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BOEM 2013-XXXX

Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishers on the Atlantic Outer Continental Shelf

Report on Best Management Practices and Mitigation Measures

U.S. Department of the Interior
Bureau of Ocean Energy Management
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ACRONYMS AND ABBREVIATIONS

AOL	avian obstruction lighting
BMP	best management practice
BOEM	(U.S. Department of the Interior) Bureau of Ocean Energy Management
Cape Wind	Cape Wind Associates, LLC
CFR	Code of Federal Regulations
COP	Construction and Operation Plan
EA	environmental assessment
EIS	environmental impact statement
ERP	emergency response plan
FAA	Federal Aviation Administration
FMC	fishery management council
FONSI	Finding of No Significant Impact
FR	Fisheries Representative
GIS	geographic information system
GW	gigawatt(s)
IP	interim policy
MAFMC	Mid-Atlantic Fishery Management Council
MMS	(U.S. Department of the Interior) Minerals Management Service (*obsolete; now* BOEM)
MNL	marine navigational lighting
MOP	Massachusetts Ocean Partnership
MW	megawatt(s)
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NM	nautical mile(s)
NM^2	square nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act

PEIS	programmatic environmental impact statement
RFI	Request for Information
ROW	right-of-way
RUE	right-of-use and easement
SAFMC	South Atlantic Fishery Management Council
SAP	Site Assessment Plan
Statoil NA	Statoil North America
U.K	United Kingdom
U.S.C.	United States Code
USCG	United States Coast Guard
VHF	very high frequency
WEA	Wind Energy Area

1 INTRODUCTION

1.1 Goals

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM), in accordance with the National Environmental Policy Act (NEPA), is developing best management practices (BMPs) and mitigation measures that may be applied to Outer Continental Shelf (OCS) leases and plans as they relate to commercial and recreational fishing practices. The goal of this project is the development, in close consultation with representatives from the fishing industry and wind energy developers, of reasonable BMPs and mitigation measures to offset impacts for analysis and decision making under NEPA and other applicable statutes. These BMPs will be used to foster compatible use areas of the OCS and reduce use conflicts within portions of the U.S. Atlantic OCS that may be used simultaneously by the wind energy industry and fishermen. The outcome of this effort is a list of BMPs and mitigation measures that ultimately will be considered during analysis and decision-making phases during the NEPA review process for wind energy siting, construction, operational and maintenance activities, and decommissioning which can be documented through the NEPA process for reducing conflict between fishermen and developers.

To reduce future conflicts between fishing and wind-related operations on the OCS, BOEM sought input from the commercial and recreational fishing industries, as well as managing agencies and scientists, relative to proposed offshore wind development areas. This project focused on engaging stakeholders with an interest in this process, including federal and state natural resource management agencies, federal fishery management councils (FMCs), commercial and recreational fishermen or interest groups, and wind energy developers and experts.

To effectively engage relevant stakeholders, the heart of this program consisted of eight stakeholder workshops that took place from Maine to North Carolina where representatives from relevant government, industry, and recreational/commercial fisheries worked together to discuss OCS wind leasing and possible BMPs. These meetings allowed for an open dialogue among the fishing community, regulatory agencies, and wind energy developers, and aided in establishing a working relationship among parties with the goal of developing a set of acceptable BMPs.

This report summarizes the findings from the workshops as a whole and presents mitigation measures in a manner that makes them readily adoptable for NEPA review and decision making as they relate to OCS renewable energy leasing and development. It also includes references to accepted measures prevalent in today's offshore construction practices and their relevance to potential fisheries and wind conflicts on the U.S. East Coast.

1.2 BOEM's Regulatory Directives

BOEM administers the OCS Renewable Energy Program in accordance with section 1337(p) of the Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1337(p)), as amended by the Energy Policy Act of 2005. The implementing regulations for this statute are found at Title 30, Part 585, of the Code of Federal Regulations (CFR). Under this program, BOEM issues leases,

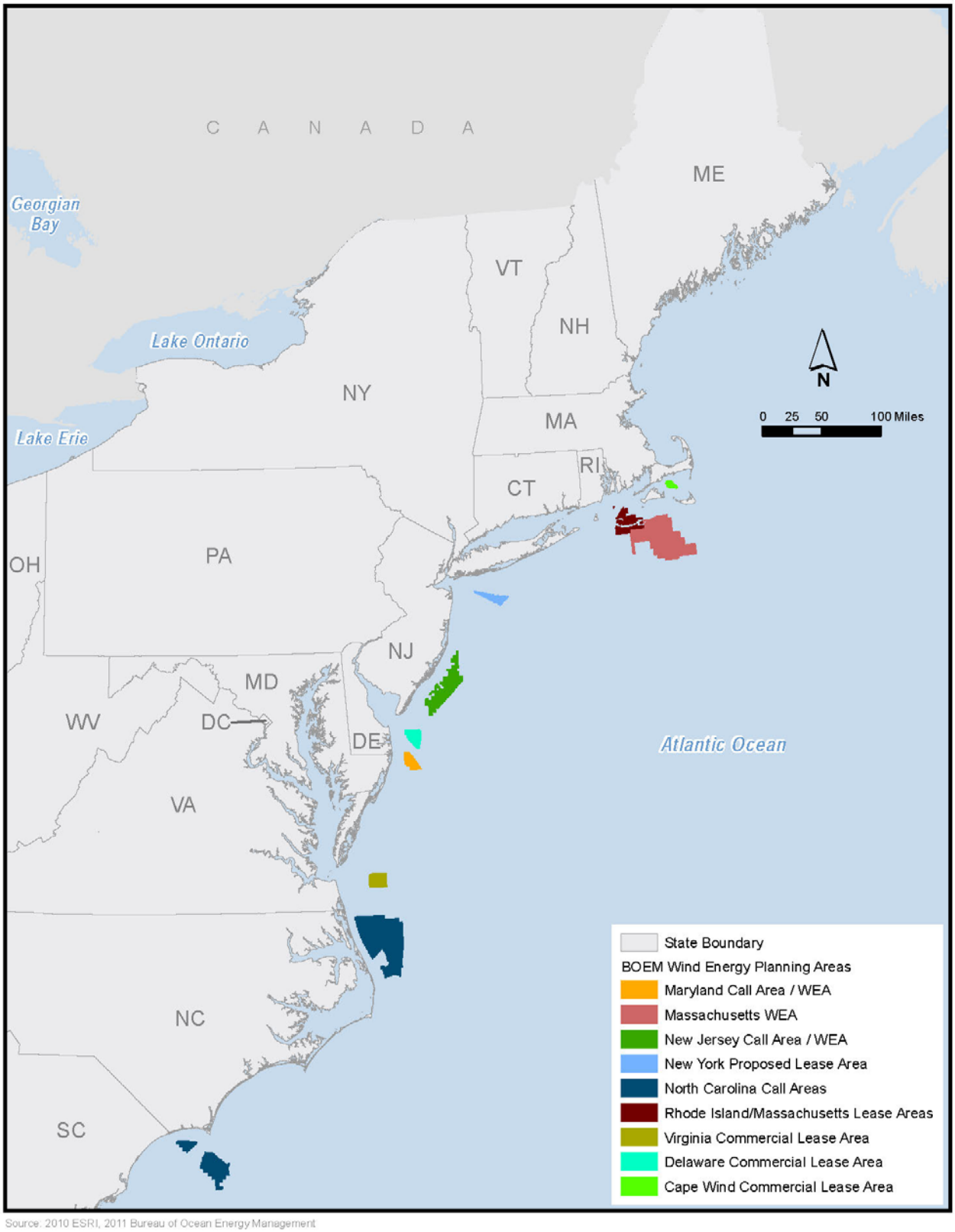
right-of-way (ROW) grants, and right-of-use and easement (RUE) grants that give parties the right to prepare and submit detailed plans for assessing resources, testing/researching technology, and constructing and operating commercial-scale renewable energy projects.

BOEM, as with other federal agencies, has a regulatory obligation to adhere to NEPA requirements. NEPA was established with the purpose of creating broad-ranging environmental protection. NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies prepare an analysis of a project's impacts in an environmental assessment (EA) or environmental impact statement (EIS). The NEPA process is intended to assist officials in making decisions based on a thorough discussion of environmental consequences and taking actions that protect, restore, and enhance the environment.

BOEM's issuance of leases and grants and approval of Site Assessment Plans (SAPs) and Construction and Operation Plans (COPs) must comply with the procedural requirements of NEPA and other applicable statutes. Therefore, an assessment of the potential environmental effects of these actions must be undertaken and includes an evaluation of aesthetic, historical, ecological, cultural, and economic resources. Environmental assessments must consider, among other impacts, socioeconomic impacts of an action and must propose measures for minimizing these impacts. OCSLA, NEPA, and other statutes require BOEM to consider competing uses of the areas being evaluated for leasing and development, and commercial fishing has emerged as a competing use along the U.S. Atlantic Coast. OCSLA §1337(p)(4)(J)(ii) specifically requires the Secretary of the Interior to ensure that any activity is carried out in a manner that provides for consideration of any other use of the sea or seabed, including use for a fishery. Therefore, BOEM must consider the impacts to the commercial and recreational fishing industries resulting from the issuance of SAPs and COPs.

1.3 Geographic Scope

The area of interest for this project includes portions of the Atlantic OCS from Maine through North Carolina. Within this geographic region, Wind Energy Areas (WEAs) and Commercial Lease Areas designated by BOEM currently exist offshore of Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, Virginia, and North Carolina (see Figure 1-1). These are areas where wind energy development is expected or could occur, or are currently under a lease call. An exchange of information with fishermen and developers, including locations of identified BOEM lease areas, high quality OCS wind energy lease areas, and areas with historically significant commercial and/or recreational fishing, indicated where potential user conflicts could occur. A description of each WEA/Commercial Lease Area/Call Area and its status in the leasing process is provided in Section 2.1.



Source: 2010 ESRI, 2011 Bureau of Ocean Energy Management

Figure 1-1. BOEM Wind Energy Planning Areas and Active Renewable Energy Leases.

1.4 Technical Approach

To meet the objective as described above, a process was undertaken that included data gathering; consultation with experts; work plan preparation for planning workshop logistics such as format, timing, locations, and invitee list; and workshop implementation.

Data Collection and Consultation

A step-wise, iterative data analysis (Section 2.2) and consultation process (Section 3.1) was used for determining the most appropriate locations and timing (Section 3.2) for stakeholder workshops.

The goals of this effort were to determine workshop locations that would reflect:

- Proximity to designated WEAs or similarly proposed offshore wind energy development areas;
- Historically high offshore commercial and/or recreational fishing effort; and
- Relevant and substantial fishing methods (i.e., gear types) at high-effort ports that could have a potential for interaction with offshore wind energy development activities.

Data collection included gathering information on localized fishery attributes such as landings, gear types, and season, along with information from fishery and wind energy groups or individuals that would be most relevant for identified Atlantic WEAs or non-designated areas. To begin this process, available data sources were reviewed to obtain relevant wind energy or fisheries landings and other spatial information to correlate with the consultation results. Data were gathered and evaluated to understand the magnitude and types of fishing activities, as well as the spatial aspects for those areas likely to have the greatest potential for use conflicts between relevant fisheries and wind energy development.

A series of conference calls (i.e., consultations) with fishery management and marine ocean planning agencies across the geographic range of the project were conducted to gather opinions, knowledge, and suggestions on local and regional fisheries, fisheries organizations and participants, and on perceived or known historical conflict among offshore user groups. Based on the information developed from both data analysis and consultations, a screening process was used to propose general meeting site locales and assess any seasonal limitations that might be important for workshop schedules. Lastly, locations were narrowed down based on fishing community proximity to WEAs, workshop schedules were proposed based on seasonal fishing activity, and potential venues were identified by considering factors such as neutrality, accessibility, and cost. Meetings were scheduled during the late fall and winter to avoid peak fishing seasons to the extent possible.

In order to obtain relevant wind energy or fisheries spatial information and to inform the consultation process, a wide variety of resources were reviewed for information including the National Marine Fisheries Service's (NMFS's) Fisheries Statistics Division automated data summary Web site, which provides commercial and recreational fisheries landings from local ports, and marine spatial planning documents including the Massachusetts Ocean Management Plan and the Rhode Island Ocean Special Area Management Plan. Collected data indicating the level of fishing activity were gathered and evaluated both as qualitative and quantitative

information, and spatial depictions were used to generate maps showcasing the areas with the highest sensitivity to a potential use conflict between wind energy development and fishing.

Preliminary analysis for evaluating potential workshop locations was based on the following five categories of information:

1. 2010 landings data from the National Oceanic and Atmospheric Administration (NOAA) for high use ports in the U.S. (NOAA Fisheries Service Office of Science and Technology 2010).

NOAA Fisheries Office of Science and Technology provides an online query tool for determining the "Total Commercial Fishery Landings at Major U. S. Ports Summarized by Year and Ranked by Poundage." The results of the query for the most current year available at the time of the analysis (2010) provided a ranked list of the top 94 U.S. ports where marine commercial landings occurred. From this list, ports within the geographic scope of the project (i.e., Maine through North Carolina inclusive) were culled and re-ranked in a final list of 25 ports.

2. "Fishing Ports of the Mid-Atlantic" (McCay and Cieri 2000).

A report by McCay and Cieri (2000) details the use patterns at Mid-Atlantic fishing ports. The report is a social and economic profile of the fishing ports and coastal counties of the Mid-Atlantic region. It includes New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina; all of the states with representatives on the MAFMC except Pennsylvania. The report covers recreational as well as commercial fisheries by including descriptions of recreational fishing presence in the fishing ports that were visited during the study. The goal of this report was to study the fishing ports; as such, the authors were precluded from a quantitative assessment of the recreational fisheries. The sources of information for the report were: (1) federal census and employment data analyzed for the counties associated with the commercial fisheries of each state; (2) NMFS weigh-out data on 1998 landings, by species, gear-type, and port, together with similar data by county from the state of North Carolina; and (3) field visits and interviews, occurring predominantly in June and July 1999. A few other published studies were reviewed, as well as information gathered from field visits and interviews conducted by McCay and Wilson in 1998 as part of a study of the social and cultural impacts of proposed changes in the management of highly migratory species.

3. Community Profiles for the Northeast U.S. Fisheries (Colburn et al. n.d.).

This series, prepared under the auspices of the NMFS Northeast Fisheries Science Center, profiles 177 fishing communities in Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. Each profile provides a historic, demographic, cultural, and economic context for understanding a community's involvement in fishing. Each profile contains sections on "People and Places," "Infrastructure," "Involvement in Northeast Fisheries," and "The Future." "People and Places" presents information on regional orientation, historical background, demographics, issues and processes, and cultural attributes. "Infrastructure" discusses current economy, government,

institutions, and physical layout. "Involvement in Northeast Fisheries" covers commercial, recreational, and subsistence fishing. The section on "The Future" includes information on perceptions of ongoing and future community involvement in fishing.

4. Spatial identification of significant offshore fisheries associated with WEAs, other high-profile WEAs, and identified ports.

Identification of likely enhanced fisheries efforts in Atlantic OCS areas that are proximal to WEAs and other potentially high-profile wind energy development areas were used during this evaluation to prioritize ports where potential user groups could be affected by wind energy development. Geographic information system (GIS) spatial data representing commercial and/or recreational fisheries were obtained from various state and federal agencies, including NOAA, BOEM, the Maryland Department of Natural Resources, the Maine Department of Marine Resources, the New Jersey Department of Environmental Protection, the Delaware Department of Natural Resources and Environmental Control, the Massachusetts Office of Coastal Zone Management, the North Carolina Division of Marine Fisheries, the Rhode Island Coastal Resources Management Council, and the Virginia Institute of Marine Science Center for Coastal Resources Management. Meeting locations were heavily based on an analysis of spatial data representing high-use fishing areas for each state.

5. Comments and opinions obtained during consultation efforts with FMCs and other stakeholder groups.

Information developed during consultation efforts is presented in Section 3.1 and reflects the opinions of experts on the most relevant ports for holding outreach meetings. The evaluation of information developed during the consultation process was qualitatively assessed and used in concert with published data, as noted above, to formulate a comprehensive understanding for determining where and why a meeting should be held in a particular locale, along with information on various user groups and topics of interest relative to fisheries in specific locales.

Chapter 3 provides more information on workshop format, informational materials prepared for the workshops, and workshop summaries. The outcome of the analysis was a series of eight stakeholder workshops between fishermen and wind energy developers (plus interested agency or advocacy groups), in which dialogue would result in the development of BMPs and mitigation measures beneficial to both parties and relevant for inclusion in analyses required under NEPA.

Work Plan Development

After data collection and consultation, a work plan was developed to document data collection and consultation efforts, determine workshop locations, and provide a guide to implementing the workshops. The work plan components included:

- **Introduction and Goals**

- **Methodology**
  - Data Analysis
  - Consultation

Location Determination

- **Workshops**
  - Participation Strategy: Identified participants will be contacted during work plan development in order to assure their cooperation and availability for attending the planned meetings. The daily and seasonal schedules of fishermen must be taken into account to ensure their participation. Correspondence is expected to be via teleconferences, videoconferences, and e-mail for this task and throughout the continuing phases of the project. Names and overall number of participants expected per meeting and a brief description of invited fishery participants based on evaluation of fishery use patterns for the local area.
  - Schedule: Proposed meeting locations and dates.
  - Logistics: Pre-meeting activities, including the development of meeting ground rules and goals and the development of questions for groups at each meeting; key messages; and workshop materials (agenda, worksheet guides, comment sheets, etc.).
  - Venues and Staffing: Roles and responsibilities including speakers/presenters and meeting facilitator.

The final eight (8) meeting locations were refined once feedback was received from the consultation process and BOEM.

2 BACKGROUND

2.1 Wind Energy Planning Areas

The United States is one among many countries that has coastal areas with high wind resource potential (USDOI, BOEM 2013a). Worldwide, there are 4.45 gigawatts (GW) of offshore wind energy currently installed, 4.72 GW are currently under construction, and an additional 30.44 GW have been approved (USDOI, BOEM 2013a). Over 50 projects are operational in coastal waters of countries such as Denmark, the United Kingdom, Germany, Norway, the Netherlands, and Japan, to name a few. At this time, the United States does not have any operational projects; however, thousands of megawatts (MW) are in the planning stages, primarily in the Northeast and Mid-Atlantic regions.

The area of interest for this project includes portions of the Atlantic OCS from Maine through North Carolina (see Figure 1-1). Currently within this geographic region, BOEM has six designated WEAs offshore Massachusetts, New Jersey, Delaware, Virginia, Maryland, and Rhode Island where wind energy development is expected to or could occur. BOEM has also designated commercial lease areas offshore Virginia, Delaware, Rhode Island, and Massachusetts. These areas were previously designated as WEAs; however, commercial leases have been issued recently for the lease areas offshore Massachusetts, Rhode Island, and Delaware. A sale for competitive lease interest for offshore Virginia occurred in September 2013. Additional information regarding the BOEM Wind Energy Planning Areas and offshore wind development in each state is summarized below.

2.1.1 Maine

On October 12, 2011, Statoil North America (Statoil NA) submitted an unsolicited request to BOEM to lease an area of the OCS approximately 12 nautical miles (NM) offshore Maine for development of a 12MW wind energy facility. After BOEM verified that Statoil NA was legally, technically, and financially qualified to hold a commercial lease on the OCS, the agency issued a Request for Information (RFI) on August 10, 2012, to determine if there was competitive interest in the area. BOEM issued a Notice of Determination of No Competitive Interest for the proposed Statoil Hywind Project on December 12, 2012, as no indications of competitive interest were submitted in response to the RFI. Statoil officially withdrew their unsolicited lease application from BOEM on November 5, 2013.

2.1.2 Massachusetts

BOEM Wind Energy Area

On December 29, 2010, BOEM published an RFI to assess the interest in commercial development of wind energy offshore Massachusetts. The Massachusetts RFI area was delineated based on deliberation and consultation with the Massachusetts Renewable Energy Task Force. BOEM then published a Call for Information and Nominations on February 6, 2012, to establish formal industry interest for commercial wind energy development. In response to this call, BOEM received 10 Nominations of Interest and the area was further refined to a defined WEA on May 30, 2012. BOEM announced the availability of a draft EA for public

comment on November 2, 2012 (USDOI, BOEM 2012a). This document evaluated the potential environmental effects of lease issuance and approval of site assessment activities in the Massachusetts WEA. BOEM is addressing public comments and will publish a revised EA when this process is complete. A Proposed Sale Notice also will be published at that time.

Cape Wind Lease Area

The Cape Wind Energy Project was proposed in November 2001 by Cape Wind Associates, LLC (Cape Wind) and a draft EIS was issued by the U.S. Army Corps of Engineers (the lead federal agency at the time) in November 2004. On September 14, 2005, Cape Wind applied for a commercial lease to construct and operate an offshore wind facility located in federal waters offshore Cape Cod, Massachusetts. A Record of Decision was issued on April 28, 2010, by the Department of the Interior announcing the decision to select the Preferred Alternative at Horseshoe Shoal in Nantucket Sound, as described in the final EIS issued in January 2009 (USDOI, MMS 2009). On October 6, 2010, Cape Wind was issued a commercial lease to construct and operate an offshore wind power facility. The lease area comprises approximately 46 square miles in Nantucket Sound offshore Massachusetts. The project footprint will occupy approximately 25 square miles of the OCS. The total capacity of the project is 468 MW.

2.1.3 Rhode Island

BOEM issued formal notice for the WEA offshore Rhode Island and Massachusetts on February 24, 2012. After completion of an EA considering the potential impacts of lease issuance, site characterization activities, and site assessment activities, a Finding of No Significant Impact (FONSI) was issued on June 5, 2013 (USDOI, BOEM 2013b). The FONSI concluded that the reasonably foreseeable impacts associated with opening the Rhode Island/Massachusetts WEA for lease would not create significant impacts. On July 31, 2013, a competitive lease sale was held for commercial offshore wind development in the Rhode Island/Massachusetts WEA. Deepwater Wind New England, LLC, was announced as the winner of the two leases in the WEA for a total of 164,750 acres after a competitively bid auction. This area is located 9.2 NM south of the Rhode Island coastline and has the potential to support 3,395 MW of wind generation.

2.1.4 New York

On September 8, 2011, BOEM received an unsolicited request for a commercial lease from the New York Power Authority to construct an offshore wind facility with the potential to generate up to 700 MW of energy. BOEM issued an RFI on January 4, 2013, to assess whether other parties were interested in developing commercial wind facilities in the same area. BOEM received indications of interest from two developers and has initiated a review of their proposals.

2.1.5 New Jersey

BOEM issued interim policy (IP) leases to three separate offshore wind energy developers in November 2009 for wind development offshore New Jersey. On February 9, 2011, BOEM issued a Notice of Intent to prepare an EA to analyze the potential impacts of lease issuance, site characterization activities, and site assessment activities in the WEAs offshore New Jersey, Delaware, Maryland, and Virginia. BOEM later issued a call for information and nominations on April 20, 2011, for an area consisting of 418 square nautical miles (NM^2), approximately 7

NM off the coast of New Jersey. The final EA along with a FONSI was announced and made available to the public on February 3, 2012 (USDOI, BOEM 2012b). BOEM has received 11 indications of interest for obtaining a commercial lease for wind energy development and is currently in the process of issuing a Proposed Sale Notice for the New Jersey area.

2.1.6 Delaware

BOEM published an RFI in the *Federal Register* on April 26, 2010, to gauge specific interest in commercial development of OCS wind resources offshore Delaware. BOEM received two indications of interest. On January 26, 2011 a Notice of Proposed Lease Area and Request for Competitive Interest was published. BOEM received only one valid expression, therefore a Determination of No Competitive Interest Notice was issued on April 12, 2011. Bluewater Wind Delaware LLC was awarded a commercial wind energy lease for the area offshore Delaware on November 16, 2012.

2.1.7 Maryland

BOEM held its first two Maryland task force meetings with federal, state, local, and tribal governments in the spring and summer of 2010 to facilitate intergovernmental communications and to present and discuss a draft RFI for wind development offshore Maryland. The Maryland RFI was published in the *Federal Register* on November 9, 2010. BOEM received nine individual expressions of interest from eight entities on the proposed area. BOEM issued a Maryland Call for Information and Nominations on February 3, 2013, to initiate the competitive leasing process. BOEM received six nominations from entities wishing to obtain a commercial lease. A draft EA was issued in July 2011 to analyze the potential impacts of lease issuance, site characterization activities, and site assessment activities in the WEAs offshore New Jersey, Delaware, Maryland, and Virginia. The final EA, along with a FONSI, was announced and made available to the public on February 3, 2012 (USDOI, BOEM 2012b). BOEM is working on the Proposed Sale Notice for the area available for leasing offshore Maryland.

2.1.8 Virginia

Virginia's first state task force meeting was held on December 8, 2009. A draft EA was issued in May 2011 to analyze the potential impacts of lease issuance, site characterization activities, and site assessment activities in the WEAs offshore New Jersey, Delaware, Maryland, and Virginia. The final EA along with a FONSI was announced and made available to the public on February 3, 2012 (USDOI, BOEM 2012b), followed by publication of a Proposed Sale Notice on December 3, 2012, to solicit public comments on the lease sale of the WEA blocks. BOEM held a commercial lease sale for the WEA offshore Virginia on September 4, 2013, which was won by the Virginia Electric Power Company (Dominion Power). The WEA covers approximately 112,799 acres and is located approximately 23.5 NM from the Virginia Beach coastline.

2.1.9 North Carolina

The first North Carolina Renewable Energy Task Force meeting was held on January 19, 2011. The North Carolina Call for Information and Nominations was published in the *Federal Register* on December 13, 2012, as was the Notice of Intent to Prepare an EA for commercial wind leasing and site assessment activities offshore North Carolina. The Call Areas described in

the notice are located on the OCS offshore North Carolina and are delineated as Wilmington-West, Wilmington-East, and Kitty Hawk. The three areas include 195 whole OCS blocks and 60 partial blocks, comprising approximately 1,441 NM^2. BOEM is reviewing the responses from the Call to gauge specific interest in acquiring commercial wind leases in some or all of the Call Areas. BOEM is also moving forward with the EA process to analyze potential impacts associated with offshore wind development lease issuance, associated site characterization, and associated site assessment in the North Carolina Call Areas.

2.2 Regional Fisheries and Gear Type Summary

Prior to convening stakeholder workshops, an analysis of relevant data was performed that included gathering information on localized fishery attributes such as landings, gear types, and season, along with information from fishery and wind energy groups or individuals that would be most relevant. Information was analyzed for port locations compared to WEAs/Call Areas; predominant fisheries found at each port (i.e., trawl, offshore, inshore, species landed); recent landings compared to other ports; and other criteria, such as comments obtained during consultations and/or whether fishers live in these identified areas or transit to the port only for fishing or landing fish.

2.2.1 Fisheries Analysis by State

At the time of the analysis, the most current fisheries data available were for the year 2010. Commercial landings in Portland, Rockland, and Stonington, Maine, totaled almost 78 million pounds in 2010. Massachusetts has three major ports (New Bedford, Gloucester, and Provincetown-Chatham) that together comprised the highest 2010 offshore commercial landings of any state in the study area. Rhode Island (Point Judith) had the sixth highest landings for all states being considered, while New Jersey had the fourth highest 2010 commercial landings (43.1 million pounds, Cape May, New Jersey). Ocean City, Maryland, had the twelfth highest landings in 2010 of all the states being considered for stakeholder workshops. The port at Reedville, Virginia, had the highest 2010 commercial landings; however, this fishery is primarily menhaden and is located almost exclusively within nearshore, state-managed waters which are outside BOEM's jurisdiction and the scope of this project. Compared to the other states in this study, the Hampton Roads and Virginia Beach area ranked thirteenth in overall landings in 2010. North Carolina has the largest proposed WEA of the states being considered for fisheries outreach and its 2010 commercial landings ranked fifth among the states being evaluated. North Carolina has a large, diverse, and active offshore recreational fishery. New York ports were not selected in the initial round of workshops since the offshore wind energy planning area off of New York was still premature in the planning process and would potentially have been a distraction for a successful conversation. For Delaware, it was decided that the proximity of the Maryland workshop to Delaware ports would facilitate their participation in that meeting. New Hampshire was not selected for a workshop due to the distance of New Hampshire ports from offshore wind planning areas and the co-occurrence of a workshop at the Maine Fishermen's Forum. States not selected for workshops generally had smaller active fishing fleets than those selected for workshop locations. Table 2-1 describes commercial fishery landings for each port, as well as relevant fishery information applicable to the states located in the study area.

Table 2-1
Port and Fishery Information

Rank	Port	2010 Landings (million pounds)[1]	Notes[2]
1	Reedville, VA	426.1	Primarily menhaden, within state waters.
2	New Bedford, MA	133.4	Scallop and lobster boats, trawlers, clammers, longliners, and gill netters. Ocean quahogging.
3	Gloucester, MA	88.8	100 miles and greater from the Wind Energy Area.
4	Cape May-Wildwood, NJ	43.1	Commercial and recreational, with significant surf clam and ocean quahog, scalloping, finfish dragging, and other fisheries. The largest port in the state and the site of several large seafood packing and processing firms.
5	Portland, ME	38.2	Largest Maine port. Statoil Hywind Project in offshore vicinity.
6	Point Judith, RI	35.6	Traditional offshore fishing fleet composed primarily of trawlers. Most larger vessels (75 feet and greater) fish for squid, herring, and whiting.
7	Wanchese-Stumpy Point, NC	25.6	Second largest port in North Carolina behind Morehead City. Commercial fishery for coastal pelagics and some charter boat recreational fisheries.
8	Atlantic City, NJ	24.2	Almost exclusively surf clam/ocean quahog port. Other gear types include sink gill-nets, and handlines. Bluefish, black sea bass, weakfish, Jonah crab, lobster, and conch predominate.
9	Rockland, ME	22.6	Commercial fishery primarily based on the lobster and herring fisheries. Vessel owners are primarily not from Rockland area.
10	Point Pleasant, NJ	20.9	Surf clams and ocean quahogs. Small trawler fleet.
11	Stonington, ME	17	Commercial fishery primarily based on the lobster and herring fisheries, with some groundfish. Purse seine fleet is small.
12	Ocean City, MD	16.7	Major port for ocean fisheries of the Exclusive Economic Zone and of concern to the Mid-Atlantic Fishery Management Council. Gears include gill-netting. Heavily dependent on angler and spiny dogfish, but engaged in a very diversified fishery; surf clam and ocean quahogging, with small by-catches of angler and scallops. Bottom dragging with otter trawls, a highly diversified fishery, with strong foci on summer flounder and loligo squid.
13	Hampton Roads (Virginia Beach) Area, VA	16.1	Landings are dominated by the menhaden fishery caught primarily in purse seines and pound nets. Crabs are second.
14	Provincetown-Chatham, MA	15.9	Large-mesh groundfish #1 landings. Fleet of between 50 and 100 vessels. Commercial fishers use their boats for recreational day fishing during closed seasons.
15	Montauk, NY	12.9	Otter-trawls and longlines are the principal gear-types. 90 species landed at port. The methods used to harvest fish and shellfish are diverse, including pound nets or fish weirs, box traps, haul seines, and spears, along with the more usual pots, lines, and trawl nets.

Table 2-1. Port and Fishery Information (continued)

Rank	Port	2010 Landings (million pounds)[1]	Notes[2]
16	Boston, MA	12	Between 12 and 15 fishing vessels dock at Fish Pier each day. Large-mesh groundfish were the most valuable fishery in Boston, followed by monkfish and lobster.
17	Engelhard-Swanquarter, NC	9.2	Crab and shrimp primary species. Fleet less than 20 boats.
18	Long Beach-Barnegat, NJ	8.5	Significant offshore longline fishery, targeting tuna species for most of the year and swordfish part of the year. Home to several state-of-the-art scallop vessels.
19	Newport, RI	7.5	Highly diverse fishery includes scallop and lobster. Large-mesh groundfishing.
20	Beaufort-Morehead City, NC	6.1	Second largest port in North Carolina, with five or six fish houses serving 10 to 15 full-time trawlers.
21	Stonington, CT	6	Diversified fishing fleet, which includes gillnetters, draggers, and lobster fishermen. Scallops are the primary landing.
22	Shinnecock, NY	4.4	Second largest fishing port in New York after Montauk. Port consists primarily of trawlers, with some clam dredge, lobster, longline, and gillnetters.
23	Oriental-Vandemere, NC	4.4	Small number of trawlers, plus boats for crabs and oysters.
24	New London, CT	3.2	Primarily lobster fishermen.
25	Chincoteague, VA	3	Primarily summer flounder trawl fishery, plus crabbing and gill netting.

Sources:
[1] NOAA Fisheries Service Office of Science and Technology 2010.
[2] Information derived from McCay and Cieri 2000, and Colburn et al. n.d.

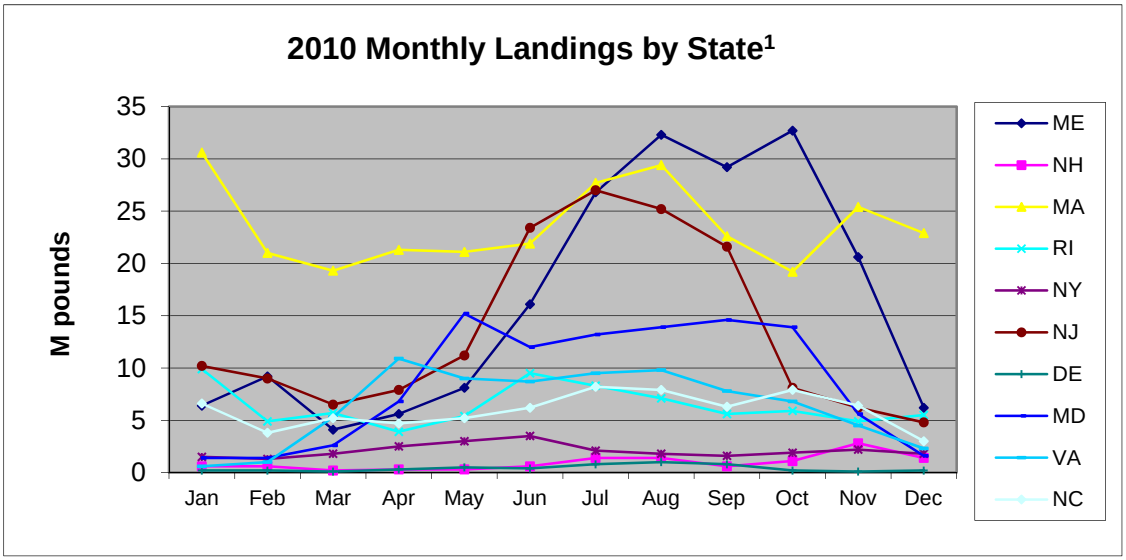
2.2.2 Workshop Schedule

In addition to simply analyzing commercial fishery landings for ports geographically near BOEM planning areas, developing a schedule for the eight workshops required input from fishery experts and analysis of seasonal fishing patterns throughout the project area to ensure adequate fishers' participation and to enhance dialogue. Fishers may provide more effective feedback during the meeting process when BOEM shows a willingness to schedule workshops around high-effort fishing periods.

First, consultation participants (see Section 3.1) were queried for opinions on time periods when fishers would be most available. Next, the most current NMFS data available at the time of the analysis (2010) on monthly commercial landings for states within the project area were reviewed (NOAA Fisheries Office of Science and Technology 2010). Landings data in most states indicated that the greatest fishing effort occurs from April through October, with lower effort from November through March (Figure 2-1). Since landings data represent all species combined (with the exception of Virginia where the menhaden data were removed from monthly totals), the results may likely show the influence of nearshore/coastal species such as crabs and

surf clams, or select offshore species and thus may not truly reflect 'only' offshore fishing effort. For example, in Massachusetts, the relatively higher landings in January likely represent mackerel and Atlantic herring fisheries that use mid-water trawlers and purse seines. But, the seasonal fishery trend confirms that most fishers would be available in winter months compared to spring, summer, or fall periods. This was confirmed by 2011 landings data for Maine offshore areas that showed highest landings (i.e., effort) during the period from June through October, with minimal landings from November through May (see Figure 2-2; Bray 2012).

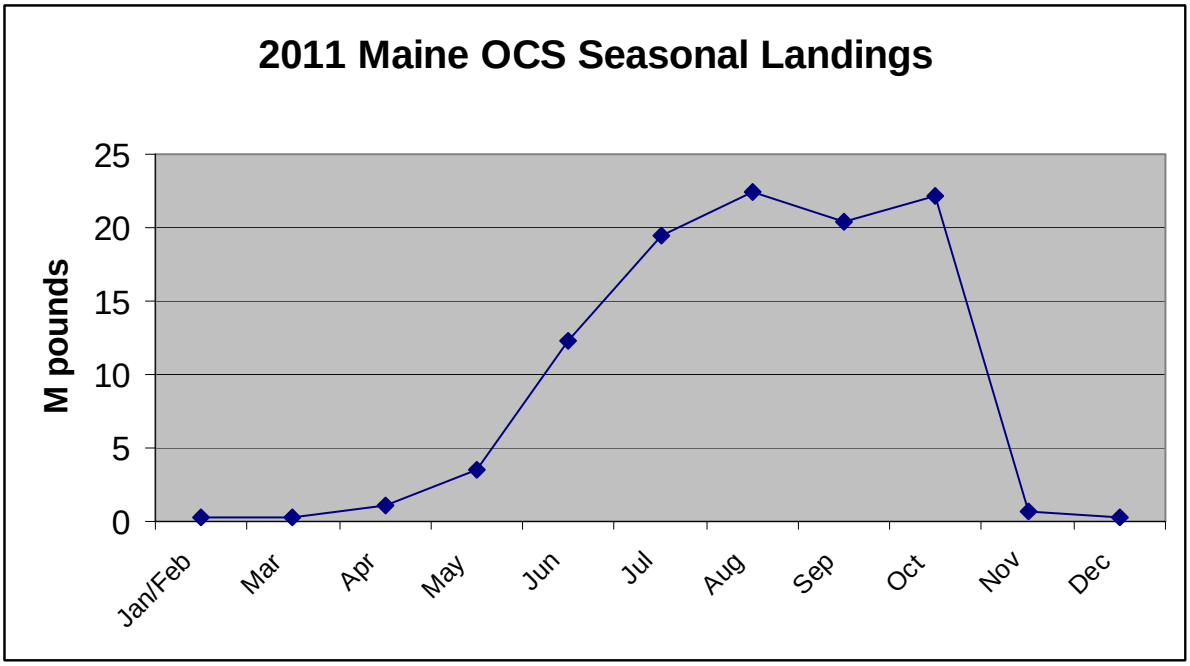
Based on findings from consultation efforts, and from the most current landings data available at the time of the analysis as presented above, workshops were scheduled during the expected 'low-effort' fishing period of mid-October 2012 through March 2013.



Source: NOAA Fisheries Service Office of Science and Technology 2010.

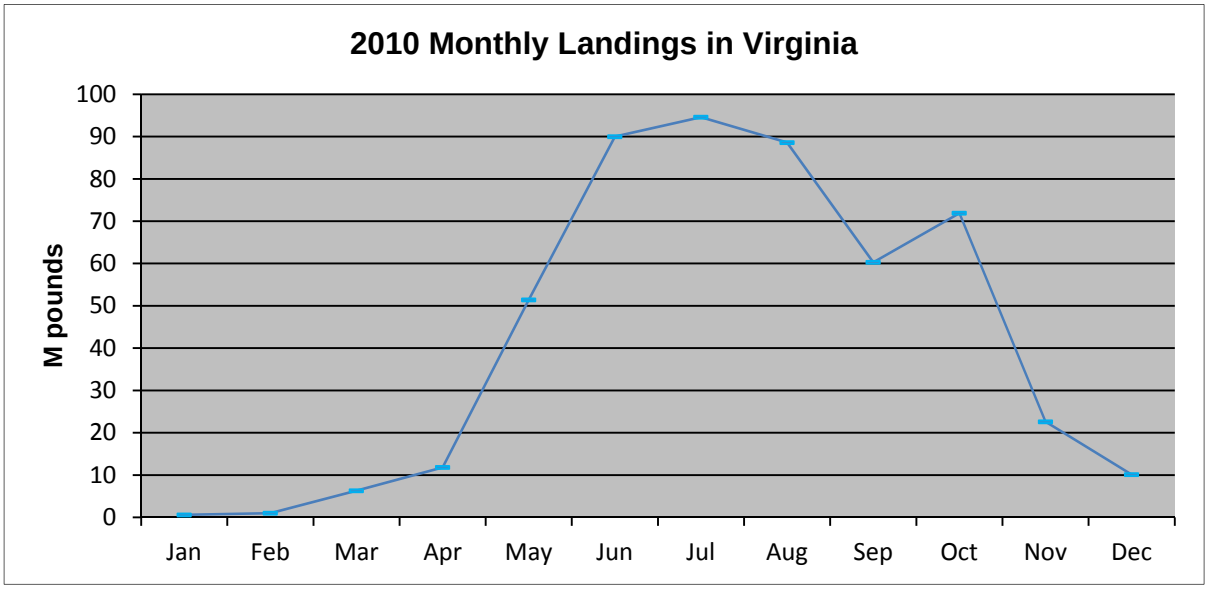
Note:
[1] Virginia menhaden data were removed from monthly totals. In Virginia, the menhaden fishery, which is largely comprised of purse seining in the Chesapeake Bay, comprises 85% of the commercial landings in the state and inflates the monthly landings. Removing the menhaden landings from Figure 2-1 does not affect the overall trend in fishing effort for the state and allows more subtle trends in the other states to be highlighted. For reference, the landings data for Virginia with menhaden included are illustrated on Figure 2-3.

Figure 2-1. 2010 Monthly Commercial Fishery Landings in Project States.



Sources: Bray 2012; NOAA Fisheries Service Office of Science and Technology 2010.

Figure 2-2. 2011 Maine OCS Commercial Fishery Landings by Month.



Source: NOAA Fisheries Service Office of Science and Technology 2010.

Figure 2-3. 2010 Monthly Commercial Fishery Landings in Virginia.

3 METHODOLOGY

3.1 Consultations

3.1.1 Methods for Identifying User Groups and Fishery Organizations

Prior to development of the stakeholder workshops, BOEM consulted a select group of key experts from federal and state government agencies and fishery and offshore wind-affiliated agencies. The purpose for contacting these individuals was to gather opinions, knowledge, and suggestions regarding local and regional fisheries, fisheries organizations, and any perceived or known conflict between offshore user groups. Specifically, BOEM was looking for recommendations on: (1) regional locations associated with high levels of fishing effort or ports, (2) workshop locations easily accessible to fishermen, (3) neutral workshop venues, (4) the timeframes when fishermen would be most available to attend workshops, and (5) additional stakeholder contacts.

As these consultations were preliminary to the larger stakeholder consultation process, BOEM wanted to solicit information from agencies and organizations with an understanding of state or regional fishing practices and potential interactions with offshore wind development. Experts within each organization were selected for consultation based on their previous outreach experience with the commercial and recreational fishing industries in order to effectively assist BOEM with planning and structuring the stakeholder workshops. BOEM also selected stakeholders based on geographic location to ensure all regions within the geographic scope of the project would be discussed during the pre-workshop consultation process.

3.1.2 Consultation Teleconference Interviews

Initial contact with the selected stakeholders began in March 2012 and continued through June 2012. Thirteen teleconference meetings were held over the course of three months, with a total of 30 individuals representing 14 companies or agencies. Table 3-1 lists the teleconference participants, their associated company or agency, and the dates of the teleconference meetings.

Suggestions from stakeholders during the April 2012 interviews led to additional contacts and subsequent interviews in June 2012. Prior to each teleconference meeting, stakeholders were provided with a summary of BOEM's goals and objectives for the project, including project background information and a list of potential questions/issues to be discussed during the interviews. BOEM provided this information to ensure consistent consultations with agencies and relevant offshore wind energy- and fisheries-associated groups who could have a stake in the outcome of this project.

Table 3-1
Pre-Workshop Stakeholder Consultation List

Company or Agency	Participant(s)	Teleconference Call Date
Rhode Island Coastal Resources Management Council	Grover Fugate and David Beutel	04/03/12
Northeast Fishery Management Council	Michelle Bachman, Chris Kellogg, and Pat Fiorelli	04/04/12
Mid-Atlantic Fishery Management Council	Mary Clark and Thomas Hoff	04/04/12
Northeast Regional Ocean Council	John Weber	04/04/12
National Oceanographic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office	John McGovern	04/10/12
Massachusetts Division of Marine Fisheries, Massachusetts Executive Office of Energy and Environmental Affairs, Massachusetts Office of Coastal Zone Management	David Pierce, Kathryn Ford, Bruce Carlisle, and Bill White	04/10/12
Deepwater Wind LLC	Aileen Kenney	05/17/12
Offshore Wind LLC	Erich Stevens	05/22/12
New Jersey Department of Environmental Protection and Fishermen's Energy	Jerri Weigand and Rhonda Jackson	05/31/12
Statoil	Kristin Aamodt, Peter Marcus, and Kolderup Greve	06/01/12
Atlantic Wind Connection	Kris Ohleth and Stephanie McClellan	06/01/12
Maine Department of Marine Resources	Pat Kelliher, Joe Fessenden, Meredith Mendelson, and Deirdre Gilbert	06/05/12
Maryland Department of Natural Resources	Catherine McCall, Carrie Kennedy, Chris Cortina, Gwynne Schultz, and Mike Luisi	06/06/12

3.1.3 Results of Consultation Efforts

Information collected during the stakeholder consultation process was qualitatively assessed and used in concert with published data to determine workshop locations, select attendees to represent the various commercial and recreational fishing groups, and to identify topics of interest relative to fisheries in specific locales. Information developed during consultation efforts was reflective of experts' opinions on the most relevant locations and timeframes for scheduling the stakeholder outreach workshops. Detailed contact reports for the pre-workshop consultation teleconference meetings are provided in Appendix A.

A synopsis of the prominent issues identified as a result of the pre-workshop consultations follows.

- **Early Outreach**. There was consensus that BOEM should engage fishermen and fishing organizations early in the process to inform them of the upcoming workshops. Several experts recommended advising fishers on the project's goals and objectives via established fishing organizations, such as the FMCs or fishery task force meetings.

- **Sensitivity to Fishers' Needs**. It was stressed throughout the stakeholder consultation process that BOEM should seek to understand fishers' perspectives and attitudes relative to offshore energy development. The stakeholders recommended BOEM inform the fishing community that the final workshop schedule and locations were established based on regional fishing seasons and fishers' business practices in an effort to maximize attendance and opportunities for dialogue. They stressed that BOEM show the agency was working within the schedule of the fishing community to the fullest extent practicable.

- **Workshop Constituents**. Recommended lists of individual fishers, fishing organizations, state and local agency representatives, non-governmental organizations, offshore wind developers, and other interested parties throughout the project area were provided to BOEM by the stakeholders during consultation. These lists were used during the workshop planning process to develop invitation lists for each state within the project scope. FMC representatives suggested that BOEM strive to include members from each fishery gear type that could be affected by wind energy development. Workshop attendees were also recommended based on their history of participation in discussions or workshops regarding mitigation measures and BMPs specific to offshore wind and the fishing industry.

- **BOEM's Responsibilities**. Considerable emphasis was placed on BOEM's role in disseminating information on offshore wind energy development and the federal permitting process for projects planned on the Atlantic OCS. It was suggested that during stakeholder workshop introductory sessions BOEM provide a brief, focused discussion on the NEPA process that would be used to evaluate potential impacts of offshore wind development and how mitigation measures and BMPs would fit into the process.

- **Workshop Schedule**. All of the stakeholders suggested that BOEM plan the workshops during periods when fishermen would be most available, such as late fall and winter, when fishing is limited due to inclement weather conditions. This late fall/winter timeframe was noted to coincide with many fisheries closures for both recreationally and commercially sought species. Finally, it was stressed that BOEM plan and finalize the workshop schedule as early as possible so that interested parties could make plans to attend.

- **Goals for the Workshops**. All parties interviewed agreed that BOEM should inform workshop participants that the project's goals are not related to any

specific wind energy project or to direct compensation to fishers as a result of lost or reduced fishing grounds or equipment. It was also mentioned that BOEM should provide a clear understanding to fishers that the environmental permitting process (NEPA) has no bearing on other transportation or exclusion-related issues that may be associated with wind energy projects, and that these would be addressed through the U.S. Coast Guard or the state agency maritime enforcement processes. The consulted stakeholders recommended BOEM emphasize that these events were to be working sessions, not meetings for public comment, and to facilitate the workshops accordingly.

- **Workshop Locations**. During the pre-workshop consultation sessions, discussions occurred regarding whether locating a workshop at a port associated with a currently proposed wind energy project would create a negative atmosphere with fishers or be more relevant to the overall mitigation development process. Interviewees provided specific locations that were included during the resulting analysis for determining workshop locations (see Section 3.2.2). Several stakeholders recommended that BOEM design each workshop to be specific to the issues and concerns of each meeting location.

- **Workshop Format**. There was consensus among interviewees that a BOEM representative should begin each workshop with a short informative discussion of the project goals and expected outcome and the NEPA process, and then open the floor to a 15-minute period for attendee questions regarding BOEM's role in offshore wind energy permitting or other pertinent topics. This strategy would provide for an effective working session once workshop participants were able to voice any concerns or questions regarding fishing and offshore wind development.

3.2 Stakeholder Workshops

3.2.1 Workshop Goals

The purpose of each regional workshop was to identify anticipated and specific user conflicts and potential and realistic mitigation measures that effectively balance the needs of fishers and offshore wind developers. This was done by fostering discussion among fishermen and wind energy developers, plus interested agency or advocacy groups, in locations where dialogue would result in development of BMPs and mitigation measures that would be beneficial to both wind developers and fishermen, and relevant for inclusion in analyses required under NEPA.

To start each workshop, a BOEM representative provided a short informative discussion of the project goals, the expected outcome, and the NEPA process, and informed participants that these goals were not related to any specific wind energy project or to direct compensation to fishers as a result of lost or reduced fishing grounds or equipment. It was made clear to all participants that the environmental permitting process (NEPA) has no bearing on other transportation or exclusion-related issues that may be associated with wind energy projects and

that these would be addressed through the U.S. Coast Guard or the state maritime enforcement agency processes.

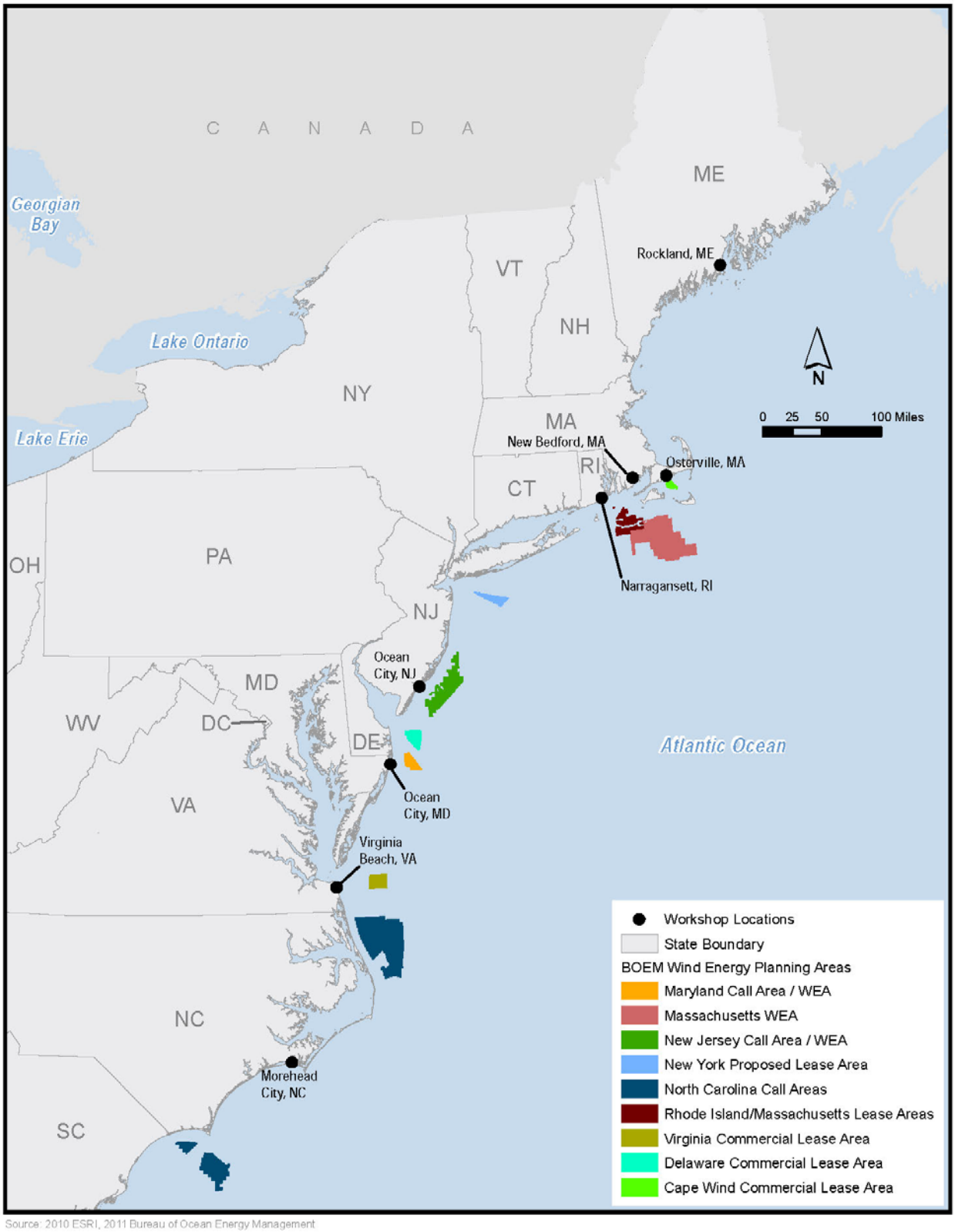
3.2.2 Locations and Schedule

The result of the data analysis and consultations described in Sections 2.2 and 3.1 was the selection of eight different locations in which the series of eight stakeholder workshops were conducted (Table 3-2). Local and regional scales were considered to address potential offshore wind energy development in the Atlantic states under consideration. Meeting locations and schedules were then chosen based on fishing community proximity to WEAs, seasonal fishing activity, and other factors such as neutrality, size, accessibility, and cost.

The series of eight workshops took place from October 2012 through February 2013 to take advantage of the expected 'low-effort' fishing periods in fall and winter. The daily and seasonal schedules of when fishermen are usually in port were also considered to ensure an increased likelihood of their participation. Information was analyzed for port locations compared to WEAs; predominant fisheries found at each port (i.e., trawl, offshore, inshore, species landed); recent landings compared to other ports; and other criteria, such as comments obtained during consultations and/or whether fishers live in these identified areas or transit to the port only for fishing or landing fish. Figure 3-1 illustrates the location of each regional workshop in relation to BOEM's currently identified WEAs.

Table 3-2
Workshop Locations and Schedule

City/State	Date	Time	Workshop Location
Virginia Beach, VA	October 12, 2012	1:00 – 4:45 p.m.	Virginia Aquarium & Marine Science Center 717 General Booth Blvd. Virginia Beach, VA 23451
Narragansett, RI	November 16, 2012	4:00 – 8:00 p.m.	University of Rhode Island Graduate School of Oceanography 215 South Ferry Rd. Narragansett, RI 02882
Osterville, MA	December 4, 2012	4:00 – 8:00 p.m.	Osterville Village Library 43 Wianno Rd. Osterville, MA 02655
New Bedford, MA	December 5, 2012	4:00 – 8:00 p.m.	Fairfield Inn and Suites 185 MacArthur Dr. New Bedford, MA 02740
Ocean City, MD	January 11, 2013	2:00 – 6:00 p.m.	Ocean Pines Library 11107 Cathell Rd. Ocean Pines, MD 21811
Morehead City, NC	January 22, 2013	1:00 – 5:00 p.m.	Morehead City Train Depot 1001 Arendell St. Morehead City, NC 28557
Ocean City, NJ	February 6, 2013	4:00 – 8:00 p.m.	Ocean City Free Library 1735 Simpson Ave. Ocean City, NJ 08226
Rockland, ME	February 28, 2013	8:00 a.m. – noon	Samoset Resort 220 Warrenton St. Rockport, ME 04856



Source: 2010 ESRI, 2011 Bureau of Ocean Energy Management

Figure 3-1. Stakeholder Workshop Locations and BOEM Wind Energy Areas/Call Areas.

3.2.3 Meeting Participants

Specific expertise in each fishery, as well as in wind energy facility design and construction, was needed at each workshop to help identify potential conflicts between wind energy facilities and specific types of fisheries gear and to identify potential practical mitigation measures. Therefore, to gain participation at the outreach meetings, specific and relevant government, industry, and fishery stakeholders were invited to be represented at each workshop.

The goal for gaining participation at the BOEM outreach meetings was to target relevant government, industry, and fishery stakeholders that should be represented at each workshop. Organizations that represent fishermen's interests were identified for each workshop location. Commercial and recreational fishing organizations and clubs were prioritized by those representing fishermen whose methods would most likely be affected by regional wind energy development and included those using both fixed and mobile gear types. Invited fishery workshop participants were based on an evaluation of fishery use patterns for the local area and information developed during consultations (see Sections 2.2 and 3.1). Factors included fishery landing statistics and predominance of commercial or recreational fishing. The daily and seasonal schedules of when fishermen are in port also were taken into account to ensure an increased likelihood of their participation. Other stakeholders, including charter boats and individual recreational fishers, were identified through contact with local port/marina facilities, Web searches, government agencies, and federal FMCs.

Email was the primary form of communication used to disseminate materials and information to participants prior to each workshop, except in instances when the participant did not have an email address, a letter was sent via the U.S. Postal Service. Along with the initial invitation, workshop participants received a project overview fact sheet that provided information about the purpose of the workshop and directions to the meeting. Federal and state agency representatives also made phone calls to fisherman prior the meetings to encourage participation.

The total number of participants across the eight workshops is provided in Table 3-3. A description of industry members represented at each regional stakeholder workshop is provided in Section 3.2.5.

Table 3-3
Total Workshop Attendance

Industry	Number of Participants
Offshore Wind Development	11
Fishing Industry	51
Fishermen/Wind Developers	3
State and Federal Government	41
Universities	9
Media	2
Power Companies	1
Transmission Cable Companies	1
Non-Profit Organizations	9
Tidal Energy	2
Surveyors	1
Attorneys	1
Environmental Consultants	5
Total	**137**

3.2.4 Workshop Content

The format for each workshop was a facilitated meeting. The workshops did not address any specific wind energy development project, but instead identified and described general types of practices or studies that could be implemented as mitigation for wind energy development. BOEM will incorporate site-specific mitigation in their NEPA process applicable to each proposed project in federal waters where a developer is requesting a lease.

Participation at each workshop was by invitation only; however, members of the public were allowed to attend and observe. Meeting rooms at each location were arranged so that invited participants sat at several tables in small groups, with chairs placed towards the back of the room to provide a seating area for the general public. Each small table accommodated eight to ten participants including a facilitator at each table. A screen and a podium with a microphone were located toward the front of each room for the introductory presentation. Room layout varied slightly by location due to differences in meeting venue size, shape, and type of tables/seating available; however, only small adjustments were necessary.

Each workshop included a check-in area with a sign-in sheet where colored nametags were provided to participants at check-in upon arrival at the meeting. The different-colored nametags represented each type of industry in attendance (fishers wore blue nametags, wind industry wore red, and government agency personnel wore yellow) so that a participant's affiliation could be easily recognized by others. Informational handouts were provided upon check-in, as well as worksheets for each breakout session. Attendees were directed to sit at tables so that different industries and agencies were represented at each table for the breakout sessions. Several visual displays were placed around the room for attendees to browse before and during the workshop.

The workshop agenda was designed to involve participants in a collaborative, step-wise process with the goal of developing a list of potential BMPs and mitigation measures that would address concerns about possible conflicts between fishing operations and wind energy development. Input from the first meeting in Virginia Beach, Virginia, provided valuable feedback on the workshop's process format and the subsequent workshops were modified accordingly. Meetings in the eight different cities started at different times, but each workshop lasted for approximately three to four hours and followed the basic flexible agenda described in Table 3-4.

Table 3-4
Stakeholder Workshop Agenda Outline

Activity	Duration
Sign-in	Begin 30 minutes before start time
Welcome and Opening Remarks	5 minutes
Introductions, Agenda, and Rules of the Road	10 minutes
BOEM Presentation *Fishing and Offshore Energy: Process, Issues, and Best Management Practices*	40 minutes
Breakout Session 1: Review Issues and Concerns Identified from Previous Meetings	30 minutes
Breakout Session 1 Group Report-outs	20 minutes
Break – Review displays and get refreshments	15 minutes
Breakout Session 2: Potential Best Management Practices and Mitigation Measures	55 minutes
Breakout Session 2 Group Report-outs	20 minutes
Final Comments and Discussion, Meeting Adjourned	15 minutes

The facilitator opened the meeting by welcoming attendees and going around the room so each participant could introduce themselves and state their affiliation. The facilitator then briefly discussed the format for the meeting so that attendees had an understanding of the agenda and meeting rules:

- Invitees are the active participants; others may observe.
- No recording or reporting of individual statements to encourage open dialogue.
- Share your views.
- Stay on track with the agenda.
- Speak one at a time.
- Allow others time to speak too.
- Be respectful: no personal attacks.
- Suggestions and ideas are not commitments: No one has to own or later accept the ideas suggested.

This was followed by an introduction of Brian Hooker, BOEM Biologist, who opened the meeting with a PowerPoint presentation that included:

- Different stages of offshore wind facility development;
- Purpose of the workshops;
- Known fishing and vessel trip data for the local area;
- Existing fishing and wind energy questions and concerns;
- Current BMPs required by BOEM;
- A description of BOEM's Environmental Studies Program; and
- Various opportunities for input.

Mr. Hooker then opened the floor to a short 15-minute period for attendee questions regarding BOEM's role in offshore wind energy permitting or other pertinent topics.

Most of the remainder of the meeting was spent in discussion during two separate breakout sessions. The breakout sessions provided opportunities to discuss previously identified and newly raised potential concerns about use conflicts and to identify reasonable measures that could be employed during wind energy development to reduce or eliminate impacts to fishery constituents. Facilitators at each table led the group through the breakout session worksheets with a goal of leading a productive discussion on the development of BMPs or mitigation measures. Since there may be a need for regional or fishery-specific mitigation measures, discussions and breakout sessions were tailored to each specific location.

The first breakout session began directly after BOEM's presentation. Each small group of participants worked on identifying issues of concern from their perspective using the provided list of issues identified from the previous workshops as a guideline. This breakout was valuable in participants raising regionally specific concerns as well as more general concerns about wind energy development. It also allowed the participants to identify the key issues from which they could develop specific possible mitigation measures. The facilitator then led "report outs" so each table could share the issues they identified with all participants. This was followed by a 15-minute break for refreshments and to browse the visual displays.

Breakout Session 2 followed the break and focused on formulating mitigation measures that could be employed during offshore wind energy development, operation, and decommissioning to reduce impacts. Using the worksheets as guides, each group identified potential management strategies that would address one or more specific concerns. Participants reviewed BOEM's current list of BMPs and mitigation measures and ideas that had risen in previous workshops, made suggestions for additions, and discussed how to make one or more BMPs and mitigation measures operational should a project be approved. Following the final breakout session, the facilitator asked each table to again summarize the key points that were discussed in each group. After the final report-out, participants were given the opportunity to provide feedback and comments on the workshop format and content, after which the meeting was adjourned. All meeting materials and handouts provided to workshop participants, including Breakout Session worksheets, are included in Appendix B.

Each subsequent meeting built upon the previous meetings by reflecting both concerns and suggestions from past participants. Comments ranged from changes in the meeting format and

adding local vessel data to poster displays to new ways of conducting outreach to increase participation. Meeting materials and worksheets were updated as needed after some meetings to reflect the suggestions from workshop participants. As the meetings progressed, to clearly distinguish between the two breakout sessions, facilitators devoted special attention to leading the groups during Breakout Session 2 in trying to formulate usable, concrete mitigation measures. Overall, participants felt that the workshops were well-received and were glad that BOEM was taking this first important step in bringing fishers and wind developers together to the same table for discussion.

3.2.5 Meeting Summaries

This section briefly describes each meeting location, the variety of industries represented, and the major topics discussed at each workshop. Specific, individual mitigation measures and BMPs are discussed in Chapter 5. Please note that the possible mitigation measures described below for each meeting are only summaries of a number of detailed, specific suggestions. Detailed meeting minutes for each workshop are included in Appendix C, and a categorized list of every suggested mitigation measure and BMP is in Appendix D.

Virginia Beach, Virginia

The first stakeholder workshop occurred in Virginia Beach, Virginia, at 1:00 p.m., Friday, October 12, 2012, at the Virginia Aquarium and Marine Science Center. The Hampton Roads area, including Virginia Beach, encompasses several active fishery ports and is close to an offshore WEA. Two wind-related conferences also took place in Virginia Beach in mid-October 2012: the American Wind Energy Association (AWEA) conference (October 9 to 11) and the Oceans12 convention (October 14 to 19). Friday, October 12 was one day after the AWEA conference ended and three days before Oceans12 began; this time and date made it convenient for potential stakeholder workshop participants who also may have attended either of these conferences. Attendance by fisherman was expected to be higher during mid-October because it is not a peak fishing period.

The Virginia Beach meeting had 18 participants representing developers (6 attendees), fishermen/developers (3 attendees), agency personnel (5 attendees), fisheries and/or representatives (2 attendees), universities (1 attendee), and wind development organizations (1 attendee). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Set specifications for siting (e.g., outside of heavily used fishing areas).
  - Set a minimum spacing distance between turbines.
  - Conduct monitoring of the effects on fisheries.

- **Construction and maintenance guidelines:**
  - Guidelines for the size of scour protection.
  - Footprint size implications for various foundation types and scour protection.
  - Set a maintenance schedule and its frequency.
  - Create usable fish habitat.

Figure 3-2. Stakeholder Workshop, Virginia Beach, VA, October 12, 2012.

- **Access, transit rules, and enforcement:**
  - Maximize access by commercial and recreational fisheries in the wind facility.
  - Establish anchoring guidelines (e.g., scour protection or turbines areas).
  - Transit should be allowed through the wind facility.
  - Small, discrete exclusion zones should only exist around individual turbines for safety purposes.

- **Communication:**
  - Engage fisherman in the siting process (e.g., fisheries liaison).
  - Develop a procedure for emergencies at sea.
  - Use Notices to Mariners, plus other notification procedures.
  - Create methods to communicate updates to vessels that may be home-ported elsewhere.

Narragansett, RI

The second stakeholder workshop occurred in Narragansett, Rhode Island, at 4:00 p.m. on Friday, November 16, 2012, at the University of Rhode Island-Graduate School of Oceanography, Island Bay Campus. A meeting of the New England Fishery Management Council (NEFMC) took place in Newport, Rhode Island, from November 13 to 15, 2012. To make the second stakeholder meeting convenient for attendees of the NEFMC meeting, the stakeholder meeting was held in the afternoon on November 16, 2012.

During consultation interviews, fall and winter were suggested as good times to hold a meeting in this region because it is not a peak fishing period. In addition, the southern New England area, including Narragansett, Point Judith, and Newport, encompasses several active fishery ports and is in proximity to an offshore WEA. Narragansett is approximately 15 miles from Newport and 7 miles from Point Judith, which has the largest fisheries landings in the state of Rhode Island.

Figure 3-3. Stakeholder Workshop, Narragansett, RI, November 16, 2012.

The Narragansett meeting had 21 participants representing wind developers (2 attendees), fishermen/developers (1 attendee), agency personnel (6 attendees), universities (1 attendee), small media (1 attendee), non-profit organizations (1 attendee), environmental consulting companies (1 attendee), and members of the fishing industry (8 attendees). Workshop participants identified concerns related to offshore wind energy development and provided some suggestions for mitigation measures to address those impacts. Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Hold developer-sponsored classes and training sessions on safety and construction updates.
  - Ensure that cables have electromagnetic field (EMF) shields.
  - Allow fishermen to identify areas of importance to them early in the design process.
  - Require adequate spacing between turbines to allow for safe fishing practices for all gear types.

- **Construction and maintenance guidelines:**
  - Require a standard cable burial depth and a process for inspection and re-burial.

- Require developers to utilize the most environmentally friendly construction methodologies.
- Maximize onshore construction.
- Construction should proceed in a phased process instead of closure of the entire area.

- **Access, transit rules, and enforcement:**
  - Transit should be allowed through the wind facility.
  - Designate clearly defined transit lanes and exclusion zones.
  - Clear and constant communication of all rules and any updates.

- **Communication:**
  - Engage fisherman early in the siting process.
  - Use a paid fisheries liaison.
  - Require a procedure for emergencies at sea.
  - Require mandatory upgraded navigational and nautical chart updates.

Osterville, MA

The third stakeholder workshop occurred in Osterville, Massachusetts, at 4:00 p.m. on December 4, 2012, at the Osterville Village Library. The Cape Cod area encompasses several active fishery ports and is in proximity to an offshore WEA. During consultation interviews, fall and winter were suggested as good times to hold a meeting in this region. This workshop was held in December to attract higher attendance by fishermen because it is not a peak fishing period throughout the southern New England region. This workshop occurred one day before the New Bedford, Massachusetts, stakeholder workshop due to their proximity.

Figure 3-4. Stakeholder Workshop, Osterville, MA, December 4, 2012.

The Osterville meeting had 11 participants representing agency personnel (3 attendees), universities (1 attendee), non-profit organizations (2 attendees), and members of the fishing industry (5 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Utilize fishermen to help with surveys, studies, construction, siting, and other operations.

- **Construction and maintenance guidelines:**
  - Require larger spacing between turbines with increasing water depth.
  - Space turbines with help from fishermen to allow continuance of fishing practices.
  - Require a plan for inspection and maintenance of buried cables.
  - Require a plan for appropriate disposal of construction debris.

- **Access, transit rules, and enforcement:**
  - Site wind facility to match existing vessel traffic patterns.
  - Areas for fishing vessels versus travel lanes for transiting vessels need to be made clear.
  - Require effective marking on turbines and foundations.

- **Communication:**
  - Developers should lead a "Fishermen's Exchange" and take U.S. fishermen to Europe to see a wind facility and interview European fishermen.
  - Consider installing a cell tower repeater within the wind facility.
  - Utilize local fishing newsletters to relay information.

New Bedford, MA

The fourth stakeholder workshop occurred in New Bedford, Massachusetts, at 4:00 p.m. on December 5, 2012, at the Fairfield Inn and Suites. New Bedford is an active fishery port for both commercial and recreational fishing (Table 2, Section 2.3) and is in proximity to an offshore WEA. During initial stakeholder consultations, New Bedford was suggested as a good meeting location for potentially interested commercial and recreational fishers in Massachusetts. These individuals also recommended fall or winter as an ideal time to hold a workshop in this area in order to attract higher attendance by fishermen since it is not a peak fishing period throughout the southern New England region. This workshop occurred one day after the Osterville, Massachusetts stakeholder workshop.

Figure 3-5. Stakeholder Workshop, New Bedford, MA, December 5, 2012.

The New Bedford meeting had 23 participants representing wind developers (3 attendees), power companies (1 attendee), fishermen/developers (2 attendees), agency personnel (5 attendees), universities (1 attendee), small media (1 attendee), transmission cable companies (1 attendee), environmental consulting companies (2 attendees), and members of the fishing industry (7 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Engage fishing vessels in site assessment surveys and other cooperative research.
  - Require developers to conduct a full space-use study of the area.

- **Construction and maintenance guidelines:**
  - Site each turbine on a micro level (e.g., within 500 feet) with the help of fishermen to avoid impacts to current fishing practices and to follow bottom contours.
  - Place a unique identifier along with a contact name and phone number on all turbines and other equipment.
  - Require a 6-foot minimum burial depth for cables.

- **Access, transit rules, and enforcement:**
  - Developers should offer a way for fishermen to fish near turbines if tie-ups will not be allowed.
  - Fishermen should leave behind any snagged gear and should be reimbursed by developer.

- **Communication:**
  - The locations of turbines and cables and other equipment should be clearly visible on navigational instruments and available in a timely manner.

- Developers should help pay for navigation software upgrades for fishermen and should install cell phone signal boosters on turbines.

Ocean City, MD

The fifth stakeholder workshop occurred in Ocean City, Maryland, at 2:00 p.m. on Friday January 11, 2013, at the Ocean Pines Library. Located on the Atlantic coast of Maryland, Ocean City is a major port of call for a large diversity of fisheries and is in proximity to the Maryland offshore WEA. The workshop was scheduled in the winter to encourage attendance by fishermen during non-peak fishing periods in Maryland. The Ocean Pines Library was suggested as an appropriate meeting location through stakeholder consultations. To attract more fishermen who may already be in the area, this workshop was held just before the Ocean City Watermen's Festival that occurred from January 13 to 15, 2013.

Figure 3-6. Stakeholder Workshop, Ocean City, MD, January 11, 2013.

The Ocean City meeting had 24 participants representing agency personnel (8 attendees), universities (3 attendees), wind developers (1 attendee), environmental consultants (1 attendee), attorneys (1 attendee), and members of the fishing industry (10 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Turbines should be utilized to collect offshore data.
  - There should be no liability for fishermen if fishing gear gets snagged on turbines or offshore equipment.

- **Construction and maintenance guidelines:**
  - Orientation and configuration of the wind arrays will be important to fishermen.
  - Include signage on turbines that explains what type of foundation is present and any rock scour of which they should be aware.

- **Access, transit rules, and enforcement:**
  - Require a very high frequency (VHF) and/or cell phone repeater station to be located within the wind facility to enhance safety.
  - Require a monitoring program to inspect buried cables on a regular basis and also after storm events.

- **Communication:**
  - Developers should consult fishermen for "micro-siting" of each individual turbine.
  - Developers should target seasonal windows for communication when fishermen are readily available.
  - Utilize local fishing newspapers and magazines for communication.

Morehead City, NC

The sixth stakeholder workshop occurred in Morehead City, North Carolina, at 1:00 p.m. on January 22, 2013, at the Morehead City Train Depot. Located within Carteret County along the Outer Banks in coastal North Carolina, Morehead City encompasses several active fishery ports and is located between the areas currently identified as North Carolina offshore WEAs. Located on the mainland approximately at the mid-point along the length of the state's coastline, Morehead City is easily accessible for stakeholders from both the northern and southern Outer Banks. The train depot is located in downtown Morehead City near commercial and recreational fish docks and seafood restaurants. To encourage attendance from South Atlantic Fishery Management Council (SAFMC) representatives, this meeting was scheduled so it would not conflict with the winter 2012 SAFMC meeting (early December). Landings in North Carolina are typically lower in mid-January, so workshop attendance by fishermen was expected to be higher during this time of year.

The Morehead City meeting had 19 participants representing agency personnel (9 attendees), universities (3 attendees), and members of the fishing industry (7 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Developers should develop an environmental baseline analysis before starting development.
  - Turbines should be used to collect offshore data.
  - If fishing gear gets snagged on turbines or cables then fishermen should cut it loose and the developer will recover the gear and fix it and return it or reimburse the fishermen for the lost gear.

Figure 3-7. Stakeholder Workshop, Morehead City, NC, January 22, 2013.

- **Construction and maintenance guidelines:**
  - Install environmental observation tools on wind facility foundations/masts that can supply real-time atmospheric and oceanographic information to aid fishermen via various web portals.
  - Paint turbines a color that is not attractive to birds and bats.
  - Coordinate offshore closures for turbine construction and maintenance with other spawning and fishing closures so that fishermen are not excluded from areas for long periods of time.

  - Access, transit rules, and enforcement:
  - Developers need to study and address the vessel traffic and dynamic nature of currents through Oregon Inlet.
  - Identify safety corridors through an offshore wind facility.
  - If no tie-ups will be allowed to the turbines then establish tie-up areas near the turbines to allow fishermen to utilize the benefits of artificial reefs.

- **Communication:**
  - Developers should purchase and provide updated navigational chips for maps and radars for fishermen's computers.
  - Utilize fishing Web sites and NOAA weather radio to communicate with fishermen.
  - Clearly communicate the specifics of construction and maintenance schedules to fishermen.

Ocean City, NJ

The seventh stakeholder workshop occurred in Ocean City, New Jersey, on Tuesday February 6, 2013, at 4:00 p.m. at the Ocean City Free Public Library. The Atlantic coast of southern New Jersey contains several ports of call for a large diversity of fisheries and is close to an offshore WEA. Located directly on the coast, Ocean City was identified as a good location for a stakeholder meeting because of its location between Atlantic City and Cape May. During early February, workshop attendance by fishermen was expected to be higher because it is not a peak fishing period in New Jersey.

Figure 3-8. Stakeholder Workshop, Ocean City, NJ, February 6, 2013.

The Ocean City meeting had 12 participants representing agency personnel (4 attendees), wind and transmission industries (5 attendees), and members of the fishing and diving industries (3 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Marine spatial planning should play a part in the siting of individual wind facilities.
  - Wind developers should hire fishermen and use their boats for development and maintenance.

- **Construction and maintenance guidelines:**
  - Install cell towers within the offshore wind facility.
  - Design wind facilities with the electrical nodes and converter stations placed landward so that less heavy cable is laid going to shore.

- **Access, transit rules, and enforcement:**
  - Minimize impacts in areas where cables come onshore so trawlers can continue operations without concern about damaging a cable.
  - Design cable-free pathways through the wind facility.

- **Communication:**
  - Require a communications plan from developers.
  - Hold many public hearings and comment periods for every offshore development.
  - Utilize local leadership within the fishing industry and publish announcements in local fishing publications.
  - Appoint one "offshore point-of-contact" from the state to facilitate effective communication and coordination with the fishing industry.

Rockland, ME

The eighth and final stakeholder workshop occurred in Rockland, Maine, at 8:00 a.m. on Thursday, February 28, 2013, at the Samoset Resort. The northern New England area encompasses several active fishery ports and is in proximity to a proposed Statoil offshore wind demonstration project. Portland was suggested as a potential meeting location during initial stakeholder consultations, and mid-March was recommended as a good time to hold this meeting since it is not a peak fishing period in Maine. This workshop coincided with the Maine Fishermen's Forum meeting, which also occurred in Rockport at the Samoset Resort from February 28 through March 2, 2013. Therefore, holding the stakeholder workshop on February 28 made it convenient for workshop participants who may also have attended the Forum.

The Rockport meeting had 27 participants representing state agency/government personnel (4 attendees), federal government (2 attendees), tidal energy developers (2 attendees), consultants (1 attendee), non-profit organizations (6 attendees), surveyors (1 attendee), and members of the fishing industry (11 attendees). Discussion of mitigation measures at this workshop focused on:

- **Baseline requirements and basic guiding principles:**
  - Look into utilizing a model of community ownership for wind facilities in the form of co-ops.
  - Utilize fishermen's help when conducting offshore studies.

- **Construction and maintenance guidelines:**
  - Research historical fisheries data within the proposed wind facility and identify areas that are important to fishermen.
  - Periodically inspect and maintain buried cables.
  - Bury cables at least 2 meters deep.

- **Access, transit rules, and enforcement:**
  - Require a safety orientation for fishermen.
  - Provide current and frequent updates to NOAA nautical charts.
  - Use beacons and reflective tape on turbines for safety and navigation.

- **Communication:**
  - Involve key leaders within the fishing industry in order to communicate with fishermen.
  - Hire a fishermen's liaison to engage fishermen early and often.
  - Utilize a variety of methods to communicate with fishermen including social media, Web sites, VHF radio, emails, and attending other fisheries meetings.

Figure 3-9. Stakeholder Workshop, Rockland, ME, February 28, 2013.

4 HISTORY OF WIND ENERGY MITIGATION DEVELOPMENT

Over the past decade, the interest in developing offshore renewable energy has highlighted the need for evaluating space-use conflicts among user groups, including the wind energy industry and fishermen who use local fishery resources (Rodmell and Johnson 2003; Fayram and de Risi 2007; Johnson and Rodmell 2009; Alexander, Wilding, and Heymans 2013; Alexander, Potts, and Wilding 2013). As early as 2004, European countries were undertaking planning efforts for offshore wind energy development through early identification and removal of non-technical barriers (Roth, Verhoef, and Dingenouts 2004). Although this effort was primarily directed at establishing an *environmental impact analysis* approach, and *permission procedures* for offshore wind energy farms, it did identify that impacts to 'men' from the collision of fishing vessels with wind towers, was a potential risk. Proposed mitigation measures, however, were almost exclusively associated with reducing or eliminating potential environmental (water, sediment) and biological (birds, marine mammals, fish) impacts (Roth, Verhoef, and Dingenouts 2004).

Consideration of the perceptions and attitudes of fishermen in the United Kingdom (U.K.) towards an emerging offshore wind energy market were analyzed by Mackinson et al. (2006). Their report summarized the extent of fishing activities in three proposed strategic wind development areas and described the perceptions of fishermen and the socioeconomic implications of wind farm development on their industry. The report also provided mitigation measures for fleets that could be disadvantaged by wind energy development. Seven themes were identified including one directed at the likelihood and expected success of mitigation measures. Mackinson et al. (2006) noted that a significant aspect of the mitigation theme was its relatively low weight of importance to fishermen, suggesting that either mitigation options did not exist or that few were known to fishermen. Primarily, fishermen considered that the only suitable alternative to the likelihood of coexisting in a WEA was to invest in other fishing methods that did not conflict with wind farm operation. One of the most important findings of the study was fishermen's perceptions that there was a lack of communication, trust, and information provided during wind energy planning and development; poor communication was specifically highlighted as an important issue and was the basis for many of the other issues raised by fishermen. Decision-making was viewed by fishermen as being highly biased and based on political objectives rather than careful weighing of the pros and cons.

Alexander, Wilding, and Heymans (2013), in their study on Scottish fishermen and marine renewable energy, found that development of the offshore renewable energy sector would have implications for the fishing industry by limiting access and navigation and could have potential impacts (both positive and negative) on commercially fished species. They point out that fishers' attitudes and behavior have been found to influence the success of fishery management measures, compliance with regulations, and success of marine protected areas, suggesting that they may also affect offshore renewable energy developments. The most important factor influencing fishermen's opinions was whether they knew of a nearby offshore development, followed by location of the development compared to their fishing locale. Loss of access to fishing grounds was the impact that was identified most often in the study. As with other similar studies, consultation with fishermen was the primary mitigation strategy proposed, with compensation and communication also mentioned.

In light of the potential for U.K. fishermen to lose access to sea areas within offshore wind farms, Collaborative Offshore Wind Research into the Environment Ltd. (COWRIE) funded a project to investigate the options and opportunities for marine fisheries mitigation (Blyth-Skyrme 2010, as cited in Perry and Smith 2012). The project's goal was the development of a list of possible mitigation options that would be useful to fishermen, developers, regulatory and statutory bodies, and marine resource managers during future discussions on wind farm development. COWRIE worked with various fishermen organizations to develop a comprehensive set of mitigation options for offsetting possible adverse impacts to the fishing industry (Blyth-Skyrme 2010, as cited in Perry and Smith 2012). The report detailed 26 possible mitigation options divided into four categories that were evaluated by those stakeholders for their merit and feasibility. The four categories included: pre-construction options to limit impacts on commercial fishing activities; options to enhance fish stocks and habitats; options to support fishing activities; and options to develop new fisheries or other non-fisheries opportunities (Blyth-Skyrme 2010, as cited in Perry and Smith 2012). Not surprisingly, the need for early stage consultation between developers and fishermen rated high on the list of mitigation ideas. A major focus of the mitigation measures developed in the report dealt with stock enhancement and extended support to fishermen and fisheries by governmental agencies.

In their review of fisheries mitigation options for the Rhode Island Ocean Special Area Management Plan, Perry and Smith (2012) noted several projects that have considered mitigation during pre-construction and design phases, including Hong Kong Offshore Wind Farm, the North Hoyle Wind Farm (U.K.), Barrow Offshore Wind Farm (U.K.), the Horns Rev Offshore Wind Farm (Denmark), and the Princess Amalia Wind Park (the Netherlands) (Hong Kong Offshore Wind Limited 2009; National Wind Power Ltd. 2002; Eneco 2012; Danish Energy Agency 2007; ELSAMPROJEKT A/S 2000; RSK ENSR 2008; and RSK ENSR 2005, respectively, all as cited in Perry and Smith 2012). These projects included consultation with local fishing industries for selecting wind farm sites in areas having historically low quality or closed fishing grounds.

To allow continued fishing in and around the Horns Rev Offshore Wind Farm in Denmark, developers agreed to bury cables 1 meter into the seabed to protect the cables from damage by fishing gear and anchors, thus allowing continuous fishing in and around the wind farm (Danish Energy Agency 2007 and ELSAMPROJEKT A/S 2000, both as cited in Perry and Smith 2012). For the Kentish Flats Extension Wind Farm (U.K.), travel corridors were established to minimize potential collisions between fishing vessels and wind towers, and all cables were to be buried deep enough to allow continued fishing in the farm (Vattenfall 2011, as cited in Perry and Smith 2012).

Designation of a fisheries liaison during early planning stages has been shown to be a critical element to effective communication between the fishing industry and the offshore wind energy sector. To minimize conflict between the wind farm operators and fishermen and to eliminate the need for an exclusion zone around the wind farm during its operation, the Barrow Offshore Wind Farm used a fisheries liaison to determine safe operating practices within the site (RSK ENSR 2008 and RSK ENSR 2005, both as cited in Perry and Smith 2012). The British Wind Energy Association, in conjunction with fisheries groups throughout the U.K., issued formal recommendations that a fisheries liaison be used for all offshore wind development projects in order to promote the coexistence of the two industries (The British Wind Energy Association 2004, as cited in Perry and Smith 2012). The Fishing Liaison with Offshore Wind and Wet

Renewables Group (FLOWW) formalized these recommendations as guidelines for offshore renewable energy developers and the fishing community (UK BERR 2008, as cited in Perry and Smith 2012). On a fundamental level, the fisheries liaison provides an avenue for open dialogue and communication between developers and the fishing industry by disseminating project information and construction timelines. Many European wind energy projects have benefited from a fisheries liaison. For the Thanet Wind Farm, the fisheries liaison was successful in minimizing impacts and served as a point of contact for daily operations; including disseminating and publishing notices on construction activities (Royal Haskonig 2005, as cited in Perry and Smith 2012).

The potential for fishing gear interaction with underwater cables has historically been of concern, with studies and guidance for these type events provided in literature (Carter et al. 2009; Drew and Hopper 2009). Drew and Hopper (2009) discussed the need for improved communication among cable companies and fishermen as a good start for alleviating some of these concerns. A United Nations study noted that mitigation for cable-gear interactions required careful planning and dissemination of information on cable locations to fishermen (Carter et al. 2009). On the U.S. West Coast the Oregon Fishermen's Cable Committee was established to officially handle conflicts between the two industries (see: http://www.ofcc.com/).

In the U.S., federal as well as state programs have begun marine spatial planning activities, and, to a more limited extent, mitigation measures for minimizing space-use conflicts in the marine environment. Federal guidance requires that mitigation measures consider impacts from both an environmental, as well as socioeconomic perspective. Section 5 provides information on BOEM's historical approach for meeting these directives. Perry and Smith (2012) note that the Rhode Island Ocean Special Area Management Plan outlined a number of policies related to impacts on fishing from offshore development, and the plan defines mitigation that serves as the basis for future mitigation negotiations. Rhode Island's policies are very specific and include requirements to meet with the Fisherman's Advisory Board to discuss potential fishery-related impacts, such as, project location, construction schedules, alternative locations, project minimization and identification of high fishing activity or habitat edges. Also, policies direct that the potential adverse impacts of offshore developments on commercial or recreational fisheries be evaluated, considered, and mitigated, and that the lease holders for offshore developments employ micro-siting techniques in order to minimize the potential impacts of such projects on edge areas. Importantly, Rhode Island directs that a lease holder designate and fund a third-party fisheries liaison for all stages of offshore development (Perry and Smith 2012).

In 2008, the Massachusetts Ocean Partnership (MOP) responded to legislation designed to improve management of the state's ocean ecosystems by analyzing various mitigation strategies for balancing the needs of stakeholder groups and their associated interests. A key consideration in implementing provisions of the legislation was determination of an appropriate means for establishing fees for mitigating the economic impacts on commercial fishing by offshore energy production. The MOP report concluded that fishermen should be compensated for lost use of ocean resources during construction of offshore renewable energy developments, but the report also provided that determination of how long and to what level this compensation should continue was the more challenging task. Importantly, the report identified the need for development of open communication and trust between developers and the fishing industry

before and during any mitigation and compensation negotiations. (Industrial Economics Incorporated and The Massachusetts Ocean Partnership 2009, as cited in Perry and Smith 2012)

In 2012, an industry-to-industry initiative was launched related to the Block Island Wind Farm Pilot Study. This initiative is undertaking cooperative research to study fish-wind interactions and develop mitigation measures/agreements through facilitated dialogue. Results of the study are not yet available.

4.1 Domestic Oil and Gas

Offshore renewable energy development is fairly recent compared to U.S. and international offshore oil and gas activities. Perry and Smith (2012) point out that interactions between the oil and gas industry and fishing industry are likely to be similar to those expected between fishing and offshore wind industries. As such, it is safe to predict that many of the mitigation options used in the offshore oil and gas industry may be similar to those proposed or in use in the offshore renewable industry. Mitigation option categories that have been developed for international oil and gas development projects include those associated with preconstruction and design, support for existing fishing activities, use of a liaison, and direct compensation (Perry and Smith 2012).

In Norway, Exxon Mobil has been working with the fishing industry to develop viable mitigation options when the two industries overlap. For instance, Exxon consulted with the fishing industry on project design resulting in backfilling and dredging of pipelines in order to allow continued fishing operations around Exxon's oil operations (Esso Norge 2004, as cited in Perry and Smith 2012). In the U.K. and the North Sea, the Fisheries and Offshore Oil Consultative Group was established to deal with damaged gear and lost resources and to administer mitigations to reduce potential impacts of continued oil and gas production activities (Perry and Smith 2012).

In the U.S., other offshore development, such as oil and gas, telecommunications and governmental projects, have impacted commercial and recreational fishing industries. Projects such as offshore liquefied natural gas terminals in Massachusetts, a gas terminal in Maine, oil and gas operations in the Gulf of Mexico, and cable projects in Oregon have used various mitigation options to offset impacts (Perry and Smith 2012). Mitigation options for these types of projects have been diverse, including gear replacement compensation, fishermen organization funding, harbor capital improvement funding, and requirements to recruit, hire, and train displaced fishermen.

4.2 Domestic Wind Energy

To date, BOEM's interim policy, which was designed for resource data collection and technology testing activities, has allowed for limited wind energy leasing on the Atlantic OCS. In June 2009, BOEM offered a total of five IP leases, four in New Jersey and one in Delaware, for the purpose of deploying meteorological observation platforms. Four of the offered IP leases were executed in November 2009. In November 2012, BOEM issued a commercial lease to Bluewater Wind Delaware LLC for the right to submit one or more plans to support the development of an offshore wind facility offshore Delaware. This total lease area is 96,430 acres. The nation's first commercial lease was issued to Cape Wind Associates, LLC (Cape

Wind) for the right to construct and operate an offshore wind facility located in federal waters offshore Massachusetts. The project consists of 130 wind turbine generators, each rated at 3.6 MW, for a total capacity of 468 MW. The final EIS for Cape Wind provided several mitigation measures for minimizing impacts to fisheries, including those associated with cable installation and monitoring, pile driving and jet plow activities, measures for working with the fishing industry and agencies that oversee their activity, fishermen notification procedures, and in-water work windows to protect sensitive fish species (see Section 5.1 for further details) (USDOI, MMS 2009). Also, via the state permitting process (and as adopted in the final EIS), mitigation strategies provided funds for habitat enhancement, preservation and monitoring, and sociological studies directed at assessing the impact of the project on fishermen and fisheries.

5 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

As described in Section 4, there has been a directed effort in recent years, at many levels of government (U.S. and abroad), to develop adequate and appropriate mitigation measures and BMPs to reduce and/or eliminate conflicts with fishermen and other user groups during offshore wind energy development. The mitigation measures and BMPs resulting from much of this effort have been based primarily on the opinions and evaluations of technical experts and/or regulatory personnel. The approach of this project was to solicit input and maritime experience from members of the fishing community likely to be affected by wind energy development on the U.S. OCS of the Atlantic Ocean, as well as regulators, wind energy lessees, and other interested stakeholders to provide a collaborative discussion opportunity from which BMPs and mitigation measures could be developed.

The following provides a summary of BOEM's previous efforts to develop mitigation measures for reducing conflict and the phases for development of an offshore wind facility. The mitigation measures and BMPs developed as a result of the workshops conducted during this study also are discussed. Some or all of these mitigation measures and BMPs may be used in the future within EISs or EAs during BOEM's NEPA review process and may be required of renewable energy lessees via lease stipulations and/or terms and conditions on the approval of project plans.

BOEM defines BMPs as planning measures, construction techniques, and operational procedures to reduce adverse impacts. Mitigation measures are project-specific, preventative, corrective, and/or compensatory actions to reduce or offset adverse impacts. BOEM's regulations (30 CFR 585 Subpart F) state that a lessee's plans must demonstrate uses of BMPs.

5.1 BOEM's Historical Approach to Mitigation Development

Historically, BOEM (formerly the Minerals Management Service [MMS]) has evaluated the impacts to OCS user groups from activities regulated by its various agency programs. In 1979 DOI established the Outer Continental Shelf Advisory Board following the requirements of the Federal Advisory Committee Act. The purpose of the Board as set out in the charter was to provide advice to the Secretary of the Interior, the Director of MMS, and other officers of MMS on activities (at that time oil and gas activities) on the OCS. The Board was made up of three elements: the Policy Committee, the Scientific Committee, and six Regional Technical Working Groups (RTWGs). For the Atlantic planning areas, the RTWGs were composed of energy industry representatives, fishery management council representatives, American Fisheries Society representatives, the National Marine Fisheries Service, and others. The RTWGs were used principally in developing scenarios, alternatives, and raising issues in EIS's as well as recommending studies. More recent examples of direct engagement with the fishing industry includes a 2003 study funded by MMS that evaluated the impacts of oil and gas industry activities on the drift gillnet fishery in Cook Inlet, Alaska (Petterson and Glazier 2004). This study sought input from gillnet fishermen and identified options that could prove useful in mitigating spatial conflicts between the two user groups. Similarly, MMS funded a study that evaluated the socioeconomic impacts of sand mining sites in both the U.S. and the U.K. (Tomlinson et al. 2007). The study looked at a range of issues relative to contemporary dredging operations that had the potential to impact commercial and recreational fisheries. It identified

and described these issues and suggested measures for mitigating potential and real conflict between offshore dredge contractors and fishermen who rely on shared waterways and resources for their livelihood. As opposed to the Cook Inlet study, the socioeconomic study for sand mining sites did not actively seek out ideas for mitigation from the fishing community. Another MMS-sponsored study in the Gulf of Mexico assessed the interactions between fishing activities and the deep-water OCS oil and gas industry (Continental Shelf Associates, Inc. 2002). The study suggested five measures for reducing conflict:

- **Produce a Guidebook**: The guidebook would contain information and graphics on offshore energy facilities (structures, vessels, and equipment used) and fishing equipment and practices (trawling, nets, and other equipment).

- **Improve Contingency Fund**: The study found that the availability of the NMFS contingency fund for fishermen impacted by the oil and gas industry was known by shrimpers but not by the longline fleet. Recommendations included providing information and filing paperwork in the guidebook.

- **Appoint a Fisheries Liaison Committee**: A committee consisting of industry representatives and independent parties was recommended to facilitate communication and mediate disputes between the fishing community and the energy industry.

- **Regulate Geophysical Surveys**: Provide notification of the intent to conduct geophysical surveys three to nine weeks prior to the survey. This requirement could be incorporated into stipulations for the official notice to lessees. The notice should be issued three weeks prior to the survey and include date, time, vessel contact information, and a nautical chart indicating the survey area with latitude and longitude. The survey may need to be conducted along alternating lanes where fishing gear has been cleared and to allow fishing in alternative lanes.

- **Improve Communication**: Vessel-to-vessel communication is typically by VHF radio; however, some barriers, including language and cooperation of vessel captains, can arise. The study recommended broader communication methods, as well as improvements in vessel-to-vessel communication (Continental Shelf Associates 2002).

BOEM also evaluated impacts from wind energy development and production on the OCS in the Final Programmatic Environmental Impact Statement (PEIS) for Alternative Energy Development and Production and Alternate Use Facilities on the Outer Continental Shelf (USDOI, MMS 2007). The PEIS reviewed all expected phases associated with wind energy development (e.g., technology testing, site characterization, construction, operation and decommissioning) and provided a short list of mitigation measures for reducing impacts to fisheries, including:

- Avoidance of sensitive fish habitats or high-use fishing areas;

- Providing for the review of planned activities by potentially affected fishing communities;
- Conducting noise-generating activities during closed fishing seasons/periods;
- The addition of lights and/or radar reflectors to increase avoidance ability;
- Providing procedures to reduce spills; and
- The burial of cables to prevent gear interactions.

The complete list of BMPs that were adopted as part of the record of decision for the 2007 PEIS is provided in Table 5-1. It is one of the goals of this report to further refine these best management practices.

Table 5-1
Current BOEM Best Management Practices

Phase	
Fish Resources and Essential Fish Habitat	
Site Assessment/ Characterization	Lessees and grantees shall conduct pre-siting surveys (may use existing data) to identify important, sensitive, and unique marine habitats in the vicinity of the projects and design the project to avoid, minimize, or otherwise mitigate adverse impacts to these habitats.
Construction	Lessees and grantees shall minimize construction activities that may impact anadromous fish during migration periods.
Construction, Operation	Lessees and grantees shall minimize seafloor disturbance during construction and installation of the facility and associated infrastructure.
Fisheries	
Site Assessment/ Characterization	Lessees and grantees shall work cooperatively with commercial and recreational fishing entities and interests to ensure that the construction and operation of a project will minimize potential conflicts with commercial and recreational fishing interests.
Site Assessment/ Characterization	Lessees and grantees shall review planned activities with potentially affected fishing organizations and port authorities to prevent unreasonable fishing gear conflicts. Lessees and grantees shall minimize conflict with commercial fishing activity and gear by notifying state and federal regional fishery management organizations and local fishing groups of the location and time frame of the project construction activities well in advance of mobilization with updates throughout the construction period.
Construction, Operation	Lessees and grantees shall use practices and operating procedures that reduce the likelihood of vessel accidents and fuel spills.
Construction, Operation	Lessees and grantees shall avoid or minimize impacts to the commercial fishing industry by marking applicable structures (e.g., wind turbines, wave generation structures) with U.S. Coast Guard-approved measures (such as lighting) to ensure safe vessel operation.
Construction, Operation	Lessees and grantees shall avoid or minimize impacts to the commercial fishing industry by burying cables, where practicable, to avoid conflict with fishing vessels and gear operation. If cables are buried, lessees and grantees shall inspect cable burial depth periodically during project operation to ensure that adequate coverage is maintained to avoid interference with fishing gear/activity.

Source: USDOI, MMS 2007.

In 2012, BOEM directed a study that evaluated the various space-use conflicts expected from OCS wind energy activities (Industrial Economics, Inc. 2012). A primary objective of the study

was to recommend measures for BOEM's consideration in order to avoid or mitigate conflicts between wind energy development and other ocean uses on the OCS. The study's findings suggested that the stakeholder engagement process (i.e., actions that occur well before any consideration of the need for avoidance or mitigation strategies) was very important and that the establishment of an effective communication and process platform would likely make the need for mitigation a less frequent occurrence and would facilitate quicker resolutions when mitigation became necessary and appropriate. Compensatory mitigation was noted in the 2012 study as a means to possibly reduce conflict between commercial fishermen and wind energy lessees (see Table 5-2).

Table 5-2
Potential Avoidance and Mitigation Strategies for Commercial Fishing [(a)]

Strategy	Description
Conflict Avoidance	Avoidance in commercial fisheries includes strategies such as avoiding negative impacts to habitats and resources, maintaining the ability to access/utilize fishing grounds, and preventing impacts to safety.
Communication/Stakeholder Engagement	Stakeholder engagement efforts must embrace differences in the needs of the communities. Communication during the construction, operation, and decommissioning phases of a renewable energy development project will be important in terms of warning fishermen of activities that could affect their operations. Participation in any planning or decision making process should be broad-based, with an emphasis on traditional users whose sometimes unique schedules should be accommodated.
Coastal and Marine Spatial Planning	Coastal and marine spatial planning identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives.
Impact Minimization through Design/Construction	The design and construction of offshore renewable energy projects can be accomplished in ways that will minimize disruption to other ocean users. For example, scheduling construction for times when fisheries are inactive.
Environmental Assessments	Environmental assessments can potentially yield a tremendous amount of fisheries-related information such as a project's capacity to function as an artificial reef, and the associated impacts; the effects of excluding or limiting fishing access within the vicinity of a project; changes in the water column due to noise and vibrations; and colonization by non-native species.
Mitigation Funds and Subsidies for Displaced/Impacted Users	Renewable energy projects may displace fisheries operations, requiring them to go around developments or steam to fishing grounds further away—both of which can cause fuel consumption to rise. Low interest loans or grants could be made available to the fleets for the specific purchase of additional or upgraded safety gear (e.g., life rafts, flares, lifejackets, and radar) or for vessel safety training programs. Financial assistance could be provided to design and test new gear.
On and Off-Site Stock Enhancement	Stock enhancement activities can include those intended to mitigate (1) impacts at the site of the renewable energy project and (2) impacts in other locations accessible to fishermen (e.g., crowding due to displacement of fishermen).
Research	Results from research opportunities could enhance fishing in sectors that absorb any displaced fishing effort that might result from the construction of offshore renewable energy facilities.

Table 5-2 Potential Avoidance and Mitigation Strategies for Commercial Fishing [(a)]

Strategy	Description
Facilities Improvements	In situations where ports are modified to support offshore renewable energy development, opportunities may exist to make port modifications (for example, with mitigation funds, but also with external funding) that also support other ocean users (e.g., new dockage, dredging projects, repair facilities, gear/fuel storage).
Fishing Effort Increases	If fishermen are displaced or significantly inconvenienced by the development of an offshore renewable energy project (e.g., being required to increase their travel time to fishing grounds in order to avoid a project area), they may benefit from increasing a quota or extending the season to provide a way to financially justify the extra effort needed to fish.
Fishing Area Re-Opening	Displaced areas could be off-set by opening previously closed fishing areas.
Fishing Ground Access Restrictions for the Public	A specific group of fishermen is given the right to fish in an area, while prohibiting others (including the public) from fishing at that location.
Access Allowed Within Facility Area	If an offshore energy facility is sited in an area of high commercial and recreational use, it may be feasible to permit access to vessels of a suitable size, draft, and use.
Vessel Routing Measures	A number of vessel routing measures could be required to improve the safety of navigation in areas where, among other things, freedom of vessel movement is inhibited by restrictive searoom and obstructions to navigation.
Safety Fairways	Offshore waters in high traffic areas can be designated as safety fairways to prohibit the placement of surface structures.
Buffer Zones Around Existing Uses	Buffer zones could be placed around existing uses such as shipping lanes, traffic separation schemes, fishing grounds, and pipes and cables.
Guard Ships	Consider the use of guard ships in areas of high traffic density. Displaced fishermen may be able to help fill this guard role.
Chart Updates to Reflect Changes Related to Safe Navigation	As changes are made to navigation, it is imperative that charts be updated to ensure safe passage in the vicinity of the offshore renewable energy projects.
Notice to Mariners	Radio Navigational Warnings and Notices to Airmen must be promulgated in advance of and during any offshore wind farm construction.
Mariner Education	Education for mariners travelling in the vicinity of offshore renewable energy projects should help ocean users identify and avoid hazards. Education efforts should cover the different hazards associated with each phase of a project, and may include guidance on how to operate safely given the hazards.
Power Cables Trenching/Burial	Power cables between wind turbines, between wind turbines and the transformer station, and between the transformer station and the shore should be sufficiently trenched to avoid exposure from scouring / sand migration or trawling activities.
Radar, Radio Navigation, and Radio Communication Interference Research	Wind energy projects have uncertain impacts on radar, radio navigation and radio communications. Efforts to evaluate those impacts on a site-by-site basis should be taken.
Post-Construction Obstruction Removal	Once a project is complete, the operator / contractor should remove all obstructions and return the sea floor to its pre-construction depth and topography.

(a) Source: Industrial Economics, Inc. 2012.

At the time of the writing of this report, BOEM has completed only one environmental assessment (in this case an EIS) for construction and operation of an offshore renewable energy facility (USDOI, MMS 2010). BOEM also has approved only one COP for the same project.

The project is located in Nantucket Sound offshore Massachusetts. Fishing mitigation measures required of the lessee, Cape Wind, LLC, include:

- Remediation for any impacted shellfish beds;
- Financial compensation to the State of Massachusetts for environmental impacts (including fishery impacts);
- In-water work prohibitions during winter flounder spawning periods;
- Cable burial;
- Fishermen notifications two weeks prior to commencement of activities; and
- Post-construction environmental monitoring requirements.

More recently, BOEM prepared EAs for commercial wind lease issuance and site assessment activities on the Atlantic OCS. One EA covered WEAs offshore New Jersey, Delaware, Maryland and Virginia (USDOI, BOEM 2012) and another covered WEAs offshore Rhode Island and Massachusetts (USDOI, BOEM 2013b). The EAs evaluated whether issuance of leases and approval of SAPs within the offshore WEAs of these states would have a significant effect on the environment and if an EIS was needed. BOEM prepared the EAs to inform decisions when issuing leases within these refined WEAs and to subsequently approve SAPs on those leases. The EAs addressed activities associated with lease site assessment including high-resolution geophysical surveys, sub-bottom sampling, benthic characterization, and archaeological and biological surveys. The EAs also included tasks related to meteorological tower construction, operation, and maintenance. For site characterization and site assessment activities, the primary mitigation measure noted for reducing impacts to commercial fishermen was a required notification via the United States Coast Guard's (USCG's) Local Notice to Mariners and daily broadcasts on Marine Channel 16.

5.2 Wind Energy Development Phases

Under the renewable energy regulations (30 CFR 585 et seq.), the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process. BOEM's wind energy regulatory program occurs in five distinct phases:

- **Planning and Analysis.** The first phase is to identify suitable areas to be considered for wind energy project leases through collaborative, consultative, and analytical processes using the state's intergovernmental renewable energy task forces, public information meetings, input from the states, Native American Tribes, and other stakeholders.

- **Lease Issuance.** The second phase is the issuance of a commercial wind energy lease. The competitive lease process is set forth at 30 CFR 585.210 to 585.225, and the noncompetitive process is set forth at 30 CFR 585.230 to 585.232. A commercial lease gives the lessee the exclusive right to subsequently seek BOEM approval for the development of the leasehold. The lease does not grant the lessee the right to construct any facilities; rather, the lease grants the right to use the leased area to develop its plans, which must be approved by BOEM before the lessee can move on to the next stage of the process (30 CFR 585.600 and 585.601).

- **Approval of a Site Assessment Plan (SAP).** The third stage of the process is the submission of a SAP, which contains the lessee's detailed proposal for the construction of a meteorological tower and/or the installation of meteorological buoys on the leasehold (30 CFR 585.605 to 585.618). The lessee's SAP must be approved by BOEM before it conducts these "site assessment" activities on the leasehold. BOEM may approve, approve with modification, or disapprove a lessee's SAP (30 CFR 585.613). This stage would be conducted over a five-year period.

- **Approval of a Construction and Operation Plan (COP).** The fourth stage of the process is the submission of a COP, a detailed plan for the construction and operation of a wind energy project on the lease (30 CFR 585.620 to 585.638). At this point, BOEM will typically conduct an environmental assessment pursuant to NEPA, the Endangered Species Act, and other statutes. BMPs and mitigation measures for construction and operations are identified in this phase. BOEM approval of a COP is a precondition to the construction of any wind energy facility on the OCS (30 CFR 585.628). As with a SAP, BOEM may approve, approve with modification, or disapprove a lessee's COP (30 CFR 585.628). Construction would take place of over multiple months and could be staged to occur over one or more years, depending on project specifics. Project operations could take place during the entire 25-year operations term of the lease or potentially longer if a lease subsequently is extended by BOEM by request of the lessee.

- **Decommissioning.** Submission and approval of a decommissioning application is required 2 years prior to the expiration of a lease or grant (30 CFR 585.905). Decommissioning would require the use of specialized vessels and equipment to remove the wind energy facilities and would likely take many months to complete. The application would include the decommissioning schedule, removal procedures, facilities or cables that would be removed and/or requested to be left in place, as well as mitigation measures to protect sensitive biological features and habitat during the removal process (30 CFR Part 585.906).

The discussions in Sections 5.2.1 through 5.2.5 note various activities associated with planning and analysis, site assessment and characterization, construction, operation and decommissioning phases that could result in impacts to fishermen and fisheries.

5.2.1 Phase 1: Planning and Analysis

This is a phase conducted by BOEM in coordination with the Intergovernmental Renewable Energy Task Forces and involves the early identification of potential wind energy areas as well as identifying and executing appropriate studies for the area. During this Planning and Analysis phase BOEM prepares notices for determining developer interest and nomination of potential lease blocks within the wind energy area. These notices also solicit public information, including information about fisheries that may occur in the wind energy area. A Notice of Intent for preparation of NEPA documentation is published and comments are sought and evaluated on

both environmental and socioeconomic factors considered in an EA or EIS. An important element of the NEPA analysis is the evaluation of potential impacts to fisheries and potential conflicts that may arise from multiple use of a WEA. During this early phase, BOEM can identify stakeholders and compile a list of concerns expected as a result of wind energy development. If an EA is prepared and finds that the proposed action described has no significant impacts, then BOEM will issue a FONSI. If the EA finds that potentially significant impacts could occur, BOEM then would prepare an EIS.

5.2.2 Phase 2: Site Assessment and Site Characterization

This phase includes very early offshore wind energy development efforts directed at assessing the wind resource (e.g., meteorological, or met, tower or buoy) and site characterization. Site characterization would involve conducting various geotechnical, geophysical, and other environmental surveys. Studies have shown that exposure to impulsive sound by airguns during sub-bottom profiling can decrease catch rates during trawling and longlining activities (Normandeau Associates, Inc. 2012). Vessel traffic associated with data collection and surveys and installation of any meteorological towers or other survey equipment would increase slightly over normal vessel traffic patterns, but the increase would be small and localized and would not likely affect commercial or recreational fishermen. Site characterization would inform the lessee not only about site selection for a met tower and/or met buoys, but would also aid in determining the configuration for their commercial operation. This includes determining the number of wind turbines, array design, and/or alignment of the wind turbines. Site characterization would also aid in the determination of cable routes and installation methods.

Site assessment would involve constructing a meteorological tower or deploying a meteorological buoy. Meteorological towers and buoys have a very small footprint and only one or two would be built in each lease area. If an offshore meteorological tower or wind turbine or other equipment was needed to characterize the wind energy site, some minor space-use conflicts could occur with commercial or recreational fisherman (USDOI, MMS 2007). Fishing vessels would be excluded from normal fishing areas within the footprint of the meteorological tower or buoy to reduce the potential for gear loss (USDOI, MMS 2007). A meteorological tower also could represent an additional navigation hazard, especially in adverse weather conditions; however, these structures would be lighted, would extend approximately 70 to 100 feet above the ocean surface, and would be equipped with radar reflectors to reduce potential navigational conflicts. Installation methods such as pile-driving could affect resident or passing biota, but only a relatively small area would be affected. The chance for hazardous material spills from vessels servicing a tower or buoy would be low; therefore, impacts to fishery resources from hazardous material spills would likely be low. The lessee would analyze impacts including fisheries associated with this phase in the SAP.

5.2.3 Phase 3: Construction

This phase includes all of the activities associated with construction of an offshore wind facility. This would include placement of offshore transmission lines using various bottom-intrusive techniques, the use of pile-driving equipment for wind energy equipment installation, the erection and installation of wind turbines, and any other similar construction efforts. Increased vessel traffic would occur during this time period, which would generally take from 12

to 24 months, depending on the location, local weather conditions, and size of the project, and might include not only increased vessel traffic across fishing grounds but concentration of vessels in the wind energy project area specifically. Temporary safety zones might be implemented in the area surrounding construction activities which could limit fishing access to these areas during construction. Pile driving and other surface to seabed activities such as cable-laying could generate noise, sediment suspension, and other impacts that could affect fishing and fish behavior. Construction and additional vessel traffic could result in increased potential for interaction with fishing vessels and would likely disturb fishery resources temporarily in areas where construction is occurring. Port congestion and traffic at fuel docks also could reduce fishing time opportunity (USDOI, MMS 2007). The possibility of fuel spills at ports would be increased, but impacts to fishery resources from fuel spills would likely be negligible (USDOI, MMS 2007).

5.2.4 Phase 4: Operations

This phase includes activities associated with operation and maintenance of an offshore wind energy facility. This would include limited, but periodic, vessel traffic to and from the wind facility for maintaining and servicing the wind turbines. This activity could cause short-term impacts to local fishery populations, such as space-use conflicts and a greater potential for fuel spills; however, multiple offshore wind foundations dispersed over large areas could act as artificial reefs that may enhance abundance and diversity of biota and habitat within the wind facility (USDOI, MMS 2007, Wilhelmsson et al. 2006). This could subsequently result in additional fishing opportunities around the wind turbine foundations. Studies have shown that although large-scale effects to fish diversity and abundance may not occur, the presence of multiple wind turbines can result in small-scale spatial changes in densities of fish associated with wind turbine foundations (Bergström et al. 2013). The occurrence of multiple platforms may result in gear loss for commercial fishing vessels and fishing may be excluded for some gear types based on a wind facility's arrangement. Undersea transmission cables could result in gear entanglement and loss if the cables become exposed or are buried at too shallow a depth, especially for bottom-towed gear such as trawls and dredges. The placement of towers in areas previously devoid of manmade structures could result in additional navigation hazards for both recreational and commercial fisherman. The possibility of fuel spills would increase slightly after the offshore wind facilities are built; however, vessel traffic associated with maintenance would be minimal. Any potential impacts to fishery resources from maintenance-related vessel traffic are not expected to be significantly greater than those anticipated during construction (USDOI, MMS 2007).

5.2.5 Phase 5: Decommissioning

This phase includes dismantling and removal of infrastructure from a wind energy facility, the removal of offshore transformers, the removal of undersea cables, and the shipment of these materials to shore for reuse or disposal (USDOI, MMS 2007). Platform pilings would be cut at a depth of approximately 15 feet below the ocean bottom surface. If explosives are required for removal of these pilings, there could be impacts to fishery resources. Increased vessel traffic would occur during this time period which could take from 6 to 12 months, or longer depending on local conditions. Removal of the foundations would likely reduce fishing opportunities that were present during the operations phase. Fishing activities would likely be restricted for short time periods in areas where decommissioning activities are occurring. Vessel activity during the

decommissioning phase would increase slightly over the operations phase, resulting in increased space-use conflicts and a greater potential for fuel spills; however, no significant impact to fishery resources from this impact is expected (USDOI, MMS 2007). After Phase 5 is complete, no further impacts to fishing activities would be expected.

5.3 Project-Developed Mitigation Measures and BMPs

Proposed mitigation measures and BMPs gathered from workshop participants were collated and categorized (see Appendix D). Suggestions ranged from general perspectives on offshore wind energy facilities planning and construction to detailed, issue-directed comments. General categories for comments received included the following:

- Wind facility size;
- Tower spacing and access route planning;
- Construction, operation, and decommissioning BMPs;
- Communication and the need for ongoing, effective engagement with the fishing community;
- Wind turbine lighting, markers, radio and radar and equipment location;
- Cable installation and monitoring;
- Fishery information and anti-degradation methods; and
- Non-fisheries enhancement / ad hoc topics.

A number of key suggestions associated with wind energy facility development emerged from the BOEM fishery workshops, including the following:

- Offshore wind facility project management should include involvement by local fisheries groups so that regional/area-specific concerns can be considered early in the process, during the planning and construction phases.
- Community involvement and clear, concise communication from lessees and regulators will result in an enhanced project development process.
- Establishing a neutral project-specific fisheries liaison with in-depth knowledge of and relationships with the fishing community would contribute to a successful and community-supported project.
- BMPs stipulated for construction, operation, and decommissioning phases should reflect project- and area-specific conditions and be practicable for reducing impacts to fisheries and fishermen.
- Cable installation plans and methods should be technically viable and comprehensive enough to reduce gear conflict to the greatest extent possible.
- Cable monitoring for verification that equipment stays buried should be required.
- Project plans should include fishery maintenance and enhancement techniques.

Based on information received during the eight outreach workshops, the following proposed mitigation measures and BMPs have been developed for reducing conflict with the fishing community during wind energy development on the Atlantic OCS. These mitigation measures and BMPs may be considered by BOEM for inclusion in future NEPA documents to eliminate and/or reduce future fisheries-related conflict during the assessment of a lessee's SAP, COP, or GAP.

BMP No. 1: Fisheries Community Outreach and Communication Program

The lessee should develop a local Fisheries Community Outreach and Communication Program. The objective of this effort is applicable and necessary throughout Phases 2 to 5, as described above: Site Assessment and Site Characterization; Construction; Operation; and Decommissioning, respectively. The program would include appointing at least two people: a fisheries liaison (FL) who works for the lessee, and a fisheries representative (FR) who may be funded by the lessee but is not directly employed by the lessee. The functions of the liaison and the representative would be communication planning, outreach meeting facilitation and support, and other tasks, as needed, for engaging and informing local fishermen during the various project phases. The lessee would develop a written Fisheries Community Outreach and Communication Plan (Plan) that outlines the specific methods and measures for engaging and disseminating project information to the local fishing community, as well as other stakeholders throughout each phase of the project. The Plan must provide for two-way communication, in addition to information sharing by the lessee or regulatory agencies. To the greatest extent possible, the Plan must seek to engage the various fishing constituencies within a project area (including local ports where major activity related to construction would take place and distant ports that harbor vessels that may fish in or near the project area) at all stages of development, so that the fishing community has an opportunity for meaningful input into the phases of development. The Plan should describe communication procedures for each of the project phases, or separate plans can be submitted before each phase begins. Elements of the Plan may include, but are not limited to:

- Hiring of a FL to serve as the lead public outreach representative from the lessee to the fishing industry. This person would be the lessee's interface with the public and the FR. This person should be able to communicate effectively with fishermen groups, and work to mitigate potential adverse project impacts by ensuring timely dissemination of information regarding all project activities, including projected vessel movements or delays. The FL would organize meetings, as necessary, in order to garner fishermen's views of project effects on their industry and navigational rights, and communicate fishermen concerns to management. The FL would work directly with one or several FRs who have specific knowledge and understanding of the local fishing communities' concerns. The FL would develop a stakeholders list, including relevant fishery community individuals, officials, and/or organizations for future communication efforts. The FL would coordinate daily information releases on relevant VHF and medium frequencies (MFs) concerning work vessels' schedules, vessels' identification, details of work to be performed and clearance warnings, as necessary. The FL also would advise fishermen/FR on removal of static gear when construction or operations could present a damage risk.

- The FR may be supported by the lessee or privately supported by fishing organizations, but should be identified and available throughout the planning

and construction phases of the project. The FR would be selected by members of the fishing community and would provide unbiased representation of the fishing community who has a stake in wind energy activities on the OCS. The FR would provide the lessee, via the FL, with guidance on fishing activity in the area and an understanding of particular fishing sensitivities. The FR would help the FL disseminate project information to his/her constituency and provide feedback to the FL regarding the success or failure of various best management practices and/or mitigation methods employed by the lessee. The FR must keep abreast of fishing activities by his/her constituents in the project area and communicate any conflicts to the FL immediately. The FR should promote safe fishing practices within the project area to his/her constituency. The FR would maintain a log of all contacts made with fishing vessels in the project area, along with the type of fishing being conducted and other details. The FR would provide regular reports to the lessee/FL and maintain confidentiality of all non-fishery-relevant project details. The FR would be unbiased with respect to claim of responsibility, or admission of fault, for fishing vessel claims that could occur.

- Communication methods and tools used by the FL and/or FR could include, but would not be limited to:
  - a project-sponsored 24-hour phone service for project information;
  - access of information via the internet, email/social media, and/or local or industry-specific newspapers/publications for disseminating project information;
  - activities designed to educate the public, with emphasis on fisherman and boaters education on construction issues and other alerts;
  - meetings or open houses held on a regular basis to keep the fishing industry abreast of current project status;
  - identification of specific methods for communicating with fishermen at sea;
  - development of a schedule for engagement of the community throughout the course of the project;
  - preparation of status reports for submittal to BOEM that provide information on outreach activities conducted and any significant events during a timeframe (e.g., may be quarterly, or by-project phase, or time period);
  - development of evaluation tools (e.g., questionnaire, web survey, phone survey, etc.) to determine if the Plan is effective; and
  - establishment of a process and approaches for fishermen dealing with gear loss or entanglement, including development of compensation formulas and/or other methods for assessing whether a lessee is liable for incurred damages.

BMP No. 2: Project Siting, Design, Navigation, and Access

BMP No. 2 would apply to all five phases described in Section 5.2: Planning and Analysis; Site Assessment and Site Characterization; Construction; Operation; and Decommissioning. Many of these measures have analogs in existing BOEM regulations for lessees found in 30 CFR Part 585. During the earliest planning stages of offshore wind facility development, the lessee will meet with local fisheries groups who are most likely to be affected by the project (see BMP No. 1) for input on the following:

- **Wind Facility Size, Spacing, and Access Route Planning**. Lessees will consider the following in their siting studies: fishing areas of importance; transit schemes; fishing gear clearance issues (e.g., trawlers and depth of buried cables); safety; likelihood for future wind development in the local area; or other pertinent issues that may evolve related to wind facility configuration and vessel transit. The overall goal of this effort will be a final wind facility development plan that reduces conflict with fisheries participants and other relevant OCS user groups. The lessee should, to the greatest extent possible, consider "micro-siting" choices such as modest changes to turbine locations to protect routes, fishing ledges, reefs, or other natural features conducive to fish congregation, breeding, rearing, and or juvenile activity. Micro-siting of individual wind turbines within an area known for historic select fishing efforts can prevent fishermen from being excluded from important fishing grounds. Also, early consideration of sites that have been shown to have lower fishing importance will likely result in less impacts to the fishing community.

- **Scour and Sedimentation**. The lessee will evaluate scour and sedimentation potential through a modeling effort. Subsequently, the lessee will work with BOEM to design a scour protection system that reduces impacts to sediment near the tower base and reduces vortices that could develop around unprotected structures. To meet both scour protection and fisheries enhancement goals, the lessee should consider opportunities to maximize fisheries value through design of tower bases and installation of scour protection material such that the design results in improved quality of fisheries habitat and preservation of ecological function.

- **Turbidity**. The lessee will use technology and construction methods (approved by BOEM in the COP) that minimize seabed disturbance and turbidity during construction, operation, and decommissioning (see 30 CFR Part 585.600).

- **Cable Route Planning, Installation, and Removal Techniques**. The lessee will obtain input from the fishing community on cable route selection and proposed installation and future removal methods. Additionally, as part of the lessee's COP or GAP, the lessee will provide a detailed analysis of cable

routing and installation methods for reducing conflict with OCS user groups. Information provided in project plans will address burial depth and monitoring methods and frequencies for reducing user group interactions. Planned cable corridors should reflect an understanding of local fishing attributes so that high-quality fishing areas are avoided to the greatest extent possible. Additionally, cable route planning should consider the underlying strata to ensure that trenching activities do not expose rocks or other material that could negatively impact trawling or other similar fishing activities. Also, proposed cable burial techniques should adhere to the most current technical methods for minimizing EMF.

- **Shoreside Facility Coordination**. The lessee will investigate, with the fishing communities, and ports more generally, any impacts to dock access, fuel access, and other activities that might interfere with fishing operations.

Some of the practices that may come out of the meetings and discussions described above are elaborated upon in BMPs 3-9 below.

BMP No. 3: Alternating/Rotating Construction Schedule

Adoption of this BMP would require the lessee to develop prior to construction, in consultation with fisheries representatives, a detailed publically available schedule that reduces conflict with fishing activity. The schedule will be maintained and updated as changes occur during the actual construction. The timing of construction should include consideration of the following:

- Fishing schedules,
- high-use fishing areas,
- seasonal species' distributions (i.e., spawning seasons), and
- current closure periods (e.g., specific days of the week closed to fishing and areas closed to fishing).

The schedule should include, as necessary, methods such as alternating construction sites or schedules to minimize impacts to fishermen and other OCS user groups. It is recognized that different gear types, species, and recreation and commercial fishing may have different and sometimes conflicting seasonal needs. In such cases, the lessee should work with all impacted fishing sectors to identify a construction schedule that minimizes impacts to all or most users, to the extent possible, and that avoids or minimizes conflict among user groups.

BMP No. 4: Safety

High safety standards are of the utmost importance to both lessees and fishermen. Therefore, BMP No. 4 applies to all five phases described in Section 5.2: Planning and Analysis; Site Assessment and Site Characterization; Construction; Operation; and Decommissioning.

Wind Facility Markings, Radio, Lighting and Safety Equipment. During the earliest planning stages of wind facility development, the lessee will meet with local fisheries groups (see BMP No. 1) who are most likely to be affected by wind facility development for input on wind turbine markings, radio communications, and lighting. All wind turbines should be equipped with the lighting (vessel and aircraft warning lights), marking, and other indicators required by the USCG and Federal Aviation Administration (FAA). Lessees will provide notice on each tower for communication (e.g., a dedicated VHF radio channel that provides information on the wind facility and its components or other methods). Lessees will also develop and coordinate with the USCG appropriate Notices to Mariners on wind facility operation and maintenance schedules. Also, radar beacons should be provided on facility peripheral towers so that mariners can easily distinguish the wind facility from other OCS structures. Tower lighting should adhere to current USCG and FAA requirements. BOEM (Orr et al. 2013) suggests several best practices for minimizing biological impacts from lighting of offshore wind facilities. The document also contains a summary of various lighting schemes for offshore wind facilities used around the world for both marine navigational lighting (MNL) and avian obstruction lighting (AOL). Details for MNL include the following:

- According to International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance, MNL should be installed on WTGs below the lowest point of the arc of the rotor blades and at a height above the highest astronomical tide (hat) of not less than 6 m (20 ft) or more than 15 m (49 ft).

IALA makes distinctions between specific structures when lighting an offshore wind facility (OWF):

- Special Peripheral Structure (SPS): a structure on corners or other significant locations of the OWF, representing locations where the shape of the OWF changes. The distance between SPSs should not normally exceed 5.5 kilometers (km) (3 nautical miles [nmi]). SPSs should be fitted with yellow MNL with a visible range of 9.3 km (5nmi) and synchronized to flash in unison to avoid confusion with other lighted aids to navigation that may be present in the area.

- Intermediate Peripheral Structure (IPS): structures on the periphery of an OWF other than SPSs. Not all peripheral structures are required to have lighting; however, selected IPSs should be fitted with yellow MNL with a visible range of not less than 3.7 km (2 nmi) and synchronized with other IPSs, to flash in unison with a characteristic distinctly different from MNL on

SPSs. The distance separating lighted IPSs or SPSs should not exceed 3.7 km (2 nmi).

- Inner Structures: structures located within the periphery of an OWF. MNL is not specifically required on structures interior of the marked outer perimeter of the OWF.

- Isolated Structures: a structure located separate from the defined periphery of the OWF (such as a meteorological tower/buoy or electrical service platform). Due to the increased danger posed by an isolated structure, isolated structures should be lit with a white light flashing Morse code "U" (▪ ▪ ▬) every 15 seconds.

- IALA recommends that as far as practicable, AOL fitted to the tops of WTGs should not be visible below the horizontal plane of these lights, so as not to conflict with MNL and confuse mariners.

  IALA suggests that authorities may permit a relaxation of the requirements for the number or intensity of the lights if the safety of navigation in the area can be secured without each of the structures being individually lit. If dedicated fishing corridors or transit ways are designed into a facilities plans, then MNL should be developed to clearly mark these corridors and differentiate them from some of the other lighting schemes described above. It should be noted that not all MNL schemes would be appropriate for each facility.

Safety Management System. BOEM regulations (30 CFR Part 585.810) require the lessee to submit a description of the Safety Management Plan with their SAP, COP, or GAP. The lessee will develop, with input from the fishing community, a safety management system (SMS). Under this BMP the SMS must include procedures for emergency events such as: collision of a vessel with a turbine structure, gear entanglement, or damage to cabling by fishing activity, catastrophic failure of a turbine, or other events. The SMS should include clear communication protocols including the fishing community and points of contact should an emergency arise. In addition to the requirements in 30 CFR Part 585.810 the following topics to include in the SMS regarding impacts to fishing activity are:

- **Situation and Planning Assumptions.** Provide a profile of the facility; identify potential hazards and their potential impacts on the facility; identify any planning assumptions upon which the plan is based.
- **Organization and Roles and Responsibilities.** Describe the emergency response organization; identify roles and responsibilities for individuals and agencies tasked with implementing the plan.

Supporting appendices may be included, as appropriate, to supplement the SMS including emergency contact lists, forms and templates, maps, etc.

BMP No. 5: Wind Facility Fishing Access

To avoid conflicts with fishermen, wind energy lessees should seek to maximize fishing access throughout all phases of offshore development: Site Assessment and Site Characterization; Construction; Operation; and Decommissioning. During the earliest planning stages of wind development, the lessee would meet with local fisheries groups (see BMP No. 1) who are most likely to be affected by offshore wind facilities development for input regarding access by fishermen. Additionally, the lessee will provide detailed guidelines on safe navigation within and through the project site during construction and operations. The lessee's COP would describe the possible use of exclusion zones, public mooring buoys expected, potential hazards to vessels and/or gear, and/or other pertinent information associated with use of OCS waters by local fishermen around and within an offshore wind facility. The lessee would work with the fishing community to determine the configuration of submarine cabling and foundation location/design relative to known adjacent fishing locations. The following are examples of fishing access mitigation measures:

- cabling could be oriented parallel to submarine dunes to the greatest extent practicable,
- cable crossings within a designated transit/fishing corridor should be minimized,
- turbine foundations should be set back a minimum of 100m from a known/utilized fishing feature (e.g. mud hole, hard bottom, etc.),
- public mooring buoys could be deployed and maintained by the lessee adjacent to particular foundations to facilitate fishing that would not potentially harm the lessee's facilities,
- establishment of clear visual indicators indicating dedicated transit and/or fishing locations within the facility.

BMP No. 6: Environmental Monitoring Plan

The lessee's COP must provide a detailed environmental monitoring plan per 30 CFR Part 585.626(b)(15) including the measures for incident reporting of any structural or environmental damage per 30 CFR 585.830. The plan should be detailed enough to easily convey the following:

- Procedures for monitoring following storm events, and routine inspections during of operation.
- Identification of when and where maintenance will take place and identification of any safety zones necessary during that work.
- As noted in BMP No. 1, the monitoring and maintenance plan should include procedures for communication with the fishing community during operation and maintenance activities.

This BMP is primarily applicable to the Construction, Operations, and Decommissioning phases of wind project development.

BMP No. 7: Financial Support for Gear Modification

The lessee would consider monetary support for gear conversion in order to develop or purchase "wind facility safe" fishing gear so that safe fishing operations can continue within an offshore wind facility. Because fishing gear can be a significant capital cost to fishermen, financial support will enable fishermen to continue fishing within the offshore wind facility after converting gear to meet the requirements of a particular fishery. The level of financial support would require detailed discussions between the impacted fishing community and the lessee. This BMP is primarily applicable to the operational phase of wind energy development.

BMP No. 8: Port or Shore-side Improvements

The lessee would consider monetary support for enhancing or improving fishing port or shore-side facilities associated with an offshore wind facility. Well-maintained port or shore-side facilities are important for the efficient and safe operation of every fishing vessel. Port facilities may include derricks, gear or fuel storage facilities, freezers, shelters, or other equipment. Shore-side efficiency likely could be improved with modification to facilities used by fishermen. This could result in reducing the length of the fishing day for fishermen and provide long-term benefits to local fishing communities. Any monetary support should consider the regional impact of siting an offshore wind facility, as well as the cost and complexity of improvements. Importantly, a key issue for undertaking this BMP would be an understanding that only a limited number of fishermen would likely benefit from a particular port improvement project. The level of financial support would require detailed discussions among the impacted fishing community, local governmental bodies and the lessee. This BMP is primarily applicable to the operational phase of wind energy development.

BMP No. 9: Measures to Offset Adverse Impacts

The lessee would consider measures that generate beneficial impacts to the fishing industry to offset any adverse impacts to affected fishing communities.

The lessee would consider procedures for handling compensation to fishermen for the loss or reduction of income to fishermen impacted by the lessee. The lessee would evaluate:

- Historical fishing activities on the proposed project sites;
- Temporal and areal restriction on fishing caused by the project;
- Amount of fishing that would continue on the site once it is constructed;
- Pressure on other fishing grounds by displaced fishermen;
- Types of fishing methods employed at the project site;
- Species of fish caught; and
- Estimated value of the catch from the project site.

This BMP would be applicable to the construction, operation, and decommissioning phases of wind energy development.

The lessee would consider monetary compensation measures such as:

- access enhancement (e.g. mooring buoys),
- cost reduction (e.g. fuel subsidy),
- seafood promotion efforts,
- permit and vessel buybacks,
- direct compensation,
- compensation through a fishing organization, and
- compensation through the state or municipal government.

Support for this measure would likely result in a future reduction of the losses incurred to fishermen impacted by offshore wind facility development. The overall goal of this measure is to enhance access to fisheries, reduce the costs associated with industry practices, promote local fisheries in order to improve profits of landings, increase product prices, and enhance the marketability of fish products. Additionally, a fuel purchase subsidy program could be established if fishermen become displaced and need to travel farther distances to fishing grounds. A vessel engine replacement program could provide for new, energy-efficient engines so that fishermen could lower costs and operate more safely. This would be important if offshore wind facility locations result in increased fuel costs from increased steaming time as fishermen avoid traveling through a wind facility. Also, funds could be available for updating safety equipment such as radar, GPS, life rafts, Emergency Position Indicating Radio Beacons, flotation suits, etc. This measure could address some of the safety concerns about operating around wind facilities.

The lessee would explore measures that could have a beneficial impact on fishing to offset any negative consequences. These measures could include enhancement of fishing in the offshore wind facility area and/or other nearby locations through measures such as the establishment of public mooring buoys, and turbine foundations designed to enhance fishery production.

The lessee would coordinate with the FR and engage the appropriate fisheries management council and the National Marine Fisheries Service regarding fishing effort reduction measures such as permit banking, and vessel and permit buyback programs.

All of the BMPs and mitigation measures presented here are recommendations from the literature search, stakeholder consultation, and the outreach workshops. Some could be required as lease conditions by BOEM, some are within the regulatory authority of other agencies (e.g., offshore structure marking, fishing effort reduction programs), and some are recommendations for offsetting any adverse impacts to the fishing industry and to enhance lessee interactions with fishing interests, while some are outside the authority of BOEM to require or enforce under current legislation.

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