Draft Generic Environmental Impact Statement for Procurement of Offshore Wind

February 2018

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List of Exhibits

List of Abbreviations and Acronyms

ADLS	aircraft detection lighting system
AIS	Automatic identification system
BOEM	Bureau of Ocean Energy Management
COBRA	Co-Benefits Risk Assessment
Cumulative Study	New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
GEIS	Generic Environmental Impact Statement
GW	gigawatts
GWh	gigawatt hours
ISO-NE	Independent System Operator-New England
Master Plan	New York State Offshore Wind Master Plan
MW	megawatts
m/s	meters per second
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration Fisheries
NRHP	New York's State Register of Historic Places
NYCRR	New York Codes, Rules and Regulations
NYISO	New York Independent System Operator
NYSEP	New York State Energy Plan
NYSERDA	New York State Energy Research and Development Authority
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
Options Paper	Offshore Wind Policy Options Paper

List of Abbreviations and Acronyms (cont.)

PJM	Pennsylvania New Jersey Maryland
RES	Renewable Energy Standard
SEQRA	New York State Environmental Quality Review Act
SIP	State Implementations Plans
TSSs	traffic separation schemes
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard

Executive Summary

In August 2016, the Public Service Commission (Commission) issued an Order Adopting a Clean Energy Standard (CES or CES Order).[1] In the CES Order, the Commission recognized the development of offshore wind generation as one of numerous avenues required to achieve the State's renewable energy goals. The Commission requested the New York State Energy Research and Development Authority (NYSERDA) to identify the appropriate mechanisms and best solutions the Commission and State may wish to consider in developing an offshore wind program and maximizing the potential for offshore wind in New York.

On January 29, 2018, NYSERDA filed a report titled "Offshore Wind Policy Options" paper (Options Paper). The Options Paper is a component of New York State's Offshore Wind Master Plan,[2] developed after two years of in-depth research, analysis, and outreach by NYSERDA, to inform a path for meeting a goal of 2,400 MW of offshore wind energy generation by 2030. The Options Paper proposes the procurement would occur in phases, beginning with two initial annual offshore wind procurement rounds of at least 400 MW each in 2018 and 2019. The Options Paper includes various procurement program design features intended to broadly apply to the development of multiple projects, over time, in different locations that will result in the installation of 2.4 GW of offshore wind generation capacity by 2030 with the ability to deliver electricity to be consumed by New Yorkers.

This Draft Generic Environmental Impact Statement (draft GEIS), prepared pursuant to the New York State Environmental Quality Review Act (SEQRA), analyzes the potential environmental impacts associated with the State's procurement of this 2.4 GW of offshore wind energy by 2030, and builds upon and incorporates by reference relevant material from NYSERDA's Offshore Wind Master Plan. The offshore wind procurement contemplated by the Offshore Options paper is a separate action and procurement program from the Renewable Energy Standard (RES) or the Zero Emission Credit (ZEC) programs previously approved by the Commission. The environmental review conducted for the Commission pursuant to the "Reforming the Energy Vision" (REV) proceeding and the RES and ZEC programs, did consider the impacts of offshore generation and where

[1] Case 15-E-0302, Proceeding to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Order Adopting a Clean Energy Standard (issued August 1, 2016).

[2] Additional information regarding the Offshore Wind Master Plan can be found at https://www.nyserda.ny.gov/offshorewind.

relevant the information contained in those documents is also incorporated herein. However, the previous environmental reviews did not contemplate a standalone procurement of offshore wind at the scale now being proposed, necessitating the development and consideration of this draft GEIS.

The Proposed Action under consideration is the procurement by 2030 of 2,400 MW of offshore wind energy capacity through a competitive mechanism with the ability to meet the delivery requirements of the RES. The procurement contemplated by the Proposed Action is meant to encourage the development of new offshore wind energy projects in the Atlantic Ocean. However, those projects, if developed, could be undertaken in a broad range of scenarios with countless variables, including the geographic area of the marine environment (offshore between Maine and North Carolina), project timing (2018 to 2030), project scale, and project technology. Therefore, it is not possible at this stage to meaningfully assess the specific potential environmental impacts of future offshore development pursuant to SEQRA.

Given these circumstances, and consistent with SEQRA regulations, 6 New York Codes, Rules and Regulations (NYCRR) §617.10(a), this draft GEIS is broader and more general than a site- or project-specific EIS, and identifies potential areas where environmental impacts could be caused by the construction and operation of new offshore wind energy projects. The Commission anticipates that these areas of potential impact will be studied in the future, as part of the environmental review conducted for offshore wind energy development and/or transmission projects at the time they are proposed. Those project-specific reviews would assess, at a site-specific level, all relevant potential environmental impacts as required under SEQRA.

The environmental setting of this draft GEIS focuses primarily on the marine environment, which includes the submerged lands, subsoil, seabed, and water under States' jurisdiction and federal jurisdiction (termed the Outer Continental Shelf [OCS]). The marine environment also includes the geographic regions defined by the Bureau of Ocean Energy Management (BOEM) as the North Atlantic OCS and Mid-Atlantic OCS. These are the offshore areas from which offshore wind energy can reasonably be expected to be transmitted to New York State. Where applicable, the environmental setting includes not only the broad geographic area described above but also waters offshore of New York State.

The generic analysis addresses those resource areas potentially impacted by development of offshore wind energy, including biological resources (benthic communities, marine mammals and sea turtles, fish, and birds), marine commercial and recreational uses and vessel traffic, cultural resources, socioeconomics, and visual and aesthetic resources. Potential impacts are balanced with regulatory requirements for avoidance, minimization, and mitigation strategies. Although specific projects could potentially impact any of these resource areas, those potential impacts would be evaluated on a project-specific evaluation. This identification of potential impacts does not reflect the screening out of other potential impacts that

could occur depending on the location and other attributes of a specific offshore wind energy project. This draft GEIS identifies potential cumulative impacts using a hypothetical and reasonable worst-case scenario whereby all 2,400 MW of offshore wind energy projects are built offshore of New York. On a generic level, the potential for cumulative impacts includes: (1) the displacement, disturbance, or loss of habitat for marine mammals and sea turtles; (2) sensory disturbance to fish; and (3) conflict with use of space for commercial and recreational vessels.

The Proposed Action could result in direct benefits in the form of economic development, workforce employment, and the avoidance of adverse health outcomes. The Proposed Action also has the potential to lead to secondary benefits in the form of development of emerging technologies, a new source of coastal tourism, indirect jobs associated with construction and operation, purchases of local products and services, and new and increased tax payments by employees and facilities.

The Commission identified the No Action alternative as the reasonable alternative to the Proposed Action, wherein the State would not implement the procurement of 2,400 MW of offshore wind energy by 2030. In the No Action alternative scenario, the State still expects to achieve its "50 by 30" goal by employing a variety of resources, including offshore wind – though less of it -- in the renewable generation portfolio. There could be more or fewer potential impacts on the environment, depending on the other types of renewable energy sources that ultimately would be used under the No Action alternative to achieve the "50 by 30" goal. However, under the No Action alternative, offshore wind energy development may still occur, and impacts on the marine environment would likely still occur.

This draft GEIS also considers the unavoidable impacts, irreversible and irretrievable commitment of resources, and effects on energy consumption. Since the Proposed Action of a GEIS is not site- or project-specific, there are no unavoidable adverse impacts or irreversible and irretrievable commitment of resources associated with the Proposed Action. Any resulting development of offshore wind energy encouraged by the Proposed Action would consider site- or project-specific potential impacts during the federal and state approval processes for offshore wind energy development. Furthermore, while the Proposed Action may affect the State's electric generation portfolio, it is not expected to directly or indirectly affect the amount of electricity used in the State or the amount of energy conserved in the State.

1 SEQRA and Description of the Proposed Action

In August 2016, the Public Service Commission (Commission) issued an Order Adopting a Clean Energy Standard (CES or CES Order).[3] In the CES Order, the Commission stated recognized the development of offshore wind generation as one of numerous avenues required to achieve the State's renewable energy goals. The Commission requested the New York State Energy Research and Development Authority (NYSERDA) to identify the appropriate mechanisms and best solutions the Commission and State may wish to consider in developing an offshore wind program and maximizing the potential for offshore wind in New York.

On January 29, 2018, NYSERDA filed a report titled "Offshore Wind Policy Options" (Offshore Options) paper. The Offshore Options paper is a component of New York State's Offshore Wind Master Plan,[4] developed after two years of in-depth research, analysis, and outreach by NYSERDA, to inform a path for meeting a goal of 2,400 MW of offshore wind energy generation by 2030, which would introduce renewable, low-carbon sources of energy to the electrical grid, thereby advancing energy independence and helping implement the State's goal that 50 percent of all electricity consumed in New York be supplied by renewable resources by the year 2030 (the "50 by 30" goal). The Offshore Options paper proposes the procurement would occur in phases, beginning with two initial annual offshore wind procurement rounds of at least 400 MW each in 2018 and 2019. The Offshore Options paper includes various procurement program design features intended to broadly apply to the development of multiple projects, over time, in different locations that will result in the installation of 2.4 GW of offshore wind generation capacity by 2030 with the ability to deliver electricity to be consumed by New Yorkers.

This Draft Generic Environmental Impact Statement (draft GEIS), prepared pursuant to the New York State Environmental Quality Review Act (SEQRA), iden-

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[3] Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Case 15-E-0302, "Order Adopting a Clean Energy Standard", issued and effective August 1, 2016. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={44C5D5B8-14C3-4F32-8399-F5487D6D8FE8}

[4] Additional information regarding the Offshore Wind Master Plan can be found at https://www.nyserda.ny.gov/offshorewind.

tifies and describes the potential areas of environmental impact that could be associated with the State's procurement of 2,400 MW of offshore wind energy by 2030, and therefore must be assessed when future offshore wind energy projects are undertaken or approved. This draft GEIS builds upon and incorporates by reference relevant material from the Master Plan and Options Paper.

The Options Paper does not propose a particular offshore wind energy facility or site from which the State would procure energy. Rather, the Options Paper includes various procurement program design features intended to broadly apply to the procurement of energy from any number of projects developed over time in different locations that will result in a total of 2,400 MW by 2030 of offshore wind generation capacity with the ability to deliver electricity to be consumed by New Yorkers. Therefore, the Commission at present is unable to assess environmental impacts that are likely to occur at any particular location, or otherwise conduct a project-specific or site-specific environmental review.

The offshore wind procurement contemplated by the Options Paper is a separate action and procurement program from the Renewable Energy Standard (RES) or the Zero Emission Credit (ZEC) programs previously approved by the Commission. The environmental review conducted for the Commission's pursuit of the "Reforming the Energy Vision" proceeding and the RES and ZEC programs did consider the impacts of offshore generation, and where relevant the information contained in those documents is also incorporated herein.[5] However, the previous environmental reviews did not contemplate a stand-alone procurement of offshore wind at the scale now being proposed, necessitating the development and consideration of this draft GEIS.

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[5] See DPS. 2015. "Final Generic Environmental Impact Statement In CASE 14-M-0101- Reforming the Energy Vision and CASE 14-M-0094- Clean Energy Fund." Prepared by Industrial Economics, Incorporated and Optimal Energy, Incorporated. Accessed January 4, 2018. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjToayDs77YA-hUG4YMKHW2BA94QFggpMAA&url=http%3A%2F%2Fon.ny.gov%2F2vViuZS&usg=AOvVaw2QY6W1sxRUioU-8q3F8qT. and DPS. 2016. "Final Supplemental Environmental Impact Statement In CASE 15-E-0302- Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard; CASE 14-M-0101- Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision; CASE 14-M-0094- Proceeding on Motion of the Com-mission to Consider a Clean Energy Fund; CASE 13-M-0412- Petition of New York State Energy Research and Development Authority to Provide Initial Capitalization for the New York Green Bank; CASE 10-M-0457- In the Matter of the System Benefits Charge IV; CASE 07-M-0548- Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard; CASE 03-E-0188- Proceeding on Motion of the Commission Regarding Retail Renewable Portfolio Standard." Prepared by Industrial Economics, Incorporated and Optimal Energy, Incorporated. Accessed January 4, 2018. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiwy-Trvr7YAhXj7oMKHUCaDzUQFggpMAA&url=http%3A%2F%2Fdocuments.dps.ny.gov%2Fpublic%2FCommon%2FViewDoc.aspx%3FDocRefId%3D%257B424F3723-155F-4A75-BF3E-E575E6B0AFDC%257D&usg=AOvVaw2pnhpT2DXoJLcgrIgcX8GG

For these reasons, the Commission is undertaking this draft GEIS in order to analyze and consider, in general and conceptual terms, the manner in which the State may fulfill its goal of procuring 2,400 MW of offshore wind energy. This draft GEIS also identifies and describes, in general terms, the environmental areas that could be impacted by the Proposed Action, so that those potential impacts can be assessed in the future, when specific off-shore wind energy projects are undertaken or approved.

1.1 The New York State Environmental Quality Review Act

SEQRA, as set forth in Article 8 of the Environmental Conservation Law, declares that it is the State's policy to:

"… encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and enhance human and community resources; and to enrich the understanding of ecological systems, natural, human and community resources important to the people of the state."

The purpose of SEQRA is to incorporate the consideration of environmental factors into the planning, review, and decision-making processes of State, regional, and local government agencies at the earliest possible time. Consistent with this intent, SEQRA requires agencies to identify the adverse impacts that could result from their actions and to consider how those impacts might be avoided or minimized. If the agency determines that an action may have a significant adverse impact, then the agency must prepare an environmental impact statement (EIS).

Preparation of a Generic Environmental Impact Statement

When an EIS is required under SEQRA, that requirement may be satisfied by the preparation of a GEIS in several circumstances, including, as here, when the proposed action involves (defined in Section 1.2) an entire program or plan having wide application, or would restrict the range of future alternative policies or projects.[6] A GEIS may be broader and more general than a site- or project-specific EIS, should include the logic and rationale of the choices advanced, and may be based on conceptual information. A GEIS also may identify the important elements of the natural resource base, as well as existing and projected cultural features, patterns, and character. SEQRA requires that a draft GEIS be made available for public comment. The lead agency then must consider the comments and prepare a final GEIS before reaching a decision on the action being considered.

SEQRA further contemplates that after preparing a GEIS for a broader program, the appropriate state, local, or federal agency may need to conduct additional, project- or site-specific environmental review when specific components of the program are proposed. As the state agency that serves to carry out the Commission's legal mandates, the Department of Public Service serves as the lead agency under

[6] 6 NYCRR § 617.10(a)(4). The required contents of an EIS are listed in the regulations that implement SEQRA (6 NYCRR §§ 617.9 and 617.10).

SEQRA for the Commission's procurement of offshore wind energy that is the subject of this draft GEIS. In this case, the Commission anticipates that environmental review would be conducted for future offshore wind energy development and/or transmission projects at the time they are proposed, which would assess, at a site-specific level, all relevant potential environmental impacts. This draft GEIS's identification and discussion of the potential impacts of the Proposed Action do not substitute for future site-specific analyses of potential environmental impacts for particular projects.

1.2 Description of the Proposed Action

The 2015 New York State Energy Plan (NYSEP) sets forth the State's long-term goal to provide 50 percent of its electricity from renewable resources by 2030. The NYSEP includes an offshore wind initiative to promote programmatic and regulatory efforts to create a system conducive for at-scale offshore wind projects. The Proposed Action would implement the offshore wind component of the NYSEP and advance the attainment of the "50 by 30" goal.[7] The Proposed Action is the procurement by 2030 of 2,400 MW of offshore wind energy capacity through a competitive mechanism with the ability to meet the delivery requirements of the New York Renewable Energy Standard.[8]

1.3 Purpose and Benefits of Offshore Wind Energy Procurement

This section describes, consistent with 6 New York Codes, Rules and Regulations (NYCRR) § 617.9(b)(5)(i), the public purpose and benefits that may result from the Proposed Action. The purpose of the Proposed Action is to support the achievement of the "50 by 30" goal. Depending on the site- or location-specific aspects of offshore wind energy development that results from the Proposed Action, increasing the supply of offshore wind energy resources to 2,400 MW is expected to result in the following general public benefits:

- ***Public health benefits*** due to avoided emissions of greenhouse gases and criteria air pollutants. As increased use of renewable energy sources, such as offshore wind, would lead to improved air quality, society benefits from reduced

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7 New York State Energy Planning Board. 2015. "New York State Energy Plan. Volume 1: The Energy to Lead." Accessed January 19, 2018. https://energyplan.ny.gov/Plans/2015.

8 For electricity to be eligible, it must be demonstrated to the satisfaction of the Commission or its designee that the electrical output of the generation facility was 1) scheduled into a market administered by the NYISO for end-use in New York State; or 2) delivered through a wholesale meter under the control of a utility, public authority or municipal electric company such that it can be measured, and such that consumption within New York State can be tracked and verified by such entity or by the NYISO; or 3) delivered through a facility dedicated generation meter, which shall be approved by and subject to independent verification by the DPS or its designee, to a customer in New York State whose electricity was obtained through the NYISO/utility system. For any facility seeking to satisfy the electricity delivery requirement through options 2 or 3 above, all costs associated with measurement, tracking, and verification, to the satisfaction of DPS staff or its designee, and for participation in the New York Generation Attribute Tracking System must and will be borne by the facility owner/developer.

negative health impacts and increased employee productivity. For example, as air quality improves, state health care expenditures for treatment of asthma, acute bronchitis, and respiratory conditions may be reduced.[9]

- ***Climate change benefits*** related to the reduction in reliance on fossil fuel energy. Climate change projections indicate increased temperatures between 4° Fahrenheit (F) and 10° F by the year 2100 for the northeastern and southeastern United States. As a result, it is projected that the northeast will see increases in total precipitation, frequency of heavy precipitation, sea level rise, and storm surge, which in turn are expected to increase flooding and coastal erosion and further strain aging infrastructure. Extreme heat events and longer summer droughts also are expected in the region as a result of climate change. Similarly, the southeast is projected to experience heavy precipitation, sea level rise, more intense hurricanes and storm surge, and periods of extreme drying.[10,11]
- ***Ecosystem services benefits*** due to reduced impacts on land and water uses, as renewable energy sources displace fossil fuel sources from New York's energy supply portfolio. For example, wind turbines require nearly no water to operate and thus "do not pollute water resources or strain supply by competing with agriculture, drinking water systems, or other important water needs."[12]
- ***Fuel diversity benefits***. The Proposed Action would likely serve to maintain fuel diversity by spurring investment in offshore wind energy development. The addition of new renewable electricity supplies also would reduce the State's reliance on natural gas.
- ***Economic development benefits***. Offshore wind energy development spurred by the Proposed Action is expected to create net regional economic benefits. These benefits can take the form of manufacturing of wind energy equipment; job and revenue creation; stable, sustained wages, as the lifespan of an offshore wind facility is at least 25 years; and the effects of spending throughout local economies.[13]
- ***Accelerated cost reductions for offshore wind technologies***. Offshore wind energy development spurred by the Proposed Action is expected to contribute to significant cost reductions for the underlying technology.

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9 NYSERDA. 2018. "New York State Offshore Wind Master Plan: Charting a Course to 2,400 Megawatts of Offshore Wind Energy." Report 17-25. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Area-for-Consideration.

10 EPA. 2016a. "Climate Impacts in the Northeast." Accessed January 10, 2018. https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-northeast_.html.

11 EPA. 2016b. "Climate Impacts in the Southeast." Accessed January 10, 2018. https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-southeast_.html.

12 Union of Concerned Scientists. 2017. Benefits of Renewable Energy Use. Accessed 4 January 2018. https://www.ucsusa.org/clean-energy/renewable-energy/public-benefits-of-renewable-power#.Wk5ZW9qWzIU.

13 New York State. 2018. "The Workforce Opportunity of Offshore Wind in New York." In New York State Offshore Wind Master Plan. Accessed January 2018. [pending publication].

1.4 Location Affected by the Action

The Proposed Action has the potential to affect varying locations, including New York, depending on the specific activities and their specific locations. At a generic, non-site specific level, this draft GEIS identifies the broad potential impact that could be caused by the types of activities that could result from the procurement of 2,400 MW of offshore wind energy.

1.5 Relationship to Other Plans and Programs

The offshore wind energy procurement will interact with a number of additional energy-related programs and plans. Many of these programs are described in the 2015 State Energy Plan and include, for example, initiatives contemplated under the Reforming the Energy Vision regulatory docket. Offshore wind energy development will potentially interact with some of these plans and programs, such as the Master Plan, NYSERDA's Clean Energy Fund, the New York Green Bank, and/or the Regional Greenhouse Gas Initiative. Under the "No Action" scenario (Chapter 6), these current programs are maintained and continue towards New York State's "50 by 30" goal without developing a specific procurement program for offshore wind energy.

2 The Electric Industry in New York State

Consistent with NYCRR § 617.9(b)(5)(ii), this chapter provides baseline information about the State's current energy industry, including existing state programs, as it relates to the implementation an offshore wind generation procurement. The background information presented in this chapter and in Chapter 3 provides the baseline condition for assessing the potential impacts of the Proposed Action (Chapters 5 through 10). The information presented below becomes part of the No Action scenario (Chapter 6), and may assist in understanding the likely impacts of the Proposed Action.

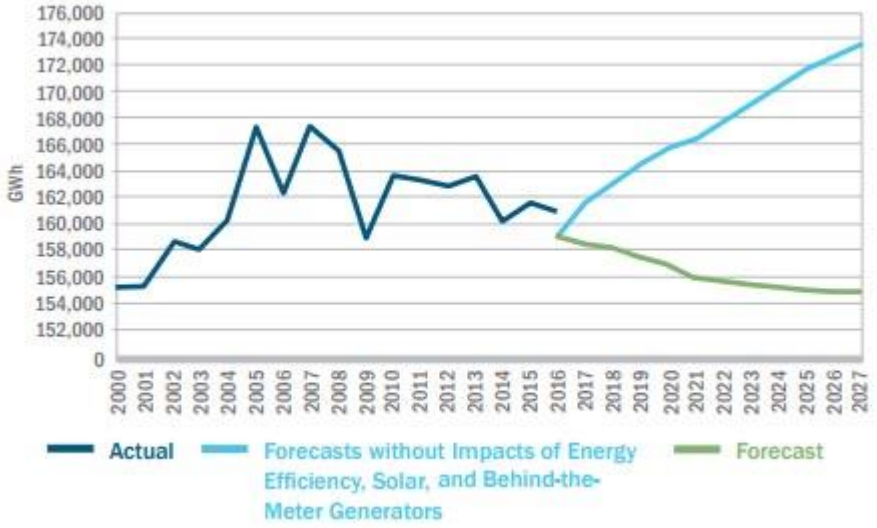
2.1 Trends in Electricity Demand and Generation

The first 15 years of the 21st century can be characterized as a time of transition in electricity use in New York State. Exhibit 2-1 presents the historical trends in the State's electric energy demand. From 2000 through 2008, annual electricity use increased from about 155,000 gigawatt hours (GWh) per year to almost 170,000 GWh per year.[14] In more recent years, annual electricity use generally declined; however, annual electricity use in 2016 still surpassed that of 2000 with an overall increase of about 5,000 GWh per year. This same variation occurred in demand forecasts of energy usage. As recently as 2014, long-term forecasts of energy usage projected 10-year average growth at 0.16% per year. However, as of 2017, New York Independent System Operator (NYISO) forecasts that energy usage in New York will decrease at an annual average rate of 0.23% based on the projected use of energy efficiency, behind-the-meter solar, and other customer-based distributed energy resources.[15]

[14] NYISO. 2017. "Power Trends 2017: New York's Evolving Electric Grid." Accessed January 9, 2018. https://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/2017_Power_Trends.pdf

[15] *Ibid.*

Exhibit 2-1 New York State Electric Energy Usage Trends, Actual and Forecast



Source: NYISO. 2017. "Power Trends 2017: New York's Evolving Electric Grid." Accessed January 9, 2018. https://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/2017_Power_Trends.pdf

Peak demand is the maximum amount of energy use for a one-hour period during the year, and while it represents a small fraction of annual overall electrical energy use, it is an important metric because it defines the amount of energy-producing resources, or power capacity, that must be available to serve maximum customer energy demand. Reducing peak demand provides the NYISO with flexibility within the transmission system to incorporate and utilize new, large generation sources such as offshore wind energy developments.

Since 2000, the addition of 11,733 MW of new generating capacity in New York State reflect a significant shift in energy use and technology in New York. Most of the new generation is powered by onshore wind and natural gas. Wind power, virtually non-existent in the State in 2000, grew to 5% of New York State's generating capability in 2017. Land-based wind-powered generating capacity in New York State grew from 48 MW in 2005 to 1,827 MW in 2017. Electricity generated by wind power increased from 101 GWh in 2005 to 3,943 GWh in 2016. According to NYISO, 4,807 MW of land-based wind projects are currently in development in the NYISO region.[16] The portion of New York's generating capability from natural gas and dual-fuel facilities grew from 47% in 2000 to 57% in 2017. In contrast, New York's generating capability from coal-fired power plants declined from 11% in 2000 to 3% in 2017, and generating capability from oil-fired power plants similarly dropped from 11% in 2000 to 6% in 2017.[17]

[16] NYISO. 2017. "Power Trends 2017: New York's Evolving Electric Grid." Accessed January 9, 2018. https://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/2017_Power_Trends.pdf

[17] *Ibid.*

This dramatic transition was facilitated by the redesign of New York's wholesale electricity markets, including changes to market rules, centralized wind forecasting, and pioneering the economic dispatch of wind energy. These and other market initiatives supported and continue to support the growth of New York's wind energy resources.

2.2 Import and Export of Electricity

To meet its electricity demand, New York State imports a portion of its electricity from the existing transmission grid. New York State's main external grid connections are with Hydro-Québec, Ontario Hydro, Independent System Operator-New England (ISO-NE), and the Pennsylvania New Jersey Maryland (PJM) Interconnection. The ISO-NE includes the coastal states of Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island; and the PJM Interconnection includes the coastal states of Delaware, Maryland, New Jersey, North Carolina, and Virginia. The majority of New York State's electricity imports come from Canada, with about 50 percent of New York's net imports during peak hours provided solely by Hydro-Québec.[18] New York exports electricity mainly to the ISO-NE.[19]

Transmission projects connecting to New York's electric system since 2000, primarily interregional high-voltage direct-current projects, include:

- The Cross-Sound Cable, linking Long Island with ISO-NE;
- The Neptune Regional Transmission System, connecting Long Island with PJM;
- The Hudson Transmission Project, connecting Manhattan with PJM; and
- The Linden Variable Frequency Transformer Line, also linking New York with PJM.[20]

NYISO manages these interfaces on the transmission grid to allow access to power in other regions; the interfaces also provide cost control and capacity flexibility during typical operations and emergency or high-peak demand situations. In the case of offshore wind energy resources, transmission interfaces allow some flexibility in that offshore wind energy resources can be located beyond the reach of the NYISO system yet still provide power back to New York State.

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18 Potomac Economics. 2015. "2014 State of the Market Report for the New York ISO Markets." Accessed January 17, 2016. http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Reports/Market_Monitoring_Unit_Reports/2014/NYISO2014SOMReport__5-13-2015_Final.pdf

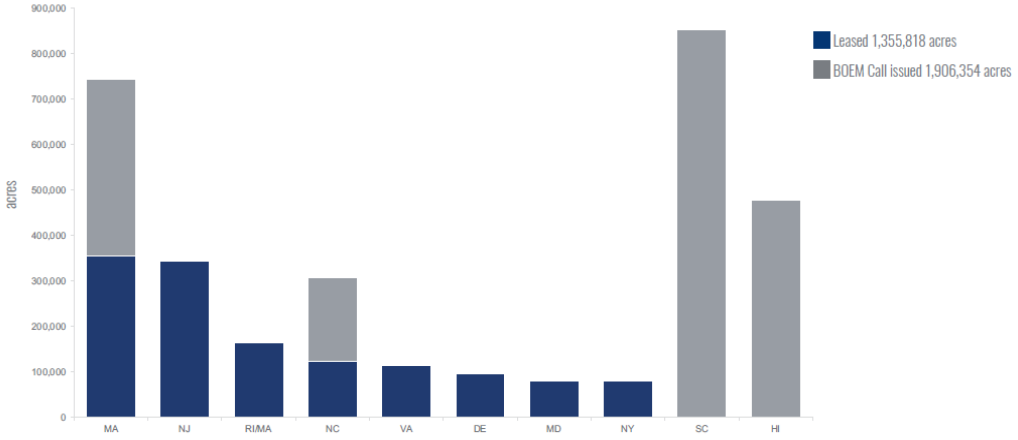
19 Potomac Economics. 2016. "2016 State of the Market Report for the New York ISO Markets." Accessed January 9, 2018 http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Reports/Market_Monitoring_Unit_Reports/2016/NYISO_2016_SOM_Report_5-10-2017.pdf

20 NYISO. 2017. "Power Trends 2017: New York's Evolving Electric Grid." Accessed January 9, 2018. https://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/2017_Power_Trends.pdf.

2.3 Potential Offshore Wind Energy Projects

Offshore wind energy development continues to expand across the globe, including in the United States, which has the potential for 2,000 GW of offshore wind energy using existing technologies. As shown in Exhibit 2-2, the Bureau of Ocean Energy Management (BOEM) leased almost 1.4 million acres in the Outer Continental Shelf (OCS) for offshore wind energy development, with nearly 2 million additional acres are under consideration. Most of the U.S. lease areas are located off the Atlantic Coast, primed for offshore wind energy development given the area's sustained high winds, shallow waters, and high electricity demand.

Exhibit 2-2 BOEM Leasing Activity by State



Source: NYSERDA. 2018. "New York State Offshore Wind Master Plan: Charting a Course to 2,400 Megawatts of Offshore Wind Energy." Report 17-25. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Area-for-Consideration.

The Proposed Action is the procurement of 2,400 MW of offshore wind energy by 2030. The Proposed Action would not include specific procurements from any existing or planned facilities, nor would it include any kind of express or implied approval for the construction or operation of any specific facility. There are a number of potential offshore wind energy projects in various stages of development, including those described below, that could provide some or all of the electricity procured by the Proposed Action. It is also possible that at least some of the procurement contemplated by the Proposed Action would be obtained from offshore wind energy projects that have not yet been proposed or constructed.

Block Island Wind Farm, located off the coast of Rhode Island, is the first offshore wind farm in the United States with a 30 MW capacity, which began commercial operations in December 2016.[21] In January 2017, Long Island Power Authority approved South Fork Wind Farm, New York's first offshore wind farm

[21] Deepwater Wind. 2018. "Clock Island Wind Farm: America's First Offshore Wind Farm." Accessed January 15, 2018. http://dwwind.com/project/block-island-wind-farm/.

with an expected operational date of 2022. South Fork Wind Farm is a 90 MW development southeast of Montauk, which will help New York State meet the "50 by 30" goal.[22] Exhibit 2-3 provides an overview of offshore wind energy lease areas that, if ultimately developed, could be wind farms from which New York State could procure additional offshore wind energy.

Exhibit 2-3 Offshore Wind Energy under Development in the Region

Name	Description	Construction Start Date	Operation Date	Off the Coast of
Empire Wind (Statoil)[23]	Parcel at 80,000 acres. Won in December 2016. Lease secured April 1, 2017. Potentially could accommodate more than 1,000 MW.	TBD	TBD (potentially mid-2020s)	New York
PNE Wind AG/ Statoil[24]	Two parcels (OCS-A 0502 and OCS-A 0503) at 248,015 acres and 140,554 acres respectively. Competitive interest by both PNE and Statoil. PNE proposes two 400 MW wind farms. Statoil proposes overall potential of the area is anywhere from 3,000 to 15,000 MW. BOEM will proceed with a competitive leasing process.[25]	TBD	TBD	Massachusetts
Bay State Wind (Ørsted and Eversource)[26]	Parcel at 187,523 acres (OCS-A 500). Awarded in 2015. Up to 2,000 MW capacity. Site Assessment Plan approved by BOEM on June 29, 2017.	TBD	TBD (potentially early 2020s)	Massachusetts
U.S. Wind Inc. (New Jersey Project)[27]	Parcel at 183,353 acres (OCS-A0499) with 1,500 MW capacity. Lease purchased.	TBD	TBD	New Jersey
Ocean Wind (RES America and Ørsted)[28]	Parcel at 160,480 acres with 1,000 MW capacity.	TBD	TBD	New Jersey

22 New York State. 2017. "Governor Cuomo Announces Approval of Largest Offshore Wind Project in the Nation." Accessed January 15, 2018. https://www.governor.ny.gov/news/governor-cuomo-announces-approval-largest-offshore-wind-project-nation.

23 Statoil. 2017. "Statoil's Empire Wind." Accessed January 15, 2018. https://www.empirewind.com/.

24 Hill, J. 2017. "European Developers Propose Offshore Wind Farms Off Long Island, Martha's Vineyard". Clean Technica. Accessed January 15, 2018. https://cleantechnica.com/2017/03/13/european-developers-propose-offshore-wind-farms-off-long-island-marths-vineyard/.

25 BOEM. n.d. "Unsolicited Lease Requests." Accessed February 6, 2018. https://www.boem.gov/Unsolicited-Lease-Requests/.

26 Bay State Wind. n.d. "Project Overview". Accessed January 15, 2018. http://www.baystatewind.com/en/about-us.

27 U.S. Wind, Inc. 2017. "Our Projects." Accessed January 15, 2018. http://www.uswindinc.com/our-projects/.

28 BOEM. 2015. "Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf. RES America Developments Inc." Accessed January 15, 2018. https://www.boem.gov/NJ-SIGNED-LEASE-OCS-A-0498/.

Exhibit 2-3 Offshore Wind Energy under Development in the Region

Name	Description	Construction Start Date	Operation Date	Off the Coast of
Vineyard Wind (Copenhagen Infrastructure Partners and Avangrid Renewables)[29]	Parcel at 166,886 acres (OCS-A 501) with 1,600 MW capacity. Lease secured in April 2015.	TBD	2027	Massachusetts
Deepwater ONE (Deepwater Wind)[30]	Two adjacent parcels at 97,498 acres and 67,252 acres with 1,000 MW capacity.	TBD	TBD	Rhode Island and Massachusetts
Revolution Wind Farm and Battery Storage System (Deepwater Wind and Tesla)[31]	Pair a 144 MW offshore wind farm with a 40 MWh battery storage system. Construction is anticipated to be finished in 2022.	TBD	2023	Massachusetts
Skipjack Wind Farm (Deepwater Wind)[32]	120 MW capacity. Construction planned to start as early as 2021, with an operational start of 2022.	2021	2022	Maryland
Dominion Energy[33]	Parcel at 112,799 acres (OCS-A 0483) with more than 2,000 MW capacity.	TBD	TBD	Virginia
Kitty Hawk (Avangrid Renewables)[34]	Parcel at 122,405 acres with 2,500 MW capacity.	TBD	TBD	North Carolina
Garden State Offshore Energy (Deepwater Wind and PSEG Renewable Generation)[35]	350 MW capacity.	TBD	TBD	New Jersey
U.S. Wind Inc. (Maryland Project)[36]	Parcel at 80,000 acres with 750 MW capacity.	TBD	TBD	Maryland

Key:
MW = megawatts
RES = Renewable Energy Standard
TBD = to be determined

29 Vineyard Wind. 2017. "The Project". Accessed January 2018. https://www.vineyardwind.com/new-page/.

30 Deepwater Wind. 2017. "Deepwater ONE". Accessed January 15, 2018. http://dwwind.com/project/deepwater-one/.

31 Shallenberger, K. 2017. "Deepwater, Tesla to pair offshore wind farm with 40 MWh battery storage system." Utility Dive. Accessed January 15, 2018. http://www.utilitydive.com/news/deepwater-tesla-to-pair-offshore-wind-farm-with-40-mwh-battery-storage-sys/448364/.

32 Deepwater Wind. 2018. "Skipjack Wind Farm." Accessed January 15, 2018. http://dwwind.com/project/skipjack-wind-farm/.

33 BOEM. 2017. "Commercial Lease for Wind Energy Offshore Virginia." Accessed January 15, 2018. https://www.boem.gov/Renewable-Energy-Program/State-Activities/VA/Commercial-Lease-for-Wind-Energy-Offshore-Virginia.aspx.

34 American Wind Energy Association. 2017. "Bidding ends at $9 million for Kitty Hawk Wind Rights." Accessed January 15, 2018. https://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=10059.

35 4C Offshore. 2016. "Garden State Offshore Energy." Accessed January 15, 2018. http://www.4coffshore.com/windfarms/bluewater-wind-delaware-united-states-us19.html.

36 U.S. Wind, Inc. 2017. "Our Projects." Accessed January 15, 2018. http://www.uswindinc.com/our-projects/.

3 Environmental Setting

Consistent with the requirement set forth in the SEQRA regulations at 6 NYCRR §617.9(b)(5)(ii), this chapter provides a "concise description of the environmental setting of the areas to be affected, sufficient to understand the impacts of the proposed action and alternatives." The environmental setting described in this chapter provides the baseline condition for assessing the potential impacts of the Proposed Action, as described in Chapters 5 through 10.

The description of the environmental setting focuses primarily on the marine environment, which includes the submerged lands, subsoil, seabed, and water under States' jurisdiction and federal jurisdiction (termed the OCS).[37] The marine environment under federal jurisdiction include the geographic regions defined by BOEM as the North Atlantic OCS and Mid-Atlantic OCS. The Energy Policy Act of 2005 amended Section 8 of the Outer Continental Shelf Lands Act (OCSLA) to give BOEM the authority to identify offshore wind development sites within the OCS and to issue leases, easements, and rights-of-way to allow for renewable energy development on the OCS. The Energy Policy Act of 2005 provided a general framework for BOEM to follow when authorizing these renewable energy activities, discussed further in Chapter 4.

The North Atlantic OCS includes the planning area off the coasts of Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, and New Jersey, while the Mid-Atlantic OCS includes the planning area off the coasts of Delaware, Maryland, Virginia, and North Carolina.[38] As described in Chapter 2, the existing transmission grid within the United States connects New York to the PJM Interconnection and the ISO-NE, which includes these states. These are the offshore areas from which offshore wind energy can reasonably be expected to be transmitted to New York State. Transmission from other potential offshore areas would require such extensive construction of transmission infrastructure that it is not a reasonably foreseeable consequence of the Proposed Action.

The environmental setting considered herein includes the broad geographic area described above and specifically New York State. Where applicable, this chapter provides specific information on the resources in New York.

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37 BOEM. n.d. "Outer Continental Shelf." Accessed January 10, 2018. https://www.boem.gov/Outer-Continental-Shelf/.

38 BOEM. 2014. "Outer Continental Shelf (OCS) Planning Area Boundaries." Accessed January 9, 2018. https://www.boem.gov/Atlantic-OCS-Plannning-Area.

3.1 Physical Resources

The marine environment is characterized, in part, by seabed, sediments, water depths, physical oceanography, and winds. Sediments experience ongoing change as a result of sorting and mixing by tides, currents, waves, and storm events. Surficial sediments can undergo biogenic mixing from human or other biological activity.[39] While the shallow substrate of the benthic environment exists in a highly dynamic setting, anthropogenic and biogenic factors have little effect on seabed composition.[40]

Seabed is characterized in terms of slope and position. The marine environment largely consists of low-slope formations, high-flat formations (e.g., banks, shoals, flats), depressions, and mid-flat formations (e.g., shelves, plateaus, flat terraces) until reaching the shelf break, where the seabed shifts to high-slope formations as water depths rapidly increase. The seabed off the coasts of Maine, New Hampshire, and northern Massachusetts is primarily composed of depressions and high-flat formations. The seabed off the coasts of southern Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina is interspersed with mid-flat formations, high-flat formations, and depressions.[41]

Sediment composition varies throughout the marine environment. Sediment off the coasts of Maine and New Hampshire is primarily sandy silt and clay around the territorial sea boundary, with areas along the shore consisting of sand and gravel deposits. Farther offshore, the sediment transitions to gravel and sand. Northern Massachusetts generally follows the same sediment pattern as Maine and New Hampshire, with the addition of bedrock close to shore and deposits of sand and gravel around the territorial sea boundary. Sediment off the coasts of southern Massachusetts, Rhode Island, and Connecticut consists primarily of sand and gravelly sediment. Sediment off the coasts of New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina follows the same sorting pattern, with sediment largely consisting of sand dispersed with areas of gravel before transitioning to finer sand, silt, and clay farther east from shore.[42]

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39 Roche, K.R., A.F. Aubeneau, M. Xie, T.C. Aquino, D. Bolster, and A.I. Packman. 2016. "An Integrated Experimental and Modeling Approach to Predict Sediment Mixing from Benthic Burrowing Behavior." *Environmental Science and Technology*. DOI: 10.1021/acs.est.6b01704.

40 Ostrowski, R. and Z. Pruszak 2011. "Relationships Between Coastal Processes and Properties of the Nearshore Sea Bed Dynamic Layer." *ScienceDirect*. Accessed January 5, 2017. http://www.sciencedirect.com/science/article/pii/S0078323411500284.

41 The Nature Conservancy (TNC). 2010. "Seabed Forms." Accessed January 5, 2017. http://portal.midatlanticocean.org/data-catalog/oceanography/#layer-info-seabed-forms.

42 USGS, USGS Continental Margin Mapping Program (CONMAP). 2005. "Atlantic Seafloor Sediment." Accessed January 5, 2018. https://cmgds.marine.usgs.gov/publications/of2005-1001.

Water depths over most of the marine environment range from 10 meters to 50 meters around the territorial sea boundary and extending farther east until the shelf break, where depths drop to 400 meters. This pattern extends along most East Coast states, with a few exceptions, such as increasing depths around the Hudson Canyon off the New York and New Jersey coasts. Additionally, the waters off the coasts of Maine, New Hampshire, and northern Massachusetts are deeper than along other states, with depths generally reaching 100 meters to 150 meters near the territorial sea boundary.[43]

The energy produced by wind is proportional to the cube of wind speed, thus stronger wind indicates the potential for a lot more power. Increased wind speeds of only a few meters per second (m/s) can produce significantly higher amounts of electric generation. Wind speeds generally increase with distance from shore, and wind speeds along the Atlantic coast vary, with higher wind speeds along the northern Atlantic coast compared to the southern Atlantic coast. At a height of 100 meters above mean sea level, which is the approximate hub height of an offshore wind turbine, wind speeds range from about 8.25 m/s to greater than 10 m/s over the North Atlantic OCS and from approximately 7.75 m/s to 9.75 m/s over the Mid-Atlantic OCS.[44]

3.2 Sensitive Biological Resources

The federal and state governments identify ("list") the sensitive biological species potentially present in the marine environment within their respective jurisdictions. Currently, 18 federally listed species have the potential to occur within the OCS, 13 of which are endangered and 6 are threatened.[45] Of these, the piping plover (*Charadrius melodus*), northern right whale (*Eubalaena glacialis*), Atlantic sturgeon (*Acipenser oxyrinchus*), and loggerhead sea turtle (*Caretta caretta*) have designated critical habitat within the marine environment. Exhibit 3-1 identifies all federally listed species with the potential to occur within the OCS.

Exhibit 3-1 Federally Endangered and Threatened Species Potentially Occurring within the OCS

Species	Federal Status	Critical Habitat?
Mammals		
Northern right whale (*Eubalaena glacialis*)	E	Yes
Sei whale (*Balaenoptera borealis*)	E	No
Blue whale (*Balaenoptera musculus*)	E	No
Fin whale (*Balaenoptera physalus*)	E	No
Sperm whale (*Physeter microcephalus*)	E	No

43 NOAA Fisheries. Office for Coastal Management (OCM). 2018. "Bathymetric Contours." Accessed January 5, 2018. https://inport.nmfs.noaa.gov/inport/item/48852.

44 BOEM. n.d. "Offshore Wind Energy." Accessed January 5, 2018. https://www.boem.gov/Offshore-Wind-Energy.

45 NOAA Fisheries. n.d. "Endangered and Threatened Marine Species under NMFS' Jurisdiction." Accessed January 8, 2018. http://www.nmfs.noaa.gov/pr/species/esa/listed.htm.

Exhibit 3-1 Federally Endangered and Threatened Species Potentially Occurring within the OCS

Species	Federal Status	Critical Habitat?
Indiana bat (*Myotis sodalis*)	E	No
Northern long-eared bat (*Myotis septentrionalis*)	T	No
Reptiles		
Green sea turtle (*Chelonia mydas*) [a]	T	No
Hawksbill sea turtle (*Eretmochelys imbricata*)	E	No
Leatherback sea turtle (*Dermochelys coriacea*)	E	No
Loggerhead sea turtle (*Caretta caretta*)[a]	T	Yes
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	E	No
Fish		
Atlantic sturgeon (*Acipenser oxyrinchus*)[b]	E	Yes
Shortnose sturgeon (*Acipenser brevirostrum*	E	No
Scalloped hammerhead shark (*Sphyrna lewini*)	T	No
Birds		
Piping plover (*Charadrius melodus*)[c]	E, T	Yes
Red knot (*Calidris canutus rufa*)	T	No
Roseate Tern (*Sterna dougalli dougalli*)	E	No

Notes:

[a] Under the ESA, loggerhead turtles are split into nine distinct population segments, and green turtles are split into 11 distinct population segments, with each listed separately.

[b] Atlantic sturgeons have five distinct population segments. The New York Bight, Chesapeake Bay, Carolina, and South Atlantic distinct population segments are listed as Endangered; the Gulf of Maine distinct population segment is listed as Threatened.

[c] The piping plover has a distinct population segment within New York State that is listed as Endangered, while a known Atlantic Coast and Northern Great Plains distinct population segment, also located within New York State, is listed as Threatened.

Key:
E = Endangered
T = Threatened

Other sensitive biological resources that could exist within the marine environment include marine mammals protected under the Marine Mammal Protection Act, fish with designated Essential Fish Habitat (EFH), coral reefs, and marine sanctuaries. EFH are "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" as dictated under the Magnuson-Stevens Fisheries Conservation and Management Act.[46] EFH may include all types of aquatic habitats, including offshore and coastal waters, wetlands, coral reefs, seagrasses, and rivers.[47] Two federally designated National Marine Sanctuaries off the coasts of the Northeast and Mid-Atlantic States include Stellwagen Bank and Monitor. These sanctuaries are located at the mouth of Massachusetts Bay

[46] NOAA Fisheries n.d. "What is Essential Fish Habitat?" Accessed January 8, 2018. http://www.habitat.noaa.gov/protection/efh/.

[47] NOAA Fisheries n.d. "Endangered and Threatened Marine Species under NMFS' Jurisdiction." Accessed January 8, 2018 http://www.nmfs.noaa.gov/pr/species/esa/listed.htm.

and off the coast of North Carolina, respectively.[48] Additionally, the New York State Department of State has designated 250 Significant Coastal Fish and Wildlife Habitat sites statewide, including many within the bays and shores of Long Island, and in the Hudson River estuary.[49]

It should further be noted that not all of the sensitive biological resources identified above may occur in the location of a specific offshore wind energy project. Similarly, this identification of sensitive biological resources does not reflect the screening out of other species that may occur at a particular location of a specific offshore wind energy project. The identification of species would depend substantially on the specific offshore wind energy facility and the local setting of the affected area(s). For example, as shown in Exhibit 3-2, 78 state-listed animal species occur in the state of New York.[50] Exhibit 3-2 identifies animal species occurring on land and in the marine environment and does not include plant species. Identification of sensitive biological resources on land would be unique to the location of a specific offshore wind energy project and its connection to the onshore electric grid. Therefore, it is anticipated that as part of the environmental review for any specific proposed project, that review would need to consider sensitive species that could be affected.

Exhibit 3-2 Endangered and Threatened Animal Species Believed or Known to Occur in New York

Species	New York State Status
Mammals	
Indiana bat (*Myotis sodalis*)	E
Northern long-eared bat (*Myotis septentrionalis*)	T
Allegheny woodrat (*Neotoma magister*)	E
Eastern cougar (*Puma concolor couguar*)[a]	E
Gray wolf (*Canis lupus*)[a]	E
Canada lynx (*Lynx canadensis*)[a]	T
Birds	
Piping plover (*Charadrius melodus*)	E
Roseate Tern (*Sterna dougalli dougalli*)	E
Spruce grouse (*Falcipennis canadensis*)	E
Pied-billed grebe (*Podilymbus podiceps*)	T
Black rail (*Laterallus jamaicensis*)	E
King rail (*Rallus elegans*)	T
Upland sandpiper (*Bartramia longicauda*)	T

48 NOAA. n.d. "National Marine Sanctuaries Northeast Region." Accessed January 8, 2018. https://sanctuaries.noaa.gov/about/northeast.html.

49 New York State Department of State Planning & Development. n.d. Significant Coastal Fish & Wildlife Habitats. Accessed February 1, 2018. https://www.dos.ny.gov/opd/programs/consistency/scfwhabitats.html.

50 New York Natural Heritage Program. 2017. "Rare Animal Status List, October 2017." Accessed January 16, 2018 http://www.dec.ny.gov/docs/wildlife_pdf/rareanimal2017.pdf.

Exhibit 3-2 Endangered and Threatened Animal Species Believed or Known to Occur in New York

Species	New York State Status
Black tern (*Chlidonias niger*)	E
Common tern (*Sterna hirundo*)	T
Least tern (*Sternula antillarum*)	T
Least bittern (*Ixobrychus exilis*)	T
Golden eagle (*Aquila chrysaetos*)	E
Northern harrier (*Circus cyaneus*)	T
Bald eagle (*Haliaeetus leucocephalus*)	T
Short-eared owl (*Asio flammeus*)	E
Peregrine falcon (*Falco peregrinus*)	E
Henslow's sparrow (*Ammodramus henslowii*)	T
Loggerhead shrike (*Lanius ludovicianus*)	E
Sedge wren (*Cistothorus platensis*)	T
Reptiles	
Bog turtle (*Clemmys muhlenbergii*)	E
Eastern massasauga (*Sistrurus catenatus*)	E
Fence lizard (*Sceloporus undulatus*)	T
Queen snake (*Regina septemvittata*)	E
Timber rattlesnake (*Crotalus horridus*)	T
Eastern Massasauga (*Sistrurus catenatus catenatus*)	E
Blanding's turtle (*Emydoidea blandingii*)	T
Eastern mud turtle (*Kinosternon subrubrum*)	E
Amphibians	
Northern cricket frog (*Acris crepitans*)	E
Tiger salamander (*Ambystoma tigrinum*)	E
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)[a]	E
Lake sturgeon (*Acipenser fulvescens*)	T
Mooneye (*Hiodon tergisus*)	T
Gravel chub (*Erimystax x-punctatus*)	T
Silver chub (*Macrhybopsis storeriana*)	E
Pugnose shiner (*Notropis anogenus*)	E
Lake chubsucker (*Erimyzon sucetta*)	T
Round whitefish (*Prosopium cylindraceum*)	E
Spoonhead sculpin (*Cottus ricei*)	E
Deepwater sculpin (*Myoxocephalus thompsonii*)	E
Mud sunfish (*Acantharchus pomotis*)	T
Banded sunfish (*Enneacanthus obesus*)	T
Northern sunfish (*Lepomis peltastes*)	T
Eastern sand darter (*Ammocrypta pellucida*)	T
Bluebreast darter (*Etheostoma camurum*)	E
Swamp darter (*Etheostoma fusiforme*)	T
Spotted darter (*Etheostoma maculatum*)	T

Exhibit 3-2 Endangered and Threatened Animal Species Believed or Known to Occur in New York

Species	New York State Status
Gilt darter (*Percina evides*)	E
Longhead darter (*Percina macrocephala*)	T
Oceanic whitetip shark (*Carcharhinus longimanus*)	T
Mollusks	
Clubshell (*Pleurobema clava*)	E
Dwarf wedgemussel (*Alasmidonta heterodon*)	E
Rayed bean (*Villosa fabalis*)	E
Brook floater (*Alasmidonta varicose*)	T
Pink mucket (*Lampsilis abrupta*)[a]	E
Wavyrayed lampmussel (*Lampsilis fasciola*)	T
Green floater (*Lasmigona subviridis*)	T
Fat pocketbook (*Potamilus capax*)[a]	E
Chittenango ovate amber snail (*Succinea chittenangoensis*)	E
Insects	
Karner blue butterfly (*Lycaeides Melissa samuelis*)	E
Tomah mayfly (*Siphlonisca aerodromia*)	E
Little bluet (*Enallagma minusculum*)	T
Scarlet bluet (*Enallagma pictum*)	T
Pine barrens bluet (*Enallagma recurvatum*)	T
Northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*)[a]	T
American burying beetle (*Nicrophorus americanus*)[a]	E
Arogos skipper (*Atrytone arogos arogos*)	E
Persius duskywing (*Erynnis persius persius*)	E
Southern grizzled skipper (*Pyrgus Wyandot*)	E
Hessel's hairstreak (*Callophrys hesseli*)	E
Frosted elfin (*Callophrys irus*)	T
Regal fritillary (*Speyeria idalia*)	E
Bogbean buckmoth (*Hemileuca sp. 1*)	E
Pine pinion moth (*Lithophane lepida lepida*)	E

Note:
[a] Species that are federally listed but are not included in the USFWS list of protected species for New York State.[51]

Key:
E = Endangered
T = Threatened

3.3 Marine Commercial and Recreational Uses

The marine environment provides for a variety of commercial and recreational uses. Commercial uses include infrastructure placement, sand and gravel mining,

[51] Information for Planning and Consultation. 2017. "IPaC: Explore Location, Resource List." Accessed January 5, 2017. https://ecos.fws.gov/ipac/location/E2KWZNXMAZBF3BM3WK5YWXU74U/resources.

ocean disposal sites, and commercial fishing. Infrastructure in the form of submarine cables (telecommunication and power cables), natural gas pipelines, and other infrastructure (e.g., buoys) is present throughout the marine environment. Exhibit 3-3 shows locations of infrastructure mapped by the National Oceanic and Atmospheric Administration Fisheries (NOAA) and the North American Submarine Cable Association. Submarine cables and natural gas pipelines provide energy and natural gas between states, and are located at varying depths at or below the seabed until they make landfall to connect to onshore distribution facilities. Telecommunications cables may be armored and buried when located closer to shore. Three international transatlantic fiber optic cables that make landfall in Virginia Beach are currently under construction and therefore are not shown on Exhibit 3-3.[52]

In addition to submarine cables and natural gas pipelines, buoys are present throughout the marine environment. Marine buoys measure a range of oceanographic parameters or serve as aids to navigation, marking navigation channels and shipping lane approaches.[53]

Sand and gravel mining occurs or formerly occurred at various sites, called borrow areas, within the marine environment. Sand and gravel mined offshore is used primarily for construction material; however, in recent decades, beach nourishment projects (to replace sand after storm events or other erosional causes) have become more common.[54,55] The majority of the active or former borrow areas are located along the East Coast between the coast and the territorial sea boundary (12 nautical miles (nm)); the farthest offshore mining site is located approximately 14 nm from shore. According to BOEM, there are no active or proposed federal OCS sand and gravel borrow lease areas north of Point Pleasant, New Jersey.[56]

Ocean disposal sites, both active and discontinued, are located throughout the marine environment and range from just offshore (less than 0.5 nm) to more than 100 nm offshore. These sites are or formerly were used for the purposes of spoil disposal, contaminated dredged material disposal, and regular dredged material

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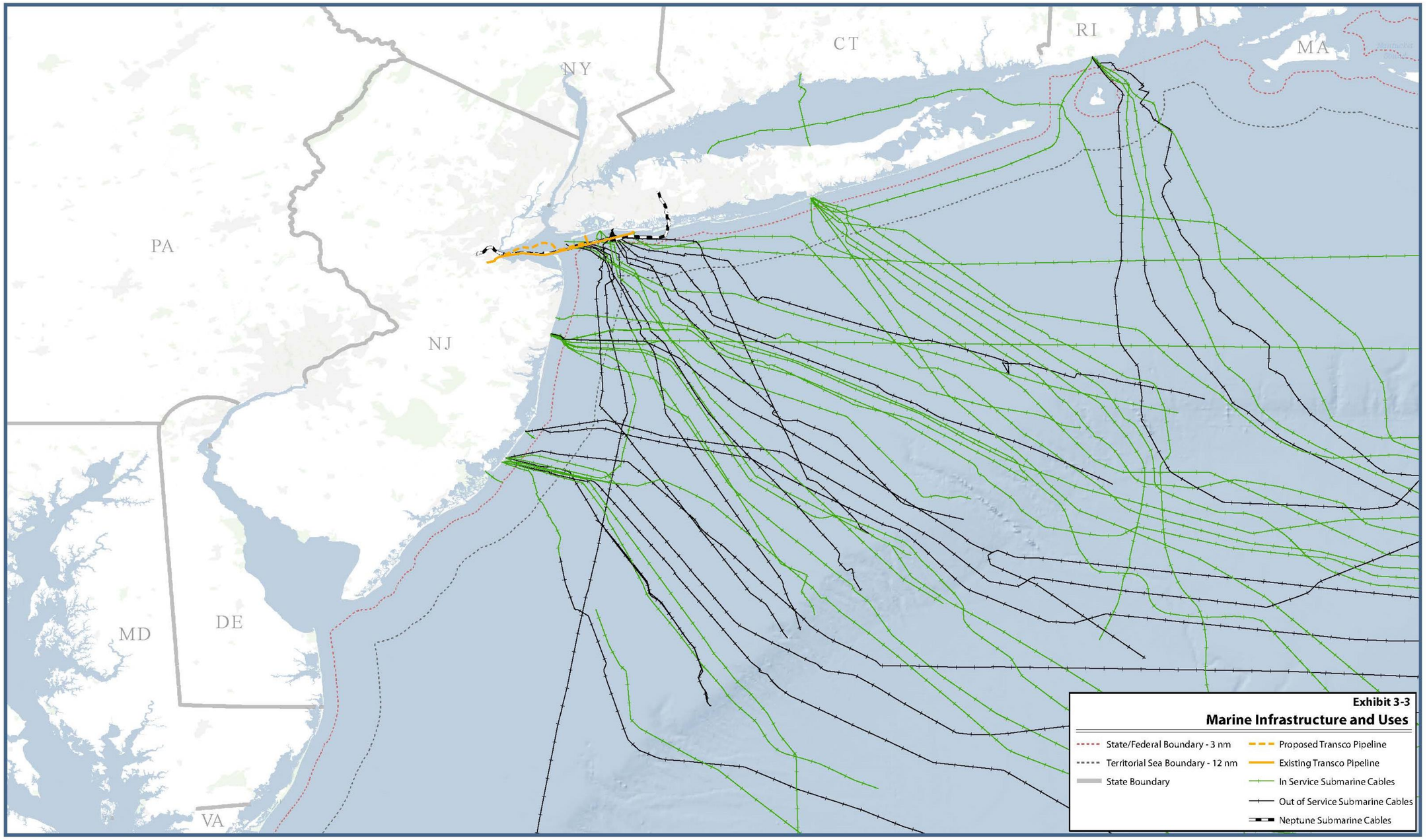
52 Huawei Marine Networks. 2017. "TeleGeography Submarine Cable Map." Accessed January 11, 2018. https://www.submarinecablemap.com/#/.

53 NYSERDA. 2017. "Cables, Pipelines, and Other Infrastructure Study." Report 17-25f. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Area-for-Consideration.

54 Garel, E., W. Bonne, and M.B. Collins. 2009. "Offshore Sand and Gravel Mining." *ResearchGate*, DOI: 10.4043/4495-MS.

55 American Shore and Beach Preservation Association. 2006. "Beach Replenishment and the Impact of Global Warming and Sea Level Rise." Accessed June 2017. http://asbpa.org/wpv2/wp-content/uploads/2016/04/globalwarmingandsealevelrise_rev3.pdf.

56 BOEM Minerals Management Program. 2016. "Federal OCS Sand and Gravel Borrow Areas (Lease Areas)." Accessed January 5, 2018. https://marinecadastre.gov/data/.


NY
CT
RI
MA
PA
NJ
MD
DE
VA
Exhibit 3-3
Marine Infrastructure and Uses
State/Federal Boundary - 3 nm
Territorial Sea Boundary - 12 nm
State Boundary
Proposed Transco Pipeline
Existing Transco Pipeline
In Service Submarine Cables
Out of Service Submarine Cables
Neptune Submarine Cables
N
W
E
S
0
25
50 Miles
0
25
50 Nautical Miles
Coordinate System: GCS_North_American_1983
Path: M:\New_York_City\NYSERDA_Offshore\Maps\MXD\GEIS_Supplement\Transportation\Exhibit3-2_Marine Infrastructure and Uses.mxd
Source: BOEM 2016c; ESRI 2010; RCG 2017
Service Layer Credits: USGS,NGA,NASA,CGIAR,GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

placement.[57,58] The United States Environmental Protection Agency (EPA) is responsible for the designation of ocean disposal sites, which generally are placed in areas where disposal will not have a significant impact on various resources such as fisheries, coral reefs, endangered species, or shipping, fishing, and recreational uses.[59]

The marine environment provides habitat for a diverse array of fish species and supports both commercial and recreational fisheries. Commercial fishing is defined as "fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through sale, barter or trade." Recreational fishing is defined as "fishing for sport or pleasure."[60] Fishing grounds exist throughout the marine environment for a variety of fish and shellfish species, including scallops, squid, monkfish, mackerel, summer and winter flounder, skates, herring, clams, crabs, lobster, bluefish, black sea bass, spiny dogfish, scup, cod, pollock, and striped bass, as well as highly migratory species such as tunas and sharks. Exhibit 3-4 presents the locations of some major commercial and recreational fishing activities on scale of use ranging from very high to low. These fishing grounds are used by commercial fishing boats landing up and down the Northeast coast, including major fishing ports such as Cape May, New Jersey; Point Judith, Rhode Island; and New Bedford, Massachusetts. Additional commercial and recreational fishing activities occur off of the Mid-Atlantic coast, including off the coasts of Ocean City, Maryland; Virginia Beach, Virginia, and the Outer Banks of North Carolina. However, as indicated in Exhibit 3-4, these areas are low and medium-low in terms of use compared to the Northeast areas. A variety of fishing gear is used both commercially and recreationally, including rod and reel, longlines, gillnets, seines, beam trawls, otter trawls, paired mid-water and bottom trawls, spears, pots and traps, and dredge.[61] According to NOAA Fisheries' *Marine Recreational Information Program National Query*, there were over 5.6 million total marine anglers in 2016 across the East Coast.[62]

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57 USACE. 2018. "Ocean Disposal Database." Accessed January 5, 2018. https://odd.el.erdc.dren.mil/ODMDSSearch.cfm.

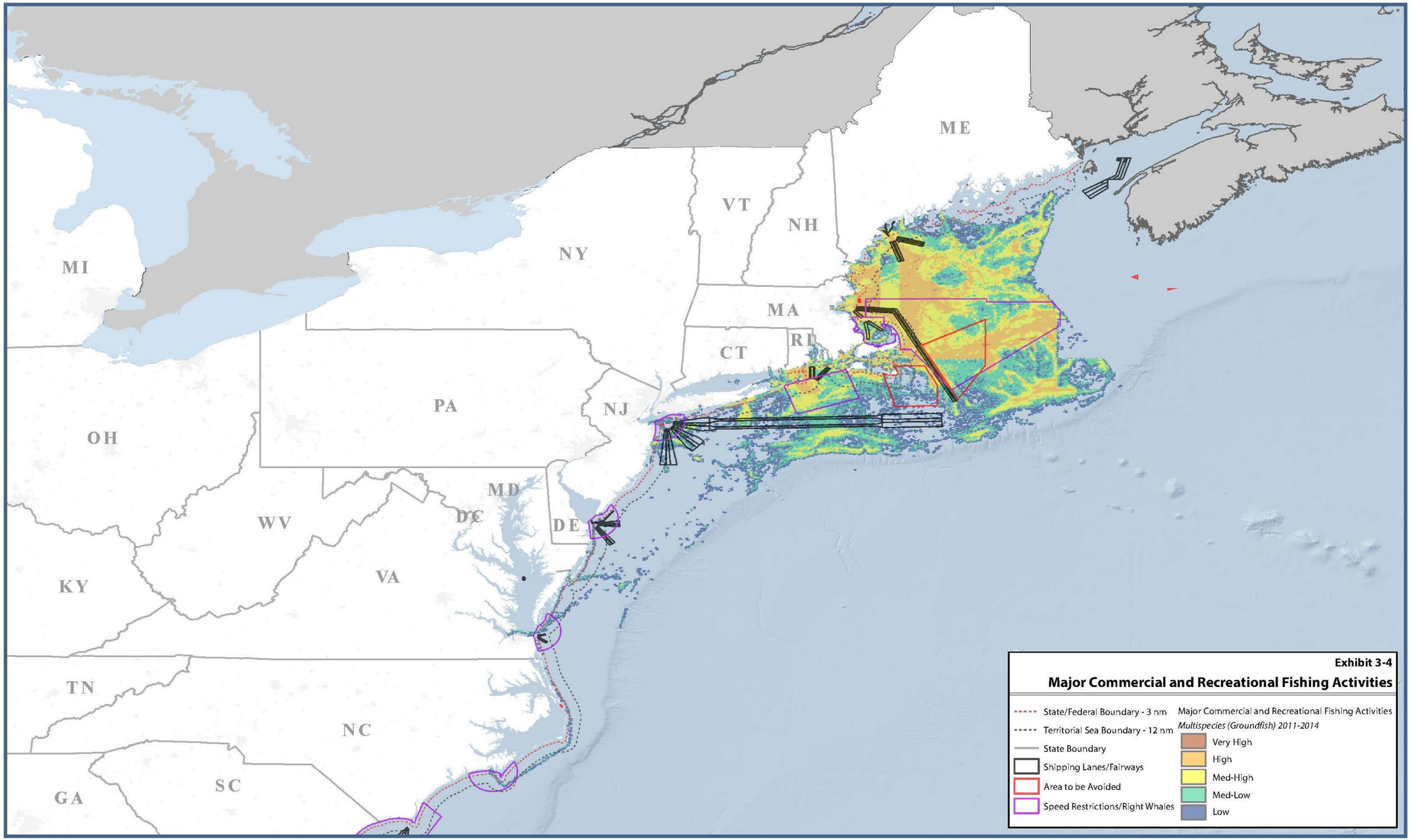
58 NOAA Office for Coastal Management. 2016. "Ocean Disposal Sites." Accessed January 5, 2018. https://www.marinecadastre.gov/data/.

59 EPA. 2018. "Ocean Disposal Site Criteria." Accessed January 10, 2018. https://www.epa.gov/ocean-dumping/ocean-disposal-site-designation.

60 NOAA Office of General Counsel. 1997. "A Guide to the Sustainable Fisheries Act: Public Law 104-297." Accessed August 7, 2017. http://www.nmfs.noaa.gov/sfa/sfaguide/102.htm.

61 Scotti, J., J. Stent, and K. Gerbino. n.d. "New York Commercial Fisherman Ocean Use Mapping: Final Report. Accessed August 7, 2017. https://docs.dos.ny.gov/communitieswaterfronts/ocean_docs/Cornell_Report_NYS_Commercial_Fishing.pdf. Cornell Cooperative Extension Marine Program.

62 NOAA Fisheries. 2016. "Marine Recreational Information Program National Query." Accessed January 5, 2018. http://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index.


ME
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DC
WV
VA
KY
TN
NC
SC
GA
Exhibit 3-4
Major Commercial and Recreational Fishing Activities
State/Federal Boundary - 3 nm
Territorial Sea Boundary - 12 nm
State Boundary
Shipping Lanes/Fairways
Area to be Avoided
Speed Restrictions/Right Whales
Major Commercial and Recreational Fishing Activities
Multispecies (Groundfish) 2011-2014
Very High
High
Med-High
Med-Low
Low
0 25 50 Miles
0 25 50 Nautical Miles
Coordinate System: GCS_North_American_1983
Path: M:\New_York_City\NYSERDA_Offshore\Maps\MXD\GEIS_Supplement\Transportation\Exhibit3-3_Fishing_rev01.mxd
Source: BOEM 2016d; ESRI 2010; NOAA et al. 2017.
Service Layer Credits: NROC, NMFS
USGS,NGA,NASA,CGIAR,GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen
and the GIS User Community

Wildlife viewing, underwater activities, and recreational boating also occur in the marine environment. Wildlife viewing includes both bird watching and whale watching, which takes place aboard charter vessels of various sizes and occurs closer to shore and in the marine environment, especially in the case of whale watching. Vessels that offer whale watching range from small, semi-private charters accommodating up to six passengers that conduct a single voyage per day, to large charters carrying up to 400 passengers that conduct three to five trips per day.[63]

Underwater activities in the marine environment consist of shore- and boat-based scuba diving, free diving, and snorkeling.[64,65] Scuba diving occurs near shipwrecks, artificial reefs, and other distinct areas of the offshore environment. Surface water activities can consist of swimming, windsurfing, surfing, and kayaking/paddling. These marine recreational uses predominantly occur near the coast and are correlated with beach activities.

Recreational boating includes personal and pleasure craft and includes both motorized recreational boats and sailboats. Recreational boating is described in more detail in Section 3.5.

Some of the marine recreational uses are more seasonally dependent than others. For example, whale watching occurs from spring through fall, with a peak in July and August; diving activity occurs year-round but is concentrated during the months of May through October; and most recreational boating activity occurs during the summer months.

3.4 Cultural Resources

Cultural resources located in the marine environment can generally be divided into three broad categories: submerged indigenous archaeological sites; shipwrecks or other objects, which may consist of aircraft remains and a variety of objects purposely or unintentionally disposed of in the marine environment; and submerged architectural or other built resources, such as piers, docks, weirs, pipelines, telecommunication cables, and artificial reefs. Relevant cultural resources may also include terrestrial cultural resources such as buildings, structures, or

63 Point97, Surfrider Foundation, and SeaPlan. 2015. "Characterization of Coastal and Marine Recreational Activity in the U.S. Northeast." Developed for the Northeast Regional Planning Body. Accessed January 29, 2018. http://archive.neoceanplanning.org/wp-content/uploads/2015/10/Recreation-Study_Final-Report.pdf.

64 Surfrider Foundation, Point 97, Nature Conservancy, and Monmouth University Urban Coast Institute. 2014. "U.S. Mid-Atlantic Coastal and Ocean Recreation Study." Prepared in collaboration with the Mid-Atlantic Regional Council on the Ocean (MARCO). Accessed January 29, 2018. http://surfridercdn.surfrider.org/images/uploads/publications/MidAtlanticCoastalandOceanRecreationStudyReport.pdf.

65 Point97, Surfrider Foundation, and SeaPlan. 2015. "Characterization of Coastal and Marine Recreational Activity in the U.S. Northeast." Developed for the Northeast Regional Planning Body. Accessed January 29, 2018. http://archive.neoceanplanning.org/wp-content/uploads/2015/10/Recreation-Study_Final-Report.pdf.

other areas; cultural or historic landscapes or seascapes; traditional cultural properties; or Native American resources that are associated with indigenous nations with an interest in the marine environment. These various types of cultural resources are associated with the prehistory and history of the marine environment.

Cultural resources can include resources that are listed, or determined eligible for listing, in a State Register, such as New York State Register of Historic Places, if a state maintains such a register and when the cultural resource is determined to be of particular importance to understanding the history of that state. Usually properties listed in the New York State Register of Historic Places are also listed in a National Register of Historic Places (NRHP). Such State Register-listed or -eligible cultural resources are typically considered when projects require state permits, approval, or funding and are reviewed by state agencies in accordance with state laws and regulations pertaining to cultural resources or historic preservation.[66]

Similarly, cultural resources can include historic properties, which are defined as any prehistoric or historic district, site, buildings, structure or object that is included (listed) or determined to be eligible for listing in the NRHP because they meet NRHP-eligibility criteria and, thus, have been determined to be of particular importance to understanding the history of the nation.[67] Cultural resources that are historic properties may also include properties that have been designated National Historic Landmarks because of their exceptional value to the nation as a whole. The term "historic properties" includes artifacts, records, and remains that are related to and located within such properties. The term also includes properties that are of traditional religious and cultural importance to an Indian tribe and meet NRHP-eligibility criteria.[68] National Register-listed or –eligible historic properties are typically considered when projects require federal permits, approval, or funding and are reviewed by federal agencies in accordance with federal laws and regulations pertaining to cultural resources or historic preservation.

Submerged indigenous archaeological sites would be located in offshore areas that were once associated with onshore (terrestrial) settings but are now submerged due to rising sea levels. Shipwrecks and other objects would be located in offshore areas with a variety of settings, depending on their unintentional disposal underwater because of storms, warfare, or other accidental or deliberate deposition. Submerged architectural or other built resources would be located in offshore areas that were intentionally selected as part of project development and construction activities. Terrestrial cultural resources, such as buildings, structures,

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66 New York State Office of Parks, Recreation and Historic Preservation. 2018. "Federal & State Preservation Legislation." Accessed January 22, 2108. https://parks.ny.gov/shpo/environmental-review/preservation-legislation.aspx.

67 Advisory Council on Historic Preservation. 2004. *36 CFR Part 800 – Protection of Historic Properties (incorporating amendments effective August 5, 2004)*. Accessed November 7, 2017. http://www.achp.gov/regs-rev04.pdf.

68 Advisory Council on Historic Preservation. 2004. *36 CFR Part 800 – Protection of Historic Properties (incorporating amendments effective August 5, 2004)*. Accessed November 7, 2017. http://www.achp.gov/regs-rev04.pdf.

or other areas, would typically be located in or near the shoreline and their significance, in whole or in part, would be associated with the marine environment. Traditional cultural landscapes or other marine areas of interest or concern to indigenous nations are typically large areas and may include submerged lands on offshore, nearshore, or shoreline locations, as well as terrestrial areas.

3.5 Transportation (Vessel Traffic)

Existing marine transportation includes a variety of commercial vessel uses, including the operation of vessels for import and export services, construction work, fishing, and cruise ship tourism, as well as recreational vessels. Recreational vessels may include charter boats used for general boating, whale-watching, fishing, birding, scuba diving, and/or snorkeling. Exhibits 3-3, 3-4, 3-5, and 3-6 include marine infrastructure and use, major commercial and fishing activities, an overall heat map showing all vessel activity from Maryland to Maine, and recreational boating routes, respectively.

Marine transportation in the offshore environment is supported by a network of navigation features, including shipping lanes, fairways, traffic separation schemes (TSSs), and features such as navigational aids, which facilitate safe navigation. TSSs are used to ensure safe passage for large commercial vessels and passenger ships. Navigation in the vicinity of the ports is guided by designated shipping lanes, as shown in Exhibit 3-5.

Cargo vessels predominantly follow fairways and TSSs and, in the absence of other constraints, generally take the most direct passage between waypoints to reduce transit time and fuel costs.[69] Similarly, tanker traffic and passenger vessels follow fairways and TSSs.[70]

The largest ports on the East Coast include the Port of New York and New Jersey, Baltimore, and Boston. Container vessels, cargo vessels, tankers, and other vessel types combined account for over 6,900 vessel calls to these three ports.[71]

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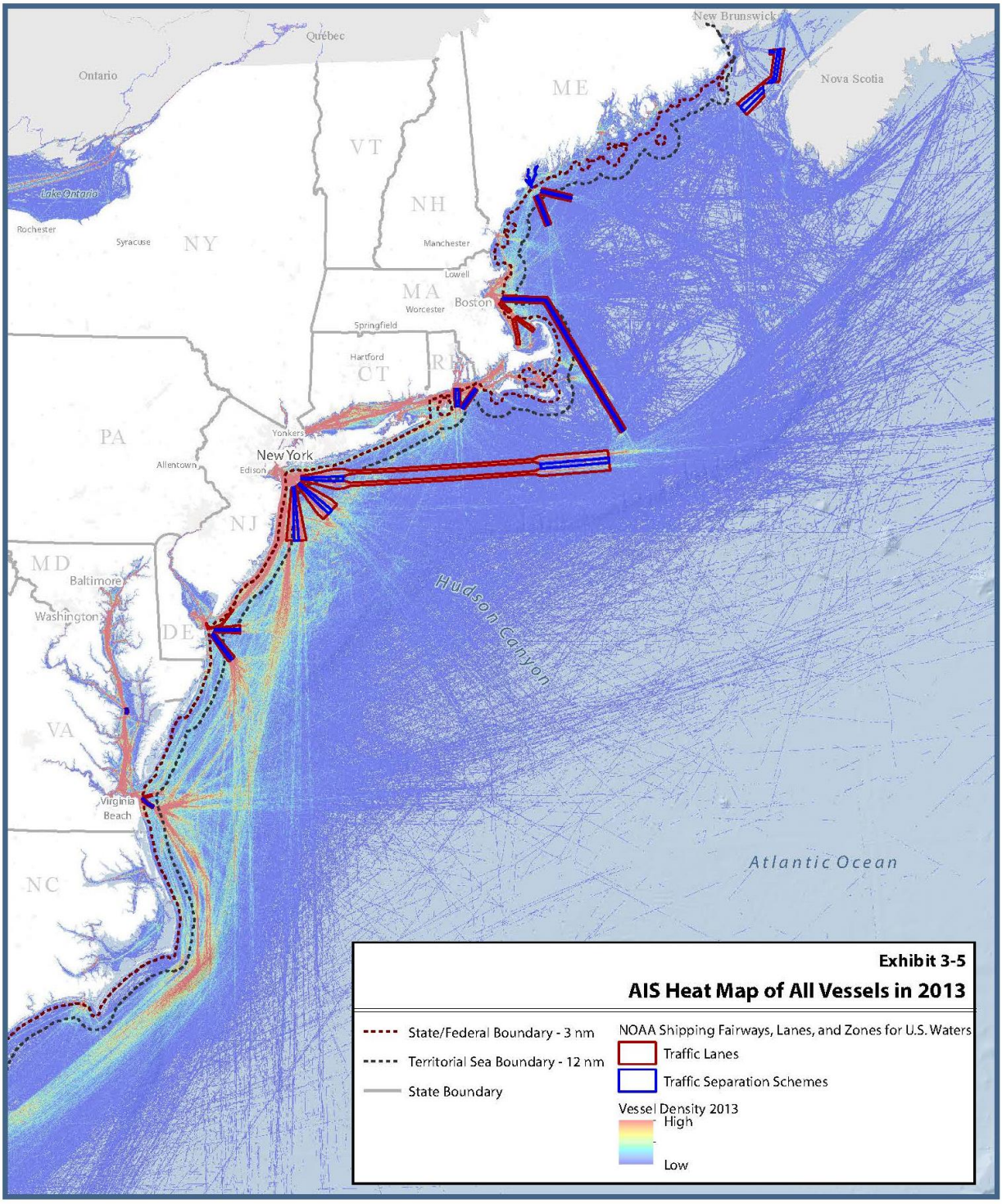
69 Toke, D. 2011. "The UK Offshore Wind Power Programme: A Sea-change in UK Energy Policy?" *Energy Policy* 39(2). pp. 526–534.

70 NYSERDA. 2017. "New York State Offshore Wind Master Plan Shipping and Navigation Study" Report 17-25g. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

71 U.S. Department of Transportation, Maritime Administration. 2015. "2015 Vessel Calls in U.S. Ports, Selected Terminals and Lightering Areas." Accessed January 8, 2018. Available at: https://www.marad.dot.gov/wp-content/uploads/pdf/DS_VesselCalls_2015.pdf.


Québec
New Brunswick
Ontario
Nova Scotia
ME
VT
NH
Lake Ontario
Rochester
Syracuse
NY
Manchester
Lowell
MA
Worcester
Boston
Springfield
Hartford
CT
RI
PA
Yonkers
New York
Edison
Allentown
NJ
MD
Baltimore
Washington
DE
Hudson Canyon
VA
Virginia Beach
NC
Atlantic Ocean
Exhibit 3-5
AIS Heat Map of All Vessels in 2013
State/Federal Boundary - 3 nm
Territorial Sea Boundary - 12 nm
State Boundary
NOAA Shipping Fairways, Lanes, and Zones for U.S. Waters
Traffic Lanes
Traffic Separation Schemes
Vessel Density 2013
High
Low
N
W
E
S
0 50 100 Miles
0 50 100 Nautical Miles
Coordinate System: GCS_North_American_1983
Path: M:\New_York_City\NYSERDA_Offshore\Maps\MXD\GEIS_Supplement\Transportation\Exhibit3-5_AIS_rev02.mxd
Source: ESRI 2010; BOEM 2016c; DOC, NOAA, NOS, OCM 2015
Service Layer Credits: USGS,NGA,NASA,CGIAR,GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

Cruise ship traffic also utilizes the shipping channels and the offshore marine environment. The three major East Coast ports—Port of New York and New Jersey, Baltimore and Boston—anticipate over 600 cruise ship departures in 2018.[72,73,74]

In addition to commercial vessel traffic, recreational boaters also utilize the marine environment. Just over half of marine recreational boating activity occurs within 1 mile of the coasts of the Northeast and Mid-Atlantic states. Long distance, offshore recreational boating routes are present throughout the offshore marine environment but at a lower density.[75,76,77] For example, low- to medium-density routes originate from multiple points along the New York coast, including, Long Beach, Mystic Beach, Hampton Bays, and Montauk; along the New Jersey coast from places such as Atlantic City and Point Pleasant; and from the Rhode Island Sound, Boston, and along the coast of Maine. Additionally, as shown on Exhibit 3-6, medium- to high-density routes originate from Lewes and Rehoboth Beach, Delaware, and from Ocean City, Maryland. Long distance sailing races also occur, including races beginning in Annapolis, Maryland, and ending in Newport, Rhode Island, as well as the Bermuda One Two, the Volvo Ocean Race, the Marian to Bermuda Race, the Corinthians, the Stamford Vineyard Race, and others. These races involve low- to medium-density routes due to their limited occurrence.

To provide a visual summary of the vessel traffic in the marine environment, automatic identification system (AIS) data from 2013 were used to create a heat map showing the use of a portion of the East Coast marine environment for the *Shipping and Navigation Study* developed for the Master Plan.[78] AIS refers to an automated vessel-tracking system intended primarily to maintain safety and avoid collisions; ships equipped with AIS transponders automatically transmit location and identification information to other vessels and shore-based facilities. At this time, only relatively large commercial

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72 Flynn Cruiseport Boston. 2018. "Cruise Schedule." Accessed January 29, 2018. http://www.massport.com/cruiseport/cruise-directory/cruise-schedule/.

73 Crew Center. 2018. "Cruise Ship Schedule." Accessed January 29, 2018. http://crew-center.com/baltimore-maryland-cruise-ship-schedule-2018.

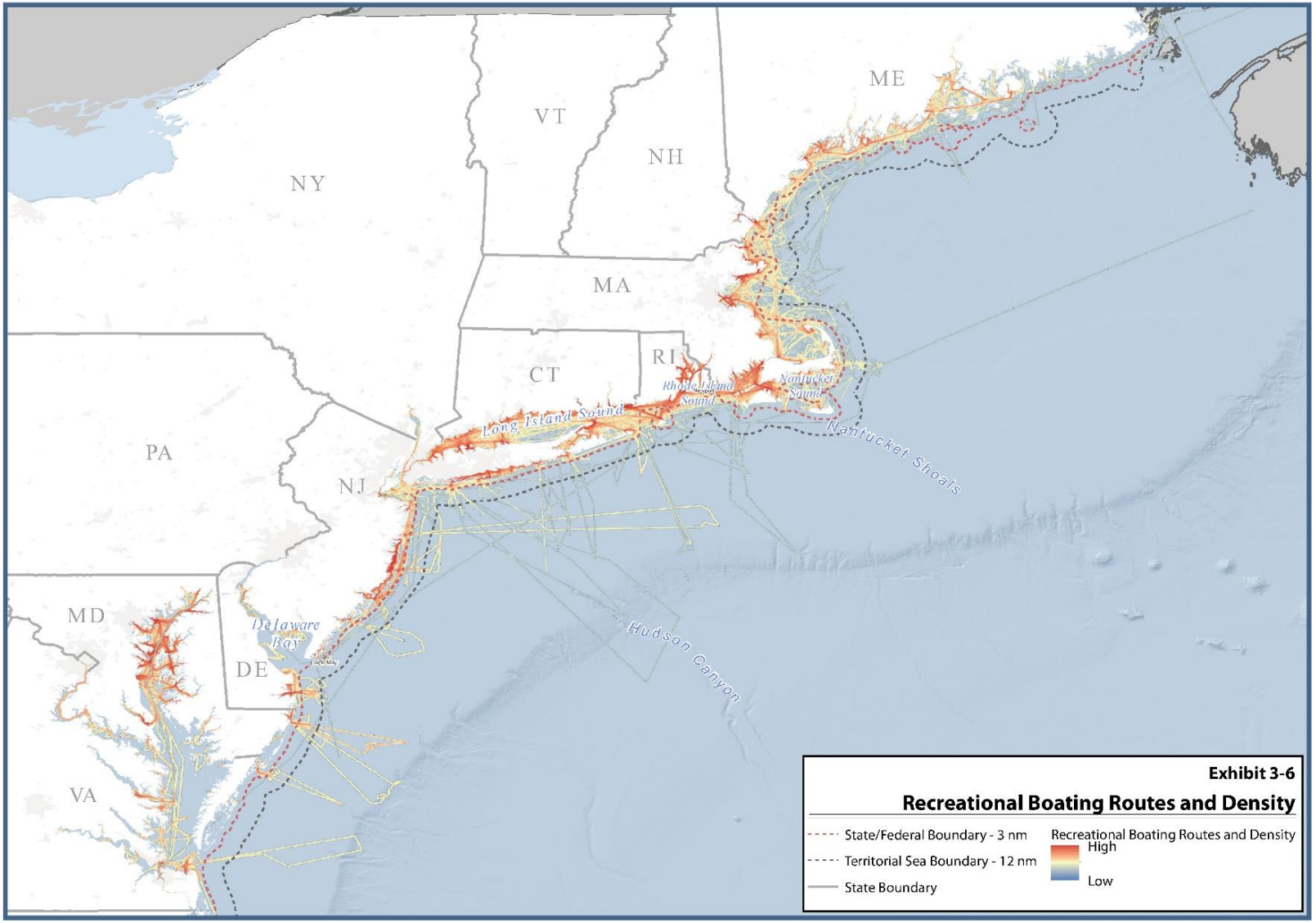
74 NYCRUISE. 2018. "Schedule." Accessed January 29, 2018. https://www.ny-cruise.com/schedule/.

75 Mid-Atlantic Ocean Data Portal. 2017. "Recreation." Accessed January 11, 2018. http://portal.midatlanticocean.org/data-catalog/recreation/.

76 SeaPlan. 2013. "2012 Northeast Recreational Boater Survey: A Socioeconomic and Spatial Characterization of Recreational Boating in Coastal and Ocean Waters of the Northeast United States." Technical Report. Document 121.13.10, Boston, Massachusetts. p.105. Accessed June 13, 2017. https://www.openchannels.org/sites/default/files/literature/2012%20Northeast%20Recreational%20Boater%20Survey.pdf.

77 SeaPlan. 2013. "Northeast Recreational Boater Route Density." [metadata]. Accessed June 5, 2017. http://www.northeastoceandata.org/files/metadata/Themes/Recreation/RecreationalBoaterRouteDensity.pdf.

78 NYSERDA. 2017. "New York State Offshore Wind Master Plan Shipping and Navigation Study." Report 17-25q. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.


ME
VT
NH
NY
MA
RI
CT
PA
NJ
MD
DE
VA
Rhode Island Sound
Nantucket Sound
Long Island Sound
Nantucket Shoals
Delaware Bay
Hudson Canyon
Exhibit 3-6
Recreational Boating Routes and Density
State/Federal Boundary - 3 nm
Territorial Sea Boundary - 12 nm
State Boundary
Recreational Boating Routes and Density
High
Low
N
W
E
S
0 25 50 Miles
0 25 50 Nautical Miles
Coordinate System: GCS_North_American_1983
Path: M:\New_York_City\NYSERDA_Offshore\Maps\MXD\GEIS_Supplement\Transportation\Exhibit3-6_RecBoating.mxd
Source: ESRI 2016; Monmouth University 2013; SeaPlan & NROC 2012
Service Layer Credits: USGS,NGA,NASA,CGIAR,GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

vessels are required to carry AIS equipment. The United States Coast Guard requires vessels with a gross tonnage of 300 tons or more, passenger ships with a gross tonnage over 150 tons, and commercial self-propelled fishing vessels of 65 feet or more to carry AIS equipment.[79] However, some owners of smaller vessels voluntarily install AIS transponders, including owners of pleasure craft and sailing vessels. The heat map converts locational data into geospatial density in transit-route pathways. Exhibit 3-5 shows vessel use of a portion of the marine environment based on numbers of vessels per year.[80] Vessels types include cargo, tanker, tug and towing, passenger, fishing, military, and recreational. Red and orange areas correspond to the highest vessel use, whereas blue and purple areas correspond to the lowest vessel use. Exhibit 3-5 shows that highest vessel use occurs closest to shore.

3.6 Socioeconomics

The following presents overall socioeconomic characteristics of the shoreline counties in the United States, using the Federal Emergency Management Agency's 452 designated shoreline counties.[81] These shoreline counties include those along the Atlantic Coast, Pacific Coast, Gulf of Mexico, and Great Lakes. With access to the waterfront, many of the employment sectors within shoreline communities are associated with industries and businesses of the offshore environment, including, but not limited to, shipping, boating, tourism, and recreation.

In a study conducted in 2013, NOAA evaluated population and housing trends of shoreline counties from 1970 to 2020. Population trends in shoreline counties have been rising since the 1970s and are projected to continue rising into 2020. Of the 313 million people living in the United States in 2010, 39% lived in shoreline counties. Since shoreline counties also account for less than 10% of total land in the United States, population density (446 persons/square mile) in shoreline counties is high when compared to the United States' average population density (105 persons/square mile).

Shoreline counties tend to have a larger concentration of wealth than inland counties. Residents of shoreline counties accounted for 52% of the share of U.S. households making more than $150,000 per year. The percentage of the population living in poverty in these counties was 13%, keeping with the 2010 national average. A larger percentage of shoreline county households made $75,000 per

79 USCG Navigation Center. 2017. "AIS Requirements." Accessed June 5, 2017. http://www.navcen.uscg.gov/?pageName=AISRequirementsRev.

80 NYSERDA. 2017. "New York State Offshore Wind Master Plan Shipping and Navigation Study." Report 17-25q. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

81 NOAA. 2013. "National Coastal Population Report. Population Trends from 1970 to 2020." Accessed January 6, 2018. https://coast.noaa.gov/digitalcoast/training/population-report.html.

year and over when compared to inland counties.[82] In 2014, coastal counties employed 54.6 million people whose earned wages totaled $3.2 trillion.[83]

The total number of housing units in shoreline counties in 2010 was 49.9 million, which amounted to 39% of total housing units in the United States. Between 2000 and 2010, the total number of housing units in shoreline counties increased by 8%.[84] When comparing shoreline counties of the Atlantic Coast, Pacific Coast, and Gulf of Mexico between 1960 and 2008, Atlantic shoreline counties experienced the largest growth of in terms of total number of housing units, adding 8.8 million units.[85] A large number of housing units in shoreline counties are seasonal. New York and New Jersey were among the leading states in number of seasonal housing units in 2010.[86]

Employment opportunities vary in shoreline counties, with opportunities including, but not limited to, shipping, boating, tourism, and recreation. Access to the waterfront is one of the distinctive features setting shoreline counties apart from inland counties. Several industries and businesses utilize this access to the waterfront, as well as access to port facilities, for a variety of activities.

The port industry facilitates a wide range of activities, primarily around shipping, transportation, and trade. Workers in port facilities are required to process shipments and move shipments from distribution facilities to industrial facilities. The processing and movement of goods include vessel activities (pilotage, tugs, provisions, fuel, crew shore leave); terminal activities (crane, stevedoring, yard handling, cargo manipulation, inspections); transaction activities (banking, insurance, data processing); and inland movement activities (trucking, rail, barge, pipeline).[87]

The Port of New York and New Jersey is the nation's third-largest port, with large ocean-going vessels using three major traffic separation corridors in and out of New York Harbor. A 31-county region in New York, New Jersey, and Pennsylvania is closely tied economically to the Port, including 12 counties in New York

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82 NOAA. 2013. "National Coastal Population Report. Population Trends from 1970 to 2020." Accessed January 6, 2018. https://coast.noaa.gov/digitalcoast/training/population-report.html.

83 NOAA. 2017. "Fast Facts: Economics and Demographics." Accessed January 8, 2018. https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html.

84 NOAA. 2013. "National Coastal Population Report. Population Trends from 1970 to 2020." Accessed January 8, 2018. https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html.

85 U.S. Census Bureau. 2010. "Coastline Population Trends in the United States: 1960 to 2008. Population Estimates and Projections." Accessed January 6, 2018. https://www.census.gov/library/publications/2010/demo/p25-1139.html.

86 NOAA. 2013. "National Coastal Population Report. Population Trends from 1970 to 2020." Accessed January 6, 2018. https://coast.noaa.gov/states/fast-facts/economics-and-demographics.html.

87 New York Shipping Association. 2017. "The Economic Impact of the New York-New Jersey Port Industry." Accessed January 18, 2018. http://nysanet.org/wp-content/uploads/NYSAEconomicImpact2017Report.pdf.

State: Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, and Westchester.[88]

In 2016, the region's port facilities handled nearly 6.3 million twenty-foot equivalent containers; close to 663,000 vehicles; nearly 47.4 million tons of bulk cargo; almost 140,000 tons of breakbulk cargo; and 260 cruise vessels. The region's port facilities supported nearly 400,000 total jobs in 2016, an increase from 336,600 in 2014. These jobs accounted for $25.7 billion in personal income and more than $64.8 billion in business income. Occupancy rates in buildings nearby ports grew substantially from 2014 to 2016, as businesses sought distribution space in close proximity to the region's consumer markets brought in through ports.[89]

Within the areas of New York Harbor, the Hudson River, and the coast of Long Island, 65 port facilities exist that could support offshore wind energy development and the local supply chain. Sites along New York Harbor are suitable for many elements associated with offshore wind development, including manufacturing, assembly, and staging activities. Hudson River sites are suitable for the manufacturing and assembly of items such as turbine blades, towers, and cables, while Long Island is positioned best for operations and maintenance facilities.[90]

3.7 Community Character

A community's character is comprised of a number of elements, including local natural features, commercial and recreational uses (Section 3.3), development patterns, population growth and density, and regional socioeconomic patterns (Section 3.5). Community character, however, is not defined only by such patterns. The more intangible characteristics that define a community include the visual landscape, demographics, open space, air quality, and traffic patterns. For instance, developed shoreline can be classified as a type of community. Shoreline communities are defined with open water being the dominant feature. They may include natural beaches, bulkheads, docks, piers, boats, ports, and marinas. Prominent industries in shoreline communities include offshore energy and other infrastructure development, sand and gravel mining, commercial fishing, tourism and recreation, shipping activities, and real estate development. Development in these communities includes a range of commercial and residential uses, and these communities often include seasonal businesses and residences. The visual landscape and air quality are also important elements of a shoreline community's character.

The visual landscape, which refers to aesthetic resources and scenic quality, is typically defined by a combination of landscape characteristics and viewer activ-

88 New York Shipping Association. 2017. "The Economic Impact of the New York-New Jersey Port Industry." Accessed January 18, 2018. http://nysanet.org/wp-content/uploads/NY-SAEconomicImpact2017Report.pdf.

89 *Ibid.*

90 NYSERDA. 2017. "The Workforce Opportunity of Offshore Wind in New York." Report 17-25t. Prepared by BVG Associates, Stantec, and GLWN. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#x.

ity and sensitivity. Some of these resources enjoy official designation, while others are simply perceived as attractive or sensitive to visual change. Existing aesthetic quality is often described by considering landscape character types, the expectations of different viewer groups, and official designations—typically assigned by some governmental body—recognizing a resource or site as having aesthetic value or sensitivity. Owing in part to the unique visual and aesthetic landscape and resources, tourism is an important industry throughout Atlantic coastal communities. Recognition of aesthetic quality also occurs at the local level. Counties, towns, and villages may consider local parks and recreation facilities, heavily used roads, local scenic overlooks/corridors, water bodies, and public gathering places as visually sensitive resources and may officially designate them as such in local planning documents.

As a reflection of community character, air quality refers to pollutants that directly affect health and the environment. The effects of air quality on human health and the environment can result in medical treatment, premature deaths, and lost work days. Most of the largest individual emission sources continue to be electric generating plants. Many quality control regions along the Atlantic coast are considered nonattainment or maintenance regions for one or more of the National Ambient Air Quality Standards (NAAQS),[91] and as a result are subject to State Implementations Plans (SIP) to control and reduce emission of pollutants.[92]

The emissions of greenhouse gases such as carbon dioxide contribute to the trend of rising average global carbon dioxide concentrations and temperatures. Combustion of fossil fuels (coal, oil, and natural gas) to generate energy is the greatest contributor to atmospheric CO_2 levels. Compared with other states in 2017, New York had the lowest carbon dioxide emissions per capita of any state in the nation. This is attributable to a smaller proportion of New York's electric energy needs being met by coal-fired power plants, and also to the widespread use of public transportation in the State's larger cities.[93]

91 EPA. 2017. "Counties Designated 'Nonattainment' or 'Maintenance' for Clean Air Act's National Ambient Air Quality Standards (NAAQS) as of 12/31/2017." Accessed January 10, 2018. https://www3.epa.gov/airquality/greenbook/map/mapnmpoll.pdf

92 EPA. 2017. "Basic Information about Air Quality SIPs." Updated September 29, 2017. Accessed January 10, 2018. https://www.epa.gov/sips/basic-information-air-quality-sips.

93 U.S. Energy Information Administration. 2017. "New York State Profile Analysis." Accessed January 10, 2018. https://www.eia.gov/state/analysis.php?sid=NY#53.

4 Regulatory Framework and Mitigation of Potential Adverse Impacts

Consistent with 6 NYCRR §§617.9(b)(5)(iv) and 617.11(d)(5) of SEQRA, this chapter identifies federal and state regulations that will help ensure, to the maximum extent practicable, avoidance, minimization, or mitigation of adverse environmental impacts that may occur due to the Proposed Action's procurement of 2,400 MW of offshore wind energy.

4.1 Federal and State Regulations and Guidance Relevant to Offshore Wind Energy Development Activities

According to Section 8 of the OCSLA, BOEM has the authority to identify offshore wind development sites within the OCS and to issue leases on the OCS for activities that are not otherwise authorized by the OCSLA, including wind farms. Therefore, development projects in the OCS are subject to review and decision-making by BOEM and other federal agencies.

Each state authority has its own laws, regulations, and review processes, and offshore wind farm developers will also be expected to adhere to these project-specific and site-specific regulations and permitting processes. For example, in New York State, the key laws and regulations applicable to the development of offshore wind energy projects include site-specific permitting, the SEQRA process, and, potentially though unlikely, Article 10 of the New York State Public Service Law. If proposed major generating facilities would be located within the jurisdictional waters of New York State, (within three miles of the shoreline), Article 10 would apply. The Master Plan suggests that future wind energy area development will be sought at least 20 miles from shore, which is also well beyond state waters, and siting is subject to federal leasing program. Under Article 10, the New York State Siting Board on Electric Generation and the Environment (the Siting Board) is responsible for siting and permitting any LSR generating project with a generating capacity equal to or greater than 25 MW. The Siting Board is required to enforce State and local environmental laws and standards, except for local ordinances that the Siting Board specifically determines should not be applied to a

particular project.[94] Therefore, for proposed projects located within federal waters, Article 10 does not apply. Article VII of the New York State Public Service Law applies to major transmission lines within New York State waters and upland areas.[95]

Exhibit 4-1 includes federal and New York State regulations, permits, review, and guideline processes potentially applicable to offshore wind energy development.

In addition, for state agency actions, consideration, conformance and application of the State's Coastal Policies and Local Waterfront Revitalization Programs are required by NYS Executive Law Article 42 and implementing regulations (19 NYCRR 600.1 et. seq.); and for actions reviewed pursuant to State Environmental Quality Review Act. In the consideration of the present action, a detailed assessment of consistency with the full range of Coastal Area Policies included in the NYS Coastal Program cannot be made until individual offshore wind project locations and designs have been advanced. Specific information regarding the Coastal Area locations where transmission and interconnection facilities including electric cables, substations, switchyards, and energy storage or converter stations are proposed to be located is needed to assess the full range of resource impacts.

The State permitting process for major electric transmission facilities siting and construction is Public Service Law Article VII. The State Coastal Policies acknowledge Article VII as requiring analysis and findings that are "entirely consistent with the general coastal zone policies derived from other laws, particularly the regulations promulgated pursuant to the Waterfront Revitalization of Coastal Areas and Inland Waterways Law."[96] State Coastal Policy 27 requires

> **Decisions on the siting and construction of major energy facilities in the coastal area will be based on public energy needs, compatibility of such facilities with the environment, and the facility's need for a shorefront location.**

As described in this EIS above, the State Energy Plan 2015 and subsequent policy decisions have identified the need to pursue at least 2,400 MW of Offshore Wind to meet the State's clean energy goals. Any generation or transmission facilities

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94 New York State Board on Electric Generation Siting and the Environment. n.d. "Siting Board – Home." Accessed on January 17, 2018. http://www3.dps.ny.gov/W/PSCWeb.nsf/All/1392EC6DD904BBC285257F4E005BE810?OpenDocument

95 New York State Public Service Commission. 2017. "The Certification Review Process for Major Electric and Fuel Gas Transmission Facilities. Under Article VII of the New York Public Service Law." Accessed January 26, 2018. http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/a021e67e05b99ead85257687006f393b/$FILE/19336071.pdf/Article%20VII%20Guide%20Web%2011-17%20Final.pdf.

96 National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, and New York State Department of State, 2017. New York State Coastal Management Program and Final Environmental Impact Statement; pg. 92.

to be sited within the designated Coastal Area would have to meet the review requirements, including coastal policy consideration, through Article VII, Article 10, or SEQRA, depending on project size and configuration.

Other policy provisions that may be applicable to any specific offshore wind-related developments include Policies 3, 9, 10 and 29. Policy 3 encourages appropriate development of the State's ports for waterborne transport of cargo and people. Offshore wind development is reliant on waterfront port facilities for support functions, procurement and transfer of materials and workforce to offshore locations. As described below in Chapter 9, development of equipment supply chain at existing ports and nearby locations, and associated increases in employment opportunities may result as a secondary effect of advancing offshore wind development. These results would advance the interests of the State's port facilities and conform to the intent of Policy 3. Policies 9 and 10 relate to potential impacts on recreational and commercial fisheries respectively.

Policy 29 directly addresses consideration of offshore wind development:

> **The development of offshore uses and resources, including renewable energy resources, shall accommodate New York's long-standing ocean and Great Lakes industries, such as commercial and recreational fishing and maritime commerce, and the ecological functions of habitats important to New York.**

This policy and the associated explanation of policy summarizes the review processes, jurisdictional considerations, and impact analysis and applicable to offshore wind or other energy resource development. [97]

[97] (NYS Dept. of State, *State Coastal Policies*, pp. 41 – 43; at https://www.dos.ny.gov/opd/programs/pdfs/CoastalPolicies.pdf.) These are considerations that would be addressed by NYS Dept.of State in review of Offshore Wind Projects located in Coastal Areas, in the context of leasing proposals and project development plans subject to federal licensing proceedings.

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
General		
Bureau of Ocean Energy Management – Lead Agency	■ Leasing and approval of site assessment and construction and operations plans. ■ National Environmental Policy Act (NEPA) review to evaluate the potential environmental impacts of the project, in coordination with other agencies.	■ Energy Policy Act of 2005 amended Section 8 of the Outer Continental Shelf Lands Act of 1953; 43 U.S.C. Chapter 29, Subchapter III ■ NEPA of 1969; 42 U.S.C. § 4321et seq.; regulations at 40 CFR Parts 1500–1508,
National Park Service	■ Right-of-Way – Required for utilities to pass over, across, or through a National Park System, which includes areas of land and water administered by the National Park Service.	■ 54 U.S.C. 100902(a) ■ 54 U.S.C. 100902(b)
New York State agencies taking discretionary actions with respect to offshore wind development	■ State Environmental Quality Review Act (SEQRA) review to evaluate the potential environmental impacts of the project, in coordination with other agencies.	■ SEQRA regulations at 6 NYCRR Part 617
New York State Department of State Office of Planning and Development	■ Coastal Zone Management Program Federal Consistency Certification	■ Coastal Zone Management Act, 16 U.S.C. §1451 et seq. regulations at 15 CFR Parts 923 and 930 ■ State Executive Law Article 42, § 910 et seq. ■ 19 NYCRR Part 600
New York State Department of State Office of Planning and Development	■ Policy 29- The development of offshore uses and resources, including renewable energy resources, shall accommodate New York's long-standing ocean and Great Lakes industries, such as commercial and recreational fishing and maritime commerce, and the ecological functions of habitats important to New York.	■ State Executive Law Article 42 ■ 19 NYCRR Part 600; Policy 29
New York State Department of State Office of Planning and Development	■ Harbor Management Plan	■ State Executive Law Article 42 ■ 19 NYCRR Part 600, 601.1, and 603)

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
New York Office of General Services	■ State Submerged Lands Easement – required for structures, including fill, located in, on, or above state-owned lands underwater.	■ New York Public Lands Law, Article 2, Section 3 ■ 9 NYCRR Parts 270 and 271
New York State Department of Public Service	■ Certificate of Environmental Compatibility and Public Need under Article VII and Article 10	■ New York State Public Service Law, Section 120–130 and 16 NYCRR Parts 85–88 (Article VII) ■ New York State Public Service Law, Section 160–167 and 16 NYCRR Parts 1000–1002 (Article 10)
Water Quality and/or Sediments		
U.S. Environmental Protection Agency	■ National Pollutant Discharge Elimination System – Stormwater/Multi-Sector General Permit or Individual Permit	■ Sections 402 and 403 of the Clean Water Act; 33 U.S.C. §1251 et seq.; 40 CFR §122.26
U.S. Army Corps of Engineers	■ Water quality and dredge-and-fill permits ■ NEPA review to evaluate the potential environmental impacts of the project, in coordination with other agencies.	■ Clean Water Act Section 404; Rivers and Harbors Act of 1899 Section 10 ■ Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972; 33 CFR Part 325
New York State Department of Environmental Conservation and New York State Department of State Office of Planning and Development	■ Tidal Wetlands Permit ■ Freshwater Wetlands Permit	■ 19 NYCRR Part 600.5 (g); Policy 44 ■ Tidal Wetlands Act, ECL Article 25; 6 NYCRR Part 661 ■ Freshwater Wetlands Act, ECL Article 24
New York State Department of Environmental Conservation and New York State Department of State Office of Planning and Development	■ Coastal Erosion Management Permit (New York State Department of Environmental Conservation) ■ Flooding and Erosion Hazard Policies (New York State Department of State)	■ ECL Article 34 Coastal Erosion Hazard Areas ■ ECL Article 70 ■ 6 NYCRR Part 505 ■ 19 NYCRR Part 600.5(g); Policies 12 and 15
New York State Department of Environmental Conservation	■ Article 15 Protection of Waters Permit- Excavation or Placement of Fill in Navigable Water and Their Adjacent and Contiguous Wetlands Permit	■ ECL Article 15, Title 5 and Article 70 ■ 6 NYCRR Parts 608 and 621

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
New York State Department of Environmental Conservation	■ Special Groundwater Protection Areas	■ ECL Article 55
New York State Department of Environmental Conservation	■ Long Island Pine Barrens Maritime Reserve Act	■ ECL Article 57
New York State Department of Environmental Conservation	■ Water Quality Certification – required for projects that require a United States Army Corps of Engineers Section 404 permit	■ U.S. Clean Water Act Section 401; 33 U.S.C. 13411 ■ 6 NYCRR Part 608 and 621.
New York State Department of State Office of Planning and Development	■ State water quality, general water State Pollutant Discharge Elimination System permit, and coastal/inland waterways review	■ 6 NYCRR Parts 608 and 701–704 ■ 19 NYCRR Part 600.5(h); Policies 31, 33-35
Air Quality		
U.S. Environmental Protection Agency	■ General Conformity Analysis – requires federal agencies to show that their activities in areas not meeting National Ambient Air Quality Standards (NAAQS) for criteria pollutants will be consistent with the state implementation plans for attainment of the NAAQS ■ Code of Federal Regulations for New Source Review (NSR) and Prevention of Significant Deterioration (PSD) and National Emission Standards for Hazardous Air Pollutants: Stationary Sources (construction)	■ Clean Air Act of 1977 (section 176(c)(4)) ■ Clean Air Act as Amended in 1990 - Title I Parts C (PSD) and D (NSR); CAA Title III - Section 328 (42 U.S.C. § 7627); 40 CFR Parts 51- 52, 55, 60, 63
New York State Department of Environmental Conservation	■ New York State Codes, Rules, and Regulations for Air Quality	■ 6 NYCCR Parts 201, 227, 231, 242, and 251
Wildlife		
U.S. Fish and Wildlife Service and NOAA Fisheries	■ Endangered Species Act (ESA) – Section 7 Consultation Process. ■ Biological Opinion – documents United States Fish and Wildlife Service determination if likelihood to adversely affect a listed species/critical habitat; may result in Incidental Take Statement, measures to minimized, and terms and conditions.	■ ESA of 1973 Section 7(a)(1) and (2); 50 CFR § 402 ■ ESA Section 10(a)(1)

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
NOAA Fisheries	■ Essential Fish Habitat Assessment – regarding an action that may adversely affect essential fish habitat. Requires consultation with NOAA.	■ Magnuson-Stevens Fishery Conservation and Management Act § 305(b)(4)(A) ■ 50 CFR § 600.920(a)(3) ■ 50 CFR § 600.920(e) ■ 50 CFR § 600.920(k)(1)
U.S. Fish and Wildlife Service and NOAA Fisheries	■ Marine Mammal Letter of Authorization or Incidental Harassment Authorization	■ Marine Mammal Protection Act of 1972 - Section 101(a)(5), see (16 U.S.C. 1361-1407) ■ Incidental Take Regulations 50 CFR Part 216
NOAA Fisheries/Office of Ocean and Coastal Resource Management	■ Coastal Consistency Determination (CCD) oversite and mediation of CCD review by states under federally approved Coastal Zone Management Plan	■ Section 307 of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. Part 1451 et seq.)
NOAA Fisheries	■ Interagency consultation between NOAA and federal agency regarding the potential to destroy, cause the loss of, or injure a sanctuary resource.	■ Section 304(d) of the National Marine Sanctuaries Act; Title 16, Chapter 32, 16 U.S.C. 1434
New York State Department of Environmental Conservation	■ Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects	■ ECL Articles 1, 3, and 11
U.S. Fish and Wildlife Service	■ Migratory Bird Treaty Act (MBTA) review; informal consultation to minimize potential impacts	■ MBTA (16 U.S.C. 703–712), listed migratory birds, ■ 50 CFR § 10.13, regulations 40 CFR Parts 13 and 21
New York State Department of Environmental Conservation	■ State-listed endangered species consultation	■ ECL Article 11 Section 535 ■ 6 NYCRR Part 182
New York State Department of Environmental Conservation	■ Wildlife and habitat regulations	■ 6 NYCRR Subpart 360–3, Part 373, Part 364 ■ Incidental Take Permit, and Local Land Use Planning and Zoning
New York State Department of Environmental Conservation	■ Marine fisheries conservation and management regulations.	■ ECL Article 15, Title 5 (Clean Water Act Section 401, 16 U.S.C. 1451)

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
New York State Department of State Office of Planning and Development	■ Significant Coastal Fish and Wildlife Habitats	■ 19 NYCRR 600.5(b)(1); Policy 7
Cultural and Visual		
Bureau of Ocean Energy Management or other federal permitting agency	■ National Historic Preservation Act (NHPA) Section 106 Review – Evaluate project effects on historical resources through Lead Agency (Bureau of Ocean Energy Management) in consultation with appropriate state and local officials, Indian tribes, applicants for federal assistance, and members of the public for those projects that require federal permits, funding, or other approval.	■ NHPA of 1966, as amended; 36 CFR Part 800 54 U.S.C. 300101 et seq. ■ Section 106 Implementing Regulations - 36 CFR Part 800 ■ 43 U.S.C. 2101–2106
New York State Office of Historic Preservation	■ Review to ensure that impacts or effects on cultural resources and historic properties are considered as part of project planning, including, but not limited to, resources that are listed, or determined eligible for listing, in the State or National Registers of Historic Places	■ Section 14.09 of the New York State Historic Preservation Act of 1980 (for projects that require only state permits, funding, or approval) ■ Section 106 of the National Historic Preservation Act of 1966, as amended, 54 U.S.C. 300101 et seq., and implementing regulations at 36 CFR 800 (for project that require federal permits, funding, or approval).
New York State Museum	■ State Lands Permit – required for activities that have the potential to disturb archaeological or geological resources on states lands, which include submerged lands under state waters	■ Section 233 of the New York State Education Law ■ 23 U.S.C. § 170
New York State Department of State Office of Planning and Development	■ Scenic Areas of Statewide Significance	■ 19 NYCRR Part 600.5(d); Policy 24
New York State Department of Environmental Conservation	■ Environmental Justice and Permitting	■ Commissioner Policy 29

Exhibit 4-1 Federal and New York State Regulations and Permits and Review and Guidance Processes Potentially Applicable to Offshore Wind Energy Development

Agency/Entity	Permit, Review, or Guideline	Applicable Law/Regulations
New York State Department of State Office of Planning and Development	■ Local Waterfront Revitalization Programs	■ Article 42 of the Executive Law, N.Y. Town Law §28-a; ■ N.Y. Town Law §272-a ■ N.Y. Village Law §7–700 et seq.
Navigation		
Federal Aviation Administration	■ Notice of Proposed Construction or Alteration; use Federal Aviation Administration-approved marking and lighting to maintain daytime and nighttime visibility	■ 14 CFR 77 ■ AC 70/7460-1L Standards
U.S. Coast Guard	■ Private Aid to Navigation and Navigation Safety Risk Assessment	■ Outer Continental Shelf Lands Act (43 U.S.C. 1333); 14 U.S.C. 81 et. seq., 33 U.S.C. 735; 33 CFR Parts 60-76 ■ Ports and Waterways Safety Act (33 U.S.C. 1221) ■ Maritime and Transportation Act of 2006 ■ Navigation and Vessel Inspection Circular No. 02-07
Transportation		
New York State Department of Transportation	■ Highway Work Permit	■ NYS Highway Law, Article 3
New York State Department of Transportation	■ Highway Use and Occupancy Permits	■ 17 NYCRR Part 131
New York State Department of Motor Vehicles	■ Any motor-driven vessel that operates within State public waterways is required to be registered with the Department of Motor Vehicles.	■ Vehicle and Traffic Law, Article 49

Key:

CFR = Code of Federal Regulations
ECL = Environmental Conservation Law
NOAA = National Oceanic and Atmospheric Administration
NYCRR = New York Codes, Rules and Regulations
U.S.C. = United States Code

4.2 Avoiding, Minimizing, and Mitigating Potential Impacts

The required avoidance, minimization, and mitigation of potential environmental impacts from future offshore wind development would occur at a site-specific level. As part of the permitting process for any specific offshore wind energy development, federal and state laws and regulations require the developer to consult with the appropriate agencies to ensure project-specific desktop and field surveys and activities comply with guidelines and regulations for offshore wind development. For instance, the developer is required to submit a survey plan to BOEM for review that describes the required geophysical and geological surveys, hazards surveys, archaeological surveys, and biological baseline collection studies for developing a site-specific design. Exhibit 4-1 identifies additional consultation requirements. The following are examples of measures that would avoid, minimize, or mitigate, to the extent practicable, potential impacts on environmental resources from offshore wind energy development:

- Appropriate siting of development projects to avoid, to the extent practicable, impacts on protected or sensitive resources and existing or planned ocean uses and development.
- Implementation of federal and state regulatory requirements, guidelines and best management practices to minimize and mitigate potential impacts. Limit construction activity to specified times and/or seasons to reduce potential impacts on sensitive receptors (e.g., community facilities, recreation).
- Adhere to appropriate setbacks to minimize potential operational and visual impacts.
- Conduct proper assessment of existing resources and potential impacts on resources.
- Develop plans to protect natural resources (e.g., emergency response plans, erosion/scour control plans).
- Utilize appropriate lighting design and controls to minimize off-site illumination.

Exhibit 4-2 further summarizes measures required by regulation or developed through agency consultations based on site-specific conditions that avoid, minimize, or mitigate, to the extent practicable, potential impacts on environmental resources from offshore wind energy development. The measures required by regulation are subject to revision if determined necessary by the responsible issuing agency, organization, or entity. Existing guidance or regulations may be updated or revised and/or new guidance or regulations may be developed after publication of this draft GEIS.

Exhibit 4-2 Potential Avoidance, Minimization, and Mitigation Measures for Offshore Wind Development

Resource(s)	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Benthic Fish Marine Mammals Sea Turtles	Avoid locating near or anchoring on known sensitive seafloor habitats by performing appropriate siting and assessing baseline data. Use scour protection. Use soft starts, pingers, and sound-reducing materials during construction. Avoid using explosives during construction. Monitor for the presence of protected species within the exclusion zone radius established during the permitting process to avoid incidental take of threatened or endangered species. During construction and ongoing maintenance operations, travel at reduced speeds and maintain a reasonable distance when whales, small cetaceans, and sea turtles are present. Use proper electrical shielding on installed cables to minimize electromagnetic fields. Avoid construction activities during species-specific migration and breeding periods.	BOEM Office of Renewable Energy Programs. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Final Environmental Assessment.* BOEM. 2016a. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP).* BOEM. 2016b. *Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).* Minerals Management Service. 2009. *Cape Wind Energy Project Final Environmental Impact Statement*. MMS EIS-EA, OCS Publication No. 2008-040. USACE. 2014. *Deepwater Wind Block Island Environmental Assessment and Statement of Findings*. September 17, 2014. Accessed on June 7, 2017. http://www.nae.usace.army.mil/Portals/74/docs/Topics/DeepwaterWind/EA17Sep2014.pdf. Virginia Coastal Zone Management Program. 2016. *Collaborative Fisheries Planning for Virginia's Offshore Wind Energy Area*. United States Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon. OCS Study BOEM 2016-040. 129 pp.
	Comply with NMFS Regional Viewing Guidelines while in transit and NOAA vessel strike avoidance measures. Perform pile driving generally during daylight hours, starting 30 minutes after dawn and ending 30 minutes prior to dusk. Use dynamic-positioning vessels and jet plow embedment to minimize sediment disturbance and alteration during cable-laying process.	Deepwater Wind. 2012. *Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan*. Prepared by TetraTech EC, Inc.

Exhibit 4-2 Potential Avoidance, Minimization, and Mitigation Measures for Offshore Wind Development

Resource(s)	Potential Avoidance, Minimization, and Mitigation Measures	Reference
	Use noise-reduction technologies during pile driving to reduce the sound levels in water.	BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).* Lucke, K., U. Siebert, P.A. Lepper, and M.A. Blanchet. 2011. "The use of an air bubble curtain to reduce the received sound levels for harbor porpoises (*Phocoena phocoena*)." *Journal of the Acoustical Society of America* 130(5): 3406-3412.
Birds and Bats	Evaluate areas of dense bird and bat use and design projects to minimize or mitigate the potential for bird strikes and habitat loss.	BOEM Office of Renewable Energy Programs. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Final Environmental Assessment.* BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).*
	Use low-intensity, radar-controlled strobe lights on turbines, and identify other measures to discourage birds from perching on equipment during operation. Design turbine structures to minimize the potential for perching and roosting.	BOEM Office of Renewable Energy Programs. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Final Environmental Assessment.* BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).*
Cultural Resources	Proper siting of project components to avoid resources/sites identified through surveys, such as submerged archaeological sites, shipwrecks or submerged built resources. Implement an Unanticipated Discovery Plan, including stop work and notification procedures, to address the inadvertent discovery of a previously unidentified submerged archaeological resource, shipwreck, or submerged built resource.	BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).*

Exhibit 4-2 Potential Avoidance, Minimization, and Mitigation Measures for Offshore Wind Development

Resource(s)	Potential Avoidance, Minimization, and Mitigation Measures	Reference
Visual Resources	Evaluate key design elements, including visual uniformity, use of tubular towers, and proportion and color of turbines. Use USCG-approved lights at the base of towers that have a maximum visible range of 4.6 miles.	BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).* Deepwater Wind. 2012. *Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan*. Prepared by TetraTech EC, Inc.
Commercial and Recreational Uses	Provide advance notifications to mariners and boaters of construction activities and vessel movements. Burying cables, where practicable, to avoid conflict with fishing vessels and gear operation.	BOEM Office of Renewable Energy Programs. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Final Environmental Assessment.* BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP) and Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP).*
	Communicate with commercial and recreational fishing agencies to identify ways to minimize potential project construction and operation impacts on their interests.	MMS. 2009. *Cape Wind Energy Project Final Environmental Impact Statement*. MMS EIS-EA, OCS Publication No. 2008-040.
	Facilitate communication of construction activities and vessel movements through a project website, public notices to mariners and vessel float plans, and a fisheries liaison. Request that fishing gear be deployed away from well-marked construction areas.	Deepwater Wind. 2012. *Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan*. Prepared by TetraTech EC, Inc.
Air Quality	Incorporate state, federal, and international guidelines on vessel emissions.	BOEM Office of Renewable Energy Programs. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York: Final Environmental Assessment.* BOEM. 2016. *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP).*

Key:
BOEM= Bureau of Ocean Energy Management

5 Areas of Potential Environmental Impact

Consistent with 6 NYCRR §617.10(a), this draft GEIS is broader and more general than a site- or project-specific EIS and discusses the concepts, logic and rationale for the choices advanced. As described in Chapter 3, the procurement contemplated by the Proposed Action would likely encourage the development of new offshore wind energy projects in the Atlantic Ocean. Those projects, if developed, could be undertaken in a broad range of scenarios with variables, including, but not limited to, the geographic area of the marine environment (offshore between Maine and North Carolina), project timing (2018 to 2030), scale, and technology, with countless permutations for the development of the full complement of 2,400 MW of wind energy. Therefore, although a GEIS "may" include an assessment of specific impacts if such details are available, and can make such an assessment based on hypothetical scenarios, no such assessment would be useful for the Proposed Action.

Any future offshore wind energy project developed as a result of this Proposed Action will require multiple federal and state permits and approvals, including site-specific environmental reviews under the National Environmental Policy Act (NEPA), SEQRA, and/or other state equivalents. Accordingly, consistent with 6 NYCRR §617.10(c), this chapter identifies the environmental areas that could be impacted by the Proposed Action and, therefore, must be assessed when future offshore wind energy projects are undertaken or approved. Where available from the Master Plan studies or elsewhere, additional information regarding the nature of potential impacts is provided; however, these qualitative discussions do not substitute for project-specific environmental reviews.

GEISs are useful tools for examining cumulative impacts of multiple potential projects on a particular resource. This draft GEIS incorporates by reference the New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects (Cumulative Study) assessing the hypothetical development of 2,400

MW of offshore wind energy as a series of projects within a particular area offshore of New York.[98] This study can be considered an examination of a reasonable "worst-case" scenario as concerns cumulative impacts on New York State from procurement of 2,400 MW of offshore wind energy, as it assumed that all of the contributing projects would be located in the waters offshore of New York, which would be in relatively close proximity compared to the marine environment from Maine to North Carolina.

The construction and operation of a specific facility are not the subject of this draft GEIS. The applicability, magnitude, duration, intensity, etc., of the types of impacts identified below would depend substantially on the specific offshore wind energy facility, setting, local species, and local communities of the affected area(s). It should further be noted that, depending on the location and other attributes of a specific offshore wind energy project, that project may have additional types of impacts not enumerated below. This identification of potential impacts does not reflect the screening out of other potential impacts that are not set forth below but that could be implicated in particular circumstances.

5.1 Overview of Offshore Wind Energy Development and Impact Analysis

This Chapter examines the environmental impact areas that could be affected by offshore wind energy development resulting from the Proposed Action. For purposes of this Chapter, "offshore wind energy" refers to the components of new or existing offshore wind energy facilities and their construction and operation, as further described below.

Offshore wind turbines are larger than land-based turbines and are designed to withstand the harsher conditions associated with the marine environment. Offshore turbines are designed to resist corrosion, and their foundations are designed to withstand natural ocean conditions such as storm waves, hurricane-force winds, and ice flows.[99] Globally in 2015, the average turbine installed offshore had a nameplate capacity of approximately 4 MW, a hub height of approximately 90 meters, and a rotor diameter of nearly 120 meters.[100] Offshore wind turbine technology is developing at a fast pace. It is projected that by 2022, the average offshore turbine will have a nameplate capacity of 10 MW, a hub height of 113.5 meters, and a rotor diameter of 177 meters. By 2030, the average offshore turbine

98 NYSERDA. 2017. "New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects." Report 17-25g. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

99 BOEM. n.d. "Offshore Wind Energy." Accessed January 5, 2018. https://www.boem.gov/Offshore-Wind-Energy/.

100 National Renewable Energy Laboratory. 2015. "2014-2015 Offshore Wind Technologies Market Report." Accessed January 11, 2018. https://www.nrel.gov/docs/fy15osti/64283.pdf.

is projected to have a nameplate capacity of 15 MW, a hub height of 138.5 meters, and a rotor diameter of 217 meters.[101]

Various pre-construction siting studies would be required prior to wind energy development. Siting studies would be undertaken at different times during the year and likely would include geological, geotechnical, archaeological, benthic, and/or biological surveys, as well as meteorological data collection. Performance of these studies would require vessel transits to and from ports and within the affected offshore marine environment. For example, the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York Environmental Assessment*[102] estimates that 200 to 540 vessel trips could be associated with pre-construction siting studies for any offshore wind energy, depending on the length of survey (i.e., 24 hours versus 10-hour days). Survey vessels would likely use smaller ports for staging and departure, and vessels associated with the installation of infrastructure to support siting studies, such as a meteorological tower, would likely depart from larger ports.

The components of a typical offshore wind energy facility include wind turbines and foundations, an electrical service platform, and inter-array cables.[103] A grid array of buried cables would collect electricity and direct it to the offshore electrical service platform, which would connect to the onshore electric grid through a transmission cable buried in the sea floor and upland to an interconnection substation.

The current design of wind turbine structures likely to be used on the Atlantic Coast includes monopile and jacket foundations. In general, monopile foundations are used at depths less than 98 feet, while jacket foundations are generally used in deeper waters. Before installing any foundations for wind turbines or an electrical service platform, some seabed preparation may be necessary, particularly if the seabed is soft due to the presence of loose sand. A pile-driving ram or vibratory hammer would be used to install the foundations into the seabed. Pile driving for monopile and jacket foundations would occur one at a time, sequentially, in appropriate sea and weather conditions. A jet plow would be used to install the cables below the seafloor, and the depth could vary, depending on the substrate encountered. This method of laying and burying the cables would ensure the placement at the target burial depth with minimum bottom disturbance.

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101 NYSERDA. 2017. "Area for Consideration for the Potential Locating of Offshore Wind Energy Areas." Report 17-25u. Accessed January 4, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Area-for-Consideration.

102 BOEM. 2016. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York Environmental Assessment*. OCS EIS/EA BOEM 2016-042. Accessed January 29, 2018. https://www.boem.gov/NY-Public-EA-June-2016/.

103 NYSERDA. 2017. "New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects." Report 17-25g. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

Vessel traffic associated with any specific offshore wind energy would use existing port facilities and established shipping corridors. Vessel traffic would include a wide variety of vessel types and sizes associated with the various stages of construction and operation, including large vessels, specialized vessels, barge traffic, and smaller vessels. Most of these vessels would be stationary or slow-moving barges and tugs conducting or supporting the installation. Vessels would also serve as construction platforms for installation of various components, stabilized on location. Support vessels may transit back and forth on a daily basis.

The construction of an offshore wind energy project typically takes several years from planning through commissioning, depending on the size of the facility. The operating life ranges from 20 to 25 years.[104] Operation includes daily maintenance activities, periodic inspections and servicing, and as-needed repairs.[105] At the end of any offshore wind energy project's life, decommissioning activities would take place, with activities and potential impacts similar to those during construction.

5.2 Biological Resources

The biological resources that could be affected by offshore wind energy development include benthic communities, marine mammals and sea turtles, fish, and birds.

5.2.1 Benthic Communities

Offshore wind energy development has the potential to impact benthic resources due to habitat disturbance. The installation of foundations would occur individually and sequentially in benthic habitat, which would temporarily create suspended sediment. Benthic communities include worms, clams, crabs, lobsters and other crustaceans, sponges and other bottom-dwelling organisms. Benthic fauna generally adapt to such minor, temporary increases in suspended sediments by physiological mechanisms such as expelling filtered sediments or reducing filtration rates.[106] The installation of foundations also would cause a loss of benthic habitat proportional to the surface area replaced by physical structures on the sea floor. In the footprint of pile-driving and excavation activities, mortality could occur from direct contact, removal, or smothering. Similar to habitat disturbance, the magnitude of any impact from direct injury and mortality would also depend on the area affected. Impacts to benthic communities generally would be proportional to the sea floor area occupied by offshore wind energy structures, which is small compared to the available sea floor. During operation, beneficial impacts on benthic communities due to benthic habitat conversion can occur. Benthic com-

104 BOEM. 2007. "Alternative Energy Programmatic EIS." Page 5–7.

105 *Ibid*. Pages 5–7, Page 5–69.

106 Clarke, D.G., and D.H. Wilbur. 2000. "Assessment of Potential Impacts of Dredging Operations Due to Sediment Resuspension." *DOER Technical Notes Collection.* U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

munities typically recolonize after construction activities, with colonization beginning within hours or days.[107,108,109] The recolonization of communities on bottom habitat disturbed for the burial of subsea cables would depend on construction materials, shape of the foundations, and the spacing of turbines.[110,111] Offshore wind energy could also provide a potential beneficial impact because the turbine foundations would make new surface area available for growth and development of benthic communities.[112]

The Master Plan includes a Benthic Survey Report[113] that provides the results of a Multibeam Echo Sounder and Sediment Profile Image and Plan View survey conducted in 2017. The survey provided planning-level characterization of the geological, geotechnical, and benthic characteristics of potential offshore wind energy in select areas offshore of New York State. These surveys revealed a range of bedforms and surface sediment features, as well as associated benthic biotic communities; all were characterized as soft substrata subject to episodic sediment transport events. Therefore, similar impacts from habitat disturbance described above could occur to existing benthic communities likely to be present offshore New York.

Benthic communities may be affected by exposure to contaminated sediments dislodged from the sea bed by construction of turbine foundations and electric cable installations. Avoidance of contaminated sediments is determined through sediment sampling and testing that occurs in detailed facility siting investigations.

5.2.2 Marine Mammals and Sea Turtles

Offshore wind energy development has the potential to impact marine mammals and sea turtles due to displacement, disturbance, loss, and conversion of habitat, as well as injury or mortality.

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107 Andersson, M.H., B. Berggren, D. Wilhelmsson, and M.C. Öhman. 2009. "Epibenthic Colonization of Concrete and Steel Pilings in a Cold-temperate Embayment: A Field Experiment." *Helgoland Marine Research* 63:249–260.

108 Golani, D., and A. Diamant. 1999. "Fish Colonization of an Artificial Reef in the Gulf of Elat, Northern Red Sea." *Environmental Biology of Fishes* 54:275-82.

109 Wilhelmsson, D., S.A.S. Yahya, and M.C. Öhman. 2006. Effects of High Structures on Cold Temperate Fish Assemblage: A Field Experiment." *Marine Biology Research* 2:136–147.

110 Raoux, A., S. Tecchio, J.P. Pezy, G. Lassalle, S. Degraer, D. Wilhelmsson, M. Cachera, B. Ernade, C. Le Guen, M. Haraldsson, K. Grangere, F. Le Loc'h, J.C. Dauvin, and N. Niquil. 2017. "Benthic and Fish Aggregation Inside an Offshore Wind Farm: Which Effects on the Trophic Web Functioning?" *Ecological Indicators* 72:33-46.

111 Andersson, M.H., and M.C. Öhman. 2010. "Fish and Sessile Assemblages Associated with Wind-turbine Constructions in the Baltic Sea." *Marine and Freshwater Research* 61:642–650.

112 Elliott, M., and C.J. Wilson. 2009. "The Habitat-creation Potential of Offshore Wind Farms." *Wind Energy* 12:203-212.

113 Svane, I., and Petersen, J. K. 2001. "On the Problems of Epibioses, Fouling and Artificial Reefs, a Review." *Marine Ecology* 22: 169-188.

5.2.2.1 Displacement, Disturbance, Loss, or Conversion of Habitat

Pile-driving and excavation activities are likely to temporarily displace species from their typical habitat due to the associated noise disturbance; this disturbance may additionally lead to changes in typical foraging and reproductive behaviors, and may mask important acoustic signals.[114,115,116,117] Increased vessel traffic may also disturb marine mammals and sea turtles, leading to their displacement into areas of higher vessel traffic, such as nearby shipping corridors, some of which are shown in Exhibit 3-3. Sensitive marine mammal and sea turtle species known to occur in offshore waters of the United States could experience an increased chance of collision with vessels. Operation generally would result in minimal noise and vessel traffic, and the spacing of wind turbines could be arranged to allow most marine mammals and sea turtles to experience typical foraging and reproductive behaviors, thereby minimizing loss of habitat. Smaller marine mammals and sea turtles in particular are likely to return to prior habitat after construction, particularly if the presence of offshore wind energy leads, as expected, to new habitat and increases benthic and fish communities.

The Master Plan includes a Marine Mammal and Sea Turtle Study.[118] In the Marine Mammal and Sea Turtle Study, researchers determined that high-frequency cetaceans (marine mammals with hearing ranges greater than 180 kilohertz) are broadly distributed in offshore waters along the northeastern Atlantic Coast during the spring months, and could experience displacement impacts from construction-related noise during this time. Harbor porpoise (*Phocoena phocoena*), North Atlantic right whales, and other baleen whales have the highest potential for disturbance.

5.2.2.2 Injury/Mortality

Injury or mortality of marine mammals and sea turtles could occur due to noise during pile driving and an increased potential for collision with vessels. The potential risk of noise-related injury, or behavioral changes from noise, would be

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[114] Nowacek, D.P., L.H. Thorne, D.W. Johnston, and P.L. Tyack. 2007. "Responses of Cetaceans to Anthropogenic Noise." *Mammal Review* 2007(37.2):81-115.

[115] Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. "Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations." *Aquatic Mammals* 33(4):411-509.

[116] Rhode Island Coastal Resources Management Council. 2010. "Rhode Island Ocean Special Area Management Plan." Volume 1, Chapter 8, Section 850. Prepared by Jennifer McCann for the Rhode Island Coastal Resources Management Council. Accessed January 29, 2018. http://seagrant.gso.uri.edu/oceansamp/.

[117] World Wildlife Fund. 2014. "Norway, Environmental Impacts of Offshore Wind Power Production in the North Sea, A Literature Overview." Accessed January 22, 2018. http://awsassets.wwf.no/downloads/wwf_a4_report___havvindrapport.pdf.

[118] NYSERDA. 2017. "New York State Offshore Wind Master Plan Marine Mammal and Sea Turtle Study." Report 17-25l. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#m.

highest for high-frequency cetaceans due to their sensitivity to loud, high-frequency noise generated by pile driving. Less is known about sea turtle hearing and thresholds; however, sea turtles may be protected from pile driving and other impulsive noise because of their rigid external shell, which may protect the organs inside the shell area.[119]

With respect to waters offshore New York State, impacts to the North Atlantic right whale (*Neobalaenid glacialis*), fin whale (*Balaenoptera physalus*) and humpback whale (*Megaptera novaeangliae*) could occur due to vessel collision.[120] Recent surveys indicate that sea turtles are also common across the OCS waters offshore New York in summer. Although sea turtles show a potential preference for the slope of the OCS and coastal areas, they may be present in waters offshore New York State. [121,122]

5.2.3 Fish

Offshore wind energy development may impact fish due to displacement, disturbance, loss, or conversion of habitat, as well as injury or mortality.

5.2.3.1 Displacement, Disturbance, Loss, or Conversion of Habitat

During construction, the installation of foundations would temporarily create suspended sediment. The majority of sediments would settle quickly, minimizing turbidity, and fish would generally relocate to nearby habitats to avoid impacts. Impacts on fish from turbidity during construction would be expected to be temporary. Pile-driving and excavation activities are likely to displace fish from regular swimming, foraging, and spawning habitats, and the fish may relocate to nearby habitats due to sensory disturbances. The majority of fish would temporarily relocate to ample available nearby habitat, and would likely return to pre-existing habitats after construction.

Offshore wind energy development may also lead to the conversion of open water to an artificial reef-like habitat. Added structures (i.e. turbine foundations) would create a new hard-bottom habitat similar to an artificial reef, which could cause a shift in species presence and diversity. As described above in Section 5.2.1, the

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119 Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, M.B. Halvorsen, S. Løkkeborg, P.H. Rogers, B.L. Southall, D.G. Zeddies, W.N. Tavolga. 2014. "Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report Prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI." Springer and ASA Press, Cham, Switzerland.

120 Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet and M. Podesta. 2001. "Collisions Between Ships and Whales." *Marine Mammal Science* 17:35-75.

121 Normandeau Associates, Inc. and APEM, Inc. 2016. "Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy." Summer 2016 taxonomic analysis summary report prepared for New York State Energy Research and Development Authority.

122 Tetra Tech and Smultea Environmental Sciences. 2017. "March 2017 Survey Report of New York Bight Whale Monitoring Aerial Surveys." Provided by the New York State Department of Conservation.

colonization of benthic communities in areas with installed structures may increase available food for larger pelagic predators. Artificial reef-like habitats may attract new fish species to the area that may use the structures as a refuge from predators.[123] In addition, species typically caught via trawl or other bottom-dragging nets may flourish due to the decrease in trawling capabilities between turbines.

New York State's Offshore Wind Master Plan Fish and Fisheries Study describes representative, sensitive, and federally protected fish species likely to occur offshore New York.[124] Construction and operation impacts on the ESA-listed Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), other species proposed for listing (*Brosme, Carcharhinus logimanus, Manta birostris*), and species with designated EFH could occur from habitat disturbance within this area.

Fish communities may be affected by electromagnetic fields (EMF) emitted from buried electric cables.[125,126,127,128] The exposure to EMF could theoretically displace fish from the area, which could impact migration, foraging, and reproductive behaviors.[129,130] However, existing and ongoing studies indicate little or no

123 Copping, A., L. Hanna, J. Whiting, S. Geerlofs, M. Grear, K. Blake, A. Coffey, M. Massaua, J. Brown-Saracino, and H. Battey. 2013. "Environmental Effects of Marine Energy Development around the World: Annex IV Final Report." Prepared by Pacific Northwest National Laboratory (PNNL) for Ocean Energy Systems (OES). Accessed January 22, 2018. http://tethys.pnnl.gov/publications/environmental-effects-marine-energy-development-around-world-annex-iv-final-report.

124 NYSERDA. 2017. "New York State Offshore Wind Master Plan Fish and Fisheries Study" Report 17-25j. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#m.

125 Bergstrom, L., L. Kautsky, T. Malm, R. Rosenberg, M. Wahlberg, N. Åstrand Capetillo, and D. Wilhelmsson. 2014. "Effects of Offshore Windfarms on Marine Wildlife—A Generalized Impact Assessment." *Environmental Research Letters* 9:034012.

126 Emeana, C.J., T.J. Hughes, J.K. Dix, T.M. Gernon, T.J. Henstock, C.E.L. Thompson, and J.A. Pilgrim. 2016. "The Thermal Regime around Buried Submarine High Voltage Cables." *Geophysical Journal International* 206:2.

127 Meißer, K., H. Schabelonbk, J. Bellebaum, and H. Sordyl. 2006. "Impacts of Submarine Cables on the Marine Environment: A Literature Review." Prepared by the Institute of Applied Ecology Ltd. for the Federal Agency of Nature Conservation, Germany. Accessed January 28, 2018. https://www.bfn.de/fileadmin/BfN/meeresundkuestenschutz/Dokumente/BfN_Literaturstudie_Effekte_marine_Kabel_2007-02_01.pdf.

128 World Wildlife Fund. 2014. "Norway, Environmental Impacts of Offshore Wind Power Production in the North Sea, A Literature Overview." Accessed January 22, 2018. http://awsassets.wwf.no/downloads/wwf_a4_report___havvindrapport.pdf.

129 Electric Power Research Institute. 2013. "EPRI Workshop on EMF and Aquatic Life." Accessed January 31, 2018. http://tethys.pnnl.gov/publications/epri-workshop-emf-and-aquatic-life.

130 Gill, A.B., I. Gloyne-Phillips, K.J. Neal, J.A. Kimber. 2005. "Electromagnetic Fields Review: The Potential Effects of Electromagnetic Fields Generated by Sub-sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms. *Sea Life: Cowrie* 2005:1-89.

behavioral responses to EMF.[131,132,133,134] Typically, cable burial and sheathing materials shield direct EMF.[135,136,137,138,139] These impacts would occur in small areas within the footprint of an electric cable.

5.2.3.2 Injury/Mortality

Noise associated with pile driving could potentially exceed the NOAA Fisheries criteria for cumulative sound exposure level, and may cause injury and/or mortality to some fish species. Eggs, larvae, and demersal species may not have the ability to avoid sensory disturbances, and as described above in Section 5.2.3.1, other sensitive species such as federally protected species and those with designated EFH may be more affected than other fish. The increase in noise is likely to disrupt foraging and reproductive behaviors, and could also cause disorientation and tissue damage, mask biologically important sounds, and even cause death. Herring in particular are sensitive to noise, and have designated larval, juvenile, and adult EFH offshore New York.[140]

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131 Kavet, R., M.T. Wyman, and A.P. Klimley. 2016. "Assessment of Potential Impact of Electromagnetic Fields from Undersea Cable on Migratory Fish Behavior." Accessed January 31, 2018. https://www.boem.gov/2016-041/.

132 Woodruff, D.L., I.R. Schultz, K.E. Marshall, J.A. Ward, and V.I. Cullinan. 2012. "Effects of Electromagnetic Fields on Fish and Invertebrates - Task 2.1.3: Effects on Aquatic Organisms Fiscal Year 2011 Progress Report." Accessed January 31, 2018. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20813Final.pdf.

133 BOEM. 2017. "Potential Impacts of Submarine Power Cables on Crab Harvest (PC-14-02)." Accessed January 31, 2018. https://www.boem.gov/pc-14-02/.

134 BOEM. 2016. "Renewable Energy In Situ Power Cable Observation." Accessed January 31, 2017 from https://www.boem.gov/2016-008/.

135 Claisse, J.T., D.J. Pondella, C.M. Williams, L.A. Zahn, and J.P. Williams. 2015. "Final Technical Report: Current Ability to Assess Impacts of Electromagnetic Fields Associated with Marine and Hydrokinetic Technologies on Marine Fishes in Hawaii." Report DE-EE0006390.0000, OCS Study BOEM 2015-042.

136 Normandeau Associates, Inc. and APEM, Inc. 2016. "Digital Aerial Baseline Survey of Marine Wildlife of Support of Offshore Wind Energy: Summary of Summer 2016 Digital Survey #1." Accessed January 31, 2018. Available at: https://remote.normandeau.com/docs/Summary%20of%20Summer%202016%20Survey%201.pdf.

137 Dunlop, E.S., S.M. Reid, and M. Murrant. 2016. "Limited Influence of a Wind Power Project Submarine Cable on a Laurentian Great Lakes Fish Community." *Journal of Applied Ichthyology* 32:18031.

138 Deepwater Wind. 2012. "Block Island Wind Farm and Block Island Transmission System Environmental Report/Construction and Operations Plan." Prepared by TetraTech EC, Inc. Accessed January 31, 2018. http://dwwind.com/wp-content/uploads/2014/08/Environmental-Report-Exec-Summary.pdf.

139 BOEM. 2016. "Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP)." Accessed January 31, 2018. https://www.boem.gov/Final-SAP-Guidelines/.

140 NYSERDA. 2017. "New York State Offshore Wind Master Plan Fish and Fisheries Study." Report 17-25j. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#m.

5.2.4 Birds

Offshore wind energy may impact birds due to displacement, disturbance, or loss of habitat, and injury or mortality.

5.2.4.1 Displacement, Disturbance, Loss, or Conversion of Habitat

Increased noise, human presence, vessel traffic, and the presence of large structures are likely to displace species from their typical habitat. This displacement may result in long-term habitat loss if new conditions are unsuitable to certain species, and may result in birds avoiding areas of increased activity and structures, affecting migration and other movements.[141] Construction activities may also temporarily displace birds from migrating, breeding, foraging, and nesting areas, and could contribute to over-crowding and competition at alternative foraging sites. Furthermore, impacts to other species such as fish (discussed in Section 5.2.3) may cause changes in available fish prey. These impacts would be temporary and likely to only occur in small areas within the footprint of offshore wind energy.

During operation, the presence of the wind turbines may create a physical barrier in a migratory flight path, or barrier effect, converting the existing habitat.[142] Multiple bird species migrate offshore, including shorebirds, marine birds, and waterfowl, as well as raptors and potential passerines displaced offshore by weather events. Avian species displaced by the barrier effect are likely to experience indirect impacts of increased energy expenditure in order to alter migratory patterns and paths. Indirect impacts can also include changes in breeding success and predator-prey behavior if a decrease in prey availability or an increase in energy expenditure occurs. The impact of habitat disturbance on avian species is dependent on siting, the distance between the wind turbines and the migratory flight path and the distance to suitable foraging areas. Birds also exhibit high variability in their sensitivity to habitat displacement.

New York State's Offshore Wind Master Plan Birds and Bats Study[143] indicates that overall bird use is greatest in three core habitat areas in offshore waters of New York State: shallower waters along the northern and northwestern offshore waters of New York State, the Hudson Shelf Valley, and the continental shelf break.[144] For example, waterfowl use is generally concentrated in shallow waters in the north and the shallower portions of the Hudson Shelf Valley. Conversely, pelagic birds are most commonly observed near the continental shelf break.

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141 Fox, A.D., M. Desholm, J. Kahlert, T.K. Christensen, and I.K. Petersen. 2006. "Information Needs to Support Environmental Impact Assessment of the Effects of European Offshore Wind Farms on Birds." *Ibis* 148: 129–144.

142 NYSERDA. 2017. "New York State Offshore Wind Master Plan Birds and Bats Study." Report 17-25d. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#m.

143 The study found very little data concerning the presence of bats in offshore environments. However, impacts to bat species may be appropriate in environmental review conducted for specific offshore wind energy projects in areas with sensitive bat populations.

144 *Ibid.*

5.2.4.2 Injury/Mortality

The presence of wind turbines may lead to avian injury or mortality due to direct collision. The potential for collision depends on many factors, including the dimensions and height of the wind turbines and their placement (i.e., in feeding or breeding areas, along migration corridors), as well as species-specific flight and feeding behavior.[145] Additionally, birds, especially those that migrate at night, may become disoriented by or attracted to lit structures, and are particularly attracted to red and white lights, increasing the potential for collision risk.[146] The majority of avian collisions with structures take place at night and during inclement weather events, and are often influenced by season.[147]

The Atlantic Flyway migratory corridor stretches from the eastern Arctic islands, along the eastern coast of the United States, and down to the Caribbean Sea. As such, offshore wind energy from Maryland to Maine would occur within the Atlantic Flyway during times of the year that birds utilize this corridor. New York State's Offshore Wind Master Plan Birds and Bats Study indicates that the Atlantic Flyway migratory corridor is located within and near offshore New York State.[148]

5.3 Marine Commercial and Recreational Uses and Vessel Traffic

The marine commercial and recreational uses, and marine transportation affected by offshore wind energy development would include recreational boating activities, other general vessel traffic, and commercial and recreational fishing. Primary potential impacts to these resources would be potential conflicts with the use of the same area.

5.3.1 Recreational Activities

Vessel traffic and temporary exclusion areas are likely to have some degree of restriction on the recreational activities such as wildlife viewing, offshore diving, and recreational boating. Noise and other sensory disturbances may temporarily displace wildlife, and recreational wildlife viewing may therefore be temporarily displaced to other areas. Temporary exclusion zones may be implemented for safety if a project specific area encompasses known dive sites. Additionally, as

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145 Drewitt, A.L., and R.H.W. Langston. 2008. "Collision Effects of Wind-power Generators and Other Obstacles on Birds". *Annals of the New York Academy of Sciences* 1134:233-266. DOI:10.1196/annals.1439.015.

146 Poot, H., B.J. Ens, H. de Vries, Donners, A.H. Maurice, M.R. Wernand, and J.M. Marquenie. 2008. "Green Light for Nocturnally Migrating Birds." *Ecology and Society* 13(2):47.

147 Kerlinger, P., J.L. Gehring, W.P. Erickson, R. Currey, and A. Jain. 2010. "Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America." *The Wilson Journal of Ornithology* 122(4): 744-754.

148 NYSERDA. 2017. "New York State Offshore Wind Master Plan Birds and Bats Study." Report 17-25d. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#m. Because of the brief seasonal presence of bats offshore and the limited overlap of bat habitat in the marine environment, bats were not considered further in this analysis.

discussed in Section 5.2, construction activities could temporarily displace marine species (i.e., fish, marine mammals, and sea turtles) causing divers to avoid certain areas due to the temporary displacement of marine life. Other recreational boating activities such as sailing, kayaking, power boating, and other rental or personal boating activities would be affected in the same ways as wildlife viewing and offshore diving activities. Recreational boaters may be displaced from areas of construction and associated vessel traffic, and recreational activities may be displaced from the footprint of a specific project.

5.3.2 Vessel Traffic

Vessel traffic would increase during construction, and some temporary diversions of commercial and recreational vessel traffic could occur. During operation, exclusion areas may be imposed around each wind turbine, which would exclude or divert vessel traffic. As described in Chapter 3, the Port of New York and New Jersey is one of the largest ports on the East Coast. As such, a large volume of commercial and recreational vessels provide import and export services, construction work, recreational whale watching, and cruises.

The United States Coast Guard (USCG) evaluates the need for exclusion measures on a case-by-case basis, taking into account the navigational risk assessment required for a specific project. Increases in vessel traffic during construction would be temporary. Overall, the volume of vessel traffic associated with construction and operation of a future project would be expected to be small in comparison to existing traffic in and out of the major ports that would service offshore wind energy development.

5.3.3 Commercial and Recreational Fishing

Potential impacts to commercial and recreational fishing could result from conflicts with the use of the space that displaces commercial and recreational vessels from fishing areas, and/or displacement of fish from the areas accessible by commercial and recreational vessels. Fish may also temporarily avoid construction areas as described in Section 5.2, which could temporarily alter typical fish catch. These impacts would depend on project- or site-specific conditions and the size, number, and distribution of turbines proposed. Offshore wind energy may limit certain fishing practices, restrict access to fish, or displace fish from traditional fishing areas. To avoid the potential risks associated with fishing within or near offshore wind energy, commercial and recreational fishers may choose to travel farther than they would otherwise, which would increase fuel costs, and potentially reduce the number of landings and catch due to a more limited fishing timeframe. Depending on the depth at which cables are buried, trawl fishing and vessel anchoring may be restricted.

The USCG, in partnership with the United States Army Corps of Engineers (USACE) in state waters and BOEM in federal waters, would determine the need for exclusion areas around specific wind turbines. There is no current formal pol-

icy to limit fishing around and through offshore wind farms, and the USCG evaluates the need for exclusion areas on a case-by-case basis. However, the potential for some conflicts with use of space may not be entirely avoidable.

5.4 Cultural Resources

Offshore wind energy could potentially result in impacts on submerged and terrestrial cultural resources. Potential impacts could include physical and visual impacts; however, the level of impact would depend on the location of infrastructure relative to the cultural resource, as well as the significance of the cultural resource (i.e., listed or potentially eligible for listing on the NRHP).

Submerged cultural resources may experience impacts, including vessel collisions during surveys, construction activities, and the inadvertent disturbance of cultural remains. Similarly, potential visual impacts on cultural resources include impacts on the views, viewsheds, and/or setting of onshore (terrestrial) architectural or other built resources, landscapes, seascapes, and traditional cultural properties. The potential effect of the introduction of offshore wind energy infrastructure into the visual setting for any historic or architecturally significant property depends on a number of factors such as distance, visual dominance, orientation of views, viewer context and activity, and the types and density of modern features in the existing view. Section 5.6 discusses potential visual impacts.

5.5 Socioeconomic Impacts

The procurement of 2,400 MW of offshore wind energy could result in direct socioeconomic impacts in the form of economic development, workforce employment, and the avoidance of adverse health outcomes. These socioeconomic benefits could occur at local, county, state, and/or regional levels.

As discussed in Section 3.6, the existing workforce in New York port and shoreline communities consists of many trained trade workers and assemblers,[149] such that the workforce in these communities is well positioned to respond to offshore wind development. In addition, growth in the supply chain of the offshore wind energy industry, including manufacturing facilities and the shipment of supplies, may benefit communities throughout the Atlantic coastal region associated with the marine environment. In particular, those communities in proximity to port facilities may benefit from offshore wind energy. This growth may lead to broader, coastal region economic development and job creation.

Workforce opportunities would include jobs in manufacturing, construction, and operation. Job opportunities are likely to be concentrated in areas nearest to port facilities. Of these jobs, many would be in operations and maintenance, which create steady job opportunities throughout the typical 25-year lifespan of offshore wind turbines. The proximity of workers to offshore wind energy development is

[149] The Institute of Marine Engineering, Science and Technology. n.d. "Working in Ports." Accessed January 18, 2018. https://www.imarest.org/membership/education-careers/careers-in-the-marine-profession/how-about-working-in-ports.

crucial, as operations and maintenance workers must be able to move to and from a project location efficiently. Port communities closest to development are therefore expected to gain these baseline jobs (i.e., jobs created locally). The procurement of offshore wind energy would also create jobs through the expansion of the coastal region supply chain for offshore wind energy development. Along the Atlantic coast and up the Hudson River, domestic and international component manufacturers would be attracted to the region as a location for manufacturing operations. Port facilities along the Atlantic coast and along New York's waterways would be attractive locations for these types of operations given their current industrial base, which provides core manufacturing competencies, and an ideal geographic location for transporting goods. Manufacturing operations would include the production of components such as blades, towers, nacelles, steel, fiberglass, and copper wire.

NYSERDA assessed the workforce benefits of offshore wind energy development in "The Workforce Opportunity of Offshore Wind in New York" study.[150] The study estimated that New York could realize nearly 5,000 new jobs in manufacturing, installation, and operation of offshore wind facilities, with a regional commitment to scale development of the resource. Nearly 3,500 of these jobs would be expected to support New York offshore wind facilities associated with the 2,400 MW goal, with the remaining supporting regional projects. Of these jobs, nearly 2,000 would be in operations and maintenance. Shoreline communities would be best equipped to realize the operations and maintenance jobs given their proximity to the specific projects. Project management and construction would represent approximately 580 additional baseline jobs. During development of offshore wind energy, the study estimated New York's manufacturing sector could support up to 2,250 jobs, while the construction sector could support up to 220 jobs, all of which could have more coastal region economic benefits.[151,152] The study did not consider the economic impacts associated with any changes in the retail price of electricity as well as the impacts associated with the cancellation or closure of any new or existing power plants made unnecessary by the offshore wind facilities.

Reducing pollution by even modest amounts in highly populated areas would be an additional benefit, resulting in significant socioeconomic benefits. As discussed in Section 3.7 Community Character, air quality affects the public health of shoreline communities. NYSERDA's Options Paper uses the EPA's Co-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool to estimate how the emission reductions from implementation of 2,400 MW of offshore wind energy would affect ambient air quality and adverse health impacts throughout the coastal region. This COBRA tool estimates how changes in ambient air quality affect public health outcomes, and then estimates the monetary

150 NYSERDA. 2017. "The Workforce Opportunity of Offshore Wind in New York." Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#v.

151 *Ibid.*

152 *Ibid.*

value of the public health impacts. The screening-level analysis found that the implementation of 2,400 MW of offshore wind energy would result in 8 to 18 fewer premature deaths annually and would avoid multiple adverse health outcomes in 2030 across the northeast United States. The model estimated the monetary value of the total health benefits to be between $73M and $165M in 2030. However, these benefits should continue well beyond 2030, and the total health benefits from the procurement of 2,400 MW of offshore wind energy could be on the order of $1B.[153]

5.6 Visual and Aesthetic Resources

Offshore wind energy could affect visual resources, although whether an impact would be caused, and the extent of that impact, would depend on the viewshed, as well as the human use of and response to changes in that viewshed. Coastal areas include parks, recreation areas, and high-value properties, which are considered sensitive viewsheds. Visibility and visual impacts would depend on a variety of factors, including:

- Distance and angle of the viewer;
- Viewer sensitivity;
- Landscape/seascape character and sensitivity;
- Time of day/sun angle;
- Number of turbines;
- Size of turbines;
- Arrangement of turbines; and
- Weather conditions.

Visual impact assessment typically relies on an evaluation of the specific sensitivity of the viewer, the viewshed, and the physical conditions that define visibility. Weather conditions and distance are primary factors in determining potential visibility. In general, wind turbines visible from designated sensitive or significant resources, or viewed by a large number of people, or viewed with more regularity or for longer periods of time may have a more pronounced impact on aesthetic resources. Increased distance from shore generally reduces the visibility because the wind turbines look smaller when farther away and because of the curvature of the Earth. When viewing a wind turbine from a beach-level position 20 miles away, the curvature of the Earth alone would screen approximately 142 feet of the lower portion of a typical wind turbine. At 25 miles, only the uppermost portions of the wind turbine would be visible, and at 30 miles, the curvature of the Earth would partially to completely screen the center of the wind turbine.[154]

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153 *Ibid.*

154 NYSERDA. 2017. "New York State Offshore Wind Master Plan Visibility Threshold Study Final Draft Report." Report 17-25s. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#v.

Visual impacts also could result from the presence of construction equipment (e.g., jack-up barges and cranes), commuting vessels, and wind turbine components. The majority of construction activities would occur during daytime hours. At night, vessels would use USCG-regulated lights in addition to work lights, angled downward, for worker safety. Wind turbines would be equipped with Federal Aviation Administration-required obstruction lighting designed to be visible even in poor visibility conditions. To meet Federal Aviation Administration requirements, projects could employ permanent and continuous lighting, which produces flashing red lights visible from long distances, or an aircraft detection lighting system (ADLS), which would activate turbine lighting only when aircraft are within visual range.

The Master Plan includes the study of a hypothetical typical wind energy development offshore of Long Island, New York. The New York State Offshore Wind Master Plan Visibility Threshold Study[155] assesses a hypothetical 800 MW wind energy project consisting of one hundred 8 MW turbines at various distances from shore under a variety of historical meteorological conditions. Historical weather data and computer-assisted visual simulations based on a variety of hypothetical project parameters were evaluated to determine the potential visual impact under a variety of distance and sky conditions. Turbines may be visible under clear or partly cloudy conditions. The analysis of historical meteorological conditions determined that daylight hours consisted of 16% to 18% clear conditions, and 5% to 7% partly cloudy conditions, depending on the season. The predominant sky condition is overcast, occurring 55% to 65% of the time, during which visibility of offshore turbines would be difficult. Furthermore, the New York State Offshore Wind Master Plan Visibility Threshold Study found that during 16% of daylight hours, visibility would be less than 10 miles, meaning that turbines located beyond 10 miles would not be visible. However, as noted in the Visibility Study, impacts on viewer experience depends on the observers' visual acuity, viewer activity, and a variety of environmental factors.

The Master Plan includes an Aviation and Radar Assets Study.[156] Researchers evaluated the potential duration of aircraft warning light activation for turbines equipped with an ADLS. The results suggest that aircraft warning light activation would occur during 0.03% to 0.08% of the available annual nighttime hours, for a total of approximately 72 to 201 minutes per year.[157] If an ADLS is not used, permanent and continuous lighting in the form of flashing red lights likely would be visible at long distances during nighttime hours and clear sky conditions.

155 *Ibid.*

156 NYSERDA. 2017. "New York State Offshore Wind Master Plan Aviation and Radar Assets Study." Report 17-25c. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Studies-and-Surveys#v.

5.7 Air Quality

The primary direct impacts on air quality from offshore wind energy would result from vessel emissions. Vessels transporting equipment, materials, and employees would be powered by fossil fuel combustion and would emit air pollutants. The number of vessel trips associated with the construction and operation of offshore wind energy would be small compared to existing vessel traffic, and the resulting emissions would be comparably small.

As noted in Chapter 3, anthropogenic emissions of CO2 contribute to the trend of rising average global CO2 concentrations and temperatures. The combustion of fossil fuels (coal, oil, and natural gas) to generate energy contributes significantly to rising atmospheric CO2 levels. Therefore, the replacement of fossil fuel-fired generation with renewable energy, including offshore wind, would contribute to a reduction in emissions of CO2. The Options Paper predicts that achieving the goal of 2,400 MW of offshore wind energy capacity would result in a cumulative reduction of carbon emissions in New York by more than 5 million short tons of CO2 equivalents by 2030, representing about a third of the cumulative CO2 emissions projected to be achieved under the "50 by 30" goal.

It is difficult to predict precisely how the addition of 2,400 MW of offshore wind energy capacity would affect the trend of rising average global CO2 concentrations and temperatures. However, evidence for global, national, and regional effects of climate change has been growing. In 2016, the EPA released the fourth report describing trends related to the causes and effects of climate change. In the Northeast, rising air temperatures caused by climate change will intensify water cycles through increased evaporation and precipitation. In New York State and throughout the Atlantic coast region, more intense water cycles lead to water impacts such as increases in localized flash and coastal flooding and increases in the frequency and intensity of extreme precipitation events. Rising ocean temperatures and sea level rise also affect Atlantic coastal areas through loss of wetlands and shoreline, an increase in severe coastal storms, storm surges, and higher tides.

Renewable energy, including offshore wind energy, provides benefits for air quality and public health, and reductions in greenhouse gas emissions, because renewably-sourced energy reduces reliance on combustion-based electricity generation. These benefits vary dramatically by region and over time depending on the generation portfolio in each region.

NYSERDA assessed the air quality benefits that could occur from offshore wind energy in the Options Paper.[158] The assessment analyzed the potential impact of 2,400 MW of offshore wind capacity interconnected to New York City and Long Island replacing other renewable energy technologies. The modeling of changes in the electricity sector produced county-level data for emissions of NO_x, SO_2,

[158] NYSERDA. 2018. "Offshore Wind Policy Options Paper." Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

and $PM_{2.5}$, subsequently used in health impacts screening modeling. The health impacts modeling estimated how the inclusion of offshore wind capacity might improve ambient air quality and reduce adverse health impacts. The modeling included assumptions for energy and peak demand, gas prices, firmly planned capacity expansion and retirement in New York and neighboring states, reliability-related dispatch proxy, and emissions limits. The Options Paper analysis shows that 2,400 MW of offshore wind energy capacity would reduce air pollution, even compared to the implementation of different renewable energy technologies. Based on the analysis, offshore wind energy would avoid an estimated 1,800 tons of NO_x, 780 tons of SO_2, and 180 tons of $PM_{2.5}$ in 2030 when compared to a scenario without offshore wind. The public health impacts from $PM_{2.5}$ and ozone, for which NO is a precursor, include respiratory and cardiovascular disease. In New York City, $PM_{2.5}$ at levels higher than background is associated with over 2,000 premature deaths, 4,800 emergency department visits for asthma and 1,500 hospitalizations for respiratory and cardiovascular disease each year.[159]

5.8 Cumulative Impacts

This darft GEIS identifies potential cumulative impacts where such impacts may be "applicable and significant." Cumulative impacts are two or more individual environmental effects that, when taken together, become environmentally significant or may compound or increase other environmental effects. Cumulative impacts are most likely to occur when the impacts of a proposed action are added to other past, present, or reasonably foreseeable actions. Cumulative impacts can result from individually-minor but collectively-significant actions that take place over time. For cumulative impacts to occur, incremental impacts must be greater than negligible.

As noted above, the Cumulative Study assessing cumulative impacts analysis of 2,400 MW of offshore wind energy within a particular area offshore of New York, which is incorporated here by reference and briefly summarized below. This study provides an analysis of a hypothetical reasonable "worst-case" scenario as far as potential cumulative impacts are concerned, as it contemplates all 2,400 MW of offshore wind energy projects being constructed offshore New York, which would be in relatively close proximity compared to the marine environment from Maine to North Carolina. However, projects located in other areas may have different or greater cumulative impacts depending on their size, proximity, technology used, and individual impacts. The Cumulative Study also assumed some common Best Management Practices to avoid or minimize impacts which may not be practicable for every project. Therefore, environmental review conducted for individual projects should consider whether they could contribute to cumulative impacts with other offshore wind energy projects and/or other marine activities. The Cumulative Study found that the resources for which potential

[159] New York City Health. 2013. "New York City Trends in Air Pollution and its Health Consequences." Accessed January 25, 2018. https://www1.nyc.gov/assets/doh/downloads/pdf/environmental/air-quality-report-2013.pdf.

unavoidable adverse impacts may occur and therefore potential cumulative impacts could occur include: (1) displacement, disturbance, or loss of habitat for marine mammals and sea turtles; (2) sensory disturbance to fish; and (3) conflict with use of space for commercial and recreational vessels.

5.8.1 Displacement, Disturbance, Loss, or Conversion of Habitat for Marine Mammals and Sea Turtles

Cumulative impacts may occur on marine mammals and sea turtles from increased vessel traffic and sensory disturbance activities and the potential increase in the probability of disturbance and displacement. The future installation and operation of turbines would also result in the removal of previously available open water habitat, reducing the ability for larger marine mammals to maneuver in those areas. Activities expected to cause similar noise and displacement impacts on marine mammals and sea turtles include existing marine cables, military use, dredging, ocean disposal of dredged materials, and vessel traffic. However, there is sufficient alternative habitat available to allow marine mammals and sea turtles to avoid impacts from sensory disturbance and displacement. The overall spatial coverage of 2,400 MW of offshore wind energy would not significantly reduce or modify marine mammal and sea turtle habitat, as most species will avoid the structures or use other nearby available habitat. Given the spatial distribution of offshore wind energy, and the available habitat in the marine environment, significant adverse cumulative impacts to marine mammals and sea turtles would not be expected.

5.8.2 Sensory Disturbance to Fish

Cumulative impacts to fish may occur from the temporary increase of noise and other sensory disturbances from pile driving, excavating, and increased vessel traffic associated with construction. The potential for injury to all fish species depends on peak sound pressure level, cumulative sound exposure level, and the weight of the individual fish.[160] During construction of offshore wind energy, noise impacts from pile driving could potentially exceed NOAA's Fisheries cumulative sound exposure level criteria, and fish would be expected to temporarily relocate outside construction areas. Pile driving for foundations would occur in isolated areas during a temporary timeframe. Most affected fish species would be expected to relocate to surrounding areas, experiencing disturbances less frequently or of lower magnitude. Given the spatial distribution of offshore wind energy, and the available habitat, significant adverse cumulative impacts to fish would not be expected.

[160] Buehler, P.E., R. Oestman, J. Reyff, K. Pommerenck, and B. Mitchell. 2015. "Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish." CTHWANP-RT-15-306.01.01. Prepared for California Department of Transportation, Division of Environmental Analysis. Accessed July 3, 2017. http://www.dot.ca.gov/hq/env/bio/fisheries_bioacoustics.htm.

5.8.3 Spatial Conflicts with Commercial and Recreational Fishing

Cumulative impacts may occur from conflict with use of the same space with commercial and recreational fishing activities. Potential adverse impacts may include gear and vessel damage, financial risk, exclusion from typical areas and types of fishing, navigational hazards, and the alteration of existing fish populations. Activities expected to cause similar impacts on commercial and recreational fishing include existing marine cables and vessel traffic. As noted in Section 5.3.1, there is no current formal policy to limit fishing around and through offshore wind farms. Ultimately, fishing within or near offshore wind energy would be based on site specific conditions and the decision of the vessel operator, including any arrangements, agreements, or mitigation measures to reduce the risk of spatial conflicts. However, the Cumulative Study's conservative estimates concluded that the construction and operation of 2,400 MW of offshore wind energy would restrict or exclude fishing within only approximately 3% of the geographic scope of analysis (an area offshore of New York identified by the State as most likely to accommodate offshore wind energy development), leaving large areas available without conflicts for fishing.

6 Alternatives Considered

Consistent with 6 NYCRR §617.9(b)(5)(v) of the SEQRA regulations, this chapter provides a description and evaluation of the range of reasonable alternatives to the Proposed Action that are feasible, considering the objectives and capabilities of the project sponsor.

The Commission has identified the No Action alternative as the reasonable alternative to the Proposed Action. The No Action alternative evaluates the adverse or beneficial changes that are likely to occur in the reasonably foreseeable future, in the absence of the Proposed Action.

In the No Action alternative scenario, the State still expects to achieve its "50 by 30" goal by employing a variety of resources, including offshore wind, in the renewable generation portfolio. However, under the No Action alternative, the State would not implement the procurement of 2,400 MW of offshore wind energy by 2030; instead, while some amount of offshore wind energy could ultimately be procured, how much energy and when the procurement would occur would remain less certain. The No Action alternative likely would result in less potential development of offshore wind energy, and perhaps less diversity in generation type, in the State's renewable generation portfolio. In connection with that reduction, there could be greater or fewer potential impacts on the environment, depending on the other types of renewable energy sources that ultimately would be used under the No Action alternative to achieve the "50 by 30" goal.

Although the Commission's analysis can only be generic at this early stage, the No Action alternative likely would result in a State renewable generation portfolio that contains more land-based renewable energy generation and less offshore wind development in order to meet the "50 by 30" goal. There could be a range of scenarios utilized to meet that goal, and each scenario would result in a different composition of renewable energy and, potentially, a different range of environmental impacts. For example, under the No Action alternative, grid solar energy and onshore wind energy would be expected to comprise a greater percentage of the renewable energy generation portfolio, than if the Proposed Action is implemented. Such a No Action scenario would require more grid solar and onshore wind energy development, which would likely result in greater potential land use and other land-based environmental impacts.

Under the No Action alternative, environmental conditions would not change from the current baseline described in Chapter 3. The impacts on the marine environment described in Chapter 5 may be less likely to occur under the No Action alternative, or may occur to a lesser degree. For example, the No Action alternative could result in fewer potential impacts on marine commercial and recreational uses, if development of less offshore wind infrastructure (e.g., wind turbines, export cables) occurs. The potential land-based impacts associated with other renewable energy technologies would continue to occur under the No Action alternative, and as noted, may occur to a greater extent in order to achieve the "50 by 30" goal.

However, it should be noted that under the No Action alternative, development of offshore wind energy development may still occur, and impacts to the marine environment would still occur. Under the No Action alternative, development could occur offshore New York State and its electricity would be procured by other states. Some amount of offshore wind energy could be developed through procurement from other states, although how much energy and when the development would occur remains less certain.

Benefits to air quality under the No Action alternative would change, and may be reduced. The potential air quality benefits that could be derived from renewable energy depend upon a variety of factors, including, but not limited to, location, time of year, time of day, and the type of renewable energy deployed. The State conducted a screening-level analysis of the air quality benefits of developing 2,400 MW of offshore wind energy. That analysis concluded that the development of 2,400 MW of offshore wind energy would result in the avoidance of 1,800 tons of NO_x, 780 tons of SO_2, and 180 tons of PM 2.5 in 2030. Thus, the No Action alternative would change, or reduce, the corresponding health benefits of reduced emissions.[161]

Similarly, the benefits associated with the Proposed Action's procurement of 2,400 MW of offshore wind, would change, and may be reduced. The Master Plan demonstrates that 2,400 MW of offshore wind energy development would reduce air pollution and create jobs. The workforce analysis estimated that 5,000 new jobs in manufacturing, installation and operation offshore wind facilities would result from the development, construction and operation of 2,400 MW of offshore wind in New York and other regional states, with 3,500 of these jobs expected to support New York offshore wind projects.[162] The No Action alternative would change, or reduce these socioeconomic benefits.

[161] NYSERDA. 2018. "Offshore Wind Policy Options Paper." Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

[162] *Ibid.*

7 Unavoidable Adverse Impacts

Consistent with 6 NYCRR §617.9(b)(5)(iii)(b), SEQRA requires an analysis of unavoidable adverse impacts. Unavoidable adverse impacts are impacts that, if the Proposed Action is implemented, cannot be avoided or adequately mitigated. Chapter 5 discusses, at a generic level, the potential impacts that may result from the procurement of offshore wind energy to help New York meet 50 percent of its electricity demand from renewable sources by 2030. As previously discussed, adverse environmental impacts could result from individual but as-yet unidentified projects implemented in the future.

This draft GEIS is not intended to evaluate specific energy projects and their potential site-specific environmental impacts. However, this draft GEIS is required to identify whether the Proposed Action or alternatives could pose unavoidable adverse impacts. As set forth in Chapter 5, there are no unavoidable adverse impacts that could not be mitigated through one or more of the mechanisms discussed in Chapter 4 (Regulatory Framework and Mitigation of Potential Adverse Impacts). Similarly, as discussed in Chapter 6, the No Action alternative presents no such unavoidable adverse impacts either.

8 Irreversible and Irretrievable Commitment of Resources

Pursuant to 6 NYCRR §617.9(b)(5)(iii)(c), SEQRA requires an assessment of the irreversible and irretrievable commitments of environmental resources associated with the Proposed Action. An irreversible commitment of resources occurs when an action's impacts would limit future use options, if the change cannot be reversed, reclaimed, or repaired. Commitments of nonrenewable resources, such as minerals or cultural resources, and resources that are renewable only over long time spans, such as soil productivity, are irreversible commitments. An irretrievable commitment of resources occurs when the used or consumed resource is neither renewable nor recoverable for use by future generations without reclamation. Irretrievable commitments are not necessarily irreversible, and can include the loss of production or harvest of natural resources.

The Proposed Action would help the State meet its "50 by 30" goal, and would not directly result in an irreversible or irretrievable commitment of resources because no specific project site would be endorsed, approved or constructed. As discussed in Chapter 1, the procurement process does not guarantee that any specific offshore wind energy project would be built, and it is possible that any such project, even if ultimately slated for construction, may be terminated before any resources are affected.

The future construction and operation of new offshore wind energy farms that may occur in response to the Proposed Action, could result in irreversible and irretrievable commitments of resources; however, such commitments would be identified in site-specific environmental analyses and avoided or minimized in accordance with applicable law and regulations, as discussed in Chapter 4 (Regulatory Framework and Mitigation of Potential Adverse Impacts). The principal commitment of resources for the construction and operation of a new offshore wind energy project is any portion of the marine environment that would be occupied by a project. Chapter 5 (Environmental Impacts of Proposed Action) describes the potential impacts and resource commitments associated with offshore wind energy development.

9 Growth-Inducing Aspects and Socioeconomic Impacts

9.1 Impacts on Growth and Community Character

Pursuant to 6 NYCRR §617.9(b)(5)(iii)(d), SEQRA requires the identification and discussion of the potential growth-inducing impacts of the Proposed Action. Growth-inducing aspects generally refer to "secondary" impacts, or the potential for an action to trigger further development. Although the Proposed Action would not endorse or approve any specific offshore wind energy project, the Proposed Action would provide an incentive for the development of such projects, which in turn could induce growth in New York's shoreline communities and beyond. Site-specific environmental reviews should address the potential growth-inducing impacts of particular offshore wind projects on the relevant communities. However, this analysis considers the potential cumulative indirect and growth inducing effect of procuring, and potentially developing, 2,400 MW of offshore wind energy. The Proposed Action has the potential to lead indirectly to development of emerging technologies, a new source of coastal tourism, employment associated with construction and operation, purchases of local products and services, and new and increased tax payments by employees and facilities.

The Proposed Action could result in the development of emerging technologies, potentially accelerating the commercialization of offshore wind energy. As a result, the region could experience the development of economies of scale for regional offshore wind energy, which would have the effect of advancing applicable technologies, increasing local knowledge, and reducing the cost of offshore wind energy development and ratepayers' energy costs.[163]

The Proposed Action could result in indirect job creation associated with construction and The Proposed Action could potentially lead to additional tourism. A 2012 study by BOEM explored the potential impacts of offshore wind energy development on tourism and recreational economies in the Atlantic region.[164]

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163 NYSERDA. 2018. "Offshore Wind Policy Options Paper." Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan.

164 Garcia, F., D. Gouveia, E. Healy, E. Johnston, and K. Schlichting. 2012. "Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development." Prepared for the Bureau of Ocean Energy Management (BOEM). Accessed January 23, 2018. https://www.boem.gov/ESPIS/5/5228.pdf.

Coastal tourism could benefit from the development of offshore wind energy facilities by providing a new source of coastal attractions. Potential new sources of tourist attractions include offshore wind energy facility boat tours, diving at turbine foundations that serve as artificial reefs, and education and information centers related to offshore wind energy. While there are limited data and research on this potential new source of coastal tourism in the United States due to the infancy of the offshore wind industry, the European experience can provide some insight on potential growth-inducing impacts for the coastal tourism industry. For example, Scroby Sands Information Centre in the U.K. operates a tourist center as well as boat tours to offshore wind energy facilities. The tourist center attracted approximately 30,000 visitors in the first six months of opening.[165] In the United States, the Block Island Ferry, as well as some private charter boats, are operating facility tours to the Block Island Wind Farm, the first offshore wind energy facility in the United States.[166,167] Additional tourism would also generate corresponding benefits on businesses that support tourism and recreational economies in the Atlantic region.

The Proposed Action could result in indirect job creation associated with construction and operation. The socioeconomic benefits of offshore wind energy, discussed in Chapter 5, are primarily associated with workforce development and increased activities surrounding existing port facilities. The ports would experience increased activities to accommodate all components of the supply chain for development, construction, and operation of offshore wind energy. The indirect benefits of workforce development and the utilization of existing port facilities would primarily occur through the increased purchases of local goods and services and added tax revenue to local economies. These new jobs could generate new residents, daily workers, and visitors. This new growth in turn could require transportation improvements and other services, and could lead to development of new housing closer to development locations and/or ports.

The Proposed Action could also result in offsetting indirect job impacts associated with any changes in the retail price of electricity as well as the impacts associated with the cancellation or closure of any new or existing power plants made unnecessary by the offshore wind facilities.

The Proposed Action could result in the purchase of locally available materials and services for offshore wind energy development. This could create temporary

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165 Garcia, F., D. Gouveia, E. Healy, E. Johnston, and K. Schlichting. 2012. "Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development." Prepared for the Bureau of Ocean Energy Management (BOEM). Accessed January 23, 2018. https://www.boem.gov/ESPIS/5/5228.pdf.

166 Block Island Ferry. 2018. "Block Island Wind Farm Tours." Accessed January 23, 2018. http://biwindfarmtours.com/.

167 Snappa Charters. n.d. "Block Island Wind Farm Sightseeing Tours." Accessed January 23, 2018. http://www.snappacharters.com/block-island-windfarm.html.

indirect benefits for suppliers in the relevant industries and transporting of materials to the region. Additionally, locally hired personnel may create economic benefits in their communities of residence by supporting local businesses. By building the local supply chain for offshore wind energy and utilizing local port facilities, investment from outside of the region could filter into New York and other Atlantic coast states.[168]

Furthermore, the Proposed Action could result in new and increased tax payments by employees using local and regional office space, residences, goods, and services. Local building owners would benefit from renting and selling office space. Regional development offices would also contribute tax revenue, which would add to the local tax base and provide communities with increased funds for public services and amenities.

9.2 Potential Program Costs

The Options Paper includes an offshore wind cost analysis. The analysis includes an evaluation of both deployments of up to 800 MW of capacity procured in 2018 and 2019 and full deployment of 2.4 GW of offshore wind by 2030. Program costs are presented as a range and are dependent on a number of key factors. Many factors influence the range of program costs, some of which are largely outside of New York's control, such as wholesale energy prices (which are driven by natural gas prices) and financing costs.

As shown in Exhibit 9-1, cost projections for the full 2,400 MW under various procurement methods are provided in the form of the following cost indicators:

1. **Gross program costs** are calculated as the incremental revenue, on top of energy and capacity, that allows projects to reach their cost of capital. They are presented as a net present value of incremental performance-based incentive payments over time, inclusive of Tier 1 REC payments.
2. **Net program costs** are defined as the gross program costs minus the net present value of the carbon value associated with the offshore wind deployment. Carbon value is calculated as the societal value of avoided CO2 emissions in excess of the value already included in the electricity price through RGGI.

[168] NYSERDA. 2017. "New York State Offshore Wind Master Plan Consideration of Potential Cumulative Effects." Report 17-25g. Accessed January 29, 2018. https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/New-York-Offshore-Wind-Master-Plan/Area-for-Consideration.

Exhibit 9-1 Cost and Benefit Projections for Offshore Wind Energy Development

Cost Indicator	1. Fixed REC	2./4. Bundled/Split PPA	3. Utility-Owned Generation		5. Market OREC	6. Index OREC	7a. Forward OREC, Conservative	7b. Forward OREC, Aggressive
Gross Program Cost	$4.6B cost	$1.9B cost	$0.7B cost		$1.9B cost	$2.1B cost	$3.9B cost	$2.5B cost
Carbon Benefit	$1.9B benefit	$1.9B benefit	$1.9B benefit		$1.9B benefit	$1.9B benefit	$1.9B benefit	$1.9B benefit
Net Program Cost	$2.7B cost	$0.1B cost	$1.1B benefit		$0.1B cost	$0.2B cost	$2.0B cost	$0.6B cost

9.3 Potential Program Benefits

9.3.1 Greenhouse Gas Reduction Benefits

Successful implementation of the Offshore Procurement program will provide a wide range of benefits including improving generation diversity; economic growth, job creation, public health improvements and greenhouse gas (GHG). As Exhibit 9.1 above demonstrates, the benefits related to GHG reductions alone are approximately equal to the cost of the Offshore Procurement program depending on the procurement design option chosen.

9.3.2 Public Health Benefits

The Offshore Procurement program is expected to provide significant beneficial impacts related to public health. Levels of fine particles (PM 2.5) and ozone remain at health significant levels in the New York City metropolitan area including the Counties of Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, and Westchester. Public health impacts associated with these two air pollutants include respiratory and cardiovascular disease and premature deaths. High levels of PM 2.5 can lead to emergency department visits and hospitalizations related to asthma and other ailments.

NYSERDA's screening-level analysis that 2.4 GW of offshore wind capacity feeding into the New York City metro area would lead to significantly lower levels of PM2.5 and ozone. Levels of NO_x, and SO_2, would also be reduced significantly. These changes in ambient air quality are expected to lead to significant reductions in hospitalizations, emergency department visits and pre-mature deaths. The Offshore Options paper indicates that health benefits through 2030 of procuring 2.4 GW of offshore wind could range from $73 million to $165 million. Because the health benefits are expected to persist well beyond 2030, the total health benefits associated with procuring 2.4 GW of offshore wind generation could be on the order of $1 billion.

9.3.3 Workforce Benefits

Procurement of 2.4 GW of offshore wind capacity can complement the State's existing clean energy programs and continue the expansion of New York's quickly expanding clean energy industry and increasing job opportunities related to renewable energy.[169] The analysis NYSERDA conducted related to offshore wind and the workforce opportunity in New York indicates a number of benefits related to the creation of jobs and expansion of the renewable energy workforce.[170]

Specifically, New York's existing infrastructure is well positioned to support offshore wind development regionally and New Yorkers possess many of the skills required by the industry. Together with a continued commitment to skill development, these factors are likely to attract offshore manufacturers and developers.

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169 2017 New York Clean Energy Industry Report, NYSERDA 2017.

170 NYSERDA. 2017. "New York State Offshore Wind Master Plan The Workforce Opportunity of Offshore Wind in New York." Accessed February 6, 2018. https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Biomass-Solar-Wind/Master-Plan/17-25t-Workforce-Opportunity-Study.pdf

Regional commitment to scale offshore wind development could lead to nearly 5,000 jobs in the manufacturing, installation, and operation of offshore wind facilities. Nearly 3,500 of those jobs are expected to support New York wind farms. Many of these jobs, approximately 1,800, are in operations and maintenance and are expected to be long-term employment opportunities with facility lifespans potentially exceeding 25 years.

9.3.4 Economies of Scale Benefits

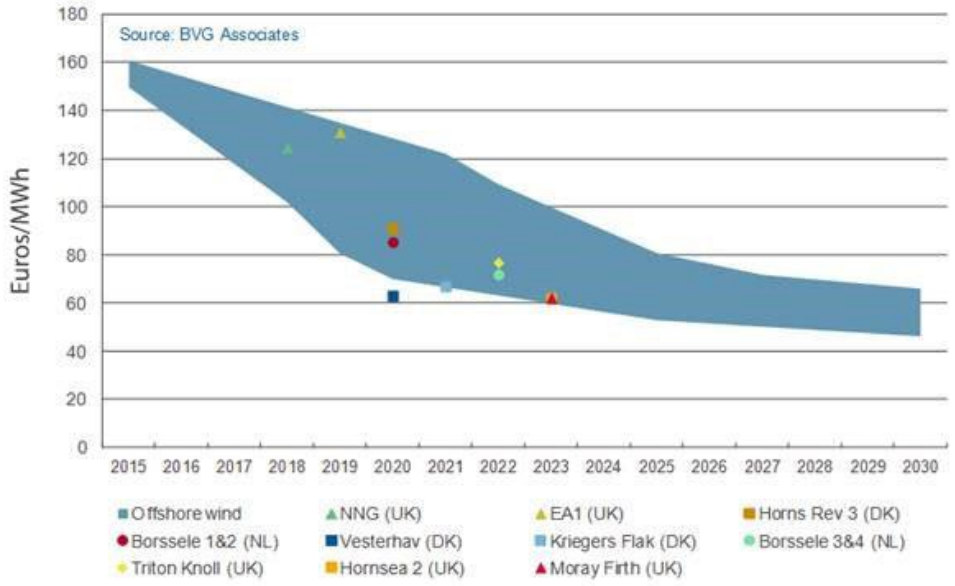
The Proposed Action could result in the State capitalizing on both the expected cost reductions that will come with building a regional U.S. industry of a sufficient scale to replicate declining cost trajectories observed in European offshore wind markets, and the corresponding economic benefits from becoming a "hub" for the emerging domestic offshore wind industry.

While the relative cost of the first offshore wind projects in the U.S. is still projected to be higher than that of typical land-based projects, the offshore wind sector has experienced dramatic cost reductions over the past few years in Europe -- to the point where in many cases the technology is cost-competitive with land-based renewables projects. Cost reductions are thus a key aspect of the successful development of offshore wind energy in New York. The cost reductions seen in Europe have depended to a material extent on local learning and local infrastructure, including supply chain scale economies; in order to unlock such cost reductions for New York, deployment at scale in the region is a prerequisite.

NYSERDA's analysis in the Offshore Options paper indicates that the Proposed Action could be expected to achieve this objective, with projected costs to procure offshore wind in 2030 lower than the cost of Tier 1 RECs associated with other large-scale renewable technologies.

The European offshore wind industry started over twenty years ago, and currently has over 12,000 MW of offshore wind in commercial operation. As depicted in Exhibit 9-2, between 2015 and the present, the offshore wind industry has experienced significant declines in the cost of actual projects and bids on projects in the development pipeline in Europe. The decline being experienced in Europe is widely attributed to industrialization of the offshore wind industry, increasing turbine size and rating, declines being realized in several key cost components, and competition among project developers as a key component of the selection process. For example, in the UK, the most recent auction results in September 2017 achieved new prices that were (on average) 47% lower than the prior UK auction results in 2015.

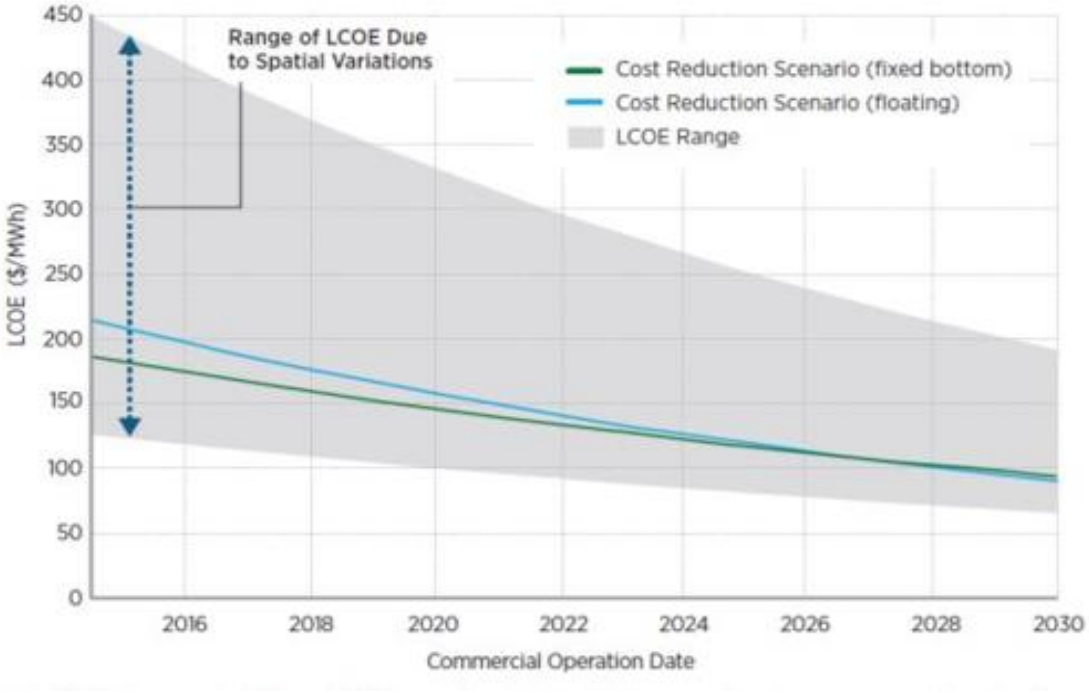
Exhibit 9-2 Decline in Levelized Cost of Electricity for Offshore Wind Projects in Europe (Euros/MWh)



Note: Based on the current exchange rate, 1 Euro equals 1.23 US Dollars.

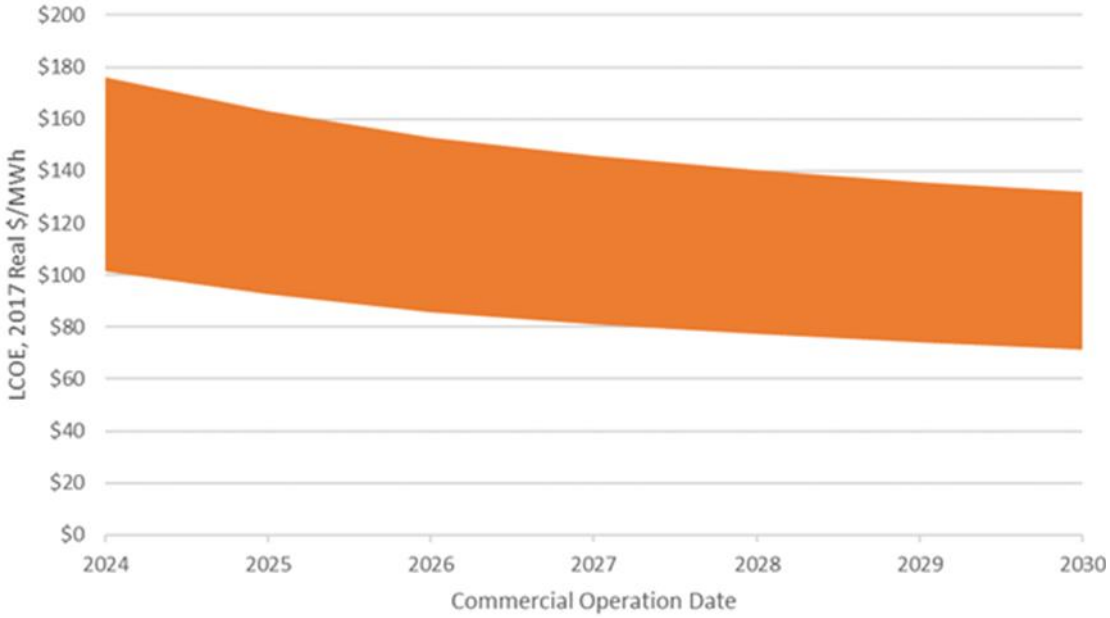
It may take several years for the U.S. offshore wind industry to mature sufficiently to realize significant scale-related reductions in costs. As shown in Exhibit 9-3, recent U.S. studies indicate that activities to drive market scale, market visibility, scale economies, construction, operating and financing experience, development of local supply chain, and competition are projected to lead to rapidly falling offshore wind prices in the U.S. as well.

Exhibit 9-3 Levelized Cost of Electricity for Potential Offshore Wind Projects throughout the U.S. Technical Resource Areas ($/MWh)



As part of the Options Paper, NYSERDA conducted a study of expected offshore wind technology cost developments between 2024, when NYSERDA anticipates the first project being deployed, and 2030, when the state seeks to achieve its goal of 2.4 GW of installed offshore wind projects. The results are summarized in Exhibit 9-4, and are in line with those for wider U.S. projections shown in Exhibit 9-3.

Exhibit 9-4 New York State Projected Levelized Cost of Electricity for Potential Offshore Wind Projects



10 Effects on Energy Consumption

Consistent with 6 NYCRR §617.9(b)(5)(iii)(e) of the SEQRA regulations, this chapter considers the Proposed Action's potential impacts on the State's energy consumption. "While the Proposed Action may affect the State's electric generation portfolio, the procurement of 2,400 MW of offshore wind energy by 2030, to the extent it does not significantly impact retail prices, is not expected to directly or indirectly affect the amount of electricity used in the State or the amount of energy conserved in the State."

Rather, the Proposed Action is expected to foster greater penetration and adoption of renewable energy at the grid scale. The Proposed Action could result in the installation of new renewable sources, and thus effect the characteristics of the supply sources that will be available to meet the State's electricity demand. In that manner, the Proposed Action could expand offshore wind energy as a source of New York's overall electric generation mix, thereby helping the State to attain its "50 by 30" goal.

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