, on the OCS (the wind farm). Once operational, the project has an estimated maximum production capacity between 704 and 880 megawatts (MW) of renewable energy. On August 12, 2022, RW submitted a revised application which EPA determined was complete on October 7, 2022, based on all submitted information from RW, including information provided by RW's consultants. The EPA is proposing a draft permit that will contain the applicable requirements under 40 C.F.R. Part 55. Since the decommissioning phase of the wind farm will occur well into the future, the EPA is unable to determine best available control technology (BACT) and lowest achievable emissions rate (LAER) for the decommissioning phase and will not be permitting this phase at this time.

After reviewing the application and additional information, the EPA prepared this Fact Sheet and draft OCS preconstruction air permit as required by 40 C.F.R. Part 55, and 40 C.F.R. Part 124 - Procedures for Decision Making. All CAA permitting requirements applicable to the wind farm are contained within EPA permit number OCS-R1-05.

The EPA's draft permit is based on the information and analysis provided by the applicant and the EPA's own technical expertise. This Fact Sheet documents the information and analysis the EPA used to support the OCS draft permit decisions. It includes a description of the proposed wind farm, the applicable regulations, and an analysis demonstrating how the applicant will comply with the requirements contained in the permit.

The EPA has made available to the public RW's application materials and any supplemental information provided by RW as part of the official record for this Fact Sheet and the draft CAA permit. The application and supplemental information for this permit is available online at the EPA Region 1 Web Site: https://www.epa.gov/caa-permitting/caa-permitting-epas-new-england-region.

II. Project Description

A. Project Location

The Revolution Wind project includes up to 100 wind turbine generators (WTGs) with a capacity of 8 to 12 MW per turbine, submarine cables between the WTGs (inter-array cables), and up to two Offshore Substations (OSSs), all of which will be located within federal waters on the OCS, specifically in the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0486. The lease area itself is approximately 98 square nm, 13 nm wide and 19 nm long at its furthest points. The Wind Development Area (WDA) for the project will be located approximately 7.5 nm southwest of Nomans Land Island, Massachusetts. An electric export cable (alternating current) will make landfall at Quonset Point in North Kingstown, Rhode Island, and connect the wind farm to the existing electric transmission system via the Davisville Substation. See Figure 1.

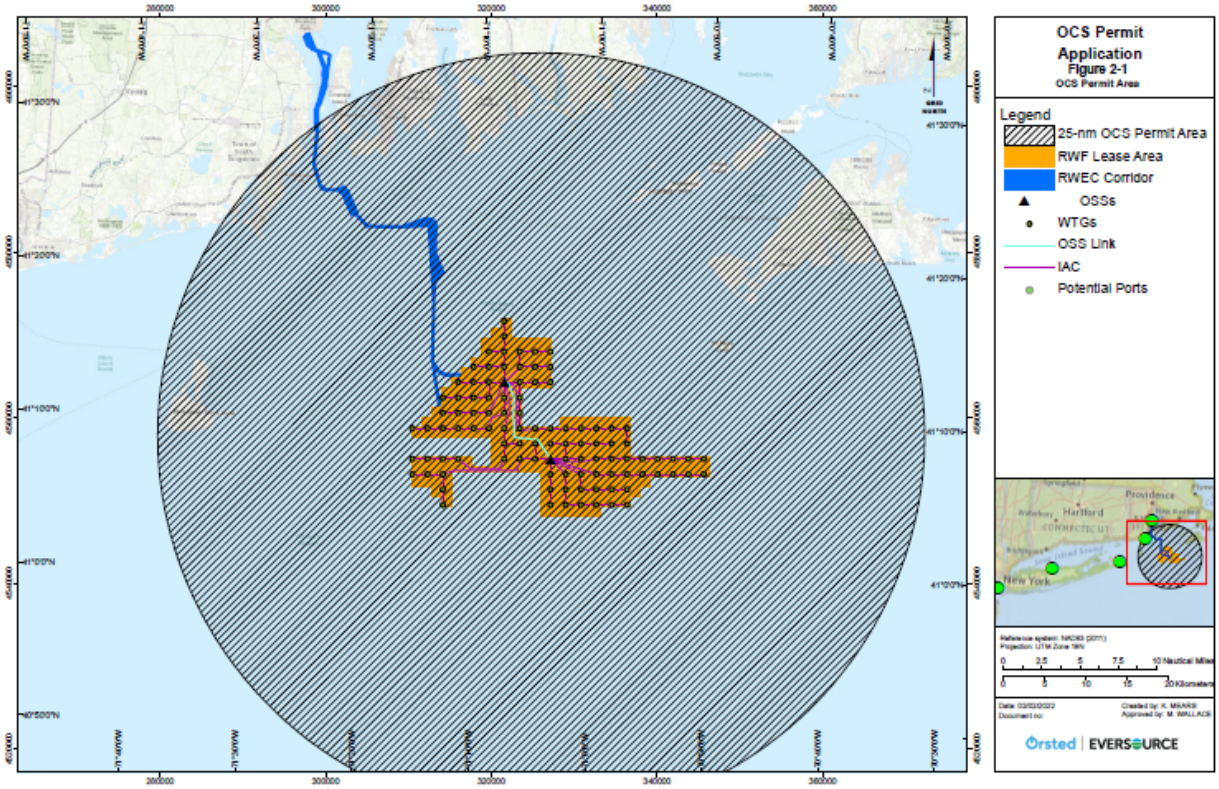

Figure 1 Location of Revolution Wind Offshore Wind Farm Project

Construction of the project is scheduled to begin in 2023 with installation of the onshore components and initiation of seabed preparation activities (e.g., clearing of debris and obstructions). Offshore construction activities subject to the OCS air permit are anticipated to begin in 2024 and to be commissioned and operational by the second quarter of 2025. RW's air permit application and associated air dispersion modeling scenarios assume a worst-case emission scenario of one year of construction, though construction could occur over two years. RW will be responsible for the construction and the operation and maintenance (O&M) of the windfarm.

B. Offshore Construction Activities

Offshore construction of the wind farm involves the installation of the foundations to the sea floor and preparation of the structures for the WTGs and the OSS(s). Work vessels then supply all the WTG components and install them on the foundations. RW plans to install a monopile foundation for each WTG. Monopile foundations will be driven to target embedment depths using impact pile driving and/or vibratory pile driving.

According to RW's application, offshore construction for the wind farm is anticipated to be completed in the following general sequence:[1]

1. Mobilization of vessels
2. Export cable and inter-array cable route clearance
3. Transportation of the foundations
4. Installation of the OSS foundation(s)
5. Installation of the WTG foundations
6. Installation of the WTGs
7. Installation of the export cable, inter-array cable, and oss-link cable
8. Topside OSS installation(s)

WTG commissioning will begin when the first WTG is installed offshore.[2] For purposes of EPA's CAA OCS permit, construction emissions from the wind farm are estimated to begin once any equipment or any activity that by itself meets the definition of an OCS source is located within the WDA. At that point, the EPA considers the facility to meet the definition of an OCS source for the purposes of calculating potential emissions, and emissions from vessels servicing or associated with any part of the facility are included in the OCS source's potential emissions while traveling to and from any part of the OCS source when within 25 nautical miles of it.

The following table contains the project's potential emissions during the construction phase (annualized), as contained in RW's revised emission estimates provided to the EPA on February 28, 2023. Note that the estimates during the construction period represent the annualized worst-case potential to emit (PTE).

Table 1 Estimated Construction OCS Emissions (tons per year (tpy)) for the Revolution Wind Project

N_2O	CO_2e	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	Lead	VOC
13.5	302,957	1,039.3	3,978	137.1	133.1	15	0.02	83.6

(1) N_2O emissions were not provided in the February 28 update. Calculations for N_2O were completed based on previous N_2O to NO_X ratio (.36%).

[1] More detailed information on the construction process can be found in RW's OCS permit application, which is accessible in the permit docket for this action.

[2] The definition of 'commissioning' is not standardized, but generally covers all activities after all components of the wind turbine are installed. Commissioning tests will usually involve standard electrical tests for the electrical infrastructure as well as the turbine, and inspection of routine civil engineering quality records. *See* https://www.wind-energy-the-facts.org/commissioning-operation-and-maintenance.html

C. Offshore Operation & Maintenance Activities

The O&M phase of the wind farm will begin when commissioning of the WTGs is completed, and the facility begins operating. The O&M phase will require frequent crew transport vessel (CTV) and service operation vessel (SOV) use for routine daily O&M activities. Infrequently, survey vessels will be used to perform routine surveys of foundations and cables that will be carried out in years one and two, and every three years thereafter, or after a major storm event (one in 50-years storm). Non-routine repairs may require the use of jack-up vessels, cable burial vessels, cranes, and cherry pickers.

During the O&M phase, the OCS source components will primarily be powered by the wind farm. During periods when the wind is not sufficient for the WTGs to operate normally, or if the WTGs are not operating for any other reason, the wind farm may draw power from the onshore grid via the bi-directional export cable. If shore power is not available, power will be supplied by the WTGs' integrated battery backup system that can provide auxiliary power to the WTGs in the event of a temporary outage. The battery backup system can be charged by the WTG when operating. In the unlikely scenario where shore power from the grid is not available, the WTGs are not producing electricity, and the previous three days did not have wind to charge the battery backup system, a temporary diesel generator would be used.

The two (2) OSS will have permanently installed 597 kW generators (each) that will be used to power the OSS(s) in the event of an outage where shore power is not available, and the WTGs are not providing power. The generators will be used under both emergency and standby conditions. During O&M, the OSS generators may be used occasionally to provide power during routine maintenance of the OSS (if grid power is unavailable or the maintenance being performed requires disconnection from the grid).

It is possible that the project's offshore facilities will require a major repair during the wind farm's 20- to 35-year lifespan. A major repair to the WTGs or OSSs would closely resemble the process of installing the WTGs and OSSs. Emission sources during a major repair would be the same as those used for routine O&M, but more vessels would be at the WDA for a longer period. Because of the infrequent and uncertain nature of a major repair, RW is not seeking authorization for major repairs in this OCS air permit. Should such an event occur in future years, RW is required to seek the appropriate permitting approvals at that time.

The following table contains the RW project's maximum potential emissions during the O&M phase (post-operational phase start date), as contained in RW's revised emission estimates provided to the EPA on February 28, 2023. The annual potential emissions during the O&M phase are anticipated to be equivalent to the source's PTE once construction has been completed and the wind farm commences operations.

Table 2 Estimated Operations and Maintenance Emissions (tpy)

N_2O	CO_2e	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	Lead	VOC
0.8	19,600	65.8	210.4	8.6	8.3	0.8	<0.01	5.1

(1) N_2O emissions were not provided in the February 28 update. Calculations for N_2O were completed based on previous N_2O to NO_X ratio (.36%).

D. Stationary Source Combined Emission Total(s)

The South Fork Wind project and the Revolution Wind project are considered one (1) stationary source for Clean Air Act permitting purposes. More information on the source determination is found in Section III.D of this Fact Sheet. The following tables contain the combined emissions for South Fork and Revolution Wind during the construction and O&M phases of the two projects as provided in the developers' respective applications.

Table 3 Combined Construction Emissions for Revolution Wind and South Fork Wind Projects (tpy)

N_2O	CO_2e	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	Lead	VOC
14.5	324,488	1,086	4,298	147.8	143.4	17.4	0.02	91.4

Table 4 Combined O&M Emissions for Revolution Wind and South Fork Wind Projects (tpy)

N_2O	CO_2e	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	Lead	VOC
0.90	21,259	69.1	229.6	9.2	8.9	0.9	0.0	5.5

III. Applicability of 40 C.F.R. Part 55 – OCS Air Regulations

A. OCS Statutory and Regulatory Authority

Section 328(a) of the CAA requires that the EPA establish air pollution control requirements for equipment, activities, or facilities located on the OCS that meet the definition of an OCS source. Sources located within 25 nm of a state's[3] seaward boundary also need to comply with several onshore requirements. To comply with this statutory mandate, on September 4, 1992, the EPA promulgated 40 C.F.R. Part 55, which established requirements to control air pollution from OCS sources in order to attain and maintain federal and state ambient air quality standards.[4]

The Energy Policy Act of 2005 (*See* Title III (Oil and Gas), Subtitle G – Miscellaneous, Section 388) amended section 8 of the Outer Continental Shelf Lands Act (OCSLA) to allow the EPA and the Department of the Interior to authorize activities on the OCS that "produce or support production, transportation, or transmission of energy from sources other than oil and gas." Section 4(a)(1) of OCSLA was recently amended to expand the scope of "exploring, developing or producing resources" to include "non-mineral energy resources" such as offshore wind. *See* William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, H.R. 6395, 116th Cong. § 9503 (2021). BOEM reviews construction and operation plans from offshore wind energy developers and approves, approves with modifications, or disapproves those plans. EPA issues a CAA OCS permit to establish air pollution control requirements for

[3] The term "state," when used to reference one of the 50 states within the United States, includes states that are officially named commonwealths, e.g., the Commonwealth of Massachusetts.
[4] Refer to the Notice of Proposed Rulemaking, December 5, 1991 (56 Fed. Reg. 63,774), and the preamble to the final rule promulgated September 4, 1992 (57 Fed. Reg. 40,792) for further background and information on the OCS regulations.

such sources when the definition of OCS source is met, as defined in CAA § 328 and 40 C.F.R. Part 55.[5]

Under CAA § 328(a)(4)(C) and 40 C.F.R. § 55.2, an OCS source includes any equipment, activity, or facility which:

(1) Emits or has the potential to emit any air pollutant;

(2) Is regulated or authorized under the OCSLA (43 U.S.C. § 1331 *et seq.*); and

(3) Is located on the OCS or in or on waters above the OCS.

Furthermore, 40 C.F.R. § 55.2 establishes that for a vessel to be considered an OCS source, the vessel must also meet one of the two following criteria:

(1) Permanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing, or producing resources therefrom, within the meaning of section 4(a)(1) of OCSLA (43 U.S.C. §1331 *et seq.*); or

(2) Physically attached to an OCS facility, in which case only the stationary sources [sic] aspects of the vessels will be regulated.

Finally, under 40 C.F.R. § 55.2, the term "[o]uter continental shelf" shall have the meaning provided by section 2 of the OCSLA (43 U.S.C. § 1331 *et seq.*), which in turn defines the "outer continental shelf" as "all submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 1301 of this title, and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control."

Once an activity, facility, or equipment (which may include a vessel) is considered an OCS source, then the emission sources of that OCS source become subject to the requirements of 40 C.F.R Part 55, which include: (1) obtaining an OCS air permit, as required by 40 C.F.R. § 55.6; (2) complying with the applicable federal regulations and requirements specified at 40 C.F.R. § 55.13; (3) for an OCS source within 25 nm of a state's seaward boundary, complying with the state or local air emissions requirements of the corresponding onshore area (COA) specified at 40 C.F.R. § 55.14; (4) monitoring, reporting, inspection, and enforcement requirements specified at 40 C.F.R. §§ 55.8 and 55.9; and (5) permit fees as specified under 40 C.F.R. § 55.10.

B. Procedural Requirements for OCS Permitting

Regulations developed pursuant to OCS statutory requirements under section 328 of the CAA are codified at 40 C.F.R. Part 55. The OCS regulations create procedures that require an applicant seeking to construct and operate an OCS source to identify the federal regulations and the state and local regulations from the COA that may apply to the source, and to seek to have those regulations apply, as a matter of federal law, to the OCS source. Once the EPA has

[5] A copy of the Construction and Operation Plan may be found at https://www.boem.gov/renewable-energy/state-activities/revolution-wind-farm-construction-and-operations-plan (last visited Nov. 7, 2022).

received a complete permit application, the EPA[6] then follows the applicable procedural requirements for federal permitting contained in 40 C.F.R. Part 124 or 40 C.F.R. Part 71, and the EPA issues an OCS permit that meets all federal requirements.[7] The EPA is following the applicable procedures in 40 C.F.R. Part 124 in issuing this OCS permit.

The OCS regulations first require the applicant to submit a notice of intent (NOI) to the nearest EPA regional office. *See* 40 C.F.R. § 55.4. The NOI provides emissions information regarding the OCS source, including information necessary to determine the applicability of onshore requirements and the source's impact in onshore areas. *See* 40 C.F.R. § 55.5. RW submitted to the EPA an NOI for the wind farm on November 5, 2021. Information provided in the NOI for this wind farm indicated that Massachusetts is the nearest onshore area (NOA"). The EPA did not receive a request from another state to be designated the COA for this project, thus Massachusetts is designated the COA. *See* 40 C.F.R. § 55.5(b)(1).

The federal requirements that apply to an OCS source are provided in 40 C.F.R. § 55.13. The EPA also reviews the state and local air requirements of the COA to determine which requirements should be applicable on the OCS and revises 40 C.F.R. Part 55 to incorporate by reference those state and local air control requirements that are applicable to an OCS source. *See* 40 C.F.R. § 55.12. Once the EPA completes its rulemaking to revise 40 C.F.R. Part 55, the state and local air regulations incorporated into 40 C.F.R. Part 55 become federal law and apply to any OCS source associated with that COA.

Under this "consistency update" process, the EPA must incorporate applicable state and local rules into 40 C.F.R. Part 55 as they exist onshore. This limits the EPA's flexibility in deciding which requirements will be incorporated into 40 C.F.R. Part 55 and prevents the EPA from making substantive changes to the requirements it incorporates. As a result, the EPA may be incorporating rules into Part 55 that do not conform to certain requirements of the CAA or are not consistent with the EPA's state implementation plan (SIP) guidance. The EPA includes all state or local air requirements of the COA except any that are not rationally related to the attainment or maintenance of federal or state ambient air quality standards or part C of Title I of the Act, that are designed expressly to prevent exploration and development of the OCS, that are not applicable to an OCS source, that are arbitrary or capricious, that are administrative or procedural rules, or that regulate toxics which are not rationally related to the attainment and maintenance of federal and state ambient air quality standards.

Consistency updates may result in the inclusion of state or local rules or regulations into 40 C.F.R. Part 55, even though the EPA may ultimately disapprove the same rules for inclusion as part of the state's SIP. Inclusion in the OCS rule does not imply that a rule meets the requirements of the CAA for SIP approval, nor does it imply that the rule will be approved by the EPA for inclusion in the SIP.

On November 23, 2021 (86 FR 66509), the EPA published a Notice of Proposed Rulemaking (NPRM) proposing to incorporate various Massachusetts air pollution control requirements into

[6] The authority granted to the "Administrator" in 40 C.F.R. Part 55 has been delegated to the Regional Administrator in EPA Region 1. *See* Docket for Delegation of Authority.
[7] *See* 40 C.F.R. § 55.6(a)(3).

40 C.F.R. Part 55. EPA's November 23, 2021 NPRM was initiated in response to the submittal of an NOI on September 9, 2021, by Sunrise Wind, LLC. However, EPA also received an NOI on November 5, 2021, from Revolution Wind, LLC, an NOI on January 28, 2022, from New England Wind, LLC, and an NOI on May 31, 2022, from Mayflower Wind Energy, LLC.[8] In accordance with 40 C.F.R. §55.5, Massachusetts is the designated COA for each of these projects. Upon receipt of the subsequent NOI's from Revolution Wind, LLC, New England Wind, LLC, and Mayflower Wind Energy, LLC, EPA conducted a consistency review in accordance with regulations at 40 C.F.R. § 55.12 and determined that recent changes to the Massachusetts regulations since the NPRM are non-substantive as they relate to OCS sources, and that it is not necessary to propose an additional consistency update at this time.[9]

EPA published a final rulemaking notice for the consistency update to Part 55 on November 15, 2022. *See* 87 Fed. Reg. 68,364 (Nov. 15, 2022). EPA's November 15, 2022, Federal Register notice satisfies EPA's obligation under § 55.12 to conduct a consistency review for the subsequent NOI's received from Revolution Wind, LLC, New England Wind, LLC, and Mayflower Wind Energy, LLC.

The Massachusetts regulations that the EPA incorporated into Part 55 in this action are the applicable provisions of (1) 310 CMR 4.00: Timely Action Schedule and Fee Provisions; (2) 310 CMR 6.00: Ambient Air Quality Standards for the Commonwealth of Massachusetts; and (3) 310 CMR 7.00: Air Pollution Control, as amended through March 5, 2021. EPA's final rule did not affect the provisions of 310 CMR 8.00 that were previously incorporated by reference into Part 55 through EPA's prior consistency update on November 13, 2018. *See* 83 Fed. Reg. 56,259 (Nov. 13, 2018).

The OCS permit applicant then follows the procedural requirements to obtain a federal permit as outlined in 40 C.F.R. Part 124. The applicant submits an air permit application that provides the information to show that it will comply with all applicable federal requirements, including those requirements found in 40 C.F.R. Part 55 (which, because of the consistency update, include certain state and local requirements incorporated by reference into federal law), and any other federal standard that may apply to the source. The EPA reviews the application and proposes either to approve or deny the application. Next, if the EPA decides to propose approval, the EPA drafts a draft air permit and a fact sheet that documents its proposed permit decision. The EPA then provides a notice and comment period of at least 30 days for the draft permit and may also hold a public hearing if there is a significant degree of public interest and/or a hearing might

[8] On February 1, 2023, Mayflower Wind Energy LLC notified EPA of a name change to South Coast Wind Energy, LLC.

[9] Since EPA's November 23, 2021 NPRM, Massachusetts revised the regulations at 310 CMR 7.00 (Statutory Authority; Legend; Preamble; Definitions) and 310 CMR 7.40 (Low Emission Vehicle Program), effective December 30, 2021. EPA previously determined that the regulations at 310 CMR 7.40 (Low Emission Vehicle Program) were not applicable to OCS sources and did not propose to incorporate this section of 310 CMR 7.00 into Part 55 as part of the November 23, 2021 NPRM. Although EPA's NPRM proposed to incorporate by reference the definitions located at 310 CMR 7.00 (Statutory Authority; Legend; Preamble; Definitions), MassDEP's most recent revisions to 310 CMR 7.00 (Statutory Authority; Legend; Preamble; Definitions) were related to the amendments to the regulations at 310 CMR 7.40 (Low Emission Vehicle Program). EPA has reviewed the recent amendments to the Massachusetts regulations at 310 CMR 7.00 (Statutory Authority; Legend; Preamble; Definitions) and determined that these changes are non-substantive as they relate to OCS sources.

clarify issues involved in the permit decision. Following the comment period, the EPA responds to all significant comments raised during the public comment period, or during any hearing, and issues the final air permit decision.

C. Scope of the "OCS Source"

The CAA permitting analysis for an offshore wind farm located in federal waters must begin with a determination of the scope of the "OCS source" because the boundaries of the source determine what activities are attributed to the source for purposes of quantifying its "potential emissions" and determining what CAA programs apply.[10] Once an OCS source is identified, EPA must then apply the terms of specific regulatory programs, including the New Source Review (NSR) preconstruction permitting and Title V operating permit programs[11], to determine whether they apply to the OCS source and if so, how. Importantly, under section 328 of the CAA and EPA's implementing regulations, emissions from vessels "servicing or associated with an OCS source" must be included in the assessment of the source's "potential emissions" and may cause the OCS source's emissions to exceed thresholds that subject the source to NSR and Title V operating permit requirements.

According to RW's permit application, RW is proposing to install up to 100 WTGs and the associated offshore infrastructure required to transmit the power generated by the WTGs to an onshore interconnection. These project components require the installation of up to two OSSs installed on platforms, inter-array cables connecting the WTGs, interconnection cabling to link the OSSs (OSS-Link Cable), and a bi-directional offshore export cable to bring the power from the OSSs to shore.

During construction, pollutant-emitting activities from the wind farm include temporary diesel generators (i.e., engines) used to supply power to the WTGs and OSS(s) during commissioning activities in the construction phase, as well as engines on vessels that meet the definition of an OCS source. During the O&M phase of the project, pollutant-emitting activities from the wind farm include engines on vessels that meet the definition of an OCS source, any generators on the OSS(s), and any generators on WTGs.

In Appendices A and B to RW's permit application, RW provided its rationale for an alternative approach to determining applicable permitting regulations and the scope of the source for the O&M phase of the project. Specifically, RW contended that during the O&M phase, only the OSS(s) (with accompanying permanent emergency generators) and any jack-up vessels would meet the definition of an OCS source during operations. The EPA disagrees with the conclusions presented by RW in Appendices A and B of the application and is proposing the draft permit based on the remaining application materials consistent with the CAA and 40 CFR Part 55.

EPA is treating all stationary equipment and activities within the proposed wind farm, including all wind turbines, as part of a single "OCS source" because all such equipment and activities are

[10] The OCS regulations themselves do not constitute a permitting program but, instead, make existing federal and state air pollution control requirements applicable to OCS sources. 40 CFR § 55.1.
[11] Applicability of Prevention of Significant Deterioration (PSD) and Nonattainment NSR (NNSR) permit programs is discussed in Section V and VI of this Fact Sheet.

integral components of a single industrial operation that emits or has the potential to emit any air pollutant, is regulated or authorized under the OCSLA, and is located on the OCS or in or on waters above the OCS. The OCS source comprises all offshore WTGs and their foundations, each OSS and its foundation, the inter-array cables, and vessels when they meet the definition of an OCS source in 40 C.F.R. § 55.2. Thus, emissions from any vessel "servicing or associated with" any component of the OCS source (including any WTG or OSS) while at the source and while en route to or from the source within 25 nautical miles of it must be included in the OCS source's potential to emit, consistent with the definition of "potential emissions" in 40 C.F.R. § 55.2.

D. Scope of the Stationary Source

For the NSR preconstruction permitting programs, which include Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR"), the EPA regulations define "stationary source" as "any building, structure, facility, or installation which emits or may emit a regulated NSR pollutant."[12] Those regulations, in turn, define the term "building, structure, facility, or installation" to mean "all of the pollutant-emitting activities which [1] belong to the same industrial grouping, [2] are located on one or more contiguous or adjacent properties, and [3] are under the control of the same person (or persons under common control)," with "same industrial grouping" referring to the same Major Group, two-digit SIC code. For the Title V permit operating program, "major source" is similarly defined in relevant part as a stationary source or group of stationary sources that meet these same three criteria.[13, 14]

State and local permitting authorities have EPA-approved NSR permitting regulations that contain identical or similar definitions for the terms "stationary source" and "major source." Under the EPA-approved Massachusetts NNSR regulations at 310 CMR 7.00, Appendix A (incorporated by reference into the federal rules at 40 C.F.R. § 55.14), "stationary source" is defined as follows:

Stationary source means any building, structure, facility, or installation which emits or which may emit any air pollutant subject to regulation under the Act.

(a) A stationary source may consist of one or more emissions units and:

1. may be a land-based point or area source; or

[12] 40 C.F.R. § 52.21(b)(5); 40 C.F.R. § 51.165(a)(1)(i); 40 C.F.R. § 51.166(b)(5); *see* 42 U.S.C. § 7602(z) (defining "stationary source" as "any source of an air pollutant" except those emissions resulting directly from certain mobile sources or engines).

[13] 40 C.F.R. § 70.2; 40 C.F.R. 71.2; see 42 U.S.C. § 7661(2) (defining major source for Title V permitting as "any stationary source (or any group of stationary sources located within a contiguous area and under common control)" that is either a major source as defined in CAA section 112 or a major stationary source as defined in CAA section 302 or part D of subchapter I (NNSR)). The EPA was also clear in promulgating its regulatory definitions of "major source" that the language and application of the Title V definitions were intended to be consistent with the language and application of the PSD definitions contained in 40 C.F.R. § 52.21 (61 FR 34210 (July 1, 1996)).

[14] RW did not apply for a Title V operating permit as part of its OCS air permit application. However, EPA anticipates the scope of the stationary source analysis will be similar for the Title V operating permit program.

2. may be located in, or on, the OCS or other submerged lands beneath navigable waters (lakes, rivers, and coastal waters adjacent to Outer Continental Shelf lands); or
3. may be any internal combustion engine, or engine combination, greater than 175 horsepower (hp) used for any stationary application; or
4. may be any internal combustion engine regulated under Sec. 111 (New Source Performance Standards (NSPS)) of the Act, regardless of size; or
5. may be any internal combustion engine of less than 175 horsepower (hp) not actually controlled to meet a regulation under Sec. 213 (Nonroad Engines and Vehicles) of the Act.

(b) A stationary source does not include:

1. emissions resulting directly from an internal combustion engine for transportation purposes; or
2. tailpipe emissions from any source regulated under title II of the Act or any emissions from in-transit, non-OCS marine vessels.

The Massachusetts NNSR regulations at 310 CMR 7.00, Appendix A define "building, structure, facility, or installation" as follows:

> [A]ll of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Any marine vessel is a part of a facility while docked at the facility. Any marine vessel is a part of an Outer Continental Shelf (OCS) source while docked at and within 25 nautical miles en route to and from the OCS source. Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same Major Group (*i.e.*, which have the same two-digit code) as described in the *Standard Industrial Classification Manual*, 1987.

The Massachusetts Title V operating permit program regulations at 310 CMR 7.00, Appendix C define a "major source" as follows:

> For the purpose of defining "major source," a stationary source or group of stationary sources shall be considered part of a single industrial grouping if all of the pollutant emitting activities at such source or group of sources on contiguous or adjacent properties belong to the same Major Group (*i.e.*, all have the same two-digit code) as described in the Standard Industrial Classification Manual, 1987.

Additionally, in 2019, EPA issued guidance[15] to provide its interpretation of the term "adjacent" as that term is used in NSR and Title V source determinations. In that guidance, EPA provided an interpretation of "adjacent" based solely on physical proximity for the purpose of determining

[15] *See* the memo "Interpreting 'Adjacent' for New Source Review and Title V Source Determinations in All Industries Other Than Oil and Gas" at https://www.epa.gov/sites/production/files/2019-12/documents/adjacent_guidance.pdf

whether separate activities are located on adjacent properties. The guidance indicated that EPA would no longer consider "functional interrelatedness" in determining whether activities are located on adjacent properties.

On January 18, 2022, EPA issued an OCS air permit to South Fork Wind, LLC for the construction and operation of a 132 MW wind farm in lease area OCS-A 0517. The South Fork Wind project lease area is in close physical proximity to the Revolution Wind project lease area. In addition, the South Fork Wind project and the Revolution Wind project are both owned and operated by Ørsted North America, Inc. and Eversource Investment, LLC. Because of the proximity of the project locations and similar parent company ownership, EPA has applied these regulatory definitions and interpretive statements to determine the scope of the stationary source for the Revolution Wind and South Fork Wind offshore wind projects under the applicable NSR and Title V regulations – i.e., for purposes of determining whether the pollutant-emitting activities, equipment, or facilities for these projects: [1] belong to the same industrial grouping, [2] are located on one or more contiguous or adjacent properties, and [3] are under common control.

Regarding the first criterion, the Revolution Wind project and South Fork Wind projects are classified under Standard Industrial Code (SIC) 4911, Electric Services. Accordingly, all pollutant-emitting activities for the Revolution Wind project and South Fork Wind project belong to the same industrial group, and thus satisfy the first criterion for treatment as a single stationary source.

Regarding the second criterion, EPA evaluated whether the pollutant-emitting activities are located on one or more contiguous or adjacent properties. All pollutant-emitting activities for the Revolution Wind project will be located on a single property. EPA has previously analyzed what constitutes a single property in other OCS air permits for offshore wind farms.[16] As explained in more detail in those actions, the EPA considers the WDA—here, the lease area held by RW occupying a relatively small tract of otherwise open ocean, distinct from its surroundings by the planned installation of a uniform and close-knit pattern of wind turbines—to fit reasonably within such a meaning of a "property" as "a place or location." EPA has made this determination for two reasons. First, the WDA is a discrete and clearly identifiable area set apart from the surrounding open ocean by its man-made features. One could not approach or pass through the WDA and its towering grid of wind turbines without recognizing that it was a fundamentally different "place" than the open ocean. Second, although the WDA occupies a relatively large area, its size is necessarily unique to the expansive spatial scales associated with OCS wind farm development projects.[17] Viewed in context, the WDA is a relatively small property when compared to the area set aside for future development by the offshore wind industry off the coast of Massachusetts and is an even smaller property when compared to the OCS and surrounding open ocean more broadly. *See* Figure 2.

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[16] *See* Source Determination for Vineyard Wind 1 Offshore Wind Farm, which is available online in the administrative docket at https://www.epa.gov/caa-permitting/permit-documents-vineyard-wind-1-llcs-wind-energy-development-project-800mw-offshore.

[17] Offshore wind farms require some degree of spacing between turbines, resulting in a single facility or installation covering a relatively large property. This spacing is necessary to balance navigational concerns, wind energy generation, and impacts to other resources such as marine mammals, recreational fishing and boating, and commercial marine fisheries.

Furthermore, the Revolution Wind project, owned and operated by RW, will be located in OCS lease area OCS-A 0486. As shown in Figure 2 below, OCS lease area OCS-A 0517 is adjacent to lease area OCS-A 0486. On January 18, 2022, EPA issued an OCS permit for the South Fork Wind project, which is located in lease area OCS-A 0517. In that permit action, EPA also determined that the WDA for the South Fork Wind Farm constitutes a single property for the same reasons outlined above.[18] EPA has evaluated the physical proximity between the Revolution Wind WDA and the WDA for the South Fork Wind project and determined that the two properties are contiguous or adjacent. Therefore, the South Fork Wind project and the Revolution Wind project are located on contiguous or adjacent properties and satisfy the second criterion for treatment as a single stationary source.[19] *See* Figure 2.

[18] *See* June 24, 2021 Initial Fact Sheet for South Fork Wind, LLC available at https://www.epa.gov/system/files/documents/2021-07/south-fork-draft-permit-fs.pdf

[19] EPA also evaluated whether the Sunrise Wind offshore wind farm project, owned and operated by Orsted/Eversource, is located on property that is contiguous or adjacent to the South Fork wind farm and Revolution Wind farm. EPA has determined that due to the physical separation between the Sunrise Wind lease area (OCS-A 0487) and the South Fork and Revolution Wind projects caused by Cox Ledge, the Sunrise Wind project is not located on property contiguous or adjacent to the South Fork Wind and Revolution Wind projects. Cox Ledge is an "area of concern" for fishery managers that provides habitat for several commercially and recreationally valuable species. It was removed from the lease areas for wind energy development by BOEM during the leasing process. Thus, in some instances, physical separation between lease areas may provide a basis for not aggregating two or more wind farms. A more detailed explanation of EPA's analysis will be provided in the Fact Sheet for the Sunrise Wind offshore wind farm draft permit when a draft permit decision is proposed.

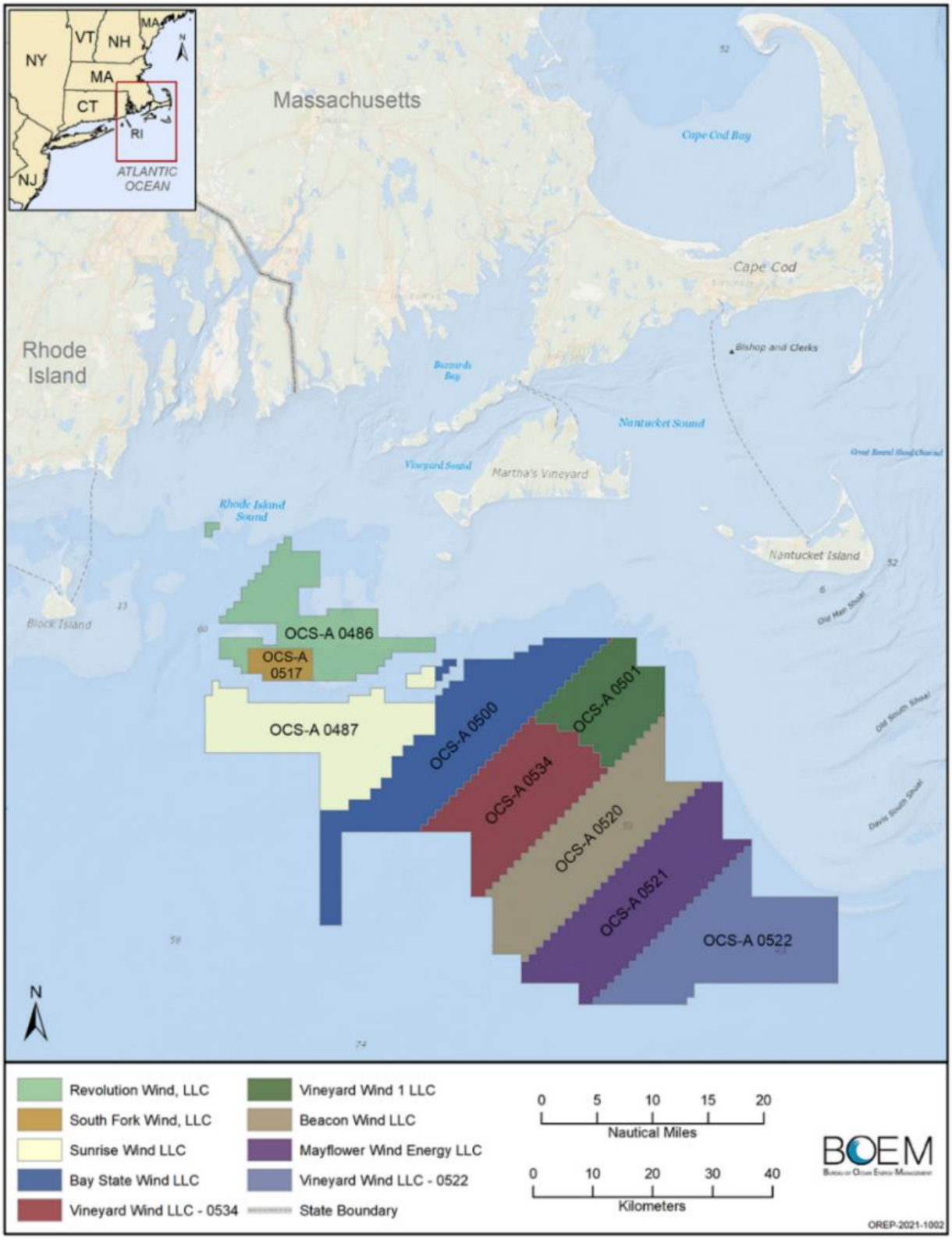

Figure 2 Map of Massachusetts/Rhode Island OCS Lease Area

Regarding the third and final criterion, common control, EPA evaluated the relationship among Revolution Wind, LLC; South Fork Wind, LLC; and the Ørsted North America, Inc. and Eversource Investment, LLC. EPA's longstanding policy considers common ownership sufficient to establish common control for corporate entities under the same corporate umbrella.[20] Both South Fork Wind, LLC and Revolution Wind, LLC are 50/50 joint ventures between Ørsted North America, Inc. and Eversource Investment, LLC. Therefore, based on EPA policy, South Fork Wind, LLC and Revolution Wind, LLC are under common control of Ørsted North America, Inc. and Eversource Investment, LLC. Furthermore, EPA's policy on common control also considers one entity's power or authority over the other to dictate decisions that could affect the applicability of, or compliance with, relevant air pollution regulatory requirements.[21] The EPA's understanding is that Ørsted North America, Inc. and Eversource Investment, LLC have the relevant power or authority over all pollutant-emitting activities, including the authority to dictate decisions of Revolution Wind, LLC and South Fork Wind, LLC. As a result of EPA's assessment, the EPA has determined that the South Fork Wind project and the Revolution Wind project are under common control and meet the third and final criterion for treatment as a single stationary source.

For the reasons discussed above, the South Fork Wind and Revolution Wind offshore wind development projects belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under common control. Therefore, the EPA has determined that the two projects constitute a single stationary source under the NSR and Title V permit programs. The scope of the "stationary source" thus coincides with the scope of the "OCS source."

IV. Emission Units Subject to Part 55

The potential emissions of the OCS source are used to determine applicability of the relevant permit program requirements under 40 C.F.R. Part 55. Part 55.2 defines potential emissions as follows:

> *Potential emissions* means the maximum emissions of a pollutant from an OCS source operating at its design capacity. Any physical or operational limitation on the capacity of a source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as a limit on the design capacity of the source if the limitation is federally enforceable. Pursuant to section 328 of the Act, emissions from vessels servicing or associated with an OCS source shall be considered direct emissions from such a source while at the source, and while enroute to or from the source when within 25 miles of the source and shall be included in the "potential to emit" for an OCS source. This definition does not alter or affect the use of this term for any other purposes under § 55.13 or § 55.14

[20] *See* Letter from Carl Daly, Acting Director, EPA Region 8 Air & Radiation Division, to Danny Powers, Air Quality Program Manager, Southern Ute Indian Tribe (July 23, 2019), available at https://www.epa.gov/sites/default/files/2019-10/documents/jaques2019.pdf.

[21] *See* Letter from William L. Wehrum, Assistant Administrator, EPA Office of Air and Radiation, to the Honorable Patrick McDonnell, Secretary, Pennsylvania Department of Environmental Protection (April 30, 2018), available at https://www.epa.gov/sites/production/files/2018-05/documents/meadowbrook_2018.pdf.

of this part, except that vessel emissions must be included in the "potential to emit" as used in §§ 55.13 and 55.14 of this part.

Once the facility meets the definition of an OCS source, emissions from vessels servicing or associated with any part of the facility are included in the OCS source's potential emissions while traveling to and from any part of the OCS source when within 25 nautical miles of it.[22] Although emissions from propulsion engines contribute to total potential emissions within 25 nautical miles of the OCS source, they are not regulated as part of the OCS source in the draft permit unless the propulsion engine would be used to supply power for purposes of performing a given stationary source function (e.g., to lift, support, and orient the components of each WTG during installation) while that vessel is meeting the three criteria of the definition of an OCS source. However, these emissions are included when making the following determinations regarding the equipment and activities that are OCS sources:

1. Applicability of CAA programs and COA requirements, including NNSR and PSD permitting;
2. When calculating the number of NO_X and VOC offsets required due to emissions during the operational phase; and
3. When determining the impact of emissions on ambient air and Class I and Class II areas.

Jack-up vessels, support vessels, or other vessels may contain emission equipment that would otherwise meet the definition of "nonroad engine," as defined in section 216(10) of the CAA. However, based on the specific requirements of CAA section 328, emissions from these otherwise nonroad engines on subject vessels are considered direct emissions from the OCS source they are associated with for the purposes of calculating potential emissions of that OCS source. Similarly, all engines, including engines on vessels that meet the definition of an OCS source and are "operating as OCS sources," are regulated as stationary sources and are subject to the applicable requirements of 40 C.F.R. Part 55, including control technology requirements.

The primary emission units for the wind farm project consist of exhaust from marine vessel traffic, heavy equipment auxiliary engines, and generator engines on vessels on offshore platforms. The facility also has emissions of sulfur hexafluoride from gas-insulated switchgear (GIS) on the OSSs.

[22] For the purposes of determining the potential emissions from vessels, Revolution Wind used a minimum travel distance of 25 nautical miles (50 nm minimum for each vessel) to calculate emissions from vessels servicing or associated with the wind farm. This is a conservative approach for calculating emissions because it assumes the maximum possible travel distance for calculating PTE from vessels servicing or associated with the OCS source. The approach likely overestimates emissions because some of the ports proposed for use by the project are less than 25 nm from the WDA facility.

A. Wind Turbine Generators and Offshore Substation(s)

As described below, WTGs and OSS(s) will be installed on the seabed within the WDA. The collection of WTGs, the OSS(s), as well as the vessels operating as OCS sources within the WDA constitute the Revolution Wind project subject to this OCS air permit.

An offshore wind farm is made up of many WTGs spread out over a wide area of the ocean. Each WTG is firmly fixed to a foundation piece on the seafloor, with a tower that extends up into the air where the blades can make use of higher wind speeds. Each WTG has three blades that rotate due to the movement of air. Within the non-rotating part on top of the turbine known as the nacelle, the blades' rotation is passed through a drive shaft, often via gear box, to turn magnets inside a coil of wire which generates an alternating current of electricity. Each WTG sends its power through cables down the tower and under the seabed to an offshore substation, or OSS.[23]

The Revolution Wind project will consist of up to 100 WTGs, sited in a grid with approximately 1 nm by 1 nm spacing. The general process for installation of the wind farm involves the installation of the foundations to the sea floor and preparation of the structures for the WTGs and the OSSs. Work vessels then supply all the WTG components and install them on the foundations. RW plans to install a monopile-style foundation for each WTG.

An OSS is an offshore platform containing the electrical components necessary to collect the power generated by the WTGs (via the inter-array cable), transform it to a higher voltage and transmit this power to onshore electricity infrastructure (via the export cables). The purpose of the OSS is to stabilize and maximize the voltage of power generated offshore, reduce the potential electrical losses, and transmit electricity to shore.

1. Generator Engines

According to RW's permit application, no generator engines are expected to be used on the WTGs during the construction phase where WTGs are being installed. Power will be provided by the jack-up vessel performing the installation work. During the commissioning of the WTGs, the WTGs will be powered by the integrated battery backup system and are not anticipated to require the use of a generator engine. However, if the battery backup system were to fail, or not provide sufficient power for the full duration of commissioning, temporary 37 kW generators on the WTGs would be required until the WTGs are connected to, and able to be powered by, the grid. RW anticipates that generator engines are necessary for use on the WTGs during the operations phase in the unlikely scenario where shore power from the grid is not available.

Specifically, the temporary diesel generators would be used to supply emergency power to the WTGs when the battery backup system has failed. Therefore, RW is requesting the ability to construct and operate generator engines for use on the WTGs.

[23] More information on the operational nature of an offshore wind farm is available at the Orsted-hosted webpage entitled, "How do offshore wind turbines work?" https://us.orsted.com/renewable-energy-solutions/offshore-wind/what-is-offshore-wind-power/how-do-offshore-wind-turbines-work. Last visited, February 23, 2023.

RW plans to construct and operate up to two OSSs, each with a maximum nominal capacity of 440 MW, to support the project's maximum production design capacity. Two temporary 156 kW diesel generators will be installed on each OSS during installation and commissioning. A 455 kW generator will also be installed on each OSS and will remain on the OSS after commissioning for emergency use and for infrequent use to provide power during maintenance activities in the operations phase. The generator engine emissions on the OSSs and the WTGs (if installed) are subject to the OCS air permit and regulated as a stationary source.

2. Gas-Insulated Switchgear (GIS)

Each of the OSSs will contain sulfur-hexafluoride (SF_6) switchgear for insulation purposes. SF_6 is used as an electrical and thermal insulator in electrical equipment, but it is also a powerful greenhouse gas, having a global warming potential (GWP) of 23,500 times that of carbon dioxide (CO_2). SF_6 has the highest GWP of all greenhouse gases addressed by the Intergovernmental Panel on Climate Change (IPCC) inventory protocols. RW proposes that OSS devices containing SF_6 will be equipped with integral low-pressure detectors to detect SF_6 gas leakages should they occur. According to RW, the WTGs will not contain SF_6 gas insulated switchgear.

B. Vessels

Construction of the project will require the use of an array of vessels. During construction, heavy lift vessels, tugboats, barges, platform supply vessels, and jack-up vessels will be used to transport the WTG, monopile, and OSS components to the lease area. Installation of the WTGs, monopiles, and OSSs is expected to be performed using a combination of jack-up vessels and dynamic positioning system (DPS) crane vessels. It is anticipated that scour protection will be installed around the WTG and OSS foundations using a specialized rock-dumping vessel. Crew transport vessels and service operations vessels will be used to support the installation of the wind farm components. To reduce noise impacts from the construction, a bubble curtain will be maintained via an anchor handling vessel.[24] In addition, four sound field verification vessels will be positioned around pile driving to monitor for sound.

Crew transfer vessels and helicopters[25] are expected to be used to transport personnel to and from the wind development area. Additional geophysical survey work will likely be conducted to ensure adequate understanding of seabed conditions around the offshore cable system and scour protection, which will require the use of survey vessels.

RW described the following vessels with air pollutant emitting equipment in the permit application.

[24] Bubble curtains utilizes a submerged, perforated tube or pipe from which compressed air is released. When laid on the seafloor around areas where offshore activities are expected to occur, the rising curtain of bubbles reduces and disperses the amount of underwater noise associated with a particular activity, protecting marine life from acoustic disturbances.

[25] The project's potential emissions include emissions from helicopters which are not required to be part of the potential to emit calculation for the project. Helicopter emissions are de minimis for the WDA facility, and whether their emissions are included or not have no impact on determining permitting applicability.

Table 5 Description of Vessels and Equipment for WTG and OSS Installation Activities included in the Potential to Emit

Vessel Type	Description of Vessel Type
Crew transport vessels	Transport crew to the WDA.
Heavy lift installation vessels	Lift, support, and orient the components of each WTG and OSS during installation. Used for foundation installation.
Cable lay and burial vessels	Lay and bury transmission cables in the seafloor
Rock dumping vessels Pre-lay grapnel runs vessels	Deposit a layer of stone around the WTG and OSS foundations to prevent the removal of sediment by hydrodynamic forces. May place cable protection over limited sections of the offshore cable system.
Boulder clearance vessels	Clear the seabed floor of debris prior to laying transmission cables.
Tugboats	Transport equipment and barges to the WDA.
Heavy transport vessels	Transport large project components to the WDA.
Platform supply vessels	Transport steel to the WDA.
Anchor handling tug supply vessels	Install underwater noise mitigation devices (e.g. bubble curtains). Support offshore export cable installation when needed.
Jack-up vessels	Transport WTG components to the WDA. Extend legs to the ocean floor to provide a safe, stable working platform. Used for offshore accommodations.
Sandwave clearance (dredging) vessels	Used in certain areas prior to cable laying to remove the upper portions of sand waves.
Survey vessels	Used to perform geophysical and geotechnical surveys.
Sound field verification vessels	Monitor sound fields during piledriving.
Service operation vessels	Transport crew to the WDA. Provide offshore living accommodation and workspace.
Onboard Generators	Supply power for air compressors and power packs.
Temporary diesel generators	Temporarily supply power to the OSSs during installation and commissioning.
Permanent diesel generators	Supply power to the OSS for brief periods during commissioning.

Some of the vessels used as part of the installation activities listed above in Table 5 may not meet the definition of an OCS source. CAA Section 328 defines an OCS source as "any equipment, activity, or facility which: (1) emits or has the potential to emit any air pollutant; (2) is regulated or authorized under the Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. § 1331 et seq.); and (3) is located on the OCS or in or on waters above the OCS." 42 U.S.C. § 7627(a)(4)(C). Such activities "include, but are not limited to, platform and drill ship exploration, construction, development, production, processing, and transportation." *Id.* The

OCS regulations, at 40 C.F.R. § 55.2, define an OCS source by first incorporating the statutory language referenced previously and then adding that vessels are considered OCS sources only when they meet either of the following criteria: (1) the vessel is "[p]ermanently or temporarily attached to the seabed and erected thereon and used for the purpose of exploring, developing or producing resources therefrom, within the meaning of section 4(a)(1) of OCSLA (43 U.S.C. § 1331 et seq.)[26];" or (2) the vessel is "[p]hysically attached to an OCS source, in which case only the stationary source aspects of the vessels will be regulated." Thus, for a vessel to be considered an OCS source, it must meet the three statutory criteria of the OCS source definition and one of the two additional criteria in the portion of the regulatory OCS source definition that specifically applies to vessels.

The Environmental Appeals Board (EAB) has issued decisions interpreting the OCS source definitions in CAA Section 328 and the 40 C.F.R. Part 55 regulations that may provide guidance when determining if a vessel meets the definition of an OCS source. In one decision, the EAB recognized that "attachment" for purposes of being an OCS source is not ordinarily "so broad" to mean "any physical connection." *In re Shell Gulf of Mex., Inc.*, 15 E.A.D. 193, 199 (E.A.B. 2011) (*Shell 2011*"). However, in another case, the EAB affirmed EPA Region 10's determination that a drill ship satisfies the requirement of being "attached to" the seabed when one of its anchors is deployed. *In re Shell Gulf of Mex., Inc.*, 15 E.A.D. 470, 488 (E.A.B. 2012) (*Shell 2012*"). Therefore, vessels operating in the WDA that deploy an anchor that connects to the seabed are similarly attached to the seabed and satisfy this requirement.

In *Shell 2011*, EPA Region 10 determined an icebreaker vessel is not "attached" to a drill ship when the icebreaker is setting or receiving the drill ship's anchors. *Shell 2011* at 194. In making this determination, EPA Region 10 defined the purpose of "attachment" as to "prevent or minimize relative movement" between the vessel and the seabed. *Id.* at 199. Region 10 determined that the icebreaker is not "attached" to the drill ship sufficient to constitute being an OCS source because the icebreaker's anchor cable is "repeatedly connected and disconnected" from one of the drill ship's anchors, and is "not intended in any way to restrict the location of" the icebreaker. *Id*. at 200. In finding Region 10's definition of "attachment" to be reasonable, the EAB also noted the anchor cable is "played out" as the icebreaker travels away from the drill ship, meaning the anchor cable is not intended to restrict the location of the icebreaker. *Id*. The EAB compared the intermittent connection of the icebreaker vessel to the drill ship to a vessel at dockside, noting that "attachment" in the context of an OCS source is more similar to the latter. *Id.* at 200.

In the *Shell 2012* EAB decision, the EAB found reasonable EPA Region 10's definition of "erected thereon" as "intended to reflect the process by which a vessel becomes attached to the seabed and used thereafter for the purpose of exploring, developing, or producing resources from the seabed." *Shell 2012* at 491. EPA supported this definition by looking to the customary meaning of the verb "to erect," which is defined as "to construct" or "to build," and thus

[26] 40 C.F.R. § 55.2 references section (4)(a)(1) of OCSLA, which states in relevant part that laws of the United States are "extended to the subsoil and seabed of the outer Continental Shelf and to all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose of exploring for, developing, or producing resources, including non-mineral energy resources, therefrom." 43 U.S.C. § 1333(a)(1).

reasoned that attachment to the seabed must occur "at the location where OCS activity is reasonably expected to occur." *Id.* The phrase "erected thereon" for the purposes of an OCS source definition requires a secure, stationary activity. For example, when a drillship is "erected" on the seabed, it remains stationary while it conducts its OCS activity, and is at the location where the OCS activity (e.g., exploratory drilling) is reasonably expected to occur.
The following subsections describe significant categories of vessels and how their operations related to the definition of an OCS source and, for OCS sources, the stationary source aspects of those vessels which will be subject to permitting requirements.

1. Jack-up vessels or jack-up barges

A jack-up vessel meets the first part of the definition of an OCS source because it will be performing an activity (i.e., constructing a WTG or an OSS) that meets all three of the following criteria:

a) The diesel-fired or gasoline-fired generating sets will emit air pollutants.
b) BOEM will approve, disapprove, or approve with modifications a construction and operation plan that allows the jack-up vessel to construct the WTGs and OSS(s) thus demonstrating the windfarm is authorized under the OCSLA (43 U.S.C. § 1331 *et seq.*); and
c) The jack-up vessel will be located on the OCS or in or on waters above the OCS.

Since the jack-up vessel is a vessel, it must meet one of the two criteria for a vessel to be considered an OCS source and thus be included as part of the OCS source that is covered in this permit. The EPA considers a jack-up vessel to meet the definition of an OCS source once three of the jack-up vessel's legs have attached to the seafloor, because the jack-up unit has become stationary at this point and is no longer operating as a vessel or a barge. Once that occurs, the jack-up vessel is "erected" on the seabed since the vessel will not be using its engines to maneuver itself at that time and it is located in a position according to a plan to conduct OCS activities, i.e., to participate in the exploration, production, or development of resources from the seabed.

From that point forward, the jack-up vessel's activity and emissions equipment involve developing or producing resources from the seabed by erecting a WTG on the seabed that will convert wind energy into electricity or an OSS to convey this electricity to shore. Once a jack-up vessel becomes an OCS source, all emission units on the jack-up vessel (including the construction equipment) are subject to the applicable terms and conditions of the permit. At the conclusion of the jack-up vessel's construction activities at a given location in the WDA, the construction equipment ceases to operate and the jack-up legs are raised from the seafloor. The jack-up vessel's stationary source activities thereon remain regulated as part of the OCS source, and subject to the terms and conditions of the permit, until the point in time when fewer than three jack-up legs are attached to the seafloor. Once the jack-up vessel is no longer attached to the seabed and no longer erected thereon for the purpose of exploration, production, or development of resources from the seabed, it returns to its status as a vessel and is no longer subject to the stationary source requirements of Part 55. However, the jack-up barge and its associated emission units are still included in the potential emissions calculations for the project

at all times when such vessel is within 25 nm of the facility. The jack-up vessel is only subject to the specific emissions limits during the time it meets the definition of an OCS source (is attached to the seabed, erected thereon, and used for the purpose of producing, exploring, or developing resources from the seabed) and thus is regulated as a stationary source under Part 55.

2. Cable-laying vessels

According to RW's application, the offshore cable-laying vessel (CLV) will move along the pre-determined route within the established corridor towards the OSSs. Cable laying and burial may occur simultaneously using a lay and bury tool, or the cable may be laid on the seabed and then trenched post-lay. Alternatively, a trench may be pre-cut prior to cable installation.

EPA has previously determined that cable-laying vessels that utilize pull-ahead anchors or DPS and are not erected on the seabed for the purpose of exploring for, developing, or producing resources therefrom are not considered part of the OCS source.[27] The emissions from these vessels are, however, included in the PTE of the OCS source when located at or traveling within 25 nm of the WDA.

3. Support and other vessels

In addition to jack-up vessels, other types of vessels may meet the definition of an OCS source at some point during the construction or operations phase of the project.

These vessels meet the first part of the definition of an OCS source because the vessels will be performing an activity (i.e., supporting the construction or operations of a WTG or OSS) and will meet all three of the following criteria:

1. The gasoline or diesel-powered engines on the vessels will emit air pollutants.
2. BOEM will approve, disapprove, or approve with modifications a construction and operation plan that allows vessels to support the construction of the WTGs and OSS(s) and authorizes a right-of-way for the cable, thus demonstrating the wind farm is authorized under the OCSLA (43 U.S.C. § 1331 *et seq.*); and
3. The vessels will be operating on the OCS or in waters above the OCS.

As stated earlier in this section, the definition of an OCS source in 40 C.F.R. Part 55 has further criteria that must be met before a vessel can be considered an OCS source. Servicing fleet vessels used in the windfarm may temporarily attach to a structure that is part of the OCS source, another vessel that meets the definition of an OCS source, or to the seabed itself and be erected thereon (the seabed) and used for the purpose of exploring, developing, or producing resources therefrom. The criteria within the definition of an OCS source for when a vessel becomes an OCS source depends on how a vessel is, in essence, remaining stationary on the OCS (i.e., how it attaches itself to an existing OCS facility or to the seabed) and, in the case of attachment to the

[27] *See* EPA's June 24, 2021 Fact Sheet and January 18, 2022 Response to Comments for the South Fork Wind, LLC's OCS air permit, available at https://www.epa.gov/caa-permitting/south-fork-wind-llcs-south-fork-windfarm-outer-continental-shelf-air-permit.

seabed, whether the vessel is also erected thereon and used for the purpose of exploring, developing, or producing resources therefrom. For service fleet vessels attached to an OCS facility, only the stationary source activity occurring on the vessel will be regulated by permit conditions. The EPA has determined that all air emission units on a service fleet vessel, while that vessel meets the definition of an OCS source, constitute a stationary source activity because the vessel will be stationary and the reason for the vessel to be on the waters above the OCS is to assist in the construction of a stationary source, i.e., a WTG or an OSS.

For service fleet vessels that do not attach to an OCS facility, but temporarily or permanently attach to the seabed, the service fleet vessel will be considered an OCS source when it is erected on the seabed and is used for the purpose of exploring, developing, or producing resources from the seabed.[28] Like the jack-up vessels, the criteria "erected thereon" is met when in the WDA the service fleet vessel attaches itself to the seabed and is in a location where it can reasonably be expected to conduct OCS activities; thus becoming stationary and used thereafter for the purpose of exploring, developing, or producing resources from the seabed like constructing a WTG or an OSS. From that point forward, the service fleet vessel's operations and emissions are related to developing or producing resources from the seabed by erecting a WTG or the OSS on the seabed that will convert wind energy into electricity.

4. Crew transfer vessels

At least one crew transport vessel will be needed daily during both the construction and operational phases. During the O&M phase, typically only crew transfer vessels and/or support vessels/inflatable boats will be used, unless a major repair is needed. For major repairs to heavy components, jack-up or crane barges may be required. Crew transfer vessels will be subject to permit requirements when they meet the definition of an OCS source.

[28] Per Section 328 of the CAA, emissions from any vessel servicing or associated with an OCS source, including emissions while at the OCS source or en route to or from the OCS source within 25 miles of the OCS source, shall be considered direct emissions from the OCS source. Therefore, emission from the service fleet vessel are still subject to the permit's NNSR offset requirements once the service fleet vessel is no longer meeting the criteria for an OCS source.

V. Prevention of Significant Deterioration

Once a source locating on the OCS is determined to be subject to PSD, the EPA must then determine the emission units that are considered part of the major stationary source associated with the project. This principle of using the definition within the specific CAA program is articulated in an EAB Decision *In Re Shell Offshore, Inc., Kulluk Drilling Unit and Frontier Discoverer Drilling Unit*, 13 E.A.D. 357, 380 (EAB 2007). The EAB stated in that decision:

> We find that the Region correctly concluded that, once it determines an emissions source located on the OCS is properly classified as an "OCS source," then that emissions source becomes subject to the requirements of 40 C.F.R. Part 55. Further, the permitting programs and other requirements to which the OCS source is subject through Part 55, including the PSD permitting program, then apply to the OCS source based on the regulations that define the scope of those programs. Specifically, simply because EPA has identified an OCS source as regulated under the CAA, and subject to the requirements of Part 55, does not mean it can avoid the next necessary step of determining the scope of the "stationary source" for PSD purposes.

In accordance with the principle articulated in the decision quoted above, the EPA must determine whether PSD regulations apply to the windfarm based on the regulations that define the scope of the CAA permitting program. Since all OCS sources are stationary, the EPA considers engines on a vessel to be stationary sources and not nonroad engines when the engines are operating while the vessel meets the definition of an OCS source. The EPA has also determined that all air polluting devices located on a WTG or an OSS are stationary sources. The OCS source definition in Section 328(a)(4)(C) of the CAA states that the OCS source includes "any equipment, activity, or facility which – emits or has the potential to emit any air pollutant." Furthermore, CAA section 328(a)(4)(D) defines the term "new OCS source" to mean "an OCS source which is a new source within the meaning of section [111(a)] of [the CAA]." Inherent in the definition of "new source" under Section 111 is that the source to be regulated is a stationary source. *See* Section 111(a)(2) of the CAA.

Moreover, the regulatory definition of OCS source in 40 C.F.R. § 55.2 provides that, for vessels physically attached to an OCS facility, "only the stationary sources [sic] aspects of the vessels will be regulated." *See* 40 C.F.R. § 55.2 (definition of OCS source). For these types of OCS source-vessels, the "stationary source aspects" of the vessel attached to an OCS source are regulated by the permit beyond inclusion of its emissions (within 25 nm of the OCS source) counting as direct emissions from the OCS source for purposes of determining potential emissions. In other words, the nonroad engines on the vessels will be subject to specific permit conditions, and its operations emissions *and* to-and-fro vessels emissions within 25 nm of the OCS source will count as direct emissions from the OCS source for determining the PTE of the source. Section 328 of the CAA requires that emission units on OCS sources be regulated as stationary sources except with respect to emissions from engines being used for propulsion of vessels while attached to an OCS source. Consideration of the emission sources on a typical vessel that is determined to be an OCS source makes clear that neither Congress nor EPA could have intended to exclude otherwise nonroad engines from being regulated as stationary sources if part of an OCS source. Congress's specific grant of authority to EPA in the 1990 CAA

amendments to regulate OCS sources would be rendered meaningless if emissions from engines that would otherwise be considered nonroad engines and that comprise the emission units on the vessels were excluded from regulation as stationary sources. Given that an engine is a stationary source when located on an OCS source for purposes of Section 111 of the CAA, it is only logical to determine that these same engines are stationary sources for purposes of other CAA programs, including the PSD permit program.

A. Project Aggregation

The initial permit application for South Fork Wind was received by EPA on February 1, 2019, with a major revised permit application submitted on September 30, 2020. The initial permit application for RW was received by EPA on May 5, 2022.[29] Since the two (2) projects, that is South Fork Wind and RW, were applied for within a short time period, EPA considered whether these projects should be evaluated for project aggregation. [30]

The two windfarm projects were determined to be separate projects because they were not "substantially related." EPA finds these two projects were not jointly planned. They are not functionally interconnected, nor are they dependent upon each other to be technically or economically viable. Approval of each project was made entirely independently of each other, and each project has separate purchase agreements for the sale of their electricity. Because there is no technical nor economic relationship between the two projects, EPA finds they are not "substantively related," and the emissions from the two projects should not be aggregated through EPA's PSD or NNSR project review.

B. Major Modification Applicability

The PSD program, as set forth in 40 C.F.R. § 52.21 (PSD regulations"), is incorporated by reference into the OCS Air Regulations at 40 C.F.R. § 55.13(d)(1) for OCS sources located within 25 nm of a state's seaward boundary if the requirements of 40 C.F.R. § 52.21 are in effect in the COA. The EPA has determined that the requirements of sections 160 through 165 of the Clean Air Act (the authority for the PSD program) are not met in Massachusetts law or regulations; therefore, the provisions of 40 C.F.R. § 52.21, except paragraph (a)(1), are incorporated and made a part of the applicable state implementation plan for the Commonwealth of Massachusetts. *See* 40 C.F.R. § 52.1165. Therefore, the provisions within 40 C.F.R. § 52.21 are in effect in the COA.[31]

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[29] SFW submitted a NOI on February 1, 2019. RW submitted an initial NOI on May 5, 2020, and subsequently replaced it on November 5, 2021. SFW's permit was issued in January 2022. Construction has already commenced and SFW is expected to be fully operational by the end of 2023. Construction for RW is expected to begin in 2023 and last 12 to 18 months.

[30] Project aggregation is a "test" to determine the scope of a project and ensures that nominally seperated projects occuring at a source are treated as a single project for NSR applicability purposes where it is unreasonable not to consider them a single project. In the 2009 NSR Aggregation Action (effective date of November 15, 2018), the EPA affirmed the "substantially related" test as an appropriate standard for assessing project aggregation.

[31] The Commonwealth of Massachusetts has taken delegation of EPA's PSD permitting program at 40 C.F.R. § 52.21 by virtue of an agreement for delegation signed by then-Regional Administrator Curtis Spaulding on April 11, 2011. See https://www.epa.gov/sites/default/files/2015-08/documents/epa-massdep-psd-delegation-agreement.pdf

The PSD program applies to new major sources of criteria pollutants or major modifications to existing sources in areas designated as being in attainment with, or unclassifiable with, the ambient air quality standards in relation to particular pollutants. "Major modification" means any physical change in or change in the method of operation of a major stationary source that would result in: (1) significant emissions increase of a regulated NSR pollutant; and (2) a significant net emission increase of that pollutant from the major stationary source. Regulated NSR pollutants (and their precursors) for which an area is in nonattainment are not subject to PSD review even if the project emission increase and net emission increase is significant. Instead, they are subject to major NNSR permitting.

Since the source[32] is considered an existing PSD major source for NO_2 and $PM_{2.5}$, the emissions increase from the Revolution Wind project must be evaluated for PSD applicability based on exceedances to the applicable significance levels. The PSD requirements apply to each regulated pollutant that a "major source emits in significant amounts" per 40 C.F.R. 52.21(j). Fugitive emissions must also be considered in evaluating Best Available Control Technology (BACT) and ambient impacts through these regulations, not distinguishing between stack and fugitive emissions.

1. Emission Increase Calculation (Project Emission Increase)

For projects that only involve the construction of new emission units, like Revolution Wind, the significant emissions increase is the new emissions unit's PTE[33]. For a new emission unit, the baseline actual emissions (BAE) for purposes of determining the emissions increase that will result from the initial construction and operation of such unit shall equal zero; and thereafter, for all other purposes, shall equal the unit's PTE. The applicant has considered fugitive emissions in the PTE of the project.

For assessing the emission increases from the RW project, emissions from the equipment or activities considered part of the OCS source and all emissions from vessels servicing or associated with the project, are included. This includes emissions from vessels, regardless of whether the vessel itself meets the definition of an OCS source, when the vessels are at or going to or from an OCS source and are within 25 nm of the source. Thus, emissions from vessels servicing or associated with an OCS source that are within 25 nm of the OCS source are considered in determining the PTE or "potential emissions" of the OCS source for purposes of applying the PSD regulations.

The emissions increases from this project are calculated pollutant by pollutant for each regulated NSR pollutant. The increases include both project emissions and any emissions from the source associated with the project. The applicant has not identified any existing emission units from the

[32] See Section III. D which concluded that Revolution Wind and the previously permitted South Fork Wind Farm are considered one stationary source.

[33] Under the PSD program, "potential to emit" or PTE is defined as the maximum capacity of a source to emit a pollutant under its physical and operational design (see 40 C.F.R. §52.21(b)(4)). Typically, emissions from mobile sources and secondary emissions do not count when determining a stationary source's PTE. However, the definition of "potential emissions" in the OCS Air Regulations is expanded to include emissions from all vessels servicing or associated with an OCS source when within 25 nm.

source, i.e., sources associated with the South Fork project, that are affected by the RW project. Emission decreases are not considered in this step.

Table 6 Emission Increase from the Revolution Wind Project

Revolution Wind - Project Emission Increase		**Regulated NSR Pollutant (TPY)**						
	NO_2	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**GHG (As CO_2e)**	**H_2S Mist**	**Pb**
BAE	0	0	0	0	0	0	0	0
PTE	3,964.5	1,039	137.1	133.1	15.0	302,957	0	0.02
Δ (PTE-BAE)	3,964.5	+1,039	+137.1	+133.1	+15.0	+302,957	-	0.02

As shown in *Table 7*, a significant emissions increase (per the definition of significant at 40 C.F.R. § 52.21(b)(23))[34] of at least one regulated NSR pollutant has occurred. In addition, the pollutant Greenhouse Gases (GHG) is subject to regulation if the stationary source is an existing major stationary source, a regulated NSR pollutant that is not GHG has triggered the Significant Emission Rate (SER) and the project results in a GHG emission increase of 75,000 TPY CO_2e or more.

Table 7 Worst Case Annual Emission Estimate Compared with PSD Significant Emissions Rate (SER) Thresholds

NSR Regulated Pollutant	Project Emission Increase (TPY)	PSD SER (TPY)	SER Triggered? (Y/N)
NO_2 (1)	3,964.5	40	**Y**
CO	1,039	100	**Y**
PM_{10}	137.1	15	**Y**
$PM_{2.5}$	133.1	10	**Y**
SO_2	15.0	40	N
GHG (as CO_2e)	302,957	75,000	**Y**
Sulfuric Acid Mist	0	7	N
Lead	0.02	0.6	N

(1) Nitrogen dioxide is the compound regulated as a criteria pollutant under PSD; however, significant emissions rate for NSR is based on the sum of all oxides of nitrogen, i.e., NO_X . Note that for PSD permitting purposes, $NO_X = N_2O + NO_2$.

[34] Per 40 C.F.R. § 52.21(b)(49), for the pollutant GHGs, an emissions increase shall be based on CO_2e, and shall be calculated assuming the pollutant GHGs is a regulated NSR pollutant and "significant" is defined as 75,000 TPY CO_2e.

2. Emission Netting (Contemporaneous Netting)

Per 40 C.F.R. § 52.21(b)(3), the definition of a "net emission increase" consists of two components:

1) Any increases in actual emissions from a particular physical change or change in the method for operation from a stationary source (i.e., Emission Increase Calculation (Project Emission Increase)); and
2) Any other increase and decrease in actual emission at the source that are contemporaneous with the change and are otherwise creditable.

In other words, netting looks at the other projects that may have been or will be undertaken at a given facility over the contemporaneous period.

RW is not pursuing a Step 2 contemporaneous netting analysis.

3. Summary

Based on the emission levels for the project, as presented in *Table 7*, NO_2, CO, PM_{10}, $PM_{2.5}$, and GHG are the NSR regulated pollutants that will be emitted by RW in quantities exceeding the respective PSD SER. The applicant has identified no anticipated contemporaneous creditable emissions increases or decreases for the proposed project (RW). Therefore, the RW project is considered a major modification.

Note that ozone (and therefore its precursors NOx and VOC) is subject to NNSR and is therefore not explored further in this section[35]. *See* Section VI.B.

C. Best Available Control Technology (BACT)

BACT is defined in the applicable permitting regulations at 40 C.F.R. § 52.21(b)(12), in relevant part, as

> an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event, shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 C.F.R. Parts 60, 61, or 63. If the Administrator determines that

[35] Duke County is a designated nonattainment area for ozone, and Massachusetts is also part of the Ozone Transport Region (OTR). Therefore, for permitting purposes Duke County is treated as a moderate nonattainment and the ozone precursors NO_X and VOC are not subject to PSD review. NOx and VOC are subject to major NNSR permitting. The pollutants subject to LAER are NO_X and VOC (*See* Section VI).

> technological or economic limitations on the application of measurement technology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology.

The CAA contains a similar BACT definition, although the 1990 CAA amendments added "clean fuels" after "fuel cleaning or treatment" in the above definition. *See* CAA § 169(3).

Therefore, the permitting authority must establish a numeric emission limitation that reflects the maximum degree of reduction achievable for each pollutant subject to BACT through the application of the selected technology or technique. However, if the permitting authority determines that technical or economic limitations on the application of a measurement methodology would make a numerical emission standard infeasible for one or more pollutants, it may establish design, equipment, work practices, or operational standards to satisfy the BACT requirements.

1. Methodology

The EPA's longstanding approach to implementing BACT is to require a "top-down" BACT analysis to demonstrate that the BACT requirement is satisfied for each emission unit that emits a regulated NSR pollutant subject to PSD review. This methodology is outlined in EPA policy memoranda and supported by the EAB. [36, 37]

Step 1 – Identify All Control Technologies

Available control technologies are identified for each emission unit in question. The following methods are used to identify a comprehensive list of potential technologies:

1. Researching the Reasonability Available Control Technology (RACT)/Best Achievable Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database;
2. Researching the CARB (California Air Resource Board) and South Coast Air Quality Management District (SCAQMD) database;
3. Surveying air pollution control equipment vendors, and
4. Surveying available literature.
5. Previously issued permits

[36] *See* EPA's "Guidance for Determining BACT Under PSD" at https://www.epa.gov/sites/production/files/2015-07/documents/bactupsd.pdf and New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting (draft Oct. 1990) at https://www.epa.gov/sites/production/files/2015-07/documents/1990wman.pdf

[37] *See, e.g., In re: Prairie State Generating Company*, 13 E.A.D. 1, 12 (EAB 2006)

Step 2 – Eliminate technically infeasible options

After the identification of control options, an analysis is conducted to eliminate technically infeasible options. A control option is eliminated from consideration if there are process-specific conditions that prohibit the implementation of the control technology or if the highest control efficiency of the option would result in an emission level that is higher than any applicable regulatory limits.

Step 3 – Rank remaining control technologies

Once technically infeasible options are removed from consideration, the remaining options are ranked based on their control effectiveness. If there is only one remaining option or if all the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required.

Step 4 – Evaluate most effective controls and document results.

Beginning with the most efficient control option in the ranking, detailed economic, energy, and environmental impact evaluations are performed. If a control option is determined to be economically feasible without adverse energy or environmental impacts, it is not necessary to evaluate the remaining options with lower control efficiencies. The economic evaluation centers on the cost effectiveness of the control option.

Step 5 – Select BACT

In the final step, one pollutant-specific control option is proposed as BACT for each emission unit under review based on evaluations from the previous step.

2. BACT Analysis for the Revolution Wind Project

A BACT analysis is required for each pollutant which exceeds an applicable PSD SER. *See* 40 C.F.R. § 52.21(j). Based on the emission levels for the project, as presented in Table 7, NO_2, CO, PM, PM_{10}, $PM_{2.5}$, and GHG are the NSR regulated pollutants that will be emitted by RW and subject to PSD.

High Level Summary of BACT Determination

For offshore engines on the wind turbine generators and/or offshore substations, BACT has been determined to be use of the highest Tier EPA Certified Engine (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII, and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan.

For marine engines on vessels that operate as an OCS source, BACT has been determined to be use of the Marine Engine that is certified to the highest Tiered Exhaust Emission Standards (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII and operated in accordance with a Good Combustion and Operating

Practices ("GCOP") Plan. Note that for third party-contracted U.S. vessels where the availability of the vessel type at the time of the application is unknown, BACT has been determined to be use of the Marine Engine that is certified to the highest Tiered Exhaust Emission Standards (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII at time of deployment and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan. Specific Conditions related to the time of deployment are justified in the subsection below. For third party-contracted U.S. or foreign-flagged vessels where the availability of the vessel type at the time of the application is unknown, BACT has been determined to be use of the Engines certified to the highest Tiered Exhaust Emission Standards (i.e., Tier III) within 40 MARPOL Annex VI at time of deployment and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan. Specific Conditions related to the time of deployment are justified in the subsection below.

For the switchgears on the offshore substations, BACT has been determined to be leak rate of SF_6 not to exceed 0.5% per year (~222 TPY CO2e) from all the MV and HV SWGs on the OSS.

The following sections document the top-down BACT determination in more detail.

a. Emission Unit Applicability

The RW project is required to apply BACT to all the new emission units proposed in this project. The Project's emission sources will primarily be compression-ignition internal combustion engines (CI-ICE). These include engines on vessels while operating as OCS source(s) and engines on the wind turbine generators (WTGs) and offshore substations(s) (OSS[s]).

Table 8 Emission Unit Group (EUG) 1 - Offshore Generators on WTGs and OSS(s)

EU ID	Description	Type of Equipment	Engine Count	Engine Rating, kW (hp)	Hours per Engine
Construction Equipment					
RW-1, RW-2	OSS/OCS Installation & Commissioning	Auxiliary Generator on OSS/OCS	2	597 (800)	4,800
RW-3, RW-4, RW-5, RW-6	Offshore OSS/OCS Installation & Commissioning	Temporary Generator on OSS	4	156 (209)	17,520[1]
RW-7	Offshore Array Cable Installation	Generator for Cable Pull-WTG	1	37 (50)	600
RW-8, RW-9	Offshore Array Cable Installation	Generator for Cable Pull-OSS/OCS	2	75 (100)	240
RW-10, 11	Offshore WTG Installation & Commissioning	Temporary Generator on WTG	2	24 (32)	120
Operating Equipment					
RW-12, 13	OSS/OCS Permanent Generators	Generator on OSS/OCS	2	597 (800)	500
RW-14 thru RW-20	WTG O&M Repair	Generator on WTG	6	120 (160)	720

[1] Note that this represents the hours of operation during the entire construction period of the project (i.e., 8,760 hpy x 2 yrs.)

A marine vessel[38] typically has two (2) kinds of engines which are considered OCS emission sources: 1) Propulsion engines, also referred to as main engines, which supply power to move the vessel but could also be used to supply power for purposes of performing a given stationary source function (e.g., to lift, support, and orient the components of each WTG during installation), and 2) Auxiliary engines, which supply power for non-propulsion (e.g., electrical) loads. The applicant has identified the anticipated horsepower ratings for propulsion and auxiliary engines, *Table 9*. Note that RW does not yet know specifically which engines or vessels will be utilized for the project. Vessel availability is constrained by the limited number of vessels capable of conducting the work, availability of those vessels at a given time, and limitations imposed by the Jones Act[39]. The procurement of the vessels, which are indicated to change on short notice, require contracts within short timeframes due to the specific nature of the OCS project, which is described in more detail below. Thus, the vessel engine types that can be secured at the projected time of construction are unknown at the time of publication of this fact sheet. EPA is considering these facts in the analysis.

Table 9 EUG 2 - Marine Engines on Vessels Operating as Potential OCS Source(s)

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Monopile Installation	Heavy Lift Installation Vessel	26,640	1,100
Monopile Installation	Heavy Lift Installation Vessel	34,560	1,100
Monopile Installation	Heavy Lift Installation Vessel (Generator Small)	NA	4
Monopile Installation	Heavy Lift Installation Vessel (Power Pack)	NA	746
Monopile Installation	Towing Tug (for fuel barge)	11,060	238
Monopile Installation	Anchor Handling Tug	11,060	238
Monopile Installation	Rock Dumping Vessel	13,500	1,692
Monopile Installation	Vessel for Bubble Curtain	11,060	874
Monopile Installation	Vessel for Bubble Curtain (Generator (Large))	NA	358

[38] Large Marine Vessels are noted to typically have Category 3 (C3) engines, which have a per cylinder displacement of 30 L/cylinder or more; however, some could have smaller Category 1 (C1) or Category 2 (C2) engines. To be classified as a Category 2 (C2) marine engine, it must be rated to have a displacement greater than or equal to 7.0 L/cylinder and less than 30.0 L/cylinder. To be classified as a Category 1 (C1) marine engine, it must be rated to have a displacement less than 7.0 L/cylinder. For Tier 1 and Tier 2, the line between Category 1 and Category 2 was set at 5.0 L/cylinder rather than 7.0 L/cylinder (40 CFR 1042).

[39] Generally, the Jones Act is a U.S. law that requires vessels that ship merchandise and passengers between two U.S. points to be U.S. built and registered (flagged), as well as owned and crewed by U.S. citizens or residents. *See generally*, Charlie Papavizas, *Jones Act Considerations for the Development of Offshore Windfarms*, 20 BENEDICT'S MAR. BULL. [1] (First Quarter 2022) (available at https://www.winston.com/images/content/2/6/v2/262961/First-Quarter-2022-Benedict-s-Maritime-Bulletin-Papavizas.pdf). U.S.C. § 55102(b), part of the Merchant Marine Act of 1920, also known as the Jones Act, precludes a vessel from providing "any part of the transportation of merchandise by water, or by land and water, between points in the United States to which the coastwise laws apply, either directly or via a foreign port, unless the vessel —(1) is wholly owned by citizens of the United States for purposes of engaging in the coastwise trade; and (2) has been issued a certificate of documentation with a coastwise endorsement under chapter 121 or is exempt from documentation but would otherwise be eligible for such a certificate and endorsement." Also part of the Jones Act, U.S.C. § 55103(a) precludes a vessel from transporting passengers between ports or places in the United States to which the coastwise laws apply, either directly or via a foreign port, unless the vessel--(1) is wholly owned by citizens of the United States for purposes of engaging in the coastwise trade; and (2) has been issued a certificate of documentation with a coastwise endorsement under chapter 121 or is exempt from documentation but would otherwise be eligible for such a certificate and endorsement.

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Monopile Installation	Heavy Transport Vessel (Generator (Small))	NA	4
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Crew Transport Vessel	2,352	48
Monopile Installation	PSO Noise Monitoring Vessel	11,060	238
Monopile Installation	Platform Supply Vessel	6,000	874
Monopile Installation	Platform Supply Vessel	1,825	525
OSS Topside Installation	Heavy Transport Vessel	13,000	1,220
Turbine Installation	Jack-up Installation Vessel	21,000	895
Turbine Installation	Jack-up Installation Vessel (Generator (Small))	NA	4
Turbine Installation	Jack-up Installation Vessel (Cherry Picker)	NA	67
Turbine Installation	Feeder Barge (Generator (Large))	NA	30
Turbine Installation	Towing Tug (for fuel barge)	11,060	238
Offshore Export Cable & OSS Link	Pre-Lay Grapnel Run	12,780	968
Offshore Export Cable & OSS Link	Boulder Clearance Vessel	2,803	964
Offshore Export Cable & OSS Link	Sandwave Clearance Vessel	7,300	964
Offshore Export Cable & OSS Link	Cable Lay and Burial Vessel	8,946	2,800
Offshore Export Cable & OSS Link	Cable Burial Vessel - Remedial	8,946	2,800
Offshore Export Cable & OSS Link	Tug - Small Capacity	4,049	238
Offshore Export Cable & OSS Link	Tug - Large Capacity	11,060	238
Offshore Export Cable & OSS Link	Crew Transport Vessel	2,204	201
Offshore Export Cable & OSS Link	Guard Vessel/Scout Vessel	400	201
Offshore Export Cable & OSS Link	Survey Vessel	1,302	418
Offshore Export Cable & OSS Link	DP2 Construction Vessel	12,780	964
Offshore Export Cable & OSS Link	Misc. Floating Equipment Landfall	400	201
Offshore Export Cable	Barge Lay (Generator (Small))	NA	75
Offshore Export Cable	Barge Lay (Crane Type 1)	NA	567
Offshore Export Cable	Barge Lay (Generator (Large))	NA	187
Offshore Export Cable	Barge Lay (Power Pack)	NA	373
Offshore Export Cable	Barge Lay (Cherry Picker)	NA	112
Offshore Export Cable	Barge Lay (Excavator)	NA	567
Offshore Export Cable	Support Barge (Generator (Large))	NA	45
Offshore Export Cable	Support Barge (Cherry Picker)	NA	567
Offshore Array Cable	Pre-Lay Grapnel Run	12,780	964

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Offshore Array Cable	Boulder Clearance Vessel	2,803	964
Offshore Array Cable	Sandwave Clearance Vessel	7,300	964
Offshore Array Cable	Cable Laying Vessel	8,946	2,800
Offshore Array Cable	Cable Burial Vessel	8,946	2,800
Offshore Array Cable	Crew Transport Vessel	2,204	201
Offshore Array Cable	Walk to Work Vessel (SOV)	6,440	N/A
Offshore Array Cable	Survey Vessel	1,302	418
Offshore Array Cable	Construction Vessel	6,440	N/A
Offshore Cable Transport	Cable Laying Vessel	8,946	2,800
Offshore Cable Transport	Array Cable Transport Freighter	7,950	3,026
All Construction Activities	Safety Vessel 1	400	201
All Construction Activities	Safety Vessel 2	400	201
All Construction Activities	Crew Transport Vessel	2,352	201
All Construction Activities	Crew Transport Vessel	2,162	201
All Construction Activities	Crew Transport Vessel	2,984	100
All Construction Activities	Lift Boat	6,000	N/A
All Construction Activities	Supply Vessel	7,530	N/A
All Construction Activities	Service Operation Vessel	6,920	201
Fisheries Monitoring	for Lobster, Lease Site	400	201
Fisheries Monitoring	for Trawl Survey	400	201
Fisheries Monitoring	for Lease Site Acoustic Telemetry	400	201
Fisheries Monitoring	for Lobster, Export Cable	400	201
Marine Mammal Mitigation	for Situational Awareness	400	201
Marine Mammal Mitigation	for Long Term Acoustic	400	201
Marine Mammal Mitigation	for ST Long Term Studies	400	201

Other units at this facility that are subject to a top-down BACT analysis are the medium voltage (MV) and high-voltage (HV) gas-insulated switchgears on the OSS because they have the potential to emit SF_6, which is a GHG. The facility has also stated in their permit application that the WTGs, which are equipped with low voltage (LV) switchgears will not utilize SF_6 and not have any potential emissions. Therefore, only the MV and HV GIS located on the OSS are required to apply BACT. *See Table 10.*

Table 10 EUG 3 - Medium, and High Voltage GIS on the OSS

EU ID	Description	Type	Count (# GIS)	Maximum Quantity
MV-GIS	MV GIS (66kV) on OSS/ESP	SF_6	2	858 kg per OSS
HV-GIS	HV GIS (220 kV-400 kV) on OSS/ESP	SF_6	2	858 kg per OSS

Pollutant Formation and Reduction Mechanisms

Emission(s) of NO_X from Compression Ignition (CI)-Internal Combustion Engines (ICE)	Air emissions of nitrogen oxides occur by two (2) different mechanisms. The predominant mechanism for engines is thermal NO_X. Most of the NO_X formed from CI-ICE is from thermal NO_X due to the high flame temperatures and pressures of engines. The maximum reduction of thermal NO_X generation can be achieved by control of both the combustion temperature and the stoichiometry. The second mechanism, fuel NO_X, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. For diesel, little fuel NO_X is formed, except in engines that fire residual and/or crude oils. Here, as with thermal NO_X, controlling excess O_2 (stoichiometry) is an important part of controlling NO_X formation.
Emission(s) of CO from CI-ICE	Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO_2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, consequently, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.
Emission(s) of VOC from CI-ICE	Volatile organic carbon compounds that are found in diesel exhaust are commonly a result of unburned fuel, although some are formed as combustion products. VOC compounds participate in atmospheric photochemical reactions. These reactions can result in the formation of ozone. VOCs do not include methane, ethane, and other compounds that have negligible photochemical reactivity. Air emissions of VOC from CI-ICE are generally minimized by ensuring complete combustion.
Emission(s) of $PM_{10/2.5}$ from CI-ICE	White, blue, and black smoke may be emitted from CI-ICE. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of CI-ICE. The primary constituent of black smoke is agglomerated carbon particles (soot).
Emission(s) of SO_2 from CI-ICE	Sulfur Dioxide is formed based on the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to SO_2.
Emission(s) of GHG from CI-ICE	MA regulations define greenhouses gas as carbon dioxide, CH_4, N_2O, and hydrofluorocarbons. CO_2 emissions are the primary GHG component from CI-ICE.
Emission(s) of GHG from GIS	SF_6 is used as an electrical and thermal insulating gas in electrical switchgears to prevent electrical arcing and minimize transmission losses.

(1) Step 1 – Identify All Available Control Technologies

The first step in the top-down BACT process is to identify all "available" control options. To satisfy the statutory requirements of BACT, EPA believes that the applicant must focus on technologies that have been demonstrated to achieve the highest levels of control for the pollutant in question, regardless of the source type in which the demonstration has occurred.

EUG 1—OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

A RBLC search was completed for the last 10 years of determinations (*August 12, 2012, through August 12, 2022*) using the following process types: 1.) 17.110 – Large ICEs (> 500 HP) - Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel); 2.) 17.210 – Small ICEs (< 500 HP) - Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The resulting determinations were divided into three searches: large emergency/non-emergency engines (>500 HP), and small emergency/non-emergency engines (<500 HP). These results are summarized within the permit application and can be found within the RBLC database after performing a search using the criteria mentioned above. Identification of other BACT options from previously issued air permit determinations were also considered.

The applicable air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the emissions unit are listed in Table 11.

Table 11 Options of Control Technologies or Techniques for EUG 1

Control Technology	Pollutant(s)	Note(s)
Good Combustion Practices	NO_2, $PM_{10, 2.5}$, CO, GHG	Use of good combustion practices based on the most recent manufacturer's specifications issued for these engines.
Highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine at 40 C.F.R. Part 1039	NO_2, $PM_{10, 2.5}$, CO	Tier 2 and Tier 3 certified engines are designed to incorporate pre-combustion controls such as fuel injection timing, exhaust gas recirculation, and other engine-based technologies to meet emissions standards. In addition to the pre-combustion controls, Tier 4 certified engines may be equipped with an integrated Selective Catalytic Reduction (SCR), Diesel Particulate Filter (DPF), and/or Diesel Oxidation Catalyst (DOC).
Diesel Particulate Filter	$PM_{10, 2.5}$	Add-on air pollution control devices. One or more DPFs or DOCs may be installed (retrofitted) on a Tier 2 or Tier 3 engine to further reduce emissions.

Control Technology	Pollutant(s)	Note(s)
Diesel Oxidation Catalyst [1]	$PM_{10, 2.5}$, CO	

Notes:

[1] RBLC Determination No. WV-0033 lists a BACT CO emission limit of 0.41 g/kW-hr (overall reduction of 88.3 % with the use of catalytic oxidation). The RBLC notes that for this case the applicant did not justify why catalytic oxidation was infeasible for the 2,100 HP Emergency Generator (EG-01). However, the emision limitation in the RBLC Determination No. WV-003 for this unit might not reflect the BACT achievable in practice since it has not been verified – particularly since the reduction appears to be applied to an engine already certified to meet Tier 4 emission standards. Nonetheless, Permit No. R14-0038 does appear to require catalytic oxidation on EG-01 and a CO emission limit of 0.41 g/kW-hr (i.e., BACT). However, Specific Condition 5.1.1 (g) states that, "When in operation other than startup or shutdown periods, the engine for EG-01 shall be a constant-speed engine." This is problematic for the engines proposed with the RW project since technical difficulties are assumed to exist when the engines are operated in variable conditions (and not just in steady state scenarios). RW has stated that the engines are not intended to operate under constant steady state loads or temperatures for a sufficient time necessary for high catalyst performance. Although Catalytic Oxidation may be infeasible in practice based on the specific operating conditions and engine parameters, the highest CO reductions could theoretically be achieved using this technology.

EUG 2—Marine Engines on Vessels when operating as OCS Source(s)

A RBLC search was completed for the last 10 years of determinations (August 12, 2012, through August 12, 2022). Note that the RBLC only contained permit information from facilities with an air permit for oil production in the eastern Gulf of Mexico since that is the only part of the Gulf where EPA has OCS permitting jurisdiction (RBLC ID: FL 0350, FL 0347, FL 0338, FL 0348). The western and central Gulf of Mexico are under BOEM jurisdiction and are not subject to OCS permitting requirements. EPA also reviewed the previous OCS Permits Determinations issued to South Fork Wind and Vineyard Wind 1.

The applicable air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the emissions unit are listed in Table 12.

Table 12 Options of Control Technologies or Techniques for EUG 2

Control Technology	Pollutant(s)	Note(s)
Good Combustion Practices	NO_2, $PM_{10, 2.5}$, CO, GHG	The RBLC included a requirement for the permittee to develop a Good Combustion and Operating Practices (GCOP) Plan. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for inspection. The plan was specifically to include, but not be limited to:1) A list of combustion optimization practices and a means of verifying the practices have occurred. 2) A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred. 3) A list of the design choices determined to be BACT and verification that designs were implemented in the final construction.

Control Technology	Pollutant(s)	Note(s)
Highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042	NO_2, $PM_{10, 2.5}$, CO	Tier 2 and Tier 3 certified engines are designed to incorporate pre-combustion controls such as fuel injection timing, exhaust gas recirculation, and other engine-based technologies to meet emissions standards. In addition to the pre-combustion controls, Tier 4 certified engines may be equipped with an integrated SCR, DPF, and/or DOC.
Highest applicable MARPOL Annex VI Tier NO_X emission limits	NO_2	*U.S. flagged vessels* must have an Engine International Air Pollution Prevention (EIAPP) certificate, issued by EPA, to document that the engine meets Annex VI NO_X standards. *Foreign flagged vessels* must have an International Air Pollution Prevention Certificate (IAPP) to document that the engine meets Annex VI NO_X standards [(1)]
Diesel Particulate Filter (DPF)	$PM_{10, 2.5}$	Add-on air pollution control devices. One or more DPFs or DOCs may be installed (retrofitted) on a Tier 2 or Tier 3 engine to further reduce emissions.
Diesel Oxidation Catalyst (DOC)	$PM_{10, 2.5}$, CO	

[(1)] The Annex VI requirements[40] apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. Vessels that operate only domestically are exempt from the NO_X limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder. Foreign-flagged vessels are exempt from having to meet the marine standards within 40 C.F.R. Part 1042 and are required to meet the emission standards in 40 C.F.R. Part 1043.

EUG 3—Medium Voltage, and High Voltage Gas Insulated Switchgears on the OSS

The applicable air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to EUG 3 are listed as follows:

- The Commonwealth of MA implements regulations under 310 CMR 7.72 to assist in GHG emission reduction goals by reducing SF_6 emissions from GIS through the imposition of declining annual aggregate emission limits and other measures, which are 1.) Per 310 CMR 7.72 (4)(a), any newly manufactured GIS that is placed under the ownership, lease, operation, or control of any GIS owner on or after January 1, 2015, must be represented by the manufacturer to have a 1.0% maximum annual leak rate, 2.) Per 310 CMR 7.72 (4)(b), any GIS owner that places GIS under ownership, lease, operation, or control on or after January 1, 2015, shall comply with any manufacturer-recommended maintenance procedures or industry best practices that have the effect of reducing leakage of SF_6, and 3.) Annual reporting requirements contained in 310 CMR 7.72 (6), including but not limited, the number of pounds of SF_6 emitted from GIS

[40] In the United States (US), MARPOL Annex VI is implemented through the Act to Prevent Pollution from Ships (33 U.S.C. §§ 1901-1905) and 40 C.F.R. Part 1043.

equipment owned, leased, operated, or controlled by the federal reporting GIS owner and located in Massachusetts during the year, using the equation specified in 40 C.F.R. § 98.303.

The RW project can comply with more stringent requirements based on their equipment specifications and has proposed the following as BACT:

- A maximum annual leak rate not to exceed 0.5%, which is more stringent than the requirement contained in 310 CMR 7.72 (4)(a). See Section (4).

- The applicant has proposed operating a Sealed System with leak detection and alarms and to complete any leak detection repair within 5 days of discovery, which complies with the requirement contained in 310 CMR 7.72 (4)(a). See Section (4).

The permit applicant is not proposing air insulated switchgear and alternative gas insulation switchgear technology for Step 1 of the GHG top-down BACT analysis, and the underlying permit record supports this exclusion, because inclusion of such technology would frustrate the inherent business purposes of the project and constitute a redefinition of the source (i.e., use of SF_6 containing GIS configuration on the OSS').[41] The purpose of the RW project is to provide renewable energy within a specific timeframe, which provides the opportunity to displace fossil fuel powered energy, and which will assist states in New England with renewable portfolio standards and clean energy targets to address climate change. Revolution Wind has entered into three Power Purchase Agreements with Rhode Island and Connecticut for 704 MW of renewable energy generation capacity. Air insulated switchgear and alternative gas insulation switchgear technology was not available to the permit applicant during the initial project design and equipment acquisition processes, and use of such technology would require a redesign of the project and lead to a significant delay. For RW to be able to use alternative gas insulation switchgears in lieu of the traditional SF_6 gas insulated switchgear would require a full redesign of the OSS since dimensions, footprint, and weight for alternative gas insulated switchgear technology is indicated to be different than traditional SF_6 gas insulated switchgears,[42] which would result in a 19-month delay to the current anticipated start date for the project. Further delays in the anticipated start date would be expected if structural modifications would be necessary for the OSS topside structure, and if there are delays in the availability of specialized lifting vessels needed to incorporate air insulated switchgear and/or alternative gas insulation switchgear technology in the OSS.

[41] EPA has recognized that a Step 1 list of options need not necessarily include inherently lower polluting processes that would fundamentally redefine the nature of the source proposed by the permit applicant. However, any decision by an applicant to exclude an option because it may "redefine the source" must be explained and documented in the permit record. EPA states that "BACT should generally not be applied to regulate the applicant's purpose or objective for the proposed facility." (*See* PSD and Title V Permitting Guidance for Greenhouse Gases, EPA-457/B-11-001, March 2011).

[42] While a conventional air insulated switchgear requires several feet of air insultation to isolate a conductor, SF_6 gas insulation needs only inches, allowing SF_6 gas insulated equipment to fit into a much smaller space than air insulated equipment.

EPA has reviewed the administrative record and supplemental documentation with respect to how the applicant has framed the goal, objectives, purpose, and basic design for this proposed project. Based on the information submitted, EPA concludes that SF_6 gas insulated switchgear on the OSS is considered an essential design element and is necessary to achieve the goals of this specific RW project (delivering renewable power onshore within the committed timeline, which will offset fossil fuel powered generation).

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(2) Step 2: Eliminate Technically Infeasible Option(s)

Below is a summary of the reasons for eliminating from further consideration, or justification for not eliminating from further consideration, each of the air pollution control options listed above for Step 1 of the top down BACT analysis for this project. For more details, please refer to the permit application and support documents in the docket. In general, the EPA considers a technology technically feasible if: 1) it has been demonstrated and operated on the same type of source, or 2) it is "*available*" and "*applicable*." Therefore, technical feasibility for "demonstrated and operated" or "available and applicable" control technologies is included in the analysis for the different BACT options listed in Step 1 of the top-down BACT analysis.

EUG 1 - OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

Good combustion practices – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Purchase the Highest Tier Certified Engine under NSPS IIII – OCS Generator Engine(s) installed on the OSS and/or WTG that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 or EPA Nonroad Engine Standards at 40 C.F.R. Part 1039 are equipped with an integrated SCR, DPF, and/or DOC are considered a demonstrated and operated control technology because the Tier Certified emission standards consider the reduction in pollution from the integrated technologies in the design. Therefore, this potential air pollution control option is technically feasible.

As of the release of this fact sheet, Marine Tier 3 and Marine Tier 4 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for the marine sector. Therefore, the Marine Tier 3 (Category 3 Marine Engines) and Marine Tier 4 (Category 1 and 2 Marine Engines) NO_X, HC, CO, and PM emission standards[43] represent the most stringent level of emissions control required by 40 C.F.R. Part 1042. Similarly, the Tier 4 Nonroad Standards emission standards required by 40 C.F.R. Part 1039 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for the nonroad sector. Therefore, the Nonroad Tier 4 NO_X, HC, CO, and PM emission standards[44] represent the most stringent level of emissions control required by 40 C.F.R. Part 1039 as it has been demonstrated and operated and thus it is technically feasible.

[43] The Tier 3 and Tier 4 marine engine emission standards may be certified to NO_X, HC, or NO_X + HC.
[44] Depending on engine size, the Tier 4 nonroad engine emission limits may be certified to nonmethane hydrocarbon (NMHC) + NO_X, or NMHC and NO_X separately.

Retrofit a Tier 1, Tier 2, or Tier 3 Engine with Diesel Oxidation Catalyst and/or Diesel Particulate Filter – DOCs are flow-through aftertreatment devices containing a catalytic coating that oxidize CO, gaseous HCs, and liquid HCs, thus lowering PM and CO emissions from diesel fueled vehicles and equipment. Engine manufacturers have used DOCs in different in-use applications for many years, and DOCs are widely used as a retrofit technology because of their simplicity and limited maintenance requirements. DOCs have also been verified in combination with crankcase ventilation systems for additional emissions reduction. In general, exhaust temperature increases with engine power and can vary dramatically as engine power demands vary. A minimum exhaust temperature is required for the catalyst to operate effectively.[45] A DPF Level 3 reduces diesel particulate matter by 85 percent or greater.[46] In a DPF, a high temperature exhaust gas, a fuel burner, or an electric heater is used to increase the temperature of the filter so that collected PM can be oxidized. The exhaust gas must reach approximately 500 °C in a DPF. DPFs are verified for use with Ultra Low Sulfur Diesel fuel (ULSD). Fuel additives should not be used unless explicitly approved by the DPF manufacturer.

Permit No. R14-0038 as referenced in a footnote to *Table 11* above, appears to require a catalytic oxidation on EG-01 and a CO emission limit of 0.41 g/kW-hr, which is the BACT limitation. However, Specific Condition 5.1.1(g) states that, "[w]hen in operation other than startup or shutdown periods, the engine for EG-01 shall be a constant-speed engine", which is problematic for the engines proposed with the RW project since technical difficulties are assumed to exist when the engines are operated in variable conditions (and not just in steady state scenarios[47]). In addition, in a previous permit action EPA Region 4 (June 19, 2014) concluded that DOCs are not technically feasible for their specific marine internal combustion engine proposed with that project because the technology would have caused back pressure on the engines, which poses a safety hazard.

Since there may be significant variations from application to application, the actual operating conditions (duty cycle, exhaust temperature profiles, and engine backpressure) prior to retrofitting an engine are essential to ensure compatibility and ensure effective DPF and/or DOC operation. Specifically, with the operating conditions of nonroad and marine engines, more technical difficulties might arise when they are located at unmanned (remote) facilities. As a result, the retrofitted technology could be considered technically infeasible depending on the actual operating conditions which are engine specific and must be considered prior to retrofitting.[48]

Since RW does not yet know specifically which engines will be utilized for the project, EPA cannot deem the retrofit technology as technically infeasible altogether. Therefore, EPA proposes that retrofitting a Tier 1, Tier 2, or Tier 3 Engine with DOC or DPFs is available and applicable, and thus could be a technically feasible option for this project.

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[45] San Pedro Bay Ports Emissions Inventory Methodology Report | Version 3a (portoflosangeles.org)
[46] Verification Procedure: Stationary | California Air Resources Board
[47] RW has stated that the OCS Engine(s) on the OSS(s) are not intended to operate under constant steady state loads or temperatures for a sufficient time necessary for high catalyst performance.
[48] CARB has an active current verified technologies for diesel particulate filters for marine engines application.

EUG 2 - Marine Engines on Vessels when operating as OCS Source(s)

To a large extent, the "applicability" analysis of the potential BACT technologies for EUG 2 is identical to the EUG 1 "applicability" analysis in terms of the rational of applicable technologies since the operating conditions are presumed to be the similar. However, the "availability" analysis of potential BACT options for EUG 2 are constrained in such a way that it needed to be distinguished from the EUG 1 "applicability" analysis.

The EPA has specifically considered these facts for the following circumstances and has summarized and addressed the technical feasibility of all these options in Table 13 and the rest of the section below respectively.

- EUG 2 – Scenario 1 - Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known.

- EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown.[49]

- EUG 2 - Scenario 3 – Third-party-contracted U.S. or foreign-flagged vessels proposed with the project and otherwise regulated under MARPOL Annex VI, where the availability of the vessel type at the time of the application is unknown.

Table 13 - Summary of Technical Feasible Options for EUG 2 BACT

Control Technology	Technically Feasible (Y/N)
Option 1 - Good Combustion Practices	
EUG 2 – Scenario 1	**Y**
EUG 2 – Scenario 2	**Y**
EUG 2 – Scenario 3	**Y**
Option 2 - Highest Tier Certified Marine Engine at 40 C.F.R. Part 1042	
EUG 2 – Scenario 1	**Y**
EUG 2 – Scenario 2	**Y** [1]
EUG 2 – Scenario 3	N/A
Option 3 – Highest Tier Certified Marine Engine at MARPOL Annex VI Tier (US and/or Foreign – third party vessels)	
EUG 2 – Scenario 1	N/A
EUG 2 – Scenario 2	N/A
EUG 2 – Scenario 3	**Y** [2]
Option 4 – Retrofit a Tier 1, Tier 2, or Tier 3 Engine with DOC and/or DPF	

[49] Note that NO_2 is subject to BACT since the facility is in an NO_2 attainment area, while NO_X is subject to LAER as an ozone precursor since the facility is considered part of an ozone nonattainment area. As presented in Section VI.B, the LAER determination considers the CA SIP requirements for certain types of existing marine vessels to be retrofitted to meet, at a minimum, the EPA Tier 2 Marine Engine Standards at 40 C.F.R. Part 1042. Since LAER is regulating NO_X (and therefore includes N_2O and NO_2 by proxy) it is presumed to be the more stringent requirement for this scenario. For those units, the LAER (NO_X) requirements will supersede the BACT (NO_2) determination.

Control Technology	Technically Feasible (Y/N)
Scenario 1	N/A
Scenario 2	N
Scenario 3	N

N/A means that this control technology is not intended to be included an a BACT option within Step 1 for that operating scenario.

[1]Option 2 for Scenario 2 has constraints regarding vessel availability which must be a consideration for Option 2 for this option to not be excluded from BACT altogether.

[2] Option 3 for Scenario 3 has constraints regarding vessel availability which must be a consideration for Option 3 for this option to not be excluded from BACT altogether.

EUG 2 – Scenario 1 – Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known.

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Option 2 – Marine vessels that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 are equipped with an integrated SCR, DPF, and/or DOC. Furthermore, since the Tier Certified emission standards consider the reduction in pollution from the integrated technologies in the design, they are considered a demonstrated control technology. This option is technically feasible.

As of the release of this fact sheet, Marine Tier 3 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for Category 3 engines in the marine sector. Furthermore, RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, CO, and PM emission standards[50] which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown.[51]

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

[50] The Tier 3 and Tier 4 marine engine emission standards may be certified to NO_X, HC, or NO_X + HC.

[51] Note that NO_2 is subject to BACT since the facility is in an NO_2 attainment area, while NO_X is subject to LAER as an ozone precursor since the facility is considered part of an ozone nonattainment area. As presented in Section VI.B, the LAER determination considers the CA SIP requirements for certain types of existing marine vessels to be retrofitted to meet, at a minimum, the EPA Tier 2 Marine Engine Standards at 40 C.F.R. Part 1042. Since LAER is regulating NO_X (and therefore includes N_2O and NO_2 by proxy) it is presumed to be the more stringent requirement. For those units, the NO_X LAER requirements will supersede the NO_2 BACT determination.

Option 2 – Marine vessels that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 are assessed for technical feasibility in terms of applicability and availability. With certain considerations given for vessel availability, Option 2 for Scenario 2 is considered technically feasible.

Applicable

As of the release of this fact sheet, Marine Tier 3 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for Category 3 engines in the marine sector. Furthermore, RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, CO, and PM emission standards[46] which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042. Option 2 for Scenario 2 is applicable.

Available

This scenario prompted a separate analysis based on information from RW which indicates that there will be marine vessels used in the project owned by third parties. With this considered, the predictability of vessel availability is indicated to be a large constraint on construction and operations of the RW windfarm, which inherently limits the number of vessels capable of conducting the work available at the time needed. Limitations imposed by the Jones Act[52] are also a constraint. The fleet of vessels available that can perform the construction activity is limited due to the specific vessel requirements needed for performing the work. As described in the permit application, slowing down, delaying, or extending the project's schedule to wait for a higher tiered vessel's availability would have significant implications that could prevent the project from being built because many of the larger, more specialized, vessels are in limited supply.[53] Restricting the use of marine engines to only those which are certified to the highest applicable Tier Standards for Marine Engine is not a technically feasible option for the RW project since the "*availability*" of the highest Tier Engines via commercial channels is the limiting factor. However, EPA proposes to not eliminate the use of vessels with the highest

[52] Generally, the Jones Act is a U.S. law that requires vessels that ship merchandise and passengers between two U.S. points to be U.S. built and registered (flagged), as well as owned and crewed by U.S. citizens or residents. *See generally*, Charlie Papavizas, *Jones Act Considerations for the Development of Offshore Windfarms*, 20 BENEDICT'S MAR. BULL. [1] (First Quarter 2022) (available at https://www.winston.com/images/content/2/6/v2/262961/First-Quarter-2022-Benedict-s-Maritime-Bulletin-Papavizas.pdf). U.S.C. § 55102(b), part of the Merchant Marine Act of 1920, also known as the Jones Act, precludes a vessel from providing "any part of the transportation of merchandise by water, or by land and water, between points in the United States to which the coastwise laws apply, either directly or via a foreign port, unless the vessel —(1) is wholly owned by citizens of the United States for purposes of engaging in the coastwise trade; and (2) has been issued a certificate of documentation with a coastwise endorsement under chapter 121 or is exempt from documentation but would otherwise be eligible for such a certificate and endorsement." Also part of the Jones Act, U.S.C. § 55103(a) precludes a vessel from transporting passengers between ports or places in the United States to which the coastwise laws apply, either directly or via a foreign port, unless the vessel--(1) is wholly owned by citizens of the United States for purposes of engaging in the coastwise trade; and (2) has been issued a certificate of documentation with a coastwise endorsement under chapter 121 or is exempt from documentation but would otherwise be eligible for such a certificate and endorsement.

[53] *See https://www.energy.gov/sites/default/files/2022-08/offshore_wind_market_report_2022.pdf*.

tiered marine engines altogether particularly since the "*applicability*" of the NSPS technology-based federal standards apply to marine engines and therefore are technically viable options based on chemical, physical, and engineering principles.

In lieu of eliminating the use of the highest tier marine vessels altogether, EPA proposes conditions that consider the inherent limitation on the number of specialized vessels that are currently available to the offshore wind industry. The applicant has agreed to utilize Scenario 2 vessels that are certified to the highest applicable EPA Tier Marine Engine Standards (i.e., Tier 3 or 4, depending on engine size) at 40 C.F.R. Part 1042. In the case that a vessel certified to the highest applicable EPA Tier Marine Engine Standard (depending on engine size) is not available within two hours[54] of when the vessel must be deployed, the permittee will be allowed to utilize Marine Engines on Vessels certified to the next highest applicable EPA Tier Marine Engine Standards (e.g., Tier 3 or Tier 2). At a minimum, all engines within EUG 2 – Scenario 2 shall comply with emission limits equal to or more stringent than EPA Tier 1 marine engine emission standards.

It is important to note the distinction in BACT and LAER determination for certain vessel types in this scenario. Specifically, the LAER determination for EUG 2 – Scenario 2 is presumed to be the more stringent determination (thus resulting in the more stringent floor requirement) for this scenario due to NNSR regulating NOx (which thereby including N_2O and NO_2 by proxy) and LAER being able to consider the SIP limitations for similar class of sources and NNSR. This means that specific vessels shall at a minimum comply with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards. See *Section VI.B.2.b(5)*. Similarly, if the total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s), the permittee will be authorized to use the next lower Tier engine(s).[55] When determining the total emissions associated with the use of a vessel with a particular engine, the permittee will include the emissions of the vessel that would occur when the vessel would be in transit to the WDA from the vessel's starting location.

Option 4 – Retrofit a Tier 1, Tier 2, or Tier 3 Engine with DOC and/or DPF

While EPA acknowledges that procuring vessels to conduct the work on the project (short term) is ultimately the responsibility of the facility, it is not technically feasible for RW to require that third-party contractors replace or retrofit vessel engines to reduce emissions. The vessels that will be utilized during construction are not owned by RW and are anticipated to largely be owned by third-party entities. Requiring the replacement or retrofit of specific third-party vessel engines to meet the highest tier standards for a short-term construction project would prevent

[54] EPA understands that offshore wind developers hold contracts with several vessel supply companies that may have multiple vessels of various tier levels capable of performing certain tasks. The condition was developed to require the selection of the cleanest vessel available within contracted fleet. Note that the 2-hour requirement is not relative to the amount of time to travel to the WDA or conduct work on the WDA facilitybut rather to ensure construction isn't delayed if a cleaner vessel is available after 2 hours from the scheduled deployment time.

[55] For example, if the contracted fleet of vessels has a higher tiered vessel that is not located near the project (e.g., several hundred miles away), the permittee may compare the total emissions (tons) that would be emitted if a higher tiered vessel were to travel the longer distance to the project location verses the total emissions (tons) resulting from the use of a lower tiered vessel located and traveling a shorter distance to the project location.

RW from being able to substitute vessels on short notice due to schedule changes or other construction issues. Therefore, this option is not technically feasible.

EUG 2 – Scenario 3 – Third-party-contracted U,S, flagged or foreign-flagged vessels proposed with the project and regulated under MARPOL Annex VI, where the availability of the vessel type at the time of the application is unknown.

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. This option is technically feasible. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Option 3 –Marine vessels that are certified to the highest applicable MARPOL Annex VI Tier NO_x emission limits are assessed for technical feasibility in terms of applicability and availability. With certain considerations given for vessel availability, Option 3 for Scenario 3 is considered technically feasible.

Applicable

As of the release of this fact sheet, the International Maritime Organization's (IMO's) International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI Tier III NOx emission standards for marine vessel engines in Emission Control Areas are fully in effect, and U.S. EPA has not adopted more stringent certification standards. The Annex VI requirements apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. Vessels that operate only domestically are exempt from the NOx limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder. Foreign-flagged vessels are exempt from having to meet the marine standards within 40 C.F.R. Part 1042 and are required to meet the emission standards in 40 C.F.R. 1043.The nitrogen oxide (NO_x) emission standards for domestic Category 3 marine engines contained in 40 C.F.R. Part 1042.104 are nearly identical to the IMO's MARPOL Annex VI Tier I, II, and III NOx emission standards for marine vessel engines in Emission Control Areas (except for a slight variation in model years). Like the marine engine and nonroad engine emission standards, the Annex VI emission standards are structured as a tiered progression (Tiers 1 through 3), with each Tier of emission standards becoming increasingly stringent over time. Option 3 for Scenario 3 is applicable.

Available

This scenario prompted a separate analysis based on information from RW which indicates that there will be marine vessels used in the project owned by third parties which are U.S.-flagged ships and foreign-flagged ships operating in U.S. waters otherwise not subject to the requirements of NSPS IIII (i.e., marine requirements of 40 C.F.R. Part 1042). Therefore, the predictability of vessel availability is indicated to be a large constraint to construction and operations of the RW windfarm, which inherently limits the number of vessels capable of

conducting the work available at the time needed. Limitations imposed by the Jones Act[56] are also a constraint. The fleet of vessels available that can perform the construction activity is limited due to the specific vessel requirements needed for performing the work. As described in the permit application, slowing down, delaying, or extending the project's schedule to wait for a higher tiered vessel's availability would have significant implications that could prevent the project from being built because many of the larger, more specialized, vessels are in limited supply.[57]

Restricting the use of marine engines to only those which are certified to the highest applicable Tier Standards for Marine Engine is not a technically feasible option for the RW project. EPA has concluded that the "*availability*" of the options via commercial channels is the limiting factor. EPA acknowledges the "*applicability*" of the add on control technologies[58] when applied to marine engines as technically viable options based on chemical, physical, and engineering principles. Therefore, it is proposed that the project will not eliminate the use of vessels with the highest tiered marine engines, however the use of the next lowest tiered vessel should be allowed in instances where a higher tiered vessel is not available at the time of deployment.

In lieu of eliminating the use of the highest tier marine vessels altogether, EPA proposes conditions that consider the inherent limitation on the number of specialized vessels that are currently available to the offshore wind industry. The applicant has agreed to utilize Scenario 3 vessels that are certified to the highest applicable Annex VI Engine Standards (i.e., Tier III). In the case that a vessel certified to the highest applicable Annex VI Engine Standards (i.e., Tier III) is not available within two hours of when the vessel must be deployed, the permittee will be authorized to utilize Marine Engines on Vessels certified to the next highest applicable Annex VI Engine Standards (i.e., Tier II or I). Similarly, if the total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s), the permittee will be authorized to use the next lower Tier engine(s). When determining the total emissions associated with the use of a vessel with a particular engine, the permittee will include the emissions of the vessel that would occur when the vessel would be in transit to the WDA from the vessel's starting location. With these considerations, Option 3 for Scenario 3 is considered available.

EUG 3 - Medium Voltage and High Voltage Gas Insulated Switchgears on the OSS – All options proposed, listed below, in Step 1 for the MV and HV GIS are technically feasible.

A maximum annual leak rate not to exceed 0.5%, which is more stringent than the requirement contained in 310 CMR 7.72 (4)(a). See Section (4).

The applicant has proposed operating a Sealed System with leak detection and alarms and to complete any leak detection repair within 5 days of discovery, which complies with the requirement contained in 310 CMR 7.72 (4)(a). See Section (4).

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[56] *Supra* note 52.

[57] *See* https://www.energy.gov/sites/default/files/2022-08/offshore_wind_market_report_2022.pdf.

[58] EPA acknowledges marine engines have their own constraints (i.e., operating in a harsher environment, variable loads, temperature fluxes etc…) when compared to typically stationary engine.

(3) Step 3 – Rank Control Technologies by Control Effectiveness (each engine described in Table 8 and controls for each listed below)

EUG 1 - OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

GCOP and engines certified to the highest applicable EPA Tier Marine Engine[59] at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine[60] at 40 C.F.R. Part 1039 contain the most stringent emission limitations in the ranking (Step 3) for EUG 1.

Carbon Monoxide (CO)

Offshore Engines (RW-3, RW-4, RW-5, RW-6, RW-7, RW-8, RW-9, RW-10, RW-11, RW-14, RW-15, RW-16, RW-17, RW-18, RW-19)

- The Tier 4 emission standards for C1 engines are only applicable to emission units with a maximumRW-3 power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. For C1 engines, the Tier 3 CO emission standard of 5.00 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between $19 \leq kW < 37$, the CO emission standard (Tier 4) of 5.5 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $37 \leq kW < 56$, the CO emission standard (Tier 4) of 5.00 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $75 \leq kW < 130$, the CO emission standard (Tier 4) of 5.00 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $130 \leq kW < 225$, the CO emission standard (Tier 4) of 3.50 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Offshore Engines (RW-1, RW-2, RW-12, RW-13)

[59] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase.
[60] Per 40 C.F.R. Part 1039, the U.S. EPA nonroad compression ignition (CI) engines have emissions standards (Tier 1, 2, 3, and 4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase.

- The Tier 4 emission standards for C2 engines are only applicable to units with a maximum power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in Table 8Table 8 , to have a maximum power rating greater than or equal to 600 kW. Therefore, for C2 engines, the Tier 3 CO emission standard of 5.00 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 560 ≤ kW < 900, the CO emission standard (Tier 4) of 3.50 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Nitrogen Dioxide (NO_2)

Offshore Engines (RW-3, RW-4, RW-5, RW-6, RW-7, RW-8, RW-9, RW-10, RW-11, RW-14, RW-15, RW-16, RW-17, RW-18, RW-19)

- The HC + NO_x emission standard for C1 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. The Tier 4 emission standards for C1 engines are only applicable to emission units with a maximum power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. Therefore, for C1 engines, the Tier 3 HC + NO_x emission standard range of 5.4–5.8(g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 19 ≤ kW < 37, the NMHC + NO_x emission standard (Tier 4) of 4.7 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 37 ≤ kW < 56, the NMHC + NO_x emission standard of 4.7 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 75 ≤ kW < 130, the NO_x emission standard (Tier 4) of 0.40 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 130 ≤ kW < 225, the NO_x emission standard (Tier 4) of 0.40 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Offshore Engines (RW-1, RW-2, RW-12, RW-13)

- The HC + NO_x emission standard for C1 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. The Tier 4 emission standards for C1 engines are only applicable to emission units with a max power rating greater than or equal to 600 kW.

The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. Therefore, for C1 engines, the Tier 3 HC + NO_x emission standard range of 5.4–5.8(g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 560 ≤ kW < 900, the NO_x emission standard (Tier 4) of 3.5 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Particulate Matter (PM)

Offshore Engines (RW-3, RW-4, RW-5, RW-6, RW-7, RW-8, RW-9, RW-10, RW-11, RW-14, RW-15, RW-16, RW-17, RW-18, RW-19)

- The PM emission standard for C1 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. The Tier 4 emission standards for C1 engines are only applicable to emission units with a maximum power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. Therefore, for C1 engines, the Tier 3 PM emission standard range of 0.10–0.40 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 19 ≤ kW < 37, the PM emission standard (Tier 4) of 0.03 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 37 ≤ kW < 56, the PM emission standard (Tier 4) of 0.03 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 75 ≤ kW < 130, the PM emission standard (Tier 4) of 0.02 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between 130 ≤ kW < 225, the PM emission standard (Tier 4) of 0.02 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Offshore Engines (RW-1, RW-2, RW-12, RW-13)

- The Tier 4 emission standards for C2 engines are only applicable to units with a maximum power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in *Table 8* , to have a maximum power rating greater than or equal to 600 kW. The PM emission standard for C2 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. Therefore, for C2 engines, the Tier 3 PM emission

standard range of 0.14–0.27 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 560 ≤ kW < 900, the PM emission standard (Tier 4) of 0.04 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

A good combustion practices plan (GCOP) is selected for all units in EUG 1. Therefore, it is not represented below. The facility will be required to incorporate the GCOP into the facility standard operating procedures (SOPs) and shall make the GCOP available for inspection. The plan should include, but not be limited to i.) A list of combustion optimization practices and a means of verifying the practices have occurred; ii.) A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred; and iii.) A list of the design choices determined to be BACT and verification that designs were implemented in the final construction.

EUG 2 - Marine Engines on Vessels Operating when operating as OCS Source(s)

The EPA has addressed Step 3 in detail below for the following EUG 2 operating scenarios:

- EUG 2 – Scenario 1 - Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known.

- EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown.[61]

EUG 2 - Scenario 3 – Third-party-contracted U,S, flagged or foreign-flagged vessels proposed with the project and regulated under MARPOL Annex VI, where the availability of the vessel type at the time of the application is unknown.

EUG 2 – Scenario 1

GCOP and Marine Engines on the Charybdis Vessel certified to the highest applicable EPA Tier Marine Engine Standards [62] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 1.

[61] Note that NO_2 is subject to BACT since the facility is in an NO_2 attainment area, while NO_X is subject to LAER as an ozone precursor since the facility is considered part of an ozone nonattainment area. As presented in Section VI.B, the LAER determination considers the California SIP requirements for certain types of existing marine vessels to be retrofitted to meet, at a minimum, the EPA Tier 2 Marine Engine Standards at 40 C.F.R. Part 1042. Since LAER is regulating NO_X (and therefore includes N_2O and NO_2 by proxy) it is presumed to be the more stringent requirement. For those units, the LAER (NO_X) requirements will supersede the BACT (NO_2) determination.

[62] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

- RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3 NO_x emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

GCOP and Marine Engines on the Eco Edison Vessel certified to the highest applicable EPA Tier Marine Engine Standards [63] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 1.

If considered a Category 3 Marine Engines:

- EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, and CO, emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3 NO_x emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

[63] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

If considered a Category 2 Marine Engines:

- EPA-Certified to meet the Marine Tier 4 (Category 2 Marine Engines) NOx, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C2 engines (Tier 4) the Tier 4 NO_x emission standard range of 1.8 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 HC emission standard of 0.19 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 PM emission standard of 0.04 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

GCOP and Marine Engines on the Primary Crew Transfer Vessel certified to the highest applicable EPA Tier Marine Engine Standards [64] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 1.

If considered a Category 3 Marine Engines:

- EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, and CO, emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3 NO_x emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

[64] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

If considered a Category 2 Marine Engines:

- EPA-Certified to meet the Marine Tier 4 (Category 2 Marine Engines) NOx, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C2 engines (Tier 4) the Tier 4 NO_x emission standard range of 1.8 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 HC emission standard of 0.19 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 PM emission standard of 0.04 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

EUG 2 – Scenario 2

GCOP and engines certified to the highest applicable EPA Tier Marine Engine[58] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 2. Note that for certain applicable units, the LAER (NO_x) requirements will supersede the BACT (NO_2) determination. *See Section VI.B.2.*

EUG 2 – Scenario 3

As of the release of this fact sheet, the IMO's MARPOL Annex VI Tier III NOx emission standards for marine vessel engines in Emission Control Areas are fully in effect and MARPOL has not adopted more stringent certification standards**.** In the United States, MARPOL Annex VI is implemented through the Act to Prevent Pollution from Ships (33 U.S.C. §§ 1901–1905) and 40 C.F.R. Part 1043. The Annex VI requirements apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. However, vessels that operate only domestically are exempt from the NOx limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder.

Table 14 Annex VI NO_X Emission Standards (g/kW-hr) 40 C.F.R. 1043.60

Tier	Area of applicability	Implementation date[a]	Maximum in-use engine speed		
			Less than 130 RPM	130-2000 RPM[b]	Over 2000 RPM
Tier I	All U.S. navigable waters and EEZ	January 1, 2004-December 31, 2010	17.0	$45.0 \cdot n^{(-0.20)}$	9.8

Tier	Area of applicability	Implementation date[a]	Maximum in-use engine speed		
			Less than 130 RPM	130-2000 RPM[b]	Over 2000 RPM
Tier II	All U.S. navigable waters and EEZ	January 1, 2011-December 31, 2015	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier II	All U.S. navigable waters and EEZ, excluding ECA and ECA associated areas	January 1, 2016 and later	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier III	ECA and ECA associated areas	January 1, 2016 and later [c]	3.4	$9.0 \cdot n^{(-0.20)}$	2.0

[a] Standards apply for engines installed on vessels with a build date in the specified time frame, or for engines that undergo a major conversion in the specified time frame.

[b] Applicable standards are calculated from n (maximum in-use engine speed, in RPM, as specified in § 1042.140). Round the standards to one decimal place.

[c] In the case of recreational vessels of less than 500 gross tonnage with length at or above 24 meters, the Tier III standards start to apply January 1, 2021.

A good combustion practices plan (GCOP) is selected for all units in EUG 2. Therefore, it is not represented below. The facility will be required to incorporate the GCOP into the facility standard operating procedures (SOPs) and shall make the GCOP available for inspection. The plan should include, but not be limited to i.) A list of combustion optimization practices and a means of verifying the practices have occurred; ii.) A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred; and iii.) A list of the design choices determined to be BACT and verification that designs were implemented in the final construction.

EUG 3—Medium Voltage, and High Voltage Gas Insulated Switchgears on the OSS

- A maximum annual leak rate not to exceed 0.5%. *See* Section (4).
- A Sealed System with leak detection and alarms and to complete leak detection repair within 5 days of discovery. *See* Section (4).

(4) Step 4 – Evaluate most effective controls and document results

RW has accepted the highest ranked control technology in Step 3, and therefore lower air pollutant emitting technology, as BACT for each EUG in this permit application. Therefore, economic feasibility issues were not considered in the determination of BACT for this permit action.

(5) Step 5 – Select BACT

Based on the preceding analysis, the following combination is proposed as BACT for the emissions from the compression ignition internal combustion engines in the project.

EUG 1 - OCS Generator Engine(s) on the OSS(s) and WTG(s)

OCS Generator Engine(s) installed on the OSS(s) and WTG(s) certified to the highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine at 40 C.F.R. Part 1039.

OCS Generator Engine(s) on the OSS(s) and WTG(s) shall be operated in accordance with the GCOP Plan for the facility. The plan shall be incorporated into the facility SOPs and shall be made available for inspection. The plan specifically should include, but is not limited to: i.) a list of combustion optimization practices and a means of verifying the practices have occurred for each engine type based on the most recent manufacturers' specifications issued for the engines at the time that they are certified (and any updates from the manufacturer should be noted and amended in the plan); ii.) a list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred (if applicable); and iii.) a list of the design choices determined to be LAER/BACT and verification that designs were implemented in the final construction.

EUG 2 - Marine Engines on Vessels Operating when operating as OCS Source(s)

The following requirements apply to all Marine Engines on Vessels Operating when operating as OCS Source(s). This includes any applicable propulsion and auxiliary generator engines utilized in the construction and operation phases of the project when they meet the definition of an OCS source. Specifically, where a propulsion engine would be used to supply power for purposes of performing a given stationary source function, i.e., for example to lift, support, and orient the components of each WTG during installation.

EUG 2 – All Scenarios

Marine Engines on Vessels when Operating as OCS Source(s) shall be operated in accordance with the GCOP Plan for the facility. The plan shall be incorporated into the facility SOPs and shall be made available for inspection. The plan specifically should include, but is not limited to: i.) a list of combustion optimization practices and a means of verifying the practices have occurred for each engine type based on the most recent manufacturers' specifications issued for the engines at the time that they are certified (and any updates from the manufacturer should be noted and amended in the plan); ii.) a list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred (if applicable); and iii.) a list of the design choices determined to be LAER/BACT and verification that designs were implemented in the final construction.

EUG 2 – Scenario 1

GCOP and Marine Engines on the Charybdis Vessel (Jack-up Installation Vessel), while operating as an OCS source, shall be EPA certified to the meet the Marine Tier 3 (Category 3 Marine Engines) emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

GCOP and Marine Engines on the Eco Edison Vessel, while operating as an OCS source, which is indicated to be used as a Service Operation Vessel, shall be EPA certified to the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, and CO emission standards or Marine Tier 4 (Category 2 Marine Engines) NO_X, HC, and CO emission standards specified within 40 C.F.R. Part 1042. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

GCOP and Marine Engines on the Primary Crew Transfer Vessel, while operating as an OCS source, shall be EPA certified to the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, and CO emission standards or Marine Tier 4 (Category 2 Marine Engines) NO_X, HC, and CO emission standards specified within 40 C.F.R. Part 1042. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

EUG 2 – Scenario 2

All applicable engines on U.S.-flagged vessels when operating as OCS source(s), and otherwise not subject to scenario 1 or 3, shall be certified to the highest applicable EPA Tier Marine Engine Standards (i.e., Tier 3 or 4, depending on engine size) as contained within 40 C.F.R. Part 1042, except if one of the conditions in subparagraph a. or b., below, is met, in which case the Permittee may use the next lower Tier engine (i.e., Tier 3). Similarly, if one of the conditions in (a.) or (b.), below, is met regarding the use of a Tier 4 engine, the Permittee may use a Tier 3 engine in lieu of a Tier 4 engine. If one of the conditions in Section IV(C)(iv)(a.) or (b.) is met regarding the use of a Tier 3 engine, the Permittee may use a Tier 2 engine in lieu of a Tier 3 engine. If one of the conditions in (a.) or (b.) is met regarding the use of a Tier 2 engine, the Permittee may use a Tier 1 engine in lieu of a Tier 2 engine. To use a lesser Tier engine, as described above, Permittee shall ensure one of the following conditions is met:

a) A vessel with a higher Tier engine is not available within two hours of when the vessel must be deployed; or

b) The total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s). 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 WDA from the vessel's starting location.

At a minimum, all applicable engines subject to this condition shall comply with emission standards (in terms of g/kW-hr) equal to or cleaner than EPA Tier 1 marine engine emission standards contained within 40 C.F.R. Part 1042.

EUG 2 – Scenario 3

All applicable engines on U.S.-flagged or foreign-flagged vessels while those vessels are operating as an OCS source within the ECA (and otherwise not subject to Scenario 2 or 3 shall be certified to meet or emit less than the MARPOL Annex VI Tier III NO_X emission standards (in terms of g/kW-hr), except if one of the conditions in (a.) or (b.) below, is met, in which case the Permittee may use the next lower Tier engine (i.e., Tier II). Similarly, if one of the conditions in (a.) or (b.), below, is met regarding the use of a Tier II engine, the Permittee may use a Tier I engine in lieu of a Tier II engine. To use a lesser Tier engine, as described above, Permittee shall ensure one of the following conditions is met:

a) A vessel with a higher Tier is not available within two hours of when the vessel must be deployed; or

b) The total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s). 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 WDA from the vessel's starting location.

At a minimum, all applicable engines subject to this condition shall comply with emission standards (in terms of g/kW-hr) equal to or cleaner than MARPOL Annex VI Tier I NO_X emission standards contained within 40 C.F.R. Part 1043.

EUG 3—Medium (MV), and High Voltage (HV) Gas Insulated Switchgears (GIS) on the OSS

The BACT requirements for the MV and HV GIS will consist of a Sealed System with leak detection and alarms, leak detection repair within 5 days of discovery, and a maximum annual leak rate not to exceed 0.5%

D. Ambient Air Impact Analysis

The regulations at 40 C.F.R. Part 51, Appendix W (*Guideline on Air Quality Models* or the "*Guideline*) provide the requirements for analyses of ambient air quality impacts. The *Guideline* specifies EPA's preferred models and other techniques, as well as guidance for their use in regulatory application in estimating ambient concentrations of air pollutants. The analyses of ambient air impacts described in this section were conducted in accordance with the *Guideline*.

The ambient air impact analysis for the project was conducted to account for two periods: the construction phase and the operational phase. The construction phase emissions account for the highest annual emissions from the source, and the analysis of ambient air impacts due to

construction are described in the first section below. Operational phase emissions for the source are considerably lower than construction period emissions for the source on an annual basis, and the analysis of ambient air impacts for the source during the operational phase are described in the second section below. The modeled emissions rely on a conservative estimate of emissions associated with the source. Even though RW construction vessels will transit between the work area and several different ports, transiting emissions were conservatively based on all vessel transits originating from Rhode Island, which represents the ports closest to Lye Brook Wilderness Area, the closest Class I area to the project. Therefore, ambient air impacts from the source will be no worse than those shown in this ambient air impact analysis. Table 15 provides the applicable National Ambient Air Quality Standard (NAAQS"), PSD increment, and significant impact levels (SILs"), which were used in determining air quality impacts from the project.

Table 15 NAAQS, PSD Increments, and Significant Impacts Level

Pollutant	Averaging Time	NAAQS (1)		PSD (2) Class II Increment	Class II SIL	PSD (2) Class I Increment	Class I SIL
		Primary	Secondary				
CO	1-hr	35 ppm	--	--	2,000	--	--
	8-hr	9 ppm	--	--	500	--	--
$PM_{2.5}$	Annual	12.0 ug/m^3	15.0 ug/m^3	4	0.2 (3)	1	0.05 (3)
	24-hr	35 ug/ m^3	35 ug/ m^3	9	1.2 (3)	2	0.27 (3)
PM_{10}	Annual	--	--	17	1 (5)	4	0.2 (4)
	24-hr	150 ug/ m^3	150 ug/ m^3	30	5 (5)	8	0.3 (4)
NO_2	Annual	53 ppb	53 ppb	25	1 (5)	2.5	0.1 (4)
	1-hr	100 ppb	--	--	7.5 (6)	--	--

(1) *See* 310 CMR 6.04: Standards

(2) *See* 40 C.F.R. 52.21(c)

(3) EPA's April 17, 2018 Guidance and associated legal memorandum and technical support documents, included as part of the permit record.

(4) Values proposed by the applicant. These values are consistent with values proposed by EPA. *See* 61 Fed. Reg. 38250, "Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR)."

(5) See 40 C.F.R. § 51.165(b)(2)

(6) EPA, June 29, 2010, "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program." The interim SIL value of 4 ppb (or 7.5 µg/m^3) was used

1. Construction Phase

The PSD permitting regulations for proposed major new sources generally require applicants to perform an air quality impact analysis for those pollutants emitted in significant quantities. For temporary emission sources subject to the PSD permitting requirements, the PSD regulations at 40 C.F.R. § 52.21(i)(3) require an assessment of the ambient air impact for Class I areas and areas where the applicable PSD increment is known to be violated. An assessment of the construction emissions was provided by the applicant in a September 2022 report "Air Quality Impact Modeling Report – Construction Class I SIL and Visibility," to correspond with the Revolution Wind OCS Air Permit Application submitted to EPA on August 12, 2022. The

September 2022 report was supplemented by a memorandum provided by the applicant entitled "Supplemental Information for Temporary Sources" on February 28, 2023.

The following sections provide the information EPA considered in determining the appropriate ambient air impacts analysis requirements to which the source is subject for the construction period, and whether those requirements have been satisfied. Specifically, the sections below describe, for the construction period: 1) the qualification as temporary; 2) the assessment of ambient air impacts at areas where PSD increment is known to be violated; 3) the assessment of ambient air impacts at Class I areas; 4) results of the assessment for the source; and 5) EPA's overall conclusion about the ambient air impacts during the construction phase for the source.

a. Qualification as a Temporary Source

The subject emissions associated with the construction of the source are anticipated to last no longer than a period of two years. The EPA considers construction sources operating for two years to be temporary sources for PSD permitting purposes, however a longer period could be considered at the Administrator's discretion. *See* Amended Regulations for Prevention of Significant Deterioration of Air Quality, 45 Fed. Reg. 52676, 52719, 52728 (Aug. 7, 1980). Since the construction emissions for the source are anticipated to last no longer than two years, the construction emissions are considered temporary.

b. Assessment of Ambient Air Impacts at Areas Where PSD Increment Is Known to be Violated

The impact-related criteria that must be met for a temporary source under 40 C.F.R. § 52.21(i)(3) require that emissions must not impact any area where the applicable increment is known to be violated. The proposed wind farm will be located approximately 7.5 nautical miles south of the Nomans Land Island National Wildlife Refuge, Massachusetts. Based on consultation between Revolution Wind, the Commonwealth of Massachusetts, and EPA, there are no areas in the vicinity of the proposed project where an applicable PSD increment is known to be violated. Therefore, because of the absence of areas known to be in violation of the PSD increment in the vicinity of the source, EPA concludes that construction emissions for the source will not impact any such area where applicable PSD increment is known to be violated.

c. Assessment of Ambient Air Impacts at Class I Areas

The impact-related criteria that must be met for a temporary source under 40 C.F.R. § 52.21(i)(3) require that the emissions must not impact any Class I area. Class I areas are defined in 40 C.F.R. § 52.21(e). The Class I areas closest to the construction area are the Lye Brook Wilderness Area, located in southwestern Vermont (within the Green Mountain National Forest), 252 km from the WDA and the Brigantine Wilderness Area, located in Southeastern New Jersey (within the Edwin B. Forsythe National Wildlife Refuge), 310 km from the WDA. These distances were provided by the applicant. A map of the location of these Class I areas with respect to the windfarm is presented in Figure 3.

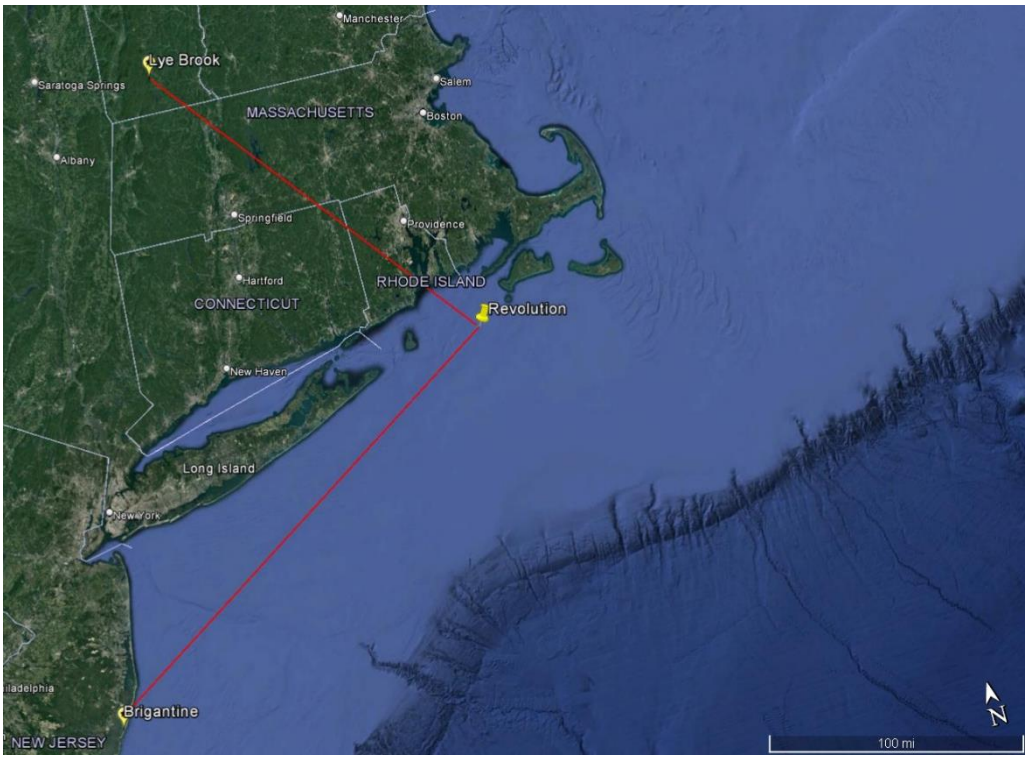

Figure 3 Distances Between the Revolution Wind Area and Closest Class I Areas

For those pollutants for which Class I PSD SILs have been established, RW has compared the modeled impacts at Class I areas with Class I PSD SILs to assess whether ambient air quality will be significantly affected. The *Guideline* specifies a two-tier screening approach for long-range transport assessments. The first-tier approach, described in section 4.2.c.i of the *Guideline*, is an assessment of near-field impacts at or within 50 km of the source. The second-tier approach, described in section 4.2.c.ii of the *Guideline*, sets forth a case-specific assessment in consultation with the EPA Regional Office. RW used a second-tier approach to assess the impacts of NO_x, $PM_{2.5}$, and PM_{10} construction emissions at the Lye Brook Wilderness Area which is the Class I area closest to the proposed location of the RW facility. To assess the impacts from these pollutants at the Lye Brook Wilderness Area, RW selected the CALPUFF model (version 5.8.5) consistent with Section 4.2.c.ii of the *Guideline.* The CALPUFF model was applied with no chemistry or deposition consistent with Section 4.2.c.ii of the *Guideline*. RW prepared representative meteorological data for use with the CALPUFF model based on prognostic meteorological data provided by EPA. The meteorological data were extracted from the Weather Research and Forecasting (WRF) prognostic model for the three-year period of 2018–2020 using the Mesoscale Model Interface Program (MMIF", version 3.4.2) and a horizontal grid resolution of 12 km. RW provided an evaluation[65] to demonstrate the suitability of the prognostic meteorological data for this purpose. The EPA's assessment of the RW evaluation of the WRF simulation is that it provides a sufficient basis for use in a screening analysis with CALPUFF for estimating PM_{10}, $PM_{2.5}$, and NO_2 impacts from the project at distant Class I areas. The CALPUFF modeling utilized 103 receptors located in the Lye Brook Wilderness Area. These receptors were provided by the National Park Service.

[65] The evaluation is provided as Appendix C to the September 8, 2022, Air Quality Impact Modeling Report-Construction Class I SIL and Visibility, available as part of the administrative record for the draft permit.

d. Assessment of NO_2 Impacts at Class I Areas

Consistent with section 4.2.c.ii of the *Guideline*, RW assessed the significance of ambient impacts for NO_2 at the Lye Brook Wilderness Area using a second-tier analysis. Even though RW construction vessels will transit between the work area and several different ports, transiting emissions were conservatively based on all vessel transits originating from Rhode Island, which represents the ports closest to Lye Brook. Also, the modeling assumes that all construction phase vessel and equipment activity will occur in the same year. RW assumed 100% conversion of NO_x to NO_2. Assessment of NO_2 by the CALPUFF model demonstrated impacts below the Class I significance level at the Lye Brook Wilderness Area. EPA has evaluated RW's approach for assessing NO_2 impacts and believes it is suitable to identify those impacts resulting from the source in the Class I area. Comparison of construction period impacts for the source to the respective SILs are presented in Table 16.

e. Assessment of $PM_{2.5}$ Impacts at Class I Areas

To determine the total impact on $PM_{2.5}$ concentrations from the facility at the Lye Brook Wilderness Area, RW summed the impact of direct $PM_{2.5}$ emissions with the impact of $PM_{2.5}$ precursor emissions on the secondary component of $PM_{2.5}$ concentrations. The total $PM_{2.5}$ concentration, consisting of the direct and secondary components of $PM_{2.5}$ impacts, was then compared to the $PM_{2.5}$ SILs. Consistent with section 4.2.c.ii of the *Guideline*, RW assessed the impacts of direct $PM_{2.5}$ emissions at the Lye Brook Wilderness Area using a second-tier analysis. Transiting emissions were based on Rhode Island ports which are closest to Lye Brook. The short-term modeling assumes that all construction phase vessel and equipment activity will occur within the same 24 hours. Also, the long-term modeling assumes that all construction phase vessel and equipment activity will occur in the same year. For assessment of the secondary component of $PM_{2.5}$ impacts resulting from the $PM_{2.5}$ precursor emissions from the facility, RW used a Tier 1 demonstration tool based on existing technically credible and appropriate relationships between emissions and impacts developed from previous modeling, as described in section 5.2(e) of the *Guideline*. Additional details on the approach used by RW to assess the direct and secondary component of $PM_{2.5}$ impacts are provided in the following paragraphs.

As explained in its April 17, 2018, memorandum, "Guidance on Significant Impact Levels (SIL) for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program" (EPA's April 17, 2018, Guidance), the EPA has recognized that permitting authorities have the discretion to apply SILs on a case-by-case basis in the review of individual permit applications. In 2010, the EPA finalized a rule to codify, among other things, particular $PM_{2.5}$ SIL values and specific applications of those values. In litigation over that rule, the EPA conceded the regulation was flawed because it did not preserve the discretion of permitting authorities to require additional analysis in certain circumstances. The court granted the EPA's request to vacate and remand the rule so that the EPA could address the flaw. *See Sierra Club v. EPA*, 705 F.3d 458 (D.C. Cir. 2013). The EPA subsequently addressed the use of SILs in the EPA's April 17, 2018, Guidance. For the purposes of this permitting action, the EPA is using $PM_{2.5}$ SILs as a compliance demonstration tool based on the technical and legal bases accompanying its April 17, 2018, Guidance. These documents (i.e., the SILs memorandum, technical analysis, and legal

memorandum) are provided in the administrative record associated with the draft permit.[66] The use of the $PM_{2.5}$ SIL as an indication of a significant impact on a Class I area was not the basis for the court's $PM_{2.5}$ SIL vacatur. Given this fact, the previous use of the $PM_{2.5}$ SILs as a significant impact indicator, and the lack of any other objective concentration metric, its use as a concentration considered small enough to qualify for the temporary source exemption (i.e., no impact to Class I areas) appears appropriate.

To assess the impact of direct $PM_{2.5}$ emissions at the Lye Brook Wilderness Area, RW selected the CALPUFF model (version 5.8.5) consistent with Section 4.2.c.ii of the *Guideline.* Consistent with Section 4.2.c.ii of the *Guideline*, CALPUFF was applied with no chemistry or deposition. The CALPUFF modeling utilized 103 receptors located in the Lye Brook Wilderness Area. These receptors were provided by the National Park Service.

For secondary $PM_{2.5}$ impacts, RW used a Tier 1 demonstration tool based on existing technically credible and appropriate relationships between emissions and impacts developed from previous modeling, as described in sections 5.2(e) and 5.4.2(b) of the *Guideline*. RW's approach for assessing secondary $PM_{2.5}$ impacts is consistent with EPA's April 30, 2019, "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program" (EPA's April 30, 2019, Guidance). In assessing secondary impacts for $PM_{2.5}$, RW relied on information provided by the EPA related to the EPA modeling of the secondary formation of $PM_{2.5}$ constituents due to precursor emissions for hypothetical NO_x and SO_2 sources. Information about the EPA hypothetical source modeling is provided in the EPA's April 30, 2019, Guidance. To identify atmospheric chemistry that is suitably representative of the area around the WDA, RW evaluated modeled secondary $PM_{2.5}$ impacts from the 15 hypothetical sources located in the Northeast Climate Zone.[67] From the 15 hypothetical sources, RW identified the highest annual and 24-hour nitrate and sulfate impact levels at a distance similar to the distance the project is from the Lye Brook Wilderness Area (252 km). By selecting the highest impacts from these 15 hypothetical sources at or near a distance of 252 km, the derived value is suitably conservative (i.e., likely to overestimate impacts) for use in this screening assessment. Then, RW scaled the hypothetical source impacts based on the ratio of the emissions to the EPA's hypothetical source modeling emissions (i.e., 3,000 tpy) to derive an expected secondary impact for nitrate and sulfate constituents for the 24-hour and annual averaging periods. The sum of these nitrate and sulfate impacts is the total secondary $PM_{2.5}$ impact when using this approach.

The sum of the direct $PM_{2.5}$ impacts predicted by the CALPUFF model and the secondary $PM_{2.5}$ impacts from the Tier I analysis demonstrated total impacts below the $PM_{2.5}$ significance levels at the Lye Brook Wilderness Area. EPA has evaluated RW's approach for assessing $PM_{2.5}$ impacts and believes it is suitable to identify those impacts resulting from the source in the Class I area. Comparison of construction period impacts for the source to the respective SILs are presented in Table 177.

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[66] The SILs memorandum, technical analysis, and legal memorandum can be found within the docket for this permit action.

[67] Figure 3-4 of EPA's April 30, 2019, "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program" (EPA's April 30, 2019 Guidance).

f. Assessment of PM_{10} Impacts at Class I Areas

Consistent with section 4.2.c.ii of the *Guideline*, RW assessed the impacts of PM_{10} emissions at the Lye Brook Wilderness Area using a second-tier analysis. Transiting emissions were based on Rhode Island ports which are closest to the Lye Brook Wilderness Area. The short-term modeling assumes that all construction phase vessel and equipment activity will occur within the same 24 hours. Also, the long-term modeling assumes that all construction phase vessel and equipment activity will occur in the same year. Assessment of PM_{10} by the CALPUFF model demonstrated impacts below the significance levels at the Lye Brook Wilderness Area. EPA has evaluated RW's approach for assessing PM_{10} impacts and believes it is suitable to identify those impacts resulting from the source in the Class I area. Comparison of construction period impacts for the source to the respective SILs are presented in Table 16.

(1) Ambient Air Impacts for the Construction Phase

Consistent with section 4.2.c.ii of the *Guideline*, RW assessed the significance of ambient impacts for NO_2, $PM_{2.5}$, and PM_{10} at the Lye Brook Wilderness Area using a second-tier analysis. RW assessed the impacts of direct $PM_{2.5}$ emissions at the Lye Brook Wilderness Area using the CALPUFF model. To assess secondary $PM_{2.5}$ impacts, RW used a Tier 1 demonstration tool based on existing technically credible and appropriate relationships between emissions and impacts developed from previous modeling, as described in section 5.2(e) of the *Guideline*. The total $PM_{2.5}$ concentration, consisting of the direct and secondary component of $PM_{2.5}$ impacts, was then compared to the appropriate SIL.

The total ambient air impacts for pollutants emitted from construction of the source discussed in this section are presented in Table 16. below. Concentrations in air are given in micrograms per cubic meter ($\mu g/m^3$). Impacts for each pollutant and associated averaging time for which Class I area SILs have been established are shown to be below significance levels at the Lye Brook Wilderness Area.

Table 16 Assessment of Construction Period Ambient Air Impact for the Source

Pollutant	Averaging Time	Class I PSD SIL (ug/m^3)	Highest Total Impact (ug/m^3) (1)	Impact Below SIL?
$PM_{2.5}$	Annual	0.05	0.02 (2)	Yes
	24-hr	0.27	0.266 (3)	Yes
PM_{10}	Annual	0.2	0.0003	Yes
	24-hr	0.3	0.1332	Yes
NO_2	Annual	0.1	0.01	Yes

Note: Concentrations are presented in $\mu g/m^3$, though NO_2 concentrations are typically reported for non-modeling applications in parts per billion (ppb).

(1) All impacts are predicted for the Lye Brook Wilderness Area.

(2) Includes 0.018 μg/m^3 predicted secondary $PM_{2.5}$ impacts.
(3) Includes 0.1372 μg/m^3 predicted secondary $PM_{2.5}$ impacts.

Though the 24-hour $PM_{2.5}$ impact is only slightly below the level of the SIL, the predicted impacts are based on conservative modeling assumptions. The short-term modeling assumes that all construction phase vessel and equipment activity will occur within the same 24 hours. This approach is extremely conservative, as it does not account for the construction schedule which will limit how much activity occurs at once, and it does not account for vessels that will be in limited supply and therefore, will not be numerous enough for multiple construction activities at once. Some vessels that will be performing several activities on site will possibly be performed by only one vessel, rather than multiples of the same vessel type. Therefore, the short-term model predicted impacts at Lye Brook are expected to be higher than would result from the construction emissions.

The predicted impacts from the proposed RW facility are compared to the Class I PSD increments in Table 17. As shown in the table, all predicted impacts are well below the Class I increments.

Table 17 Comparison of Construction Period Impacts to Class I PSD Increments

Pollutant	Averaging Time	Class I PSD Increment (ug/m^3)	Highest Total Impact (ug/m^3) (2)	Percent of Increment
$PM_{2.5}$	Annual	1.0	0.02 (1)	2%
	24-hr	2.0	0.266 (1)	13%
PM_{10}	Annual	4.0	0.0003	<1%
	24-hr	8.0	0.1332	2%
NO_2	Annual	2.5	0.01	<1%

(1) $PM_{2.5}$ reported as the sum of primary and secondary impacts.
(2) All impacts are predicted for the Lye Brook Wilderness Area.

(2) EPA Conclusion About Ambient Air Impacts During Construction Phase

The EPA has assessed the ambient air quality demonstration submitted by RW and concludes that it is appropriate for its intended purpose of estimating construction period impacts from the source. Therefore, the EPA concludes that there will be no significant impacts at Class I areas resulting from construction of the source. Predicted impacts for all pollutants and averaging periods are also well below the Class I increments. Details of RW's modeling are provided in the applicant's modeling reports included in the administrative record.

2. Operational Phase

The PSD permitting regulations for proposed major new sources generally require applicants to perform an air quality impact analysis for those pollutants with significant emissions. All pollutants with emissions greater than these thresholds during both the construction and operational phases must be appropriately assessed to ensure that emissions from the source do not cause or contribute to a violation of the NAAQS or PSD increment. Assessment of the

operations and maintenance emissions was provided by the applicant in a September 2022 report "Air Quality Impact Modeling Report – Operations and Maintenance Emissions," to correspond with the Revolution Wind OCS Air Permit Application submitted to EPA on August 12, 2022. The September 2022 report was supplemented by a memorandum provided by the applicant entitled "Revolution Wind OCS Air Permit Application – Supplemental Tables Summarizing O&M Class I Impacts" on January 26, 2023, and by a memorandum provided by the applicant entitled "Supplemental Information for Temporary Generators" on February 28, 2023.

The following sections provide the EPA's assessment of information provided by RW in determining whether ambient air impacts from the source are protective of air quality standards. Specifically, the sections below describe: 1) an overview of the air modeling conducted by RW; 2) comparison of operational phase impacts against the SILs; 3) comparison of operational phase impacts against the NAAQS; 4) comparison of operational phase impacts against the PSD increments for Class I and Class II areas; 5) assessment of operational phase impairment to visibility, soils, and vegetation; and 6) EPA's conclusion about the ambient air impacts during the operational phase of the facility.

a. Overview of the Air Modeling Conducted by RW

To assess direct impacts within a 50-km distance, RW selected the Ocean and Coastal Dispersion (OCD) model (Version 5), consistent with Section 4.2.c.i of the *Guideline*. RW prepared hourly representative onshore and offshore meteorological data for use with the OCD model based on prognostic meteorological modeling data provided by EPA. The meteorological data were extracted from the WRF prognostic model for the three-year period of 2018-2020 using the MMIF, Version 3.4.2. Prior to using the meteorological data with the OCD model, RW submitted an evaluation to demonstrate the suitability of the prognostic meteorological data for such a purpose.[68] The EPA's assessment of the RW evaluation of the WRF simulation is that it provides a sufficient basis for use in a screening analysis with the OCD model for estimating CO, PM_{10}, $PM_{2.5}$ and NO_2 impacts out to 50 km from RW. Emissions included in the analysis represent the highest emitting activities anticipated for the operational period of the source. Impacts from multiple emission scenarios (representing different activities) are assessed separately or combined as appropriate depending on the averaging time for the relevant air quality standard. For the short-term scenarios, emissions sources were modeled at or near the WTG located closest to land, and RW assessed impacts at an array of receptors centered at the WTG closest to land. For the annual modeling, sources were modeled at locations divided across the lease area, and RW assessed impacts at an array of receptors centered around the project centroid. The receptor grids used for both short-term and annual modeling consisted of a dense grid near the center of the receptor grid and less dense receptor spacing farther from the grid center out to 50 km. No receptors were excluded from analysis.

[68] The evaluation is provided as Appendix A to the September 9, 2022, Air Quality Impact Modeling Report-Operations and Maintenance Emissions, available as part of the administrative record for the draft permit.

The facility must also account for secondary formation of $PM_{2.5}$ resulting from precursor emissions of SO_2 and NO_x. To do so, RW employed the MERPs approach, which is an appropriate Tier 1 demonstration tool consistent with requirements in section 5.4.2.b of the *Guideline*, as described in the EPA's April 30, 2019, Guidance. Specifically, RW relied on the most conservative (lowest) MERPs value from all hypothetical sources located in the northeast climate zone.[69] RW combined the maximum predicted secondary $PM_{2.5}$ impacts with the modeled primary (i.e., resulting from direct emissions) $PM_{2.5}$ impacts to calculate total $PM_{2.5}$ impacts for comparison with the SIL, NAAQS, and Class II PSD increment.

Modeling methodologies, inputs, and techniques were used consistent with the *Guideline* and EPA guidance. RW justified treatment of certain emissions as intermittent with regards to the 1-hour NO_2 NAAQS as addressed in the EPA's March 1, 2011, memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (EPA's March 1, 2011, Guidance). As such, RW applied a ratio of the number of operating hours per year by 8,760 hours to the 1-hour NO_2 emissions. The EPA agrees that RW has appropriately represented the intermittent sources and accounted for their expected operation with respect to the 1-hour NO_2 standard. For modeling 1-hour NO_2 impacts, RW applied EPA's ambient ratio method 2 (ARM2) screening method consistent with Section 4.2.3.4.d of the *Guideline*. For modeling annual NO_2 impacts, RW assumed 100% conversion of NO_x to NO_2.The EPA has evaluated the methods and techniques included in the air quality impact analyses for the operational period provided by RW and determined that they are appropriate for assessing compliance with the SILs, NAAQS, and PSD increment.

As discussed earlier in this section, in the short-term modeling scenarios, the assumption was made that the vessels would be operating continuously at or near one WTG. In reality, the O&M vessels will be moving from location to location throughout the wind farm spending only one or two days near each WTG and OSS each year. By modeling the vessels near a single WTG, 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. Also note, as discussed in Section c., the cumulative analysis for the 1-hour NO_2 and 24-hour $PM_{2.5}$ NAAQS analysis summarizes the maximum modeled impacts (in units of ug/m^3) resulting from the contributions from RW and the two neighboring wind farms are independent of time and physical location. Therefore, the maximum impact from each of the facilities individually were added together – even though those maximum impacts did not occur at the same location. These worse-case assumptions made in the modeling approach likely results in the impacts being conservative. Therefore, EPA does not feel it is necessary to include short term, hourly emission limits on any specific OCS source to support compliance with NAAQS or increment for short term standards, i.e., 1-hour NO_2 NAAQS and the 24-hour $PM_{2.5}$ increment.

[69] Figure 3-4 of EPA's April 30, 2019, "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program" (EPA's April 30, 2019, Guidance).

b. Assessment of Significant Impacts

The $PM_{2.5}$ SILs used in this portion of the assessment were established in the EPA's April 17, 2018, Guidance, as described earlier, with associated legal memorandum and technical support documents. The EPA is relying on the SIL recommended in the April 17, 2018, Guidance as appropriate for the project.

RW's screening model results for CO, NO_2, PM_{10} and $PM_{2.5}$ are presented in Table 18. This screening modeling indicates that impacts for annual NO_2, annual $PM_{2.5}$, annual PM_{10}, 24-hour PM_{10}, 1-hour CO and 8-hour CO, were below the Class II significance threshold and no further analysis is warranted. Further analysis was required for 1-hour NO_2 and 24-hour $PM_{2.5}$, and the sections below will provide summaries of these analyses. Because the modeling scenarios for short-term SILs (24-hour average or less) were representative of maximum emissions around each foundation that will be operated as part of the windfarm, the EPA considers the significant impact area radius to extend from each foundation rather than at the individual receptors used in this modeling assessment.

Table 18 Comparison of the OCS Source Operational Period Impacts Against Class II SILs

Pollutant	Averaging Time	Class II SIL (ug/m^3)	Impact (ug/m^3)	Significant Impacts?	Significant Impact Area Radius
CO	1-hr	2,000	59.1	No	--
	8-hr	500	36.8	No	--
$PM_{2.5}$	Annual	0.2	0.07[(2)]	No	--
	24-hr	1.2	2.8 [(1)]	**Yes**	1.5
PM_{10}	Annual	1.0	0.07	No	--
	24-hr	5.0	3.4	No	--
NO_2	Annual	1.0	0.29	No	--
	1-hr	7.5	40.3	**Yes**	4.5 km

Note: Concentrations are presented in $\mu g/m^3$, though for NO_2 concentrations are typically reported for non-modeling applications in parts per billion (ppb).

[(1)] Includes 0.11 µg/m3 predicted secondary PM2.5 impacts.

[(2)] Includes 0.004 µg/m3 predicted secondary PM2.5 impacts.

c. Compliance with the NAAQS

RW completed a refined modeling analysis for 1-hour NO_2 and 24-hour $PM_{2.5}$.

When using results from refined modeling for NAAQS compliance, background concentrations including impacts from nearby sources must be combined with impacts from the proposed source to identify total ambient concentrations for comparison with the NAAQS. RW selected onshore monitoring data as appropriately representative of air quality in the area. The EPA finds that this assumption is protective of air quality because it likely overestimates concentrations near the

windfarm. RW evaluated the emissions sources in the area and determined that the only potentially interactive sources were South Fork Wind which was recently permitted[70] and Sunrise Wind which recently submitted an OCS permit application but has not yet been issued a permit. South Fork Wind will be located immediately adjacent to RW, and Sunrise Wind will be located just south of RW. The EPA concludes that the monitored background values account for all other nearby sources.

The results of South Fork Wind's O&M SIL modeling were presented in their September 2020 Outer Continental Shelf Permit – "*Air Quality Impact Modeling Report for Operations and Maintenance Emissions*." Using the OCD model, it was concluded that the O&M phase exceeded the SILs for 1-hour NO_2 and 24-hour $PM_{2.5}$. The results of Sunrise Wind's O&M SIL modeling are presented in their February 2023 Outer Continental Shelf Permit Application – *"Offshore Coastal Dispersion Air Quality Impact Analysis Report*." Using the OCD model, it was concluded that the O&M phase exceeded the SIL for 1-hour NO_2 and did not exceed the SIL for 24-hour $PM_{2.5}$. Because RW, South Fork Wind, and Sunrise Wind exceeded the SIL for 1-hour NO_2 and RW and South Fork Wind exceeded the SIL for 24-hour $PM_{2.5}$, a cumulative analysis was triggered. To determine the combined impacts from RW, South Fork Wind and Sunrise Wind, RW combined the SIL modeling impacts from the three projects with the background concentrations for comparison to the 1-hour NO_2 and 24-hour $PM_{2.5}$ NAAQS. This method is conservative because it takes worst-case impacts for the projects and combines them without consideration of temporal or spatial alignment. Even though Sunrise Wind did not exceed the 24-hour $PM_{2.5}$ SIL, their contribution to $PM_{2.5}$ concentrations in the area is included for conservatism and completeness. The results of the total pollutant concentrations using this method are shown in Table 19 below.

All refined modeling was performed in accordance with the *Guideline* and in consultation with the EPA. Total impacts of $PM_{2.5}$ included both primary and secondary impacts. Assessment of NO_2 impacts predicted by OCD were post-processed with the ARM2 equation tier 2 screening method in a manner consistent with the *Guideline*. RW applied this as a post-processing step because OCD does not have capabilities to implement this approach directly or include more refined techniques for NO_2 impact screening. The EPA concludes that RW's modeling was appropriate to assess impacts for these pollutants. A summary of the refined modeling, which demonstrates compliance with the 24-hr $PM_{2.5}$ and 1-hr NO_2 NAAQS, is presented in Table 19 below.

[70] *See* Final Permit for South Fork Wind, issued January 18, 2022. https://www.epa.gov/caa-permitting/south-fork-wind-llcs-south-fork-windfarm-outer-continental-shelf-air-permit.

Table 19 NAAQs Assessment Results

Pollutant	Avg. Time	RW Impact (ug/m^3)	Background Level (ug/m^3)	South Fork Wind Impact (ug/m^3)	Sunrise Wind Impact (ug/m^3)	Total Concentration (ug/m^3)	NAAQs (ug/m^3)	Exceeds NAAQs ?
NO_2	1-hr	40.3	74.20	44.9	11.9	171.3	188.0	No
$PM_{2.5}$	24-hr	2.80(1)	14.50	8.40(2)	0.28(3)	26.0	35.0	No

Note: Concentrations are presented in µg/m3, though NO_2 concentrations are typically reported for non-modeling applications in parts per billion (ppb).
(1) Includes 0.11 ug/m^3 secondary $PM_{2.5}$ impacts
(2) Includes 0.002 ug/m^3 secondary $PM_{2.5}$ impacts
(3) Includes 0.02 ug/m^3 secondary $PM_{2.5}$ impacts

The EPA concludes that the assessment provided by RW sufficiently demonstrates that air quality impacts will not violate the NAAQS for any pollutant.

d. Compliance with Class II PSD Increment

RW is required to demonstrate compliance with the PSD increment for PM_{10}, $PM_{2.5}$ and NO_2 because the project is a major source for these pollutants. The significance analysis presented above demonstrates compliance with the PSD increments for 24-hour and annual PM_{10}, annual NO_2 and annual $PM_{2.5}$. RW provided a PSD increment analysis for 24-hour $PM_{2.5}$, for which the project was shown to have significant impacts. There is no PSD increment for 1-hour NO_2, so no PSD increment analysis is required.

RW is required to demonstrate compliance with the PSD increment for PM_{10}, $PM_{2.5}$ and NO_2 because the project is a major source for these pollutants. The significance analysis presented above demonstrates compliance with the PSD increments for 24-hour and annual PM_{10}, annual NO_2 and annual $PM_{2.5}$. RW provided a PSD increment analysis for 24-hour $PM_{2.5}$, for which the project was shown to have significant impacts (*See* Table 159). There is no PSD increment for 1-hour NO_2, so no PSD increment analysis is required. Table 1721 presents the maximum PSD increment consumed for 24-hour $PM_{2.5}$ within the RW significant impact area. The maximum PSD increment consumption occurs within 330 meters of each WTG, and no more than 35% of the increment is consumed beyond 400 meters from each WTG. The PSD increment consumption for 24-hour $PM_{2.5}$ around a single RW WTG foundation is shown in Figure 4. In Figure 4, the RW WTG is depicted by the yellow dot on the left side of the figure.

Nomans Land Island in the Town of Chilmark in Dukes County, Massachusetts is the closest land area to the OCS area where the windfarm project is located, and this onshore area is the COA for the project. In Massachusetts, the PSD increment, the maximum amount of pollution an area is allowed to increase, is tracked by county for $PM_{2.5}$ and by municipality for NO_2. No previous major source project has triggered the minor source baseline date, the date used to determine the baseline concentration in the area, in Dukes County, or any portion thereof.

Because the windfarm is not located within the jurisdiction of the Town of Chilmark or Dukes County, the project does not establish a minor source baseline date for the onshore areas corresponding to the project. Instead, the EPA considers the OCS lease area as the baseline area for which the minor source baseline date is set for this OCS project. That is, the minor source baseline date for BOEM Lease Area OCS-A 0486 for $PM_{2.5}$ and NO_2 is the date of receipt of the RW Permit Application. Similarly, for the neighboring South Fork Wind facility, the minor source baseline date for BOEM Lease OCS-A 0517 is January 13, 2021 (set by South Fork) for NO_2 and $PM_{2.5}$.[71] Therefore, the South Fork Wind facility is a $PM_{2.5}$ increment consumer and RW performed an analysis to determine the potential cumulative consumption of the 24-hour $PM_{2.5}$ increment from RW and South Fork. The proposed Sunrise Wind facility, which will be located just south of RW, will also be a $PM_{2.5}$ increment consumer. However, the results of Sunrise Wind's O&M SIL modeling, presented in their February 2023 Outer Continental Shelf Permit Application – *"Offshore Coastal Dispersion Air Quality Impact Analysis Report*" concluded that the O&M phase did not exceed the SIL for 24-hour $PM_{2.5}$. The O&M SIL modeling predicted impacts from Sunrise Wind (.28 $\mu g/m^3$) well below the 24-hour $PM_{2.5}$ SIL (1.2 $\mu g/m^3$). Therefore, Sunrise Wind was not included in the cumulative increment analysis.

In South Fork Wind's O&M significant impact area (SIA) modeling for 24-hour $PM_{2.5}$, a scenario was modeled which is representative of larger-scale repairs that will not occur on a set schedule. Nevertheless, this scenario was modeled as continuous for three years of meteorological data, although this activity is only anticipated to occur for 14 days every 2 years. Therefore, emissions sources that only have a 2% chance of occurring in any 24-hour period were conservatively modeled as though they would occur continuously. This conservative modeling of this scenario was found to exceed the Class II SIL for 24-hour $PM_{2.5}$, with an SIA of 2.5 km. The dimensions used to simulate downwash in the South Fork wind modeling were representative of the South Fork OSS structure, therefore, the South Fork SIA was assumed to originate from the South Fork OSS. The nearest RW WTG is 3.7 km from the South Fork OSS, or 1.2 km from the edge of the SFW 24-hr $PM_{2.5}$ SIA (see Figure 4). As shown in Figure 34, RW modeled impacts did not equal or exceed the $PM_{2.5}$ 24-hour SIL at any receptor located within the South Fork Wind SIA circle. This analysis performed by RW is very conservative for several reasons:

- It assumes that the worst-case 24-hour RW emissions occur at the same time as the worst-case South Fork Wind 24-hour emissions (which only have a 2% chance of occurring in any 24-hour period).
- It assumes that these worst-case emissions would occur as close as possible out of the many square kilometers of lease area between these two projects.
- It assumes that these worst-case emissions that are occurring as close as possible are also occurring on the worst day of dispersion.

[71] The PSD regulations at 40 C.F.R. § 52.21(b)(14)(ii) define the minor source baseline date as the earliest date after the trigger date on which a major stationary source or a major modification subject to 40 C.F.R. § 52.21 or to regulations approved pursuant to 40 C.F.R. § 51.166 submits a complete application under the relevant regulations. The trigger date for $PM_{2.5}$ is October 20, 2011.

- As depicted in Figure 4, the maximum 24-hour $PM_{2.5}$ impacts from RW and South Fork individually occur in very close proximity to each facility (within 350 meters) and the concentration gradients around each facility decrease rapidly with distance.
- The SIA for South Fork shown in Figure 4 is conservatively drawn. South Fork does not have impacts greater than the 24-hour $PM_{2.5}$ SIL at all locations with the SIA circle. Rather, the concentric rings composing the SIA represent the maximum 24-hour $PM_{2.5}$ concentration anywhere within each ring. If a similar conservative SIA circle with a radius of 1.5 km is drawn for RW, then the SIAs would overlap by about .3 km. The SIAs would overlap in an area where each facility has impacts in the 1.2 to 1.5 $\mu g/m^3$ range. Therefore, the worst-case cumulative impact would be less than 3 $\mu g/m^3$ which is similar to the maximum impact from RW alone (2.7 $\mu g/m^3$) and well below the 24-hour $PM_{2.5}$ increment (9 $\mu g/m^3$).

Based on this conservative analysis, RW determined that the cumulative impact from RW and South Fork Wind is less than 3 $\mu g/m^3$ which is well below the 24-hour $PM_{2.5}$ increment of 9 $\mu g/m^3$. The EPA has reviewed the modeling assessment for PSD increment performed by RW and concludes that the analysis was performed appropriately. Figure 4 was submitted by RW as part of the "Air Quality Impact Modeling Report – Operations and Maintenance Emissions" dated September 9, 2022.

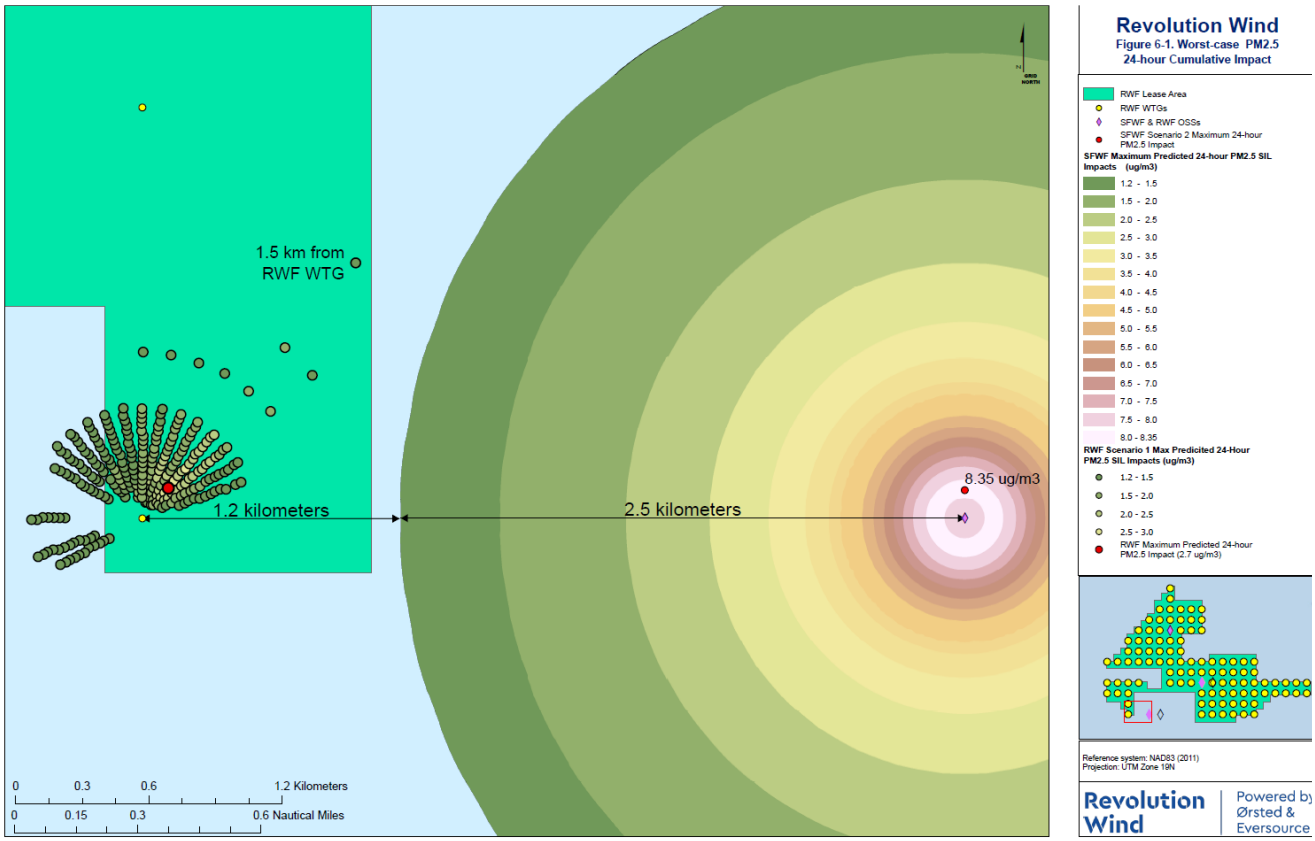

Figure 4 $PM_{2.5}$ SIA Comparison Analysis (24-hr)

PSD increment impacts are normally presented based on the high second-high 24-hour value at each receptor. The value reported in Table 20 is based on the high-first high 24-hour value as an

additional measure of conservatism. RW assessed impacts at an array of receptors centered around the WTG closest to land. For conservatism, RW impacts were assumed to occur at the WTG nearest to the South Fork Wind OSS.

Table 20 Class II PSD Increment Assessment Results

Pollutant	Averaging Time	Impact (ug/m^3)	Class II PSD Increment (ug/m^3)	Percent of Increment Consumed
$PM_{2.5}$	24-hr	2.70 (1)	9	30%

(1) This value includes both primary and secondary $PM_{2.5}$ impacts. The secondary $PM_{2.5}$ impact was 0.11 ug/m^3

e. Significance at Class I areas

RW assessed the significance levels at Class I areas by assessing the maximum impacts at 50 km from the source. Table 21 presents these values. The EPA has reviewed the modeling assessment for Class I area significance and concludes that the analysis was performed appropriately. Though the 24-hour $PM_{2.5}$ impact is only slightly below the level of the SIL, the impacts predicted by OCD are at 50 km from RW. This modeled impact is expected to be higher than would result from O&M emissions at Lye Brook which is located 252 km from RW.

Table 21 Class I PSD Significance Assessment

Pollutant	**Averaging Time**	**Class I PSD SIL (ug/m^3)**	**Impact (ug/m^3)**	**Significant Impacts?**
$PM_{2.5}$	Annual	0.05	0.03 (1)	No
	24-hr	0.27	0.25 (1)	No
PM_{10}	Annual	0.20	0.03	No
	24-hr	0.30	0.20	No
NO_2	Annual	0.10	0.06	No

(1) This value includes both primary and secondary $PM_{2.5}$ impacts.

f. Impairment to Visibility, Soils, Vegetation, and Growth

RW provided an analysis consistent with the requirements of 40 C.F.R. § 52.21(o) to assess air quality impacts and impairment to visibility, soils, and vegetation due to operational period emissions of the OCS Source and general commercial, residential, industrial, and other growth associated with the operational period of the windfarm. The EPA has evaluated the analyses provided by RW to address these requirements.

Regarding visibility, RW submitted an analysis of impacts from construction emissions on Class I areas. This analysis is presented in the Construction Class I SIL and Visibility Modeling Report, submitted by RW and dated September 2022. The visibility modeling was performed at

the request of the U.S. Forest Service (USFS"). *See* Section V.3.c of this fact sheet for more information. This analysis demonstrates acceptable visibility impacts from construction emissions at the Lye Brook Wilderness Area. Therefore, considering that O&M emissions are only about 6% of the construction emissions, the results of the construction phase visibility analysis imply acceptable impacts for the O&M emissions as well. In addition, RW applied the EPA VISCREEN model to assess visibility impacts at nearby Class II area vistas and found that visibility impacts were below significance criteria. The EPA finds that the RW analysis is appropriate to identify impacts on visibility and that impacts are below the screening thresholds. Therefore, the EPA concludes that operational emissions from the windfarm will not impair visibility.

RW assessed impacts on soil and vegetation by comparing the maximum concentrations predicted by OCD against screening values derived from EPA's December 12, 1980 "Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals: Final Report." The EPA finds that the RW analysis is appropriate to identify impacts to vegetation and that impacts are well below the screening thresholds. EPA expects that impacts to soil will be similarly low based on the presented emissions levels and distance to land areas from the source. Therefore, EPA concludes that operational emissions from the windfarm will not impair soil or vegetation.

RW described projected growth resulting from the operation of the windfarm and stated that no new significant emissions would be associated with population, economic, and employment growth due to the source.

Based on the results of the analyses and the EPA's evaluation, the EPA finds that the operational period emissions and associated impacts from commercial, residential, industrial, and other growth will not result in an impairment to visibility, soils, or vegetation.

g. EPA Conclusion About Ambient Air Impacts During Operational Phase

The EPA has assessed the analyses submitted by RW related to ambient air impacts during the operational period. Based on this information and the EPA's assessment, as described above, the EPA concludes that the operational period emissions will not cause or contribute to violations of the NAAQS or PSD increment. Therefore, the ambient air impact requirements of the PSD regulations for the operational period of the source have been satisfied. Under the applicable Massachusetts regulations at 310 CMR 7.00 incorporated into 40 C.F.R. Part 55, EPA has authority to require additional modeling for pollutants that are non-major for this project. Based on the location of the project in an area that is remote from residences, the generally diffuse nature of the emissions sources, and the anticipated environmental benefits of the project, EPA is choosing not to exercise its authority to require additional modeling for the operational phase of this project.

3. Consultation with Federal Land Managers

For sources impacting Federal Class I areas, 40 C.F.R. § 52.21(p) requires the EPA to consider any demonstration by the Federal Land Manager that emissions from the proposed source would have an adverse impact on air quality related values, including visibility impairment. If EPA concurs with the demonstration, the rules require that the EPA shall not issue the PSD permit.

The USFS requested that a Class I visibility analysis be performed for construction emissions using the CALPUFF Model. In response to this request, RW performed a visibility analysis for the Lye Brook Wilderness Area located in southern Vermont approximately 252 km northwest of the RW project. This analysis is presented in Section 6.2 of the Construction Class I SIL and Visibility Modeling Report, submitted by RW and dated September 2022. The September 2022 report was supplemented by a memorandum provided by the applicant entitled "Supplemental Information for Temporary Generators" on February 28, 2023. The visibility analysis demonstrates acceptable visibility impacts at the Lye Brook Wilderness Area from construction emissions. The USFS has concurred[72] with the results of the visibility modeling analysis. Considering that the O&M emissions are only approximately 6% of the construction emissions, the results of the construction phase visibility modeling imply acceptable impacts for the O&M emissions at the Lye Brook Wilderness Area.

[72] *See* February 1, 2023, email from John Sinclair, US Forest Service, available as part of the administrative record for the draft permit. Note that a slightly revised visibility analysis was presented as a part of the February 28, 2023, submittal by RW. *See* March 6, 2023, email to the US Forest Service, available as part of the administrative record for the draft permit.

VI. Nonattainment New Source Review (NNSR)

Within Massachusetts, Dukes County is currently designated as a marginal nonattainment area for the 2008 ozone NAAQS. *See* 40 C.F.R. § 81.322. However, portions of the OCS source are closer to Bristol County, Massachusetts, than they are to Dukes County, and Bristol County is not a nonattainment area for ozone. Nevertheless, because Massachusetts is part of the Ozone Transport Region (OTR"),[73] and areas within the OTR are treated, at a minimum, as moderate nonattainment areas for ozone, the ozone precursors NO_x and VOC are subject to the state's NNSR program requirements. The NNSR regulations in Massachusetts are implemented under 310 CMR 7.00, *Appendix A.* The regulations specify that new major stationary sources or major modifications to an existing major source within an air quality nonattainment area must undergo a NNSR review and obtain all applicable federal and state preconstruction permits prior to commencement of construction. The intent of the NNSR review and conditions are to ensure that the increased emissions from a new or modified source are controlled to the greatest degree possible; and to ensure that more than an equivalent offsetting emission reduction (emission offsets) for operational emissions be achieved by existing sources; so that there will be reasonable further progress toward achievement of the NAAQS. Regulated NSR pollutants (and their precursors) for which an area is nonattainment are not subject to PSD review even if the project emission increase and net emission increase is significant. Instead, they are subject to major NNSR permitting. Therefore, the ozone precursors NO_x and VOC are not subject to PSD review and instead are subject to major NNSR permitting review as described below. The NNSR program applies to new major sources and major modifications at existing major sources as defined and described in 310 CMR 7.00*, Appendix A.*

Per 310 CMR 7.00*, Appendix A*, "Major Stationary Source means any stationary source of air pollutants which emits or has the federal potential emissions greater than or equal to, 100 tpy or more of any pollutant subject to regulation under the Act, except those lower emissions thresholds shall apply as follows: 50 TPY of volatile organic compounds (VOC), or 50 TPY of oxides of nitrogen (NO_x)." Since the source[74] is an existing major source and subject to COA requirements for NNSR, the emissions increase from the Revolution Wind project must be evaluated under NNSR to determine if it exceeds the significant emissions rate of *Appendix A* (see *Table 22*). The NNSR requirements apply to each regulated NNSR pollutant that a "major source emits in significant amounts" per 310 CMR 7.00, *Appendix A. See Table 22 below for a summary of these applicable thresholds.*

Table 22 NNSR SER Thresholds under 310 CMR 7.00, Appendix A

NNSR Regulated Pollutant	NNSR Significant Emission Rate (SER)
Ozone	25 tpy of nitrogen oxides (NO_x) where an administratively complete application was received on or after November 15, 1992, for the physical change or change in the method of operation.

[73] In the CAA amendments of 1990, Congress created the OTR, located in the northeast portion of the country, to address ozone formation due to transport of air emissions. Congress included all of Massachusetts as one of the states or commonwealths within the OTR.
[74] EPA issued an OCS permit to South Fork Wind, LLC on January 18, 2022.

NNSR Regulated Pollutant	NNSR Significant Emission Rate (SER)
Ozone	40 tpy of VOC 25 tpy of VOC where an administratively complete application was received on or after November 15, 1992, for the physical change or change in the method of operation.

A. Major Modification Applicability

"Major Modification" means any physical change in or change in the method of operation of a major stationary source that would result in a significant net emission increase of any pollutant, for which the existing source is major, subject to regulation under the Act: (a) Any net emissions increase that is considered significant for VOCs shall be considered significant for ozone; and (b) For the purpose of applying the requirements of 310 CMR 7.00: *Appendix A* to major stationary sources of NO_x, any significant net emissions increase of NO_x is considered significant for ozone, in addition to any separate requirements for NO_x under part C or D of Title I of the Act.[75]

1. Emission Increase Calculation (Project Emission Increase)

For projects that only involve the construction of new emission units, like Revolution Wind, the significant emissions increase is the new emissions unit's PTE.[76] For a new emission unit, the baseline actual emissions (BAE) for purposes of determining the emissions increase that will result from the initial construction and operation of such unit shall equal zero; and thereafter, for all other purposes, shall equal the unit's PTE.

For assessing the emission increases from the Revolution Wind project, emissions from the equipment or activities considered part of the OCS source, and all emissions from vessels servicing or associated with the project, are included in the PTE. This includes emissions from vessels, regardless of whether the vessel itself meets the definition of an OCS source, when the vessels are at or going to or from an OCS source and are within 25 nm of the facility. Thus, emissions from vessels servicing or associated with an OCS source that are within 25 nm[77] of the OCS facility are considered in determining the PTE or "potential emissions" of the OCS source for purposes of applying the NNSR regulations.

The emission increases from this project are calculated on a pollutant-by-pollutant basis for each regulated NNSR pollutant emitted by the source. The emission increases include both project emissions and any emissions from the source associated with the project. The applicant has not

[75] Per 310 CMR 7.00, Appendix A, "Major Stationary Source" also specifies that OCS sources shall include fugitive emissions in determining, for any of the purposes of 310 CMR 7.00: Appendix A, whether the stationary source is a major stationary source. Therefore, fugitive emissions are considered in evaluating LAER and ambient impacts due to the regulations not distinguishing between stack and fugitive emissions for these purposes.
[76] Under 310 CMR 7.00, "potential to emit" is defined as the maximum capacity of a source to emit a pollutant under its physical and operational design (pg. 430). Typically, emissions from mobile sources and secondary emissions do not count when determining a stationary source's PTE. However, the definition of "potential emissions" in the OCS Air Regulations is expanded to include emissions from all vessels servicing or associated with an OCS source when within 25 NM.
[77] 1 Nautical Mile (NM) = 1.15077 Miles

identified any existing emission units from the South Fork Wind project that are affected by the Revolution Wind project. Emission decreases are not considered in this step.

Table 23 Emission Increase from the Revolution Wind Project (NNSR)

Revolution Wind Project Emission Increase	Regulated NNSR Pollutant (TPY)	
	NO_x	VOC
BAE	0	0
PTE	3,978	83.6
Δ (PTE-BAE)	+ 3,978	+ 83.6

As shown in Table 24, a significant emissions increase (per the definition of significant at *310 CMR 7.00, Appendix A)* of ozone has occurred. Note that NOx and VOC are considered precursors for the criteria pollutant ozone.

Table 24 Worst Case Annual Emission Estimate Compared with NNSR SER Thresholds

NNSR Regulated Pollutant	Project Emission Increase (TPY)	NNSR Significant Emission Rate (TPY)	SER Triggered? (Y/N)
NO_x	3,978	25	**Y**
VOC	83.6	25	**Y**

2. Emission Netting (Contemporaneous Netting)

Per 310 CMR 7.00: *Appendix A*, the definition of a "net emission increase" consists of two components: (1) Any increases in actual emissions from a particular physical change or change in the method for operation from a stationary source (i.e., Emission Increase Calculation (Project Emission Increase)); and (2) Any other increases and decreases in actual emissions at the source shall be included for netting purposes, that are contemporaneous with the change and are otherwise creditable as described in 310 CMR 7.00: *Appendix A* Net Emissions Increase (b), (c), (d), (e) and (f). In other words, netting looks at the other projects that may have been or will be undertaken at a given facility over the contemporaneous period. RW is not pursuing a Step 2 contemporaneous netting analysis because either there are no contemporaneous increases or decreases foreseeable or any increases or decreases would not impact the applicant's conclusions on NNSR review for the pollutants that exceed the SER threshold.

3. Summary

Based on the emission levels for the project, as presented in Table 24, NO_x and VOC will be emitted by the Revolution Wind project in quantities exceeding the respective NNSR (SER). The applicant has identified no anticipated contemporaneous creditable emissions increases or decreases for the proposed project RW, and therefore, the RW project is considered a major modification to a major source (South Fork Wind) and therefore subject to NNSR requirements for NO_x and VOC.

B. Lowest Achievable Emission Rate (LAER)

As defined in 310 CMR 7.00*, Appendix A*, LAER means, for any source, the more stringent rate of emissions based on: (a) The most stringent emissions limitation which is contained in any state SIP for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or (b) The most stringent emissions limitation which is achieved in practice by such class or category of stationary source. In no event shall LAER allow a proposed new or modified stationary source to emit any pollutant more than the amount allowable pursuant to an applicable NSPS.

RW does not yet know specifically which vessels will be utilized for the project. The procurement of the vessels requires contracts within short timeframes due to the specific nature of the OCS project which is described in more detail below. Thus, the vessel engine types that can be secured at the projected time of construction are unknown at the time of this fact sheet. In addition, RW has indicated that some of the marine vessels will be owned by third parties; however, the procurement of the vessels for purposes of conducting the work on the project is ultimately decided by the facility (i.e., Revolution Wind). These third-party vessels are noted to have the potential to be considered an OCS source. The EPA is considering these facts in determining LAER for those emission units proposed in the project.

1. Methodology

Although the definition for LAER differs from BACT, the BACT and LAER analysis have overlap in the methodology used to perform this analysis. EPA follows the equivalent Step 1 and Step 2 procedure[78] as outlined in the "top-down" process used to satisfy the BACT requirements (see Section V.C.1 above) in its analysis of paragraph (a) of the definition of LAER. Paragraph (b) of the definition of LAER follows Steps 3 through 5 of the "top-down" BACT analysis closely with only one major distinction. In Step 4 of a BACT analysis, where energy, environmental, and economic impacts are assessed, the EPA can remove a technology from consideration based on any of those criteria. However, for LAER determinations, when determining the emission limit and identifying at least one technology that can be used to achieve the emission limit, the EPA cannot consider the energy, environmental, or economic impacts associated with that technology, it is the most stringent emissions limitation for the project. Furthermore, the LAER analysis is on a per pollutant basis, like PSD, but the regulated NSR pollutants that are evaluated are only the NAAQS for each emission unit that could emit a NAAQS in a nonattainment area. In the case of this RW permit application, NOx and VOC are both subject to NNSR and thus LAER review. In light of these similarities, EPA has conducted a "top-down" LAER analysis consistent with the definition of LAER in 310 CMR 7.00*, Appendix A*. The "top-down" process is described in V.B.1 above.

[78] Paragraph (a) of the definition for LAER is addressed within Steps 1 and 2 of a BACT analysis. Step 1 of the BACT analysis requires the identification of all emission control technologies that are possible for the sources, including technologies used to comply with the most stringent emission limit in a state SIP. Step 2 of the BACT analysis requires the permitting authority, in this case EPA, to document why a particular control technology is technically infeasible, for that source category. Unless the proposed LAER has been indicated by the applicant to not be achievable, such that the cost is so great that project could not be built. The remaining highest ranked technically feasible technology after Step 3 of the BACT analysis was carried through to Step 5.

2. LAER Analysis for the Revolution Wind Project

a. Emission Unit Applicability

The RW project is required to apply LAER to all the new emission units proposed in this project. The Project's emission sources will primarily be compression-ignition internal combustion engines (CI-ICE). These include engines on vessels while operating as OCS source(s) and engines on the wind turbine generators (WTGs) and offshore substations(s) (OSS[s]).

Table 25 EUG 1 - Offshore Generators on OSS(s) and WTG(s)

EU ID	Description	Type of Equipment	Engine Count	Engine Rating, kW (hp)	Hours per Engine
Construction Equipment					
RW-1, RW-2	OSS/OCS Installation & Commissioning	Auxiliary Generator on OSS/OCS	2	597 (800)	4,800
RW-3, RW-4, RW-5, RW-6	Offshore OSS/OCS Installation & Commissioning	Temporary Generator on OSS	4	156 (209)	17,520[1]
RW-7	Offshore Array Cable Installation	Generator for Cable Pull-WTG	1	37 (50)	600
RW-8, RW-9	Offshore Array Cable Installation	Generator for Cable Pull-OSS/OCS	2	75 (100)	240
RW-10, 11	Offshore WTG Installation & Commissioning	Temporary Generator on WTG	2	24 (32)	120
Operating Equipment					
RW-12, 13	OSS/OCS Permanent Generators	Generator on OSS/OCS	2	597 (800)	500
RW-14 thru RW-20	WTG O&M Repair	Generator on WTG	6	120 (160)	720

Notes:
[1] This represents the hours of operation during the entire construction period of the project (i.e., 8,760 hpy x 2 yrs.)

A marine vessel[79] typically has two (2) kinds of engines which are considered OCS emission sources: 1) Propulsion engines, also referred to as main engines, which its primary purposes is to supply power to move the vessel. However, BACT and LEAR would apply to the propulsion engines in the construction and operation phases of the project if it meets the definition of an OCS source. Specifically, where a propulsion engine would be used to supply power for purposes of performing a given stationary source function, i.e., for example to lift, support, and orient the components of each WTG during installation., and 2) Auxiliary engines, which supply power for non-propulsion (e.g., electrical) loads. The applicant has identified the anticipated horsepower ratings for propulsion and auxiliary engines, *Table 26*. Note that RW does not yet

[79] Large Marine Vessels are noted to typically have Category 3 (C3) engines, which have a per cylinder displacement of 30 L/cylinder or more; however, some could have smaller Category 1 (C1) or Category 2 (C2) engines. To be classified as a Category 2 (C2) marine engine, it must be rated to have a displacement greater than or equal to 7.0 L/cylinder and less than 30.0 L/cylinder. To be classified as a Category 3 (C3) marine engine, it must be rated to have a displacement greater than or equal to 30.0 L/cylinder

know specifically which engines or vessels will be utilized for the project. Vessel availability is indicated to be constrained by the limited number of vessels capable of conducting the work, availability of those vessels at a given time, and limitations imposed by the Jones Act. The procurement of the vessels, which are indicated to change on short notice, require contracts within short timeframes due to the specific nature of the OCS project, which is described in more detail below. Thus, the vessel engine types that can be secured at the projected time of construction are unknown at the time of publication of this fact sheet. EPA is considering these facts in the analysis.

Table 26 EUG 2 - Marine Engines on Vessels Operating as Potential OCS Source(s)

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Monopile Installation	Heavy Lift Installation Vessel	26,640	1,100
Monopile Installation	Heavy Lift Installation Vessel	34,560	1,100
Monopile Installation	Heavy Lift Installation Vessel (Generator Small)	NA	4
Monopile Installation	Heavy Lift Installation Vessel (Power Pack)	NA	746
Monopile Installation	Towing Tug (for fuel barge)	11,060	238
Monopile Installation	Anchor Handling Tug	11,060	238
Monopile Installation	Rock Dumping Vessel	13,500	1,692
Monopile Installation	Vessel for Bubble Curtain	11,060	874
Monopile Installation	Vessel for Bubble Curtain (Generator (Large))	NA	358
Monopile Installation	Heavy Transport Vessel (Generator (Small))	NA	4
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Heavy Transport Vessel	11,952	3,600
Monopile Installation	Crew Transport Vessel	2,352	48
Monopile Installation	PSO Noise Monitoring Vessel	11,060	238
Monopile Installation	Platform Supply Vessel	6,000	874
Monopile Installation	Platform Supply Vessel	1,825	525
OSS Topside Installation	Heavy Transport Vessel	13,000	1,220
Turbine Installation	Jack-up Installation Vessel	21,000	895
Turbine Installation	Jack-up Installation Vessel (Generator (Small))	NA	4
Turbine Installation	Jack-up Installation Vessel (Cherry Picker)	NA	67
Turbine Installation	Feeder Barge (Generator (Large))	NA	30
Turbine Installation	Towing Tug (for fuel barge)	11,060	238
Offshore Export Cable & OSS Link	Pre-Lay Grapnel Run	12,780	968
Offshore Export Cable & OSS Link	Boulder Clearance Vessel	2,803	964
Offshore Export Cable & OSS Link	Sandwave Clearance Vessel	7,300	964
Offshore Export Cable & OSS Link	Cable Lay and Burial Vessel	8,946	2,800
Offshore Export Cable & OSS Link	Cable Burial Vessel - Remedial	8,946	2,800

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Offshore Export Cable & OSS Link	Tug - Small Capacity	4,049	238
Offshore Export Cable & OSS Link	Tug - Large Capacity	11,060	238
Offshore Export Cable & OSS Link	Crew Transport Vessel	2,204	201
Offshore Export Cable & OSS Link	Guard Vessel/Scout Vessel	400	201
Offshore Export Cable & OSS Link	Survey Vessel	1,302	418
Offshore Export Cable & OSS Link	DP2 Construction Vessel	12,780	964
Offshore Export Cable & OSS Link	Misc. Floating Equipment Landfall	400	201
Offshore Export Cable	Barge Lay (Generator (Small))	NA	75
Offshore Export Cable	Barge Lay (Crane Type 1)	NA	567
Offshore Export Cable	Barge Lay (Generator (Large))	NA	187
Offshore Export Cable	Barge Lay (Power Pack)	NA	373
Offshore Export Cable	Barge Lay (Cherry Picker)	NA	112
Offshore Export Cable	Barge Lay (Excavator)	NA	567
Offshore Export Cable	Support Barge (Generator (Large))	NA	45
Offshore Export Cable	Support Barge (Cherry Picker)	NA	567
Offshore Array Cable	Pre-Lay Grapnel Run	12,780	964
Offshore Array Cable	Boulder Clearance Vessel	2,803	964
Offshore Array Cable	Sandwave Clearance Vessel	7,300	964
Offshore Array Cable	Cable Laying Vessel	8,946	2,800
Offshore Array Cable	Cable Burial Vessel	8,946	2,800
Offshore Array Cable	Crew Transport Vessel	2,204	201
Offshore Array Cable	Walk to Work Vessel (SOV)	6,440	N/A
Offshore Array Cable	Survey Vessel	1,302	418
Offshore Array Cable	Construction Vessel	6,440	N/A
Offshore Cable Transport	Cable Laying Vessel	8,946	2,800
Offshore Cable Transport	Array Cable Transport Freighter	7,950	3,026
All Construction Activities	Safety Vessel 1	400	201
All Construction Activities	Safety Vessel 2	400	201
All Construction Activities	Crew Transport Vessel	2,352	201
All Construction Activities	Crew Transport Vessel	2,162	201
All Construction Activities	Crew Transport Vessel	2,984	100
All Construction Activities	Lift Boat	6,000	N/A
All Construction Activities	Supply Vessel	7,530	N/A
All Construction Activities	Service Operation Vessel	6,920	201
Fisheries Monitoring	for Lobster, Lease Site	400	201
Fisheries Monitoring	for Trawl Survey	400	201
Fisheries Monitoring	for Lease Site Acoustic Telemetry	400	201
Fisheries Monitoring	for Lobster, Export Cable	400	201

Marine Vessel	Vessel Type	Main Engine Rating (kW)	Auxiliary Engine Rating (kW)
Marine Mammal Mitigation	for Situational Awareness	400	201
Marine Mammal Mitigation	for Long Term Acoustic	400	201
Marine Mammal Mitigation	for ST Long Term Studies	400	201

b. Pollutant Applicability

A LAER analysis is required for each new emission unit for each pollutant which exceeds the NNSR SER. Based on the emission levels for the project, as presented in *Table 24,* NO_X and VOC are the precursors for the Nonattainment NSR regulated pollutant ozone which will be subject to LAER.

High Level Summary of LAER Determination

For offshore engines on the wind turbine generators and/or offshore substations, LAER has been determined to be use of the highest Tier EPA Certified Engine (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII, and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan.

For marine engines on vessels that operate as an OCS source, LAER has been determined to be use of the Marine Engine that is certified to the highest Tiered Exhaust Emission Standards (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan.

For third party-contracted U.S. vessels where the availability of the vessel type at the time of the application is unknown, LAER has been determined to be use of the Marine Engine that is certified to the highest Tiered Exhaust Emission Standards (i.e., Tier 3 or 4, dependent on the final selected engine size and associated displacement) within 40 CFR Part 60, Subpart IIII at time of deployment (not to exceed Tier 2 Emission Standards for applicable vessel types covered by SIP limitations identified for similar class of sources) and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan. Specific Conditions related to the time of deployment are justified in the subsection below.

For third party-contracted U.S. or foreign-flagged vessels where the availability of the vessel type at the time of the application is unknown, LAER has been determined to be use of the Engines certified to the highest Tiered Exhaust Emission Standards (i.e., Tier III) within 40 MARPOL Annex VI at time of deployment and operated in accordance with a Good Combustion and Operating Practices ("GCOP") Plan. Specific Conditions related to the time of deployment are justified in the subsection below.

The following sections document the LAER determination in more detail.

(1) Step 1 – Eligible LAER Controls

EUG 1—OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

Possible LAER options were derived from EPA and state RACT/BACT/LAER clearinghouses, recently issued regulations, and permit decisions from similar projects.

A RBLC search was completed for the last 10 years of determinations (*August 12, 2012, through August 12, 2022*) using the following process types: 1.) 17.110 – Large ICEs (> 500 HP) - Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel); 2.) 17.210 – Small ICEs (< 500 HP) - Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The resulting determinations were divided into three searches: from OCS air permit determinations, large emergency/non-emergency engines (>500 HP), and small emergency/non-emergency engines (<500 HP). These results are summarized within the permit application and can be found within the RBLC database after performing a search using the criteria mentioned above.

The applicable air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the EUG 1 are listed in Table 27.

Table 27 Control Technologies or Techniques for OCS Offshore Generators on the OSS(s) and WTG(s)

Control Technology	Pollutant(s)	Note(s)
Good Combustion Practices	NO_X, VOC	Use of good combustion practices based on the most recent manufacturer's specifications issued for these engines.
Highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine at 40 C.F.R. Part 1039	NO_X, VOC	Tier 2 and Tier 3 certified engines are designed to incorporate pre-combustion controls such as fuel injection timing, exhaust gas recirculation, and other engine-based technologies to meet emissions standards. In addition to the pre-combustion controls, Tier 4 certified engines may be equipped with an integrated SCR, DPF, and/or DOC.

EUG 2—Marine Engines on Vessels when operating as OCS Source(s)

Possible LAER options were derived from EPA and state RACT/BACT/LAER clearinghouses, recently issued regulations, and permit decisions from similar projects.

A RBLC search was completed for the last 10 years of determinations (*August 12, 2012, through August 12, 2022*). Note that the RBLC only contained those facilities with an OCS air permit for oil production, generally in the Gulf of Mexico off the coast of Florida. However, the previous OCS Permits Determinations issued to South Fork Wind and Vineyard Wind 1 are also considered for purposes of BACT selection.

The applicable air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the emissions unit are listed in *Table 28.*

Table 28 Control Technologies or Techniques for Marine Engines on Vessels when operating as OCS Source(s)

Control Technology	Pollutant(s)	Note(s)
Good Combustion Practices	NO_2, $PM_{10, 2.5}$, CO, GHG	Included in the RBLC was a requirement for the permittee to develop a Good Combustion and Operating Practices (GCOP) Plan. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for inspection. The plan was specific to include, but not be limited to i.) A list of combustion optimization practices and a means of verifying the practices have occurred. ii.) A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred. iii.) A list of the design choices determined to be BACT and verification that designs were implemented in the final construction.
Highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042	$NO_{2,}$ $PM_{10, 2.5}$, CO	Tier 2 and Tier 3 certified engines are designed to incorporate pre-combustion controls such as fuel injection timing, exhaust gas recirculation, and other engine-based technologies to meet emissions standards. In addition to the pre-combustion controls, Tier 4 certified engines may be equipped with an integrated SCR, DPF, and/or DOC.
Highest applicable MARPOL Annex VI Tier NOx emission limits	NO_2	*U.S.-flagged vessels* must have an Engine International Air Pollution Prevention (EIAPP) certificate, issued by EPA, to document that the engine meets Annex VI NO_x standards. *Foreign-flagged vessels* must have an International Air Pollution Prevention Certificate (IAPP) to document that the engine meets Annex VI NO_X standards [(1)]

[(1)] The Annex VI requirements[80] apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. Vessels that operate only domestically are exempt from the NO_X limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder. Foreign-flagged vessels are exempt from having to meet the marine standards within 40 C.F.R. Part 1042 and are required to meet the emission standards in 40 C.F.R. Part 1043.

As part of the LAER review, the following SIP limitations for similar class of sources to EUG 2 were identified:

- Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port (13 CCR § 2299.3 and 17 CCR § 93118.3, dated January 2, 2009).

- *Airborne Toxic Control Measure for Commercial Harbor Craft* (17 CCR § 93118.5, excluding (e)(1), dated July 20, 2011)

California's "At-Berth Regulation" at 13 CCR § 2299.3 and 17 CCR § 93118.3 requires vessel operators visiting California ports to reduce at-berth emissions from auxiliary engines on ocean-going vessels by either: 1) turning off auxiliary engines and connecting the vessel to some other

[80] In the United States (U.S.), MARPOL Annex VI is implemented through the Act to Prevent Pollution from Ships (33 U.S.C. §§ 1901–1905) and 40 C.F.R. Part 1043.

source of power (most likely grid-based shore power); or 2) using alternative control technologies that achieve equivalent emission reductions (CARB 2017b). This requirement does not apply to the project's OCS sources because project-related vessels will not be OCS sources while at-berth.

California's "Commercial Harbor Craft Regulation" at 17 CCR § 93118.5 requires all engines in "newly acquired" harbor craft that are intended to operate in any Regulated California Waters to be certified to meet the EPA Tier 2, Tier 3, or Tier 4 marine engine emission standards in effect at the time of acquisition (see 17 CCR § 93118.5(e)(3) and (4)). Under this regulation, marine engines for newly acquired in-use harbor craft are not required to meet Tier 4 marine standards, but engines that are already certified as meeting Tier 4 marine standards cannot be replaced with lower Tier engines (17 CCR § 93118.5(e)(3)). Any engines in newly acquired new harbor craft must meet applicable EPA Tier 2, 3, or Tier 4 marine standards in effect at the date of vessel acquisition (17 CCR § 93118.5(e)(4)). At the time of application, EPA is aware of one vessel that may become an OCS source and will be "newly acquired" by the Proponent. The parent company of the RW project, has contracted for the custom buildout of a service operations vessel for use at Ørsted-owned wind farms in northeast United States. Therefore 17 CCR § 93118.5(e)(3) and 17 CCR § 93118.5(e)(4) apply to the project.

The Commercial Harbor Craft Regulation also requires the eventual replacement or cleanup of pre-Tier 1 or Tier 1 engines used in ferries, excursion vessels, tugboats, towboats, push boats, crew and supply vessels, barge, and dredge vessels. Under 17 CCR § 93118.5(e)(6), Tier 1 and earlier engines in these vessel types must be brought into compliance with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards through engine replacement, modification, or retrofit by the dates provided in the compliance schedules (CARB 2017a). The compliance dates are designed to clean up the fleet's oldest and dirtiest engines first, while giving more time for relatively newer, Tier 1 engines to be upgraded or replaced. Based on the EPA-approved 2011 version of the Commercial Harbor Craft Regulation that is incorporated into the California SIP (*see* 83 Fed. Reg. 23232, May 18, 2018), these vessel types are defined as:

- Ferry: A harbor craft having provisions only for deck passengers or vehicles, operating on a short run, on a frequent schedule between two points over the most direct water route, and offering a public service of a type normally attributed to a bridge or tunnel.

- Excursion vessel: A self-propelled vessel that transports passengers for purposes including, but not limited to, dinner cruises; harbor, lake, or river tours; scuba diving expeditions; and whale watching tours. "Excursion Vessel" does not include crew and supply vessels, ferries, and recreational vessels.

- Tugboat: Any self-propelled vessel engaged in, or intending to engage in, the service of pulling, pushing, maneuvering, berthing, or hauling alongside other vessels, or any combination of pulling, pushing, maneuvering, berthing or hauling alongside such vessels in harbors, over the open seas, or through rivers and canals. Tugboats generally can be divided into three groups: harbor or short-haul tugboats, ocean-going or long-haul

tugboats, and barge tugboats. "Tugboat" is interchangeable with "towboat" and "push boat" when the vessel is used in conjunction with barges.

- Towboat or push boat: Any self-propelled vessel engaged in or intending to engage in the service of pulling, pushing, or hauling alongside barges or other vessels, or any combination of pulling, pushing, or hauling alongside barges or other vessels. Push boats and towboats are interchangeable terms.

- Crew and supply vessel: A self-propelled vessel used for carrying personnel and/or supplies to and from off-shore and in-harbor locations (including, but not limited to, off-shore work platforms, construction sites, and other vessels).

- Barge: A vessel having a flat-bottomed rectangular hull with sloping ends and built with or without a propulsion engine.

- Dredge: A vessel designed to remove earth from the bottom of waterways, by means of including, but not limited to, a scoop, a series of buckets, or a suction pipe. Dredges include, but are not limited to, hopper dredges, clamshell dredges, or pipeline dredges.

The following vessel types and engines are exempt from 17 CCR § 93118.5(e)(6), as incorporated into the California SIP:

- Temporary replacement vessels (a temporary replacement vessel is only exempt upon written approval and can only be used as a replacement for up to one year
- Temporary emergency rescue/recovery vessels
- Recreational vessels, registered historic vessels, US Coast Guard (USCG) vessels, and military tactical support vessels
- Near-retirement vessels (must be taken out of service within one year of its engines' compliance date)
- Engines less than 50 horsepower
- Ocean-going vessels other than ocean-going tugboats and towboats.[81] Ocean-going vessels are defined as a commercial, government, or military vessels meeting any one of the following criteria:
    a) a vessel greater than or equal to 400 feet in length overall as defined in 50 C.F.R. § 679.2, as adopted June 19, 1996;

    b) a vessel greater than or equal to 10,000 gross tons per the convention measurement (international system) as defined in 46 C.F.R. 69.51.61, as adopted September 12, 1989; or

[81] Ocean-going tugboats and towboats are defined as tugboats and towboats with a "registry" (foreign trade) endorsement on its USCG certificate of documentation, or tugboats and towboats that are registered under the flag of a country other than the U.S.

c) a vessel propelled by a marine compression-ignition engine with a per cylinder displacement of greater than or equal to 30 liters.

The EPA's review of SIPs found no other NO_X or VOC emission limitations relating to marine compression-ignition internal combustion engines.

(2) Step 2 – Eliminate Technically Infeasible Options

Below is a summary of the reasons for eliminating, or justification for not eliminating, each of the control options from further consideration in the top down LAER analysis for this project. For more details, please refer to the permit application and support documents in the docket.

In general, the EPA considers a technology technically feasible if it has been demonstrated and operated on the same type of source, or it is "*available*" and "*applicable*." Each of the criteria is included in the analysis for the different options to maintain full transparency.

EUG 1 - OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

Good combustion practices – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. This option is technically feasible.

Purchase the Highest Tier Certified Engine under NSPS IIII – OCS Generator Engine(s) installed on the OSS and/or WTG that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 or EPA Nonroad Engine Standards at 40 C.F.R. Part 1039 are equipped with an integrated SCR, DPF, and/or DOC. Furthermore, since the Tier Certified emission standards consider the reduction in pollution from the integrated technologies in the design, they are considered a demonstrated control technology. This option is technically feasible.

As of the release of this fact sheet, Marine Tier 3 and Marine Tier 4 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for the marine sector. Therefore, the Marine Tier 3 (Category 3 Marine Engines) and Marine Tier 4 (Category 1 and 2 Marine Engines) NO_X, HC, CO, and PM emission standards[82] represent the most stringent level of emissions control required by 40 C.F.R. Part 1042. Similarly, the Tier 4 Nonroad Standards emission standards required by 40 C.F.R. Part 1039 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for the nonroad sector. Therefore, the Nonroad Tier 4 NO_X, HC, CO, and PM emission standards[83] represent the most stringent level of emissions control required by 40 C.F.R. Part 1039.

EUG 2 - Marine Engines on Vessels Operating when operating as OCS Source(s)

[82] The Tier 3 and Tier 4 marine engine emission standards may be certified to NO_X, HC, or NO_X + HC.
[83] Depending on engine size, the Tier 4 nonroad engine emission limits may be certified to nonmethane hydrocarbon (NMHC) + NO_X, or NMHC and NO_X separately.

To a large extent, the "applicability" analysis of the potential LAER technologies for EUG 2 is identical to the EUG 1 "applicability" analysis in terms of the rational of applicable technologies since the operating conditions are presumed to be the similar. However, the "availability" analysis of potential LAER options for EUG 2 are constrained in such a way that it needed to be distinguished from the EUG 1 "applicability" analysis.

The EPA has specifically considered these facts within a separate analysis addressed in detail below for the following circumstances:

- EUG 2 – Scenario 1 - Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known.

- EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown.[84]

- EUG 2 - Scenario 3 – Third-party-contracted vessels proposed with the project, which could be U.S.- or foreign-flagged otherwise regulated under MARPOL Annex VI where the availability of the vessel type at the time of the application is unknown.

Table 29 – Summary of Technical Feasible Options for EUG 2 LAER

Control Technology	**Technically Feasible (Y/N)**
Option 1 – Good Combustion Practices	
EUG 2 – Scenario 1	**Y**
EUG 2 – Scenario 2	**Y**
EUG 2 – Scenario 3	**Y**
Option 2 – Highest Tier Certified Marine Engine at 40 C.F.R. Part 1042	
EUG 2 – Scenario 1	**Y**
EUG 2 – Scenario 2	**Y** [1]
EUG 2 – Scenario 3	N/A
Option 3 – Highest Tier Certified Marine Engine at MARPOL Annex VI Tier (U.S.- and/or Foreign-Flagged Third-Party Vessels)	
EUG 2 – Scenario 1	N/A
EUG 2 – Scenario 2	N/A
EUG 2 – Scenario 3	**Y** [2]
Option 4 - Tier 1 and earlier engines in meeting the vessel types contained within the CA SIP must be brought into compliance with emission limits equal to or cleaner than EPA Tier 2 marine engine emission standards through engine replacement, modification, or retrofit	
EUG 2 – Scenario 1	N/A

[84] Note that NO_2 is subject to BACT since the facility is in an NO_2 attainment area, while NO_X is subject to LAER as an ozone precursor since the facility is considered part of an ozone nonattainment area. As presented in Section VI.B, the LAER determination considers the California SIP requirements for certain types of existing marine vessels to be retrofitted to meet, at a minimum, the EPA Tier 2 Marine Engine Standards at 40 C.F.R. Part 1042. Since LAER is regulating NO_X (and therefore includes N_2O and NO_2 by proxy) it is presumed to be the more stringent requirement. For those units, the LAER (NO_X) requirements will supersede the BACT (NO_2) determination.

Control Technology	Technically Feasible (Y/N)
EUG 2 – Scenario 2	**Y**
EUG 2 – Scenario 3	N/A

N/A means that this control technology is not intended to be included an a BACT option within Step 1 for that operating scenario.

[1]- Option 2 for Scenario 2 has constraints regarding vessel availability which must be a consideration for Option 2 for it to not be excluded from BACT altogether.

[2] Option 3 for Scenario 3 has constraints regarding vessel availability which must be a consideration for Option 3 for it to not be excluded from BACT altogether.

EUG 2 – Scenario 1 – Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known.

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Option 2 – Marine vessels that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 are equipped with an integrated SCR, DPF, and/or DOC. Furthermore, since the Tier-Certified emission standards consider the reduction in pollution from the integrated technologies in the design, they are considered a demonstrated control technology. This option is technically feasible.

As of the release of this fact sheet, Marine Tier 3 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for category 3 engines in the marine sector. Furthermore, RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, CO, and PM emission standards[85] which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown.

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Option 2 – Marine vessels that are certified to the highest applicable EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042 are assessed for technical feasibility in terms of applicability and availability. With certain considerations given for vessel availability, Option 2 for Scenario 2 is considered technically feasible.

[85] The Tier 3 and Tier 4 marine engine emission standards may be certified to NO_X, HC, or NO_X + HC.

Restricting the use of marine engines to only those which are certified to the highest applicable Tier Standards for Marine Engine is not a technically feasible option for the RW project. EPA has concluded that the "*availability*" of the options via commercial channels is the limiting factor. EPA acknowledges the "*applicability*" of the add on control technologies[86] when applied to marine engines as technically viable options based on chemical, physical, and engineering principles. Therefore, it is proposed that the project will not eliminate the use of vessels with the highest tiered marine engines, however the use of the next lowest tiered vessel should be allowable in instances where a higher tiered vessel is not available at the time of deployment.

Applicable

As of the release of this fact sheet, Marine Tier 3 emission standards required by 40 C.F.R. Part 1042 are fully in effect, and U.S. EPA has not adopted more stringent certification standards for category 3 engines in the marine sector. Furthermore, RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NO_x, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042. Option 2 for Scenario 2 is applicable.

Available

This scenario prompted a separate analysis based on information from RW which indicates that there will be marine vessels used in the project owned by third parties. With this considered, the predictability of vessel availability is indicated to be a large constraint to construction and operations of the RW windfarm, which inherently limits the number of vessels capable of conducting the work available at the time needed. Limitations imposed by the Jones Act[87] are also a constraint. The fleet of vessels available that can perform the construction activity is limited due to the specific vessel requirements needed for performing the work. As described in the permit application, slowing down, delaying, or extending the project's schedule to wait for a higher tiered vessel's availability would have significant implications that could prevent the project from being built because many of the larger, more specialized, vessels are in limited supply.[88] Restricting the use of marine engines to only those which are certified to the highest applicable Tier Standards for Marine Engine is not a technically feasible option for the RW project since the "*availability*" of the highest Tier Engines via commercial channels is the limiting factor. However, EPA proposes to not eliminate the use of vessels with the highest tiered marine engines altogether particularly since the "*applicability*" of the NSPS technology-based federal standards apply to marine engines and therefore are technically viable options based on chemical, physical, and engineering principles.

In lieu of eliminating the use of the highest tier marine vessels altogether, EPA proposes conditions that consider the inherent limitation on the number of specialized vessels that are

[86] EPA acknowledges marine engines have their own constraints (i.e., operating in a harsher environment, variable loads, temperature fluxes etc…) when compared to typically stationary engine.
[87] *Supra* note 52.
[88] *See* https://www.energy.gov/sites/default/files/2022-08/offshore_wind_market_report_2022.pdf.

currently available to the offshore wind industry. The applicant has agreed to utilize Scenario 2 vessels that are certified to the highest applicable EPA Tier Marine Engine Standards (i.e., Tier 3 or 4, depending on engine size) at 40 C.F.R. Part 1042. In the case that a vessel certified to the highest applicable EPA Tier Marine Engine Standard (depending on engine size) is not available within two hours of when the vessel must be deployed, the permittee will be allowed to utilize Marine Engines on Vessels certified to the next highest applicable EPA Tier Marine Engine Standards (i.e., as an example Tier 3 or Tier 2). Similarly, if the total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s), the permittee will be authorized to use the next lower Tier engine(s). When determining the total emissions associated with the use of a vessel with a particular engine, the permittee will include the emissions of the vessel that would occur when the vessel would be in transit to the WDA from the vessel's starting location. With these considerations, Option 2 for Scenario 2 is considered available.

At a minimum, all engines subject to this condition shall comply with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards. In no event will the marine engines on applicable vessels covered in Scenario 2 be allowed emit more than the Tier 2 emission limits at 40 C.F.R. Part 1042, Appendix I. This ensures that the Project's OCS sources will meet the most stringent NO_X and VOC emission rates contained in the California SIP.

Option 4 – Tier 1 and earlier engines in meeting the vessel types contained within the CA SIP must be brought into compliance with emission limits equal to or cleaner than EPA Tier 2 marine engine emission standards through engine replacement, modification, or retrofit. Since this requirement has been demonstrated to be feasible within the SIP limitations for similar class of sources, Option 4 for Scenario 2 is considered technically feasible.

Therefore, retrofitting and/or modifying existing pre-Tier 1 or Tier 1 marine engines to comply with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards is also applicable since the SIP limitations is for similar class of sources. The Commercial Harbor Craft Regulation requires the eventual replacement or cleanup of pre-Tier 1 or Tier 1 engines used in ferries, excursion vessels, tugboats, towboats, push boats, crew and supply vessels, barge, and dredge vessels. Under 17 CCR § 93118.5(e)(6), Tier 1 and earlier engines in these vessel types must be brought into compliance with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards through engine replacement, modification, or retrofit by the dates provided in the compliance schedules.

While EPA acknowledges that the procurement of the vessels for purposes of conducting the work on the project (short-term) is ultimately the responsibility of the facility, it is not feasible for RW to require the retrofit of specific third-party vessel engines to meet the highest tier standards for a short-term construction project. This would prevent RW from being able to substitute vessels on short notice due to schedule changes or other construction issues. However, the most stringent emissions limitation contained in any California SIP has been demonstrated for this category of stationary source.

Therefore, the project will require, at a minimum, that all marine engines on vessels subject to regulation comply with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards for the vessels associated with Scenario 2. In no event will the marine

engines on vessels covered in Scenario 2 be allowed emit more than the Tier 2 emission limits at 40 C.F.R. Part 1042, Appendix I. This ensures that the Project's OCS sources will meet the most stringent NO_X and VOC emission rates contained in the California SIP.

EUG 2 – Scenario 3 – Third-party-contracted U.S. flagged or foreign-flagged vessels proposed with the project and regulated under MARPOL Annex VI, where the availability of the vessel type at the time of the application is unknown.

Option 1 – Good combustion practices entail operating the engine according to the manufacturer's recommendations and generally accepted industry practices. Since this practice is "demonstrated and operated" this potential BACT option is technically feasible.

Option 3 –Marine vessels that are certified to the highest applicable MARPOL Annex VI Tier NO_X emission limits are assessed for technical feasibility in terms of applicability and availability. With certain considerations given for vessel availability, Option 3 for Scenario 3 is considered technically feasible.

Restricting the use of marine engines to only those which are certified to the highest applicable Tier Standards for Marine Engine is not a technically feasible option for the RW project. EPA has concluded that the "*availability*" of the options via commercial channels is the limiting factor. EPA acknowledges the "*applicability*" of the add on control technologies[89] when applied to marine engines as technically viable options based on chemical, physical, and engineering principles. Therefore, it is proposed that the project will not eliminate the use of vessels with the highest tiered marine engines, however the use of the next lowest tiered vessel should be allowable in instances where a higher tiered vessel is not available at the time of deployment.

Applicable

As of the release of this fact sheet, the IMO's MARPOL Annex VI Tier III NO_X emission standards for marine vessel engines in Emission Control Areas are fully in effect, and U.S. EPA has not adopted more stringent certification standards. The Annex VI requirements apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. Vessels that operate only domestically are exempt from the NO_X limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder. Foreign-flagged vessels are exempt from having to meet the marine standards within 40 C.F.R. Part 1042 and are required to meet the emission standards in 40 C.F.R. §1043.The NO_X emission standards for domestic Category 3 marine engines contained in 40 C.F.R. Part 1042.104 are nearly identical to the IMO's MARPOL Annex VI Tier I, II, and III NO_X emission standards for marine vessel engines in Emission Control Areas (except for a slight variation in model years). Like the marine engine and nonroad engine emission standards, the Annex VI emission standards are structured as a tiered progression (Tiers 1 through 3), with each Tier of emission standards becoming increasingly stringent over time. Option 3 for Scenario 3 is applicable.

[89] EPA acknowledges marine engines have their own constraints (i.e., operating in a harsher environment, variable loads, temperature fluxes etc…) when compared to typically stationary engine.

Available

This scenario prompted a separate analysis based on information from RW which indicates that there will be marine vessels used in the project owned by third parties which are U.S.-flagged ships and foreign-flagged ships operating in U.S. waters otherwise not subject to the requirements of NSPS IIII (i.e., marine requirements of 40 C.F.R. Part 1042). Therefore, the predictability of vessel availability is indicated to be a large constraint to construction and operations of the RW windfarm, which inherently limits the number of vessels capable of conducting the work available at the time needed. Limitations imposed by the Jones Act[90] are also a constraint. The fleet of vessels available that can perform the construction activity is limited due to the specific vessel requirements needed for performing the work. As described in the permit application, slowing down, delaying, or extending the project's schedule to wait for a higher tiered vessel's availability would have significant implications that could prevent the project from being built because many of the larger, more specialized, vessels are in limited supply.[91]

In lieu of eliminating the use of the highest tier marine vessels altogether, EPA proposes conditions that consider the inherent limitation on the number of specialized vessels that are currently available to the offshore wind industry. The applicant has agreed to utilize Scenario 3 vessels that are certified to the highest applicable Annex VI Engine Standards (i.e., Tier III). In the case that a vessel certified to the highest applicable Annex VI Engine Standards (i.e., Tier III) is not available within two hours of when the vessel must be deployed, the permittee will be authorized to utilize Marine Engines on Vessels certified to the next highest applicable Annex VI Engine Standards (i.e., Tier II or I). Similarly, if the total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s), the permittee will be authorized to use the next lower Tier engine(s). When determining the total emissions associated with the use of a vessel with a particular engine, the permittee will include the emissions of the vessel that would occur when the vessel would be in transit to the WDA from the vessel's starting location. With these considerations, Option 3 for Scenario 3 is considered available.

(3) Step 3 – Rank remaining control technologies

GCOP is selected for all units in EUG 1 and EUG 2. Therefore, it is not represented below. The facility will be required to incorporate the GCOP into the facility SOPs and shall make the GCOP available for inspection. The GCOP should include, but not be limited to: i.) A list of combustion optimization practices and a means of verifying the practices have occurred; ii.) A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred; iii.) A list of the design choices determined to be LAER and verification that designs were implemented in the final construction.

[90] *Supra* note 52.
[91] *See* https://www.energy.gov/sites/default/files/2022-08/offshore_wind_market_report_2022.pdf.

EUG 1 - OCS Generator Engine(s) Installed on the OSS(s) and/or WTG(s)

GCOP and engines certified to the highest applicable EPA Tier Marine Engine[92] at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine[93] at 40 C.F.R. Part 1039 contain the most stringent emission limitations in the ranking (Step 3) for EUG 1.

Nitrogen Dioxide (NO_X)

Offshore Engines (RW-3, RW-4, RW-5, RW-6, RW-7, RW-8, RW-9, RW-10, RW-11, RW-14, RW-15, RW-16, RW-17, RW-18, RW-19)

- The HC + NO_X emission standard for C1 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. The Tier 4 emission standards for C1 engines are only applicable to emission units with a max power rating greater than or equal to 600 kW. The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. Therefore, for C1 engines, the Tier 3 HC + NO_X emission standard range of 5.4–5.8(g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between $19 \leq kW < 37$, the NMHC + NO_X emission standard (Tier 4) of 4.7 (g/kW-hr) represents the stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $37 \leq kW < 56$, the NMHC + NO_X emission standard of 4.7 (g/kW-hr) represents the stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $75 \leq kW < 130$, the NO_X emission standard (Tier 4) of 0.40 (g/kW-hr) represents the stringent level of emissions control required by 40 C.F.R. Part 1039.

- For engines with a power rating (kW) between $130 \leq kW < 225$, the NO_X emission standard (Tier 4) of 0.40 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

Offshore Engines (RW-1, RW-2, RW-12, RW-13)

- The HC + NO_X emission standard for C1 engines (Tier 3) ranges based on the specific displacement (L/cylinder) of the engine. The Tier 4 emission standards for C1 engines are only applicable to emission units with a maximum power rating greater than or equal to

[92] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tier 1- 4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase.

[93] Per 40 C.F.R. Part 1039, the U.S. EPA nonroad compression ignition (CI) engines have emissions standards (Tier 1, 2, 3, and 4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase.

600 kW. The applicant has not identified any offshore generator, as contained in *Table 8*, to have a maximum power rating greater than or equal to 600 kW. Therefore, for C1 engines, the Tier 3 HC + NO_X emission standard range of 5.4–5.8(g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- For engines with a power rating (kW) between 560 ≤ kW < 900, the NO_X emission standard (Tier 4) of 3.5 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1039.

EUG 2 - Marine Engines on Vessels Operating when operating as OCS Source(s)

The EPA has addressed Step 3 in detail below for the following EUG 2 operating scenarios:

- EUG 2 – Scenario 1 – Vessels regulated under 40 C.F.R. Part 1042 where RW has secured contracts and the availability of the vessel type at the time of the application is known

- EUG 2 – Scenario 2 – Third-party-contracted vessels regulated under 40 C.F.R. Part 1042 where the availability of the vessel type at the time of the application is unknown[94]

- EUG 2 - Scenario 3 – Third-party-contracted vessels proposed with the project, which could be U.S.- or foreign-flagged otherwise regulated under MARPOL Annex VI where the availability of the vessel type at the time of the application is unknown.

EUG 2 – Scenario 1

GCOP and Marine Engines on the Charybdis Vessel certified to the highest applicable EPA Tier Marine Engine Standards [95] at 40 C.F.R. Part 1042 contains the most stringent LAER in the ranking (Step 3) for EUG 2 – Scenario 1.

- RW has secured a contract to use the Charybdis Vessel (Jack-up Installation Vessel) for the WTG installation activities. The engines installed on the Charybdis vessel are Category 3 Marine Engines and will be EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NO_X and HC emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_X emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3

[94] Note that NO_2 is subject to BACT since the facility is in an NO_2 attainment area, while NO_X is subject to LAER as an ozone precursor since the facility is considered part of an ozone nonattainment area. As presented in Section VI.B, the LAER determination considers the California SIP requirements for certain types of existing marine vessels to be retrofitted to meet, at a minimum, the EPA Tier 2 Marine Engine Standards at 40 C.F.R. Part 1042. Since LAER is regulating NO_X (and therefore includes N_2O and NO_2 by proxy) it is presumed to be the more stringent requirement. For those units, the LAER (NO_X) requirements will supersede the BACT (NO_2) determination.
[95] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase.

NO_X emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

GCPP and Marine Engines on the Eco Edison Vessel certified to the highest applicable EPA Tier Marine Engine Standards [96] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 1.

If considered a Category 3 Marine Engines:

- EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, and CO, emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3 NO_x emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

If considered a Category 2 Marine Engines:

- EPA-Certified to meet the Marine Tier 4 (Category 2 Marine Engines) NOx, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C2 engines (Tier 4) the Tier 4 NO_x emission standard range of 1.8 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 HC emission standard of 0.19 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

[96] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

- The C3 engines, the Tier 4 PM emission standard of 0.04 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

GCPP and Marine Engines on the Primary Crew Transfer Vessel certified to the highest applicable EPA Tier Marine Engine Standards [97] at 40 C.F.R. Part 1042 contains the most stringent BACT emission limitations in the ranking (Step 3) for EUG 2 – Scenario 1.

If considered a Category 3 Marine Engines:

- EPA-Certified to meet the Marine Tier 3 (Category 3 Marine Engines) NOx, HC, and CO, emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C3 engines (Tier 3) ranges based on N, the maximum test speed of the engines in revolutions per minute (rpm). Therefore, for C3 engines, the Tier 3 NO_x emission standard range of 2.0–3.4 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 HC emission standard of 2.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 3 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

If considered a Category 2 Marine Engines:

- EPA-Certified to meet the Marine Tier 4 (Category 2 Marine Engines) NOx, HC, CO, and PM emission standards which represent the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The NO_x emission standard for C2 engines (Tier 4) the Tier 4 NO_x emission standard range of 1.8 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 HC emission standard of 0.19 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

- The C3 engines, the Tier 4 PM emission standard of 0.04 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

[97] Per 40 C.F.R. Part 1042, the U.S. EPA Category 1, 2, and 3 marine compression ignition (CI) engines have emissions standards (Tiers 1–4) for oxides of nitrogen (NO_X), carbon monoxide (CO), hydrocarbons (HC), and particulate matter (PM) that become progressively cleaner as Tier levels increase. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

- The C3 engines, the Tier 4 CO emission standard of 5.0 (g/kW-hr) represents the most stringent level of emissions control required by 40 C.F.R. Part 1042.

EUG 2 – Scenario 2

GCOP and engines certified to the highest applicable EPA Tier Marine Engine [58] at 40 C.F.R. Part 1042 contain the most stringent LAER emission limitations in the ranking (Step 3) for EUG 2 – Scenario 2. The project will require, at a minimum, that all marine engines on vessels subject to regulation comply with emission limits equal to or more stringent than EPA Tier 2 marine engine emission standards for the vessels associated with Scenario 2. In no event, will the marine engines on vessels covered in Scenario 2 be allowed to emit more than the Tier 2 emission limits at 40 C.F.R. Part 1042, Appendix I. This ensures that the Project's OCS sources will meet the most stringent NO_X and VOC emission rates contained in the California SIP.

EUG 2 – Scenario 3

GCOP and prioritizing engines IMO's MARPOL Annex VI Tier III NO_X emission standards for marine vessel engines in Emission Control Areas.

In the U.S., MARPOL Annex VI is implemented through the Act to Prevent Pollution from Ships (33 U.S.C. §§ 1901–1905) and 40 C.F.R. Part 1043. The Annex VI requirements apply to U.S.-flagged ships wherever located and to foreign-flagged ships operating in U.S. waters. However, vessels that operate only domestically are exempt from the NO_X limits of 40 C.F.R. Part 1043 provided that their engines meet the requirements of 40 C.F.R. Part 1042 (including Appendix I) and have a displacement of less than 30 liters per cylinder.

Table 30 Annex VI NO_X Emission Standards (g/kW-hr) 40 C.F.R. 1043.60

Tier	Area of applicability	Implementation date[a]	Maximum in-use engine speed		
			Less than 130 RPM	130-2000 RPM [b]	Over 2000 RPM
Tier I	All U.S. navigable waters and EEZ	January 1, 2004-December 31, 2010	17.0	$45.0 \cdot n^{(-0.20)}$	9.8
Tier II	All U.S. navigable waters and EEZ	January 1, 2011-December 31, 2015	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier II	All U.S. navigable waters and EEZ, excluding ECA and ECA associated areas	January 1, 2016, and later	14.4	$44.0 \cdot n^{(-0.23)}$	7.7
Tier III	ECA and ECA associated areas	January 1, 2016, and later [c]	3.4	$9.0 \cdot n^{(-0.20)}$	2.0

[a] Standards apply for engines installed on vessels with a build date in the specified time frame, or for engines that undergo a major conversion in the specified time frame.

[b] Applicable standards are calculated from n (maximum in-use engine speed, in RPM, as specified in § 1042.140). Round the standards to one decimal place.

[c] In the case of recreational vessels of less than 500 gross tonnage with length at or above 24 meters, the Tier III standards start to apply January 1, 2021.

(4) Step 4 – Evaluate most effective controls and document results

The LAER determination does not consider economic, energy, or other environmental factors. Therefore, the cost effectiveness of each control technology is not necessary for the selection of LAER.

(5) Step 5 – Select LAER

Based on the proceeding analysis, the following combination(s) are proposed as LAER for NO_X and VOC emissions from the regulated compression ignition internal combustion engines in the project.

EUG 1 - OCS Generator Engine(s) Installed on the OSS(s) and WTG(s)

OCS Generator Engine(s) installed on the OSS(s) and WTG(s) certified to the highest applicable EPA Tier Marine Engine at 40 C.F.R. Part 1042 or EPA Tier 4 Nonroad Engine at 40 C.F.R. Part 1039.

OCS Generator Engine(s) Installed on the OSS(s) and WTG(s) shall be operated in accordance with the GCOP Plan for the facility. The plan shall be incorporated into the facility SOPs and shall be made available for inspection. The plan specifically should include, but is not limited to: i.) a list of combustion optimization practices and a means of verifying the practices have occurred for each engine type based on the most recent manufacturers' specifications issued for the engines at the time that they are certified (and any updates from the manufacturer should be noted and amended in the plan); ii.) a list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred (if applicable); and iii.) a list of the design choices determined to be LAER and verification that designs were implemented in the final construction.

EUG 2 - Marine Engines on Vessels Operating when operating as OCS Source(s)

The following requirements apply to all Marine Engines on Vessels Operating when operating as OCS Source(s). This includes any propulsion and auxiliary generator engines utilized in the construction and operation phases of the project if it meets the definition of an OCS source. Specifically, where a propulsion engine would be used to supply power for purposes of performing a given stationary source function, i.e., for example to lift, support, and orient the components of each WTG during installation.

EUG 2 – All Scenarios

Marine Engines on Vessels when Operating as OCS Source(s) shall be operated in accordance with the GCOP Plan for the facility. The plan shall be incorporated into the facility SOPs and shall be made available for inspection. The plan specifically should include, but is not limited to: i.) a list of combustion optimization practices and a means of verifying the practices have occurred for each engine type based on the most recent manufacturers' specifications issued for the engines at the time that they are certified (and any updates from the manufacturer should be noted and amended in the plan); ii.) a list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred (if applicable); and iii.) a list of the design choices determined to be LAER and verification that designs were implemented in the final construction.

EUG 2 – Scenario 1

The Marine Engines on the Charybdis Vessel(s) while operating as an OCS source, which is indicated to be used (but not limited to) the WTG installation activities, shall be EPA certified to the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, and CO emission standards specified within 40 C.F.R. Part 1042.

GCOP and Marine Engines on the Eco Edison Vessel, while operating as an OCS source, which is indicated to be used as a Service Operation Vessel, shall be EPA certified to the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, and CO emission standards or Marine Tier 4 (Category 2 Marine Engines) NO_X, HC, and CO emission standards specified within 40 C.F.R. Part 1042. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

GCOP and Marine Engines on the Primary Crew Transfer Vessel, while operating as an OCS source, shall be EPA certified to the Marine Tier 3 (Category 3 Marine Engines) NO_X, HC, and CO emission standards or Marine Tier 4 (Category 2 Marine Engines) NO_X, HC, and CO emission standards specified within 40 C.F.R. Part 1042. Tier 4 emission standards apply to engine(s) at or above 600 kW, and Tier 3 emission standards apply to engine(s) below 600 kW.

EUG 2 – Scenario 2(i) and (ii)

(2)(i) Engines on vessels while operating as OCS sources that satisfy the definition of a *tugboat, towboat, push boat, crew and supply vessel, dredge,* or *barge* (as defined in Section III and which do not meet definition of an "*exempt vessel*" (as defined in Section III) shall be certified to the highest applicable EPA Tier Marine Engine Standards (i.e., Tier 3 or 4, depending on engine size) as contained within 40 C.F.R. Part 1042, except if one of the conditions in subparagraph 4.a. or 4.b., below, is met, in which case the Permittee may use the next lower Tier engine (i.e., Tier 3). Similarly, if one of the conditions in Section IV(C)(iii)(a.) or (b.), below, is met regarding the use of a Tier 4 engine, the Permittee may use a Tier 3 engine in lieu of a Tier 4 engine. If one of the conditions in Section IV(C)(iii)(a.) or (b.) is met regarding the use of a Tier 3 engine, the Permittee may use a Tier 2 engine in lieu of a Tier 3 engine. To use a lesser Tier engine, as described above, the Permittee shall ensure one of the following conditions is met:

a. A vessel with a higher Tier engine is not available within two hours of when the vessel must be deployed; or

b. The total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s). 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 WDA from the vessel's starting location.

At a minimum, all applicable engines subject to this condition shall comply with emission standards (in terms of g/kW-hr) equal to or cleaner than EPA Tier 2 marine engine emission standards contained within 40 C.F.R. Part 1042.

2 (ii) All applicable engines on U.S.-flagged vessels when operating as OCS source(s), and otherwise not subject to scenario 1, 2(i) or 3, shall be certified to the highest applicable EPA Tier Marine Engine Standards (i.e., Tier 3 or 4, depending on engine size) as contained within 40 C.F.R. Part 1042, except if one of the conditions in subparagraph 4.a. or 4.b., below, is met, in which case the Permittee may use the next lower Tier engine (i.e., Tier 3). Similarly, if one of the conditions in (a.) or (b.), below, is met regarding the use of a Tier 4 engine, the Permittee may use a Tier 3 engine in lieu of a Tier 4 engine. If one of the conditions in (a.) or (b.) is met regarding the use of a Tier 3 engine, the Permittee may use a Tier 2 engine in lieu of a Tier 3 engine. If one of the conditions in (a.) or (b.) is met regarding the use of a Tier 2 engine, the Permittee may use a Tier 1 engine in lieu of a Tier 2 engine. To use a lesser Tier engine, as described above, Permittee shall ensure one of the following conditions is met:

a) A vessel with a higher Tier engine is not available within two hours of when the vessel must be deployed; or

b) The total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s). 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 WDA from the vessel's starting location.

At a minimum, all applicable engines subject to this condition shall comply with emission standards (in terms of g/kW-hr) equal to or cleaner than EPA Tier 1 marine engine emission standards contained within 40 C.F.R. Part 1042.

EUG 2 - Scenario 3

All applicable engines on U.S.-flagged or foreign-flagged vessels while those vessels are operating as an OCS source within the ECA (and otherwise not subject to Section IV (C)(ii), (iii) or (iv), shall be certified to meet or emit less than the MARPOL Annex VI Tier III NO_X emission standards (in terms of g/kW-hr), except if one of the conditions in Section IV(C)(v)(a.) or (b.) below, is met, in which case the Permittee may use the next lower Tier engine (i.e., Tier II). Similarly, if one of the conditions in Section IV(C)(v)(a.) or (b.), below, is met regarding the use of a Tier II engine, the Permittee may use a Tier I engine in lieu of a Tier II engine. To use a

lesser Tier engine, as described above, Permittee shall ensure one of the following conditions is met:

a) A vessel with a higher Tier is not available within two hours of when the vessel must be deployed; or
b) The total emissions associated with the use of a vessel with the higher Tier engine(s) would be greater than the total emissions associated with the use of the vessel with the next lower Tier engine(s). 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 WDA from the vessel's starting location.

At a minimum, all applicable engines subject to this condition shall comply with emission standards (in terms of g/kW-hr) equal to or cleaner than MARPOL Annex VI Tier I NO_X emission standards contained within 40 C.F.R. Part 1043.

C. Offset Requirements

Emissions during the construction phase for the project will end when construction and commissioning is completed, and the operational phase begins as defined in the draft permit. EPA and state/local permitting authorities implementing the NNSR program have interpreted the NNSR CAA requirements as only requiring offsets for operating emissions, not construction emissions. This is supported by text in the Clean Air Act and is reflected in EPA regulations. The project will have emissions that are anticipated to occur every year the wind farm operates after the wind farm commences commercial operations. To offset operating emissions, the draft permit requires a continuous emission reduction credit (CERC"), or simply an ERC, which is referred to as a rate-based ERC in 310 CMR 7.00, Appendix B. The unit used to define a rate-based ERC is in tons per year, to recognize that the emission credit can offset yearly emissions that will occur each operating year of the source. The application of the NNSR offset requirements to operating emissions is consistent with the applicable statutes and permitting regulations, as well as the practice implemented by state and local NNSR programs.

The Operational Phase Start Date is defined as the date RW identifies in its notice to BOEM, pursuant to 30 C.F.R. §585.636, that the windfarm will commence commercial operations. The permit requires RW to obtain offsets for operating emissions prior to the beginning of the operational phase.

Per 310 CMR 7.00, *Appendix A*, Section 6(e)(1), offsets for the operational phase of the project are subject to the adjustment factor of 1.2:1 for VOC or NO_X. In addition, per the requirement of 310 CMR 7.00, Appendix B, Section 3(e)(2), persons seeking to use ERCs from the Massachusetts ERC bank must obtain an amount of credit equal to five (5) percent (%) more than the amount needed for the offset calculation, this results in a 1.26:1 offset ratio.

Based on the potential emissions from the operational phase of the project, the offsets required for the RW project are presented below.

Table *31* Maximum NO_X Offsets Needed for Operational Phase of Project (assuming a 1.26:1 offset ratio)

Project Phase	NO_X Emissions	NO_X Offsets Needed	Units
Operation and Maintenance	211	265.86*	tons per year

* 253.2 tpy (adjustment factor of 1.2:1)

Table *32* Maximum VOC Offsets Needed for Operational Phase of Project (assuming a 1.26:1 offset ratio)

Project Phase	VOC Emissions	VOC Offsets Needed	Units
Operation and Maintenance	5.1	6.43**	tons per year

** 6.12 tpy (adjustment factor of 1.2:1)

RW can obtain rate-based offsets in the following manner:

- Purchasing ERCs identified in the Massachusetts ERC bank which have been created in accordance with 310 CMR 7.00, *Appendix B*. *Appendix B* allows companies to certify emission reductions by over-controlling their emissions, shutting down emission units or entire facilities, or taking enforceable restrictions on their operations that lead to emission reductions. 310 CMR 7.00, *Appendix B* was approved into the Massachusetts state implementation plan on August 8, 1996. *See* 61 Fed. Reg. 41335[98]. Thus, ERCs in the Massachusetts ERC bank are federally enforceable.

- Enter into a third-party agreement that requires the third-party to lower its emissions. Such an agreement would need to be made federally enforceable prior to issuance of the final permit for RW; or,

- From a facility that has ceased operations and had its CAA permits revoked or rescinded and has not had the resulting emissions reductions certified under the Massachusetts trading bank regulations under 310 CMR 7.00, *Appendix B*. Offsets obtained in this manner must be memorialized in a document from the Commonwealth of Massachusetts to ensure that the offsets from such a shutdown are fully in compliance with the CAA and have not been relied on by Massachusetts to meet other CAA requirements. Once the offsets are used by a source pursuant to this option, the offsets would be retired and would no longer be available to be used by another company, or by the Commonwealth in meeting another CAA requirement.

NNSR offsets are required to be obtained from sources within the same nonattainment area or may be obtained from another area if two criteria are met. *See* 310 CMR 7.00, *Appendix A*(6)(b). Based on 2014 emission data from the EPA's National Emission Inventory database, total anthropogenic NO_X emissions in Dukes County were 1,034 tons. Due to the lack of availability of potential NO_X offsets (i.e., ERCs) within the Dukes County 2008 ozone nonattainment area, the EPA anticipates that RW will obtain NNSR offsets using ERCs from another classified area. The two criteria that must be met when obtaining NNSR offsets from another classified area are:

1. The other area has an equal or higher nonattainment classification than the area in which the source is located; and

2. Where the proposed new source or modified source is located in a nonattainment area, emissions from such other area contribute to a violation of a national ambient air quality standard in the nonattainment area in which the proposed new or modified source would construct.

Areas within the OTR are required to meet the requirements of a moderate nonattainment area, regardless of whether the area is classified as marginal nonattainment or unclassifiable/attainment. Even though all areas within Massachusetts, outside of Dukes County, were designated unclassifiable/attainment for the 2008 ozone standard.[99] NNSR offsets from sources within Massachusetts meet the first criterion since all the Commonwealth is required to meet the nonattainment requirements of a moderate nonattainment area.[100] The second criterion requires a demonstration that emissions from the other area contributes to a violation of the ozone standard within Dukes County.[101] Based on recent air dispersion modeling that EPA conducted to assist states with their ozone transport analysis for the 2015 ozone NAAQS, sources within Massachusetts are projected to contribute 10.54 ppb ozone in Dukes County in 2023.[102] Therefore, with both criteria met, the EPA is determining that RW can obtain offsets from anywhere within Massachusetts.

If offsets were obtained from another state, a separate analysis would need to be performed and submitted to the EPA and concurred upon prior to relying on those offsets for compliance with offset obligations.

1. Compliance Demonstration

For nonattainment pollutants, the OCS source will have to obtain offsets as required by the COA, as presented in *Table 31* and *Table 32.* To ensure the appropriate amount of NNSR offsets are obtained from the OCS source, EPA has determined that daily emissions tracking is necessary and appropriate due to the daily variability in vessel emissions from the OCS source.

The averaging period associated with the emission limits will be a daily rolling, 365-day total. The daily rolling, 365-day total for NO_X and VOC allows the facility the benefit and flexibility to operate vessels as it needs during operation while the daily emission calculations ensure that NO_X and VOC offsets for the operational phase of the project are properly accounted for. *See* Permit No. OCS-R1-05.

[99] All of Massachusetts is designated attainment/unclassifiable for the 2015 ozone standard, a standard that is more stringent than the 2008 ozone standard. *See* 40 C.F.R. § 81.322.
[100] The EPA notes that 310 CMR 7.00, Appendix A requires new or modified sources of NO_X and VOC to meet the requirement of NNSR as if the source were being located in a serious nonattainment area
[101] The EPA determined that Dukes County attained the 2008 ozone standard by the July 20, 2015 attainment date (*See* 81 Fed. Reg. 26697, May 4, 2016).
[102] *See* https://www.epa.gov/airmarkets/memo-and-supplemental-information-regarding-interstate-transport-sips-2015-ozone-naaqs, last visited on October 19, 2021. The 2015 NAAQS Interstate Transport Assessment Design Values and Contributions spreadsheet can be found in the docket.

The BACT and LAER specific conditions of the permit require each engine utilized on the project to be certified to one (1) of the following: the NO_X emission standards under EPA Tier Marine Engine Standards at 40 C.F.R. Part 1042, EPA Nonroad Engine Standards at 40 C.F.R. Part 1039, U.S.-flagged vessels must have an Engine International Air Pollution Prevention (EIAPP) certificate, issued by EPA, to document that the engine meets Annex VI NO_X standards, and foreign-flagged vessels must have an International Air Pollution Prevention Certificate (IAPP").

Note that the Annex VI regulations do not require certification to a HC or VOC emissions standards. Therefore, the specific conditions require that for those cases, the permittee shall use manufacturing specifications (for any given engine) when a HC or VOC emission factors are given. If the engine manufacture specifications do not contain HC or VOC emission factors, permittee shall then utilize the most representative VOC emissions factors for the vessel utilized as contained in the EPA Ports Emissions Inventory Guidance (EPA-420-B-22-011, April 2022).

D. Alternative Site Analysis

The location of the Rhode Island/Massachusetts Wind Energy Area (RI-MA WEA) has two lease areas (North Lease OCS-A 0486 and South Lease OCS-A 0487). The RW project is located within the Lease Area OCS-A 0486. The South Fork Wind project is located within the Lease Area OCS-A-0487. The lease area auction and siting decisions by BOEM were the result of a multi-year effort by state and federal regulatory agencies to identify OCS areas suitable for offshore renewable energy development. An extensive review of site characterization data and the assessment of potential impacts was conducted, including environmental, economic, cultural, and visual resources, and use conflicts.

Alternative siting considerations are addressed extensively around BOEM's approval of the surrounding lease areas for the industry as outlined in the Construction and Operations Plan (COP) (07/22) for the project. EPA finds that RW sufficiently satisfied the requirements of the alternative site analysis for the purposes of NNSR and 310 CMR 7.00, *Appendix A*, Section (8)(b) for this project by relying on the analysis outlined in the COP that weighed the necessary environmental, economic, cultural, and social factors and determined the best location for this project considering those factors.

E. Nonattainment NSR Compliance Certification

Certification that all major facilities owned or operated in the state are in compliance or on a schedule for compliance with all applicable emissions limitations. RW meets this requirement because the South Fork Wind project has not begun activities subject to its OCS air permit and no other facilities are owned or operated by RW in the COA.

VII. Other COA Emission Control Requirements

As previously stated, the COA for the windfarm is the Commonwealth of Massachusetts. Thus, the project is subject to applicable provisions of the Massachusetts air pollution control regulations which are codified at 310 CMR 4.00 (Timely Action Schedule and Fee Provisions), 6.00 (Ambient Air Quality Standards for the Commonwealth of Massachusetts), 7.00 (Air Pollution Control), and 8.00 (The Prevention and/or Abatement of Air Pollution Episode and Air Pollution Incident emergencies). These Massachusetts regulations are incorporated by reference in 40 C.F.R. Part 55, Appendix A. This section identifies which Massachusetts regulations incorporated into Appendix A apply to the windfarm, including the vessels that meet the definition of an OCS vessel and which regulations result in terms and condition(s) specified in Permit No. OCS-R1-05.

For the purposes of fulfilling requirements for pollutants below major source thresholds but above the state's minor source permitting or plan approval threshold, a BACT determination[103] is made below for sulfur dioxide (SO_2). *See* Section VII.

310 CMR 7.00 contains the following definitions, which are important to note when assessing the regulatory requirements of the COA.

Building, Structure, Facility, or Installation means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Any marine vessel is a part of a facility while docked at the facility. Any marine vessel is a part of an OCS source while docked at and within 25 nm en route to and from the OCS source.

Marine Vessel means any tugboat, tanker, freighter, barge, passenger ship, or any other boat, ship, or watercraft except those used primarily for recreation.

Stationary Source means any building, structure, facility, or installation which emits, or which may emit any air pollutant subject to regulation under the Act.

a) A stationary source may consist of one or more emissions units, and
    1. may be a land-based point or area source; or
    2. may be located in, or on, the OCS or other submerged lands beneath navigable waters (lakes, rivers, and coastal waters adjacent to Outer Continental Shelf lands); or
    3. may be any internal combustion engine, or engine combination, greater than 175 horsepower (hp) used for any stationary application; or
    4. may be any internal combustion engine regulated under Sec. 111 (NSPS) of the Act, regardless of size; or
    5. may be any internal combustion engine of less than 175 horsepower (hp) not actually controlled to meet a regulation under Sec. 213 (Nonroad Engines and Vehicles) of the Act.
b) A stationary source does not include:

[103] In accordance with MassDEP's BACT guidance document https://www.mass.gov/doc/best-available-control-technology-bact-guidance/download

1. emissions resulting directly from an internal combustion engine for transportation purposes; or

2. tailpipe emissions from any source regulated under title II of the Act or any emissions from in-transit, non-OCS marine vessels.

Fuel Utilization Facility means any furnace(s), fuel burning equipment, boiler(s), space heaters or any appurtenance thereto used for the burning of fuels, for the emission of products of combustion, or in connection with any process which generates heat and emits products of combustion but does not mean a motor vehicle or an incinerator.

Distillate Fuel Oil means No. 1 or No. 2 fuel oil.

*Residual Fuel Oil m*eans No. 4, No. 5, or No. 6 fuel oil.

A. 310 CMR 7.02: Plan Approval and Emission Limitations

The project must meet the requirements for a comprehensive plan approval (CPA) under 310 CMR 7.02(5)(a)(7). To comply with a CPA, Massachusetts' regulations indicate that a BACT analysis. *See* 310 CMR 7.02(8)(a)(2).

Project emissions for SO_2 fall below PSD applicability thresholds but above thresholds for sources subject to Massachusetts minor NSR permitting and thus require a BACT analysis,[104] whereas emissions for lead fall below Massachusetts' permitting and plan approval thresholds.[105]

State BACT requirements derived from Massachusetts's regulations apply for SO_2. Massachusetts BACT analysis utilizes the federal methodology procedure in that the same five-step elimination of air pollution control technologies and strategies is performed to arrive at the selected emission limit for the project, as described above in Section V.C. In some cases, sources may be subject to a "top case BACT" emission limit[106] where the technology has been demonstrated to be effective for a source from the same industrial sector in the state. For unique sources such as this windfarm, EPA does not believe "top case BACT" should be applied, and EPA is applying the top-down BACT determination process as described in Section V.C. *See* 310 CMR 7.02(8)(a)2.c.

[104] 310 CMR 7.02(8)(a)(2) stipulates that a BACT analysis per state guidance is required for all plan approvals, i.e., comprehensive and limited plan approvals covering either major or minor sources emitting above the "significance" threshold for an air pollutant.

[105] In Massachusetts, a comprehensive plan approval is required for "any facility where the construction, substantial reconstruction, alteration or subsequent operation would result in an increase in potential emissions of a single air contaminant equal to or greater than ten tons per year, calculated over any consecutive 12-month time period." *See* 310 CMR 7.02(5)(a)(1). A limited plan approval is required for "any facility where the construction, substantial reconstruction, alteration or subsequent operation would result in an increase in potential emissions of a single air contaminant equal to or greater than one ton per year and less than ten tons per year, calculated over any consecutive 12-month time period." *See* 310 CMR 7.02(4)(a).

[106] *See* MassDEP's "Top Case Best Available Control Technology (BACT) Guidelines" at https://www.mass.gov/doc/top-case-bact-guidelines/download. THIS SHOULD BE PUT IN THE DOCKET.

1. SO_2 State BACT

In no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 C.F.R. Parts 60 and 61. SO_2 State BACT is proposed to be equivalent to the fuel sulfur content requirement to utilize ULSD fuel as required in 40 C.F.R. Part 60, Subpart IIII ULSD and ECA compliant marine fuel as contained in 40 C.F.R. 1090, depending on engine type.

Per the requirements of 40 C.F.R. Part 1090.325, sulfur content in fuel is restricted to using ULSD (at 15 ppm sulfur content) for all non-Category 3 marine engines and nonroad engines. ECA marine fuel must meet the 1000 ppm sulfur content limit for fuel used in category 3 vessels operating in ECAs. BACT also includes prioritizing the use of ULSD in Category 3 marine engines in lieu of ECA-compliant 1,000 ppm sulfur marine diesel fuel when it is feasible to do so. If ULSD is determined not feasible for use in Category 3 marine engines, the fuel sulfur limits of 1,000 ppm that apply to ships operating in specially designated ECAs is presumed to satisfy SO_2 State BACT.

B. 310 CMR 7.05: Fuels All Districts

310 CMR 7.05(1)(a)(1) specifies that no person owning, leasing, or controlling the operation of a fossil fuel utilization facility shall cause, suffer, allow or permit the burning therein of any liquid fossil fuel having a sulfur content in excess of that listed in 310 CMR 7.05(1)(a)1.: Table 1 and in accordance with the associated timelines contained in the same table. For distillate oil (statewide), the sulfur content is restricted to 15 ppm which is equivalent to the fuel sulfur content requirement to utilize ULSD as contained in 40 C.F.R. Part 60, Subpart IIII.

310 CMR 7.05(1)(a)(3) specifies that on and after July 1, 2007, no person owning, leasing or controlling a stationary engine or turbine subject to the requirements of 310 CMR 7.02(8)(i), 310 CMR 7.03(10), or 310 CMR 7.26(40) through (44) shall accept for delivery for burning any diesel or other fuel unless said fuel complies with the applicable U.S. Environmental Protection Agency sulfur limits for fuel pursuant to 40 C.F.R. 80.29, 40 C.F.R. 80.500, and 40 C.F.R. 80.520(a) and (b) as in effect January 18, 2001.

EPA notes that the fuel regulations, previously within 40 C.F.R. Part 80, have been incorporated into 40 C.F.R. Part 1090 as of January 1, 2022. Per the definitions contained within 310 CMR 7.00, a marine vessel is considered to be an OCS source while docked at and/or within 25 nm en route to and from the OCS source. Therefore, any marine vessels that meet the definition of an OCS are subject to this subpart when operating in the manner specified. All engines installed on WTGs or OSSs are also subject to the requirements of this section. All requirements contained in this regulation have been incorporated into the permit.

C. 310 CMR 7.06: Visible Emissions

310 CMR 7.06(1)(a) No person shall cause, suffer, allow, or permit the emission of smoke which has a shade, density, or appearance equal to or greater than No. 1 of the [Ringlemann Scale]

Chart for a period, or aggregate period of time in excess of six minutes during any one hour, provided that at no time during the said six minutes shall the shade, density, or appearance be equal to or greater than No. 2 of the Chart.

310 CMR 7.06(1)(b) No person shall cause, suffer, allow or permit the operation of a facility so as to emit contaminant(s), exclusive of uncombined water or smoke subject to 310 CMR 7.06(1)(a) of such opacity which, in the opinion of the Department, could be reasonably controlled through the application of modern technology of control and a good Standard Operating Procedure, and in no case, shall exceed 20% opacity for a period or aggregate period of time in excess of two minutes during any one hour provided that, at no time during the said two minutes shall the opacity exceed 40%.

310 CMR 7.06(3) contain specific requirements that apply to marine vessels. All tailpipe emissions from OCS marine vessels (in-transit and when docked), and offshore engines installed on the WTGs and/or OSSs are subject to the visible emission standards contained in this section. Note that tailpipe emissions from any source regulated under Title II of the Act or any emissions from in-transit, non-OCS marine vessels are not subject to the requirements of this subpart. specifies that marine vessels shall be subject to the provisions of 310 CMR 7.06(1)(a) and 7.06(1)(b). 310 CMR 7.06(3) shall apply only in the Merrimack Valley Air Pollution Control District, Metropolitan Boston Air Pollution Control District, and the Southeastern Massachusetts Air Pollution Control District.

310 CMR 7.06(6) specifies that no person shall cause, suffer, allow, or permit excessive emission of visible air contaminants, other than water, from non-stationary source diesel engines. All requirements contained in this regulation have been incorporated into the permit.

D. 310 CMR 7.11: Transportation Media

310 CMR 7.11(4) contains specific requirements for Marine Vessels. No person owning, operating, or having control of a seagoing vessel while it is in the district shall cause, suffer, allow, or permit, aboard said vessel, tube blowing or soot removal activities that cause or contribute to a condition of air pollution. 310 CMR 7.11 shall apply only in the Merrimack Valley Air Pollution Control District, Metropolitan Boston Air Pollution Control District, and the Southeastern Massachusetts Air Pollution Control District. All requirements contained in this regulation have been incorporated into the permit.

E. 310 CMR 7.12: Source Registration

310 CMR 7.12 requires owners/operators of facilities to submit an annual source registration to Massachusetts. Per 310 CMR 7.12(1), the regulations apply to any owner/operator of a facility if such facility meets any of the criteria in 310 CMR 7.12(1)(a)1 through 11. This facility meets criteria 6, 7, and 11 and is subject to the requirements of this section. All requirements contained in this regulation have been incorporated into the permit.

F. 310 CMR 7.18: Volatile and Halogenated Organic Compounds

The purpose of 310 CMR 7.18 (30) is to limit VOCs in adhesive, sealant, adhesive primer, or sealant primer. The RW project has potential to use adhesive, sealant, adhesive primer, or sealant primer and thus could become subject to the standards contained this section. Per 310 CMR 7.18(30)(4), if the total facility-wide VOC emissions from all adhesives, sealants, adhesive primers, and sealant primers used are less than 200 pounds per calendar year, or an equivalent volume, the facility is exempt from the requirement of 310 CMR 7.18(30)(c)3 and 5. Any person claiming this exemption shall maintain sufficient monthly operational records in accordance with 310 CMR 7.18(30)(e) to demonstrate compliance with this exemption. All requirements contained in this regulation have been incorporated into the permit.

G. 310 CMR 7.72: SF_6

The purpose of 310 CMR 7.72 is to assist the Commonwealth in achieving the greenhouse gas emissions reduction goals by reducing sulfur hexafluoride (SF_6) emissions from GIS through the imposition of declining annual aggregate emission limits and other measures on GIS. All requirements contained in this regulation have been incorporated into the permit.

Per 310 CMR 7.72 (4)(a), Any newly manufactured GIS that is placed under the ownership, lease, operation, or control of any GIS owner on or after January 1, 2015, must be represented by the manufacturer to have a 1.0% maximum annual leak rate.

- The applicant has accepted a best achievable control technology limit of a maximum annual leak rate not to exceed 0.5%, which is more stringent that the requirement contained in 310 CMR 7.72 (4)(a). See Section V.C.2.a(4).

Per 310 CMR 7.72 (4)(b), any GIS owner that places GIS under ownership, lease, operation, or control on or after January 1, 2015, shall comply with any manufacturer-recommended maintenance procedures or industry best practices that have the effect of reducing leakage of SF_6.

- The applicant has a BACT limit of a sealed system with leak detection and alarms and a commitment to repair detected leaks within 5 days of discovery, which complies with the requirement contained in 310 CMR 7.72 (4)(a). See Section V.C.2.a(4).

The facility may be required to comply with all annual reporting requirements contained in 310 CMR 7.72 (6), including but not limited to, the number of pounds of SF_6 emitted from GIS equipment owned, leased, operated, or controlled by the federal reporting GIS owner and located in Massachusetts during the year, using the equation specified in 40 C.F.R. §98.303 if 40 C.F.R. Part 98 subpart DD applies.

User Emissions = (Decrease in SF_6 Inventory) + (Acquisitions of SF_6) – (Disbursements of SF_6) – (Net Increase in Total Nameplate Capacity of Equipment Operated)

(Eq. DD-1)

Figure 5 - Calculate the annual SF_6 emissions using the mass-balance approach

Where:

Decrease in SF_6 Inventory = (pounds of SF_6 stored in containers, but not in energized equipment, at the beginning of the year) − (pounds of SF_6 stored in containers, but not in energized equipment, at the end of the year).

Acquisitions of SF_6 = (pounds of SF_6 purchased from chemical producers or distributors in bulk) + (pounds of SF_6 purchased from equipment manufacturers or distributors with or inside equipment, including hermetically sealed-pressure switchgear) + (pounds of SF_6 returned to facility after off-site recycling).

Disbursements of SF_6 = (pounds of SF_6 in bulk and contained in equipment that is sold to other entities) + (pounds of SF_6 returned to suppliers) + (pounds of SF_6 sent off site for recycling) + (pounds of SF_6 sent off-site for destruction).

Net Increase in Total Nameplate Capacity of Equipment Operated = (The Nameplate Capacity of new equipment in pounds, including hermetically sealed-pressure switchgear) − (Nameplate Capacity of retiring equipment in pounds, including hermetically sealed-pressure switchgear).

Note that Nameplate Capacity refers to the full and proper charge of equipment rather than to the actual charge, which may reflect leakage.

VIII. Other Federal Requirements

Pursuant to 40 C.F.R. §55.13(c), NSPS apply to OCS sources in the same manner as in the COA. The broad definition of OCS source contained in the OCS Air Regulations require that some marine vessel engines and offshore construction equipment (which are typically not considered stationary sources) be subject to NSPS IIII. Similarly, 40 C.F.R. Part 61, together with any other provisions promulgated pursuant to section 112 of the Act, e.g., Part 63 standards, apply to OCS sources in the same manner as in the COA. The broad definition of OCS source contained in the OCS Air Regulations require that some marine vessel engines and offshore construction equipment (which are typically not considered stationary sources) be subject to 40 C.F.R. Part 63 subpart ZZZZ (NESHAP ZZZZ).

A. New Source Performance Standards (NSPS)

Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Subpart IIII affects stationary CI ICE based on power and displacement ratings, depending on date of construction, beginning with those constructed after July 11, 2005. NSPS IIII contains a set of technology-based federal standards that apply to specific categories of stationary sources of air pollution.

RW expects nearly all engines on the Project's OCS sources to be non-emergency compression-ignition internal combustion engines.

The Project may require emergency generators to provide secondary back-up power to the WTGs during O&M in the unlikely event of a failure of the primary and secondary power sources. To be considered an emergency stationary internal combustion engine, it must satisfy the criteria within 40 C.F.R. Parts 60.4219 and 60.4211(f).[107]

The EPA recognizes in its NSPS that an owner of a stationary source in a marine environment (non-emergency and emergency) can certify its engine based on the marine engine requirements at 40 C.F.R. Part 1042 (including Appendix I) rather than the nonroad engine requirements at 40 C.F.R. Part 1039 (including Appendix I) (*see* 40 C.F.R. § 60.4201(f)(2)).

The Proponent will comply with 40 C.F.R. Part 60, Subpart IIII by using engines on the WTGs, OSS[s], and vessels operating as OCS sources that are certified by the manufacturer to meet the applicable emission standards in Subpart IIII, by complying with the work practice standards specified in Subpart IIII (as applicable), and by burning fuel that meets the sulfur content requirements and other specifications in 40 C.F.R. §60.4207. The Proponent notes that foreign-flagged vessels are exempt from having to meet the marine standards within 40 C.F.R. Part 1042 (including Appendix I) and instead are required to meet the emission standards in 40 C.F.R. § 1043. *See Section VIII.C* for additional discussion of EPA and MARPOL Annex VI emission standards and fuel sulfur content requirements for marine engines.

40 C.F.R. Part 1042 sets NO_X, HC, PM, and CO emission standards and certification requirements for Category 1, Category 2, and Category 3 marine diesel engines installed on U.S.-flagged vessels. The emission standards are structured as a tiered progression (Tiers 1 through 4), with each Tier of emission standards becoming increasingly stringent over time. The exact emission limits (in g/kW-hr) that apply to each engine depend on the engine's size, displacement, speed, and/or power density.

Per 40 C.F.R. Part 1042, Category 1 marine engines have a displacement of less than 7 liters per cylinder and Category 2 marine engines have a displacement greater than or equal to 7 liters per cylinder and less than 30 liters per cylinder. However, in 40 C.F.R. Part 1042, Appendix I, engines with a displacement between 5 and 7 liters per cylinder are considered Category 2 rather than Category 1 marine engines. Category 3 marine engines have a displacement at or above 30 liters per cylinder. The NO_X emission limits for Category 3 engines at 40 C.F.R. Part 1042 are the same as the NO_X emission standards under 40 C.F.R. Part 1043. See the document within the docket for this permit, *Federal Marine Compression-Ignition (CI) Engines: Exhaust Emission Standards* (EPA-420-B-20-021, July 2020).

[107] (1) Must only operate for emergencies, maintenance, and testing, and no more than 50 hours per year in non-emergency situations. (2) Must operate no more than 100 hours per year for maintenance checks, readiness testing, and non-emergency situations (limited to 50 hours per year). (3) Cannot be used for peak shaving or non-emergency demand response, or to generate income for a facility to an electric grid or otherwise supply power as part of a financial arrangement with another entity, except as described in 40 C.F.R. 60.4211(f)(3)(i). There is no time limit on the use of emergency stationary internal combustion engines in emergency situations (*see* 40 C.F.R. § 60.4211(f)(1)).

B. National Emission Standards for Hazardous Air Pollutants

Subpart ZZZZ, Reciprocating Internal Combustion Engines. This subpart establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. An affected source is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand.

RW expects nearly all engines on the Project's OCS sources to be non-emergency compression-ignition internal combustion engines, and RW is considered an area source of HAP.

The project's CI-ICE that become OCS sources and were built or reconstructed after June 12, 2006, are considered "a new or reconstructed stationary RICE located at an area source." Per 40 C.F.R. 63.6590(c), An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this part by meeting the requirements of 40 C.F.R. Part 60 subpart IIII, for compression ignition engines. Therefore, RICEs that become OCS sources and were built or reconstructed after June 12, 2006, must meet the requirements of NSPS IIII and are not subject to any further requirements under NESHAP ZZZZ.

The Project's existing RICE (constructed or reconstructed before June 12, 2006) that are OCS sources are subject to emission limitations, operating limitations, and other requirements at 40 C.F.R. § 63.6603, which applies to existing stationary RICEs located at an area source of HAP emissions (see 40 C.F.R. § 63.6590(a)(1)(iii)). However, existing stationary non- emergency compression-ignition RICEs with a rating greater than 300 horsepower located on an offshore vessel that is an OCS source do not have to meet the CO emission limitations specified in Table 2d of Subpart ZZZZ; they must meet the management practices at 40 C.F.R. Part 63.6603(c).

Table 33 Table 2d to Subpart ZZZZ of Part 63 - Requirements for Existing Stationary RICE Located at Area Sources of HAP Emissions

RICE Category	You must meet the following requirement, except during periods of startup….	During periods of startup, you must….
1. Non-Emergency, non-black start CI stationary RICE ≤300 HP	a. Change oil and filter every 1,000 hours of operation or annually, whichever comes first [(1)]	Minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply.
	b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary;	
	c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.	

RICE Category	You must meet the following requirement, except during periods of startup….	During periods of startup, you must….
2. Non-Emergency, non-black start CI stationary RICE 300<HP≤500	a. Limit concentration of CO in the stationary RICE exhaust to 49 ppmvd at 15 percent O2; or	
	b. Reduce CO emissions by 70 percent or more.	
3. Non-Emergency, non-black start CI stationary RICE >500 HP	a. Limit concentration of CO in the stationary RICE exhaust to 23 ppmvd at 15 percent O2; or	
	b. Reduce CO emissions by 70 percent or more.	
4. Emergency stationary CI RICE and black start stationary CI RICE.2	a. Change oil and filter every 500 hours of operation or annually, whichever comes first;	
	b. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary; and	
	c. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.	

[1] Sources have the option to utilize an oil analysis program as described in § 63.6625(i) or (j) in order to extend the specified oil change requirement in Table 2d of this subpart.

[2] If an emergency engine is operating during an emergency and it is not possible to shut down the engine in order to perform the management practice requirements on the schedule required in Table 2d of this subpart, or if performing the management practice on the required schedule would otherwise pose an unacceptable risk under federal, state, or local law, the management practice can be delayed until the emergency is over or the unacceptable risk under federal, state, or local law has abated. The management practice should be performed as soon as practicable after the emergency has ended or the unacceptable risk under federal, state, or local law has abated. Sources must report any failure to perform the management practice on the schedule required and the federal, state or local law under which the risk was determined to be unacceptable.

C. MARPOL Annex VI, the Act to Prevent Pollution from Ships, and 40 C.F.R. Part 1043

Annex VI of the IMO's MARPOL treaty is the main international treaty that addresses air pollution from marine vessels. The IMO has also adopted legally binding energy efficiency measures as amendments to MARPOL Annex VI. It was implemented in the United States through the Act to Prevent Pollution from Ships (APPS"), 33 U.S.C. §§ 1901–1905. Annex VI requirements comprise both engine-based and fuel-based standards and apply to U.S.-flagged ships wherever located and to non-U.S. flagged ships operating in U.S. waters.

- Annex VI establishes:

- Limits on NO_X emissions from marine diesel engines with a power output of more than 130 kW. The standards apply to both main propulsion and auxiliary engines and require the engines to be operated in conformance with the Annex VI NO_X emission limits.

- Limits on the sulfur content of marine fuels.

  40 C.F.R. Part 1090, Subpart D contains the standards for Diesel Fuel and ECA Marine Fuel. ECA marine fuels, both ECA marine distillate and ECA marine residual, is limited to a maximum sulfur content of 1000 ppm for all marine vessels operating in the ECA area. However, per 40 C.F.R. §1090.325, the use of EC Marine Fuel (1000 ppm sulfur) is limited to use in Category 3 Marine Engines only. Note that a Category 3 engine is defined as a marine engine having a displacement greater than 30 L/cylinder. All other engines category's (Category 1, Category 2, and nonroad) will fall into the ULSD (15 ppm) limitation as contained in 40 C.F.R. § 1090.305 and Subpart IIII.

- U.S.-flagged vessels are subject to inspection for compliance with Annex VI. Non-U.S. flagged ships are subject to examination under Port State Control while operating in U.S. waters. The USCG or EPA may bring an enforcement action for a violation.

- Ships operating up to 200 nautical miles off U.S. shores must meet the most advanced standards for NO_X emissions and use fuel with lower sulfur content. This geographic area is designated under Annex VI as the ECA.

- Each regulated diesel engine in U.S.-flagged vessels must have an EIAPP certificate, issued by EPA, to document that the engine meets Annex VI NO_X standards. Certain vessels are also required to have an IAPP Certificate which is issued by the USCG. Ship operators must also maintain records on board regarding their compliance with the emission standards, fuels requirements and other provisions of Annex VI.

- U.S.-flagged vessels are subject to inspection for compliance with Annex VI. Non-U.S. flagged ships are subject to examination under Port State Control while operating in U.S. waters. The USCG or EPA may bring an enforcement action for a violation.

IX. Monitoring, Reporting, Recordkeeping and Testing Requirements

The following reports required by the Specific Conditions of Permit No. OCS-R1-05.

- Self-reporting (i.e., prompt reporting) of deviations from permit terms and conditions. The EPA is requiring the prompt reporting of permit deviations as a condition of the preconstruction permitting requirements of the draft permit.

- The draft permit associated with this Fact Sheet contains the exact information that must be submitted. See Specific Condition No. 1 through 15 of Permit No. OCS-R1-05.

Demonstrating compliance with the permit requires robust monitoring and recordkeeping of activities. The monitoring, recordkeeping, and testing requirements can be grouped into several categories. These categories are:

- Tracking, on a daily rolling, 365-day total, the actual emissions of NO_X and VOC commences on day 1 of the operational phase start date from all OCS sources including vessels servicing or associated with the OCS source while at or going to or from an OCS source while within 25 nautical miles of the OCS source.

- Documenting key design parameters and manufacturers certifications for every internal combustion engine and any other emission unit classified as an OCS source. This information is necessary to demonstrate compliance with the BACT and LAER emission limits.

- Records as required by NSPS IIII and NESHAP ZZZZ.

- Certifying that at the time a vessel will become an OCS source, the vessel in question has the least polluting internal combustion engines on it available to RW or its contractors.

- Demonstrating compliance with the sulfur fuel limits by obtaining the fuel supplier's certificate that contains information regarding the fuel's sulfur content.

X. Consultations

For the purposes of the Endangered Species Act (ESA"), Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA"), and the National Historic Preservation Act (NHPA"), the issuance of an OCS air permit is a federal action undertaken by the EPA. BOEM is the lead federal agency for authorizing renewable energy activities on the OCS and the RW wind farm is also a federal action for BOEM. BOEM's regulations at 30 C.F.R. Part 585 require RW to obtain a COP approval before commencing construction on the windfarm. In conjunction with the COP approval, BOEM is also responsible for issuing the Record of Decision (ROD) on the Environmental Impact Statement conducted under the National Environmental Policy Review Act (NEPA").

The applicant requests a lease, easement, right-of-way, and any other related approvals from BOEM necessary to authorize construction, operation, and eventual decommissioning of the proposed action. BOEM's authority to approve, deny, or modify the project derives from the Energy Policy Act of 2005. Section 388 of the Act amended the OCSLA by adding subsection 8(p), which authorizes the Department of the Interior to grant leases, easements, or rights-of-way on OCS lands for activities that produce or support production, transportation, or transmission of energy from sources other than oil and gas, such as wind power.

The EPA assesses its own permitting action (i.e., to issue an OCS air permit for the windfarm) as interrelated to, or interdependent with, the BOEM's COP approval and issuance of the NEPA ROD for the RW wind farm. Accordingly, the EPA has designated BOEM as the lead Federal

agency for purposes of fulfilling statutory obligations under the statutes mentioned previously.[108] BOEM has accepted the designation as lead Federal agency.[109]

A. Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and National Historic Preservation Act

Under Section 7(a)(2) of the ESA, 16 U.S.C. § 1536(a)(2), the EPA must ensure that any action authorized, funded, or carried out by the EPA is not likely to jeopardize the continued existence of any federally-listed endangered species or threatened species or result in the destruction or adverse modification of such species' designated critical habitat. If the EPA's action (i.e., OCS air permit issuance) may affect a federally-listed species or designated critical habitat, Section 7(a)(2) of the ESA and relevant implementing regulations at 50 C.F.R. Part 402 require consultation between the EPA and the U.S. Fish and Wildlife Service (FWS) and/or the National Marine Fisheries Service (NMFS"), depending on the species and/or habitat at issue.

In accordance with Section 305(b)(2) of the MSFCMA, 16 U.S.C. § 1855(b)(2), Federal agencies are also required to consult with the NMFS on any action that may result in adverse effects to essential fish habitat (EFH").

Section 106 of the NHPA, 16 U.S.C. 470f, and the implementing regulations at 36 C.F.R. Part 800 require federal agencies to consider the effect of their actions on historic properties and afford the opportunity for the Advisory Council on Historic Preservation (ACHP) and consulting parties to consult on the federal undertaking.

The ESA regulations at 50 C.F.R. § 402.07, the MSFCMA regulations at 50 C.F.R. § 600.920(b), and the NHPA regulations at 36 C.F.R. § 800.2(a)(2) provide that where more than one federal agency is involved in an action, the consultation requirements may be fulfilled by a designated lead agency on behalf of itself and the other involved agencies. As previously discussed, BOEM is the designated lead agency for the purposes of fulfilling EPA's obligations under Section 7 of the ESA, Section 305(b) [of the] MSFCMA, and Section 106 of the NHPA for offshore wind development projects on the Atlantic OCS, including the project. As a result of this designation, BOEM will consider the effects of the EPA's OCS permitting action in fulfilling its consultation obligations under each of these statutes for the NEPA ROD and COP approval process.

At the time of writing this Fact Sheet and the EPA's associated proposal of the draft permit, BOEM has commenced but not completed its consultation requirements for ESA, MSFCMA, and NHPA for the COP approval and NEPA ROD for the project. The EPA understands that BOEM will satisfy its statutory obligations as lead federal agency under each of these statutes prior to EPA issuance of a final OCS air permit for the RW windfarm. Should the result of BOEM's consultation under one or more of these statutes identify any conditions or restrictions on air emissions for inclusion in the OCS air permit, the EPA will include those conditions or restrictions in the final permit as necessary. The EPA will also provide an additional opportunity

[108] A copy of the July 25, 2018 letter from EPA R1 to the BOEM regarding lead agency designation is included in the administrative record for this action.
[109] A copy of the September 24, 2018 letter from the BOEM to EPA R1 accepting lead agency designation is included in the administrative record for this action.

for public comment regarding any such new conditions or restrictions as necessary and appropriate.

B. Coastal Zone Management Act (CZMA")

Section 307 of the CZMA, 16 U.S.C. § 1456, and the implementing regulations at 15 C.F.R. Part 930 provide a federal consistency process for state programs to use to manage coastal activities and resources and to facilitate cooperation and coordination with federal agencies. Generally, federal consistency requires that federal actions, within and outside the coastal zone, which have reasonably foreseeable effects on any coastal use (land or water) or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. Federal actions include federal agency activities, federal license or permit activities, and federal financial assistance activities. Federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of a state coastal management program, and license and permit and financial assistance activities must be fully consistent.

Under 15 C.F.R. Part 930, subpart D, a non-federal applicant for a federal license or permit is required to provide a state with a consistency certification if the state has identified the federal license or permit on a list of activities subject to federal consistency review in its federally approved coastal management program. State federal consistency lists identify the federal agency, federal license or permit, and federal financial assistance activities that are subject to federal consistency review if the activities occur within a state's coastal zone pursuant to the applicable subparts of the regulations at 15 C.F.R. Part 930. The EPA has reviewed the listed federal actions for federal license or permit activities for Massachusetts and Rhode Island. The EPA's action to issue an OCS air permit under the regulations at 40 C.F.R. Part 55 is not included on the current list of federal actions for federal consistency review. Thus, issuance of this OCS air permit is not required to be preceded by a federal consistency review.[110]

C. Clean Air Act General Conformity

Pursuant to 40 C.F.R. § 93.153(d)(1), a conformity determination is not required for the portion of an action that includes major or minor new or modified stationary sources that require a permit under the NSR program.

XI. Environmental Justice

Executive Order (EO) 12898 entitled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires that federal agencies identify and address, as appropriate and to the extent practicable and permitted by existing law, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. *See* Executive Order 12898, Section 1-101, 59 Fed. Reg. 7629 (Feb. 16, 1994). Consistent with EO 12898 and

[110] The EPA confirmed with the State of Rhode Island and the Commonwealth of Massachusetts that the states do not seek a consistency review for OCS air permits. A copy of the email confirmation from Rhode Island and Massachusetts is included in the administrative record for this action.

the EPA's "Plan EJ 2014: Considering Environmental Justice in Permitting," the EPA must (1) consider the environmental justice issues, on a case-by-case basis, connected with the issuance of federal permits (particularly when permitting projects for major sources that may involve activities with significant public health or environmental impacts on already overburdened communities); and (2) focus on whether the federal permitting action would have disproportionately high and adverse human health or environmental effects on minority or low income populations.

The EPA defines "Environmental Justice" (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The EPA's goal with respect to Environmental Justice in permitting is to enable overburdened communities to have full and meaningful access to the permitting process and to develop permits that address environmental justice issues to the greatest extent practicable under existing environmental laws. Overburdened is used to describe the minority, low-income, and tribal nations and indigenous peoples or communities in the United States that potentially experience disproportionate environmental harms and risks as a result of greater vulnerability to environmental hazards.

In light of Executive Order 12898, the White House Council on Environmental Quality (CEQ) issued Environmental Justice: Guidance Under the National Environmental Policy Act (NEPA). As part of the NEPA process, BOEM conducted an environmental justice analysis in accordance with this guidance. The guidance includes six principles for environmental justice analyses to determine any disproportionately high and adverse human health or environmental effects to low-income, minority, and tribal populations. The EPA evaluated BOEM's analysis of these principles with regard to environmental justice for the Revolution Wind project. The principles are:

1. Consider the composition of the affected area to determine whether low-income, minority or tribal populations are present and whether there may be disproportionately high and adverse human health or environmental effects on these populations;

2. Consider relevant public health and industry data concerning the potential for multiple exposures or cumulative exposure to human health or environmental hazards in the affected population, as well as historical patterns of exposure to environmental hazards;

3. Recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the proposed action;

4. Develop effective public participation strategies;

5. Assure meaningful community representation in the process, beginning at the earliest possible time; and

6. Seek tribal representation in the process.

Additionally, EPA has published eight principles to assist each Region to promote environmental justice in air permitting programs.[111] The following principles were also evaluated or implemented with regard to environmental justice for the Revolution Wind project:

1. Identify communities with potential environmental justice concerns
2. Engage early in the permitting process to promote meaningful participation and fair treatment
3. Enhance public involvement throughout the permitting process
4. Conduct a "fit for purpose" environmental justice analysis
5. Minimize and mitigate disproportionately high and adverse effects associated with the permit action to promote fair treatment
6. Provide federal support throughout the air permitting process
7. Enhance transparency throughout the air permitting process
8. Build capacity to enhance the consideration of environmental justice in the air permitting process

A. Air Quality Review

For purposes of Executive Order 12898 on environmental justice, the Environmental Appeals Board has recognized that compliance with the National Ambient Air Quality Standards (NAAQS) is "emblematic of achieving a level of public health protection that, based on the level of protection afforded by a primary NAAQS, demonstrates that minority or low-income populations will not experience disproportionately high and adverse human health or environmental effects due to the exposure to relevant criteria pollutants."[112] This is because the NAAQS are health-based standards, designed to protect public health with an adequate margin of safety, including sensitive populations such as children, the elderly, and asthmatics. Based on PSD-required modeling for this project, the EPA has determined that issuance of this OCS permit will not contribute to NAAQS or increment violations nor have potentially adverse effects on ambient air quality. *See* Section V.C of this document for a detailed analysis of the ambient air impact analysis of the project.

B. Environmental Impacts to Potentially Overburdened Communities

EPA's EJ Screen tool[113] is an environmental justice screening and mapping tool that utilizes standard and nationally consistent data to highlight places that may have higher environmental burdens and vulnerable populations. In EJ Screen, EPA uses the 80th percentile as a threshold to identify geographic areas that may warrant further consideration, analysis, or outreach for environmental justice. CEQ's 1997 guidance document identifies minority populations in an

[111] *See* EPA's December 22, 2022, EJ in Air Permitting - Principles for Addressing Environmental Justice Concerns in Air Permitting. https://www.epa.gov/caa-permitting/ej-air-permitting-principles-addressing-environmental-justice-concerns-air.
[112] See Environmental Appeals Board order In re Shell Gulf of Mexico, Inc. & In re Shell Offshore, Inc., 15 E.A.D. 103, 156 (December 30, 2010). A copy of the order can be found in the administrative record for this action.
[113] EJSCREEN is an environmental justice mapping and screening tool that provides the EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators. More information on EPA's EJ Screen tool is available at https://www.epa.gov/ejscreen.

affected environment if (a) the minority population of the affected area exceeds 50 percent of the affected area's total population or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. The Commonwealth of Massachusetts has more stringent criteria and defines an environmental justice community as one or more U.S. Census block groups that meet one or more of the following criteria: the annual median household income is not more than 65 per cent of the statewide annual median household income; minorities comprise 40 per cent or more of the population; 25 per cent or more of households lack English language proficiency; or minorities comprise 25 per cent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statewide annual median household income.[114]

In the Draft Environmental Impact Statement (DEIS) for RW, BOEM analyzed potential air quality impacts as a result of the construction and operation of the Revolution Wind project.[115] EPA finds BOEM's analysis helpful in identifying potential environmental justice areas of concern. Indirect air quality impacts[116] to environmental justice communities were evaluated for the Geographic Analysis Area (GAA"). The GAA includes all counties adjacent to the Lease Area and any areas where Project offshore infrastructure may be visible. Counties adjacent to onshore Project infrastructure or ports used to support Project construction, O&M, and decommissioning activities in the WDA and along the export cable route are also included in the GAA. In addition, the GAA includes counties adjacent to major ports that support commercial fisheries potentially affected by the Project. The percentage of minority and low-income populations in each block group, county, and city/town were determined using EPA's EJ Screen tool in BOEM's DEIS for RW. Potential environmental justice areas of concern were identified if 1) the minority population exceeds 50% or 2) the minority or low-income population percentage is meaningfully greater than the minority or low-income population percentage of a reference population[117]. Of the estimated 11,000 block groups, approximately 50% were identified as EJ areas of concern.[118] The analysis area also includes tribal lands and communities that the Project may affect, and port areas indirectly affected by the project.

Any direct air quality impacts[119] during the construction phase of the project are temporary, occurring over less than two years. Direct air quality impacts from ongoing project activities regulated by this permit are localized around the WDA (which is 7.5 nm south of Noman's Land Island, Massachusetts) and insignificant in all onshore areas.

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[114] *See* Environmental Justice Policy of the Executive Office of Energy and Environmental Affairs. Available at: https://www.mass.gov/doc/environmental-justice-policy6242021-update/download. Last accessed November 30, 2022.

[115] A copy of BOEM's September 2022 DEIS for the Revolution project can be found in the administrative record for this action.

[116] For the purposes of this discussion, indirect air quality impacts are those that are caused by activities such as onshore construction, staging of materials, and emissions from vessels associated with the construction and operation of RW. These emissions are not directly regulated by EPA's CAA OCS permit and are outside the regulatory authority of EPA within the context of CAA OCS permitting.

[117] BOEM (2022). Rev Wind Draft EIS, 3.12-7.

[118] BOEM (2022). Rev Wind Draft EIS, 3.12-7.

[119] For the purposes of this discussion, direct air quality impacts are those that are regulated by EPA's CAA OCS permit and include emissions associated with the OCS source.

Many of the air emitting activities analyzed by BOEM's DEIS are not regulated under EPA's OCS air permit program. Vessel emissions, such as transit vessels and vessel activity at port communities beyond 25 miles from the OCS source are not subject to EPA's OCS air permit. In addition, only vessels within the WDA that meet the definition of an OCS source are subject to the permit terms and conditions. However, these vessels are subject to stringent EPA and IMO standards for marine engines found at 40 CFR part 1042, 40 CFR part 1043, and IMO Annex VI. These standards also require the use of ULSD for certain engine categories. These standards apply to the marine engines on all vessels independent of this OCS air permit.

According to RW's application, the potential port facilities to be used to support construction of the project include existing ports in New York, Rhode Island, Connecticut, Massachusetts, Virginia, Maryland, or New Jersey. During O&M the potential ports to be used to support the Project include existing ports in New York and Rhode Island. EPA and the states operate an extensive network of air quality monitoring locations to ensure ambient air quality meets the NAAQS. Many of these air monitoring locations coincide with port communities such as New Bedford, MA; Fall River, MA; Providence, RI; New London, CT; and Bridgeport, CT, as well as other northeast and mid-atlantic states.[120] See below Figure 6 for a map of Ozone and PM Air Monitoring Stations in states with potential port facilities. Air quality monitoring data from these locations is publicly available online at https://www.epa.gov/outdoor-air-quality-data.

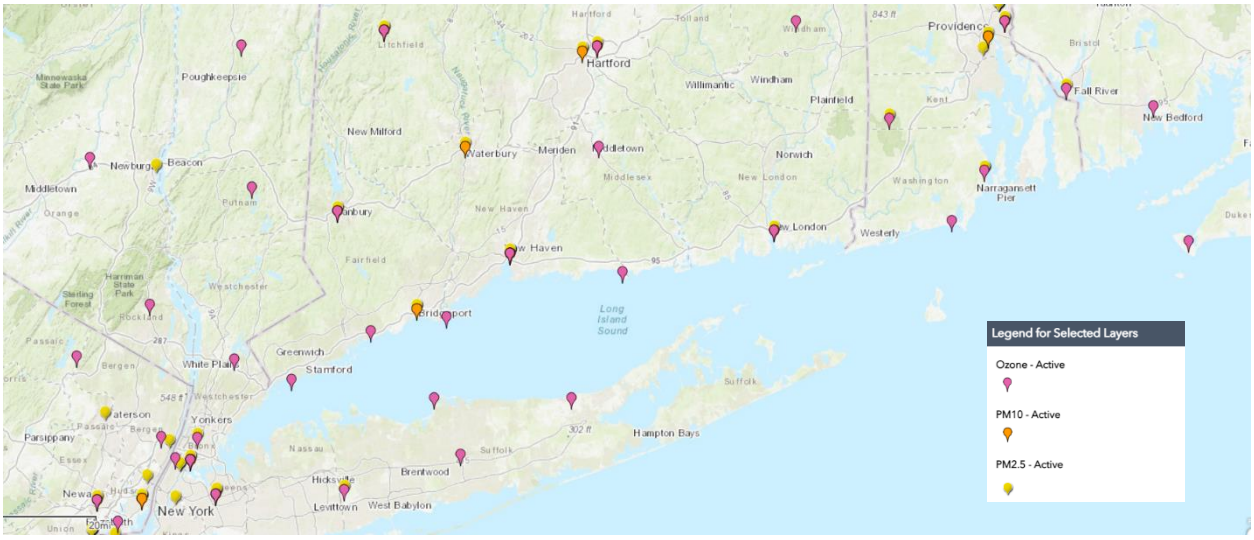

Figure 6 Map of Ozone and PM Air Monitoring Stations

Over time, the development of offshore wind, a renewable and non-emitting energy source, on the Atlantic Coast is expected to displace fossil-fuel fired generation of electricity and improve air quality in the region, in turn significantly reducing adverse health impacts to EJ communities in the area. RW estimates avoided emissions of offshore wind displacing fossil fuel generators for the project are 599 to 749 tons NO_X per year, 318 to 398 tons SO_X per year and 1,120,189 to 1,400,236 tons CO_{2e} per year.[121] EPA expects substantial, long-term air quality improvements

[120] An interactive map of air quality monitoring locations is available at https://www.epa.gov/outdoor-air-quality-data.
[121] Rev Wind 8/12/2022 Application, Table 5-7.

will have a beneficial impact on the health and safety of EJ populations as a result of this project. Furthermore, BOEM analyzed the employment and economic activity impacts associated with offshore wind development and found there to be minor beneficial impacts from new job formation.[122]

Direct air emissions from the project are subject to BACT and LAER emission limits as well as the requirement to obtain emissions offsets (for the operational phase of the project) in advance under the NNSR permitting programs. Thus, the emissions generating activities at the source will be controlled by compliance with the OCS air permit. In other words, emissions control and NNSR offset requirements in the air permit will minimize air pollutant emissions. The emissions generated during the operation phase of the windfarm engines would be very low and the engines are certified to meet EPA emissions standards. In addition, work practice standards that will be employed during the construction and operation of the project include minimizing the idling of the engines of the vessels; and the use of ultra-low sulfur diesel whenever possible to minimize sulfur and particulate emissions. The EPA notes that some of the emissions generated by the vessels' engines, which will depart from and return to the ports, would occur near shore. These emissions would add a small amount to the current vessel traffic emissions in the area, and, given their very low-level and very short duration, would have minor (if any) human health or environmental effects on the overall population, including any minority or low-income population.[123]

C. Tribal Consultation

Per the EPA Policy on Consultation and Coordination with Indian Tribes, the EPA Region 1 offers tribal government leaders an opportunity to consult on all OCS air permit actions. On November 10, 2022, the EPA notified the tribes in Massachusetts, Rhode Island, and Connecticut that they will be provided the opportunity to conduct government-to-government consultation prior to issuing the OCS air permit.[124] To date the EPA has not received a request from any tribe requesting consultation on this permit action. However, tribes may request consultation at any time.

D. Public Participation

In order to comply with Section 5-5(c) (Public Participation and Access to Information) of EO 12898, which requires that each federal agency work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public, the EPA has prepared a Public Notice, available on the EPA website at https://www.epa.gov/caa-permitting/caa-permitting-epas-new-england-region. Interested parties can also subscribe to an EPA email list that notifies them of public comment opportunities in Region 1 for proposed air pollution control permits via email at https://www.epa.gov/caa-permitting/caa-permitting-epas-new-england-region. In addition, the EPA will hold a virtual public hearing for this permit action. These procedures, along with this

[122]BOEM (2022). Rev Wind Draft EIS, 3.11-17.
[123] BOEM (2022). Rev Wind Draft EIS, 3-12-22.
[124] Letters offering government-to-government consultation to each of the affected tribes are included in the administrative record for this air permit action.

Fact Sheet, will ensure an opportunity for meaningful involvement for all communities, including potentially impacted environmental justice communities.

XII. Comment Period, Hearings and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the Draft Permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, in writing. Due to the COVID-19 emergency, EPA prefers that all comments be submitted by electronic means to:

Morgan M. McGrath, P.E.
Email: mcgrath.morgan@epa.gov

If email submittal of comments is not feasible, hard copy comments may be submitted to the address below.

Morgan M. McGrath, P.E.
Air and Radiation Division
U.S. EPA Region 1
5 Post Office Square, Suite 100
(Mail code: 5-MD)
Boston, MA 02109

Comments may also be submitted electronically through https://www.regulations.gov (Docket ID #**EPA-R01-OAR-2023-0060**).

A public hearing will be held during the public comment period. See the public notice for details. The EPA will consider requests for extending the public comment period for good cause. In reaching a final decision on the Draft Permit, the EPA will respond to all significant comments and make these responses available upon request.

Following the close of the public comment period, and after the public hearing, the EPA will issue a Final Permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of issuance of the final permit decision, any eligible parties may submit a petition for review of the final permit decision to the EPA's Environmental Appeals Board consistent with 40 C.F.R. § 124.19.

XIII. EPA Contacts

Additional information concerning the draft permit may be obtained from:

Morgan M. McGrath, P.E.
Telephone: (617) 918-1541
Email: mcgrath.morgan@epa.gov

All supporting information regarding this permitting action can also be found on EPA's website at https://www.epa.gov/caa-permitting/epa-issued-caa-permits-region-1 or at www.regulations.gov Docket ID #**EPA-R01-OAR-2023-0060**.