Appendix F
Analysis of Incomplete and Unavailable Information and Other Required Analyses

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Abbreviations and Acronyms

AIS	automatic identification system
BA	biological assessment
BOEM	Bureau of Ocean Energy Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
EFH	essential fish habitat
EIS	environmental impact statement
EMF	electromagnetic fields
ESP	electrical service platform
IPF	impact-producing factor
MARIPARS	Massachusetts and Rhode Island Port Access Route Study
MVR	marine vessel radar
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
OECC	offshore export cable corridor
RI/MA Lease Areas	Rhode Island and Massachusetts Lease Areas
SME	subject matter expert
SWDA	Southern Wind Development Area
USCG	U.S. Coast Guard
VMS	vessel monitoring system
WTG	wind turbine generator

F Analysis of Incomplete and Unavailable Information and Other Required Analyses

F.1 Analysis of Incomplete and Unavailable Information

In accordance with the Code of Federal Regulations, Title 40, Section 1502.21 (40 CFR § 1502.21) "when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement [EIS], and there is incomplete or unavailable information, the agency shall make clear that such information is lacking."

Given the substantial geographic and temporal scale of the impacts analysis of planned activities (including offshore wind), some information regarding planned activities is unavailable or only available in qualitative or summary form. For example, project-specific information is only available from the 12 Construction and Operations Plans (COP) lessees for projects on the Atlantic Outer Continental Shelf (OCS), including the COP for the proposed New England Wind Project (Project). Considering that such information is lacking for approximately 12 other offshore wind projects considered planned, and several of the COPs submitted to Bureau of Ocean Energy Management (BOEM) are currently under review to determine whether they contain complete and sufficient information for environmental review, a series of assumptions were necessary to conduct the impacts analysis. These assumptions are listed in EIS Appendix E, Planned Activities Scenario. While it is not known whether or to what degree future offshore wind activities will proceed according to these assumptions, these assumptions are adequate to allow the analysis to proceed with a reasonable degree of certainty.

In addition, information is also incomplete or unavailable regarding the likely consequences of various activities on the resources analyzed.[1] When incomplete or unavailable information was identified, BOEM considered whether the information was relevant to the impacts assessment and essential to its alternatives analysis based on the resource analyzed. If essential to a reasoned choice among the alternatives, BOEM considered whether it was possible to obtain the information, if the cost of obtaining it was exorbitant, and if it could not be obtained, BOEM applied acceptable scientific methodologies to inform the analysis considering this incomplete or unavailable information. For example, conclusive information on many impacts of the offshore wind industry may not be available for years and not within the contemplated timeframe of this National Environmental Policy Act (NEPA) process. In its place, subject matter experts (SME) have used the available scientifically credible information and accepted scientific methodologies to evaluate impacts on the resources while this information is unavailable.

F.2 Incomplete or Unavailable Information Analysis for Resource Areas

F.2.1 Air Quality

Although a quantitative emissions inventory analysis of the region over the next 30 years would more accurately assess the overall change in emissions from the proposed Project, any action alternative would lead to reduced emissions and can only lead to a net improvement in air quality. The differences among action alternatives with respect to direct emissions due to construction, operations, and decommissioning of the proposed Project are expected to be minimal. As such, the analysis provided in the Draft EIS is

[1] Climate change impacts would contribute to significant impacts for all resource areas. However, the resource impacts from climate change would not differ among alternatives and are not further identified here, as these impacts are not essential for a reasoned choice among alternatives.

sufficient to support sound scientific judgments and informed decision-making related to the use of the Southern Wind Development Area (SWDA) and offshore export cable corridor (OECC). Therefore, BOEM does not believe that there is incomplete or unavailable information on air quality essential to a reasoned choice among alternatives.

F.2.2 Water Quality

No incomplete or unavailable information related to the impacts analysis on water quality was identified.

F.2.3 Bats

There will always be some level of incomplete information on the distribution and habitat use of migratory tree bats in the SWDA, as habitat use and distribution varies among seasons and species. Additionally, there is some uncertainty regarding the potential collision risk to individual bats that may be present within the SWDA because there are no operational utility-scale offshore wind projects in the United States. However, sufficient information on collision risk to migratory tree bats observed at land-based U.S. wind projects exists, and it was used to analyze and corroborate the potential for impacts as a result of the proposed Project. In addition, as described in EIS Appendix G, Impact-Producing Factors Tables and Assessment of Resources with Minor (or Lower) Impacts, the likelihood of an individual migratory tree bat encountering an operating wind turbine generator (WTG) during migration is very low; therefore, the differences among action alternatives with respect to bats for the proposed Project are expected to be minimal. As such, the analysis provided in the Draft EIS is sufficient to support sound scientific judgments and informed decision-making related to distribution and use of the SWDA, as well as the potential for collision risk of migratory tree bats. Therefore, BOEM does not believe that there is incomplete or unavailable information on bats essential to a reasoned choice among alternatives.

F.2.4 Benthic Resources

Although there is uncertainty regarding the temporal distribution of benthic (animal) resources and periods during which they might be especially vulnerable to disturbance, Park City Wind, LLC's (the applicant) surveys of benthic resources, surveys completed for the Final EIS for Vineyard Wind 1 adjacent to the proposed Project, and other broad-scale studies (Guida et al. 2017; The Nature Conservancy 2014) provided a suitable basis for generally predicting the species, abundances, and distributions of benthic resources in the geographic analysis area. Uncertainty also exists regarding impact-producing factors (IPF) on benthic resources. For example, species-specific stimulus-response thresholds for acoustics and electromagnetic fields (EMF) have not been established for all benthic species, but there is information from benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States. Similarly, specific secondary impacts such as changes in diets through the food chain resulting from habitat modification and synergistic behavioral impacts from multiple IPFs are not fully known. Again, results of benthic monitoring at European wind facilities and the Block Island Wind Farm in the United States provide for a broad understanding of the overall impacts of these IPFs combined, if not individually. As such, the analysis provided in the Draft EIS is sufficient to support sound scientific judgments and informed decision-making related to the overall impacts. Therefore, BOEM does not believe that there is incomplete or unavailable information on benthic resources essential to a reasoned choice among alternatives.

F.2.5 Birds

There is incomplete information on the exact migratory routes of passerines and shore birds that fly over the Atlantic OCS (including those that fly at night). Some may fly overland or along the coast before crossing the ocean. In addition, there will always be some level of incomplete information on the distribution and habitat use of marine birds in the SWDA, as habitat use and distribution varies between

season, species, and years. However, the SWDA has been surveyed approximately 49 times from 2007 to 2015, and the results were used to inform the predictive models and analyze the potential impacts on birds in the Draft EIS. Additionally, there will always be some level of uncertainty regarding the potential for collision risk and avoidance behaviors for some of the bird species that may be present within the SWDA because there are no operational utility-scale offshore wind projects in the United States.

To put the potential for bird mortality associated with operating WTGs on the Atlantic OCS in context, the Draft EIS used some data collected at onshore wind facilities and makes assumptions regarding the applicability of these data to offshore environments. The estimated mortality provided in the Draft EIS could be larger than expected due to differences in species groups present, the life history and behavior of those species, and the offshore marine environment compared to onshore habitats. Similarly, the Draft EIS also provides an estimate of potential mortality using the Band (2012) collision risk model and Avian Stochastic collision risk model. Modeling is commonly used to predict the potential mortality rates for marine bird species in Europe and the United States (BOEM 2015, 2022a). Model inputs include monthly bird densities, flight behavior, avoidance behavior, and other factors to determine the estimated number of annual collisions with operating WTGs. Due to inherent data limitations, these models often represent only a subset of marine bird populations potentially present. Collison risk models were used to estimate the potential mortality associated with future offshore wind development. Twelve common marine bird species had sufficient species-specific information (e.g., density estimates, flight height distributions, avoidance rates) to be used in the model, and these species represent a wide range of marine bird species on the Atlantic OCS spanning five taxonomic orders. Although detailed species-specific information is not known for many of the other marine bird species that use the Atlantic OCS, many of these species are taxonomically similar and have similar ecologies as those modeled. The datasets used by both the applicant and BOEM to assess the potential for exposure of marine birds to the SWDA represent the best available data and provide context at both local and regional scales.

The regional scale assessment of potential exposure to the SWDA includes data that were collected on a large regional and temporal scale and includes aerial and boat survey data collected from 1978 to 2014 to develop long-term average annual and seasonal models. Further, sufficient information on collision risk and avoidance behaviors observed in related species at European offshore wind projects is available and was used to analyze and corroborate the potential for these impacts as a result of the proposed Project (e.g., Petersen et al. 2006; Skov et al. 2018). However, the estimates of potential collision mortality in the Draft EIS are not provided to quantify the anticipated mortality associated with the development of Atlantic offshore wind energy facilities. These estimates are not relied on to reach an impact level determination but are provided to assess the potential for collision mortality associated with the planned development on the Atlantic OCS generally and the proposed Project specifically. As such, the analysis provided in the Draft EIS is sufficient to support sound scientific judgments and informed decision-making related to bird distribution and use of the SWDA, as well as to the potential for collision risk and avoidance behaviors in bird resources. Therefore, BOEM does not believe that there is incomplete or unavailable information on birds essential to a reasoned choice among alternatives.

F.2.6 Coastal Habitats and Fauna

No incomplete or unavailable information related to the impacts analysis on coastal habitats and fauna was identified.

F.2.7 Finfish, Invertebrates, and Essential Fish Habitat

There is uncertainty regarding the spatial and temporal occurrence of finfish, invertebrates, and essential fish habitat (EFH) throughout the entire geographic analysis area. However, broad-scale information is available from sources such as federal fisheries management plans, Guida et al. (2017), and surveys completed to support COPs. There is also uncertainty regarding behavioral impacts from each IPF

individually and combined. BOEM is able to draw on years of fish monitoring results in Europe and analogous activities in the United States (e.g., bridge construction, oil and gas platforms, etc.). Thus, BOEM extrapolated or drew assumptions from what is known about similar species and/or situations. Additional information, extrapolations, and assumptions are presented in EIS Section 3.9, Commercial Fisheries and For-Hire Recreational Fishing, references therein, the Biological Assessment (BA) (BOEM 2022a), and the EFH Assessment (BOEM 2022b). As such, the analysis provided in the Draft EIS provides sufficient information on the likely impacts of each IPF and the potential impacts that could result from the proposed Project and past, present, and planned actions. Therefore, BOEM does not believe that there is incomplete or unavailable information on finfish, invertebrates, and EFH essential to a reasoned choice among alternatives.

F.2.8 Marine Mammals

There is some incomplete information regarding the interaction of marine mammals with EMF fields produced by submarine cables. These gaps remain partly because of difficulties in evaluating impacts at population scale around these deployments (Taormina et al. 2018). Scientific studies examining impacts of altered EMF on marine mammals have not been conducted. The large size of marine mammals and other logistical constraints make experimental studies infeasible. However, a summary of existing relevant evidence is provided in the BOEM-sponsored report by Normandeau et al. (2011) cited in EIS Section 3.7, Marine Mammals. Using this information, BOEM's SMEs have estimated that marine mammals would likely have a low risk of impacts related to EMF from submarine cables because the high mobility of marine mammals would tend to reduce exposure time.

There is uncertainty regarding the response of large whale species to new structures due to the novelty of this type of development on the Atlantic OCS. Although 2,955 new structures are anticipated under the planned activities scenario, spacing would be sufficient to allow unobstructed access within and between wind facilities. While avoidance of wind lease areas due to new structures is possible, it is unlikely due to the whales' size relative to WTG spacing. Additionally, while there is some uncertainty regarding how hydrodynamic changes around foundations may affect prey availability, these changes are expected to have limited impacts on the local conditions around WTG foundations. It is anticipated that the hydrodynamic impacts and the reef effect both may result in potential impacts on marine mammal prey species in the immediate vicinity of WTG foundations. The potential consequences of these impacts on the Atlantic OCS are unknown. Modeling conducted by Johnson et al. (2021) showed that the introduction of WTGs on the Atlantic OCS would modify current magnitude, temperature, and wave heights. Further, the modeled change in currents would lead to discernable changes in larval settlement densities on the OCS. Monitoring studies would determine if these potential changes in hydrodynamics and larval transport would result in changes in whale behavior more precisely.

There is also uncertainty regarding the combined planned activities acoustic impacts associated with pile-driving activities. The available information relative to impacts on marine mammals from pile driving associated with offshore wind development is primarily limited to information on harbor porpoises (*Phocoena phocoena*) and harbor seals (*Phoca vitulina*), as the vast majority of this research has occurred at European offshore wind projects where large whales are uncommon. At this time, it is unclear whether marine mammals would cease feeding, and when individuals would resume normal feeding, migrating, or breeding behaviors once daily pile-driving activities cease or if secondary impacts would persist. Under the planned activities scenario, individual whales may be exposed to acoustic impacts from multiple projects in 1 day or from one or more projects over the course of multiple days. The consequences of these exposure scenarios have been analyzed with the best available information, but a lack of real-world observations on species' responses to pile driving results in uncertainty. Additionally, it is currently unclear how sequential years of construction of multiple projects would affect marine mammals. However, Southall et al. (2021) have developed an analytical framework to assess the potential risk to marine mammals as a result of multiple activities over broad timescales.

Finally, there are no data relative to the impacts of elevated turbidity on marine mammals; therefore, it is conservatively assumed that normal movements may be altered. However, these movements would be too small to be meaningfully measured, and no impacts would be expected from marine mammals swimming through turbidity plumes to leave the turbid area (NOAA 2020).

BOEM believes that the overall costs of obtaining this information are exorbitant, and the means to obtain it are not known. Although the above information is unavailable, BOEM extrapolated or drew assumptions from what is known about similar species and/or situations. Additional information, extrapolations, and assumptions are presented in EIS Section 3.7, references therein, and the BA submitted to the National Marine Fisheries Service (NMFS) (BOEM 2022a). BOEM used the best available information to predict potential impacts on marine mammals, and the analysis provided in the Draft EIS is sufficient to support sound scientific judgments and informed decision-making related to the proposed uses of the SWDA. Therefore, BOEM does not believe that there is incomplete or unavailable information on marine mammals essential to a reasoned choice among alternatives.

F.2.9 Sea Turtles

The impacts of EMF on sea turtles, both foraging and migrating, are not completely understood. However, the available relevant information is summarized in the BOEM-sponsored report by Normandeau et al. (2011) cited in EIS Section 3.8, Sea Turtles, and used in the BA for the proposed Project (BOEM 2022a). Although the thresholds for EMF disturbing various sea turtle behaviors are not known, no impacts on sea turtles from the numerous submarine power cables around the world have been documented to occur. In addition, no nesting beaches, critical habitat, or other biologically important habitats were identified in the OECC or landfall location.

There is also uncertainty relative to sea turtle responses to construction activities on the Atlantic OCS. Some potential for displacement from construction areas exists. However, if this displacement occurs, it is unclear whether individuals would be displaced into lower quality habitat or into areas with higher risk of fatal vessel interactions. Additionally, it is currently unclear whether concurrent construction of multiple projects or construction completed over sequential years would be the most impactful to sea turtles. There is also uncertainty regarding the combined planned activities acoustic impacts associated with pile-driving activities. However, it is assumed that sea turtles would resume normal feeding, migrating, or breeding behaviors once daily pile-driving activities cease. Under the planned activities scenario, individual sea turtles may be exposed to acoustic impacts from multiple projects in 1 day or from one or more projects over the course of multiple days. The consequences of these exposure scenarios have been analyzed with the best available information. Despite a lack of real-world observations on species' responses to pile driving, the anticipated impacts have been assessed on the species' hearing abilities behavior and observed responses to other impulsive sounds.

Some uncertainty exists regarding the potential for sea turtle responses to Federal Aviation Administration and navigation lighting associated with offshore wind development. Given the placement of the new structures from nesting beaches, no impacts on nesting female or hatchling sea turtles would be expected. However, at this time, it is unclear whether the required lighting on WTGs and electrical service platforms (ESP) would be visible under the water surface, and, if so, how sea turtles would respond to such light. Although the potential impacts of offshore lighting on juvenile and adult sea turtles is uncertain, WTG lighting is not anticipated to have any detectable impacts (adverse or beneficial) on any age class of sea turtles in the offshore environment; there is a lack of evidence that platform lighting leads to impacts on sea turtles, as shown by decades of oil and gas platform operation in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs (BOEM 2022a).

Finally, information regarding the impacts of elevated turbidity on juvenile and adult sea turtles was not identified, although it is assumed that normal movements may be altered. However, these movements

would be too small to be meaningfully measured, and no impacts would be expected from sea turtles swimming through turbidity plumes to leave the turbid area (NOAA 2021).

BOEM believes that the overall costs of obtaining this information are exorbitant, and the means to obtain it are not known. Although the above information is unavailable, BOEM extrapolated or drew assumptions from what is known about similar species and/or situations. Additional information, extrapolations, and assumptions are presented in EIS Section 3.8, references therein, and the BA submitted to NMFS (BOEM 2022a). As such, the analysis provided in the Draft EIS is sufficient to support sound scientific judgments and informed decision-making related to the proposed uses of the SWDA. BOEM used the best available information to predict potential impacts on sea turtles. Therefore, BOEM does not believe that there is incomplete or unavailable information on sea turtles essential to a reasoned choice among alternatives.

F.2.10 Terrestrial Habitats and Fauna

Although the preferred habitats of terrestrial and coastal fauna are generally known, exact abundances and distributions of various fauna are likely to remain unknown for the foreseeable future. However, the species inventories and other information from nearby areas provide an adequate basis for evaluating the fauna likely to inhabit the onshore areas potentially affected by the proposed Project, and the differences among action alternatives with respect to terrestrial and coastal fauna for the proposed Project are expected to be minimal. Additionally, the onshore activities proposed involve only common, industry-standard activities for which impacts are generally understood. BOEM does not believe that there is incomplete or unavailable information on terrestrial habitats and fauna essential to a reasoned choice among alternatives.

F.2.11 Wetlands and Other Waters of the United States

No incomplete or unavailable information related to the impacts analysis on wetlands and waters of the U.S. was identified.

F.2.12 Commercial Fisheries and For-Hire Recreational Fishing

Fisheries are managed in the context of an incomplete understanding of fish stock dynamics and impacts of environmental factors on fish populations (EIS Section 3.6, Finfish, Invertebrates, and Essential Fish Habitat; EIS Section 3.9, Commercial Fisheries and For-Hire Recreational Fishing; Section B.2 in EIS Appendix B, Supplemental Information and Additional Figures and Tables). Although the fisheries information used in this assessment has limitations (e.g., vessel trip report data is an imprecise measurement of where fishing occurred; vessel monitoring systems (VMS) are not required of all fishing vessels; available historical data lacks consistency, making comparisons challenging), it is the best available data and is sufficient information to support the findings presented in the Draft EIS. Therefore, BOEM does not think that additional research to overcome the limitations of the best available information would be essential to a reasoned choice among alternatives.

BOEM concluded that the information provided by NMFS and described in EIS Section 3.9 and EIS Appendix B regarding commercial fisheries and for-hire recreational fishing data, as well as scientific research and surveys, is sufficient to support the impact findings presented in the Draft EIS, including how potential impacts on NMFS' scientific surveys may affect stock assessments and commercial and for-hire fishery catch quotas. Therefore, BOEM does not believe that there is incomplete or unavailable information on commercial fisheries or for-hire recreational fishing essential to a reasoned choice among alternatives.

F.2.13 Cultural Resources

As discussed in EIS Section 3.10, Cultural Resources, the proposed Project's impacts on cultural resources may differ depending on the resource, however, the differences among alternatives are not expected to be meaningful. In the event an unanticipated discovery is made, the Unanticipated Discovery Plans for both onshore and offshore, would be implemented. Development and implementation of proposed Project-specific treatment plans, avoidance, minimization, and mitigation of identified cultural resources and mitigation and monitoring measures would be conditions of BOEM's approval of the COP. BOEM does not believe there is incomplete or unavailable information on cultural resources essential to a reasoned choice among alternatives.

F.2.14 Demographics, Employment, and Economics

The economic analysis for the proposed Project estimated the employment and economic requirements and outputs for Alternative B, but BOEM's estimates for changes in jobs, expenditures, and economic outputs for demographic, employment, and economic impacts for Alternative C were based on comparisons with Alternative B estimate. This provided sufficient information for the evaluation of demographics, employment, and economics to support a reasoned choice among alternatives. There is some inherent uncertainty in forecasting how economic variables in various areas will evolve over time. However, the differences among action alternatives with respect to demographics, employment, and economics are not expected to be significant. Therefore, BOEM does not believe that there is incomplete or unavailable information on demographics, employment, and economics essential to a reasoned choice among alternatives.

F.2.15 Environmental Justice

Evaluations of impacts on environmental justice communities rely on assessment of impacts on other resources. As a result, while there is no incomplete or unavailable information related to the analysis of environmental justice impacts, incomplete or unavailable information related to other resources discussed throughout EIS Chapter 3, Affected Environment and Environmental Consequences, also affect the impacts analysis on environmental justice communities. As discussed in the sections previously referenced, the incomplete and unavailable information was either not relevant to a reasoned choice among alternatives or BOEM's SMEs used alternative methods to perform an analysis that would allow for a reasoned choice among the alternatives considered. Further, the differences among action alternatives with respect to environmental justice are not expected to be significant. Therefore, BOEM does not believe that there is incomplete or unavailable information on environmental justice essential to a reasoned choice among alternatives.

F.2.16 Land Use and Coastal Infrastructure

No incomplete or unavailable information related to the impacts analysis on land use and coastal infrastructure was identified.

F.2.17 Navigation and Vessel Traffic

The navigation and vessel traffic impact analysis in the Draft EIS is based on automatic identification system (AIS) data from vessels required to carry AIS (i.e., those 65 feet or greater in length) since January 2016, as well as VMS data for individual vessel trips. VMS data for fishing vessels provided to BOEM by NMFS were the basis for polar histograms and other analytical outputs used in evaluating commercial and for-hire recreational fishing trips (EIS Section 3.13, Navigation and Vessel Traffic). The Navigational Risk Assessment for the COP (Appendix III-I; Epsilon 2022) also includes observations about VMS data, based on maps of 2016 to 2019 VMS data provided by NMFS and the Northeast Regional Ocean Council, as well as BOEM's own data analysis. These observations supplement the AIS

data by identifying areas of fishing vessel concentration within the SWDA and surrounding area. Some smaller recreational and fishing vessels carry an AIS; however, the AIS analysis likely excludes most vessels less than 65 feet long that traverse the SWDA. In addition, the VMS data provided by NMFS exclude some non-federally managed commercial fishing, federally managed commercial fishing that does not require VMS, as well as recreational fishing vessel trips through the SWDA and across the OECC. Nonetheless, the combination of AIS and VMS data described above represent the best available vessel traffic data and is sufficient for BOEM to make a reasoned choice among alternatives.

The U.S. Coast Guard's (USCG) Final Massachusetts and Rhode Island Port Access Route Study (MARIPARS), evaluating the need for establishing vessel routing measures, was published in the *Federal Register*, Volume 85, Issue 19 (January 29, 2020) pp. 5222-5224 (85 Fed. Reg. 19 pp. 5222-5224) (USCG 2020). The Final MARIPARS recommended an aligned, regular, and gridded layout throughout the Rhode Island and Massachusetts Lease Areas (RI/MA Lease Areas) that provides adequate sea room to facilitate predictable safe navigation throughout the contiguous leases. The recommendation includes three "lines of orientation," or predictable headings that vessels can take at any location within the contiguous lease areas. The Final MARIPARS stated that 1-nautical-mile-wide (1.15-mile-wide) east-to-west paths would facilitate traditional fishing methods in the area, and 1-nautical-mile-wide north-to-south paths would provide the USCG with adequate access for search and rescue access. Finally, 0.6- to 0.8-nautical-mile-wide (0.7- to 0.9-mile-wide) northwest-to-southeast paths would allow commercial fishing vessels to continue their travel from port, through the lease areas, and to fishing grounds. The leaseholders for offshore wind projects in the RI/MA Lease Areas have proposed a collaborative regional layout for wind turbines (an east-to-west, north-to-south grid pattern with 1 nautical mile [1.9 kilometers, 1.15 miles] × 1 nautical mile [1.9 kilometers, 1.15 miles] spacing between positions and with 0.7-nautical-mile [0.8-mile] theoretical transit routes oriented northwest-to-southeast) across their respective BOEM leases (Geijerstam et al. 2019) that meets the layout rules set forth in the Final MARIPARS recommendations. As a cooperating agency, the USCG will continue to consult with BOEM over the course of the NEPA process for the proposed Project as it relates to navigational safety and other aspects, including the impacts associated with alternatives assessed.

As stated in EIS Section 3.14, Other Uses (National Security and Military Use, Aviation and Air Traffic, Offshore Cables and Pipelines, Radar Systems, Scientific Research and Surveys, and Marine Minerals), WTG and ESP structures could potentially interfere with marine radars. A 2022 National Academies of Sciences study found impacts on marine vessel radar (MVR) from offshore WTGs (NAS 2022). Specifically, the study found that offshore WTGs affect MVR in some situations, most commonly through a substantial increase in strong reflected energy cluttering the operator's display, leading to complications in navigation decision-making (NAS 2022). The sizes of anticipated offshore WTGs and projects would exacerbate these impacts (NAS 2022). This decreased efficacy applies to both traditional, magnetron-based MVRs, and solid-state MVRs. Degraded effectiveness of MVR could lead to lost contact with smaller objects, such as recreational vessels and buoys (NAS 2022). MVRs have varied capabilities and the ability of radar equipment to properly detect objects is dependent on radar type, equipment placement, and operator proficiency; however, trained radar operators, properly installed and adjusted vessel equipment, marked wind turbines, and the use of AIS would all enable safe navigation with minimal loss of radar detection (USCG 2020). The National Academies of Sciences study also found that WTG-related MVR interference could be lessened through improved radar signal processing and display logic or signature-enhancing reflectors on small vessels to minimize lost contacts.

Based on the foregoing, BOEM does not believe that there is incomplete or unavailable information on navigation and vessel traffic essential to a reasoned choice among alternatives.

F.2.18 Other Uses (National Security and Military Use, Aviation and Air Traffic, Offshore Cables and Pipelines, Radar Systems, Scientific Research and Surveys, and Marine Minerals)

There is no incomplete or unavailable information related to the analysis of other uses (national security and military use, aviation and air traffic, offshore cables and pipelines, radar systems, scientific research and surveys, and marine minerals), aside from the aspects described in this appendix for the proposed Project, the planned offshore wind projects for which BOEM has not received COPs, and land-based radar systems.

As discussed in EIS Section 3.14 and Appendix B, preliminary analyses of the impacts on survey areal coverage show substantial impacts on NMFS' ability to continue using current methods to fulfill its mission of precisely and accurately assessing fish and shellfish stocks for the purpose of fisheries management and assessing protected species for the purpose of protected species management. EIS Section 3.14 and Section B.3 in Appendix B also discuss potential approaches and opportunities to lessen impacts on scientific research and surveys in the long term. Regardless of such actions, long-standing NMFS surveys would not be able to continue as currently designed, and extensive costs and efforts would be required to adjust survey approaches. As a result, BOEM has concluded that the information provided by the National Oceanic and Atmospheric Administration (NOAA) in EIS Section 3.14 regarding scientific research and surveys are sufficient to support the impact findings presented in the Draft EIS. Therefore, BOEM does not believe that there is incomplete or unavailable information on other uses essential to a reasoned choice among alternatives.

F.2.19 Recreation and Tourism

No incomplete or unavailable information related to the impacts analysis on recreation and tourism was identified.

F.2.20 Scenic and Visual Resources

As discussed in EIS Section 3.16, Scenic and Visual Resources, WTGs in the RI/MA Lease Areas could potentially be visible to viewers on shore and at sea, depending on atmospheric, lighting, and weather conditions. The design characteristics of WTGs (most notably the height of the tops of WTG nacelles, as well as the maximum height of WTG blade tips at full vertical extension) for many projects have not yet been determined. EIS Section 3.16, as well as EIS Appendix I, Seascape and Landscape Visual Impact Assessment, describe the assumptions about WTG characteristics that underlie the analysis of visual impacts in the Draft EIS. While the actual WTGs may differ from the assumed WTG characteristics, those differences are unlikely to change the impact determinations in the Draft EIS. As a result, BOEM does not believe that there is incomplete or unavailable information on scenic and visual resources essential to a reasoned choice among alternatives.

F.3 Unavoidable Adverse Impacts of the Proposed Action

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA (Code of Federal Regulations, Title 40, Section 1502.16 [40 CFR § 1502.16]) require that an EIS evaluate the potential unavoidable adverse impacts associated with a proposed action. Adverse impacts that can be reduced by mitigation and monitoring measures but not eliminated are considered unavoidable. Table F.3-1 provides a listing of such impacts. Most potential unavoidable adverse impacts associated with the Proposed Action would occur during construction and would be temporary. EIS Chapter 3 and Appendix B provide additional information on the potential impacts listed below.

All impacts from past, present, and planned activities are still expected to occur as described in the No Action Alternative analysis in the Draft EIS, regardless of whether the Proposed Action is approved.

Table F.3-1: Potential Unavoidable Adverse Impacts of the Proposed Action

Resource Area	Potential Unavoidable Adverse Impacts of the Proposed Action
Air Quality	• Increase in emissions from engines associated with vessel traffic, construction activities, and equipment operation
Water Quality	• Increase in suspended sediments due to seafloor disturbance during construction, operations, and decommissioning
Bats	• Displacement and avoidance behavior due to habitat loss/alteration, equipment noise, and vessel traffic • Increase in individual mortality due to collisions with operating WTGs
Benthic Resources	• Increase in suspended sediments and resulting impacts due to seafloor disturbance • Reduction in habitat as a result of seafloor surface alternations • Disturbance, displacement, and avoidance behavior due to habitat loss/alteration, equipment noise, and vessel traffic • Increase in individual mortality due to construction • Conversion of soft-bottom habitat to new hard-bottom habitat
Birds	• Displacement and avoidance behavior due to habitat loss/alteration, equipment noise, and vessel traffic • Increase in individual mortality due to collisions with operating WTGs
Coastal Habitats and Fauna	• Increase in suspended sediments and reduction in habitat quality due to seafloor disturbance
Finfish, Invertebrates, and Essential Fish Habitat	• Increase in suspended sediments and resulting impacts due to seafloor disturbance • Habitat quality alterations or loss of habitat • Displacement, disturbance, and avoidance behavior due to habitat loss/alteration, equipment noise, vessel traffic, increased turbidity, sediment deposition, and EMF • Increase in individual mortality due to construction activities
Marine Mammals	• Displacement, disturbance, and avoidance behavior due to habitat loss/alteration, equipment and vessel noise, and vessel traffic during construction and operations • Temporary loss of acoustic habitat and increased potential for vessel strikes • Increased risk for injury or mortality associated with fisheries gear
Sea Turtles	• Disturbance, displacement, and avoidance behavior due to habitat loss/alteration, equipment noise • Increased potential for vessel strikes • Increased risk for injury or mortality associated with fisheries gear
Terrestrial Habitats and Fauna	• Habitat alteration-induced impacts, avoidance behavior, and individual mortality due to clearing and grading activities
Wetlands and Other Waters of the United States	• Increase in low-level sedimentation of wetlands and other waters of the U.S. during onshore construction
Commercial Fisheries and For-Hire Recreational Fishing	• Disruption to access or temporary restriction in harvesting activities due to construction of offshore proposed Project elements • Disruption to harvesting activities during operations of offshore wind facility • Changes in vessel transit and fishing operation patterns
Cultural Resources	• Impacts on viewsheds of and to historic properties • Damage to underwater paleo and form features
Demographics, Employment, and Economics	• Disruption of commercial fishing, for-hire recreational fishing, and marine recreational businesses during offshore construction and cable installation • Hindrance to ocean economy sectors due to the presence of the offshore wind facility, including commercial fishing, recreational fishing, sailing, sightseeing, and supporting businesses
Environmental Justice	• Loss of employment or income due to disruption to commercial fishing, for-hire recreational fishing, or marine recreation businesses • Hindrance to subsistence fishing due to offshore construction and operation of the offshore wind facility

Resource Area	Potential Unavoidable Adverse Impacts of the Proposed Action
Land Use and Coastal Infrastructure	• Land use disturbance due to construction, as well as noise, vibration, and travel delays • Increase in potential for accidental releases during construction
Navigation and Vessel Traffic	• Change in vessel transit patterns • Congestion in port channels • Increased navigational complexity, vessel congestion, and allision risk within the offshore SWDA • Hindrance to search and rescue missions within the offshore SWDA
Other Uses (National Security and Military Use, Aviation and Air Traffic, Offshore Cables and Pipelines, Radar Systems, Scientific Research and Surveys, and Marine Minerals)	• Disruption to offshore scientific research and surveys and species monitoring and assessment • Increased navigational complexity for military or national security vessels operating within the offshore SWDA • Need for changes in vessel transit patterns for military or national security vessels • Changes to aviation and air traffic navigation patterns • Impacts on marine-based radar systems when close to the WTGs
Recreation and Tourism	• Disruption of coastal recreation activities during onshore construction, such as beach access • Alteration of marine and coastal recreation enjoyment and tourism activities due to WTGs • Disruption to access or temporary restriction of in-water recreational activities due to construction of offshore proposed Project elements • Temporary disruption to the marine environment and marine species important to fishing and sightseeing due to turbidity and noise • Hindrance to some types of recreational fishing, sailing, and boating within the area occupied by WTGs during operation
Scenic and Visual Resources	• Alteration of existing scenic conditions due to WTGs, as well as viewer experiences

EMF = electromagnetic fields; SWDA = Southern Wind Development Area; WTG = wind turbine generator

F.4 Irreversible and Irretrievable Commitment of Resources

The CEQ regulations for implementing NEPA (40 CFR § 1502.16) require that an EIS review the potential impacts on irreversible or irretrievable commitments of resources resulting from implementation of a proposed action. The CEQ considers a commitment of a resource irreversible when the primary or secondary impacts from its use limit the future options for its use. Irreversible commitment of resources typically applies to impacts of non-renewable resources, such as marine minerals or cultural resources. The irreversible commitment of resources occurs due to the use or destruction of a specific resource. An irretrievable commitment refers to the use, loss, or consumption of a resource, particularly a renewable resource, for a period of time.

Table F.4-1 provides a listing of potential irreversible and irretrievable impacts by resource area. EIS Chapter 3 and Appendix B provide additional information on the impacts summarized below.

Table F.4-1: Irreversible and Irretrievable Commitment of Resources by Resource Area

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Air Quality	No	No	Air emissions would comply with permits regulating air quality standards, and emissions would be temporary during construction. If the Proposed Action displaces fossil-fuel energy generation, overall improvement of air quality would be expected.
Water Quality	No	No	Activities would not cause loss of, or significant impacts on, existing inland waterbodies or wetlands. Turbidity impacts in the marine and coastal environment would be temporary.
Bats	Yes	No	Irreversible impacts on bats could occur if one or more individuals were injured or killed; however, implementation of mitigation and monitoring measures developed in consultation with the U.S. Fish and Wildlife Service would reduce or eliminate the potential for such impacts. Decommissioning of the proposed Project would reverse the impacts of being displaced from foraging habitat.
Benthic Resources	No	No	Although local mortality could occur, there would not be population-level impacts on benthic organisms; habitat could recover after decommissioning.
Birds	Yes	No	Irreversible impacts on birds could occur if one or more individuals were injured or killed; however, implementation of mitigation and monitoring measures developed in consultation with the U.S. Fish and Wildlife Service would reduce or eliminate the potential for such impacts. Decommissioning of the proposed Project would reverse the impacts of being displaced from foraging habitat.
Coastal Habitats and Fauna	No	No	Any turbidity impacts would be short term and not lead to irreversible or irretrievable impacts. Changes in seabed composition/habitat as a result of cable protection could result in minimal beneficial impacts.
Finfish, Invertebrates, and Essential Fish Habitat	No	No	Although local mortality could occur, there would not be population-level impacts. The proposed Project could alter habitat during construction and operations but could restore the habitat after decommissioning.
Marine Mammals	Yes	Yes	Irreversible impacts on marine mammals could occur if one or more individuals of species listed under the Endangered Species Act were injured or killed; however, implementation of mitigation and monitoring measures, developed in consultation with NMFS, would reduce or eliminate the potential for such impacts on listed species. Irretrievable impacts could occur if individuals or populations grow more slowly as a result of displacement from the proposed Project area.
Sea Turtles	Yes	Yes	Irreversible impacts on sea turtles could occur if one or more individuals of species listed under the Endangered Species Act were injured or killed; however, implementation of mitigation and monitoring measures, developed in consultation with NMFS, would reduce or eliminate the potential for impacts on listed species. Irretrievable impacts could occur if individuals or populations grow more slowly as a result of displacement from the proposed Project area.
Terrestrial Habitats and Fauna	Yes	Yes	Removal of habitat associated with clearing and grading activities, as well as construction of the substation, could potentially create irreversible and irretrievable impacts.

Resource Area	Irreversible Impacts	Irretrievable Impacts	Explanation
Wetlands and Other Waters of the United States	No	No	Although localized and temporary impacts on wetlands and other waters of the U.S. could occur, the resource is expected to recover to existing conditions without remedial or mitigating actions.
Commercial Fisheries and For-Hire Recreational Fishing	No	Yes	Although impacts on commercial fisheries would not result in irreversible impacts. the proposed Project could alter habitat during construction and operations, limit access to fishing areas during construction, or reduce vessel maneuverability during operations. However, the decommissioning of the proposed Project would reverse those impacts. Irretrievable impacts could occur due to the loss of use of fishing areas at an individual permit level.
Cultural Resources	Yes	Yes	Although unlikely, unanticipated removal or disturbance of previously unidentified cultural resources onshore and offshore could result in irreversible and irretrievable impacts.
Demographics, Employment, and Economics	No	Yes	There would not be any irreversible impacts. A temporary increase of contractor needs, housing needs, and supply requirements could occur during construction. This could lead to an irretrievable loss of workers for other projects, and increased housing and supply costs.
Environmental Justice	No	Yes	Impacts on environmental justice communities could occur due to loss of income or employment for low-income workers in marine industries; this could be reversed by proposed Project decommissioning or other employment, but income lost during proposed Project operations would be irretrievable.
Land Use and Coastal Infrastructure	Yes	Yes	Onshore facilities may or may not be decommissioned; if not decommissioned, the presence of these facilities could lead to irreversible impacts. Land use required for construction and operations, such as the land proposed for the substation, could result in an irreversible impact. Construction activities could result in an irretrievable impact due to the temporary loss of use of the land for otherwise typical activities.
Navigation and Vessel Traffic	No	Yes	There would not be any irreversible impacts. Based on the anticipated duration of construction and operations, impacts on vessel traffic would not result in irreversible impacts. Irretrievable impacts could occur due to changes in transit routes, which could be less efficient during the life of the proposed Project.
Other Uses (National Security and Military Use, Aviation and Air Traffic, Offshore Cables and Pipelines, Radar Systems, Scientific Research and Surveys, and Marine Minerals)	No	Yes	Disruption of offshore scientific research and surveys would occur during proposed Project construction, operations, and decommissioning.
Recreation and Tourism	No	No	Construction activities near the shore could result in a temporary loss of use of the land for recreation and tourism purposes.
Scenic and Visual Resources	No	No	Visual impacts associated with the construction and operations of WTGs that are visible from shore would be reversed once those structures are decommissioned and removed.

BOEM = Bureau of Ocean Energy Management; NMFS = National Marine Fisheries Service; WTG = wind turbine generator

F.5 Relationship Between the Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The CEQ regulations for implementing NEPA (40 CFR § 1502.16) require that an EIS address the relationship between short-term use of the environment and the potential impacts of such use on the maintenance and enhancement of long-term productivity. Such impacts could occur as a result of a reduction in the flexibility to pursue other options in the future or assignment of a specific area (land or marine) or resource to a certain use that would not allow other uses, particularly beneficial uses, to occur at a later date. An important consideration when analyzing such impacts is whether the short-term environmental impacts of the action would result in detrimental impacts on long-term productivity of the affected areas or resources.

As assessed in EIS Chapter 3 and Appendix B, the majority of the potential impacts associated with the Proposed Action would occur during construction and be short term in nature. These impacts would cease after decommissioning. In assessing the relationships between short-term use of the environment and the maintenance and enhancement of long-term productivity, it is important to consider the long-term benefits of the Proposed Action, which include:

- Promotion of clean and safe development of domestic energy sources and clean energy job creation;
- Promotion of renewable energy to help ensure geopolitical security, combat climate change, and provide electricity that is affordable, reliable, safe, secure, and clean;
- Delivery of power to the New England energy grid to contribute to the renewable energy requirements of Connecticut and Massachusetts, particularly Connecticut's mandate to obtain 2,000 megawatts of offshore wind energy by 2030 (as outlined in Connecticut Public Act 19-71) and the Massachusetts requirement that distribution companies jointly and competitively solicit proposals for offshore wind energy generation (Title 220 of the Code of Massachusetts Regulations, Section 23.04(5)); and
- Expansion of habitat for certain fish species.

Based on the anticipated potential impacts evaluated in the Draft EIS that could occur during Proposed Action construction, operations, and decommissioning, and with the exception of some potential impacts associated with onshore components, the Proposed Action would not result in impacts that would significantly narrow the range of future uses of the environment. Removal or disturbance of habitat associated with onshore activities (e.g., construction of the proposed substation) could create long-term irreversible impacts. For purposes of this analysis, BOEM assumes that the irreversible impacts presented in Section F.3 would be long term. After completion of the Proposed Action's operations and decommissioning stages, however, the majority of marine and onshore environments to return to normal long-term productivity levels.

F.6 References

Band, B. 2012. *Using a collision risk model to assess bird collision risks for offshore wind farms (with extended method)*. Report to Strategic Ornithological Support Services. Accessed: July 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Using-a-collision-risk-model-to-assess-bird-collision-risks-for-offshore-wind-farms.pdf

BOEM (Bureau of Ocean Energy Management). 2015. *Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia: Revised Environmental Assessment*. Office of Renewable Energy Program. OCS EIS/EA BOEM 2015-031. Accessed: July 2022. Retrieved from: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/VA/VOWTAP-EA.pdf

BOEM (Bureau of Ocean Energy Management). 2022a. *New England Wind Project Biological Assessment*. For the National Marine Fisheries Service.

BOEM (Bureau of Ocean Energy Management). 2022b. *New England Wind Essential Fish Habitat Assessment*.

Epsilon (Epsilon Associates, Inc.). 2022. *Draft New England Wind Construction and Operations Plan for Lease Area OCS-A 0534*. New England Wind Project. Accessed: October 2022. Retrieved from: https://www.boem.gov/renewable-energy/state-activities/new-england-wind-ocs-0534-construction-and-operations-plan

Geijerstam, C.A., L. Olivier, J. Hartnett, T. Brostrøm, and L.T. Pedersen. 2019. *Proposal for a Uniform 1 x 1 Wind Turbine Layout for New England Offshore Wind.* Letter to Michael Emerson. November 1, 2019.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela-Gomez. 2017. *Habitat Mapping and Assessment of Northeast Wind Energy Areas*. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088.

Johnson, T.L., J.J. van Berkel, L.O. Mortensen, M.A. Bell, I. Tiong, B. Hernandez, D.B. Snyder, F. Thomsen, and O.S. Petersen. 2021. *Hydrodynamic Modeling, Particle Tracking and Agent-Based Modeling of Larvae in the U.S. MidAtlantic Bight*. OCS Study BOEM 2021-049. Accessed: September 2, 2022. Retrieved from: https://espis.boem.gov/final%20reports/BOEM_2021-049.pdf

NAS (National Academies of Sciences, Engineering, and Medicine) 2022. *Wind Turbine Generator Impacts to Marine Vessel Radar*. Washington, DC: The National Academies Press. Accessed: June 27, 2022. Retrieved from: https://nap.nationalacademies.org/read/26430/chapter/1.

NOAA (National Oceanic and Atmospheric Administration). 2021. "Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region." Greater Atlantic Regional Fisheries Office. Accessed: July 2022. Retrieved from: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region

Normandeau (Normandeau Associates, Inc.), Exponent, Inc., T. Tricas, and A. Gill. 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09.

Petersen, I.K., T.K. Christensen, J. Kahlert, M. Desholm, and A.D. Fox. 2006. *Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark*. National Environmental Research Institute, Ministry of the Environment, Denmark. Accessed: July 2020. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/NERI_Bird_Studies.pdf

Skov, H., S. Heinanen, T. Norman, R.M. Ward, S. Mendez-Roldan, and I. Ellis. 2018. *ORJIP Bird Collision and Avoidance Study. Final Report*. The Carbon Trust. United Kingdom. April 2018.

Southall, B., W. Ellison, C. Clark, D. Tollit, and J. Amaral. 2021. *Marine Mammal Risk Assessment for New England Offshore Windfarm Construction and Operational Scenarios*. OCS Study BOEM 2021-080. Prepared under Contract: 140M0120C0007. Accessed: September 2, 2022. Retrieved from: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Marine%20Mammal%20Risk%20Assessment%20for%20New%20England%20Offshore%20Wind%20Farms%20Construction%20and%20Operation%20Scenarios.pdf

Taormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. "A Review of Potential Impacts of Submarine Power Cables on the Marine Environment: Knowledge Gaps, Recommendations, and Future Directions." *Renewable and Sustainable Energy Reviews* 96 (2018) 380–391.

The Nature Conservancy. 2014. "Spatial Data: NAMERA." Accessed: July 2022. Retrieved from: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/marine/namera/namera/Pages/Spatial-Data.aspx

USCG (U.S. Coast Guard). 2020. *The Areas Offshore of Massachusetts and Rhode Island Port Access Route Study*. USCG-2019-0131. January 22.